FANUC Series 0*i*-MODEL F

OPERATION AND MAINTENANCE HANDBOOK

B-64607EN/01

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Further, re-export to another country may be subject to the license of the government of the country from where the product is re-exported. Furthermore, the product may also be controlled by re-export regulations of the United States government.
Should you wish to export or re-export these products, please contact FANUC for advice.

The products in this manual are manufactured under strict quality control. However, when some serious accidents or losses are predicted due to a failure of the product, make adequate consideration for safety.

In this manual we have tried as much as possible to describe all the various matters.
However, we cannot describe all the matters which must not be done, or which cannot be done, because there are so many possibilities.
Therefore, matters which are not especially described as possible in this manual should be regarded as "impossible".

This manual contains the program names or device names of other companies, some of which are registered trademarks of respective owners. However, these names are not followed by ® or ™ in the main body.

SAFETY PRECAUTIONS

This section describes the safety precautions related to the use of CNC units.

It is essential that these precautions be observed by users to ensure the safe operation of machines equipped with a CNC unit (all descriptions in this section assume this configuration). Note that some precautions are related only to specific functions, and thus may not be applicable to certain CNC units.

Users must also observe the safety precautions related to the machine, as described in the relevant manual supplied by the machine tool builder. Before attempting to operate the machine or create a program to control the operation of the machine, the operator must become fully familiar with the contents of this manual and relevant manual supplied by the machine tool builder.

DEFINITION OF WARNING, CAUTION, AND NOTE

This manual includes safety precautions for protecting the user and preventing damage to the machine. Precautions are classified into Warning and Caution according to their bearing on safety. Also, supplementary information is described as a Note. Read the Warning, Caution, and Note thoroughly before attempting to use the machine.

⚠ **WARNING**

Applied when there is a danger of the user being injured or when there is a danger of both the user being injured and the equipment being damaged if the approved procedure is not observed.

⚠ **CAUTION**

Applied when there is a danger of the equipment being damaged, if the approved procedure is not observed.

NOTE

The Note is used to indicate supplementary information other than Warning and Caution.

- Read this manual carefully, and store it in a safe place.

GENERAL WARNINGS AND CAUTIONS

⚠ **WARNING**

1 Never attempt to machine a workpiece without first checking the operation of the machine. Before starting a production run, ensure that the machine is operating correctly by performing a trial run using, for example, the single block, feedrate override, or machine lock function or by operating the machine with neither a tool nor workpiece mounted. Failure to confirm the correct operation of the machine may result in the machine behaving unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

2 Before operating the machine, thoroughly check the entered data. Operating the machine with incorrectly specified data may result in the machine behaving unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

3 Ensure that the specified feedrate is appropriate for the intended operation. Generally, for each machine, there is a maximum allowable feedrate. The appropriate feedrate varies with the intended operation. Refer to the manual provided with the machine to determine the maximum allowable feedrate.
If a machine is run at other than the correct speed, it may behave unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

4 When using a tool compensation function, thoroughly check the direction and amount of compensation. Operating the machine with incorrectly specified data may result in the machine behaving unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

5 The parameters for the CNC and PMC are factory-set. Usually, there is not need to change them. When, however, there is not alternative other than to change a parameter, ensure that you fully understand the function of the parameter before making any change.
Failure to set a parameter correctly may result in the machine behaving unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

⚠ **CAUTION**

1 Immediately after switching on the power, do not touch any of the keys on the MDI panel until the position display or alarm screen appears on the CNC unit.
Some of the keys on the MDI panel are dedicated to maintenance or other special operations. Pressing any of these keys may place the CNC unit in other than its normal state. Starting the machine in this state may cause it to behave unexpectedly.

2 The User’s Manual and programming manual supplied with a CNC unit provide an overall description of the machine's functions, including any optional functions. Note that the optional functions will vary from one machine model to another. Therefore, some functions described in the manuals may not actually be available for a particular model. Check the specification of the machine if in doubt.

3 Some functions may have been implemented at the request of the machine-tool builder. When using such functions, refer to the manual supplied by the machine-tool builder for details of their use and any related cautions.

4 The liquid-crystal display is manufactured with very precise fabrication technology. Some pixels may not be turned on or may remain on. This phenomenon is a common attribute of LCDs and is not a defect.

NOTE

Programs, parameters, and macro variables are stored in nonvolatile memory in the CNC unit. Usually, they are retained even if the power is turned off. Such data may be deleted inadvertently, however, or it may prove necessary to delete all data from nonvolatile memory as part of error recovery. To guard against the occurrence of the above, and assure quick restoration of deleted data, backup all vital data, and keep the backup copy in a safe place.

WARNINGS AND CAUTIONS RELATED TO PROGRAMMING

This section covers the major safety precautions related to programming. Before attempting to perform programming, read the supplied User's Manual carefully such that you are fully familiar with their contents.

⚠ **WARNING**

1 Coordinate system setting
If a coordinate system is established incorrectly, the machine may behave unexpectedly as a result of the program issuing an otherwise valid move command. Such an unexpected operation may damage the tool, the machine itself, the workpiece, or cause injury to the user.

2 Positioning by nonlinear interpolation
When performing positioning by nonlinear interpolation (positioning by nonlinear movement between the start and end points), the tool path must be carefully confirmed before performing programming. Positioning involves rapid traverse. If the tool collides with the workpiece, it may damage the tool, the machine itself, the workpiece, or cause injury to the user.

3 Function involving a rotary axis
When programming polar coordinate interpolation or normal-direction (perpendicular) control, pay careful attention to the speed of the rotary axis. Incorrect programming may result in the rotary axis speed becoming excessively high, such that centrifugal force causes the chuck to lose its grip on the workpiece if the latter is not mounted securely. Such mishap is likely to damage the tool, the machine itself, the workpiece, or cause injury to the user.

4 Inch/metric conversion
Switching between inch and metric inputs does not convert the measurement units of data such as the workpiece origin offset, parameter, and current position. Before starting the machine, therefore, determine which measurement units are being used. Attempting to perform an operation with invalid data specified may damage the tool, the machine itself, the workpiece, or cause injury to the user.

5 Constant surface speed control
When an axis subject to constant surface speed control approaches the origin of the workpiece coordinate system, the spindle speed may become excessively high. Therefore, it is necessary to specify a maximum allowable speed. Specifying the maximum allowable speed incorrectly may damage the tool, the machine itself, the workpiece, or cause injury to the user.

6 Stroke check
After switching on the power, perform a manual reference position return as required. Stroke check is not possible before manual reference position return is performed. Note that when stroke check is disabled, an alarm is not issued even if a stroke limit is exceeded, possibly damaging the tool, the machine itself, the workpiece, or causing injury to the user.

7 Interference check for each path (T series)
An interference check for each path is performed based on the tool data specified during automatic operation. If the tool specification does not match the tool actually being used, the interference check cannot be made correctly, possibly damaging the tool or the machine itself, or causing injury to the user. After switching on the power, or after selecting a tool post manually, always start automatic operation and specify the tool number of the tool to be used.

⚠ CAUTION

1 Absolute/incremental mode
If a program created with absolute values is run in incremental mode, or vice versa, the machine may behave unexpectedly.

2 Plane selection
If an incorrect plane is specified for circular interpolation, helical interpolation, or a canned cycle, the machine may behave unexpectedly. Refer to the descriptions of the respective functions for details.

3 Torque limit skip
Before attempting a torque limit skip, apply the torque limit. If a torque limit skip is specified without the torque limit actually being applied, a move command will be executed without performing a skip.

4 Programmable mirror image
Note that programmed operations vary considerably when a programmable mirror image is enabled.

5 Compensation function
If a command based on the machine coordinate system or a reference position return command is issued in compensation function mode, compensation is temporarily canceled, resulting in the unexpected behavior of the machine.
Before issuing any of the above commands, therefore, always cancel compensation function mode.

WARNINGS AND CAUTIONS RELATED TO HANDLING

This section presents safety precautions related to the handling of machine tools. Before attempting to operate your machine, read the supplied User’s Manual carefully, such that you are fully familiar with their contents.

⚠ **WARNING**

1 Manual operation
When operating the machine manually, determine the current position of the tool and workpiece, and ensure that the movement axis, direction, and feedrate have been specified correctly. Incorrect operation of the machine may damage the tool, the machine itself, the workpiece, or cause injury to the operator.

2 Manual reference position return
After switching on the power, perform manual reference position return as required.
If the machine is operated without first performing manual reference position return, it may behave unexpectedly. Stroke check is not possible before manual reference position return is performed.
An unexpected operation of the machine may damage the tool, the machine itself, the workpiece, or cause injury to the user.

3 Manual numeric command
When issuing a manual numeric command, determine the current position of the tool and workpiece, and ensure that the movement axis, direction, and command have been specified correctly, and that the entered values are valid.
Attempting to operate the machine with an invalid command specified may damage the tool, the machine itself, the workpiece, or cause injury to the operator.

4 Manual handle feed
In manual handle feed, rotating the handle with a large scale factor, such as 100, applied causes the tool and table to move rapidly. Careless handling may damage the tool and/or machine, or cause injury to the user.

5 Disabled override
If override is disabled (according to the specification in a macro variable) during threading, rigid tapping, or other tapping, the speed cannot be predicted, possibly damaging the tool, the machine itself, the workpiece, or causing injury to the operator.

6 Origin/preset operation
Basically, never attempt an origin/preset operation when the machine is operating under the control of a program. Otherwise, the machine may behave unexpectedly, possibly damaging the tool, the machine itself, the tool, or causing injury to the user.

7 Workpiece coordinate system shift
Manual intervention, machine lock, or mirror imaging may shift the workpiece coordinate system. Before attempting to operate the machine under the control of a program, confirm the coordinate system carefully.
If the machine is operated under the control of a program without making allowances for any shift in the workpiece coordinate system, the machine may behave unexpectedly, possibly damaging the tool, the machine itself, the workpiece, or causing injury to the operator.

8 Software operator's panel and menu switches
Using the software operator's panel and menu switches, in combination with the MDI panel, it is possible to specify operations not supported by the machine operator's panel, such as mode change, override value change, and jog feed commands.
Note, however, that if the MDI panel keys are operated inadvertently, the machine may behave unexpectedly, possibly damaging the tool, the machine itself, the workpiece, or causing injury to the user.

⚠ **WARNING**

9 RESET key
Pressing the RESET key stops the currently running program. As a result, the servo axes are stopped. However, the RESET key may fail to function for reasons such as an MDI panel problem. So, when the motors must be stopped, use the emergency stop button instead of the RESET key to ensure security.

⚠ **CAUTION**

1 Manual intervention
If manual intervention is performed during programmed operation of the machine, the tool path may vary when the machine is restarted. Before restarting the machine after manual intervention, therefore, confirm the settings of the manual absolute switches, parameters, and absolute/incremental command mode.

2 Feed hold, override, and single block
The feed hold, feedrate override, and single block functions can be disabled using custom macro system variable #3004. Be careful when operating the machine in this case.

3 Dry run
Usually, a dry run is used to confirm the operation of the machine. During a dry run, the machine operates at dry run speed, which differs from the corresponding programmed feedrate. Note that the dry run speed may sometimes be higher than the programmed feed rate.

4 Tool radius and tool nose radius compensation in MDI mode
Pay careful attention to a tool path specified by a command in MDI mode, because tool radius or tool nose radius compensation is not applied. When a command is entered from the MDI to interrupt in automatic operation in tool radius or tool nose radius compensation mode, pay particular attention to the tool path when automatic operation is subsequently resumed. Refer to the descriptions of the corresponding functions for details.

5 Program editing
If the machine is stopped, after which the machining program is edited (modification, insertion, or deletion), the machine may behave unexpectedly if machining is resumed under the control of that program. Basically, do not modify, insert, or delete commands from a machining program while it is in use.

WARNINGS RELATED TO DAILY MAINTENANCE

⚠ **WARNING**

1 Memory backup battery replacement
When replacing the memory backup batteries, keep the power to the machine (CNC) turned on, and apply an emergency stop to the machine. Because this work is performed with the power on and the cabinet open, only those personnel who have received approved safety and maintenance training may perform this work.
When replacing the batteries, be careful not to touch the high-voltage circuits (marked ⚠ and fitted with an insulating cover).
Touching the uncovered high-voltage circuits presents an extremely dangerous electric shock hazard.

NOTE

The CNC uses batteries to preserve the contents of its memory, because it must retain data such as programs, offsets, and parameters even while external power is not applied.
If the battery voltage drops, a low battery voltage alarm is displayed on the machine operator's panel or screen.
When a low battery voltage alarm is displayed, replace the batteries within a week. Otherwise, the contents of the CNC's memory will be lost.
Refer to the Section “Method of replacing battery” of the Part IV, “Maintenance” in the User’s Manual (Common to T/M series) for details of the battery replacement procedure.

⚠ **WARNING**

2 Absolute Pulsecoder battery replacement
When replacing the memory backup batteries, keep the power to the machine (CNC) turned on, and apply an emergency stop to the machine. Because this work is performed with the power on and the cabinet open, only those personnel who have received approved safety and maintenance training may perform this work.
When replacing the batteries, be careful not to touch the high-voltage circuits (marked ⚠ and fitted with an insulating cover).
Touching the uncovered high-voltage circuits presents an extremely dangerous electric shock hazard.

NOTE

The absolute Pulsecoder uses batteries to preserve its absolute position. If the battery voltage drops, a low battery voltage alarm is displayed on the machine operator's panel or screen.
When a low battery voltage alarm is displayed, replace the batteries within a week. Otherwise, the absolute position data held by the Pulsecoder will be lost.
Refer to the FANUC SERVO MOTOR αi series Maintenance Manual for details of the battery replacement procedure.

⚠ **WARNING**

3 Fuse replacement
Before replacing a blown fuse, however, it is necessary to locate and remove the cause of the blown fuse.
For this reason, only those personnel who have received approved safety and maintenance training may perform this work.
When replacing a fuse with the cabinet open, be careful not to touch the high-voltage circuits (marked ⚠ and fitted with an insulating cover).
Touching an uncovered high-voltage circuit presents an extremely dangerous electric shock hazard.

PREFACE

The Operation and Maintenance Handbook is for persons who are familiar with NC programs and operations. It is used to refer to necessary information quickly in operating or maintaining NC machine tools at a work site.
The Handbook only contains reference information. It does not contain other types of information, such as essential information or notes. Read the following manuals first.
The Handbook assumes that the reader is familiar with the information in the following manuals.
For information on safety precautions, be sure to read "SAFETY PRECAUTIONS" described on the first page of the manual.

(1) Applicable models

This manual describes the models indicated in the table below.
In the text, the abbreviations indicated below may be used.

Model name	Abbreviation		
FANUC Series 0*i*-TF	0*i*-TF	Series 0*i*-F	Series 0*i*
FANUC Series 0*i*-MF	0*i*-MF		

NOTE
1 For an explanatory purpose, the following descriptions may be used according to the types of path control used:
- 0i-TF : Lathe system (T series)
- 0i-MF : Machining center system (M series)

2 Some functions described in this manual may not be applied to some products. For details, refer to the DESCRIPTIONS (B-64602EN).

(2) Special symbols

This manual uses the following symbols:

- M

Indicates a description that is valid only for the machine center system (M series).
In a general description of the method of machining, a machining center system operation is identified by a phase such as "for milling machining".

- T

Indicates a description that is valid only for the lathe system (T series).
In a general description of the method of machining, a lathe system operation is identified by a phrase such as "for lathe cutting".

-

Indicates the end of a description of a system control type.
When a system control type mark mentioned above is not followed by this mark, the description of the system control type is assumed to continue until the next item or paragraph begins. In this case, the next item or paragraph provides a description common to the control types.

(3) Description of parameters

Parameters are classified by data type as follows:

Data type	Valid data range	Remarks
Bit	0 or 1	
Bit machine group		
Bit path		
Bit axis		
Bit spindle		
Byte	-128 to 127	Some parameters handle these types of data as unsigned data.
Byte machine group		
Byte path		
Byte axis		
Byte spindle		
Word	-32768 to 32767	Some parameters handle these types of data as unsigned data.
Word machine group		
Word path		
Word axis		
Word spindle		
2-word	0 to ±999999999	Some parameters handle these types of data as unsigned data.
2-word machine group		
2-word path		
2-word axis		
2-word spindle		
Real	See the standard parameter setting tables.	
Real machine group		
Real path		
Real axis		
Real spindle		

NOTE

1 Each of the parameters of the bit, bit machine group, bit path, bit axis, and bit spindle types consists of 8 bits for one data number (parameters with eight different meanings).
2 For machine group types, parameters corresponding to the maximum number of machine groups are present, so that independent data can be set for each machine group.
3 For path types, parameters corresponding to the maximum number of paths are present, so that independent data can be set for each path.
4 For axis types, parameters corresponding to the maximum number of control axes are present, so that independent data can be set for each control axis.
5 For spindle types, parameters corresponding to the maximum number of spindles are present, so that independent data can be set for each spindle axis.
6 The valid data range for each data type indicates a general range. The range varies according to the parameters. For the valid data range of a specific parameter, see the explanation of the parameter.

(4) Related manuals of Series 0*i*-MODEL F

The following table lists the manuals related to Series 0*i*-F

Manual name	Specification number
DESCRIPTIONS	B-64602EN
CONNECTION MANUAL (HARDWARE)	B-64603EN
CONNECTION MANUAL (FUNCTION)	B-64603EN-1
OPERATOR'S MANUAL (Common to Lathe System/Machining Center System)	B-64604EN
OPERATOR'S MANUAL (For Lathe System)	B-64604EN-1
OPERATOR'S MANUAL (For Machining Center System)	B-64604EN-2
MAINTENANCE MANUAL	B-64605EN
PARAMETER MANUAL	B-64610EN
Programming	
Macro Executor PROGRAMMING MANUAL	B-63943EN-2
Macro Compiler PROGRAMMING MANUAL	B-66263EN
C Language Executor PROGRAMMING MANUAL	B-63943EN-3
PMC	
PMC PROGRAMMING MANUAL	B-64513EN
Network	
PROFIBUS-DP Board CONNECTION MANUAL	B-63993EN
Industrial Ethernet CONNECTION MANUAL	B-64013EN
Fast Ethernet / Fast Data Server OPERATOR'S MANUAL	B-64014EN
DeviceNet Board CONNECTION MANUAL	B-64043EN
FL-net Board CONNECTION MANUAL	B-64163EN
CC-Link Board CONNECTION MANUAL	B-64463EN
Operation guidance function	
MANUAL GUIDE *i* (Common to Lathe System/Machining Center System) OPERATOR'S MANUAL	B-63874EN
MANUAL GUIDE *i* (For Machining Center System) OPERATOR'S MANUAL	B-63874EN-2
MANUAL GUIDE *i* Set-up Guidance OPERATOR'S MANUAL	B-63874EN-1
MANUAL GUIDE 0*i* OPERATOR'S MANUAL	B-64434EN
TURN MATE *i* OPERATOR'S MANUAL	B-64254EN
Dual Check Safety	
Dual Check Safety CONNECTION MANUAL	B-64483EN-2

(5) Related manuals of SERVO MOTOR α*i* series, SPINDLE MOTOR α*i* series, SERVO AMPLIFIER α*i*-B series

The following table lists the manuals related to SERVO MOTOR α*i* series, SPINDLE MOTOR α*i* series, and SERVO AMPLIFIER α*i* series.

Manual name	Specification number
FANUC AC SERVO MOTOR α*i*-B series FANUC AC SERVO MOTOR α*i* series DESCRIPTIONS	B-65262EN
FANUC AC SERVO MOTOR α*i* series FANUC AC SERVO MOTOR β*i* series FANUC LINEAR MOTOR L*i*S series FANUC SYNCHRONOUS BUILT-IN SERVO MOTOR D*i*S series PARAMETER MANUAL	B-65270EN
FANUC AC SPINDLE MOTOR α*i* series DESCRIPTIONS	B-65272EN
FANUC AC SPINDLE MOTOR α*i*/β*i* series BUILT-IN SPINDLE MOTOR B*i* series PARAMETER MANUAL	B-65280EN
FANUC SERVO AMPLIFIER α*i* series DESCRIPTIONS	B-65282EN
FANUC SERVO AMPLIFIER α*i*–B series DESCRIPTIONS	B-65412EN
FANUC AC SERVO MOTOR α*i* series FANUC AC SPINDLE MOTOR α*i* series FANUC SERVO AMPLIFIER α*i* series MAINTENANCE MANUAL	B-65285EN

Either of the following servo motors and the corresponding spindle can be connected to the CNC covered in this manual.
This manual mainly assumes that the FANUC SERVO MOTOR α*i* series of servo motor is used. For servo motor and spindle information, refer to the manuals for the servo motor and spindle that are actually connected.

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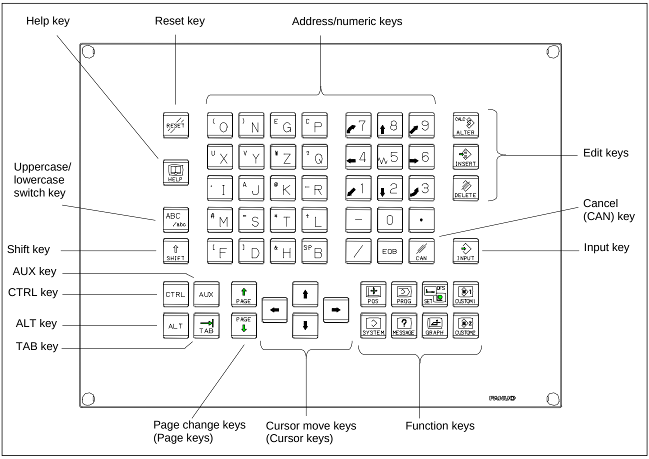
1 SCREEN DISPLAY AND OPERATION

1.1 SETTING AND DISPLAY UNITS

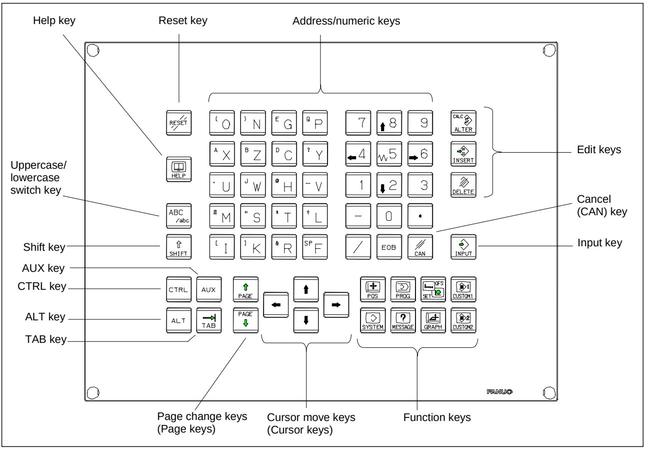
The MDI units are shown in below.

1.1.1 Standard MDI Unit (ONG Key)

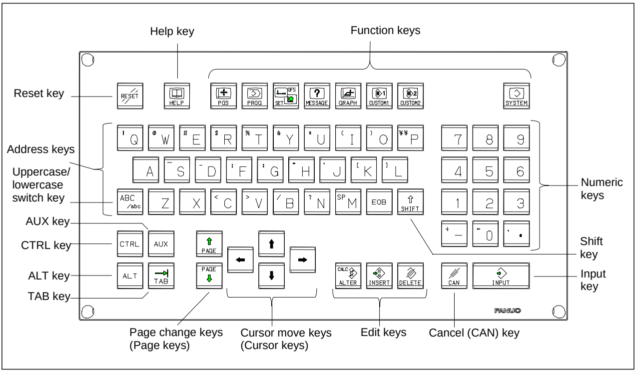
- Unit with machining center system



- Unit with lathe system

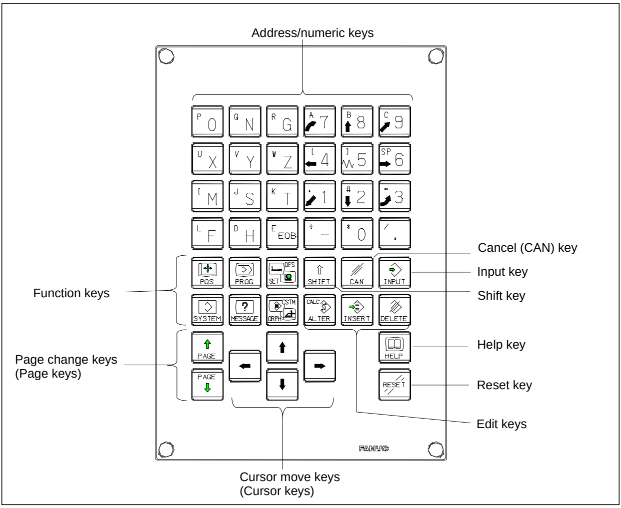


1.1.2 Standard MDI Unit (QWERTY Key)

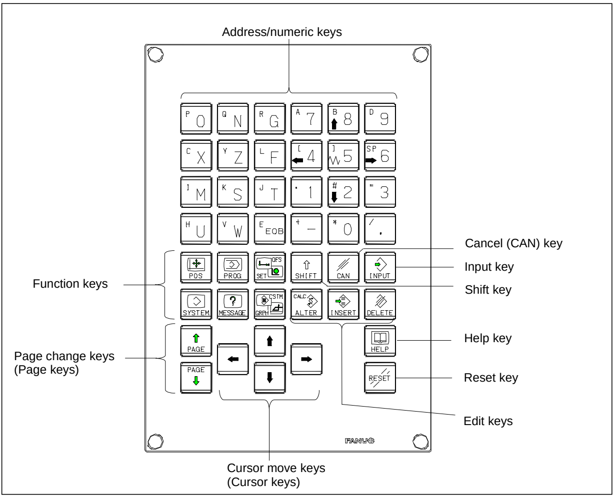


1.1.3 Small MDI Unit (ONG Key)

- Unit with machining center system



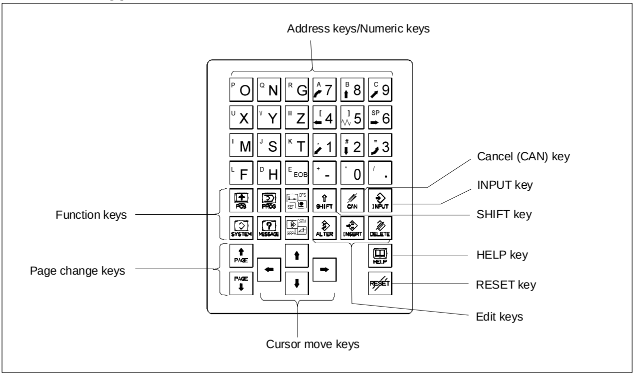
- Unit with lathe system



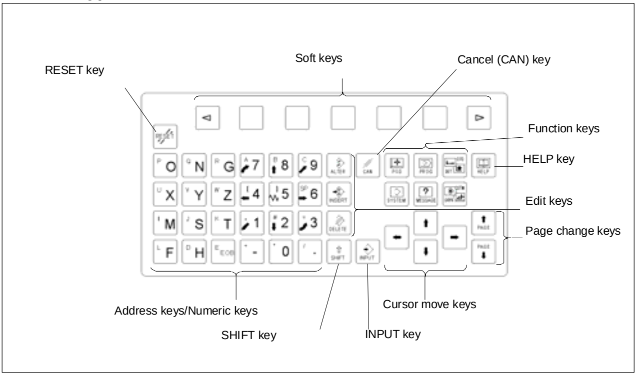
1.1.4 Horizontal / Vertical unit MDI key (ONG Key)

- For Machining center (M Series)

Horizontal type

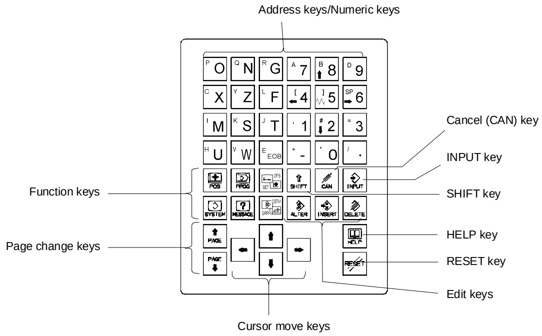


Vertical type

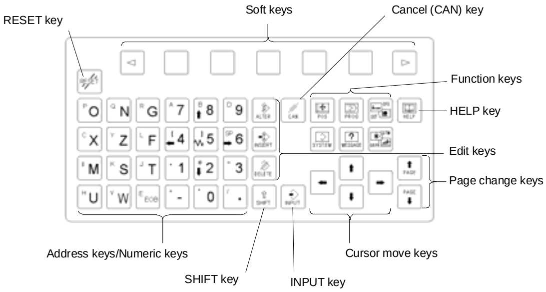


- For Lathe (T Series)

Horizontal type



Vertical type



1.1.5 Explanation of the MDI Unit

Table 1.1.5 Explanation of the MDI unit

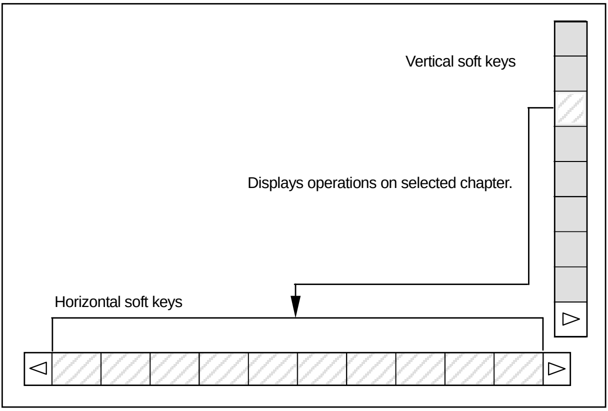
No.	Name	Explanation
1	Reset key RESET	Press this key to reset the CNC, to cancel an alarm, etc.
2	Help key HELP	Press this button to use the help function when uncertain about the operation of an MDI key (help function).
3	Soft keys	The soft keys have various functions, according to the Applications. The soft key functions are displayed on the display unit.
4	Address and numeric keys Q N [4	Press these keys to input alphabetic, numeric, and other characters.
5	Shift key SHIFT	Some keys have two characters on their keytop. Pressing the SHIFT key switches the characters. Special character ^ is displayed on the screen when a character indicated at the top left corner on the keytop can be entered.
6	Input key INPUT	When an address or a numerical key is pressed, the data is input to the buffer, and it is displayed on the screen. To copy the data in the key input buffer to the offset register, etc., press the INPUT key. This key is equivalent to the [INPUT] key of the soft keys, and either can be pressed to produce the same result. This key is also used to move to a folder on the program folder screen.
7	Cancel (CAN) key CAN	Press this key to delete the last character or symbol input to the key input buffer. Example) When the key input buffer displays > N001X100Z_ and the cancel key CAN is pressed, Z is canceled and >N001X100_ is displayed.
8	Edit keys CALC ALTER INSERT DELETE	Press these keys when editing the program. CALC ALTER : ALTER INSERT : INSERT DELETE : DELETE
9	Function keys POS PROG . . .	Press theses keys to switch display screens for each function. See Sections 1.3 to 1.8 for details of the function keys.

No.	Name	Explanation
10	Cursor move keys (Cursor keys) ↑ ← ↓ →	There are four different cursor move keys. → : This key is used to move the cursor to the right or in the forward direction. The cursor is moved in short units in the forward direction. ← : This key is used to move the cursor to the left or in the reverse direction. The cursor is moved in short units in the reverse direction. ↓ : This key is used to move the cursor in a downward or forward direction. The cursor is moved in large units in the forward direction. ↑ : This key is used to move the cursor in an upward or reverse direction. The cursor is moved in large units in the reverse direction.
11	Page change keys (Page keys) ↑ PAGE PAGE ↓	Two kinds of page change keys are described below. PAGE ↓ : This key is used to changeover the page on the screen in the forward direction. ↑ PAGE : This key is used to changeover the page on the screen in the reverse direction.
12	Uppercase/ lowercase switch key ABC /abc	Press this key to switch between uppercase and lowercase when entering alphabetic characters.
13	PC function key CTRL AUX ALT TAB	These keys are used with the personal computer function.

Explanation

- **15” LCD/MDI soft key configuration**

The 15” LCD panel has 12 soft keys horizontally and 9 soft keys vertically.
As shown below, the 8 vertical soft keys and the lowermost key are used as chapter selection soft keys. By pressing each of these keys, the screen (chapter) belonging to each function can be selected. The horizontal 12 soft keys are used to perform operations on the screen selected with a vertical soft key.
For an LCD display with a touch panel, touch a soft key on the screen to select it.



In this manual, the descriptions below assume a 10.4" LCD display panel with 12 soft keys.

- **Key operation with multi-path control**

In the multi-path control, be sure to select the tool post for which data is specified, using the path selection switch on the machine operator's panel. Then, perform MDI unit operation, such as displaying or specifying various data items, and editing a program.

1.2 FUNCTION KEYS AND SOFT KEYS

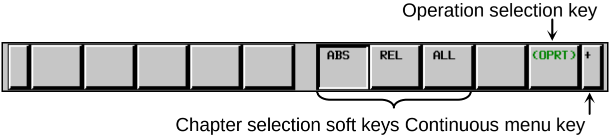
The function keys are used to select the type of screen (function) to be displayed. When a soft key (section select soft key) is pressed immediately after a function key, the screen (section) corresponding to the selected function can be selected.

1.2.1 General Screen Operations

- Procedure

1 By pressing a function key on the MDI unit, the chapter selection soft keys that belong to the function are displayed.

Example 1)

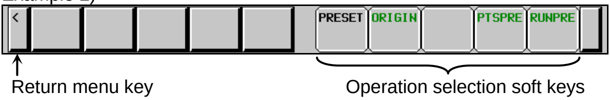


2 When one of the chapter selection soft keys is pressed, the screen of the chapter is displayed. If the soft key of a desired chapter is not displayed, press the continuous menu key.
In a chapter, a further choice may be made from multiple chapters.

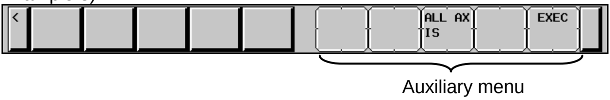
3 When the screen of a desired chapter is displayed, press the operation selection key to display operations to be performed.

4 Select a desired operation with the operation selection soft key.
Depending on the operation to be executed, an auxiliary menu of soft keys is displayed. Perform an operation according to the indications on the auxiliary menu.

Example 2)



Example 3)



5 To return to the display of chapter selection soft keys, press the return menu key.

A general screen display procedure is provided above.
The actual display procedure varies from one screen to another.
For details, see each description of operation.

Position display screen

The chapter selection soft keys that belong to the function key  and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	ABS	REL	ALL	HNDL	(OPRT)	+

	(6)	(7)	(8)	(9)	(10)	
Page 2	MONI	5AXMAN			(OPRT)	+

Table 1.2.1 (a) Position display screen

No.	Chapter menu	Description
(1)	ABS	Selects the absolute coordinate display screen.
(2)	REL	Selects the relative coordinate display screen.
(3)	ALL	Selects the overall coordinate display screen.
(4)	HNDL	Selects the operation screen for manual handle operation.
(6)	MONI	Selects the screen for displaying the servo axis load meter, serial spindle load meter, and speedometer.
(7)	5AXMAN	Displays a handle pulse interrupt amount in 3-dimensional manual feed.

Program screen

The chapter selection soft keys that belong to the function key  and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	PROGRA M	FOLDER	NEXT	CHECK	(OPRT)	+

	(6)	(7)	(8)	(9)	(10)	
Page 2	RSTR	JOG		ROBOT SELECT	(OPRT)	+

Table 1.2.1 (b) Program

No.	Chapter menu	Description
(1)	PROGRAM	Selects the screen for displaying and editing of contents of part programs currently registered.
(2)	FOLDER	Selects the screen for displaying a list of part programs currently registered.
(3)	NEXT	Selects the screen for displaying the command values of the block currently executed and the next block to be executed among the command values.
(4)	CHECK	Selects the screen for displaying programs, position data, modal information, and so forth simultaneously.
(6)	RSTR	Selects the operation screen for restarting an interrupted program operation.
(7)	JOG	Selects the screen for executing, in the JOG mode, data specified in the program format from the MDI.
(9)	ROBOT SELECT	Selects the screen for registering robot programs and part programs for the Robot connection function.

Offset/setting screen

The chapter selection soft keys that belong to the function key OFS SET and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	OFFSET	SETTING	WORK		(OPRT)	+
	(6)	(7)	(8)	(9)	(10)	
Page 2	MACRO		OPR	TOOL MANAGER	(OPRT)	+
	(11)	(12)	(13)	(14)	(15)	
Page 3	OFST.2	W.SHFT	GEOM.2		(OPRT)	+
	(16)	(17)	(18)	(19)	(20)	
Page 4		PR-LV			(OPRT)	+
	(21)	(22)	(23)	(24)	(25)	
Page 5	CHUCK TAIL	LANG.	PROTECT	GUARD	(OPRT)	+

Table 1.2.1 (c) Offset

No.	Chapter menu	Description
(1)	OFFSET	Selects the screen for setting tool offset values.
(2)	SETTING	Selects the screen for setting the setting parameters.
(3)	WORK	Selects the screen for setting a workpiece coordinate system offset.
(6)	MACRO	Selects the screen for setting macro variables.
(8)	OPR	Selects the screen for operating some operation switches on the machine operator's panel as soft switches.
(9)	TOOL MANAGER	Selects the screen for setting data related to tool management.
(11)	OFST.2	Selects the screen for setting a Y-axis offset.
(12)	W.SHFT	Selects the screen for setting a workpiece coordinate system shift value.
(13)	GEOM.2	Selects the screen for setting a second geometry offset.
(17)	PR-LV	Selects the screen for setting a precision level.
(21)	CHUCK TAIL	Selects the chuck tail stock barrier screen.
(22)	LANG.	Selects the screen for setting a display language.
(23)	PROTECT	Selects the screen for setting data protection.
(24)	GUARD	Selects the screen for setting wrong operation prevention.

System screen

The chapter selection soft keys that belong to the function key SYSTEM and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	PARAM	DGNOS	SERVO GUIDEM	SYSTEM	(OPRT)	+
	(6)	(7)	(8)	(9)	(10)	
Page 2	MEMORY	PITCH	SERVO PARAM	SP.SET	(OPRT)	+
	(11)	(12)	(13)	(14)	(15)	
Page 3	PMC MAINTE	PMC LADDER	PMC CONFIG		(OPRT)	+
	(16)	(17)	(18)	(19)	(20)	
Page 4	MCNG TUNING	ALL IO	ALL IO	OPEHIS	(OPRT)	+
	(21)	(22)	(23)	(24)	(25)	
Page 5	COLOR	MAINTE	M-INFO	W. DGNS	(OPRT)	+
	(26)	(27)	(28)	(29)	(30)	
Page 6		FSSB	PRMTUN	P.MATE MGR.	(OPRT)	+
	(31)	(32)	(33)	(34)	(35)	
Page 7	EMBED PORT	PCMCIA LAN	ETHER NET	PROFI MASTER	(OPRT)	+
	(36)	(37)	(38)	(39)	(40)	
Page 8	REMOTE DIAG	M CODE			(OPRT)	+
	(41)	(42)	(43)	(44)	(45)	
Page 9	PROFI SLAVE	DEVNET MASTER	FL-net 1CH	DEVNET SLAVE	(OPRT)	+
	(46)	(47)	(48)	(49)	(50)	
Page 10	DUAL CHECK	R.TIME MACRO			(OPRT)	+
	(51)	(52)	(53)	(54)	(55)	
Page 11	ID-INF				(OPRT)	+
	(56)	(57)	(58)	(59)	(60)	
Page 12	CCLink REMOTE	ROBOT STATUS	ROBOT CON.		(OPRT)	+
	(61)	(62)	(63)	(64)	(65)	
Page 13	USB	FL-net 2CH			(OPRT)	+

Table 1.2.1 (d) System

No.	Chapter menu	Description
(1)	PARAM	Selects the screen for setting parameters.
(2)	DGNOS	Selects the screen for displaying CNC state.
(3)	SERVO GUIDEM	Selects the screen for displaying the servo guide mate.
(4)	SYSTEM	Selects the screen for displaying the current system status.
(6)	MEMORY	Selects the screen for displaying the contents of memory.
(7)	PITCH	Selects the screen for setting pith error compensation.
(8)	SERVO PARAM	Selects the screen for setting the servo-related parameters.
(9)	SP.SET	Selects the screen for spindle-related setting.
(11)	PMC MAINTE	Selects the screen related to PMC maintenance such as PMC signal state monitoring and tracing, and PMC parameter display/editing.
(12)	PMC LADDER	Selects the screen related to ladder display/editing.
(13)	PMC CONFIG	Displays the screen for displaying/editing data other than ladders that makes up a sequence program and for setting the PMC function.
(16)	MCNG TUNING	Displays the screen for setting the parameter set for emphasis on speed (LV1) or emphasis on precision (LV10).
(17)	ALL IO	Selects the screen for data I/O.
(18)	ALL IO	Selects the screen for data input to and output from the memory card.
(19)	OPEHIS	Selects the screen for displaying the history of operations performed by the operator and issued alarms.
(21)	COLOR	Selects the screen for setting colors to be used on the screen.
(22)	MAINTE	Selects the screen for setting maintenance items to be managed periodically.
(23)	M-INFO	Selects the screen for displaying information about maintenance performed.
(24)	W.DGNS	Selects the screen for displaying data such as servo positional deviation values, torque values, machine signals, and so forth as graphs.
(27)	FSSB	Selects the screen for making settings related to the high-speed serial servo bus (FSSB: Fanuc Serial Servo Bus).
(28)	PRMTUN	Selects the screen for setting parameters necessary for start-up and tuning.
(29)	P.MATE MGR.	Selects the screen for displaying Power Mate CNC maneger.
(31)	EMBED PORT	Selects the screen for making settings related to the embedded Ethernet (embedded port).
(32)	PCMCIA LAN	Selects the screen for making settings related to the embedded Ethernet (PCMCIA Ethernet card).
(33)	ETHERNET	Selects the screen for making settings related to the fast Ethernet/fast data server.

No.	Chapter menu	Description
(34)	PROFI MASTER	Selects the screen for making settings related to the PROFIBUS master function.
(36)	REMOTE DIAG	Selects the screen for making settings related to the Machine Remote Diagnosis.
(37)	M CODE	Selects the screen for setting an M code group.
(41)	PROFI SLAVE	Selects the screen for making settings related to the PROFIBUS slave function.
(42)	DEVNET MASTER	Selects the screen for making settings related to the DeviceNet master function.
(43)	FL-net 1CH	Selects the screen for making settings related to the FL-net (port 1) function.
(44)	DEVNET SLAVE	Selects the screen for making settings related to the DeviceNet slave function.
(46)	DUAL CHECK	Selects the screen for displaying dual check safety diagnostic data.
(47)	R.TIME MACRO	Selects the screen for making settings related to the real-time custom macro function.
(51)	ID-INF	Selects the screen for displaying CNC ID information.
(56)	CCLink REMOTE	Selects the screen for making settings related to the CC-Link remote device function.
(57)	ROBOT STATUS	Selects the robot status screen for the Robot connection function.
(58)	ROBOT CON.	Selects the screen for making settings related to the Robot connection function.
(61)	USB	Selects the USB maintenance screen.
(62)	FL-net 2CH	Selects the screen for making settings related to the FL-net (port 2) function.

Message screen

The chapter selection soft keys that belong to the function key [MESSAGE] and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	ALARM	MSG	HISTRY	MSGHIS		+
	(6)	(7)	(8)	(9)	(10)	
Page 2	EMBED LOG	PCMCIA LOG	ETHER LOG	FL-net 1CH		+
	(11)	(12)	(13)	(14)	(15)	
Page 3		USB LOG	FL-net 2CH			+
	(16)	(17)	(18)	(19)	(20)	
Page 4	DNET M HISTRY	DNET S HISTRY				+

Table 1.2.1 (e) Message

No.	Chapter menu	Description
(1)	ALARM	Selects the alarm message screen.
(2)	MSG	Selects the operator message screen.
(3)	HISTRY	Selects the screen for displaying the details of alarms issued so far.
(4)	MSGHIS	Selects the external operator message screen.
(6)	EMBED LOG	Selects the screen for displaying error messages related to the embedded Ethernet (embedded port).
(7)	PCMCIA LOG	Selects the screen for displaying error messages related to the embedded Ethernet (PCMCIA Ethernet card).
(8)	ETHER LOG	Selects the screen for displaying error messages related to the fast Ethernet/fast data server.
(9)	FL-net 1CH	Selects the screen for displaying error messages related to the FL-net (port 1) function.
(12)	USB LOG	Selects the screen for displaying error messages related to the USB function.
(13)	FL-net 2CH	Selects the screen for displaying error messages related to the FL-net (port 2) function.
(16)	DNET M HISTRY	Selects the screen for displaying communication histories related to the DeviceNet master function.
(17)	DNET S HISTRY	Selects the screen for displaying communication histories related to the DeviceNet slave function.

Graphic screen

The chapter selection soft keys that belong to the function key [GRAPH] and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	PARAM	GRAPH			(OPRT)	+

Table 1.2.1 (f) Graphic

No.	Chapter menu	Description
(1)	PARAM	Selects the screen for setting graphic parameters.
(2)	GRAPH	Selects the screen for graphically displaying the tool path.

1

1.3 SCREENS DISPLAYED BY FUNCTION KEY POS

Press function key POS to display the current position of the tool.

The following three screens are used to display the current position of the tool:

- Current position display screen for the workpiece coordinate system.
- Current position display screen for the relative coordinate system.
- Current overall position display screen.

The above screens can also display the feedrate, run time, and the number of parts. In addition, a floating reference position can be set on these screens.

Function key POS can also be used to display the load on the servo motor and spindle motor and the rotation speed of the spindle motor (operating monitor display).

Function key POS can also be used to display the screen for displaying the distance moved by handle interruption. See Subsection, "Handle Interrupt Display" for details on this screen.

1.3.1 Position Display in the Workpiece Coordinate System

Displays the current position of the tool in the workpiece coordinate system. The current position changes as the tool moves. The least input increment is used as the unit for numeric values. The title at the top of the screen indicates that absolute coordinates are used.

Display procedure for the current position screen in the workpiece coordinate

Procedure

1 Press function key POS.

2 Press soft key [ABS].

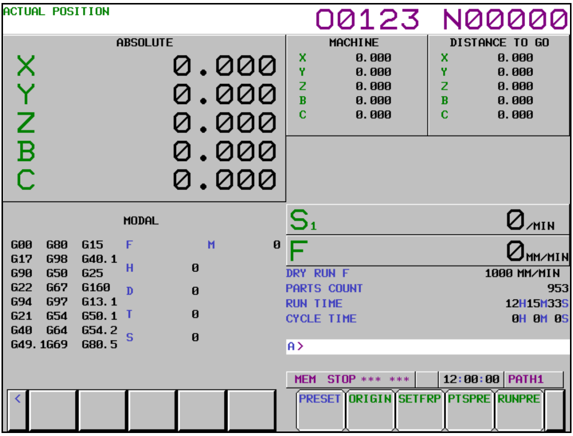


Fig. 1.3.1 (a) Current position (absolute) screen (M series)

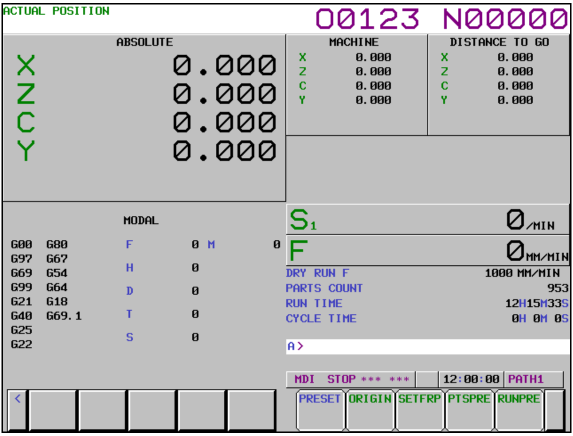


Fig. 1.3.1 (b) Current position (absolute) screen (T series)

Explanation

- Display including compensation values

M

Bits 6 (DAL) and 7 (DAC) of parameter No.3104 can be used to select whether the displayed values include tool length compensation and tool radius compensation.

T

Bit 1 (DAP) of parameter No.3129 and bit 7 (DAC) of parameter No.3104 can be used to select whether the displayed values include tool offset and tool nose radius compensation.

1.3.2 Position Display in the Relative Coordinate System

Displays the current position of the tool in a relative coordinate system based on the coordinates (see Explanation) set by the operator. The current position changes as the tool moves. The increment system is used as the unit for numeric values.
The title at the top of the screen indicates that relative coordinates are used.

Display procedure for the current position screen with the relative coordinate system

---

Procedure

1 Press function key [POS].

2 Press soft key [REL].

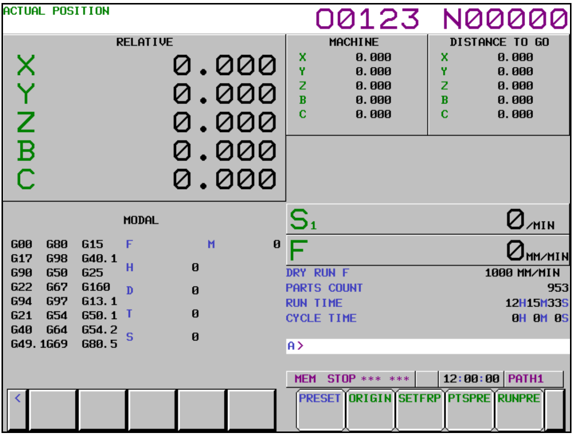


Fig. 1.3.2 (a) Current position (relative) screen (M series)

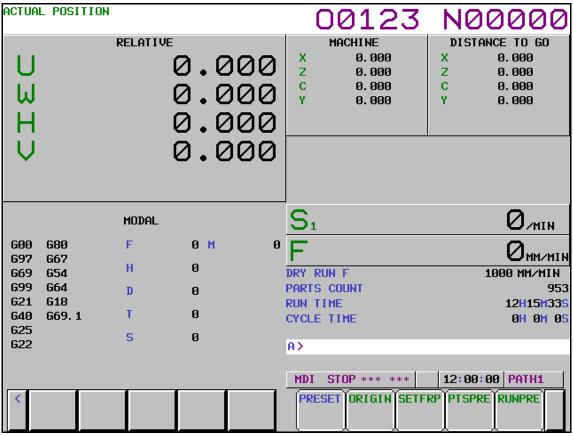


Fig. 1.3.2 (b) Current position (relative) screen (T series)

See Explanation for the procedure for setting the coordinates.

Explanation

- **Setting the relative coordinates**

The current position of the tool in the relative coordinate system can be reset to 0 or preset to a specified value as follows:

Procedure to set the axis coordinate to a specified value

Procedure

1 To reset the coordinate to 0, press soft key [ORIGIN].
Key in an axis name to be reset (such as X or Y), then press soft key [EXEC].

2 For presetting to a specified value, key in an axis name to be preset and a preset value (such as X100.000), then press soft key [PRESET].

- **Display including compensation values**

M

Bits 4 (DRL) and 5 (DRC) of parameter No.3104 can be used to select whether the displayed values include tool length compensation and tool radius compensation.

T

Bit 0 (DRP) of parameter No.3129 and bit 5 (DRC) of parameter No.3104 can be used to select whether the displayed values include tool offset and tool nose radius compensation.

- **Presetting by setting a coordinate system**

M

Bit 3 (PPD) of parameter No.3104 can be used to specify whether the position indication values in the absolute coordinate system are preset as those in the relative coordinate system during coordinate system setting or manual reference position return by the G92 command.

T

Bit 3 (PPD) of parameter No.3104 can be used to specify whether the position indication values in the absolute coordinate system are preset as those in the relative coordinate system during coordinate system setting or manual reference position return by the G50 command (for G code system A) or G92 command (for G code system B or C).

1.3.3 Overall Position Display

Displays the following positions on a screen: Current positions of the tool in the workpiece coordinate system, relative coordinate system, and machine coordinate system, and the remaining distance. The relative coordinates can also be set on this screen. See Subsection, “Position Display in the Relative Coordinate System” for the procedure.

Procedure for displaying overall position display screen

Procedure

1 Press function key .

2 Press soft key [ALL].

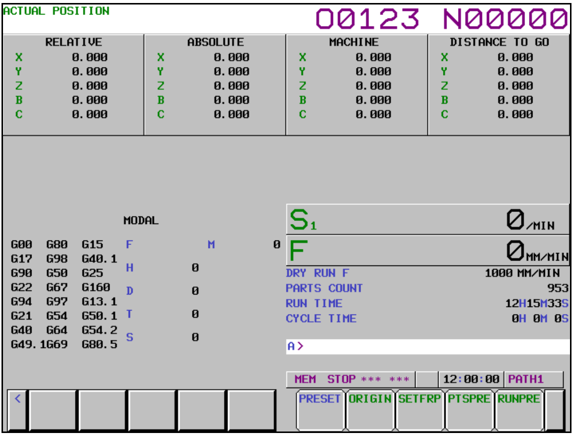


Fig. 1.3.3 (a) Current position (overall) screen (M series)

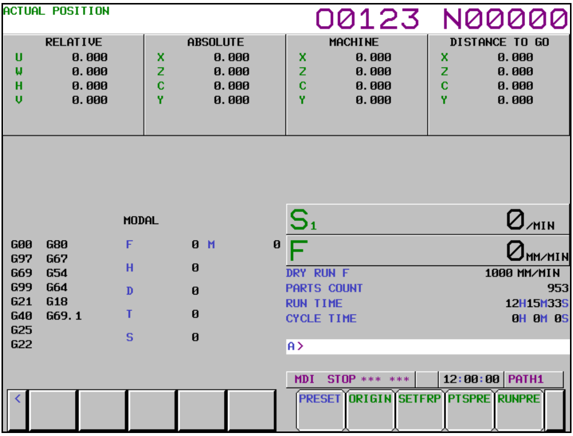


Fig. 1.3.3 (b) Current position (overall) screen (T series)

Explanation

- **Coordinate display**

  The current positions of the tool in the following coordinate systems are displayed at the same time:
  - Current position in the relative coordinate system (relative coordinate)
  - Current position in the workpiece coordinate system (absolute coordinate)
  - Current position in the machine coordinate system (machine coordinate)
  - Distance to go (distance to go)

- **Distance to go**

  The distance remaining is displayed in the MEM or MDI mode. The distance the tool is yet to be moved in the current block is displayed.

- **Machine coordinate system**

  The least command increment is used as the unit for values displayed in the machine coordinate system. However, the least input increment can be used by setting bit 0 (MCN) of parameter No.3104.

- **Resetting the relative coordinates**

  The total position display screen also supports the resetting of the relative coordinates to 0 or presetting of them to specified values. See the procedure for resetting the relative coordinates described in Subsection, “Position Display in the Relative Coordinate System”.

1.3.4 Handle Interrupt Display

Displays the distance traveled due to a handle interrupt.
The distance is displayed as four types of data, input unit, output unit, relative coordinates, and remaining distance to go, at the same time.

Procedure for displaying manual handle interruption screen

Procedure

1 Press function key 

.
2 Press soft key [HANDLE].

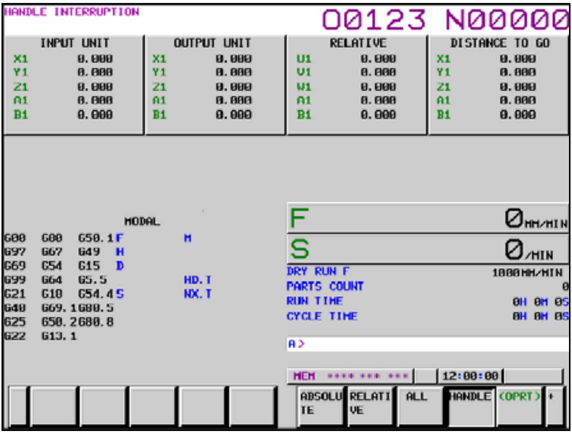


Fig. 1.3.4 Manual handle interruption screen

Explanation

- **Data to be displayed**

  The following types of data are displayed at the same time:
  - Distance traveled due to a handle interrupt in input units (input unit)
  - Distance traveled due to a handle interrupt in output units (output unit)
  - Position in relative coordinates (relative coordinates)
  - Remaining distance to go in the current block (remaining distance to go)

- **Input unit**

  The distance traveled due to a handle interrupt is displayed in the least input increment.

- **Output unit**

  The distance traveled due to a handle interrupt is displayed in the least command increment.

- **Relative coordinates**

  Not related to the distance traveled due to a handle interrupt.

- **Distance to go**

  Not related to the distance traveled due to a handle interrupt.
  The distance traveled due to a handle interrupt is cleared upon completion of the manual reference position return for each axis.

- **Display for five or more axes**

  The display on a system with five or more axes is the same as the overall position display.

1.3.5 Operating Monitor Display

The reading on the load meter can be displayed for each servo axis and the serial spindle by setting bit 5 (OPM) of parameter No.3111 to 1. The reading on the speedometer can also be displayed for the serial spindle.

Procedure for displaying the operating monitor

Procedure

1 Press function key 

.

2 Press the continuous menu key .

3 Press soft key [MONITOR].

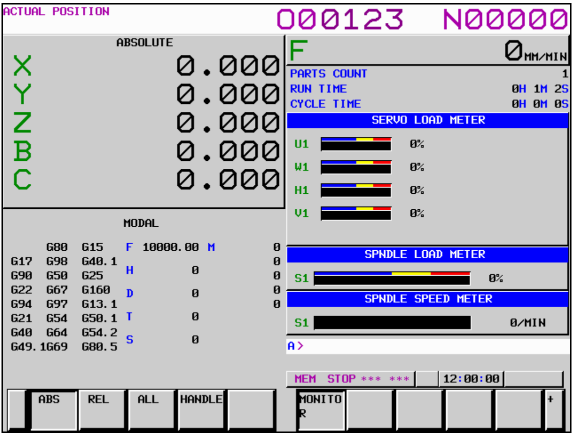


Fig. 1.3.5 (a) Operating monitor (M series)

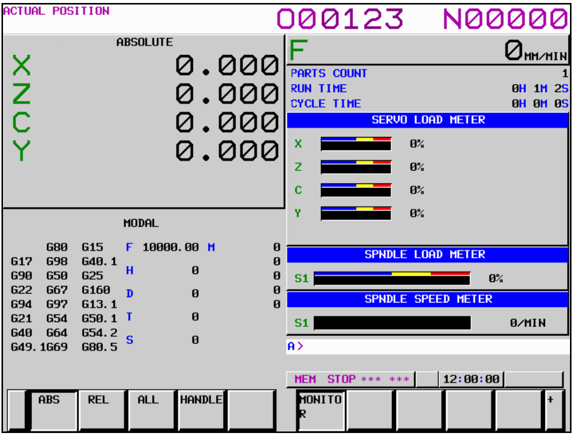


Fig. 1.3.5 (b) Operating monitor (T series)

Explanation

- **Display of the servo axes**

Servo axis load meters as many as the maximum number of controlled axes of the path can be displayed. One screen displays load meters for up to five axes at a time. By pressing the [MONITOR] soft key, load meters for the 6th axis and up are displayed.

- **Display of the spindle axes**

When serial spindles are used, the reading on the load meter and speedometer can be displayed only for the main serial spindle.

- **Unit of graph**

The bar graph for the load meter shows load up to 200% (only a value is displayed for load exceeding 200%). The bar graph for the speedometer shows the ratio of the current spindle speed to the maximum spindle speed (100%).

- **Load meter**

The reading on the load meter depends on servo parameter No.2086 and spindle parameter No.4127.

- **Speedometer**

Although the speedometer normally indicates the speed of the spindle motor, it can also be used to indicate the speed of the spindle by setting bit 6 (OPS) of parameter No.3111 to 1.
The spindle speed to be displayed during operation monitoring is calculated from the speed of the spindle motor (see the formula below). The spindle speed can therefore be displayed, during operation monitoring, even when no position coder is used. To display the correct spindle speed, however, the maximum spindle speed for each gear (spindle speed at each gear ratio when the spindle motor rotates at the maximum speed) must be set in parameters Nos. 3741 to 3744.
The input of the clutch/gear signals CTH1A, CTH2A<Gn070.3, Gn070.2> for the first serial spindle is used to determine the gear which is currently selected. Control the input of the CTH1A and CTH2A signals according to the gear selection, by referring to the table below.
(Formula for calculating the spindle speed to be displayed)

$$\text{Spindle speed displayed during operation monitoring} = \frac{\text{Speed of spindle motor}}{\text{Maximum speed of spindle motor}} \times \text{Maximum spindle speed with the gear being used}$$

The following table lists the correspondence between clutch/gear signals CTH1A and CTH2A, used to determine the gear being used, and parameters:

CTH1A	CTH2A	Parameter	Serial spindle specification
0	0	=No.3741 (Maximum spindle speed with gear 1)	HIGH
0	1	=No.3742 (Maximum spindle speed with gear 2)	MEDIUM HIGH
1	0	=No.3743 (Maximum spindle speed with gear 3)	MEDIUM LOW
1	1	=No.3744 (Maximum spindle speed with gear 4)	LOW

The speed of the spindle motor and spindle can be displayed, during operation monitoring, only for the first serial spindle and the spindle switching axis for the first serial spindle. It cannot be displayed for the second spindle.

- **Color of graph**

If the value of a load meter exceeds 100%, the bar graph turns purple on a color LCD.

1.4 SCREENS DISPLAYED BY FUNCTION KEY PROG (MEM MODE)

This section describes the screens displayed by pressing function key PROG. The screens include a program editing screen, program folder list display screen, and screens for displaying the command states of the program currently being executed.

1. Program screen
2. Program folder screen
3. Next block display screen
4. Program check screen

On the program screen, you edit the program that is currently selected, and display the block that is currently executed during program operation. In MDI mode, you also edit an MDI operation program, and display the block that is currently executed.

1.4.1 Program Contents Display

Displays the program currently being executed in MEM mode.

Displaying the program being executed

Procedure

1 Press function key PROG to display the program screen.

2 Press chapter selection soft key [PROGRAM].
The cursor is positioned at the block currently being executed.

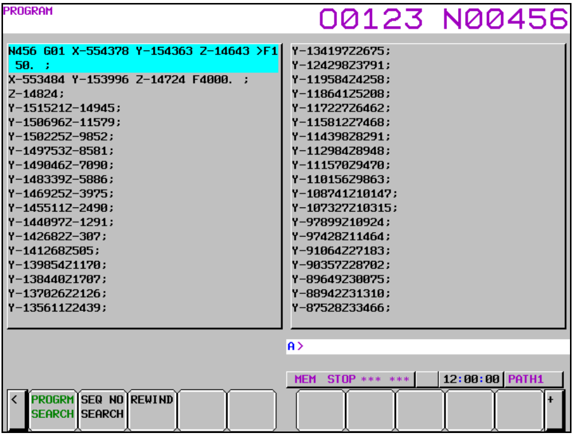


Fig. 1.4.1 Screen for displaying the program being executed

1.4.2 Program Check Screen

Displays the program currently being executed, current position of the tool, and modal data.

Procedure for displaying the program check screen

Procedure

1 Press function key .

2 Press chapter selection soft key [CHECK].
The program currently being executed, current position of the tool, and modal data are displayed.

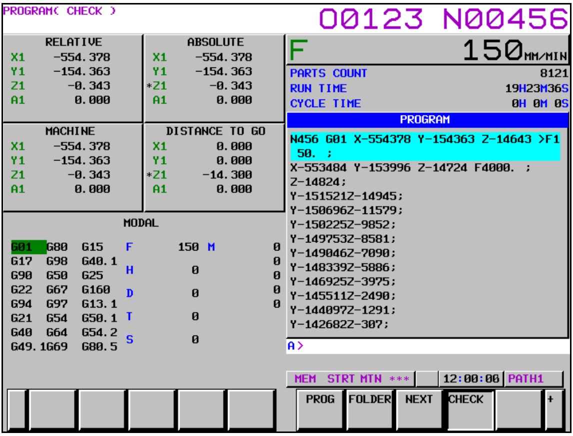


Fig. 1.4.2 Program check screen

Explanation

- **Program display**
The program currently being executed is displayed.
The block being executed is displayed in reverse video.

- **Current position display**
The current position in the relative coordinate system, workpiece coordinate system, and machine coordinate system, and the remaining amount of travel are displayed.

- **Modal G codes**
Up to 24 modal G codes are displayed.

1.4.3 Next Block Display Screen

Displays the block currently being executed and the block to be executed next.

Procedure for displaying the next block display screen

Procedure

1 Press function key 

.

2 Press chapter selection soft key [NEXT].
The G codes, addresses, command values specified in the block currently being executed and the next block are displayed.

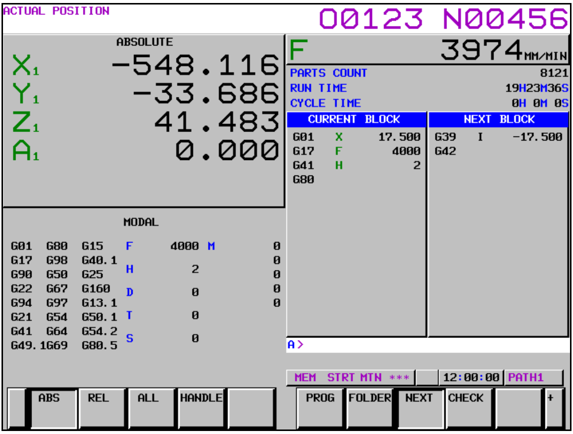


Fig. 1.4.3 Next block display screen

1.5 SCREENS DISPLAYED BY FUNCTION KEY (EDIT MODE)

This section describes the screens displayed by pressing function key PROG. The screens include a program editing screen, program folder list display screen, and screens for displaying the command states of the program currently being executed.

1. Program screen
2. Program folder screen
3. Next block display screen
4. Program check screen

On the program screen, you edit the program that is currently selected, and display the block that is currently executed during program operation. In MDI mode, you also edit an MDI operation program, and display the block that is currently executed.

1.5.1 Editing a Program

A program can be edited in the EDIT mode.
Two modes of editing are available. One mode is word editing, which performs word-by-word editing. The other is character editing, which performs character-by-character editing. For program creation and editing operation, see Chapters, "Creating Programs" and "Editing Programs" in the Operator’s Manual (Common to Lathe System/Machining Center System)”.

Displaying the program editing screen

Procedure

1 Press function key PROG to display the program screen.

2 Press chapter selection soft key [PROGRAM].

- **Word editing**

Editing operations such as text insertion, modification, and deletion, and cursor movements are performed on a word-by-word basis.

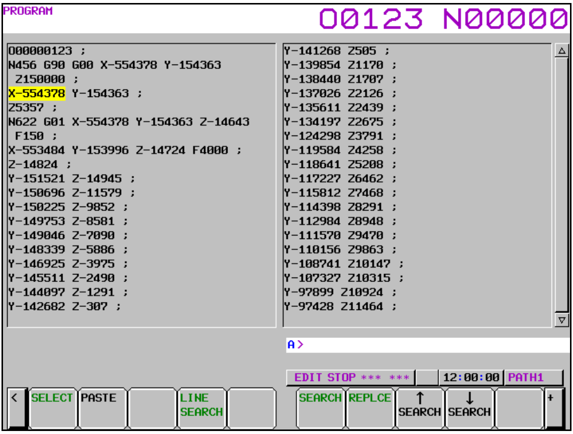


Fig. 1.5.1 (a) Program word editing screen

- **Character editing**

Program editing operations and cursor movements are performed on a character-by-character basis as with a general text editor.
Text is input directly to the cursor position instead of using the key input buffer.

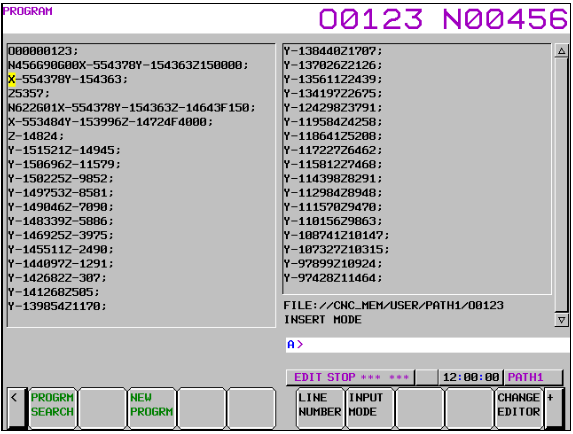


Fig. 1.5.1 (b) Program character editing screen

Switching between program editing modes

You can switch between word editing and character editing with soft keys.

Procedure

1 Press function key  to display the program screen.

2 Press chapter selection soft key [PROGRAM].
3 Press operation soft key [(OPRT)].
4 Pressing the [CHANGE EDITOR] operation soft key switches the editing mode between word editing and character editing.

1.5.2 Program Folder Screen

A list of programs registered in the program memory is displayed.
For the program folder screen, see Chapter, "Program Management" in the Operator’s Manual (Common to Lathe System/Machining Center System)”.

Displaying the program folder screen

Procedure

1 Press function key .

2 Press chapter selection soft key [FOLDER].

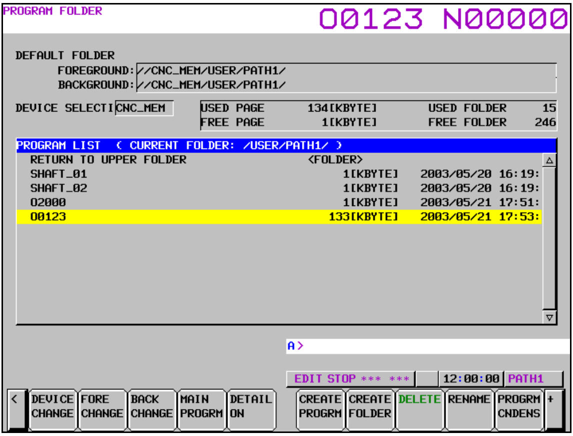


Fig. 1.5.2 Program folder screen

1.6 SCREENS DISPLAYED BY FUNCTION KEY

Press function key to display or set tool compensation values and other data.

This section describes how to display or set the following data:

1. Tool compensation value
2. Settings
3. Sequence number comparison and stop
4. Run time and part count
5. Workpiece origin offset value
6. Custom macro common variables
7. Software operator's panel
8. Tool management data
9. Display language switching
10. Protection of data at eight levels
11. Precision level selection

The software operator's panel, display language switching, and precision level selection depend on the specifications of the machine tool builder. See the manual issued by the machine tool builder for details.

1.6.1 Setting and Displaying the Tool Offset Value

Dedicated screens are provided for displaying and setting tool offset values and tool nose radius compensation values.

Setting and displaying the tool offset value and the tool nose radius compensation value

Procedure

1 Press function key .

When using a multi-path system, select, in advance, a path for which a tool offset value is to be set, by using the path selection switch.

2 Press chapter selection soft key [OFFSET] or press function key several times until the tool compensation screen is displayed.

Different screens are displayed depending on whether tool geometry offset, wear offset, or neither is applied.

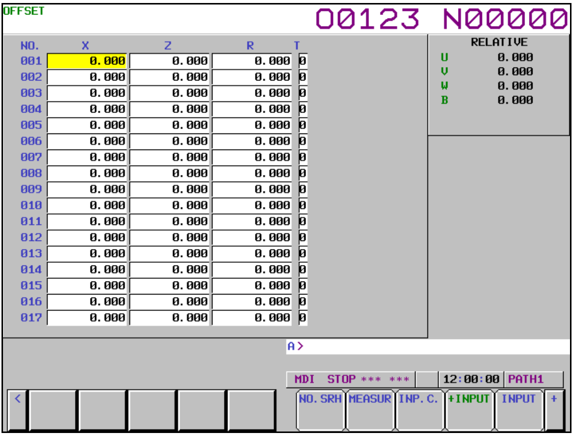


Fig. 1.6.1 (a) Without tool geometry/wear offset

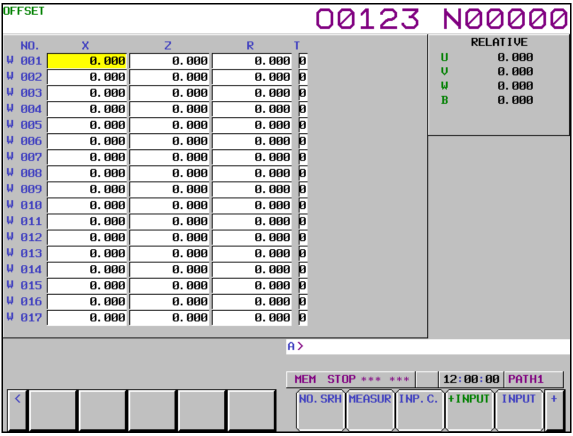


Fig. 1.6.1 (b) With tool geometry offset

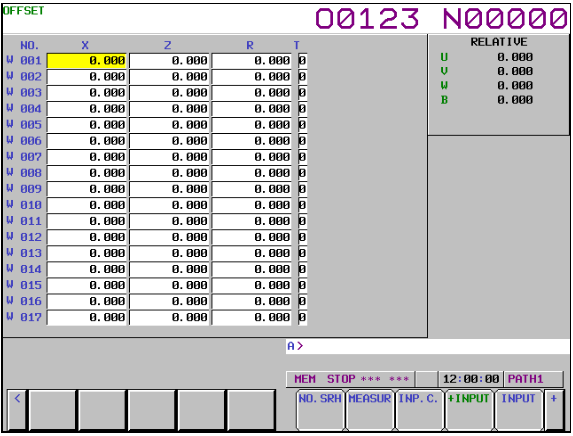


Fig. 1.6.1 (c) With tool wear offset

3 Move the cursor to the compensation value to be set or changed using page keys and cursor keys, or enter the compensation number for the compensation value to be set or changed and press soft key [NO.SRH].

4 To set a compensation value, enter a value and press soft key [INPUT]. To change the compensation value, enter a value to add to the current value (a negative value to reduce the current value) and press soft key [+INPUT].

TIP is the number of the imaginary tool nose.
TIP may be specified on the geometry compensation screen or on the wear compensation screen.

Explanation

- **Decimal point input**

A decimal point can be used when entering a compensation value.

- **Other method**

An external input/output device can be used to input or output a tool radius compensation value. See Chapter, “Data Input/Output” in the Operator’s Manual (Common to Lathe System/Machining Center System).
Tool length compensation values can be set using the following functions described in subsequent subsections: direct input of tool offset value measured, direct input of tool offset value measured B, and counter input of offset value.

- **Number of tool compensation values**

16 groups are provided for tool compensation. The number of groups can be optionally extended to 32, 64, or 999. For the multi-path control, the above number of groups can be used for each path. Tool geometry compensation or wear compensation can be selected for each group.

- **Disabling entry of compensation values**

In some cases, tool wear compensation or tool geometry compensation values cannot be input because of the settings in parameters WOF, GOF (No. 3290#0, #1). The input of tool compensation values from the MDI can be inhibited for a specified range of offset numbers. The first offset number for which the input of a value is inhibited is set in parameter (No. 3294). The number of offset numbers, starting from the specified first number, for which the input of a value is inhibited is set in parameter (No. 3295).
Consecutive input values are set as follows:

1) When values are input for offset numbers, starting from one for which input is not inhibited to one for which input is inhibited, a warning is issued and values are set only for those offset numbers for which input is not inhibited.
2) When values are input for offset numbers, starting from one for which input is inhibited to one for which input is not inhibited, a warning is issued and no values are set.

- **Displaying radius and TIP**

The radius and TIP are not displayed if the tool nose radius compensation option is not displayed.

- **Changing offset values during automatic operation**

When offset values have been changed during automatic operation, bit 4 (LGT) and bit 6 (LWM) of parameter 5002 can be used for specifying whether new offset values become valid in the next move command or in the next T code command.

Fig. 1.6.1

LGT	LWM	When geometry compensation values and wear compensation values are separately specified	When geometry compensation values and wear compensation values are not separately specified
0	0	Become valid in the next T code block	Become valid in the next T code block
1	0	Become valid in the next T code block	Become valid in the next T code block
0	1	Become valid in the next T code block	Become valid in the next move command
1	1	Become valid in the next move command	Become valid in the next move command

1.6.2 Displaying and Entering Setting Data

1

Data such as the TV check flag and output code is set on the setting data screen. On this screen, the operator can also enable/disable parameter writing, enable/disable the automatic insertion of sequence numbers in program editing, and perform settings for the sequence number comparison and stop function.

See Section, “Automatic Insertion of Sequence Numbers” in the Operator’s Manual (Common to Lathe System/Machining Center System) for automatic insertion of sequence numbers.

See Subsection, “Sequence Number Comparison and Stop” in the Operator’s Manual (Common to Lathe System/Machining Center System) for the sequence number comparison and stop function. This subsection describes how to set data.

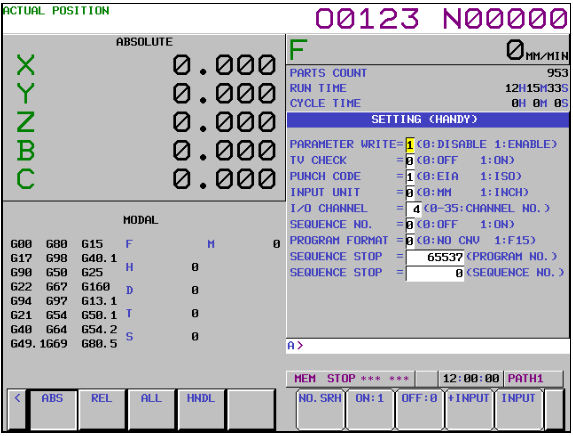
Procedure for setting the setting data

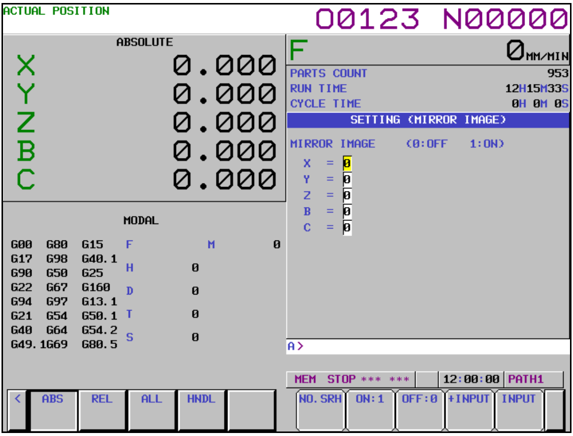
Procedure

1 Select the MDI mode.

2 Press function key .

3 Press soft key [SETTING] to display the setting data screen.
This screen consists of several pages.
Press page key  or  until the desired screen is displayed.
An example of the setting data screen is shown below.





4 Move the cursor to the item to be changed by pressing cursor keys [↑] [↓] [←] [→].

5 Enter a new value and press soft key [INPUT].

Explanation

- **PARAMETER WRITE**

  Setting whether parameter writing is enabled or disabled.
  0 : Disabled
  1 : Enabled

- **TV CHECK**

  Setting to perform TV check.
  0 : No TV check
  1 : Perform TV check

- **OUTPUT CODE**

  Setting code when data is output through RS232-C interface.
  0 : EIA code output
  1 : ISO code output

- **INPUT UNIT**

  Setting a program input unit, inch or metric system
  0 : Metric
  1 : Inch

- **I/O CHANNEL**

  Using channel of RS232-C interface.
  0 : Channel 0
  1 : Channel 1
  2 : Channel 2

- **SEQUENCE NO.**

  Setting of whether to perform automatic insertion of the sequence number or not at program edit in the EDIT mode.
  0 : Does not perform automatic sequence number insertion.
  1 : Perform automatic sequence number insertion.

- **PROGRAM FORMAT**

  Setting of whether to use the Series 10/11 format.
  0: Uses the standard format.
  1: Uses the Series 10/11 format.
  For the Series 10/11 format, refer to the Chapter "MEMORY OPERATION USING Series 10/11 FORMAT" of "PROGRAMMING" in the OPERATOR’S MANUAL (For Lathe System) or OPERATOR’S MANUAL (For Machining Center System).

- **SEQUENCE STOP**

  Setting the sequence number with which the operation stops for the sequence number comparison and stop function and the number of the program to which the sequence number belongs

- **MIRROR IMAGE**

  Setting of mirror image ON/OFF for each axis.
  0 : Mirror image off
  1 : Mirror image on

- **Others**

  Page key [⇧ PAGE] or [PAGE ⇩] can also be pressed to display the SETTING (TIMER) screen. See Subsection, “Displaying and Setting Run Time, Parts Count, and Time” in the Operator's Manual (Common to Lathe System/Machining Center System) for this screen.

1.6.3 Displaying and Setting the Workpiece Origin Offset Value

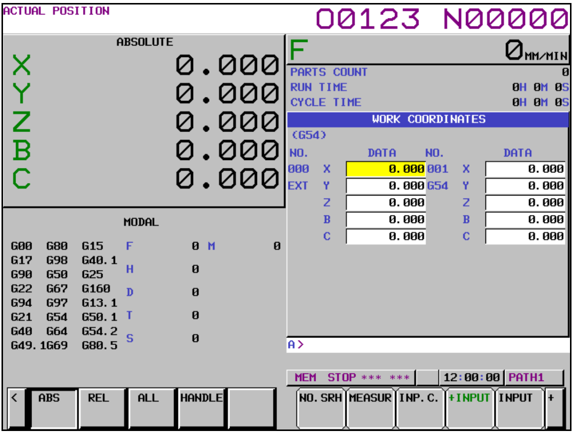
Displays the workpiece origin offset for each workpiece coordinate system (G54 to G59, G54.1 P1 to G54.1 P48 and G54.1 P1 to G54.1 P300) and external workpiece origin offset. The workpiece origin offset and external workpiece origin offset can be set on this screen.

Procedure for displaying and setting the workpiece origin offset value

Procedure

1 Press function key .

2 Press chapter selection soft key [WORK].
The workpiece coordinate system setting screen is displayed.



3 The screen for displaying the workpiece origin offset values consists of two or more pages. Display a desired page in either of the following two ways:

- Press the page key  or .
- Enter the workpiece coordinate system number (0 : external workpiece origin offset, 1 to 6: workpiece coordinate systems G54 to G59, P1 to P48 : workpiece coordinate systems G54.1 P1 to G54.1 P48, P1 to P300 : workpiece coordinate systems G54.1 P1 to G54.1 P300) and press operation selection soft key [NO.SRH].

4 Turn off the data protection key to enable writing.

5 Move the cursor to the workpiece origin offset to be changed.

6 Enter a desired value by pressing numeric keys, then press soft key [INPUT]. The entered value is specified in the workpiece origin offset value. Or, by entering a desired value with numeric keys and pressing soft key [+INPUT], the entered value can be added to the previous offset value.

7 Repeat 5 and 6 to change other offset values.

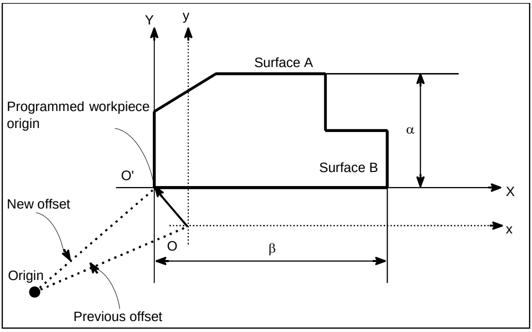
8 Turn on the data protection key to disable writing.

1.6.4 Direct Input of Workpiece Origin Offset Value Measured

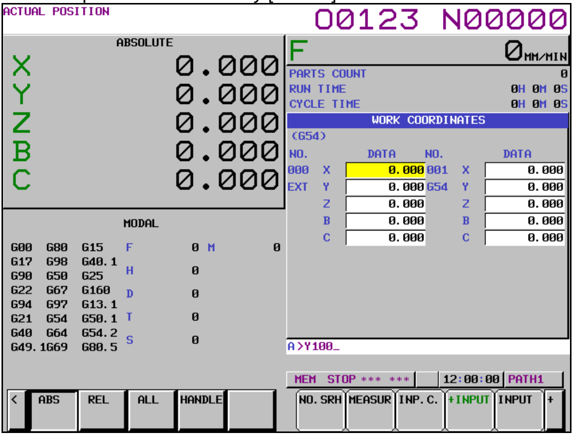
This function is used to compensate for the difference between the programmed workpiece coordinate system and the actual workpiece coordinate system. The measured offset for the origin of the workpiece coordinate system can be input on the screen such that the command values match the actual dimensions.
Selecting the new coordinate system matches the programmed coordinate system with the actual coordinate system.

Procedure for direct input of workpiece origin offset value measured

Procedure



1 When the workpiece is shaped as shown above, position the reference tool manually until it touches surface A of the workpiece.
2 Retract the tool without changing the Y coordinate.
3 Measure distance α between surface A and the programmed origin of the workpiece coordinate system as shown above.
4 Press function key .
5 To display the workpiece origin offset setting screen, press the chapter selection soft key [WORK].



6 Position the cursor to the workpiece origin offset value to be set.
7 Press the address key for the axis along which the offset is to be set (Y-axis in this example).
8 Enter the measured value (α) then press the [MEASUR] soft key.
9 Move the reference tool manually until it touches surface B of the workpiece.
10 Retract the tool without changing the X coordinate.
11 Enter the measured value of distance (β) to surface B as an X value as with steps 7 and 8.

Limitation

- **Consecutive input**

  Offsets for two or more axes cannot be input at the same time.

- **During program execution**

  This function cannot be used while a program is being executed.

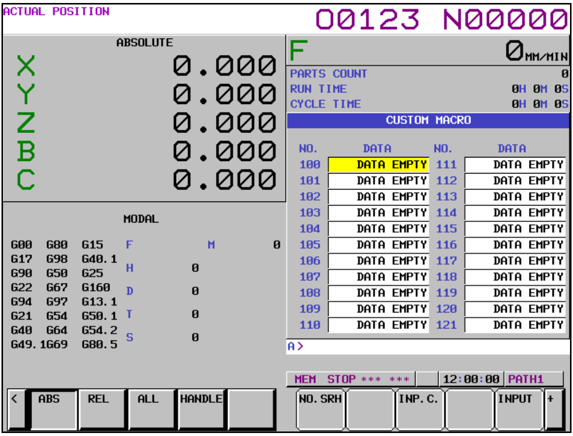
1.6.5 Displaying and Setting Custom Macro Common Variables

Displays common variables (#100 to #149 or #100 to #199, and #500 to #531 or #500 to #999) on the screen. The values for variables can be set on this screen. Relative coordinates can also be set to variables.

Procedure for displaying and setting custom macro common variables

Procedure

1. Press function key .
2. Press the continuous menu key , then press chapter selection soft key [MACRO]. The following screen is displayed.



3. Move the cursor to the variable number to set using either of the following methods:
   - Enter the variable number and press soft key [NO.SRH].
   - Move the cursor to the variable number to set by pressing page keys and/or and cursor keys , , , and/or .
4. Enter data with numeric keys and press soft key [INPUT].
5. To set a relative coordinate in a variable, press address key X, Y, or Z, then press soft key [INP.C.].
6. To set a blank in a variable, just press soft key [INPUT]. The value field for the variable becomes blank.

Explanation

If the value of a variable produced by an operation is not displayable, an indication below is provided.

When the significant number of digits is 12 (with parameter F16 (No. 6008#0) set to 0):

Variable value range	Variable value indication
0 < Variable value < +0.00000000001	+Underflow
0 > Variable value > -0.00000000001	-Underflow
Variable value > 999999999999	+Overflow
Variable value < -999999999999	-Overflow

When the significant number of digits is 8 (with parameter F16 (No. 6008#0) set to 1):

Variable value range	Variable value indication
0 < Variable value < +0.0000001	+Underflow
0 > Variable value > -0.0000001	-Underflow
Variable value > 99999999	+Overflow
Variable value < -99999999	-Overflow

1.6.6 Displaying and Setting the Software Operator's Panel

Operations on the MDI unit can substitute for the functions of switches on the machine operator's panel. This means that a mode selection, jog feed override selection, and so forth can be made with operations on the MDI unit, eliminating the need to use the corresponding switches on the machine operator's panel.
Jog feed can be performed using numeric keys.

Procedure for displaying and setting the software operator's panel

Procedure

1 Press function key 

.

2 Press the continuous menu key , then press chapter selection soft key [OPR].

3 The screen consists of several pages. Press page key 

or 

until the desired screen is displayed.

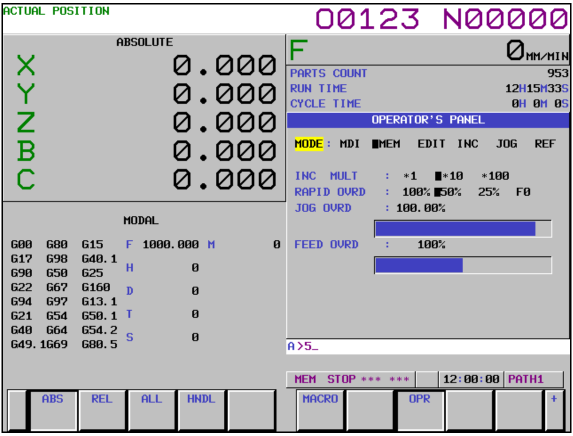


Fig. 1.6.6 (a) Without the manual handle feed function

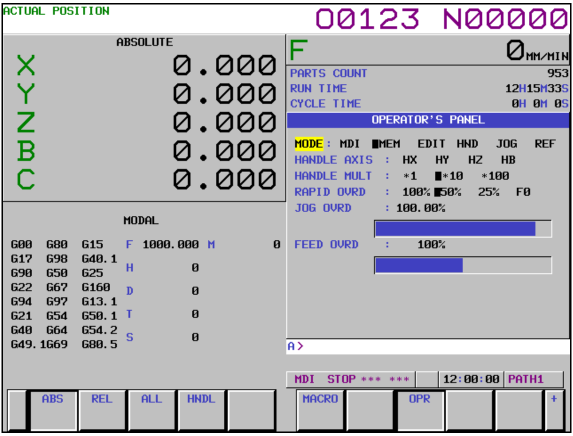


Fig. 1.6.6 (b) With the manual handle feed function

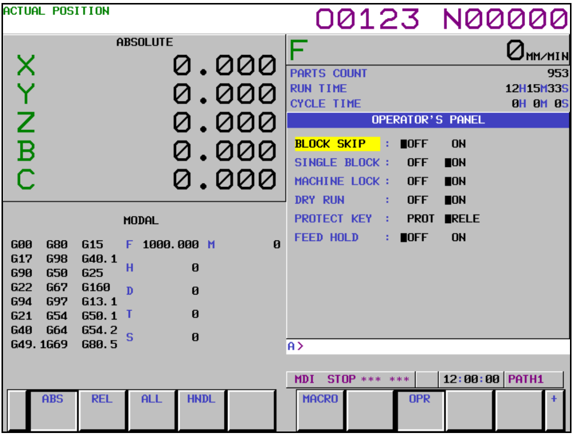


Fig. 1.6.6 (c)

4 Move the cursor to the desired switch by pressing cursor key ↑ or ↓.

5 Push the cursor key ← or → to match the mark ■ to an arbitrary position and set the desired condition.

6 Press one of the following arrow keys to perform jog feed. Press the W 5 key together with an arrow key to perform jog rapid traverse.

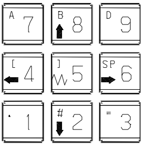


Fig. 1.6.6 (d) MDI arrow keys

Explanation

- **Valid operations**

  The valid operations on the software operator's panel are shown below. Whether to use each group can be chosen using parameter No. 7200. Those groups that are not used are not displayed on the software operator's panel.

  Group 1 : Mode selection
  Group 2 : Selection of jog feed axis, Manual rapid traverse
  Group 3 : Selection of manual pulse generator feed axis, selection of manual pulse magnification
  Group 4 : Jog feedrat, feedrate override, rapid traverse override
  Group 5 : Optional block skip, single block, machine lock, dry run
  Group 6 : Protect key
  Group 7 : Feed hold

- **Screens on which jog feed is valid**

  When the LCD indicates other than the software operator's panel screen and self-diagnosis screen, jog feed is not conducted even if the arrow key is pushed.

- **Jog feed and arrow keys**

  The feed axis and direction corresponding to the arrow keys can be set with parameters (Nos. 7210 to 7217).

- **General purpose switches**

  For the meanings of these switches, refer to the manual issued by machine tool builder.

1.6.7 Character-to-Codes Correspondence Table

Character	Code	Comment	Character	Code	Comment
A	065		6	054	
B	066		7	055	
C	067		8	056	
D	068		9	057	
E	069			032	Space
F	070		!	033	Exclamation mark
G	071		”	034	Quotation mark
H	072		#	035	Sharp
I	073		$	036	Dollar sign
J	074		%	037	Percent
K	075		&	038	Ampersand
L	076		’	039	Apostrophe
M	077		(	040	Left parenthesis
N	078		)	041	Right parenthesis
O	079		*	042	Asterisk
P	080		+	043	Plus sign
Q	081		,	044	Comma
R	082		-	045	Minus sign
S	083		.	046	Period
T	084		/	047	Slash
U	085		:	058	Colon
V	086		;	059	Semicolon
W	087		<	060	Left angle bracket
X	088		=	061	Equal sign
Y	089		>	062	Right angle bracket
Z	090		?	063	Question mark
0	048		@	064	At mark
1	049		[	091	Left square bracket
2	050		]	093	Right square bracket
3	051		^	094	
4	052		_	095	Underscore
5	053				

1.7 SCREENS DISPLAYED BY FUNCTION KEY [SYSTEM]

When the CNC and machine are connected, parameters must be set to determine the specifications and functions of the machine in order to fully utilize the characteristics of the servo motor or other parts.
This chapter describes how to set parameters on the MDI unit. Parameters can also be set with external input/output devices such as the memory card (see Chapter, “Data Input/Output” in the Operator’s Manual (Common to Lathe System/Machining Center System)).
In addition, pitch error compensation data used for improving the precision in positioning with the ball screw on the machine can be set or displayed by the operations under function key [SYSTEM].
See Chapter, “Alarm and Self-diagnosis Functions” in the Operator’s Manual (Common to Lathe System/Machining Center System) for the diagnosis screens displayed by pressing function key [SYSTEM].

1.7.1 Displaying and Setting Parameters

When the CNC and machine are connected, parameters are set to determine the specifications and functions of the machine in order to fully utilize the characteristics of the servo motor. The setting of parameters depends on the machine. Refer to the parameter list prepared by the machine tool builder.
Normally, the user need not change parameter setting.

Procedure for displaying and setting parameters

Procedure

1 Set 1 (ENABLE) for PARAMETER WRITE to enable writing. See the procedure for enabling/disabling parameter writing described below.

2 Press function key [SYSTEM].

3 Press chapter selection soft key [PARAM] to display the parameter screen.

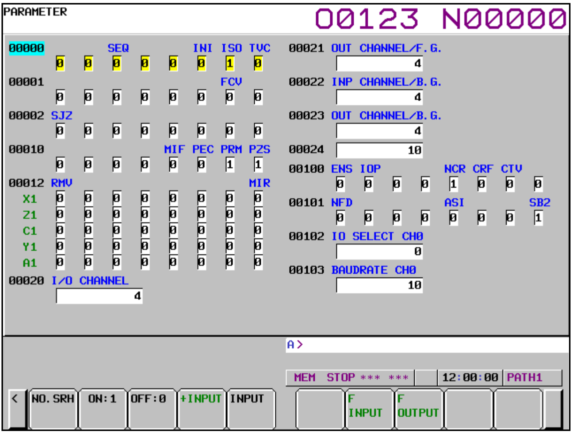


Fig. 1.7.1

4 Move the cursor to the parameter number to be set or displayed in either of the following ways:

- Enter the parameter number and press soft key [NO.SRH] .
- Move the cursor to the parameter number using the page keys, [PAGE ↑] and [PAGE ↓], and cursor keys, [↑], [↓], [←], and [→].

5 To set the parameter, enter a new value with numeric keys and press soft key [INPUT]. The parameter is set to the entered value and the value is displayed.
6 Set 0 (DISABLE) for PARAMETER WRITE to disable writing.

1.7.2 Checking by Self-Diagnosis Screen

The system may sometimes seem to be at a halt, although no alarm has occurred. In this case, the system may be performing some processing. The state of the system can be checked by displaying the self-diagnosis screen.

Checking by self-diagnosis screen

Procedure

1 Press function key 

.
2 Press the chapter selection soft key [DGNOS].
3 The diagnosis screen has more than 1 page. Select the screen by the following operation.
   (1) Change the page by the page keys 

 and 

.
   (2) Method by soft key
   - Key input the number of the diagnosis data to be displayed.
   - Press soft key [NO.SRH].

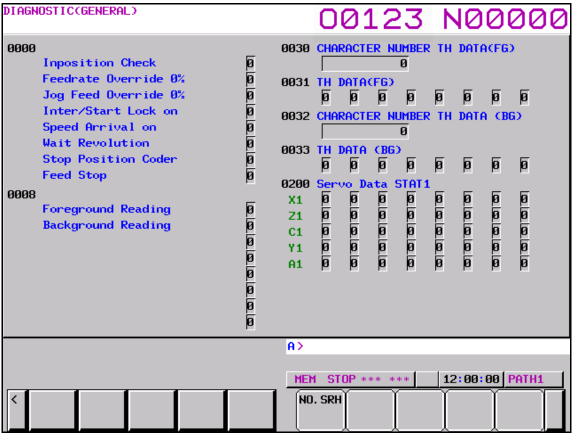
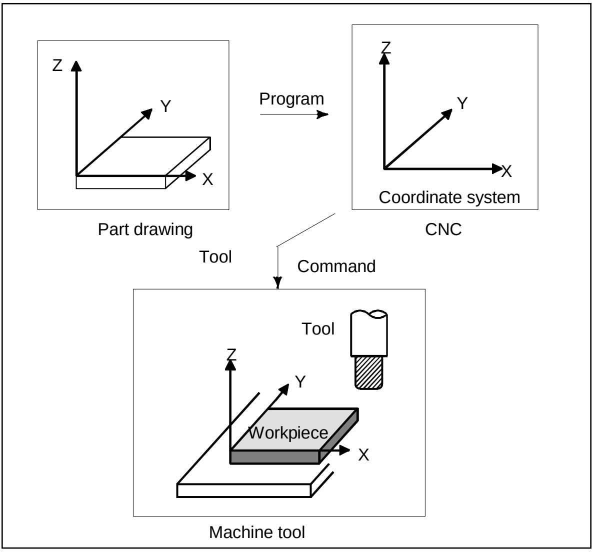


Fig. 1.7.2 Self-diagnosis screen

1.7.3 Coordinate System on Part Drawing and Coordinate System Specified by CNC - Coordinate System

- For milling machining



- For lathe cutting

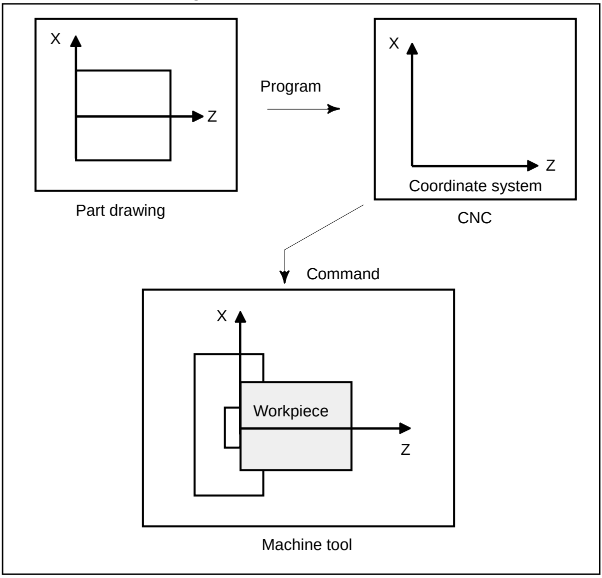


Fig. 1.7.3 (a) Coordinate system

Explanation

- **Coordinate system**

The following two coordinate systems are specified at different locations: (See Chapter, “Coordinate System” in the Operator’s Manual (Common to Lathe System/Machining Center System).)

1. Coordinate system on part drawing
   The coordinate system is written on the part drawing. As the program data, the coordinate values on this coordinate system are used.
2. Coordinate system specified by the CNC
   The coordinate system is prepared on the actual machine tool table. This can be achieved by programming the distance from the current position of the tool to the zero point of the coordinate system to be set.

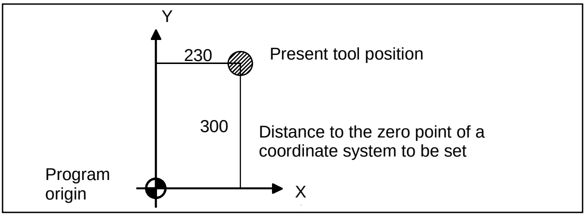
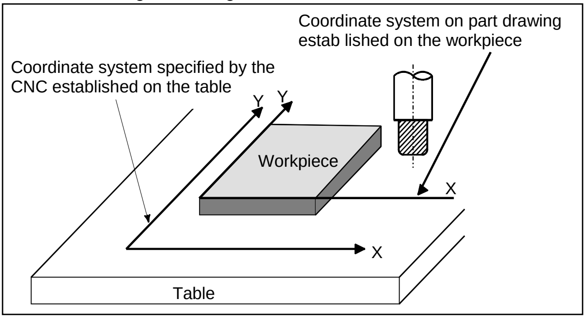


Fig. 1.7.3 (b) Coordinate system specified by the CNC

Concrete programming methods for setting coordinate systems specified by the CNC are explained in Chapter, "Coordinate System" in the Operator’s Manual (Common to Lathe System/Machining Center System).
The positional relation between these two coordinate systems is determined when a workpiece is set on the table.

- For milling machining



- For lathe cutting

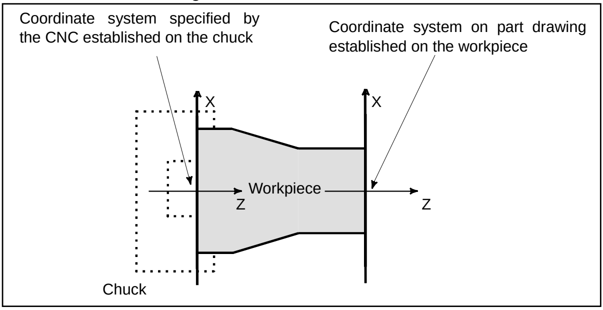


Fig. 1.7.3 (c) Coordinate system specified by CNC and coordinate system on part drawing

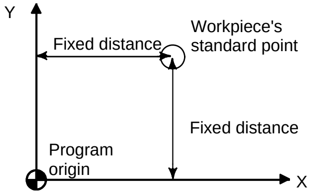
The tool moves on the coordinate system specified by the CNC in accordance with the command program generated with respect to the coordinate system on the part drawing, and cuts a workpiece into a shape on the drawing.
Therefore, in order to correctly cut the workpiece as specified on the drawing, the two coordinate systems must be set at the same position.

- Methods of setting the two coordinate systems in the same position

M

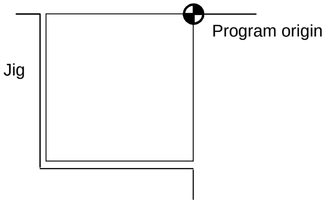
To set the two coordinate systems at the same position, simple methods shall be used according to workpiece shape, the number of machinings.

1. Using a standard plane and point of the workpiece.



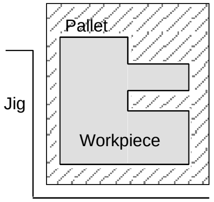
Bring the tool center to the workpiece standard point.
And set the coordinate system specified by CNC at this position.

2. Mounting a workpiece directly against the jig



Meet the tool center to the reference position. And set the coordinate system specified by CNC at this position. (Jig shall be mounted on the predetermined point from the reference position.)

3. Mounting a workpiece on a pallet, then mounting the workpiece and pallet on the jig

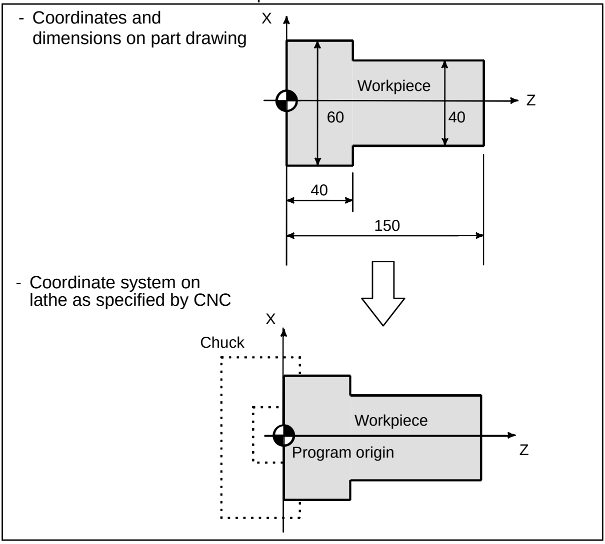


(Jig and coordinate system shall be specified by the same as (2)).

T

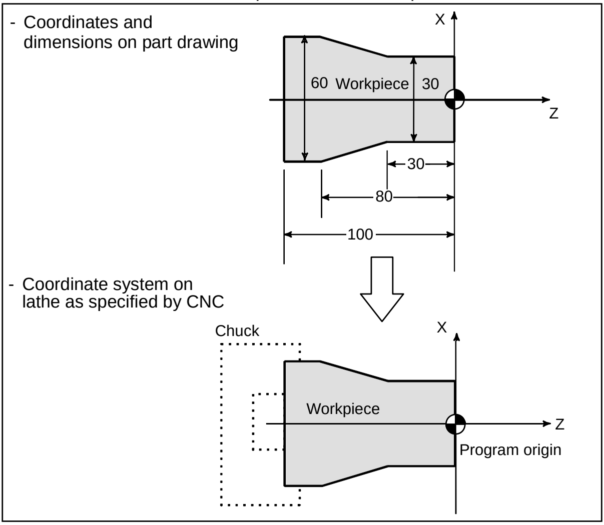
The following method is usually used to define two coordinate systems at the same location.

1 When coordinate zero point is set at chuck face



When the coordinate system on the part drawing and the coordinate system specified by the CNC are set at the same position, the program origin can be set on the chuck face.

2 When coordinate zero point is set at workpiece end face.



When the coordinate system on the part drawing and the coordinate system specified by the CNC are set at the same position, the program origin can be set on the end face of the workpiece.

1.7.4 Displaying and Setting Pitch Error Compensation Data

If pitch error compensation data is specified, pitch errors of each axis can be compensated in detection unit per axis.

Pitch error compensation data is set for each compensation point at the intervals specified for each axis. The origin of compensation is the reference position to which the tool is returned.

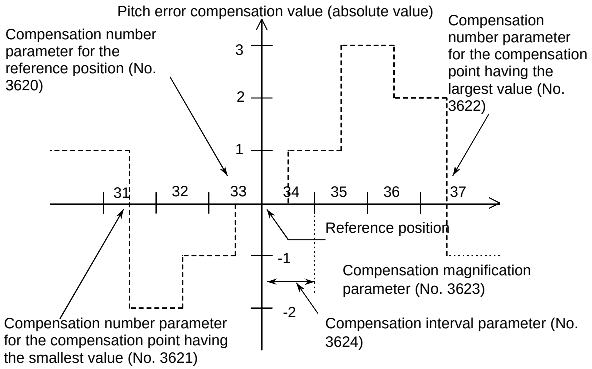
The pitch error compensation data is set according to the characteristics of the machine connected to the NC. The content of this data varies according to the machine model. If it is changed, the machine accuracy is reduced.

In principle, the end user must not alter this data.

Pitch error compensation data can be set with external devices such as the memory card (see Chapter, “Data Input/Output” in the Operator’s Manual (Common to Lathe System/Machining Center System)). Compensation data can also be written directly with the MDI unit.

The following parameters must be set for pitch error compensation. Set the pitch error compensation value for each pitch error compensation point number set by these parameters.

In the following example, 33 is set for the pitch error compensation point at the reference position.



Compensation position number	31	32	33	34	35	36	37
Compensation value to be set	-3	+1	+1	+1	+2	-1	-3

- Number of the pitch error compensation point at the reference position (for each axis): Parameter No. 3620
- Number of the pitch error compensation point having the smallest value (for each axis): Parameter No. 3621
- Number of the pitch error compensation point having the largest value (for each axis): Parameter No. 3622
- Pitch error compensation magnification (for each axis): Parameter No. 3623
- Interval of the pitch error compensation points (for each axis): Parameter No. 3624
- Travel distance per revolution of pitch error compensation of the rotary axis type (for each axis): Parameter No. 3625

- **Bi-directional pitch error compensation**

The bi-directional pitch error compensation function allows independent pitch error compensation in different travel directions. (When the movement is reversed, compensation is automatically carried out as in a backlash.)

To use this function, specify pitch error compensation for each travel direction, that is, separately for the positive and negative directions of a movement.

When using bi-directional pitch error compensation (setting the parameter BDP (No. 3605#0) to 1), specify the following parameters in addition to the pitch error compensation parameter.

- Number of the pitch error compensation point at the negative end (for travel in the positive direction, for each axis): Parameter No. 3621
- Number of the pitch error compensation point at the positive end (for travel in the positive direction, for each axis): Parameter No. 3622
- Number of the pitch error compensation point at the negative end (for travel in the negative direction, for each axis): Parameter 3626
- Pitch error compensation in the reference position when moving to the reference position from opposite to the reference position return direction (for each axis): Parameter No. 3627

- **Stored Pitch Error Compensation Total Compensating Value Input function**

When bit 0 (APE) of parameter No. 3602 is set to 1, stored pitch error compensation data can be input by a total value. About details, please refer to “Stored Pitch Error Compensation Total Compensating Value Input function” in the CONNECTION MANUAL (FUNCTION).

Procedure for displaying and setting the pitch error compensation data

Procedure

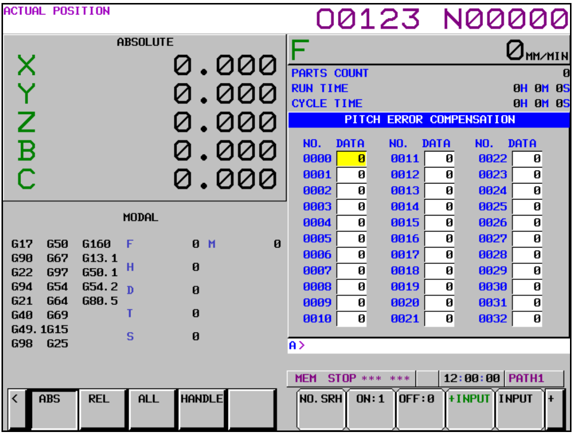
1 Set the following parameters:
- Number of the pitch error compensation point at the reference position (for each axis): Parameter No. 3620
- Number of the pitch error compensation point having the smallest value (for each axis): Parameter No. 3621
- Number of the pitch error compensation point having the largest value (for each axis): Parameter No. 3622
- Pitch error compensation magnification (for each axis): Parameter No. 3623
- Interval of the pitch error compensation points (for each axis): Parameter No. 3624
- Travel distance per revolution of pitch error compensation of the rotary axis type (for each axis): Parameter No. 3625

When using bi-directional pitch error compensation (setting the parameter BDP (No. 3605#0) to 1), specify the following parameters in addition to the pitch error compensation parameter.
- Number of the pitch error compensation point at the negative end (for travel in the positive direction, for each axis): Parameter No. 3621
- Number of the pitch error compensation point at the positive end (for travel in the positive direction, for each axis): Parameter No. 3622
- Number of the pitch error compensation point at the negative end (for travel in the negative direction, for each axis): Parameter No. 3626
- Pitch error compensation in the reference position when moving to the reference position from opposite to the reference position return direction (for each axis): Parameter No. 3627

2 Press function key 

.

3 Press the continuous menu key , then press chapter selection soft key [PITCH].
The following screen is displayed:



4 Move the cursor to the compensation point number to be set in either of the following ways:

- Enter the compensation point number and press the [NO.SRH] soft key.
- Move the cursor to the compensation point number using the page keys, and , and cursor keys, , , , and .

5 Enter a value with numeric keys and press the [INPUT] soft key.

1.8 SCREENS DISPLAYED BY FUNCTION KEY MESSAGE

By pressing the function key MESSAGE, data such as alarms, and alarm history data can be displayed.

For information relating to alarm display, see Section III-7.1, “Alarm Display” in the Operator’s Manual (Common to Lathe System/Machining Center System). For information relating to alarm history display, see Section III-7.2, “Alarm History Display” in the Operator’s Manual (Common to Lathe System/Machining Center System).

1.8.1 Alarm Display

Explanation

- **Alarm screen**

When an alarm is issued, the display changes to the alarm screen. Two alarm screens "DETAIL" and "ALL PATH" are provided. You can choose one of the screens by pressing the corresponding soft key.

- Detail screen

  Alarm information for the currently selected path is displayed.

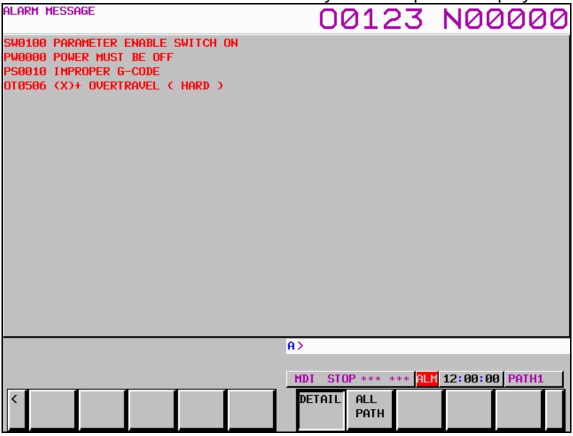


Fig. 1.8.1 (a) Alarm detail screen

- All path screen

  Alarm information for all paths is displayed sequentially from path 1.

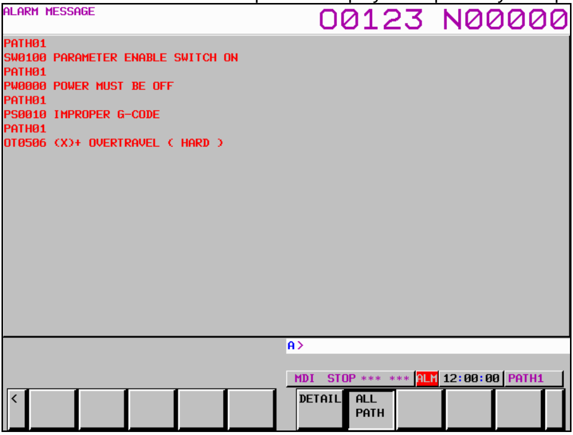


Fig. 1.8.1 (b) All path screen

- **Displaying an alarm screen**

ALM is sometimes indicated in the bottom part of the screen display without displaying an alarm screen.

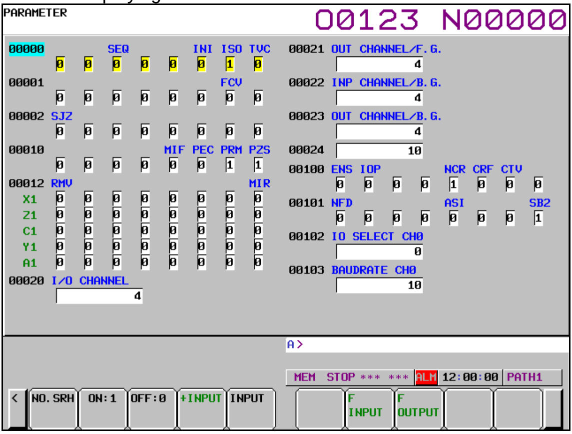


Fig. 1.8.1 (c) Parameter screen

In this case, display the alarm screen by following the steps below.

1. Press function key .
2. Press the chapter selection soft key [ALARM].
3. Pressing the soft key [ALARM] changes the screen display to the "DETAIL" screen (or the alarm screen selected previously), and the soft keys [DETAIL] and [ALL PATH] appears.
   - Pressing the soft key [DETAIL] displays the "DETAIL" screen.
   - Pressing the soft key [ALL PATH] displays the "ALL PATH" screen.

   If the number of paths is 1, pressing the soft key [ALARM] displays the "DETAIL" screen, but the soft key [ALARM] indication remains unchanged.
4. You can change pages by using the page keys.

- **Releasing alarm**

The cause of an alarm can be determined from the error code, number, and associated message. To release the alarm, generally correct the cause, then press the  key.

- **Error code and number**

The type of an alarm is indicated by an error code and number.
Example: PS0010, SV0004, etc.
For details, see Chapter, "Alarm List".

1.8.2 Alarm History Display

The CNC including the latest alarm are stored and displayed on the screen.
The display procedure is explained below.

NOTE
Alarms, operations, external operator messages, data change history data, etc. are stored in the same storage area. If the storage capacity is exceeded due to other history data, alarm history data may be erased. If, however, bit 2 (SAH) of parameter No. 11354 is 1, up to 50 alarms can be recorded regardless of the operation history state.
The maximum number of history data items that can be stored is as follows, where the history data is assumed to include alarm data only:
If bit 7 (HAL) of parameter No. 3196 is 1, about 4000 items.
If bit 7 (HAL) of parameter No. 3196 is 0, modal information and coordinates observed when an alarm is issued are also recorded, so that the maximum number varies from system to system.
(Example: For a 5-axis system, about 280 data items; for a 10-axis system, about 200 data items)
If bit 3 (EAH) of parameter No. 3112 is 1, however, macro and external alarm messages are also stored, so that the maximum number further decreases.

Alarm history display

Procedure

1 Press function key .

2 Press the chapter selection soft key [HISTRY].
An alarm history is displayed.
The following information is displayed:
<1> Date and time of alarm issuance
<2> Alarm type
<3> Alarm number
<4> Alarm message (sometimes not displayed depending on the alarm)
<5> Page No.

3 You can change pages by using the page keys.

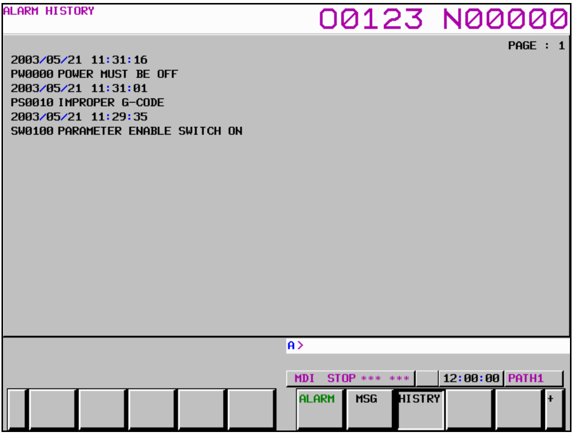


Fig. 1.8.2 Alarm history screen

1.9 HELP FUNCTION

This function, which provides alarm information, operation methods, and a table of parameter numbers, etc., can be used instead of the handbook.
The help function displays the following:

- **Initial menu screen**

The initial menu screen is displayed by pressing the 

key when the CNC screen is displayed.
From the initial menu screen, you can go to each of the help screens, alarm detail, operation method, and parameter table.

- **Alarm detail screen**

If you make an error while operating the CNC or attempt to execute an erroneous machining program, the CNC enters an alarm status. If you display the help screen while in this status, the screen shows the cause of the alarm that has been generated at that time and how to release it.

- **Operation method screen**

If you do not know how to operate the CNC, you can refer to this help screen, which displays the operation method for each operation item.

- **Parameter table screen**

If you do not know the number of the parameter you want to set or view, you can refer to this help screen, which displays a list of parameter numbers for each function.

1.9.1 Initial Menu Screen

Press the 

key on the MDI unit, and the initial menu screen of the help function is displayed.

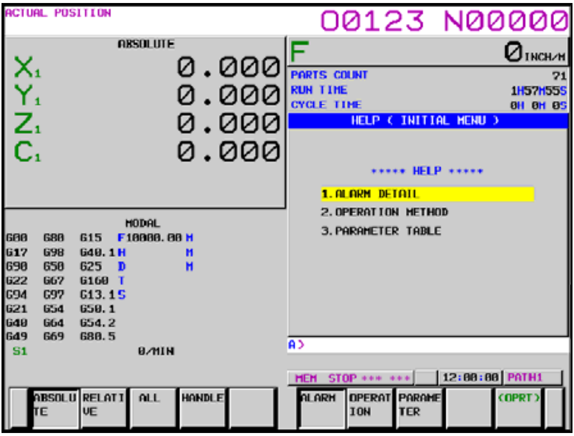
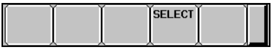


Fig. 1.9.1 Initial help screen of the help function

To return to the original screen, press the 

key or the function key again.
From the initial menu screen of the help function, you can select each help screen.

Operation



On the initial menu screen, you can go to each help screen by performing the following:

- Soft key [SELECT]
  - Enter a menu number in the key input buffer and press soft key [SELECT].
  - Select a menu with the cursor and press soft key [SELECT].
-  key
  - Enter a menu number in the key input buffer and press the  key.
  - Select a menu with the cursor and press the  key.

1.9.2 Alarm Detail Screen

On the initial menu screen of the help function, you can display the alarm detail screen by performing either of the following:

- Press soft key [ALARM].
- Select "1. ALARM DETAIL" with the cursor and press either  or soft key [SELECT].
- Enter 1 in the key input buffer and press either  or soft key [SELECT].

If an alarm has been generated

If you display the alarm detail screen when an alarm has been generated, the screen shows the details of the alarm that has been generated at that time. If more than one alarm has been generated, the screen shows the alarm displayed at the top of the alarm screen.

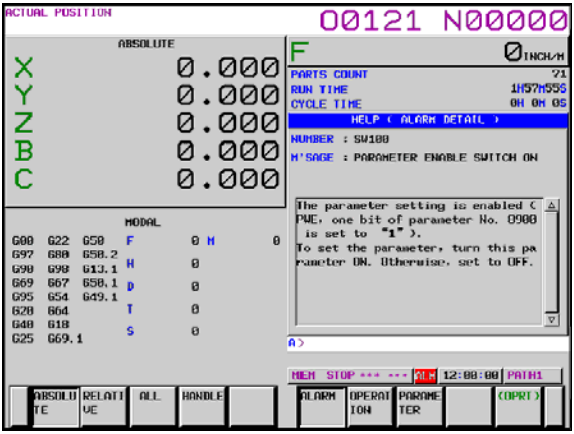


Fig. 1.9.2 (a) Alarm detail screen displayed if an alarm has been generated

If all alarms are reset, the alarm detail screen changes to the display when no alarm has been generated (Fig. 1.9.2 (b)).

If no alarm has been generated

If you display the alarm detail screen when no alarm has been generated, the screen shows the following:

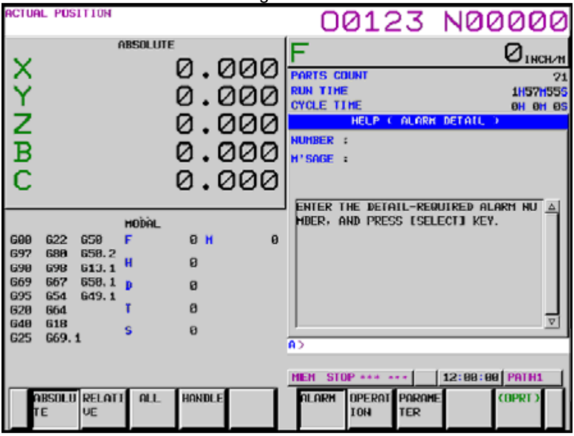


Fig. 1.9.2 (b) Alarm detail screen displayed if no alarm has been generated

Operation

On the alarm detail screen, you can perform the following:

- Soft key [SELECT]
-  key

  Enter an alarm number in the key input buffer. Press  key or soft key [SELECT] to search for the alarm number and display the details of the alarm.

  If the detailed message spans more than one page, you can switch between pages by using the cursor keys  and  or the page keys  and .

  <Alarm search example>

  Enter an alarm group name plus an alarm number.
  For example, if you want to know the details of alarm PS123, enter "PS123" in the key input buffer and press  key or soft key [SELECT].
- Soft key [MENU]

  Use this key to go to the initial menu screen of the help function.

1.9.3 Operation Method Screen

1 On the initial help menu of the help function, you can display the operation method menu screen by performing either of the following:

- Press soft key [OPERATION].
- Select "2. OPERATION METHOD" with the cursor and press key or soft key [SELECT].
- Enter 2 in the key input buffer and press key or soft key [SELECT].

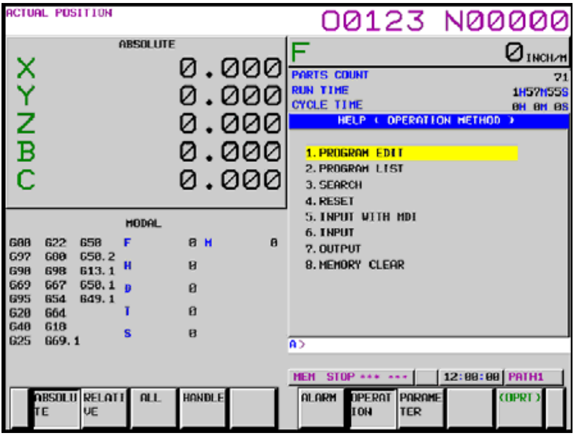


Fig. 1.9.3 Operation method menu screen

2 Display an operation method screen by performing either of the following:

- Enter an item number in the key input buffer and press key or soft key [SELECT].
- Select an item with the cursor and press key or soft key [SELECT].

On each operation method screen, you can switch between pages by using the cursor keys and or the page keys and . The current page number is displayed at the upper right corner of the screen.

3 If you want to select another operation method screen directly, key in the desired item number and press key or soft key [SELECT].

<Example>

On the operation method screen for "4. RESET", key in 7.
Press soft key [SELECT], and the screen changes to the operation method screen for "7. OUTPUT".

Operation

On the operation method menu screen and on an operation method screen, you can perform the following:

- Soft key [SELECT]
-  key

  Enter the item number of the desired operation method in the key input buffer and press  key or soft key [SELECT], and the corresponding operation method screen is displayed.
  On the operation method menu screen, you can select an item number with the cursor.
- Soft key [MENU]

  Press this key to go to the initial menu screen of the help function.

1.9.4 Parameter Table Screen

1 On the initial menu screen of the help function, you can display a list of parameter numbers screen by performing either of the following:

- Press soft key [PARAMETER].
- Select "3. PARAMETER TABLE" with the cursor and press either  key or soft key [SELECT].
- Enter 3 in the key input buffer and press  key or soft key [SELECT].

On the table of parameters screen, you can switch between pages by using the cursor keys  and  or the page keys  and . The current page number is displayed at the upper right corner of the screen.

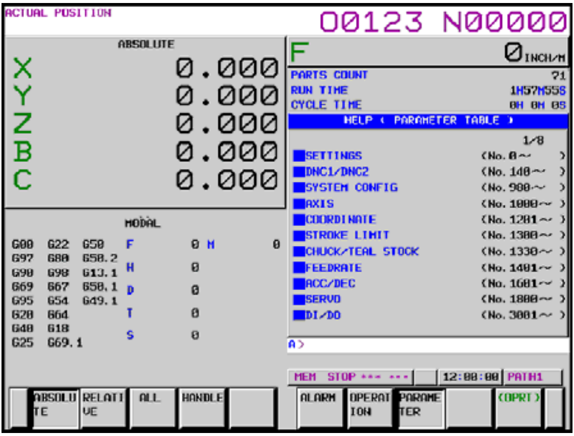
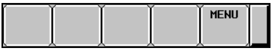


Fig. 1.9.4 Parameter table screen

Operation



On the table of parameters screen, you can perform the following:

- Soft key [MENU]

  Press this key to go to the initial menu screen of the help function.

2 OPERATION LIST

(1) Reset

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Operating time				POS	[(OPRT)] → [RUNPRE] → [EXEC]
Number of machined parts				POS	[(OPRT)] → [PTSPRE] → [EXEC]
Alarm 100 (SW0100)					"RESET while pressing "CAN"

(2) Input from MDI

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter		○	MDI or emergency stop	SYSTEM	[PARAM] → Parameter No. → [NO.SRH] → Data → "INPUT" or [INPUT] → PWE = 0
Offset	○			OFS/SET	[OFFSET] → Offset No. → [NO.SRH] → Offset value → "INPUT"
Setting (Handy, Timer, Mirror image)			MDI or emergency stop	OFS/SET	[SETTING] → "↑" and "↓" → Data → "INPUT" or [INPUT]
Setting (Parameter)			MDI or emergency stop	OFS/SET	[SETTING] → Parameter No. → [NO.SRH] → Data → "INPUT" or [INPUT]
PMC parameter (Timer, Counter, Keep relay, Data table)				SYSTEM	[▷] → [PMC MAINTE] → [▷] → Timer [TIMER] → Data → "INPUT" Counter [COUNTR] → Data → "INPUT" Keep relay [KEEP RELAY] → Data → "INPUT" Data table [DATA] → Data → "INPUT"
Tool length measurement			JOG	POS OFS/SET	"POS" → [REL] → [ORIGIN] → [ALL AXIS] or Axis name → [EXEC] → "OFS" → [OFFSET] → Jog the tool to measuring position → Offset No. → [NO.SRH] → Axis name [INP.C.]
Pitch error compensation value		○	MDI or emergency stop	SYSTEM	[▷] → [PITCH] → Compensation point number → [NO.SRH] → Data → "INPUT" or [INPUT]

(3) Input from I/O device

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter		○	EDIT or emergency stop	SYSTEM	[PARAM] → [(OPRT)] → [INPUT] → [EXEC]
PMC data (Loader, Parameter) (Supplement) [PMC CONFIG] → [SETING] → Move cursor to "ENABLE PROGRAMMER FUNCTION" → [YES]		○		SYSTEM	[PMC MAINTE] → [I/O] → Move cursor to PMC → Select desired PMC → Move cursor to "DEVICE" → Select desired device → Move cursor to "FUNCTION" → Select [INPUT] → [(OPRT)] → [LIST] → [SELECT], enter file number or file name → [EXEC]
Pitch error compensation value		○	EDIT or emergency stop	SYSTEM	▷ → [PITCH] → [(OPRT)] → ▷ → [INPUT] (→ File name) → [EXEC]
Offset	○		EDIT or emergency stop	OFS/SET	[OFFSET] → [(OPRT)] → [INPUT] (→ File name) → [EXEC]
Custom macro variable	○		EDIT	OFS/SET	▷ → [MACRO] → [(OPRT)] → ▷ → [INPUT] (→ File name) → [EXEC]
All programs in folder	○		EDIT	PROG	[(OPRT)] → ▷ → [INPUT] → [EXEC]
One program,			EDIT	PROG	[(OPRT)] → ▷ → [INPUT] → [P SET, F SET] → [EXEC]

(4) Output to I/O device

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter			EDIT or emergency stop	SYSTEM	[PARAM] → [(OPRT)] → [OUTPUT] → [EXEC]
PMC data (Loader, Parameter)			EDIT	SYSTEM	[PMC MAINTE] → [I/O] → Move cursor to PMC → Select desired PMC → Move cursor to "DEVICE" → Select desired device → Move cursor to "FUNCTION" → Select [WRITE] → Move cursor to "DATA TYPE" → Select desired data → [(OPRT)] → [NEW NAME] or enter file name → [EXEC]
Pitch error compensation value			EDIT or emergency stop	SYSTEM	▷ → [PITCH] → [(OPRT)] → ▷ → [OUTPUT] (→ File name) → [EXEC]

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Offset			EDIT or emergency stop	OFS/SET	[OFFSET] → [(OPRT)] → [OUTPUT] (→ File name) → [EXEC]
Custom macro variable			EDIT or emergency stop	OFS/SET	▷ → [MACRO] → [(OPRT)] → ▷ → [OUTPUT] (→ File name) → [EXEC]
All programs				PROG	[(OPRT)] → ▷ → [OUTPUT] → [EXEC]
One program				PROG	[(OPRT)] → ▷ → [OUTPUT] → [P SET, F SET] → [EXEC]

(5) Search

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Program No.				PROG	"O" + Program No. → [PROGRM SEARCH] or [PROGRM SEARCH] → "O" + Program No. → [PROGRM NAME]
Main program				PROG	[PROGRM SEARCH] → [MAIN SRCH]
Sequence No., Address + Word, Address only				PROG	[SEARCH] → Sequence No., Address + Word, Address → [↑ SEARCH, ↓ SEARCH] → [↑ SEARCH, ↓ SEARCH]
Line				PROG	[LINE SEARCH] → [LINE NUMBER (character mode), TOP, BOTTOM (Word mode, character mode)]
Offset No.				OFS/SET	[OFFSET] → Offset No. → [NO.SRH]
Diagnosis No.				SYSTEM	[DGNOS] → Diagnosis No. → [NO.SRH]
Parameter No.				SYSTEM	[PARAM] → Parameter No. → [NO.SRH]

(6) Program editing (Word editing)

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Creation of new program				PROG	[FOLDER] → [(OPRT)] → Program name → [CREATE PROGRM]
Creation of new folder				PROG	[FOLDER] → [(OPRT)] → Folder name → [CREATE FOLDER]
Deletion of all programs from folder	○		EDIT	PROG	[PROGRM] → “O” + -9999 → “DELETE”

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Deletion of all specified programs	○			PROG	[FOLDER] → [SELECT START] → Select desired program with [SELECT] → [DELETE] → [EXEC]
Deletion of one program	○			PROG	[PROGRM] → "O" + Program No. → "DELETE" → [EXEC] or move cursor to program → [DELETE] → [EXEC]
Delete folder				PROG	[FOLDER] → [(OPRT)] → Move cursor to folder → [DELETE]
Copying of program from one holder to another	○			PROG	[FOLDER] → [SELEC TSTART] → Select desired program with [SELECT] → [SELECT END] → Move cursor to destination folder → [COPY]
Movement of program from one folder to another	○			PROG	[FOLDER] → [SELEC TSTART] → Select desired program with [SELECT] → [SELECT END] → Move cursor to destination folder → [MOVE]
Word insertion	○		EDIT	PROG	[PROGRM] (→ Search for word before which to insert) → New word → "INSERT" or "INPUT"
Word overwriting	○		EDIT	PROG	[PROGRM] (→ Search for word to overwrite) → New word → "ALTER"
Word/address replacement	○		EDIT	PROG	[PROGRM] → [(OPRT)] → [REPLCE] → [BEFORE] → [AFTER] → [↑ SEARCH, ↓ SEARCH] → [REPLCE] ([REPLCE ALL] → [YES])
Deletion of one block	○		EDIT	PROG	[PROGRM] → Move cursor to line to delete → "EOB" + "DELETE"
Word deletion	○		EDIT	PROG	[PROGRM] (→ Search for word to delete) → "DELETE"
Copying of words in specified range	○		EDIT	PROG	[PROGRM] → [(OPRT)] → [SELECT] → Select range → [COPY] → [PASTE]
Movement of words in specified range	○		EDIT	PROG	[PROGRM] → [(OPRT)] → [SELECT] → Select range → [CUT] → [PASTE]

(7) Program editing (Character editing)

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Editor change			EDIT	PROG	[PROGRM] → [(OPRT)] → ▷ → [CHANGE EDITOR]

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Character insertion	○		EDIT	PROG	[PROGRM] → [(OPRT)] → ▷ → [INPUT MODE] → Enter insert mode [PROGRM] (→ Search for character before which to insert) → New character
Character overwriting	○		EDIT	PROG	[PROGRM] → [(OPRT)] → ▷ → [INPUT MODE] → Overwrite mode is entered [PROGRM] (→ Search for character to overwrite) → New character
Character string replacement	○		EDIT	PROG	[PROGRM] → [(OPRT)] → [REPLCE] → Enter character string in search/replace dialog box → [↑ SEARCH, ↓ SEARCH] → [REPLCE, REPLCE ALL]
Character deletion	○		EDIT	PROG	[PROGRM] (→ Search for character to delete) → “DELETE”
Copying of character string in specified range	○		EDIT	PROG	[PROGRM] → [(OPRT)] → [SELECT] → Select range → [COPY] → [PASTE]
Movement of character string in specified range	○		EDIT	PROG	[PROGRM] → [(OPRT)] → [SELECT] → Select range → [CUT] → [PASTE]
Undoing	○		EDIT	PROG	[PROGRM] → [(OPRT)] → [UNDO]
Program insertion	○		EDIT	PROG	[PROGRM] → [(OPRT)] → ▷ → [INSERT] → [CURSOR POSITION, BOTTOM] → Enter program name → [EXEC]

(8) I/O to and from Handy File

Function	KEY SW	PWE = 1	Mode	Function key	Operation
File head search				PROG	[FOLDER] → [(OPRT)] → File number → [F SRH]
File deletion	○		EDIT	PROG	[FOLDER] → [(OPRT)] → Move cursor to desired program and press [DELETE] → [EXEC]
Input of all programs	○		EDIT	PROG	[FOLDER] → [(OPRT)] → [INPUT] → [EXEC]
Input of one program	○		EDIT	PROG	[FOLDER] → [(OPRT)] → [INPUT] → [F SET, P SET] → [EXEC]
Output of all programs			EDIT	PROG	[FOLDER] → [(OPRT)] → [OUTPUT] → [EXEC]
Output of one program			EDIT	PROG	[FOLDER] → [(OPRT)] → [OUTPUT] → [F SET, P SET] → [EXEC]

(9) Playback

Function	KEY SW	PWE = 1	Mode	Function key	Operation
NC data input	○		TJOG, THND	PROG	Move tool → "X" , "Y" or "Z" → "INSERT" or "INPUT" → NC data → "INSERT" or "INPUT" → "EOB" → "INSERT" or "INPUT"

(10) Clear

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Memory all clear			At power-up		"RESET" and "DELETE"
RAM for PMC ladder storage (Ladder programs are cleared from the memory for execution. The previous state is restored when the power is turned on again.)			At power-up		"X" and "O"
PMC nonvolatile memory (PMC parameters and so forth are cleared.)					"Z" and "O"

(11) Manual operation

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Manual reference position return			REF		Use "axis selection switch" to select axis on which to perform reference position return → Turn "operate button" ON → "Reference position return lamp ON"
Jog feed			JOG		Use "axis selection switch" to select axis along which to move → Turn "operate button" ON Press "rapid traverse button" if required.
Incremental feed			INC		Use "axis selection switch" to select axis along which to move → Turn "movement operate button" ON → Move in least input increment Magnifications of 10, 100, and 1000 can be applied. Press "rapid traverse button" if required.
Manual handle feed			HND		Use "axis selection switch" to select axis along which to move → Turn "manual pulse generation" Magnifications of 10, 100, and 1000 can be applied.

(12) Display

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Display of program memory used and contents of current folder				PROG	[FOLDER]
Display of specified value			MEM or MDI	PROG	Currently executed program in memory
					[PROGRM]
					Specified value under execution, next specified value to be executed, and current position
					[NEXT]
					Currently executed program in memory and current position
					[CHECK]
Display of current position				POS	Display of position in workpiece coordinate system
					[ABS]
					Display of position in relative coordinate system
					[REL]
					Overall position display
					[ALL]
Operating monitor screen				POS	▷ →[MONITOR]
Alarm display				MESSAGE	When an alarm is issued
					[ALARM]
Operator message display				MESSAGE	When there is a message to the operator from the outside
					[MSG]
Alarm history display				MESSAGE	[HISTRY]
Parameter setting display				SYSTEM	[PARAM]
System configuration				SYSTEM	[SYSTEM]
Servo information				SYSTEM	[SYSTEM] → [SERVO INFO]
Spindle information				SYSTEM	[SYSTEM] → [SPINDLE INFO]
Servo adjustment screen				SYSTEM	Parameter (No.3111#0) = 1 ▷ → [SERVO PARAM]
Spindle adjustment screen				SYSTEM	Parameter (No.3111#1) = 1 ▷ → [SP.SET]
Machining parameter adjustment screen				SYSTEM	▷ → [M-TUN] * Option required

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Operation history display				SYSTEM	▷ → [OPEHIS]
Periodic maintenance screen				SYSTEM	▷ → [MAINTE]
Maintenance information screen				SYSTEM	▷ → [M-INFO]
Servo waveform display				SYSTEM	▷ → [W.DGNS]
Parameter setting assistance screen				SYSTEM	▷ → [PRMTUN]
Power Mate CNC manager				SYSTEM	▷ → [P.MATE MGR.]
Multi-language display				OFS SET	▷ → [LANG.]
Software operator's panel				OFS SET	▷ → [OPR] * Option required
Precision level selection screen				OFS SET	▷ → [PR-LEV] * Option required
Data protection				OFS SET	▷ → [PROTECT] * Option required.
Screen clear					Press “CAN” and function key simultaneously. Press function key to redisplay.

(13) Graphic function (*option required)

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter setting				GRAPH	[PARAM]
Tool path drawing				GRAPH	Select graphic drawing screen [GRAPH] Start drawing, end it [(OPRT)] → [START], [END]
Tool path clear				GRAPH	[(OPRT)] → [CLEAR]
Tool path scale				GRAPH	[(OPRT)] → [SCALE] Specify center magnification for enlargement/reduction [CENTER] → Use MDI keys to enter magnification → [INPUT] → [EXEC] Enlarge portion selected with an arrow [AREA] → Move cursor to select portion to enlarge → [EXEC] Use [CURSOR CHANGE] to change moving cursor

(14) Help function

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Displaying INITIAL MENU screen				HELP	
Displaying ALARM DETAIL screen				HELP	[ALARM] → Alarm No. → [SELECT]
Displaying OPERATION METHOD screen				HELP	[OPERATION] → Item No. of operation method → [SELECT]
Displaying PARAMETER TABLE screen				HELP	[PARAMETER]

(15) Self-diagnosis function

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Displaying DIAGNOSIS screen				SYSTEM	[DGNOS] → 1. Page change keys PAGE ⇩ PAGE ⇧ 2. Number of the diagnosis data [NO.SRH]

(16) Screen hard copy

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Screen hard copy					Parameter (No. 0020) = 4, parameter (No.3301#7) = 1 → Insert memory card or Parameter (No. 0020) = 17, parameter (No.3301#7) = 1 → Insert USB memory → Display screen whose hard copy is to be produced → SHIFT key (5 seconds or more) - Clock display stops. → Screen hard copy operation is executed. - Clock display restarts. → Screen hard copy operation stops. Supplement: Copy operation can also be started with the hard copy execution request signal <G0067.7>.

(17) BOOT

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Displaying system monitor screen			At power-up		▷ and the soft key to its left

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Reading file from memory card					User data
					Move cursor to 2.USER DATA LOADING on system monitor screen → [SELECT] → Move cursor to file to be read → [SELECT] → [YES]
					System data
					Move cursor to 3.SYSTEM DATA LOADING on system monitor screen → [SELECT] → Move cursor to file to be read → [SELECT] → [YES]
Displaying detail screen for flash ROM or memory card file list					Move cursor to 4.SYSTEM DATA CHECK on system monitor screen → [SELECT] → Move cursor to system data to read → [SELECT] → Move cursor to file to read → [SELECT] → [YES]
Deleting user file in flash ROM or memory card file					Move cursor to 5. SYSTEM DATA DELETE on system monitor screen → [SELECT] → Move cursor to system data to delete → [SELECT] → Move cursor to file to delete → [SELECT] → [YES]
Outputting user file in flash ROM to memory card					Move cursor to 6.SYSTEM DATA SAVE on system monitor screen → [SELECT] → Move cursor to file to be output → [SELECT] → [YES]
Batch input and output of SRAM data					Move cursor to 7. SRAM DATA UTILITY on system monitor screen → [SELECT]
					Output from CNC to memory card
					Move cursor to 1.SRAM BACKUP → [SELECT] → [YES]
					Input from memory card to CNC
					Move cursor to 2.SRAM RESTORE → [SELECT] → [YES]
					Input auto backup data in FROM to CNC
					Move cursor to 3. AUTO BKUP RESTORE → [SELECT] → Move cursor to backup data to read → [SELECT] → [YES]
Formatting memory card					Move cursor to 8.MEMORY CARD FORMAT on system monitor screen → [SE LECT] → [YES]
Exiting system monitor					Move cursor to 1.END on system monitor screen → [SELECT] → [YES]

A number following address G determines the meaning of the command for the concerned block.
G codes are divided into the following two types.

Type	Meaning
One-shot G code	The G code is effective only in the block in which it is specified.
Modal G code	The G code is effective until another G code of the same group is specified.

[Example]
G01 and G00 are modal G codes in group 01.

```
G01 X_ ; ⎫
    Z_ ; ⎬ G01 is effective in this range.
    X_ ; ⎭
G00 Z_ ; ⎫ G00 is effective in this range.
    X_ ; ⎭
G01 X_ ;
  :
```

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There are three G code systems in the lathe system : A, B, and C (Table 3.2). Select a G code system using the parameters GSB and GSC (No. 3401#6 and #7). To use G code system B or C, the corresponding option is needed. Generally, This Handbook describes the use of G code system A, except when the described item can use only G code system B or C. In such cases, the use of G code system B or C is described.

Explanation

1. When the clear state (parameter CLR (No. 3402#6)) is set at power-up or reset, the modal G codes are placed in the states described below.
   (1) The modal G codes are placed in the states marked with (*) as indicated in Tables 3.1 and 3.2.
   (2) G20 and G21 remain unchanged when the clear state is set at power-up or reset.
   (3) Which status G22 or G23 at power on is set by parameter G23 (No. 3402#7). However, G22 and G23 remain unchanged when the clear state is set at reset.
   (4) The user can select G00 or G01 by setting parameter G01 (No. 3402#0).
   (5) The user can select G90 or G91 by setting parameter G91 (No. 3402#3).
   When G code system B or C is used in the lathe system, setting parameter G91 (No. 3402#3) determines which code, either G90 or G91, is effective.
   (6) In the machining center system, the user can select G17, G18, or G19 by setting parameters G18 and G19 (No. 3402#1 and #2).
2. G codes other than G10 and G11 are one-shot G codes in group 00.
3. When a G code not listed in the G code list is specified, or a G code that has no corresponding option is specified, alarm PS0010, “IMPROPER G-CODE” occurs.
4. Multiple G codes can be specified in the same block if each G code belongs to a different group. If multiple G codes that belong to the same group are specified in the same block, only the last G code specified is valid.
5. If a G code belonging to group 01 is specified in a canned cycle for drilling, the canned cycle for drilling is cancelled. This means that the same state set by specifying G80 is set. Note that the G codes in group 01 are not affected by a G code specifying a canned cycle for drilling.
6. G codes are indicated by group.
7. The group of G60 is switched according to the setting of the parameter MDL (No. 5431#0). (When the MDL bit is set to 0, the 00 group is selected. When the MDL bit is set to 1, the 01 group is selected.)

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8. When G code system A is used, absolute or incremental programming is specified not by a G code (G90/G91) but by an address word (X/U, Z/W, C/H, Y/V). Only the initial level is provided at the return point of the canned cycle for drilling.

3.1 G CODE LIST IN THE MACHINING CENTER SYSTEM

Table 3.1 G code list

G code	Group	Function	
G00 (*)	01	Positioning (rapid traverse)	
G01 (*)		Linear interpolation (cutting feed)	
G02		Circular interpolation CW or helical interpolation CW	
G03		Circular interpolation CCW or helical interpolation CCW	
G04	00	Dwell	
G04.1		G code preventing buffering	
G05		AI contour control (high-precision contour control compatible command)	
G05.1		AI Advanced Preview Control / AI contour control / Nano smoothing	
G05.4		HRV3,4 on/off	
G07.1 (G107)	00	Cylindrical interpolation	
G08		AI Advanced Preview Control / AI contour control (advanced preview control compatible command)	
G09		Exact stop	
G10		Programmable data input	
G10.6		Tool retract and recover	
G11		Programmable data input mode cancel	
G15 (*)	17	Polar coordinates command cancel	
G16		Polar coordinates command	
G17 (*)	02	XpYp plane selection	Xp: X axis or its parallel axis Yp: Y axis or its parallel axis Zp: Z axis or its parallel axis
G18 (*)		ZpXp plane selection	
G19 (*)		YpZp plane selection	
G20 (G70)	06	Inch input	
G21 (G71)		Metrci input	
G22 (*)	04	Stored stroke check function on	
G23		Stored stroke check function off	
G27	00	Reference position return check	
G28.2		In-position check disable reference position return	
G28		Automatic return to reference position	
G29		Movement from reference position	
G30		2nd, 3rd, and 4th reference position return	
G30.2		In-position check disable 2nd, 3rd, or 4th reference position return	
G31		Skip function	
G31.8		EGB-axis skip	
G33	01	Threading	
G37	00	Automatic tool length measurement	
G38		Tool radius and tool nose radius compensation : preserve vector	
G39		Tool radius and tool nose radius compensation : corner circular interpolation	

G code	Group	Function
G40 (*)	07	Tool radius and tool nose radius compensation : cancel
G41		Tool radius and tool nose radius compensation : left
G42		Tool radius and tool nose radius compensation : right
G40.1	18	Normal direction control cancel mode
G41.1		Normal direction control on : left
G42.1		Normal direction control on : right
G43	08	Tool length compensation +
G44		Tool length compensation -
G43.7		Tool offset
G45	00	Tool offset increase
G46		Tool offset decrease
G47		Tool offset double increase
G48		Tool offset double decrease
G49 (G49.1) (*)	08	Tool length compensation cancel
G50 (*)	11	Scaling cancel
G51		Scaling
G50.1 (*)	22	Programmable mirror image cancel
G51.1		Programmable mirror image
G50.4	00	Cancel synchronous control
G50.5		Cancel composite control
G50.6		Cancel superimposed control
G50.9		Auxiliary function output in moving axis
G51.4		Start synchronous control
G51.5		Start composite control
G51.6		Start superimposed control
G52		Local coordinate system setting
G53		Machine coordinate system setting
G53.1		Tool axis direction control
G53.6		Tool center point retention type tool axis direction control
G54 (G54.1) (*)	14	Workpiece coordinate system 1 selection
G55		Workpiece coordinate system 2 selection
G56		Workpiece coordinate system 3 selection
G57		Workpiece coordinate system 4 selection
G58		Workpiece coordinate system 5 selection
G59		Workpiece coordinate system 6 selection
G60	00	Single direction positioning
G61	15	Exact stop mode
G62		Automatic corner override
G63		Tapping mode
G64 (*)		Cutting mode
G65	00	Macro call
G66	12	Macro modal call A
G66.1		Macro modal call B

G code	Group	Function
G67 (*)		Macro modal call A/B cancel
G68	16	Coordinate system rotation start or 3-dimensional coordinate conversion mode on
G69 (*)		Coordinate system rotation cancel or 3-dimensional coordinate conversion mode off
G68.2		Tilted working plane indexing
G68.3		Tilted working plane indexing in tool axis direction
G68.4		Tilted working plane indexing (incremental multi-command)
G73	09	Peck drilling cycle
G74		Left-handed tapping cycle
G75	01	Plunge grinding cycle
G76	09	Fine boring cycle
G77	01	Plunge direct sizing/grinding cycle
G78		Continuous-feed surface grinding cycle
G79		Intermittent-feed surface grinding cycle
G80 (*)	09	Canned cycle cancel / Electronic gear box: synchronization cancellation
G80.4 (*)	34	Electronic gear box: synchronization cancellation
G81.4		Electronic gear box: synchronization start
G81	09	Drilling cycle or spot boring cycle / Electronic gear box: synchronization start
G81.1	00	Oscillation function
G82	09	Drilling cycle or counter boring cycle
G83		Peck drilling cycle
G84		Tapping cycle
G84.2		Rigid tapping cycle (FS15 format)
G84.3		Left-handed rigid tapping cycle (FS15 format)
G85		Boring cycle
G86		Boring cycle
G87		Back boring cycle
G88		Boring cycle
G89		Boring cycle
G90 (*)	03	Absolute programming
G91 (*)		Incremental programming
G91.1	00	Checking the maximum incremental amount specified
G92		Setting for workpiece coordinate system or clamp at maximum spindle speed
G92.1		Workpiece coordinate system preset
G93	05	Inverse time feed
G94 (*)		Feed per minute
G95		Feed per revolution
G96	13	Constant surface speed control
G97 (*)		Constant surface speed control cancel
G96.1	00	Spindle indexing (waiting for completion)
G96.2		Spindle indexing (not waiting for completion)
G96.3		Spindle indexing completion check
G96.4		SV rotation control mode ON

G code	Group	Function
G98 (*)	10	Canned cycle : return to initial level
G99		Canned cycle : return to R point level
G107	00	Cylindrical interpolation
G160 (*)	20	In-feed control cancel
G161		In-feed control

3.2 G CODE LIST IN THE LATHE SYSTEM

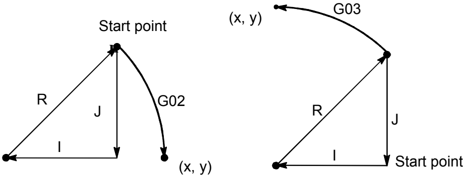
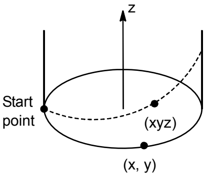
Table 3.2 G code list

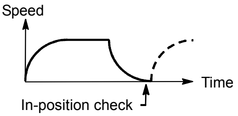
G code system			Group	Function
A	B	C		
G00 (*)	G00 (*)	G00 (*)	01	Positioning (Rapid traverse)
G01	G01	G01		Linear interpolation (Cutting feed)
G02	G02	G02		Circular interpolation CW or helical interpolation CW
G03	G03	G03		Circular interpolation CCW or helical interpolation CCW
G04	G04	G04	00	Dwell
G04.1	G04.1	G04.1		G code preventing buffering
G05.1	G05.1	G05.1		AI contour control
G05.4	G05.4	G05.4		HRV3, 4 on/off
G07.1 (G107)	G07.1 (G107)	G07.1 (G107)	00	Cylindrical interpolation
G08	G08	G08		AI contour control (advanced preview control compatible command)
G09	G09	G09		Exact stop
G10	G10	G10		Programmable data input
G10.6	G10.6	G10.6		Tool retract and recover
G11	G11	G11		Programmable data input mode cancel
G12.1 (G112)	G12.1 (G112)	G12.1 (G112)	21	Polar coordinate interpolation mode
G13.1 (G113) (*)	G13.1 (G113) (*)	G13.1 (G113) (*)		Polar coordinate interpolation cancel mode
G17	G17	G17	16	XpYp plane selection
G18 (*)	G18 (*)	G18 (*)		ZpXp plane selection
G19	G19	G19		YpZp plane selection
G20	G20	G70	06	Inch input
G21	G21	G71		Metrci input
G22 (*)	G22 (*)	G22 (*)	09	Stored stroke check function on
G23	G23	G23		Stored stroke check function off
G25 (*)	G25 (*)	G25 (*)	08	Spindle speed fluctuation detection off
G26	G26	G26		Spindle speed fluctuation detection on
G27	G27	G27	00	Reference position return check
G28	G28	G28		Return to reference position
G28.2	G28.2	G28.2		In-position check disable reference position return
G29	G29	G29		Movement from reference position
G30	G30	G30		2nd, 3rd and 4th reference position return
G30.1	G30.1	G30.1		Floating reference position return
G30.2	G30.2	G30.2		In-position check disable 2nd, 3rd, or 4th reference position return
G31	G31	G31		Skip function
G31.8	G31.8	G31.8		EGB-axis skip
G32	G33	G33	01	Thread cutting

G code system A	G code system B	G code system C	Group	Function
G34	G34	G34		Variable lead thread cutting
G35	G35	G35		Circular thread cutting CW
G36	G36	G36		Circular thread cutting CCW (When the parameter G36 (No. 3405#3) is set to 1) or Automatic tool offset (X axis) (When the parameter G36 (No. 3405#3) is set to 0)
G37	G37	G37		Automatic tool offset (Z axis) (When the parameter G36 (No. 3405#3) is set to 0)
G37.1	G37.1	G37.1		Automatic tool offset (X axis) (When the parameter G36 (No. 3405#3) is set to 1)
G37.2	G37.2	G37.2		Automatic tool offset (Z axis) (When the parameter G36 (No. 3405#3) is set to 1)
G38	G38	G38		Tool radius and tool nose radius compensation: with vector held
G39	G39	G39		Tool radius and tool nose radius compensation: corner rounding interpolation
G40 (*)	G40 (*)	G40 (*)	07	Tool radius and tool nose radius compensation : cancel
G41	G41	G41		Tool radius and tool nose radius compensation : left
G42	G42	G42		Tool radius and tool nose radius compensation : right
G43.7 (G44.7)	G43.7 (G44.7)	G43.7 (G44.7)	23	Tool offset (lathe system ATC type) (Bit 3 (TCT) of parameter No. 5040 must be "1".)
G49 (G49.1)	G49 (G49.1)	G49 (G49.1)		Tool length compensation cancel
G50	G92	G92	00	Coordinate system setting or max. spindle speed clamp
G50.3	G92.1	G92.1		Workpiece coordinate system preset
G50.1	G50.1	G50.1	22	Programmable mirror image cancel
G51.1	G51.1	G51.1		Programmable mirror image
G50.2 (G250) (*)	G50.2 (G250) (*)	G50.2 (G250) (*)	20	Polygon turning cancel
G51.2 (G251)	G51.2 (G251)	G51.2 (G251)		Polygon turning
G50.4	G50.4	G50.4	00	Cancel synchronous control
G50.5	G50.5	G50.5		Cancel composite control
G50.6	G50.6	G50.6		Cancel superimposed control
G50.9	G50.9	G50.9		Auxiliary function output in moving axis
G51.4	G51.4	G51.4		Start synchronous control
G51.5	G51.5	G51.5		Start composite control
G51.6	G51.6	G51.6		Start superimposed control
G52	G52	G52		Local coordinate system setting
G53	G53	G53		Machine coordinate system setting

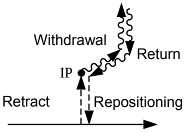
G code system			Group	Function
A	B	C		
G54 (*)	G54 (*)	G54 (*)	14	Workpiece coordinate system 1 selection
G55	G55	G55		Workpiece coordinate system 2 selection
G56	G56	G56		Workpiece coordinate system 3 selection
G57	G57	G57		Workpiece coordinate system 4 selection
G58	G58	G58		Workpiece coordinate system 5 selection
G59	G59	G59		Workpiece coordinate system 6 selection
G61	G61	G61	15	Exact stop mode
G62	G62	G62		Automatic corner override mode
G63	G63	G63		Tapping mode
G64	G64	G64		Cutting mode
G65	G65	G65	00	Macro call
G66	G66	G66	12	Macro modal call A
G66.1	G66.1	G66.1		Macro modal call B
G67 (*)	G67 (*)	G67 (*)		Macro modal call A/B cancel
G68	G68	G68	04	Mirror image on for double turret or balance cutting mode
G68.1	G68.1	G68.1	17	Coordinate system rotation start or 3-dimensional coordinate conversion mode on
G69 (*)	G69 (*)	G69 (*)	04	Mirror image off for double turret or balance cutting mode cancel
G69.1	G69.1	G69.1	17	Coordinate system rotation cancel or 3-dimensional coordinate conversion mode off
G70	G70	G72	00	Finishing cycle
G71	G71	G73		Stock removal in turning
G72	G72	G74		Stock removal in facing
G73	G73	G75		Pattern repeating cycle
G74	G74	G76		End face peck drilling cycle
G75	G75	G77		Outer diameter/internal diameter drilling cycle
G76	G76	G78		Multiple-thread cutting cycle
G71	G71	G72	01	Traverse grinding cycle
G72	G72	G73		Traverse direct sizing/grinding cycle
G73	G73	G74		Oscillation grinding cycle
G74	G74	G75		Oscillation direct sizing/grinding cycle
G80 (*)	G80 (*)	G80 (*)	10	Canned cycle cancel for drilling / Electronic gear box: synchronization cancellation
G80.4 (*)	G80.4 (*)	G80.4 (*)	28	Electronic gear box: synchronization cancellation
G81	G81	G81	10	Spot drilling(FS10/11-T format)/ Electronic gear box: synchronization start
G81.1	G81.1	G81.1	00	Oscillation function

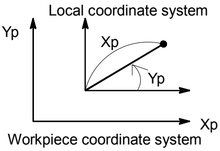
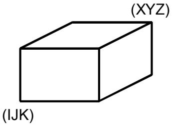
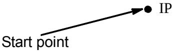
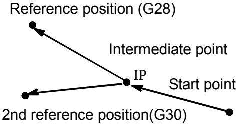
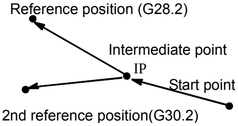
G code system			Group	Function
A	B	C		
G81.4	G81.4	G81.4	28	Electronic gear box: synchronization start
G82	G82	G82	10	Counter boring (FS10/11-T format)
G83	G83	G83		Cycle for face drilling
G83.1	G83.1	G83.1		High-speed peck drilling cycle (FS10/11-T format)
G83.5	G83.5	G83.5		High-speed peck drilling cycle
G83.6	G83.6	G83.6		Peck drilling cycle
G84	G84	G84		Cycle for face tapping
G84.2	G84.2	G84.2		Rigid tapping cycle (FS10/11-T format)
G85	G85	G85		Cycle for face boring
G87	G87	G87		Cycle for side drilling
G87.5	G87.5	G87.5		High-speed peck drilling cycle
G87.6	G87.6	G87.6		Peck drilling cycle
G88	G88	G88		Cycle for side tapping
G89	G89	G89		Cycle for side boring
G90	G77	G20	01	Outer diameter/internal diameter cutting cycle
G92	G78	G21		Threading cycle
G94	G79	G24		End face turning cycle
G91.1	G91.1	G91.1	00	Maximum specified incremental amount check
G96	G96	G96	02	Constant surface speed control
G97 (*)	G97 (*)	G97 (*)		Constant surface speed control cancel
G96.1	G96.1	G96.1	00	Spindle indexing execution (waiting for completion)
G96.2	G96.2	G96.2		Spindle indexing execution (not waiting for completion)
G96.3	G96.3	G96.3		Spindle indexing completion check
G96.4	G96.4	G96.4		SV speed control mode ON
G98	G94	G94	05	Feed per minute
G99 (*)	G95 (*)	G95 (*)		Feed per revolution
-	G90 (*)	G90 (*)	03	Absolute programming
-	G91	G91		Incremental programming
-	G98	G98	11	Canned cycle : return to initial level
-	G99	G99		Canned cycle : return to R point level

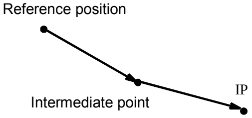
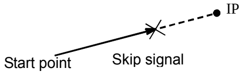
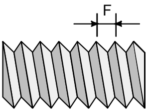
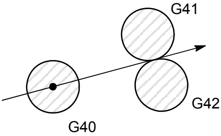
Function	Positioning (G00)
Program format	G00 IP_ ;
Illustration	
Function	Linear interpolation (G01)
Program format	G01 IP_ F_;
Illustration	
Function	Circular interpolation (G02, G03)
Program format	- For machining center system $G17 \left\{\begin{matrix} G02 \\ G03 \end{matrix}\right\} X\_ Y\_ \left\{\begin{matrix} R\_ \\ I\_ J\_ \end{matrix}\right\} F\_ ;$ $G18 \left\{\begin{matrix} G02 \\ G03 \end{matrix}\right\} X\_ Z\_ \left\{\begin{matrix} R\_ \\ I\_ K\_ \end{matrix}\right\} F\_ ;$ $G19 \left\{\begin{matrix} G02 \\ G03 \end{matrix}\right\} Y\_ Z\_ \left\{\begin{matrix} R\_ \\ J\_ K\_ \end{matrix}\right\} F\_ ;$ - For lathe system $\left\{\begin{matrix} G02 \\ G03 \end{matrix}\right\} X\_ Z\_ \left\{\begin{matrix} R\_ \\ I\_ K\_ \end{matrix}\right\} F\_ ;$
Illustration	
Function	Helical interpolation (G02, G03)
Program format	$G17 \left\{\begin{matrix} G02 \\ G03 \end{matrix}\right\} X\_ Y\_ \left\{\begin{matrix} R\_ \\ I\_ J\_ \end{matrix}\right\} \alpha\_F\_ ;$ $G18 \left\{\begin{matrix} G02 \\ G03 \end{matrix}\right\} X\_ Z\_ \left\{\begin{matrix} R\_ \\ I\_ K\_ \end{matrix}\right\} \alpha\_F\_ ;$ $G19 \left\{\begin{matrix} G02 \\ G03 \end{matrix}\right\} Y\_ Z\_ \left\{\begin{matrix} R\_ \\ J\_ K\_ \end{matrix}\right\} \alpha\_F\_ ;$ α : Any address other than circular interpolation axes.
Illustration	 In case of G03 on X-Y plane
Function	Dwell (G04)
Program format	$G04 \left\{\begin{matrix} X\_ \\ P\_ \end{matrix}\right\} ;$

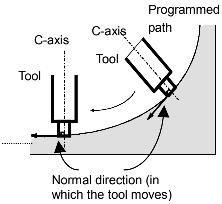
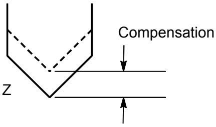
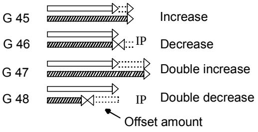
Function	G code preventing buffering (G04.1)
Program format	G04.1 (P_) ; P : The operation mode of G04.1. P1: Compatible operation to preventing buffering by command of only G31. P2: Compatible operation to preventing buffering by command of only G53.
Function	AI advanced preview control (G05.1)
Program format	- For machining center system only G05.1 Q1 ; AI advanced preview control mode on G05.1 Q0 ; AI advanced preview control mode off
Function	AI contour control (G05.1)
Program format	G05.1 Q1 ; AI contour control mode on G05.1 Q0 ; AI contour control mode off
Function	Nano smoothing (G05.1)
Program format	G05.1 Q3 IP0 ; Nano smoothing mode on G05.1 Q0 ; Nano smoothing mode off
Function	Cylindrical interpolation (G07.1)
Program format	G07 IP_ r _;Cylindrical interpolation mode r : Cylinder radius G07 IP 0; Cylindrical interpolation mode cancel
Function	AI advanced preview control (Advanced preview control compatible command) (G08)
Program format	- For machining center system only G08 P1 ; AI advanced preview control mode on G08 P0 ; AI advanced preview control mode off
Function	AI contour control (Advanced preview control compatible command) (G08)
Program format	G08 P1 ; AI contour control mode on G08 P0 ; AI contour control mode off
Function	Exact stop (G09)
Program format	$\mathrm{G09}\left\{\begin{array}{c}\mathrm{G01}\\\mathrm{G02}\\\mathrm{G03}\end{array}\right\}\mathrm{IP\_}\ ;$
Illustration	

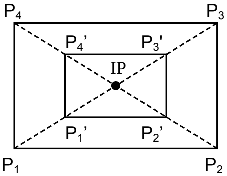
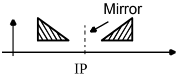
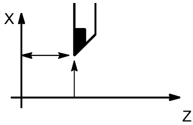
Function	Programmable data input (G10)
Program format	- For machining center system Tool compensation memory A G10 L01 P_ R_ ; Tool compensation memory B G10 L10 P_ R_ ; (Geometry offset amount) G10 L11 P_ R_ ; (Wear offset amount) Tool compensation memory C G10 L10 P_ R_ ; (Geometry offset amount/H) G10 L11 P_ R_ ; (Wear offset amount/H) G10 L12 P_ R_ ; (Geometry offset amount/D) G10 L13 P_ R_ ; (Wear offset amount/D) - For lathe system Geometry offset amount G10 P_ X_ Z_ R_ Q_ ; P= 10000 + Geometry offset number Wear offset amount G10 P_ X_ Z_ C_ Q_ ; P= Wear offset number - For machining center system Tool life G10 L3 P_ ;(No P: Registration, P1: Change, P2: Deletion) P_L_ ; (P: Group number, L: Tool life) T_H_D_ ; - For lathe system Tool life G10 L3 P_ ;(No P: Registration, P1: Change, P2: Deletion) P_L_ ; (P: Group number, L: Tool life) T_(D_) ; Interference check G10 L6 P_Q_X_Z_I_K_ ; (P: Tool number, Q: Area) - Common to lathe system/machining center system Setting of workpiece origin offset G10 L2 Pp IP_ ; p=0 : External workpiece origin offset p=1 to 6 : Workpiece origin offset for workpiece coordinate systems 1 to 6 IP_ : Absolute programming → Workpiece origin offset for an axis Incremental programming → Value to be added to the workpiece origin offset for an axis that is set

Function	Programmable parameter input (G10, G11)
Program format	For parameter input mode G10 L52 ; Parameter input mode setting N_ R_ ; Non-axis parameter input N_ P_ R_ ; Axis parameter input : G11 ; Parameter input mode cancel N_ : Parameter No. R_ : Parameter setting (leading zero omissible) P_: Axis number 1 to maximum number of controlled axes (to be specified when an axis or spindle parameter is input) For pitch error compensation data input mode G10 L50 ; Pitch error compensation data input mode setting N_ (L1) R_ ; Pitch error compensation data input : G11 ; Pitch error compensation data input mode cancel N_ : Pitch error compensation point No. + 10,000 L1 : Input format of pitch error compensation data (Total value type) R_ : Pitch error compensation data
Function	Tool retract and recover (G10.6)
Program format	G10.6 IP_ ; Specify the amount of retraction G10.6 (as a single block containing no other commands) ; Cancel the amount of retraction
Illustration	
Function	Programmable internal data change (G10.8)
Program format	Tolerance change in smooth TCP mode $\text{G10.8 L1} \begin{Bmatrix} \alpha\_\ \beta\_ \\ P\_ \end{Bmatrix};$ α : Compensation tolerance for the first rotation axis β : Compensation tolerance for the second rotation axis P0 : 0 is used as the compensation tolerance for first or second rotation axis P1 : Parameter No.10486 or 10487 is used as the compensation tolerance for first or second rotation axis
Function	Polar coordinate interpolation (G12.1, G13.1)
Program format	- For lathe system only G12.1 ; Polar coordinate interpolation mode on G13.1 ; Polar coordinate interpolation cancel

Function	Polar coordinate command (G15, G16)
Program format	G17 G16 Xp_ Yp_ … ; G18 G16 Zp_ Xp_ … ; G19 G16 Yp_ Zp_ … ; G15 ; Cancel
Illustration	
Function	Plane selection (G17, G18, G19)
Program format	G17 ; Xp Yp-plane selection G18 ; Zp Xp-plane selection G19 ; Yp Zp-plane selection
Function	Inch/metric conversion (G20, G21)
Program format	Inch input G20 ; Metric input G21 ;
Function	Stored stroke check (G22, G23)
Program format	G22 X_ Y_ Z_ I_ J_ K_ ; G23 ; Cancel
Illustration	
Function	Reference position return check (G27)
Program format	G27 IP_ ;
Illustration	
Function	Reference position return (G28)
	2nd Reference position return (G30)
Illustration	
Program format	G28 IP_ ;
	G30 IP_ ;
Function	In-position check disable reference position return (G28.2)
	In-position check disable 2nd reference position return (G30.2)
Illustration	
Program format	G28.2 IP_ ;
	G30.2 IP_ ;

<table>
<tr><td>Function</td><td>Movement from reference position (G29)</td></tr>
<tr><td>Program format</td><td>G29 IP_ ;</td></tr>
<tr><td>Illustration</td><td>
</td></tr>
<tr><td>Function</td><td>Skip function (G31)</td></tr>
<tr><td>Program format</td><td>G31 IP_ F_ ;</td></tr>
<tr><td>Illustration</td><td>
</td></tr>
<tr><td>Function</td><td>EGB skip function (G31.8)</td></tr>
<tr><td>Program format</td><td>G81 T_ L_ ; (EGB mode on)
G31.8 G91 α0 P_ Q_ R_ ; (EGB skip command)
α : Specify an EGB slave axis. The value must always be "0".
P : Start number of the custom macro variable used to store the machine coordinates when a skip signal is input.
Q : Number of times a skip signal can be input during the execution of G31.8
(Valid range: 1 to 512)
R : Number of the custom macro variable used to store the number of times a skip signal is input. The value specified in Q is stored in the custom macro variable specified in R. You need not necessarily specify it. Specify it if you want to check the number of times a signal is input.</td></tr>
<tr><td rowspan="2">Function</td><td>Thread cutting (G33)</td></tr>
<tr><td>Thread cutting (G32)</td></tr>
<tr><td rowspan="2">Program format</td><td>- For machining center system
G33 IP_ F_ ;
F : Lead</td></tr>
<tr><td>- For lathe system
Equal lead threading
G32 P_ F_ ;</td></tr>
<tr><td>Illustration</td><td>
</td></tr>
<tr><td>Function</td><td>Tool radius and tool nose radius compensation, (G38, G39, G40 to G42)</td></tr>
<tr><td>Program format</td><td>- For machining center system only
$\begin{Bmatrix} G17 \\ G18 \\ G19 \end{Bmatrix} \begin{Bmatrix} G41 \\ G42 \end{Bmatrix}$ D_ ;
D: Tool compensation number
G40: Cancel</td></tr>
<tr><td>Illustration</td><td>
</td></tr>
</table>

Function	Tool radius and tool nose radius compensation (G40 to G42) (G38, G39)
Program format	- For lathe system only $\left\{\begin{matrix}\text{G41}\\\text{G42}\end{matrix}\right\}$ IP_ ; G40 : Cancel
Function	Normal direction control (G40.1, G41.1, G42.1)
Program format	G41.1 ; Normal direction control on : right G42.1 ; Normal direction control on : left G40.1 ; Normal direction control cancel
Illustration	
Function	Tool length compensation (G43, G44, G49)
Program format	- For machining center system only $\left\{\begin{matrix}\text{G43}\\\text{G44}\end{matrix}\right\}$ Z_ H_ ; $\left\{\begin{matrix}\text{G43}\\\text{G44}\end{matrix}\right\}$ H_ ; H: Tool compensation number G49: Cancel
Illustration	
Function	Tool offset (G45 to G48)
Program format	- For machining center system only $\left\{\begin{matrix}\text{G45}\\\text{G46}\\\text{G47}\\\text{G48}\end{matrix}\right\}$ IP_ D_ ; D: Tool offset No.
Illustration	

Function	Scaling (G50, G51)
Program format	- For machining center system only G51 X_ Y_ Z_ { P_ / I_ J_ K_ } ; P, I, J, K: Scaling magnification X, Y, Z: Control position of scaling G50: Cancel - For lathe system only Enabled when G code system B/C is used
Illustration	
Function	Programmable mirror image (G50.1, G51.1)
Program format	G51.1 IP_ ; G50.1 ; Cancel
Illustration	
Function	Synchronous, composite, and superimposed control by program command (G50.4, G51.4, G50.5, G51.5, G50.6, G51.6)
Program format	G51.4 P_Q_(L_) ; Start synchronous control (L_ can be omitted.) G50.4 Q_ ; Cancel synchronous control. P : Number to identify synchronous master axis Q : Number to identify synchronous slave axis L : Parking start command G51.5 P_Q_ ; Start composite control G50.5 P_Q_ ; Cancel composite control P : Number to identify composite axis 1 Q : Number to identify composite axis 2 G51.6 P_Q_ ; Start superimposed control G50.6 Q_ ; Cancel superimposed control P : Number to identify superimposed master axis Q : Number to identify superimposed slave axis
Function	Coordinate system setting (G50) Maximum spindle speed clamp (G50)
Program format	- For lathe system only G50 IP_ ; (Coordinate system setting) G50 S_ ; (Maximum spindle speed clamp)
Illustration	
Function	Workpiece coordinate system preset (G50.3)
Program format	- For lathe system only G50.3 IP 0 ;

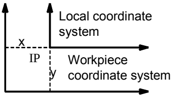
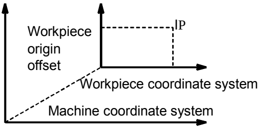
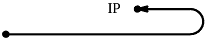
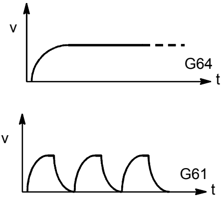
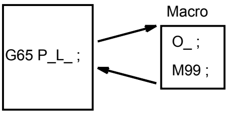
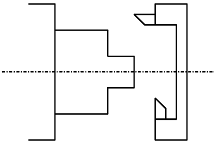
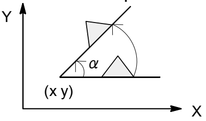
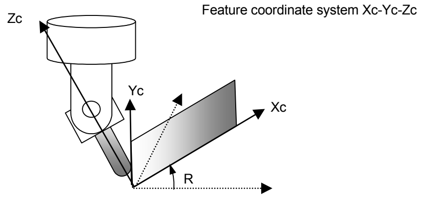
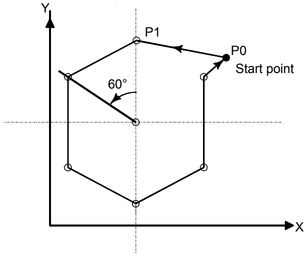
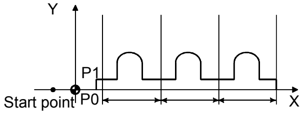
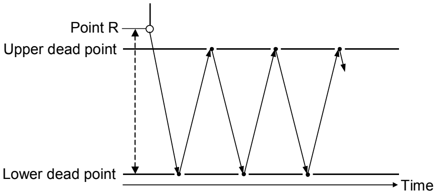
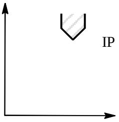
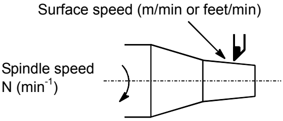
Function	Local coordinate system setting (G52)
Program format	G52 IP_ ;
Illustration	
Function	Command in machine coordinate system (G53)
Program format	G53 IP_ ;
Function	Tool axis direction control (G53.1)
Program format	G53.1 ; Tool axis direction control
Function	Selection of workpiece coordinate system (G54 to G59)
Program format	$\left\{\begin{array}{l}\text{G54}\\ \vdots\\ \text{G59}\end{array}\right\}$ IP_ ;
Illustration	
Function	Single direction positioning (G60)
Program format	G60 IP_ ;
Illustration	
Function	Cutting mode (G64) Exact stop mode (G61) Tapping mode (G63)
Program format	G64_ ; Cutting mode G61_ ; Exact stop mode G63_ ; Tapping mode
Illustration	
Function	Automatic corner override (G62)
Program format	G62_ ; Automatic corner override
Illustration	
Function	Custom macro (G65, G66, G66.1, G67)
Program format	One-shot call G65 P_ L_ <Argument assignment> ; P : Program number L : Number of repetition Modal call G66 P_ L_ <Argument assignment> ; Call after the move command G66.1 P_ L_ <Argument assignment> ; Each block call G67 ; Cancel

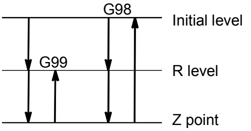
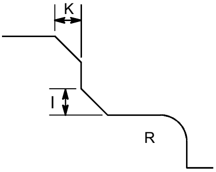
Illustration	
Function	Mirror image for double turret (G68, G69)
Program format	- For lathe system only G68 : Mirror image on for double turret G69 : Mirror image cancel
Illustration	
Function	Coordinate system rotation, Three-dimensional coordinate conversion (G68, G69), (G68.1, G69.1)
Program format	- For machining center system $G68 \left\{ \begin{array}{l} G17\ X\_\ Y\_ \\ G18\ Z\_\ X\_ \\ G19\ Y\_\ Z\_ \end{array} \right\} R\ \underline{\alpha}\ ;$ G69 ; Cancel - For lathe system $G68.1 \left\{ \begin{array}{l} G17\ X\_\ Y\_ \\ G18\ Z\_\ X\_ \\ G19\ Y\_\ Z\_ \end{array} \right\} R\ \underline{\alpha}\ ;$ G69.1 ; Cancel
Illustration	In case of X-Y plane 
Function	Tilted working plane indexing command (G68.2)
Program format	G68.2 X_ Y_ Z_ I_ J_ K_ ; G69 ; Cancel X, Y, Z: Feature coordinate system origin I, J, K : Euler angles for determining the orientation of the feature coordinate system
Function	Tilted working plane indexing command with guidance (G68.2, G68.4)
Program format	G68.2/G68.4 P_ X_ Y_ Z_ I_ J_ K_ ; G68.2 : Tilted working plane indexing command G68.4 : Tilted working plane indexing command (incremental multiplexed command) G69 ; Tilted working plane indexing command cancel Without P : Euler's angle P1 : Roll, pitch, yaw P2 : Three points P3 : Two vectors P4 : Projection angle

Function	Tilted working plane indexing command in tool direction (G68.3)
Program format	G68.3 X_ Y_ Z_ R_ ; G69 ; Cancel X, Y, Z: Feature coordinate system origin R : Angle of rotation about the Z-axis in the feature coordinate system
Illustration	
Function	Figure copy (G72.1, G72.2)
Program format	Rotational copy $\left\{\begin{matrix}(G17)\\(G18)\\(G19)\end{matrix}\right\}$ G72.1 P_ L_ $\left\{\begin{matrix}X\_\ Y\_\\Z\_\ X\_\\Y\_\ Z\_\end{matrix}\right\}$ R_ ; Linear copy $\left\{\begin{matrix}(G17)\\(G18)\\(G19)\end{matrix}\right\}$ G72.2 P_ L_ $\left\{\begin{matrix}I\_\ J\_\\K\_\ I\_\\J\_\ K\_\end{matrix}\right\}$;
Illustration	Rotational copy  Linear copy 
Function	Canned cycle for drilling (G73, G74, G80 to G89)
Program format	- For machining center system only G80 ; Cancel $\left.\begin{matrix}G73\\G74\\G76\\G81\\:\\G89\end{matrix}\right\}$ X_Y_Z_P_Q_R_F_K_ ;

Function	Canned cycle for turning (G71 to G76) (G90, G92, G94)
Program format	- For lathe system only N_ G70 P_ Q_ ; G71 U_ R_ ; G71 P_ Q_ U_ W_ F_ S_ T_ ; G72 W_ R_ ; G72 P_ Q_ U_ W_ F_ S_ T_ ; G73 U_ W_ R_ ; G73 P_ Q_ U_ W_ F_ S_ T_ ; G74 R_ ; G74 X(U)_ Z(W)_ P_ Q_ R_ F_ ; G75 R_ ; G75 X(U)_ Z(W)_ P_ Q_ R_ F_ ; G76 P_ Q_ R_ ; G76 X(U)_ Z(W)_ P_ Q_ R_ F_ ; $\left\{\begin{matrix}\text{G90}\\\text{G92}\end{matrix}\right\}$ X_ Z_ I_ F_ ; G94 X_ Z_ K_ F_ ;
Function	Canned grinding cycle (for grinding machine) (G71 to G75, G77 to G79)
Program format	- For machining center G75 I_ J_ K_ α_ R_ F_ P_ L_ ; G77 I_ J_ K_ α_ R_ F_ P_ L_ ; G78 I_ (J_) K_ α_ F_ P_ L_ ; G79 I_ J_ K_ α_ R_ F_ P_ L_ ; α : Arbitrary axis address of the grinding axis - For lathe G71 A_ B_ W_ U_ I_ K_ H_ ; G72 P_ A_ B_ W_ U_ I_ K_ H_ ; G73 A_ (B_) W_ U_ K_ H_ ; G74 P_ A_ (B_) W_ U_ K_ H_ ;
Function	Electric gear box (EGB) (G81, G80)
Program format	G81 T_ (L_) (Q_ P_) ; Starts synchronization. G80 ; Cancels synchronization. T: Number of teeth (specifiable range: 1 to 5000) L: Number of hob threads (specifiable range: -250 to 250) Q: Module or diametral pitch Specify a module in the case of metric input. (Unit: 0.00001 mm, Specifiable range: 0.01 to 25.0 mm) Specify a diametral pitch in the case of inch input. (Unit: 0.00001 $inch^{-1}$, Specifiable range: 0.01 to 25.0 $inch^{-1}$) P: Gear helix angle (Unit: 0.0001 deg, Specifiable range: .90.0 to 90.0 deg.) * When specifying Q and P, the user can use a decimal point.

Function	Electric gear box automatic phase synchronization (G81, G80)
Program format	- Acceleration/deceleration type G81 T_ L_ R1 ; Synchronization start G80 R1 ; Synchronization end - Acceleration/deceleration plus automatic phase synchronization type G81 T_ L_ R2 ; Synchronization start G80 R2 ; Synchronization end T : Number of teeth (specifiable range: 1 to 5000) L : Number of hob threads (specifiable range: -250 to 250) When L is positive, the direction of rotation about the workpiece axis is positive (+ direction). When L is negative, the direction of rotation about the workpiece axis is negative (- direction).
Function	High precision oscillation function (G81.1, G80)
Program format	G81.1 Z_ Q_ R_ F_ ; Z : Upper dead point Q : Distance between the upper dead point and lower dead point R : Distance from the upper dead point to point R F : Oscillation base feedrate G80 ; Cancels oscillation
Illustration	
Function	Absolute/incremental programming (G90/G91)
Program format	- For machining center system G90_ ; Absolute programming G91_ ; Incremental programming : G90_ G91_ ; Programming in both modes - For lathe system X_ Z_ C_ : Absolute programming U_ W_ H_ : Incremental programming (Distinguished by an address specified in combined use with a G function such as G00 and G01.)
Function	Maximum incremental command value check (G91.1)
Program format	G91.1 IP_ ; IP_ ; Maximum incremental value Set 0 to cancel maximum incremental value check.

Function	Change of workpiece coordinate system (G92) Maximum spindle speed clamp (G92)
Program format	- For machining center system only G92 IP_ ; Change of workpiece coordinate system G92 S_ ; Constant surface speed control : Maximum spindle speed clamp
Illustration	
Function	Workpiece coordinate system preset (G92.1)
Program format	G92.1 IP 0 ;
Function	Inverse time feed (G93)
Program format	G93 ; Inverse time setting mode
Function	Rate feed (G93.2)
Program format	G93.2 IP_ F_ ; Rate feed command IP_ ; For an absolute programming, the coordinates of an end point, and for an incremental programming, the distance of the tool move. F_ ; Speed in the point.
Function	Feed per minute, Feed per revolution (G94, G95) (G98, G99)
Program format	- For machining center system G94 F_ ; Feed per minute G95 F_ ; Feed per revolution - For lathe system G94 (G98 when G code system A) F_ ; Feed per minute G95 (G99 when G code system A) F_ ; Feed per revolution
Illustration	mm/min inch/min mm/rev inch/rev
Function	Constant surface speed control (G96, G97)
Program format	G96 S_ ; Constant surface speed control on (surface speed specification) G97 S_ ; Constant surface speed control off (spindle speed specification)
Illustration	
Function	SV rotation control mode command (G96.1, G96.2, G96.3, G96.4)
Program format	G96.1 P_ ; G96.2 P_ ; G96.3 P_ ; G96.4 P_ ;

Function	Initial point return / R point return (G98, G99)
Program format	- For machining center system only G98_ ; G99_ ;
Illustration	
Function	Optional chamfering/corner R
	Chamfering/corner R
Program format	- For machining center system only ,C_: Chamfering ,R_: Corner R
	- For lathe system only $X\_ ,\begin{Bmatrix} C\pm K \\ R\_ \end{Bmatrix} P\_;$ $Z\_ ;\begin{Bmatrix} C\pm I \\ R\_ \end{Bmatrix} P\_;$
Illustration	
Function	In-feed control (for grinding machine) (G160, G161)
Program format	- For machining center system only G161 R_ ; $\boxed{\text{Figure program (G01,G02,G03)}}$ G160 ;

5 CUSTOM MACRO

5.1 TYPES OF VARIABLES

Variable name	Variable number	Remarks
Local variable	#1 - #33	
Common variable	#100 - #149 (#199) #500 - #549 (#999)	The following variables are also available with the relevant options: - Addition of custom macro common variables: #150 to #199, #550 to #999 - Embedded macro: #200 to #499
System variable	Greater than #1000	See Section 5.2 for details.

- **Setting of common variable names and command (SETVN)**

Using the command below, you can assign a name of up to eight characters to each of the 50 common variables #500 to #549.

SETVN n[VAR500,VAR501,VAR502,……] ;

where n denotes the start number of the common variable to which a name is to be assigned.

VAR500, VAR501, VAR502, and so on are the variable names of variables n, n+1, n+2, and so on. Once assigned, the variable names are available in the program. For example, if you substitute 10 for variable #510, you can specify [#TOOL_NO]=10;, instead of #510=10;.

5.2 SYSTEM VARIABLE

List of system variables and constants

n represents a subscript.

R, W, and R/W are attributes of a variable and indicate read-only, write-only, and read/write enabled, respectively.

- **Interface signals**

System variable number	System variable name	Attri-bute	Description
#1000 - #1031	[#_UI[n]]	R	Interface input signals (BIT), UI000-UI031 (Note)Subscript n represents a BIT position (0-31) Corresponds to <Gn054 - Gn057>, respectively
#1032 - #1035	[#_UIL[n]]	R	Interface input signals (LONG), UI000 - UI031 / UI100 - UI131 / UI200 - UI231 / UI300 - UI331 (Note) Subscript n (0 - 3) 0=UI000 - UI031, 1=UI100 - UI131, 2=UI200 - UI231, 3=UI300 - UI331 Unified input of <Gn054 - Gn057>
#1036 - #1067	[#_UI[n]]	R	Interface input signals (BIT), UI400-UI431 (Note)Subscript n represents a BIT position (32-63)
#1068 - #1071	[#_UIL[n]]	R	Interface input signals (LONG), UI400-UI431 / UI500-UI531 / UI600-UI631 / UI700-UI731 (Note) Subscript n (4 - 7) 4=UI400-UI431, 5=UI500-UI531, 6=UI600-UI631, 7=UI700-UI731
#1100 - #1131	[#_UO[n]]	R/W	Interface output signals (BIT), UO000 - UO031 (Note)Subscript n represents a BIT position (0-31). Corresponds to <Fn054 - Fn055, Fn276 - Fn0277>, respectively
#1132 - #1135	[#_UOL[n]]	R/W	Interface output signals (LONG),UO000 - UO031/ UO100 - UO131 / UO200 - UO231 / UO300 - UO331 (Note) Subscript n (0 - 3): 0=UO000 - UO031, 1=UO100 - UO131, 2=UO200 - UO231, 3=UO300 - UO331 Unified output of <Fn054 - Fn055, Fn276 - Fn0277>

System variable number	System variable name	Attri-bute	Description
#1136 - #1167	[#_UO[n]]	R/W	Interface output signals (BIT), UO400-UO431 (Note)Subscript n represents a BIT position (32-63)
#1168 - #1171	[#_UOL[4]] - [#_UOL[7]]	R/W	Interface output signals (LONG),UO400-UO431 / UO500-UO531 / UO600-UO631 / UO700-UO731 (Note) Subscript n (4 - 7) 4=UO400-UO431, 5=UO500-UO531, 6=UO600-UO631, 7=UO700-UO731

- **Tool compensation value**

M

Tool compensation memory A

System variable number	System variable name	Attri-bute	Description
#2001 - #2200 #10001 - #10999	[#_OFS[n]]	R/W	Tool compensation value (Note) Subscript n represents a compensation number (1 - 200). When the number of sets is larger than 200, the numbers to the left can also be used. (Note) Subscript n represents a compensation number (1 - 999).

Tool compensation memory C when parameter V15 (No.6000#3) = 0

System variable number	System variable name	Attri-bute	Description
#2001 - #2200	[#_OFSHW[n]]	R/W	Tool compensation value (H code, wear) (Note) Subscript n represents a compensation number (1 - 200).
#10001 - #10999			The numbers to the left can also be used. (Note) Subscript n represents a compensation number (1 - 999).
#2201 - #2400	[#_OFSHG[n]]	R/W	Tool compensation value (H code, geometry) (Note) Subscript n represents a compensation number (1 - 200).
#11001 - #11999			The numbers to the left can also be used. (Note) Subscript n represents a compensation number (1 - 999).
#12001 - #12999	[#_OFSDW[n]]	R/W	Tool compensation value (D code, wear) (Note) Subscript n represents a compensation number (1 - 999).
# 13001 - #13999	[#_OFSDG[n]]	R/W	Tool compensation value (D code, geometry) (Note) Subscript n represents a compensation number (1 - 999).

Tool compensation memory C when parameter V15 (No.6000#3) = 1

System variable number	System variable name	Attri-bute	Description
#2001 - #2200	[#_OFSHG[n]]	R/W	Tool compensation value (H code, geometry) (Note) Subscript n represents a compensation number (1 - 200).
#10001 - #10999			The numbers to the left can also be used. (Note) Subscript n represents a compensation number (1 - 999).
#2201 - #2400	[#_OFSHW[n]]	R/W	Tool compensation value (H code, wear) (Note) Subscript n represents a compensation number (1 - 200).

Tool compensation memory C when parameter V15 (No.6000#3) = 1

System variable number	System variable name	Attri-bute	Description
#11001 - #11999			The numbers to the left can also be used. (Note) Subscript n represents a compensation number (1 - 999).
#2401 - #2600	[#_OFSDG[n]]	R/W	Tool compensation value (D code, geometry) (Note 1) Subscript n represents a compensation number (1 - 200). (Note 1) Enabled when parameter D15 (No.6004#5) = 1.
#12001 - #12999			The numbers to the left can also be used. (Note) Subscript n represents a compensation number (1 - 999).
#2601 - #2800	[#_OFSDW[n]]	R/W	Tool compensation value (D code, wear) (Note 1) Subscript n represents a compensation number (1 - 200). (Note 1) Enabled when parameter D15 (No.6004#5) = 1.
#13001 - #13999			The numbers to the left can also be used. (Note) Subscript n represents a compensation number (1 - 999).

Tool compensation memory C
System variables not dependent onparameter V15 (No.6000#3)

System variable number	System variable name	Attri-bute	Description
#21001-#21999	[#_CORR_G[n]]	R/W	Corner R offset (geometry) Note) Subscript n represents a compensation number (1 to 999).
#22001-#22999	[#_CORR_W[n]]	R/W	Corner R offset (wear) Note) Subscript n represents a compensation number (1 to 999).

- **Tool compensation value**

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Without tool geometry/wear compensation memory

System variable number	System variable name	Attri-bute	Description
#2001 - #2064 #10001 - #10999	[#_OFSX[n]]	R/W	X-axis compensation value (*1) (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2101 - #2164 #11001 - #11999	[#_OFSZ[n]]	R/W	Z-axis compensation value (*1) (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).

Without tool geometry/wear compensation memory

System variable number	System variable name	Attri-bute	Description
#2201 - #2264 #12001 - #12999	[#_OFSR[n]]	R/W	Tool nose radius compensation value (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2301 - #2364 #13001 - #13999	[#_OFST[n]]	R/W	Virtual tool tip T position (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2401 - #2449 #14001 - #14999	[#_OFSY[n]]	R/W	Y-axis compensation value (*1) (Note) Subscript n represents a compensation number (1 - 49). When the number of sets is larger than 49, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).

(*1) X-axis: X-axis of basic three axes, Z-axis: Z-axis of basic three axes,
Y-axis: Y-axis of basic three axes

With tool geometry/wear compensation memory

System variable number	System variable name	Attri-bute	Description
#2001 - #2064 #10001 - #10999	[#_OFSXW[n]]	R/W	X-axis compensation value (wear) (*1) (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2101 - #2164 #11001 - #11999	[#_OFSZW[n]]	R/W	Z-axis compensation value (wear) (*1) (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2201 - #2264 #12001 - #12999	[#_OFSRW[n]]	R/W	Tool nose radius compensation value (wear) (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2301 - #2364 #13001 - #13999	[#_OFST[n]]	R/W	Virtual tool tip T position (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).

5

With tool geometry/wear compensation memory

System variable number	System variable name	Attri-bute	Description
#2401 - #2449 #14001 - #14999	[#_OFSYW[n]]	R/W	Y-axis compensation value (wear) (*1) (Note) Subscript n represents a compensation number (1 - 49). When the number of sets is larger than 49, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2451 - #2499 #19001 - #19999	[#_OFSYG[n]]	R/W	Y-axis compensation value (geometry) (*1) (Note) Subscript n represents a compensation number (1 - 49). When the number of sets is larger than 49, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2701 - #2749 #15001 - #15999	[#_OFSXG[n]]	R/W	X-axis compensation value (geometry) (*1) (Note) Subscript n represents a compensation number (1 - 49). When the number of sets is larger than 49, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 49).
#2801 - #2849 #16001 - #16999	[#_OFSZG[n]]	R/W	Z-axis compensation value (geometry) (*1) (Note) Subscript n represents a compensation number (1 - 49). When the number of sets is larger than 49, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).
#2901 - #2964 #17001 - #17999	[#_OFSRG[n]]	R/W	Tool nose radius compensation value (geometry) (Note) Subscript n represents a compensation number (1 - 64). When the number of sets is larger than 64, the numbers to the left can be used. (Note) Subscript n represents a compensation number (1 - 999).

(*1) X-axis: X-axis of basic three axes, Z-axis: Z-axis of basic three axes,
Y-axis: Y-axis of basic three axes

- Workpiece coordinate system shift amount

T

System variable number	System variable name	Attri-bute	Description
#2501	[#_WKSFTX]	R/W	X-axis workpiece shift amount (*1)
#2601	[#_WKSFTZ]	R/W	Z-axis workpiece shift amount (*1)
#100751 - #100800	[#_WZ_SFT [n]]	R/W	nth axis workpiece shift amount Note) Subscript n represents an axis number (1 to 50).

(*1) X-axis: X-axis of basic three axes, Z-axis: Z-axis of basic three axes

- Automatic operation or the like

System variable number	System variable name	Attri-bute	Description
#3000	[#_ALM]	W	Macro alarm
#3001	[#_CLOCK1]	R/W	Clock 1 (Unit: ms)
#3002	[#_CLOCK2]	R/W	Clock 2 (Unit: hr)

System variable number	System variable name	Attri-bute	Description
#3003	[#_CNTL1]	R/W	Enable or disable the suppression of single block stop. Enable or disable the waiting of the auxiliary function completion signal.
#3003 bit0	[#_M_SBK]	R/W	Enable or disable the suppression of single block stop.
#3003 bit1	[#_M_FIN]	R/W	Enable or disable waiting for the auxiliary function completion signal.
#3004	[#_CNTL2]	R/W	Enable or disable feed hold. Enable or disable feedrate override. Enable or disable exact stop check.
#3004 bit0	[#_M_FHD]	R/W	Enable or disable feed hold.
#3004 bit1	[#_M_OV]	R/W	Enable or disable feedrate override.
#3004 bit2	[#_M_EST]	R/W	Enable or disable exact stop check.
#3005	[#_SETDT]	R/W	Read/write setting data.
#3006	[#_MSGSTP]	W	Stop with a message.
#3007	[#_MRIMG]	R	Status of a mirror image (DI and setting)
#3008	[#_PRSTR]	R	Restarting/not restarting a program

- Time

System variable number	System variable name	Attri-bute	Description
#3011	[#_DATE]	R	Year/Month/Date
#3012	[#_TIME]	R	Hour/Minute/Second

- Path number of the parameter to be read or written

System variable number	System variable name	Attri-bute	Description
#3018	-	R/W	Path number of the parameter to be read or written

- Number of the path on which a macro is being executed

System variable number	System variable name	Attri-bute	Description
#3019	[#_PATH_NO]	R	Number of the path on which a macro is being executed

- Number of parts

System variable number	System variable name	Attri-bute	Description
#3901	[#_PRTSA]	R/W	Total number of parts
#3902	[#_PRTSN]	R/W	Number of required parts

- Tool compensation memory

M

System variable number	System variable name	Attri-bute	Description
#3980	[#_OFSMEM]	R	Tool compensation memory information

- **Main program number**

System variable number	System variable name	Attri-bute	Description
#4000	[#_MAINO]	R	Main program number

- **Modal information**

M

System variable number	System variable name	Attri-bute	Description
#4001 - #4030	[#_BUFG[n]]	R	Modal information on blocks that have been specified by last minute (G code) (Note) Subscript n represents a G code group number.
#4102	[#_BUFB]	R	Modal information on blocks that have been specified by last minute (B code)
#4107	[#_BUFD]	R	Modal information on blocks that have been specified by last minute (D code)
#4108	[#_BUFE]	R	Modal information on blocks that have been specified by last minute (E code)
#4109	[#_BUFF]	R	Modal information on blocks that have been specified by last minute (F code)
#4111	[#_BUFH]	R	Modal information on blocks that have been specified by last minute (H code)
#4113	[#_BUFM]	R	Modal information on blocks that have been specified by last minute (M code)
#4114	[#_BUFN]	R	Modal information on blocks that have been specified by last minute (sequence number)
#4115	[#_BUFO]	R	Modal information on blocks that have been specified by last minute (program number)
#4119	[#_BUFS]	R	Modal information on blocks that have been specified by last minute (S code)
#4120	[#_BUFT]	R	Modal information on blocks that have been specified by last minute (T code)
#4130	[#_BUFWZP]	R	Modal information on blocks that have been specified by last minute (additional workpiece coordinate system number)
#4201 - #4230	[#_ACTG[n]]	R	Modal information on the block currently being executed (G code) (Note) Subscript n represents a G code group number.
#4302	[#_ACTB]	R	Modal information on the block currently being executed (B code)
#4307	[#_ACTD]	R	Modal information on the block currently being executed (D code)
#4308	[#_ACTE]	R	Modal information on the block currently being executed (E code)
#4309	[#_ACTF]	R	Modal information on the block currently being executed (F code)
#4311	[#_ACTH]	R	Modal information on the block currently being executed (H code)
#4313	[#_ACTM]	R	Modal information on the block currently being executed (M code)
#4314	[#_ACTN]	R	Modal information on the block currently being executed (sequence number)
#4315	[#_ACTO]	R	Modal information on the block currently being executed (program number)
#4319	[#_ACTS]	R	Modal information on the block currently being executed (S code)

System variable number	System variable name	Attri-bute	Description
#4320	[#_ACTT]	R	Modal information on the block currently being executed (T code)
#4330	[#_ACTWZP]	R	Modal information on the block currently being executed (additional workpiece coordinate system number)
#4401-#4430	[#_INTG[n]]	R	Modal information on interrupted blocks (G code) Note) Subscript n represents a G code group number.
#4502	[#_INTB]	R	Modal information on interrupted blocks (B code)
#4507	[#_INTD]	R	Modal information on interrupted blocks (D code)
#4508	[#_INTE]	R	Modal information on interrupted blocks (E code)
#4509	[#_INTF]	R	Modal information on interrupted blocks (F code)
#4511	[#_INTH]	R	Modal information on interrupted blocks (H code)
#4513	[#_INTM]	R	Modal information on interrupted blocks (M code)
#4514	[#_INTN]	R	Modal information on interrupted blocks (sequence number)
#4515	[#_INTO]	R	Modal information on interrupted blocks (program number)
#4519	[#_INTS]	R	Modal information on interrupted blocks (S code)
#4520	[#_INTT]	R	Modal information on interrupted blocks (T code)
#4530	[#_INTWZP]	R	Modal information on interrupted blocks (additional workpiece coordinate system number)

T

System variable number	System variable name	Attri-bute	Description
#4001 - #4030	[#_BUFG[n]]	R	Modal information on blocks that have been specified by last minute (G code) (Note) Subscript n represents a G code group number.
#4108	[#_BUFE]	R	Modal information on blocks that have been specified by last minute (E code)
#4109	[#_BUFF]	R	Modal information on blocks that have been specified by last minute (F code)
#4113	[#_BUFM]	R	Modal information on blocks that have been specified by last minute (M code)
#4114	[#_BUFN]	R	Modal information on blocks that have been specified by last minute (sequence number)
#4115	[#_BUFO]	R	Modal information on blocks that have been specified by last minute (program number)
#4119	[#_BUFS]	R	Modal information on blocks that have been specified by last minute (S code)
#4120	[#_BUFT]	R	Modal information on blocks that have been specified by last minute (T code)
#4130	[#_BUFWZP]	R	Modal information on blocks that have been specified by last minute (additional workpiece coordinate system number)
#4201 - #4230	[#_ACTG[n]]	R	Modal information on the block currently being executed (G code) (Note) Subscript n represents a G code group number.
#4308	[#_ACTE]	R	Modal information on the block currently being executed (E code)

5

System variable number	System variable name	Attri-bute	Description
#4309	[#_ACTF]	R	Modal information on the block currently being executed (F code)
#4313	[#_ACTM]	R	Modal information on the block currently being executed (M code)
#4314	[#_ACTN]	R	Modal information on the block currently being executed (sequence number)
#4315	[#_ACTO]	R	Modal information on the block currently being executed (program number)
#4319	[#_ACTS]	R	Modal information on the block currently being executed (S code)
#4320	[#_ACTT]	R	Modal information on the block currently being executed (T code)
#4330	[#_ACTWZP]	R	Modal information on the block currently being executed (additional workpiece coordinate system number)
#4401 - #4430	[#_INTG[n]]	R	Modal information on interrupted blocks (G code) (Note) Subscript n represents a G code group number.
#4508	[#_INTE]	R	Modal information on interrupted blocks (E code)
#4509	[#_INTF]	R	Modal information on interrupted blocks (F code)
#4513	[#_INTM]	R	Modal information on interrupted blocks (M code)
#4514	[#_INTN]	R	Modal information on interrupted blocks (sequence number)
#4515	[#_INTO]	R	Modal information on interrupted blocks (program number)
#4519	[#_INTS]	R	Modal information on interrupted blocks (S code)
#4520	[#_INTT]	R	Modal information on interrupted blocks (T code)
#4530	[#_INTWZP]	R	Modal information on interrupted blocks (additional workpiece coordinate system number)

- **Position information**

System variable number	System variable name	Attri-bute	Description
#5001 - #5020	[#_ABSIO[n]]	R	End point position of the previous block (workpiece coordinate system) (Note) Subscript n represents an axis number (1 - 20).
#100001 - #100050			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).
#5021 - #5040	[#_ABSMT[n]]	R	Specified current position (machine coordinate system) (Note) Subscript n represents an axis number (1 - 20).
#100051 - #100100			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).
#5041 - #5060	[#_ABSOT[n]]	R	Specified current position (workpiece coordinate system) (Note) Subscript n represents an axis number (1 - 20).
#100101 - #100150			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).

#5061 - #5080	[#_ABSKP[n]]	R	Skip position (workpiece coordinate system) (Note) Subscript n represents an axis number (1 - 20).
#100151 - #100200			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).

- Tool length compensation value

M

System variable number	System variable name	Attri-bute	Description
#5081 - #5100	[#_TOFS[n]]	R	Tool length compensation value (Note) Subscript n represents an axis number (1 - 20).
#100201 - #100250			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).

- Tool offset value

T

System variable number	System variable name	Attri-bute	Description
#5081, #100201	[#_TOFSWX]	R	X-axis tool offset (wear)
#5082, #100202	[#_TOFSWZ]		Z-axis tool offset (wear)
#5083, #100203	[#_TOFSWY]		Y-axis tool offset (wear)
#5084 - #5100	[#_TOFS[n]]	R	Tool position offset on an arbitrary axis (wear) (Note) Subscript n represents an axis number (4 - 20).
#100204 - #100250			The numbers to the left can also be used. (Note) Subscript n represents an axis number (4 - 50).
#5121, #100901	[#_TOFSGX]	R	X-axis tool offset (geometry)
#5122, #100902	[#_TOFSGZ]		Z-axis tool offset (geometry)
#5123, #100903	[#_TOFSGY]		Y-axis tool offset (geometry)
#5124 - #5140	[#_TOFSG[n]]	R	Tool position offset on an arbitrary axis (geometry) (Note) Subscript n represents an axis number (4 - 20).
#100904 - #100950			The numbers to the left can also be used. (Note) Subscript n represents an axis number (4 - 50).

X-axis: X-axis of basic three axes, Z-axis: Z-axis of basic three axes,
Y-axis: Y-axis of basic three axes

- Servo position deviation

System variable number	System variable name	Attri-bute	Description
#5101 - #5120	[#_SVERR[n]]	R	Servo position deviation (Note) Subscript n represents an axis number (1 - 20).
#100251 - #100300			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).

- **Manual handle interruption**

System variable number	System variable name	Attri-bute	Description
#5121 - #5140	[#_MIRTP[n]]	R	Manual handle interruption (Note) Subscript n represents an axis number (1 - 20).
#100651 - #100700			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).

- **Distance to go**

System variable number	System variable name	Attri-bute	Description
#5181 - #5200	[#_DIST[n]]	R	Distance to go (Note) Subscript n represents an axis number (1 - 20).
#100801 - #100850			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).

- **Workpiece origin offset value, extended workpiece origin offset value**

M

System variable number	System variable name	Attri-bute	Description
#5201 - #5220	[#_WZCMN[n]]	R/W	Common workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5221 - #5240	[#_WZG54[n]]	R/W	G54 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5241 - #5260	[#_WZG55[n]]	R/W	G55 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5261 - #5280	[#_WZG56[n]]	R/W	G56 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5281 - #5300	[#_WZG57[n]]	R/W	G57 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5301 - #5320	[#_WZG58[n]]	R/W	G58 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5321 - #5340	[#_WZG59[n]]	R/W	G59 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#100301 - #100350	[#_WZCMN[n]]	R/W	Common workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100351 - #100400	[#_WZG54[n]]	R/W	G54 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100401 - #100450	[#_WZG55[n]]	R/W	G55 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100451 - #100500	[#_WZG56[n]]	R/W	G56 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).

System variable number	System variable name	Attri-bute	Description
#100501 - #100550	[#_WZG57[n]]	R/W	G57 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100551 - #100600	[#_WZG58[n]]	R/W	G58 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100601 - #100650	[#_WZG59[n]]	R/W	G59 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
Extended workpiece origin offset value			
#7001 - #7020	[#_WZP1[n]]	R/W	G54.1P1 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#7021 - #7040	[#_WZP2[n]]	R/W	G54.1P2 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
:	:	:	:
#7941 - #7960	[#_WZP48[n]]	R/W	G54.1P48 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#14001 - #14020	[#_WZP1[n]]	R/W	G54.1P1 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#14021 - #14040	[#_WZP2[n]]	R/W	G54.1P2 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
:	:	:	:
#19981 - #20000	[#_WZP300[n]]	R/W	G54.1P300 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#101001 - #101050	[#_WZP1[n]]	R/W	G54.1P1 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#101051 - #101100	[#_WZP2[n]]	R/W	G54.1P2 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
:	:	:	:
#115901 - #115950	[#_WZP299[n]]	R/W	G54.1P299 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#115951 - #116000	[#_WZP300[n]]	R/W	G54.1P300 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).

T

System variable number	System variable name	Attri-bute	Description
#5201 - #5220	[#_WZCMN[n]]	R/W	External workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5221 - #5240	[#_WZG54[n]]	R/W	G54 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5241 - #5260	[#_WZG55[n]]	R/W	G55 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).

System variable number	System variable name	Attri-bute	Description
#5261 - #5280	[#_WZG56[n]]	R/W	G56 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5281 - #5300	[#_WZG57[n]]	R/W	G57 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5301 - #5320	[#_WZG58[n]]	R/W	G58 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#5321 - #5340	[#_WZG59[n]]	R/W	G59 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#100301 - #100350	[#_WZCMN[n]]	R/W	External workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100351 - #100400	[#_WZG54[n]]	R/W	G54 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100401 - #100450	[#_WZG55[n]]	R/W	G55 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100451 - #100500	[#_WZG56[n]]	R/W	G56 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100501 - #100550	[#_WZG57[n]]	R/W	G57 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100551 - #100600	[#_WZG58[n]]	R/W	G58 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#100601 - #100650	[#_WZG59[n]]	R/W	G59 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
Extended workpiece origin offset value			
#7001 - #7020	[#_WZP1[n]]	R/W	G54.1P1 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#7021 - #7040	[#_WZP2[n]]	R/W	G54.1P2 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
:	:	:	:
#7941 - #7960	[#_WZP48[n]]	R/W	G54.1P48 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 20).
#101001 - #101050	[#_WZP1[n]]	R/W	G54.1P1 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#101051 - #101100	[#_WZP2[n]]	R/W	G54.1P2 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
:	:	:	:
#115901 - #115950	[#_WZP299[n]]	R/W	G54.1P299 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).
#115951 - #116000	[#_WZP300[n]]	R/W	G54.1P300 workpiece origin offset value (Note) Subscript n represents an axis number (1 - 50).

- **Skip position (detection unit)**

System variable number	System variable name	Attri-bute	Description
#5421 - #5440	[#_SKPDTC[n]]	R	Skip position (detection unit) (Note) Subscript n represents an axis number (1 - 20).
#100701 - #100750			The numbers to the left can also be used. (Note) Subscript n represents an axis number (1 - 50).

- **Second geometry tool offset value**

T

System variable number	System variable name	Attri-bute	Description
#5801-#5832	[#_OFSX2G[n]]	R/W	Second geometry tool offset X-axis compensation value Note) Subscript n represents a compensation number (1 to 32).
#27001-#27999			If the number of pairs is greater than 32, the numbers on the left are also permitted. Note) Subscript n represents a compensation number (1 to 999).
#5833-#5864	[#_OFSZ2G[n]]	R/W	Second geometry tool offset Z-axis compensation value Note) Subscript n represents a compensation number (1 to 32).
#28001-#28999			If the number of pairs is greater than 32, the numbers on the left are also permitted. Note) Subscript n represents a compensation number (1 to 999).
#5865-#5896	[#_OFSY2G[n]]	R/W	Second geometry tool offset Y-axis compensation value Note) Subscript n represents a compensation number (1 to 32).
#29001-#29999			If the number of pairs is greater than 32, the numbers on the left are also permitted. Note) Subscript n represents a compensation number (1 to 999).

- **Feedrate reduction ratio for rapid traverse overlap**

System variable number	System variable name	Attri-bute	Description
#100851-#100900	[#_ROVLP [n]]	R/W	Feedrate reduction ratio for rapid traverse overlap Note) Subscript n represents an axis number (1 to 50).

- **Serial spindle**

System variable number	System variable name	Attri-bute	Description
#100951-#100954	[#_SPSTAT[n]]	R	State of each spindle Note) Subscript n represents a spindle number (1 to 4).

- **Clamp value of spindle maximum speed**

System variable number	System variable name	Attri-bute	Description
#100959	[#_CSSSMAX]	R	Spindle maximum speed commanded at clamp command of maximum spindle speed

- **Dynamic standard tool compensation value**

M

System variable number	System variable name	Attri-bute	Description
#118051 - #118100	[#_DOFS1[n]]	R/W	Dynamic standard tool compensation value (first set) (Note) Subscript n represents an axis number (1 - 50).
#118101 - #118150	[#_DOFS2[n]]	R/W	Dynamic standard tool compensation value (second set) (Note) Subscript n represents an axis number (1 - 50).
#118151 - #118200	[#_DOFS3[n]]	R/W	Dynamic standard tool compensation value (third set) (Note) Subscript n represents an axis number (1 - 50).
#118201 - #118250	[#_DOFS4[n]]	R/W	Dynamic standard tool compensation value (fourth set) (Note) Subscript n represents an axis number (1 - 50).
#118251 - #118300	[#_DOFS5[n]]	R/W	Dynamic standard tool compensation value (fifth set) (Note) Subscript n represents an axis number (1 - 50).
#118301 - #118350	[#_DOFS6[n]]	R/W	Dynamic standard tool compensation value (sixth set) (Note) Subscript n represents an axis number (1 - 50).
#118351 - #118400	[#_DOFS7[n]]	R/W	Dynamic standard tool compensation value (seventh set) (Note) Subscript n represents an axis number (1 - 50).
#118401 - #118450	[#_DOFS8[n]]	R/W	Dynamic standard tool compensation value (eighth set) (Note) Subscript n represents an axis number (1 - 50).

- **Local coordinate system offset value**

System variable number	System variable name	Attri-bute	Description
#118501- #118550	[#_LCLOFS[n]]	R	Local coordinate system offset value Note) Subscript n represents an axis number (1 to 50).

- **Quick program restart**

System variable number	System variable name	Attri-bute	Description
#151171	[#_QRSTD]	R/W	The control to store the block information in the program restart memory.

- **Tool life management**

System variable number	System variable name	Attri-bute	Description
#181000	[#_TLMGN_C]	R	Tool life management data (Tool group numbers)
#181001	[#_TLMML_C]	R	Tool life management data (Tool life values)
#181002	[#_TLMLC_C]	R	Tool life management data (Life counter values)

- **Others**

System variable number	System variable name	Attri-bute	Description
#8570		R/W	Switching between P-CODE/system variables (#10000 and above) #8570=0 : System variable #8570=1 : P code variable

- **System variable**

System constant number	System constant name	Attribute	Description
#0 , #3100	[#_EMPTY]	R	Null
#3101	[#_PI]	R	Circular constant π = 3.14159265358979323846
#3102	[#_E]	R	Base of natural logarithm e = 2.71828182845904523536

5.3 ARGUMENT SPECIFICATION I/II

- Argument specification I addresses and corresponding variables in macros

Address	Variable number
A	#1
B	#2
C	#3
D	#7
E	#8
F	#9
H	#11

Address	Variable number
I	#4
J	#5
K	#6
M	#13
Q	#17
R	#18
S	#19

Address	Variable number
T	#20
U	#21
V	#22
W	#23
X	#24
Y	#25
Z	#26

I, J, and K need to be specified alphabetically.
Argument specification I is always used for I, J, and K by setting parameter IJK (No. 6008#7) to 1. In this case, you need not specify them in alphabetical order.

- Argument specification II addresses and corresponding variables in macros
  Argument specification II uses A, B, and C once each and uses I, J, and K up to ten times. Argument specification II is used to pass values such as three-dimensional coordinates as arguments.

Address	Variable number
A	#1
B	#2
C	#3
I_1	#4
J_1	#5
K_1	#6
I_2	#7
J_2	#8
K_2	#9
I_3	#10
J_3	#11

Address	Variable number
IK_3	#12
I_4	#13
J_4	#14
K_4	#15
I_5	#16
J_5	#17
K_5	#18
I_6	#19
J_6	#20
K_6	#21
I_7	#22

Address	Variable number
J_7	#23
K_7	#24
I_8	#25
J_8	#26
K_8	#27
I_9	#28
J_9	#29
K_9	#30
I_{10}	#31
J_{10}	#32
K_{10}	#33

- Subscripts of I, J, and K for indicating the order of argument specification are not written in the actual program.
- If parameter IJK (No. 6008#7) is 1, argument specification II cannot be used.

5.4 ARITHMETIC AND LOGIC OPERATION

Type of operation	Operation	Description
<1> Definition or replacement	#i=#j	Definition or replacement of a variable
<2> Addition- type operations	#i=#j+#k #i=#j-#k #i=#j OR #k #i=#j XOR #k	Addition Subtraction Logical OR (bit by bit of 32 bits) Exclusive OR (bit by bit of 32 bits)
<3> Multiplication-type operations	#i=#j*#k #i=#j/#k #i=#j AND #k #i=#j MOD #k	Multiplication Division Logical AND (bit by bit of 32 bits) Remainder (A remainder is obtained after #j and #k are rounded to their nearest whole numbers. When #j is a negative value, #i is assumed to be a negative value.)
<4> Functions	#i=SIN[#j] #i=COS[#j] #i=TAN[#j] #i=ASIN[#j] #i=ACOS[#j] #i=ATAN[#j] #i=ATAN[#j]/[#k] #i=ATAN[#j,#k] #i=SQRT[#j] #i=ABS[#j] #i=BIN[#j] #i=BCD[#j] #i=ROUND[#j] #i=FIX[#j] #i=FUP[#j] #i=LN[#j] #i=EXP[#j] #i=POW[#j,#k] #i=ADP[#j] #i=PRM[#j] #i=PRM[#j,#k] #i=PRM[#j]/[#l] #i=PRM[#j,#k]/[#l]	Sine (in degrees) Cosine (in degrees) Tangent (in degrees) Arc sine Arc cosine Arc tangent (one argument), ATN can also be used. Arc tangent (two arguments), ATN can also be used. Arc tangent (two arguments), ATN can also be used. Square root, SQR can also be used. Absolute value Conversion from BCD to binary Conversion from binary to BCD Rounding off, RND can also be used. Rounding down to an integer Rounding up to an integer Natural logarithm Exponent using base e (2.718...) Power (#j to the #kth power) Addition of a decimal point Parameter reading (system common, path, or machine group parameter) Parameter reading (system common, path, or machine group parameter bit number specification) Parameter reading (axis or spindle parameter) Parameter reading (axis or spindle parameter bit number specification)

5.5 CONTROL COMMAND

Purpose	Expression	Kind of operation (operator)	
Unconditional branch	**GOTOn** n : Sequence number (1-99999999) Branch to sequence number n unconditionally.		
Conditional branch	**IF[<conditional expression >]GOTOn** Branch to sequence number n when <conditional expression> is satisfied (true); otherwise, execute the next block. **IF[<conditional expression >]THEN** Execute the macro statement specified after THEN when <conditional expression> is satisfied (true). Only one macro statement may be specified.	#j EQ #k(=) #j NE #k(≠) #j GT #k(>) #j LT #k (<) #j GE #k(≥) #j LE #k (≤)	Equal to Not equal to Greater than Less than Greater than or equal to Less than or equal
Repetition	**WHILE [conditional expression] DO m ; (m=1,2,3)** Processing **END m**	#j EQ #k(=) #j NE #k(≠) #j GT #k(>) #j LT #k (<) #j GE #k(≥) #j LE #k (≤)	Equal to Not equal to Greater than Less than Greater than or equal to Less than or equal

5.6 MACRO CALL

- Macro call
  - Simple call (G65)
  - Modal call (G66, G66.1, G67)
  - Macro call using a G code
  - Macro call using an M code
- Subprogram call
  - Subprogram call using an M code
  - Subprogram call using a T code
  - Subprogram call using an S code
  - Subprogram call using a second auxiliary function code
  - Subprogram call using a specific code

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- **Called program and folders to be searched**

  The order in which folders are called depends on the method of calling a macro or subprogram.
  Folders are searched in sequence and the program found first is called.

- **Call nesting**

  The macro call nesting level is five, including simple calls (G65) and modal calls (G66/G66.1). The subprogram call nesting level is 15, including macro calls.

5.6.1 Simple Call (G65)

G65 P p L λ <argument-specification> ;

P : Number of the program to call
λ : Repetition count (1 by default)
Argument : Data passed to the macro

```
O0001 ;
   :
G65 P9010 L2 A1.0 B2.0 ;
   :
M30 ;
```

```
O9010 ;
#3=#1+#2 ;
IF [#3 GT 360] GOTO 9 ;
G00 G91 X#3 ;
N9 M99 ;
```

5.6.2 Modal Call: Call After the Move Command (G66)

Once G66 is issued to specify a modal call a macro is called after a block specifying movement along axes is executed. This continues until G67 is issued to cancel a modal call.

G66 P p L λ <argument-specification>

P : Number of the program to call
λ : Repetition count (1 by default)
Argument : Data passed to the macro

```
O0001 ;
   :
G66 P9100 L2 A1.0 B2.0 ;
G00 G90 X100.0 ;
Y200.0 ;
X150.0 Y300.0 ;
G67 ;
   :
M30 ;
```

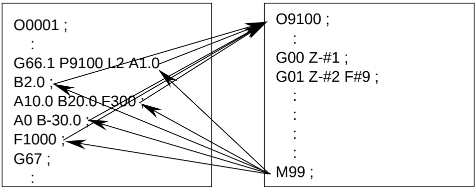
```
O9100 ;
   :
G00 Z-#1 ;
G01 Z-#2 F300 ;
   :
   :
   :
   :
M99 ;
```

5.6.3 Modal Call: Each Block Call (G66.1)

Specified macro is unconditionally called for each NC command block. All data other than O, program name, N, and G codes that is specified in each block is not executed and is used as arguments.

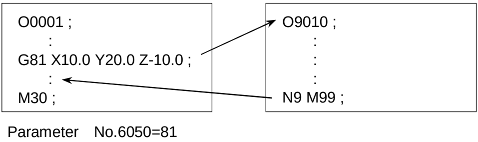
G66.1 P p L λ <argument-specification> ;

P : Number of the program to call
λ : Repetition count (1 by default)
Argument : Data passed to the macro



5.6.4 Macro Call Using a G Code

By setting a G code number used to call a macro program in a parameter, the macro program can be called in the same way as for a simple call (G65).



- **Correspondence between parameter numbers and program numbers**

G code with no decimal point		G code with a decimal point	
Parameter number	Program number	Parameter number	Program number
6050	O9010	6060	O9040
6051	O9011	6061	O9041
6052	O9012	6062	O9042
6053	O9013	6063	O9043
6054	O9014	6064	O9044
6055	O9015	6065	O9045
6056	O9016	6066	O9046
6057	O9017	6067	O9047
6058	O9018	6068	O9048
6059	O9019	6069	O9049

5.6.5 Macro Call Using a G Code (Specification of Multiple Definitions)

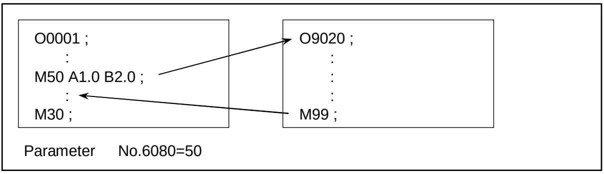
By setting the starting G code number used to call a macro program, the number of the starting program to be called, and the number of definitions, macro calls using multiple G codes can be defined.

5.6.6 Macro Call Using a G Code with a Decimal Point (Specification of Multiple Definitions)

When bit 0 (DPG) of parameter No. 6007, by setting the starting G code number with a decimal point used to call a macro program, the number of the starting program to be called, and the number of definitions, multiple macro calls using multiple G codes with a decimal point can be defined.

5.6.7 Macro Call Using an M Code

By setting an M code number used to call a macro program in a parameter, the macro program can be called in the same way as with a simple call (G65).



- **Correspondence between parameter numbers and program numbers**

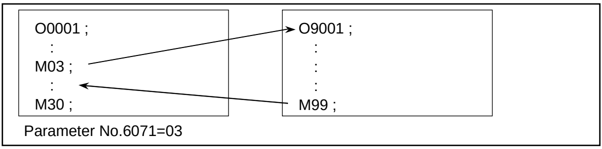
Parameter number	Corresponding program number
6080	O9020
6081	O9021
6082	O9022
6083	O9023
6084	O9024
6085	O9025
6086	O9026
6087	O9027
6088	O9028
6089	O9029

5.6.8 Macro Call Using an M Code (Specification of Multiple Definitions)

By setting the starting M code number used to call a macro program, the number of the starting program to be called, and the number of definitions, macro calls using multiple M codes can be defined.

5.6.9 Subprogram Call Using an M Code

By setting an M code number used to call a subprogram (macro program) in a parameter, the macro program can be called in the same way as with a subprogram call (M98).



- **Correspondence between parameter numbers and program numbers**

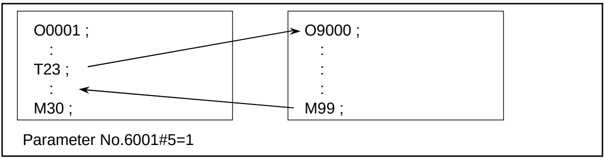
Parameter number	Program number
6071	O9001
6072	O9002
6073	O9003
6074	O9004
6075	O9005
6076	O9006
6077	O9007
6078	O9008
6079	O9009

5.6.10 Subprogram Call Using an M Code (Specification of Multiple Definitions)

By setting the starting M code number used to call a subprogram, the number of the starting subprogram to be called, and the number of definitions, subprogram calls using multiple M codes can be defined.

5.6.11 Subprogram Calls Using a T Code

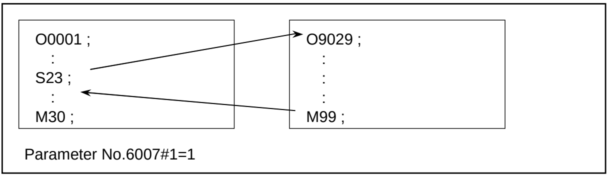
By enabling subprograms to be called with a T code in a parameter, a subprogram can be called each time the T code is specified in the machining program.



By setting parameter TCS (No. 6001#5) to 1, subprogram O9000 can be called each time a T code is specified in a machining program. A T code specified in a machining program is assigned to common variable #149.

5.6.12 Subprogram Calls Using an S Code

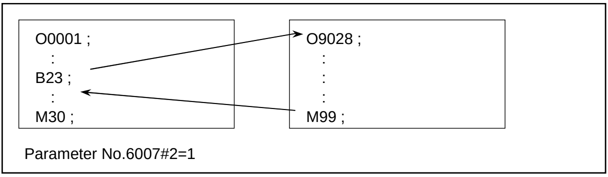
By enabling subprograms to be called with an S code in a parameter, a subprogram can be called each time the S code is specified in the machining program.



By setting parameter SCS (No. 6007#1) to 1, subprogram O9029 can be called each time a S code is specified in a machining program. An S code specified in a machining program is assigned to common variable #147.

5.6.13 Subprogram Calls Using a Secondary Auxiliary Function

By enabling subprograms to be called with a secondary auxiliary function in a parameter, a subprogram can be called each time the secondary auxiliary function is specified in the machining program.



By setting parameter BCS (No. 6007#2) to 1, subprogram O9028 can be called each time a secondary auxiliary function code is specified in a machining program. A secondary auxiliary function specified in a machining program is assigned to common variable #146.

5.6.14 Subprogram Call Using a Specific Address

By enabling subprograms to be called with a specific address in a parameter, a subprogram can be called each time the specific address is specified in the machining program.

```
O0001 ;                      O9004 ;(#146=100.)
   :                            :
B100. ;                         :
   :                            :
M30 ;                        M99 ;

Parameter No.6090=66(B)
```


By setting the code (ASCII code converted to decimal) corresponding to a specific address in parameter (No. 6090 or No. 6091), the custom macro program, O9004 or O9005, corresponding to each parameter can be called when the specific address is specified in a machining program. The code value corresponding to a specific address specified in a machining program is assigned to the common variables (#146, #147). The table below indicates the addresses that can be set.

M

Address	Parameter setting
A	65
B	66
D	68
F	70
H	72
I	73
J	74
K	75
L	76
M	77
P	80
Q	81
R	82
S	83
T	84
V	86
X	88
Y	89
Z	90

NOTE
When address L is set, the number of repetitions cannot be set.

T

Address	Parameter setting
A	65
B	66
F	70
H	72
I	73
J	74
K	75
L	76
M	77
P	80
Q	81
R	82
S	83
T	84

NOTE
When address L is set, the number of repetitions cannot be set.

- **Correspondence between parameter numbers and program numbers and between the parameter numbers and common variables**

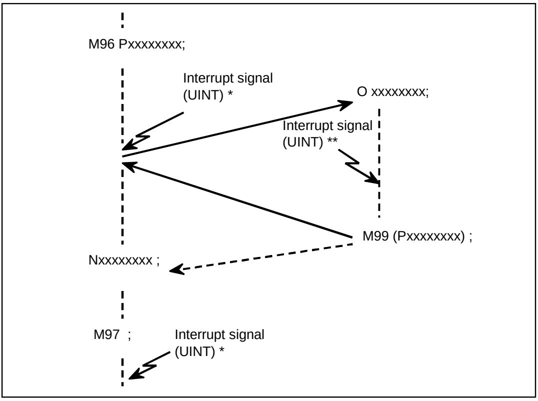
Parameter number	Program number	Common variable
6090 6091	O9004 O9005	#146 #147

5.7 INTERRUPTION TYPE CUSTOM MACRO

When a program is being executed, another program can be called by inputting an interrupt signal (UINT) from the machine.
This function is referred to as an interruption type custom macro function.
Program an interrupt command in the following format:

Format

M96Pxxxx ;	Enables custom macro interrupt
M97 ;	Disables custom macro interrupt



5.8 EXTERNAL OUTPUT COMMANDS

In addition to the standard custom macro commands, the following macro commands are available. They are referred to as external output commands.
- BPRNT
- DPRNT
- POPEN
- PCLOS

These commands are provided to output variable values and characters through the input/output interface.

- Open command POPEN

The POPEN command establishes a connection to an external input/output device. It must be specified before a sequence of data output commands.

- Data output command BPRNT

The BPRNT command outputs characters and variable values in binary.

BPRNT [a #b [c] ---]

c: Number of significant decimal places
#b: Variable
a: Character

(i) Specified characters are output.
Specifiable characters are as follows:
- Letters (A to Z)
- Numbers
- Special characters (*, /, +, -, ?, @, &, _)

(ii) All variables are stored with a decimal point. Specify a variable followed by the number of significant decimal places enclosed in brackets. A variable value is treated as 2-word (32-bit) data, including the decimal digits. It is output as binary data starting from the highest byte.

(iii) When specified data has been output, an EOB code is output.

(iv) <Null> variables are regarded as 0.

- Data output command DPRNT

DPRNT [a #b [c d] ---]

d: Number of significant decimal places
c: Number of significant digits in the integer part
#b: Variable
a: Character

The DPRNT command outputs characters and each digit in the value of a variable.

(i) For an explanation of the DPRNT command, see Items (i), (iii), and (iv) for the BPRNT command.

(ii) When outputting a variable, specify # followed by the variable number, then specify the number of digits in the integer part and the number of decimal places enclosed in brackets.
For the value of a variable, as many codes as the specified number of digits are output according to the settings one by one, starting with the highest digit. The decimal point is also output using the set code. Each variable must be a numeric value consisting of up to nine digits. When high-order digits are zeros, these zeros are not output if bit 1 (PRT) of parameter No. 6001 is 1. If parameter PRT is 0, a space code is output each time a zero is encountered.
When the number of decimal places is not zero, digits in the decimal part are always output. If the number of decimal places is zero, no decimal point is output. When parameter PRT is 0, a space code is output to indicate a positive number instead of +; if parameter PRT is 1, no code is output.

- **Close command PCLOS**

  The PCLOS command releases a connection to an external input/output device. Specify this command when all data output commands have terminated.

5.9 COMMAND RANGE

Item	Contents
Usable variable	Local variable: #1-#33 Common variable: #100-#149, #500-#549 Additional common variable: #100-#199, #500-#999 System variable: greater than #1000, greater than #100000
Usable value of variable	When parameter F16 (No.6008#0) = 0 Maximum value: Approx. $\pm 10^{308}$ Minimum value: Approx. $\pm 10^{-308}$ When parameter F16 (No.6008#0) = 1 Maximum value: Approx. $\pm 10^{47}$ Minimum value: Approx. $\pm 10^{-29}$
Constant value usable in <expression>	Maximum value: ±999999999999 Minimum value: ±0.00000000001 The maximum allowable number of digits is 12 in decimal notation.
Arithmetic precision	When parameter F16 (No.6008#0) = 0 Decimal 15 digits When parameter F16 (No.6008#0) = 1 Decimal 8 digits
Macro call duplex	Max. 5 loops
Iteration	1 - 3
Nesting	Max. 5 loops
Nesting of subprograms	Max. 10 loops (15 loops including macro calls)

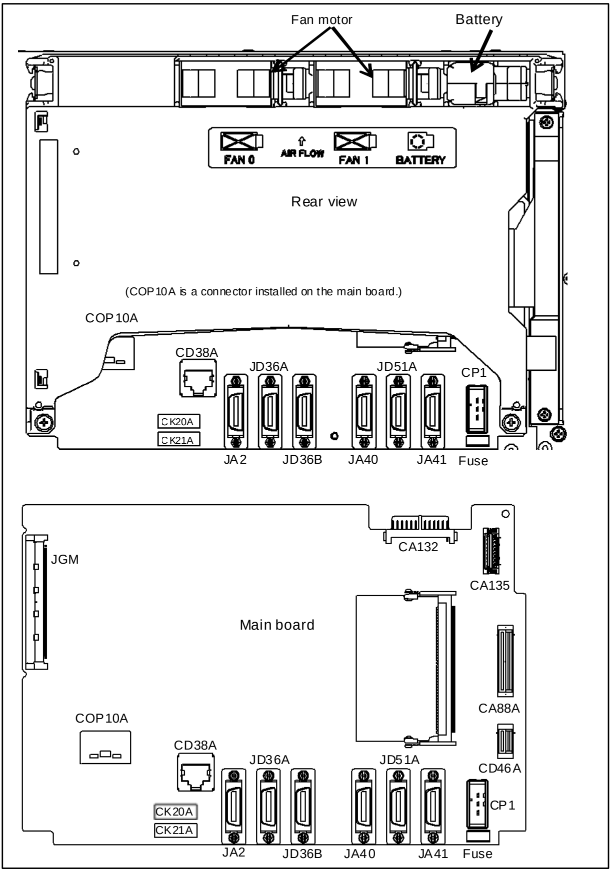
6.1 LCD-MOUNTED TYPE CONTROL UNIT HARDWARE

This section describes the hardware configurations of LCD-mounted type control units and display of LEDs mounted on them.

6.1.1 LCD-mounted Type Control Unit (Basic unit A and Basic unit C)

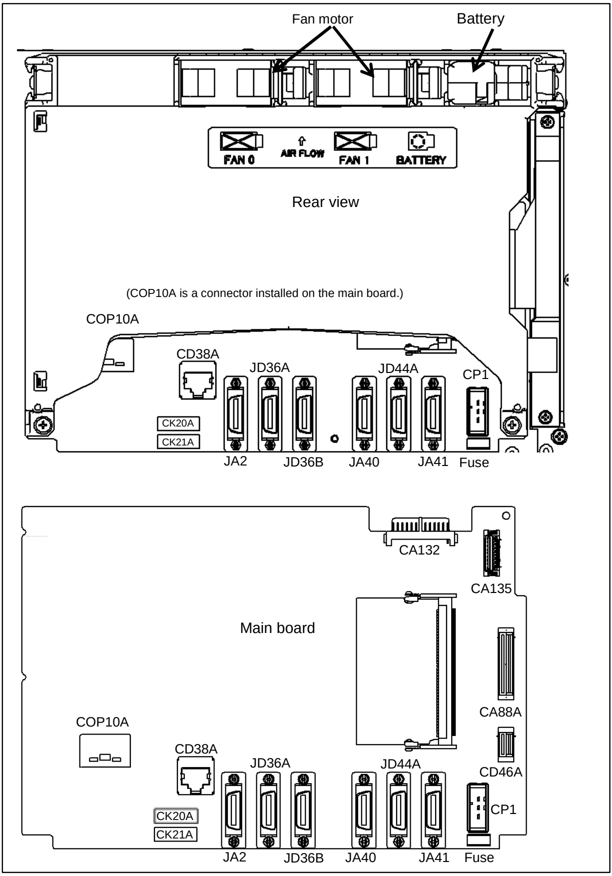
Connector mounting location

Basic unit A



Connector number	Application
COP10A	For FSSB interface
JA2	For MDI
JD36A	For I/O device interface (RS232-C)
JD36B	For I/O device interface (RS232-C)
JA40	For high-speed skip and analog output
JD51A	For I/O Link *i*
JA41	For position coder
CP1	For power supply
JGM	For back panel
CA135	For video signal interface
CA88A	For memory card interface
CD46A	For USB port
CK20A	For horizontal soft key
CK21A	For vertical soft key
CA132	For fan adapter board
CD38A	For Ethernet (Embedded Ethernet)

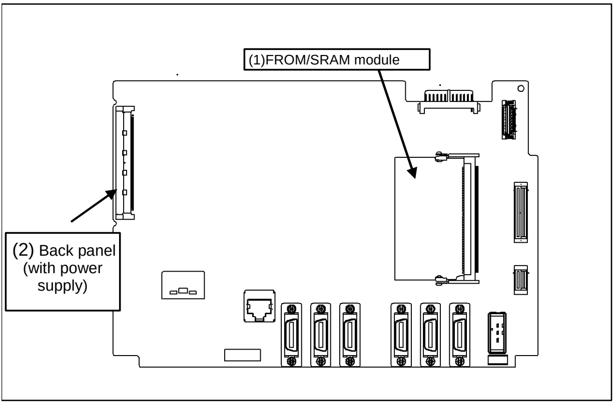
Basic unit C



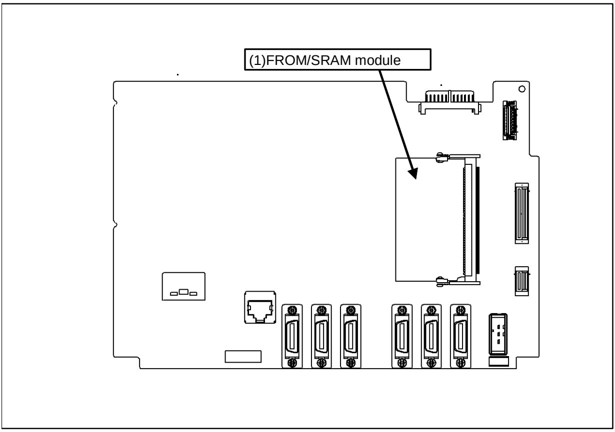
Connector number	Application
COP10A	For FSSB interface
JA2	For MDI
JD36A	For I/O device interface (RS232-C)
JD36B	For I/O device interface (RS232-C) ※This connector depending on the type is not implemented.
JA40	For high-speed skip and analog output
JD44A	For I/O Link *i*
JA41	For position coder
CP1	For power supply
CA135	For video signal interface
CA88A	For memory card interface
CD46A	For USB port
CK20A	For horizontal soft key
CK21A	For vertical soft key
CA132	For fan adapter board
CD38A	For Ethernet (Embedded Ethernet)

Card and module mounting location

Basic unit A

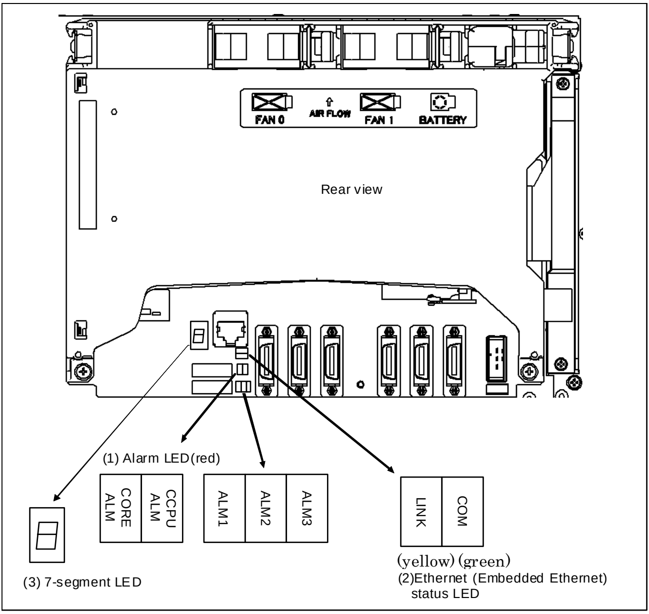


Basic unit C



LED display

Basic unit A and Basic unit C



(1) Alarm LED (red) indication

CORE ALM	ALM 1	ALM 2	ALM 3	CCPU ALM	Meaning
◇	□	■	□	◇	Low battery voltage. The battery may be running out.
◇	■	■	□	◇	Software detected an error and stopped the system.
◇	□	□	■	◇	Hardware detected a failure in the system.
◇	■	□	■	◇	An alarm was issued with the servo circuit on the main board.
◇	□	■	■	◇	An error was detected in the data of the SRAM on the FROM/SRAM module. The FROM/SRAM module may be faulty, the battery voltage may have dropped, or the main board may be faulty.
◇	■	■	■	◇	Abnormal power supply operation. The cause may be noise or the back panel (with power supply) failure.
◇	◇	◇	◇	■	The Main board may be faulty.
■	◇	◇	◇	◇	Lights if there is an abnormal condition in the power supply on the main board.

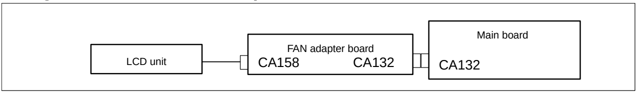
■: On □: Off ◇: Don’t care

(2) Ethernet (Embedded Ethernet) status LED

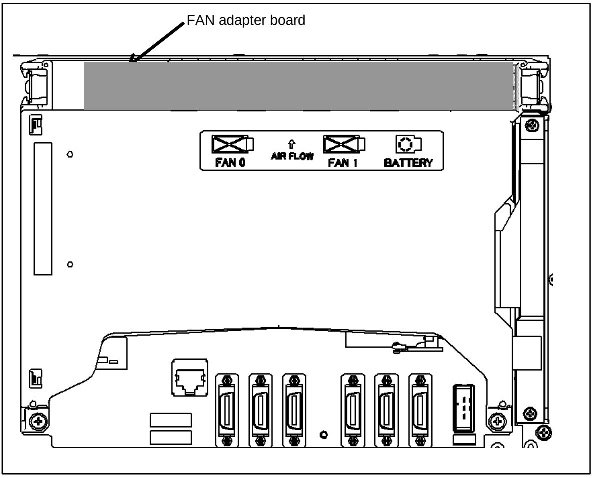
LED	Meaning
LINK (green)	Turned on when a connection is made with the hub correctly
COM (yellow)	Turned on when data is transferred

(3) 7-segment LED
Refer to section “LED Display”.

Configuration of the FAN adapter

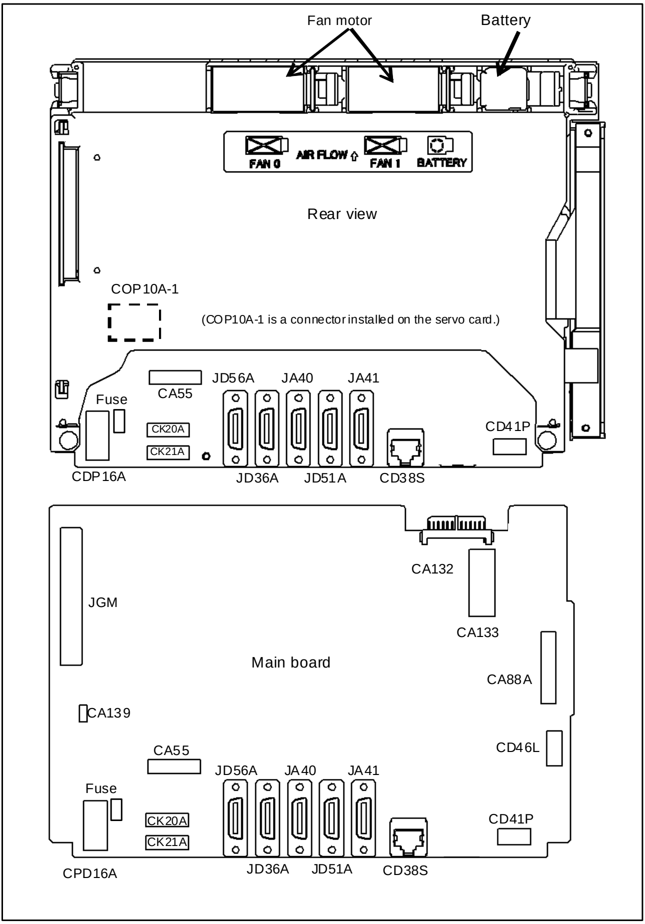


Location of the FAN adapter board



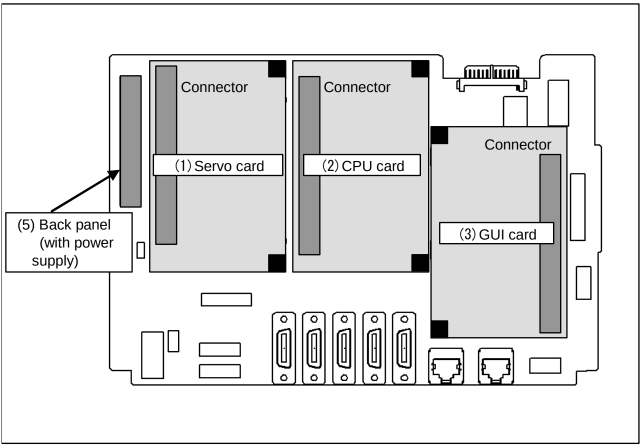
6.1.2 LCD-mounted Type Control Unit (Basic unit G)

Connector mounting location

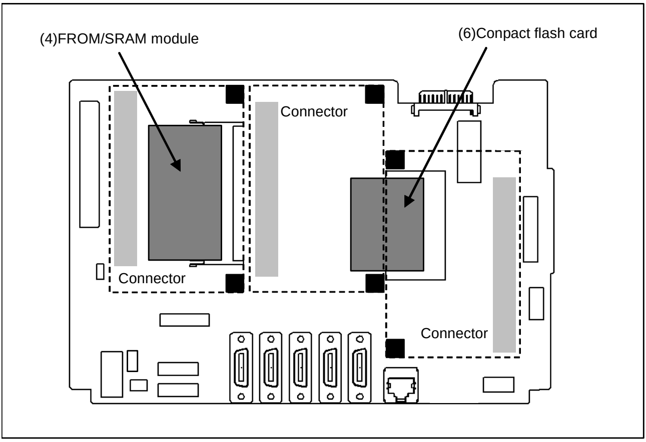


Connector number	Application
COP10A-1	For FSSB interface
CA55	For MDI
JD56A	For I/O device interface (RS232-C)
JD36A	For I/O device interface (RS232-C)
JA40	For high-speed skip and analog output
JD51A	For I/O Link *i*
CPD16A	For power supply
JGM	For back panel
CA133	For video signal interface
CA88A	For memory card interface
CD46L	For USB port
CD41P	USB port
CK20A	For horizontal soft key
CK21A	For vertical soft key
CA132	For FAN adapter board
CD38S	For Ethernet (Embedded Ethernet)
CA139	For touch panel interface

Card mounting location

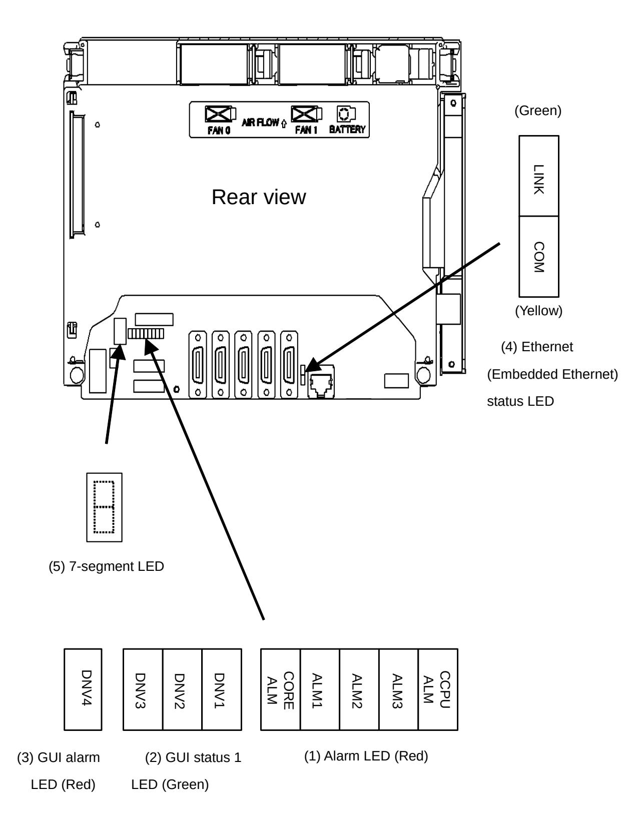


FROM/SRAM module and compact flash card mounting location



A compact flash card is mounted on the main board.

LED display



(1) Alarm LED (red LED)

CORE ALM	ALM 1	ALM 2	ALM 3	CCPU ALM	Meaning
◇	□	■	□	◇	Low battery voltage. The battery may be running out.
◇	■	■	□	◇	Software detected an error and stopped the system.
◇	□	□	■	◇	Hardware detected a failure in the system.
◇	■	□	■	◇	An alarm was issued with the servo card on the main board.
◇	□	■	■	◇	An error was detected in the data of the SRAM on the FROM/SRAM module. The FROM/SRAM module may be faulty, the battery voltage may have dropped, or the main board may be faulty.
◇	■	■	■	◇	Abnormal power supply operation. The cause may be noise or the back panel (with power supply) failure.
◇	◇	◇	◇	■	The CPU card may be faulty.
■	◇	◇	◇	◇	Lights if there is an abnormal condition in the power supply on the main board.

■: On □: Off ◇: Don't care

(2) GUI status 1 LED (green LED)

No.	LED			Meaning
	DNV3 (STA3)	DNV2 (STA2)	DNV1 (STA1)	
1	□	□	□	State where the power is not tuned on, or state where the system was started up successfully and is running normally.
2	■	■	■	State immediately after the power is turned on.
3	■	■	□	The interface between the CPU card and GUI card is being initialized. If the status does not proceed further beyond this indication, the CPU card, GUI card, or main board may be faulty.
4	□	■	■	Start-up on the GUI card side is being awaited. If the status does not proceed further beyond this indication, the GUI card or main board may be faulty.
5	□	■	□	The control unit is being started or an error occurs in the CPU card-GUI card interface RAM. If the status does not proceed further beyond this indication, the CPU card, GUI card, or main board may be faulty.

■: On □: Off

(3) GUI alarm LED (red LED)

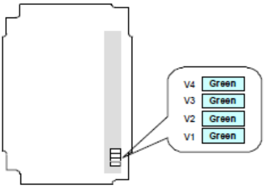
LED	Meaning
DNV4 (RAME)	Turned on when a common RAM error occurs. The main board may be faulty.

(4) Ethernet (Embedded Ethernet) status LED

LED	Meaning
LINK (green)	Turned on when a connection is made with the hub correctly
COM (yellow)	Turned on when data is transferred

(5) 7-segment LED
Refer to the section “LED Display”.

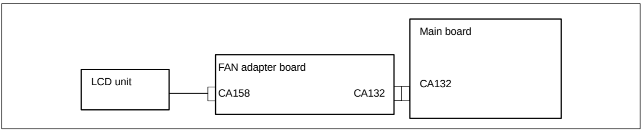
LED display (GUI Card)



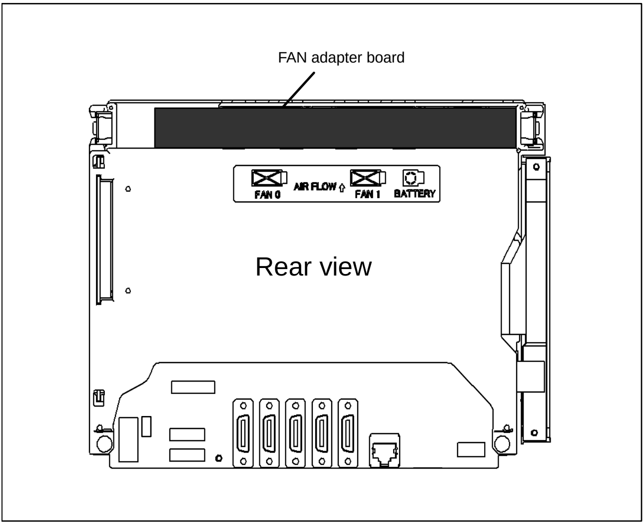
LED				Status	Meaning when LED stops
V4	V3	V2	V1		
□	□	□	□	Power-on	The cause may be the GUI card or the main board failure.
■	■	■	□	FROM check	The cause may be the GUI card failure.
■	■	□	□	DRAM check	
■	□	■	□	Display beginning	The cause may be the GUI card or the main board failure.
■	□	□	□	DRAM check	The cause may be the GUI card failure.
□	■	■	□	GUI system loading beginning	The cause may be the GUI card, the compact flash card or the main board failure.
□	■	□	□	GUI system start	
□	□	■	□	GUI system operation beginning	The cause may be the GUI card failure.
■	■	■	■	NAND flash driver start	The cause may be the GUI card failure.
■	■	□	■	HSSB driver start	The cause may be the CPU card, the servo card or the main board failure.
■	□	■	■	PCMCIA driver start	The cause may be the main board failure.
■	□	□	■	ETHERNET,RS232C driver start	The cause may be the GUI card or the main board failure.
□	■	■	■	USB driver start	
□	■	□	■	DISPLAY driver start	
□	□	■	■	Backlight-on	
□	□	□	■	MDI,TOUCH PANEL driver start	The cause may be the GUI card or the main board failure.
□	□	□	☆	FROM error	The cause may be the GUI card or the main board failure.
□	□	☆	☆	DRAM error	
□	☆	□	☆	NAND flash error	The cause may be the GUI card failure.
□	☆	☆	☆	Filesystem error	The cause may be the GUI card failure.
☆	□	□	☆	CNC error	The cause may be the CPU card, the servo card or the main board failure.
☆	☆	☆	□	Normal status	

□: Off ■: On ☆: Blinking

Configuration of the FAN adapter board



Locations of the FAN adapter board

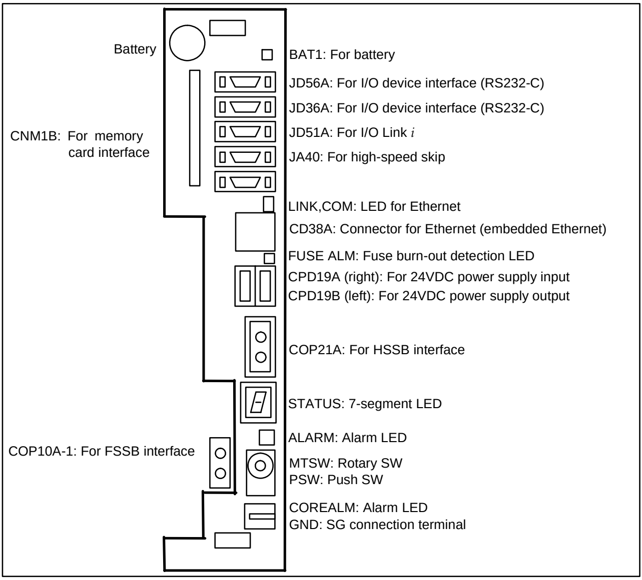


6.2 STAND-ALONE TYPE CONTROL UNIT HARDWARE

This section describes the hardware configurations of the stand-alone type control unit and display unit and display of LEDs mounted on them.

6.2.1 Stand-Alone Type Control Unit

Mounting positions of connectors, LEDs, etc.

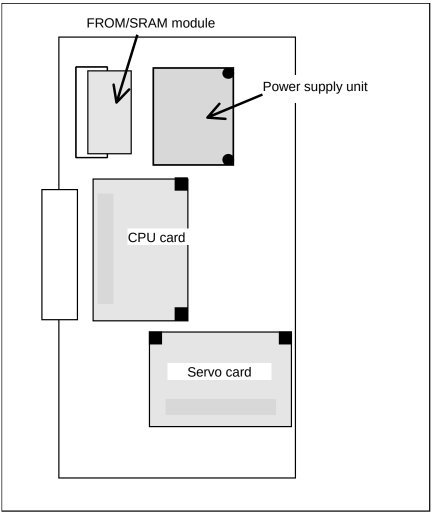


STATUS 7-segment LED
: This LED usually indicates the state of the CNC. This LED is used also for setting and maintenance using the rotary switch MTSW and the push switch PSW.

MTSW rotary switch
: This rotary switch is used for setting and maintenance operations, in combination with the STATUS 7-segment LED and the PSW push switch.

PSW push switch:
: This push switch is used for setting and maintenance operations, in combination with the STATUS 7-segment LED and the MTSW rotary switch.

Mounting positions of cards, power supply unit, and FROM/SRAM module



Attaching and detaching the main board

The main board is secured to the control unit by the fan unit. So, when the fan unit is attached to the control unit, the main board cannot be detached.

Before attaching or detaching the main board, <u>be sure to detach the fan unit. Before attaching the fan unit, fully understand the description in CAUTION and NOTE below.</u>

⚠ **CAUTION**

Attaching the fan unit

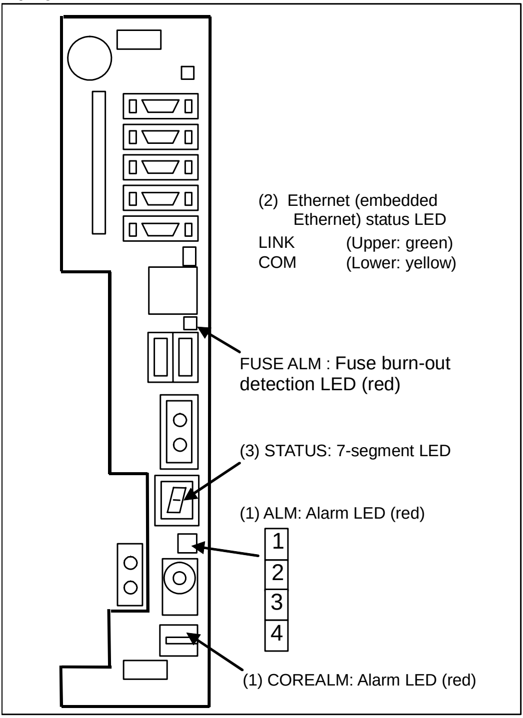
1. If the power is turned on with the fan unit connected improperly, the fan may not rotate or a fan alarm may be issued even though the fan rotates. After replacing the fan unit, confirm that the fan rotates normally and no fan alarm is issued.
2. The fan unit is directly coupled with the main board with a connector. Mount the fan unit with the correct procedure, or the connector coupling may be damaged.

NOTE

Attaching the fan unit

When much force is required to connect the fan unit to the main unit, check whether any connector pin on the base printed circuit board is bent and whether the base printed circuit board is inserted all the way.

LED display



(1) Alarm LED (red) display

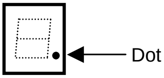
ALM 1	ALM 2	ALM 3	ALM 4	CORE ALM	Meaning
□	■	□	◇	◇	Low battery voltage. The battery may be running out.
■	■	□	◇	◇	Software detected an error and stopped the system.
□	□	■	◇	◇	Hardware detected a failure in the system.
■	□	■	◇	◇	An alarm was issued with the servo card on the main board.
□	■	■	◇	◇	An error was detected in the data of the SRAM on the FROM/SRAM module. The FROM/SRAM module may be faulty, the battery voltage may have dropped, or the main board may be faulty.
■	■	■	◇	◇	Abnormal power supply operation. The cause may be noise or the power supply unit failure.
◇	◇	◇	■	◇	The CPU card may be faulty.
◇	◇	◇	◇	■	Lights if there is an abnormal condition in the power supply on the main board.

■: On □: Off ◇: Don’t care

(2) Ethernet (Embedded Ethernet) status LED

LED	Meaning
LINK (green)	Turned on when a connection is made with the hub correctly
COM (yellow)	Turned on when data is transferred

(3) 7-segment LED



LED	Meaning
Dot	Turned on when the display unit is not connected to connector COP21A. If this LED is turned on when the display unit is connected, it is probable that the optical fiber cable is broken, the display unit is not powered on, or the display unit is faulty.

Refer to section “LED Display” for others.

6.2.2 Display Unit for Stand-Alone Type Control Unit

It uses as a display unit the FANUC PANEL *i* or a commercially available personal computer.
If connect the FANUC PANEL *i*, refer to the connection and maintenance manual (B-64223EN).

6.3 HARDWARE COMMON TO LCD-MOUNTED TYPE AND STAND-ALONE TYPE CONTROL UNITS

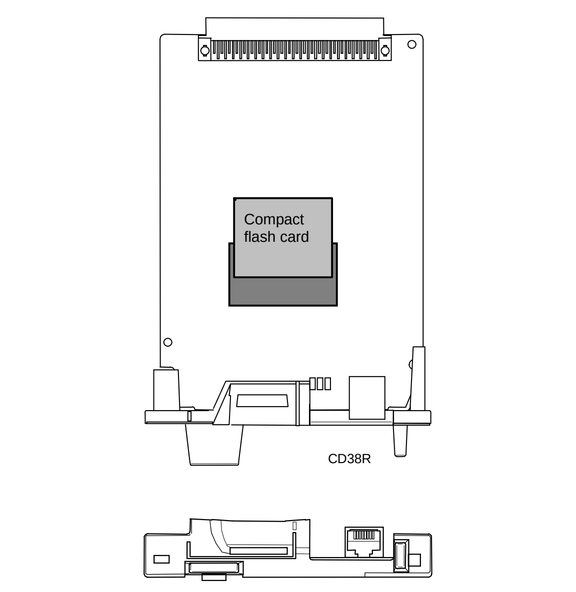
This section describes the optional boards and other units common to LCD-mounted type and stand-alone type control units.

6.3.1 Optional Board

6.3.1.1 Fast Ethernet board

NOTE
This board is also used as the Data Server function and FL-net function according to the parameter setting.

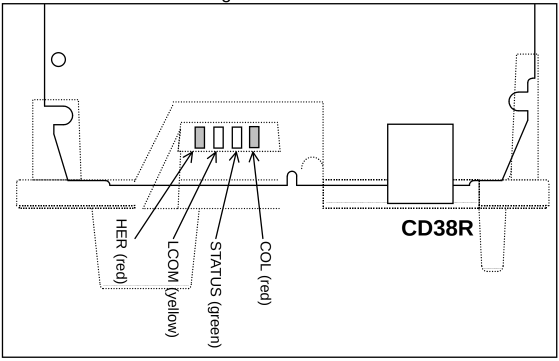
Connector mounting location



Connector number	Application
CD38R	For Ethernet

LED display

The board incorporates four LEDs.
The locations and meanings of the LEDs are indicated below.



In the following explanations, the LED lighting states are expressed as follows:

□: Off ■: On ☆: Blinking ◇: Don't care

- **LED display transition for STATUS (during power-on)**

LED display	Status	Meaning
□	Power-off	
■	Immediately after power-on	Initial state entered immediately after power-on. If the board is stopped in this condition, the cause is one of the following: → The CNC communication software may not be running normally. Check whether the communication software is installed properly. → The hardware may be faulty. Replace this board.
☆	Start completion	The board has started normally.

- **LED display transition for STATUS (during normal operation)**

LED display	Status	Meaning
☆	Normal status	The board is operating normally.

- **LED display for LCOM**

LED display	Status	Meaning
□	Not connected to hub	The board is not connected to the hub properly. The LED stays off also when the power to the hub is off. Check whether the board is connected to the hub properly.
■	Connected to hub	The board is connected to the hub.
☆	Transmission/reception in progress	Data is being transmitted or received.

- **LED display for COL**

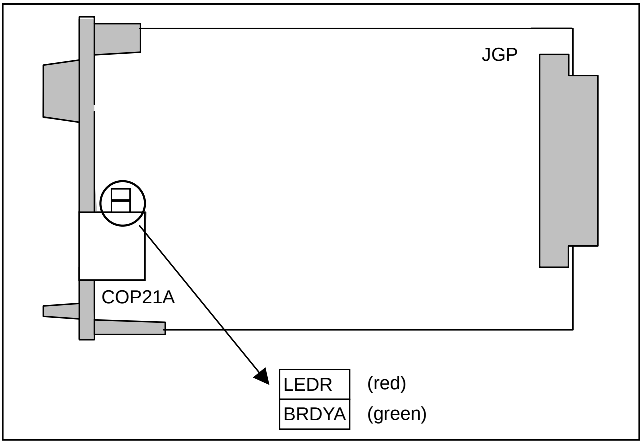
LED display	Status	Meaning
□	Normal status	The board is operating normally.
■ ☆	Collision occurs. (Data collision occurs.)	The LED is on or blinks at short intervals when the Ethernet communication traffic (communication amount) is high or ambient noise is high.

- **LED display for HER**

LED display	Status	Meaning
□	Normal status	The board is operating normally.
■	Error detected in the hardware	The cause may be a failure in this board or a malfunction due to noise.
☆	Error detected in the software	

6.3.1.2 HSSB interface board

Connector and LED mounting location and LED display



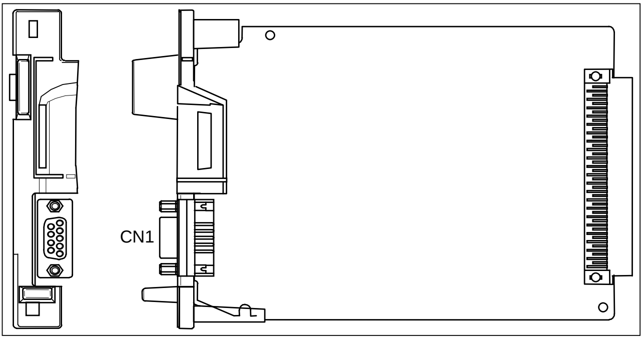
Connector number	Application
COP21A	For HSSB interface

LED	Meaning
LEDR	Turned on when a common RAM parity error occurs in this board.
BRDYA	Lights to indicate that a link has been established.

6.3.1.3 PROFIBUS-DP board

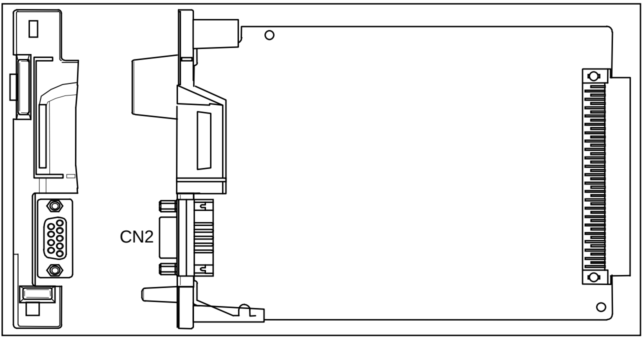
Connector mounting location

- **PROFIBUS-DP master board**



Connector number	Application
CN1	For PROFIBUS-DP master interface

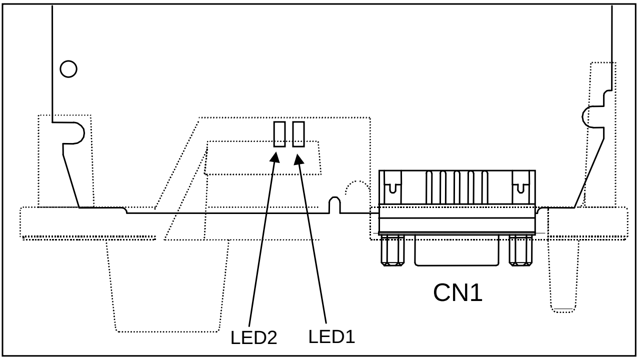
- **PROFIBUS-DP slave board**



Connector number	Application
CN2	For PROFIBUS-DP slave interface

LED display and their meanings

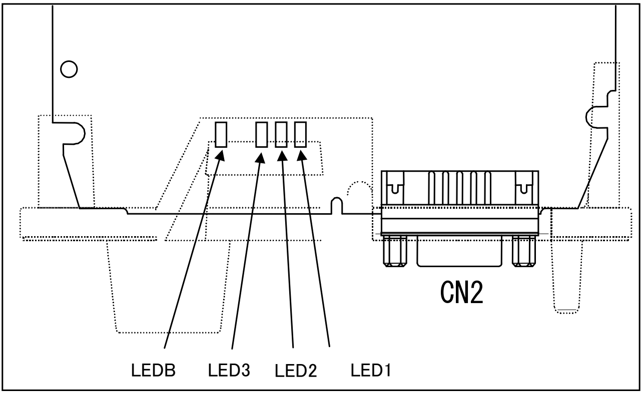
- **PROFIBUS-DP master board**



> **NOTE**
> The face plate is indicated with dotted line.

Name	Color	Description
LED1	Green	Indicates that the CPU on this board has started running. On: RESET has been released, allowing the CPU to start running. The LED is turned off when the power is turned on.
LED2	Green	Indicates whether communication is being normally carried out. On: Communication is being normally carried out. Off: Communication is not being carried out. The LED is turned off when the power is turned on.

- **PROFIBUS-DP slave board**



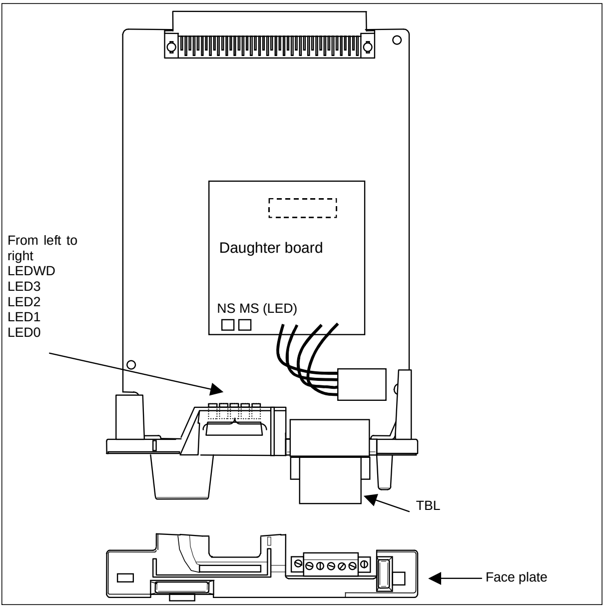
NOTE
The face plate is indicated with dotted line.

Name	Color	Description
LED1	Green	Indicates that the CPU on this board has started running. On: RESET has been released, allowing the CPU to start running. The LED is turned off when the power is turned on.
LED2	Green	Indicates that communication has started. On: Communication has started. The LED is turned off when the power is turned on or if: - No parameter data and configuration data have been received. - Invalid parameter data and configuration data have been received.
LED3	Green	Indicates whether communication is being normally carried out. On: Communication is being normally carried out. Off: Communication is not being carried out. The LED is turned off when the power is turned on.
LEDB	Red	Indicates that a RAM parity alarm condition has occurred on this board. On: A RAM parity alarm condition has occurred. The LED is turned off when the power is turned on. Once it has been turned on, it stays on until the power is turned off.

6.3.1.4 DeviceNet board

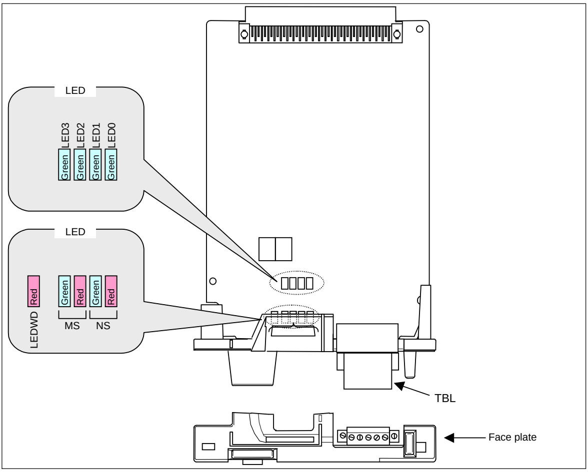
Connector and LED mounting location

- **Master board**



Connector number	Application
TBL	For DeviceNet interface

- **Slave board**



Connector number	Application
TBL	For DeviceNet interface

LED display and their meanings

- **Master board**

  This board provides four green LEDs and one red LED for status indication. In addition, the internal daughter board has two LEDs that emit red and green light.

Name	Color	Meaning
LED0 to 3	Green	Indicates the activation state of the DeviceNet application software.
LEDWD	Red	Indicates an error on the daughter board.
MS	Red / green	Indicates the module status, which is the status of the local node.
NS	Red / green	Indicates the network status, which is the status of the network.

In the following explanations, the LED lighting states are expressed as follows:

□: Off ■: On ☆: Blinking ◇: Don't care

LED display transition for LED0, LED1, LED2, and LED3 (during power-on)

LED 3 2 1 0	Status after power-on	Action when stopped after power-on
□□□□	Power-off	
■■■■	After power-on, the DeviceNet application software does not start.	The DeviceNet application software is not running normally. Check whether the software is installed properly.
□□□□	Initializing the firmware on the daughter board.	Replace the DeviceNet master board.
□□□■	Checking memory on the daughter board.	
□□■□	Recognizing the firmware on the daughter board.	
□□■■	Reading DeviceNet parameters.	Enable the DeviceNet master function (software option).
□■□□	Verifying that DeviceNet parameter "NETWORK" is set to "ONLINE."	Set DeviceNet parameter "NETWORK" to "ONLINE."
□■□■	Setting the bus parameter in DeviceNet parameters.	Replace the DeviceNet master board.
□■■□	Setting the slave parameter in DeviceNet parameters.	Set the slave parameter in DeviceNet parameters correctly. Or, replace the DeviceNet master board.
□■■■	Checking duplicate MAC IDs.	Check duplication with the MAC ID of a slave device. Check if cables are connected correctly. Check if power for communication is correctly supplied. Check if slave devices are turned on.
■□□□	The DeviceNet application software has been initialized and I/O communication starts.	

LED display for LEDWD

LED display	Status	Meaning
■	Daughter board failure	The daughter board failed. Replace the DeviceNet master board.

LED display for MS and NS (during normal operation)

LED display	Status	Meaning
MS □ NS □	Immediately after power-on	The MPU on the daughter board is being reset.
MS ☆ green NS □	Initializing	The firmware on the daughter board is making a initialization.
MS ■ green NS □	Checking duplication of MAC IDs	The firmware on the daughter board is checking duplicated MAC IDs.
MS ■ green NS ☆ green	I/O communication stopped	The firmware on the daughter board is stopping I/O communication.
MS ■ green NS ■ green	I/O communication in advance	The firmware on the daughter board is successfully performing I/O communication.

LED display for MS and NS (during occurrence of an error)

LED display	Status	Error and action
MS ☆ red NS ◇	Daughter board failure	A MAC ID or communication rate setting error occurred or the daughter board failed. When the setting is correct, replace the DeviceNet master board.
MS ■ red NS □	Daughter board failure	The daughter board failed. Replace the DeviceNet master board.
MS ◇ NS ■ red	Duplicate MAC IDs	MAC IDs are duplicate. Verify the following: → MAC IDs are not duplicate by check the MAC IDs of all nodes.
	Busoff detection	Communication stopped because a communication error occurred frequently. Verify the following: → The communication rates of all nodes are set to the same value. → The cable length is appropriate. → The cable is not loose or broken. → A terminal is placed on only both ends of the main line. → There are not much noise.

LED display	Status	Error and action
MS ◇ NS □	Network power failure	Power for communication is not supplied. Verify the following: → Power for communication is properly supplied.
	Transmission error	Transmission is not completed successfully. Verify the following: → All slaves are turned on. → There is no other master on the network. → The communication rates of all nodes are set to the same value. → The cable length is appropriate. → The cable is not loose or broken. → A terminal is placed on only both ends of the main line. → There are not much noise.
MS ◇ NS ☆ red	Slave not present	No slaves are present. Verify the following: → The slave is turned on. → The communication rates of all nodes are set to the same value. → The cable length is appropriate. → The cable is not loose or broken. → A terminal is placed on only both ends of the main line. → There are not much noise.
	Slave I/O size mismatch	The slave I/O size setting does not match the setting of the actual slave. Verify the following: → The slave I/O size setting matches the setting of the actual slave.
MS ◇ NS ☆ red	I/O communication error	I/O communication timed out. Verify the following: → The communication rates of all nodes are set to the same value. → The cable length is appropriate. → The cable is not loose or broken. → A terminal is placed on only both ends of the main line. → There are not much noise.

- **Slave board**

  This board provides four green LEDs (LED0 to LED3) and one red LED (LEDWD) for status indication. In addition, there are two LED sets (MS and NS) that consist of one red LED and one green LED.

Name	Color	Meaning
LED 0 to 3	Green	Indicates the activation state of the DeviceNet application software.
LEDWD	Red	Indicates an error on the DeviceNet slave board.
MS	Red / green	Indicates the module status, which is the status of the local node.
NS	Red / green	Indicates the network status, which is the status of the network.

In the following explanations, the LED lighting states are expressed as follows:

□: Off ■: On ☆: Blinking ◇: Don't care ? : Undefined

LED display transition for LED0, LED1, LED2, and LED3

LED 3 2 1 0	Status after power-on	Action when stopped after power-on
□□□□	Power-off	
■■■■	After power-on, the DeviceNet application software does not start. Or, the DeviceNet slave function (software option) is disabled.	The DeviceNet application software is not running normally. Check whether the software is installed properly. Or, confirm that the DeviceNet slave function (software option) has been purchased.
□□□□	Initializing the firmware.	Replace the DeviceNet slave board.
□□□■	Firmware has been initialized.	
□□■□	A line baud rate check is in progress.	Check the status of communication with the DeviceNet master. A network power failure may also occur. Check whether the power for communication is supplied properly. If the system does not recover from the error, replace the DeviceNet slave board.
□□■■	Checking duplication of MAC IDs	
□■□□	Waiting for I/O communication to be established.	
□■□■	I/O communication is normal.	
□■■□	I/O communication has timed out.	
□■■■	I/O communication is idle.	

LED display for LEDWD

LED display	Status	Meaning
■	Board failure	The DeviceNet slave board failed. Replace the DeviceNet slave board.

LED display for MS and NS (during normal operation)

In the “during normal operation” status, when communication is normally established, a transition to the “I/O communication normal” status is made.

LED display	Status	Meaning
MS □ green MS □ red NS □ green NS □ red	Immediately after power-on	The onboard firmware is being initialized when the onboard MPU is in the reset status or reset release status.
MS ■ green MS □ red NS □ green NS □ red	Communication under preparation	The onboard firmware performs processing in the order below. (1) Waits for the DeviceNet application software to be initialized. (2) Checks the baud rate. (3) Checks MAC ID duplication.
MS ■ green MS □ red NS ☆ green NS □ red	Waiting for I/O communication to be established.	Each status corresponds to DeviceNet MPU status transition.
MS ■ green MS □ red NS ■ green NS □ red	I/O communication is normal.	
MS ◇ green MS ◇ red NS ■ green NS ☆ red	I/O communication has timed out.	

NOTE

When a transition to the "I/O communication normal" status is not made, confirm that the power for communication is correctly supplied because a network power failure may have occurred.

LED display of MS and NS (during occurrence of an unrecoverable failure)

In the "during occurrence of an unrecoverable failure" status, once an error occurred, recovery is not performed unless this slave station is powered off and back on again.

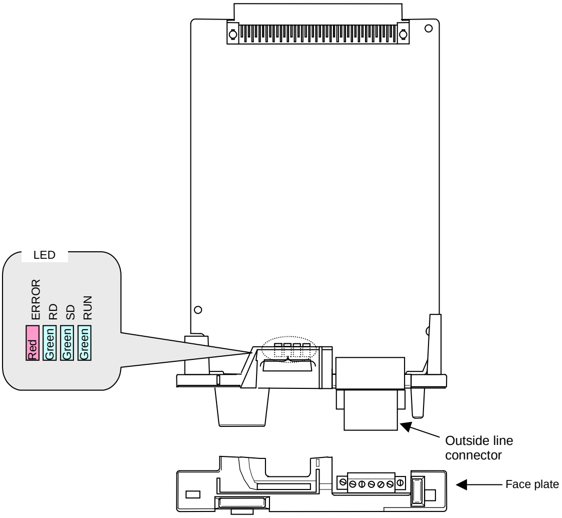
LED display	LED 3 2 1 0	Status	Error and action
MS ◇ green MS ◇ red NS □ green NS ■ red	■□□□ ↑ ↓ □□■□ (Repetition)	Duplicate MAC IDs	Check the following and then turn the slave power off and back on again. → MAC IDs are not duplicate by check the MAC IDs of all nodes.
	■□□□ ↑ ↓ □□■■ (Repetition)	Busoff detection	Check the following and then turn the slave power off and back on again. → The communication rates of all nodes are set to the same value. → The cable length is appropriate. → The cable is not loose or broken. → A terminal is placed on only both ends of the main line. → There are not much noise.
MS □ green MS ■ red NS ◇ green NS ◇ red	■□□□ ↑ ↓ □ ? ? ? (Repetition)	Board failure	The DeviceNet slave board failed. Replace the DeviceNet slave board.
MS ◇ green MS ◇ red NS ◇ green NS ◇ red	□□□□ ↑ ↓ ■■■■ (Repetition)	An unrecoverable failure occurred on the CNC side.	Contact FANUC.

6

6.3.1.5 CC-Link board

Connector and LED mounting location

- **Remote device station board**



LED display and their meanings

- **Remote device station board**

  This board provides three green LEDs and one red LED for status indication.

Name	Color	On	Off
RUN	Green	Online	Offline
SD	Green	Sending data.	Not sending data.
RD	Green	Channel carrier detected.	Channel carrier error.
ERROR	Red	CRC error detected.	Communicating normally.

In the usual, normal communication state, the on/off states of the LEDs are as follows:

Name	On/off state
RUN	On
SD	Blinking
RD	On
ERROR	Off

NOTE
If the number of units on the network is small, SD blinks at high speed, and it may appear on not insteading of blinking to the human eye.

LED indicators in the event of an error

In any of the following LED states, check the settings as listed in the table below.

□: Off ■: On ☆: Blinking ◇: Don't care

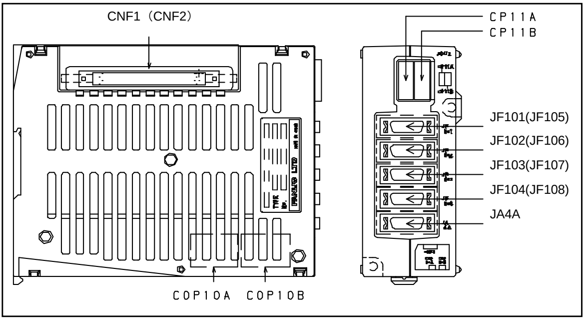
LED display				Meaning of the state	Check item
RUN	SD	RD	ERROR		
◇	◇	◇	☆	- A CRC error occurred.	Cable connection Terminating resistors Measures against noise Baud rate
■	□	■	□	- Data destined to the local station cannot be received from the master station.	Settings of the master station
□	☆	■	□	- The master station is not link-started.	Settings of the master station
□	□	■	□	- Data cannot be received.	Cable connection Measures against noise Settings of the master station
□	□	□	□	- The cable is disconnected. - The master station is not turned on.	Cable connection Settings of the master station

Check item	What to check
Cable connection	- The cable is not connected. - The cable and the connector are connected together correctly. - The cable is not bend forcibly. - The inter-slave station distance is correct.
Terminating resistors	- Terminating resistors are connected to both ends of the cable. - The terminating resistors match the cable type.
Measures against noise	- Each unit is grounded.
Baud rate	- The same baud rate is set for the master and slave stations.
Settings of the master station	- The master station is turned on. - The master station is operating normally. - The settings of the master station are made correctly.

6.3.2 Other Units

6.3.2.1 Separate detector interface unit

Connector mounting location



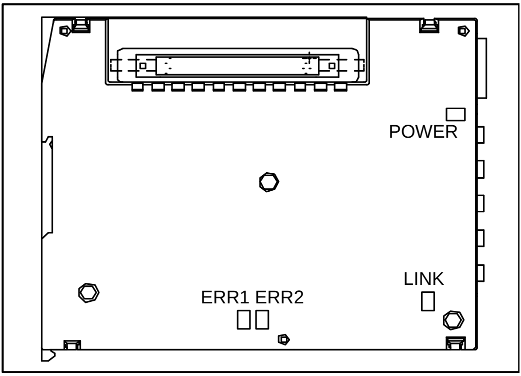
The parenthesized connector names are for the additional unit.

Connector number	Application
CP11A	24 VDC power input
CP11B	24 VDC power output
COP10A	Back stage of the FSSB interface
COP10B	Front stage of the FSSB interface
JF101 to JF104 (JF105 to JF108)	Separate detector interface
JA4A	Connection of a battery for the absolute detector
CNF1 (CNF2)	Connection of the additional unit

The parenthesized connector names are for the additional unit.

LED display

Status indication LEDs are installed on the board in the basic unit case. Two green LEDs (POWER and OPEN) and two red LEDs (ERR1 and ERR2) are provided. The locations and meanings of the LEDs are indicated below.

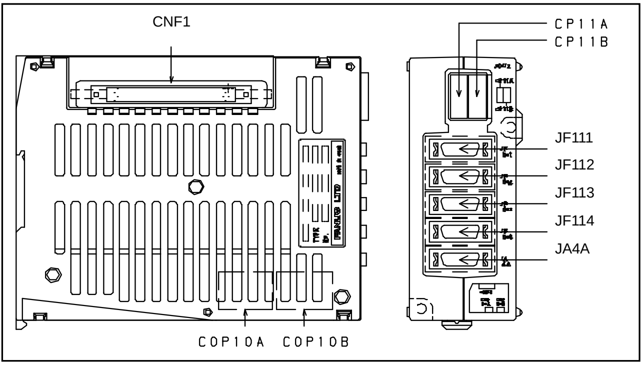


- **LED indication**

No.	LED	Meaning
1	POWER	Turned on when the power is on.
2	LINK	Turned on when FSSB communication is performed.
3	ERR1	Turned on when COP10A (back stage) is disconnected.
4	ERR2	Turned on when COP10B (front stage) is disconnected.

6.3.2.2 Analog input separate detector interface unit

Connector mounting location

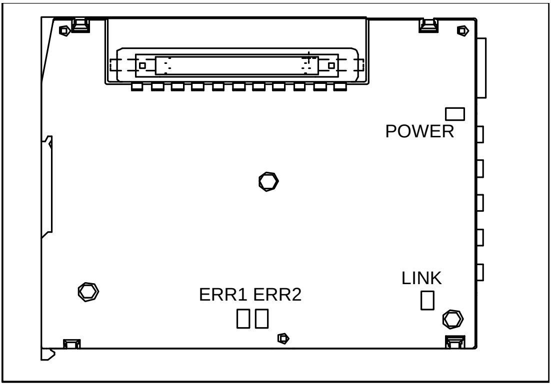


The parenthesized connector names are for the additional unit.

Connector number	Application
CP11A	24 VDC power input
CP11B	24 VDC power output
COP10A	Back stage of the FSSB interface
COP10B	Front stage of the FSSB interface
JF111 to JF114	Separate detector interface
JA4A	Connection of a battery for the absolute detector
CNF1	Connection of the additional unit

LED display

Status indication LEDs are installed on the board in the basic unit case. Two green LEDs (POWER and OPEN) and two red LEDs (ERR1 and ERR2) are provided. The locations and meanings of the LEDs are indicated below.



LED indication

No.	LED	Meaning
1	POWER	Turned on when the power is on.
2	LINK	Turned on when FSSB communication is performed.
3	ERR1	Turned on when COP10A (back stage) is disconnected.
4	ERR2	Turned on when COP10B (front stage) is disconnected.

7.1 HOW TO ENTER THE PARAMETERS

Setting procedure of parameters

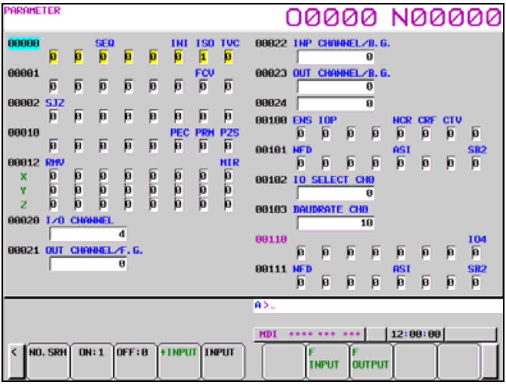
Parameter writing is enabled with following steps 1 to 3.

1 Set to MDI mode or emergency stop state.

2 Press function key several times or press soft key [SETING] to display SETTING (HANDY) screen.

3 Set the cursor to PARAMETER WRITE and, press and keys in this order. Here alarm SW0100, “PARAMETER ENABLE SWITCH ON” will be displayed.

4 Press function key several times to display the following screen.



(To make the cursor display in bit unit, press the cursor keys ⬅ or ➡.)

5 Press soft key [(OPRT)] and the following operation menu is displayed.

<1> Soft key [NO.SRH] :
Searched by number.
Example) Parameter number → [NO.SRH]

<2> Soft key [ON : 1] :
Item with cursor position is set to 1. (Bit parameter only)

<3> Soft key [OFF : 0] :
Item with cursor position is set to 0. (Bit parameter only)

<4> Soft key [+INPUT] :
Input value is added to the value at cursor. (Word type only)

<5> Soft key [INPUT] :
Input value is replaced with the value at cursor.

<6> Soft key [F INPUT] :
Parameters are input from RS232-C interface.

<7> Soft key [F OUTPUT] :
Parameters are output to RS232-C interface.

6 After the parameters have been input, set PARAMETER WRITE on the SETTING screen to 0. Press key to release alarm SW0100.

7 Convenient method

<1> To change parameters in bit unit, press cursor move key ⬅ or ➡, then the cursor becomes bit length and you can set parameters bit by bit (Bit parameter only).

<2> To set data consecutively, use [EOB] key.

(Example 1)

[1] [2] [3] [4] [EOB] [4] [5] [6] [7] [EOB] [9] [9] [9] [9] [INPUT]

This key sequence sets data as follows:

```
0 → 1 2 3 4
0   4 5 6 7
0   9 9 9 9
0         0
```

(Example 2)

[1] [2] [3] [4] [EOB] [EOB] [9] [9] [9] [9] [INPUT]

This key sequence sets data as follows:

```
0 → 1 2 3 4
0         0
0   9 9 9 9
0         0
```

<3> To set the same data sequentially, press “=”.

(Example)

[1] [2] [3] [4] [EOB] "=“ [EOB] "=" [INPUT]

This key sequence sets data as follows:

```
0 → 1 2 3 4
0   1 2 3 4
0   1 2 3 4
0         0
```

<4> Bit parameters can be set as follows:

(Example)

[1] [1] [EOB] "=“ [EOB] [INPUT]

This key sequence sets data as follows:

```
0 0 0 0 0 0 0 0 → 0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 → 0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 → 0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 → 0 0 0 0 0 0 0 0
```

8 After the required parameters are set, set PARAMETER WRITE to 0.

7

7.2 PARAMETER LIST

NOTE

1 With some parameter numbers, the range of setting is restricted.
2 Some parameters can be entered on the setting screen.
3 In the description of a bit parameter, the explanation on the left side of a slash (/) corresponds to the setting of 0, and the explanation on the right side corresponds to the setting of 1.
4 <Axis> indicated for a parameter in the right-hand column of the parameter table means that the parameter is specified for each axis.
5 <T series> indicated for a parameter in the right-hand column of the parameter table means that the parameter can be used only with a lathe system. Similarly, <M series> indicated for a parameter in the right-hand column of the parameter table means that the parameter can be used only with a machining center system.

7.2.1 Setting

(The parameters below can be set on the setting screen.)

0000	Setting	
#0 TVC #1 ISO #2 INI #5 SEQ	TV check is, not performed (0) / performed (1) The code used for data output is, EIA code (0) / ISO code(1) The unit of input is, mm (0) / inch (1) Automatic insertion of sequence numbers is, not performed (0) / performed (1)	
0001	Program format	
#1 FCV	FS16 standard format (0) / FS10/11 format (1)	
0002	Reference position return, Remote diagnosis	
#7 SJZ	For manual reference position return, deceleration dogs are used when a reference position is not established, and positioning is performed when a reference position is established (0) / deceleration dogs are used at all times (1)	M series PRM 1005#3=1
0010	Output format	
#0 PZS #1 PRM #2 PEC	When a part program is output, the O number is, not zero-suppressed (0) / zero-suppressed (1) When parameters are output, the parameters whose values are 0 are, output (0) / not output (1) When pitch error compensation data is output, the data whose value is 0 is, output (0) / not output (1)	
0012	Axis detach, Move command, Mirror image	<Axis>
#0 MIR #7 RMV	Mirror image for each axis is, OFF (0) / ON (1) Assignment of the control axis for each axis is, not released (0) / released (1)	PRM 1005#7=1

7.2.2 RS232-C Interface

0020	Selection of an input/output device, Selection of a foreground input device	PRM110#0

Setting	Description (I/O device selected)
0	Channel 0 (RS232-C serial port 1)
1	Channel 1 (RS232-C serial port 1)
2	Channel 2 (RS232-C serial port 2)
4	Memory card of CNC Memory card/USB interface in the secondary display unit for Ethernet connection or the shared display unit for Ethernet connection
5	Data Server
6	DNC operation is performed or M198 is specified by FOCAS2/Ethernet.
9	Embedded Ethernet
15	M198 is specified by FOCAS2/HSSB. (Parameter (No. 8706#1) = 1)
16	DNC operation is performed or M198 is specified by FOCAS2/HSSB (PORT2).
17	USB memory
20 to 35	Data is transferred to and from a Power Mate CNC manager in group n (n: 0 to 15) via the I/O Link. [Setting value 20 → Group 1]

Setting value	Common setting	Output format	Specifi-cation number	Transfer rate	Transfer method	Connector
0	No.100	No.101	No.102	No.103	Not set	JD36A
1		No.111	No.112	No.113		
2		No.121	No.122	No.123		JD36B

0021	Foreground output device setting	
0022	Background input device setting	
0023	Background output device setting	

0024	Setting of communication with the ladder development tool (FANUC LADDER-III, ladder editing package)	
0 The settings on the PMC online monitor setting screen are not modified. 1 RS232-C serial port 1 (JD36A) 2 RS232-C serial port 2 (JD36B) 10 High-speed interface (HSSB(COP7) or Ethernet) 11 High-speed interface or RS232-C serial port 1 12 High-speed interface or RS232-C serial port 2 255 Communication is terminated forcibly (as with the [EMGSTP] soft key).		
0100	Output format common to all channels	
#1 CTV #2 CRF #3 NCR #6 IOP #7 ENS	Character counting for TV check in the comment section of a program is, performed (0) / not performed (1) When an EOB is output by ISO code, the setting of the parameter is followed (0) / CR and LF are used (1) When an EOB is output by ISO code, LF, CR, and CR are used (0) / CR is used (1) Stopping a program input or output operation by a reset is, enabled (0) / disabled (1) When an NULL code is found during input of EIA code, an alarm is generated (0) / the NULL code is ignored (1)	 PRM100#3 Alarm SR0001
0101	Output format (when I/O = 0)	
#0 SB2 #3 ASI #7 NFD	The number of stop bits is, 1 (0) / 2 (1) Code used at data input is, EIA or ISO code (automatically distinguished) (0) / ASCII code (1) Before and after data, feed is, output (0) / not output (1)	
0102	Spec. No. of the I/O device (when I/O = 0)	
0 RS232-C (Used control codes DC1 to DC4) 1 CASSETTE B1/B2 (BUBBLE CASSETTE) 2 FLOPPY CASSETTE ADAPTOR F1 3 PROGRAM FILE Mate, FANUC FA Card, FSP-H, FLOPPY CASSETTE, Handy File 4 RS232-C (Not used control codes DC1 to DC4) 5 Portable tape reader 6 PPR, FSP-G, FSP-H		
0103	Baud rate (when I/O = 0)	
8: 1200bps, 9: 2400bps, 10: 4800bps, 11: 9600bps, 12: 19200bps		
0110	Separate control of I/O channel numbers	
#0 IO4	Separate control of I/O channel numbers is, not performed (0) / performed (1)	PRM 20 - 23
0111	Output format (when I/O = 1)	
#0 SB2 #3 ASI #7 NFD	The number of stop bits is, 1 (0) / 2 (1) Code used at data input is, EIA or ISO code (automatically distinguished) (0) / ASCII code (1) Before and after data, feed is, output (0) / not output (1)	
0112	Spec. No. of the I/O device (when I/O = 1)	PRM102
0113	Baud rate (when I/O = 1)	PRM103
0121	Output format (when I/O = 2)	
#0 SB2 #3 ASI #7 NFD	The number of stop bits is, 1 (0) / 2 (1) Code used at data input is, EIA or ISO code (automatically distinguished) (0) / ASCII code (1) Before and after data, feed, is output (0) / not output (1)	
0122	Spec. No. of the I/O device (when I/O = 2)	PRM102
0123	Baud rate (when I/O = 2)	PRM103
0138	Memory card I/O	
#0 MDP #5 SCH	To the extension of a file to be output or input, a path number is, not added (0) / added (1) The scheduled operation function is, disabled (0) / enabled (1)	

#7 MNC	External subprogram call from the memory card is, not performed (0) / performed (1)	PRM20=4
0139	Memory card I/O	
#0 ISO	When a memory card is selected as an I/O device, data input/output is performed using ASCII codes (0) / ISO codes (1)	
0313	NC data output function	
#0 BOP #1 TFO	NC data output function is, disabled (0) / enabled (1) On NC data output function, text data (such as parameter, program) is, output (0) / not output (1)	

7.2.3 CNC Screen Display

0300	CNC screen display functions, Memory card interface	
#0 PCM	When a memory card interface is provided on the NC side, and the CNC screen display function is activated, the memory card interface on the NC side is used (0) / the memory card interface on the personal computer side is used (1)	PRM20

7.2.4 Ethernet / Data Server Function

0901	FTP file transfer function	
#1 EFT	The FTP file transfer function by the Ethernet function is, not used (0) used (1)	
0904	Ethernet / Data Server function 1	
#0 BWT #4 UNM #5 DNS #6 DHC #7 LCH	If FTP communication is behind data supply during DNC operation in the buffer mode of the Data Server function, an error is caused (0) / no error is caused and DNC operation continues after waiting the completion of FTP communication (1) The CNC Unsolicited Messaging function is, not used (0) / used (1) The DNS client function is, not used (0) / used (1). The DHCP client function is, not used (0) / used (1). In the LIST-GET service of the Data Server function, when a list file specifies 1025 or more files, a check for duplicated file names is, performed (0) / not performed (1)	
0905	Ethernet / Data Server function 2	
#0 DNE #1 PCH #3 DSF #4 UNS	During DNC operation using the FOCAS2/Ethernet functions, the termination of DNC operation is, waited (0) / not waited (1) (FOCAS2/HSSB compatible specification) At the start of communication of the Data Server function, FTP file transfer function, or machine remote diagnosis function, checking for the presence of the server using PING is, performed (0) / not performed (1) When an NC program is stored on the memory card of the Data Server, the file name takes priority (0) / the program name in the NC program takes priority (1) In the CNC Unsolicited Messaging function, when the end of the function is requested by other than the CNC Unsolicited Messaging server currently connected, the request for the end of the function is, rejected (0) / accepted (1)	
0906	Ethernet / Data Server function 3	
#2 OVW #3 PSV	When the Data Server is working as an FTP server, if it receives a file having the same name as for an existing file in it from an FTP client, an error occurs (0) / no error occurs, and the received file is written over the existing file (1) The FTP clients of the Data Server functions or FTP file transfer function operate in, Active mode (0) / Passive mode (1)	

<table>
<tr><td>#5 SCM

#6 EXP

#7 FSP</td><td>The forwarding mode of the memory card of the Data Server is assumed to be a mode that the memory card supports (0) / a PIO mode2 (1)
When Data Server function operates as FTP server and FTP client executes the GET operation of a text file in the binary mode, EOB(End Of Block) is changed to, the value according to the settings of bit2(CRF) and bit3(NCR) of parameter No.0100 (0) / “LF” (1)
When Data Server function operates as FTP server and the NC programs are stored on the memory card on Data Server, The file name takes priority(0) / The program name in the NC program takes priority (1)</td><td></td></tr>
<tr><td>0907</td><td>Ethernet / Data Server function 4</td><td></td></tr>
<tr><td>#3 TIP</td><td>TCP/IP Communication function for C Language Executor is, Not used (0) / Used (1)</td><td></td></tr>
<tr><td>0908</td><td>Ethernet / Data Server function 5</td><td></td></tr>
<tr><td>#0 ISO</td><td>When a Data Server is selected as an I/O device, data input/output is performed using, ASCII codes (0) / ISO codes (1)</td><td></td></tr>
<tr><td>0909</td><td>Ethernet / Data Server function 6</td><td></td></tr>
<tr><td>#0 HDS</td><td>On the Data server host file list screen, high speed file search is, Invalid(0) / Valid(1)</td><td></td></tr>
<tr><td>0921</td><td>Selects the host computer 1 OS.</td><td></td></tr>
<tr><td>0922</td><td>Selects the host computer 2 OS.</td><td></td></tr>
<tr><td>0923</td><td>Selects the host computer 3 OS.</td><td></td></tr>
<tr><td colspan="2">No.0921-No.0923:
<table>
<tr><th>Settings</th><th>Description</th></tr>
<tr><td>0</td><td>Windows95/98/Me/NT/2000/XP/Vista/7</td></tr>
<tr><td>1</td><td>UNIX,VMS</td></tr>
<tr><td>2</td><td>Linux</td></tr>
</table></td><td></td></tr>
<tr><td>0924</td><td>FOCAS2/Ethernet waiting time setting</td><td></td></tr>
<tr><td>0929</td><td>File attribute specification during FTP server operation
<table>
<tr><th>Settings</th><th>Description</th></tr>
<tr><td>0</td><td>Priority is given to the file attribute specified in a TYPE command from an FTP client.</td></tr>
<tr><td>1</td><td>Text files are always assumed.</td></tr>
<tr><td>2</td><td>Binary files are always assumed.</td></tr>
</table></td><td></td></tr>
<tr><td>0930</td><td>Maximum number of files that can be registered to the memory card of the Data Server and maximum size per file that can be registered
<table>
<tr><th>Settings</th><th>Maximum number of files</th><th>Maximum size per file</th></tr>
<tr><td>0</td><td>2047</td><td>512MB</td></tr>
<tr><td>10</td><td>511</td><td>2048MB</td></tr>
<tr><td>11</td><td>1023</td><td>1024MB</td></tr>
<tr><td>12</td><td>2047</td><td>512MB</td></tr>
<tr><td>13</td><td>4095</td><td>256MB</td></tr>
<tr><td>14</td><td>8191</td><td>128MB</td></tr>
<tr><td>15</td><td>16383</td><td>64MB</td></tr>
</table></td><td></td></tr>
<tr><td>0970</td><td>Select a hardware option that operates the Ethernet function, Data Server function, or Modbus/TCP Server function</td><td></td></tr>
<tr><td>0971</td><td>Select a hardware option that operates the first FL-net function</td><td></td></tr>
<tr><td>0973</td><td>Select a hardware option that operates the PROFINET IO Device function</td><td></td></tr>
</table>

No.0970-No.0973:

Settings	Description
-1	Not used
0	Unsetting
1	Multi-function Ethernet
3	Fast Ethernet board mounted in slot 1
4	Fast Ethernet board mounted in slot 2

0975 EtherNet/IP function operating condition selection 1

Value	Operating condition	
	Function to operate	Hardware option
-1	Not operated	
0	Unsetting (initial value)	
10	Scanner function only	Same hardware option as that specified for parameter No. 970
20	Adapter function only	
30	Both Scanner function and Adapter function	

0976 EtherNet/IP function operating condition selection 2

Value	Operating condition		
	Function to operate	Hardware option	
-1	Not operated		
0	Unsetting (initial value)		
11	Scanner function only	Multi-function Ethernet	
12		Reserved	
13		Fast Ethernet board	(slot1)
14			(slot2)
21	Adapter function only	Multi-function Ethernet	
22		Reserved	
23		Fast Ethernet board	(slot1)
24			(slot2)
31	Both Scanner function and Adapter function	Multi-function Ethernet	
32		Reserved	
33		Fast Ethernet board	(slot1)
34			(slot2)

7.2.5 Power Mate CNC Manager

0960	Power Mate CNC manager	
#1 MD1	The input/output destination of slave parameters is, program memory (0) / memory card (1)	PRM 960#2=0
#2 MD2	The parameter is, always set to 0 (0) / reserved (1)	

MD2	MD1	
0	0	Program memory
0	1	Memory card

#3 PMN	The Power Mate CNC manager is, enabled (0) / disabled (1)	
#4 PPE	Slave parameter setting by the Power Mate CNC manager, is always possible (0) / follows the setting of PWE of the host CNC (1)	
0961	I/O LINK βi, Program number	
#3 PMO	The O number of a program for saving and restoring the I/O Link βi parameter is set based on, group number and channel number (0) / group number only (1)	

7.2.6 System Configuration

0980	Machine group number to which each path belongs	
0981	Absolute path number to which each axis belongs	<Axis>
0982	Absolute path number to which each spindle belongs	
00983	Path control type of each path 0: Lathe system 1: Machining system For the 0i-F, this parameter does not need to be set because it is set automatically.	
00987	Number of control axes	
00988	Number of spindle axes	

7.2.7 Axis Control / Increment System

1000	Extended axis name, Extended spindle name	
#0 EEA	An extended axis name and extended spindle name are, invalid (0) / valid (1)	PRM 1025,1026
1001	Least command increment	
#0 INM	Least command increment on the linear axis is, metric system (0) / inch system (1)	
1002	Reference position return, Number of axes controlled simultaneously in manual operation	
#0 JAX #3 AZR #4 XIK #7 IDG	The number of axes controlled simultaneously in manual operation is, 1 (0) / 3 (1) If G28 is used when no reference position is set, deceleration dogs are used (0) / alarm (PS0304) is issued (1) When an axis-by-axis interlock signal is applied during nonlinear positioning, only the interlocked axis is stopped (0) / all axes are stopped (1) When the reference position is set without dogs, automatic setting of parameter (No. 1012#0) is, not performed (0) / performed (1)	 PRM1005 #1 PRM1401 #1
1004	Least input increment	
#7 IPR	Least input increment of each axis is set to, 1 time (0) / 10 times (1), of the least command increment	
1005	Control axis detach, External deceleration, Reference position return	<Axis>
#0 ZRN #1 DLZ #3 HJZ #4 EDP #5 EDM #6 MCC #7 RMB	If automatic operation is performed without reference position return, an alarm is issued (0) / no alarm is issued (1) The function for setting the reference position without dogs is, disabled (0) / enabled (1) For manual reference position return performed when a reference position is established, deceleration dogs are used (0) / the setting of parameter (No. 0002#7) is followed (1) External deceleration in the positive (+) direction in cutting feed is, invalid (0) / valid (1) External deceleration in the negative (-) direction in cutting feed is, invalid (0) / valid (1) At control axis detach time, the MCC signal is, turned off (0) / not turned off (1) Control axis detachment is, invalid (0) / valid (1)	ALM PS0224 PRM1005 #1 PRM1426 PRM12#7

<table>
<tr><td>1006</td><td>Controlled axes</td><td><Axis></td></tr>
<tr><td>#0 ROT
#1 ROS</td><td>
<table>
<tr><th>ROS</th><th>ROT</th><th>Meaning</th></tr>
<tr><td>0</td><td>0</td><td>Linear axis
(1) Inch/metric conversion is done.
(2) Coordinate values are not rounded in 0 to 360°.
(3) Stored pitch error compensation is linear axis type</td></tr>
<tr><td>0</td><td>1</td><td>Rotary axis (A type)
Machine coordinate values are rounded in 0 to 360°.
Absolute and relative coordinate values are rounded or not rounded by parameter (No. 1008#0 or #2).</td></tr>
<tr><td>1</td><td>1</td><td>Rotary axis (B type)
All coordinate values are not rounded in 0 to 360°.</td></tr>
<tr><td colspan="2">Except for the above</td><td>Setting is invalid (unused)</td></tr>
</table>
</td><td>PRM3624</td></tr>
<tr><td>#3 DIA</td><td>The move command for each axis is based on, radius programming (0) / diameter programming (1)</td><td></td></tr>
<tr><td>#5 ZMI</td><td>The direction of manual reference position return is, + direction (0) / - direction (1)</td><td></td></tr>
<tr><td>1007</td><td>Rotary axis command</td><td><Axis></td></tr>
<tr><td>#0 RTL</td><td>When manual reference position return is performed on a rotary axis (A type) before a reference position is established, a movement is made at, reference position return feedrate FL (0) / rapid traverse rate (1)</td><td></td></tr>
<tr><td>#1 ALZ</td><td>In automatic reference position return (G28), rapid traverse is used (0) / the same sequence as for manual reference position return is used (1)</td><td></td></tr>
<tr><td>#4 GRD</td><td>When matching between the machine position and the position by the absolute position detector is not completed, setting of the reference position without dogs is, not performed two or more times (0) / performed two or more times (1)</td><td></td></tr>
<tr><td>#7 ZPA</td><td>In automatic reference position return (G28), a coordinate system is, not preset (0) / preset (1)</td><td></td></tr>
<tr><td>1008</td><td>Rotary axis setting</td><td><Axis></td></tr>
<tr><td>#0 ROA</td><td>The roll-over function of a rotary axis is, invalid (0) / valid (1)</td><td>PRM1006
#0</td></tr>
<tr><td>#1 RAB</td><td>In an absolute command, a movement on the axis is made, in the shortcut direction (0) / according to the sign of the command value (1)</td><td>PRM1008
#0</td></tr>
<tr><td>#2 RRL</td><td>Relative coordinates are, not rounded by the amount of shift per rotation (0) / rounded by the amount of shift per rotation (1)</td><td>PRM1260</td></tr>
<tr><td>#4 SFD</td><td>In reference position return based on the grid method, the reference position shift function is, invalid (0) / valid (1)</td><td></td></tr>
<tr><td>#5 RMC</td><td>When machine coordinate system selection (G53) is specified, parameter (No. 1008#1) and parameter (No. 1007#3) are, invalid (0) / valid (1)</td><td></td></tr>
<tr><td>#6 RRF</td><td>In reference position return, when the roll-over function is enabled for a rotary axis, the direction of rotation in an absolute command for the axis is determined, according to the setting of bit 1 of parameter No. 1008 to the intermediate point and the setting of bit 5 of parameter No. 1006 from the intermediate point (0) / according to the setting of bit 1 of parameter No. 1008 (1)</td><td>PRM1006
#5
1008#1</td></tr>
<tr><td>1012</td><td>Reference position setting without DOG</td><td><Axis></td></tr>
<tr><td>#0 IDG</td><td>The function for setting the reference position again without dogs is, not inhibited (0) / inhibited (1)</td><td>PRM1002
#7</td></tr>
</table>

<table>
<tr><td>1013</td><td>Least input increment</td><td><Axis></td></tr>
<tr><td>#0 ISA
#1 ISC</td><td><table><tr><th>Increment system</th><th>ISC</th><th>ISA</th></tr><tr><td>IS-A</td><td>0</td><td>1</td></tr><tr><td>IS-B</td><td>0</td><td>0</td></tr><tr><td>IS-C</td><td>1</td><td>0</td></tr></table></td><td></td></tr>
<tr><td>1014</td><td>PMC axis control, Cs axis contour control</td><td><Axis></td></tr>
<tr><td>#7 CDM</td><td>The Cs contour control axis is, not a virtual Cs axis (0) / virtual Cs axis (1)</td><td></td></tr>
<tr><td>1015</td><td>Reference position return, Workpiece origin offset, Increment system</td><td></td></tr>
<tr><td>#4 ZRL

#6 WIC

#7 DWT</td><td>In automatic reference position return (G28), the tool path from the middle point to the reference position and machine coordinate positioning (G53) are based on, positioning of nonlinear interpolation type (0) / positioning of linear interpolation type (1)
In direct input of a measured workpiece origin offset, an external workpiece origin offset is, not considered (0) / considered (1)
When a dwell time is specified by P, the time depends on the increment system (0) / does not depends on the increment system (1 ms) (1)</td><td>PRM 1401#1=1

M series</td></tr>
<tr><td>1020</td><td>Program axis name for each axis
X : 88 Y : 89 Z : 90
A : 65 B : 66 C : 67
U : 85 V : 86 W :87</td><td><Axis></td></tr>
<tr><td>1022</td><td>Setting of each axis in the basic coordinate system
0 : Neither the basic three axes nor a parallel axis
1 : X axis of the basic three axes
2 : Y axis of the basic three axes
3 : Z axis of the basic three axes
5 : Axis parallel to the X axis
6 : Axis parallel to the Y axis
7 : Axis parallel to the Z axis</td><td><Axis></td></tr>
<tr><td>1023</td><td>Number of the servo axis for each axis</td><td><Axis></td></tr>
<tr><td>1024</td><td>Series name of servo control software<table><tr><th>Value</th><th>Description</th></tr><tr><td>0</td><td>90x0 series is used.</td></tr><tr><td>1 to 2</td><td>SV0455 alarm is generated.</td></tr><tr><td>3</td><td>90x3 series is used.</td></tr><tr><td>4 to 9</td><td>SV0455 alarm is generated.</td></tr></table>If the servo control software specified by this parameter does not exist, SV0455 alarm is generated.</td><td><Axis></td></tr>
<tr><td>1025</td><td>Servo axis name 2 for each axis</td><td rowspan="2"><Axis>
PRM 1000#0=1</td></tr>
<tr><td>1026</td><td>Servo axis name 3 for each axis</td></tr>
<tr><td>1031</td><td>Reference axis</td><td></td></tr>
</table>

7.2.8 Coordinate System 1

<table>
<tr><td>1201</td><td>Coordinate system</td><td></td></tr>
<tr><td>#0 ZPR

#2 ZCL

#6 NWS

#7 WZR</td><td>When manual reference position return is performed, a coordinate system is, not set automatically (0) / set automatically (1)
When manual reference position return is performed, the local coordinate system is, not canceled (0) / canceled (1)
The workpiece coordinate system shift amount setting screen is, displayed (0) / not displayed (1)
When parameter (No. 3402#6) is set to 0, the G code of group number 14 is, reset (0) / not reset (1)</td><td>Workpiece coordinate system

T series</td></tr>
<tr><td>1202</td><td>Workpiece origin offset</td><td></td></tr>
<tr><td>#0 EWD</td><td>The shift direction of the external workpiece origin offset is, the same as the sign of the offset (0) / opposite to the sign of the offset (1)</td><td></td></tr>
</table>

#1 EWS #2 G92 #3 RLC	The external workpiece origin offset is, valid (0) / invalid (1) If a command for coordinate system setting is specified when the workpiece coordinate system option is enabled, no alarm is issued (0) / the alarm (PS0010) is issued (1) The local coordinate system is, not canceled by reset (0) / canceled by reset (1)	T series
1203	Extended external machine zero point shift, 3-dimensional coordinate system conversion	
#0 EMS #4 WZP	The extended external machine zero point shift function is, disabled (0) / enabled (1) In the 3-dimensional coordinate system conversion mode, a modification to the workpiece coordinate system from the MDI is, not prohibited (0) / prohibited (1)	
1205	Reference position output	
#4 RP1 #5 RP2 #6 3TW #7 WTC	The output of the signal for the reference position is, disabled (0) / enabled (1) The output of the signal for the 2nd reference position is, disabled (0) / enabled (1) When workpiece coordinate system selection is specified with G code in tilted working plane indexing mode, the alarm PS5462, "ILLEGAL COMMAND (G68.2/G69)" is issued (0) / workpiece coordinate system selection is executed (1) When workpiece coordinate system preset is done, actual tool length offset is, not considered (0) / considered (1)	
1220	External workpiece origin offset value in each axis	<Axis>
1221	Workpiece origin offset value in workpiece coordinate system 1 (G54) [Increment system]	<Axis>
1222	Workpiece origin offset value in workpiece coordinate system 2 (G55) [Increment system]	<Axis>
1223	Workpiece origin offset value in workpiece coordinate system 3 (G56) [Increment system]	<Axis>
1224	Workpiece origin offset value in workpiece coordinate system 4 (G57) [Increment system]	<Axis>
1225	Workpiece origin offset value in workpiece coordinate system 5 (G58) [Increment system]	<Axis>
1226	Workpiece origin offset value in workpiece coordinate system 6 (G59) [Increment system]	<Axis>
1240	Coordinate value of the 1st reference position in the machine coordinate system [Increment system]	<Axis>
1241	Coordinate value of the 2nd reference position in the machine coordinate system [Increment system]	<Axis>
1242	Coordinate value of the 3rd reference position in the machine coordinate system [Increment system]	<Axis>
1243	Coordinate value of the 4th reference position in the machine coordinate system [Increment system]	<Axis>
1244	Coordinate value of the floating reference position in the machine coordinate system	<Axis>
1250	Coordinate system of the reference position used when automatic coordinate system setting is performed	<Axis>
1260	Amount of a shift per one rotation of a rotary axis	<Axis>
1280	Start address of signals used with the extended external machine zero point shift function	PRM 1203#0=1
1290	Distance between two opposite tool posts in mirror image	T series PRM1031

7.2.9 Stroke Limit Check

1300	Stored stroke check	
#0 OUT	The inhibition area of stored stroke check 2 is, inside (0) / outside (1)	
#1 NAL	When the tool enters the inhibition area of stored stroke limit 1, the overtravel alarm signal is, not output (0) / output (1)	PRM 1320,1321 1326,1327
#2 LMS	The EXLM signal for switching stored stroke check 1 is, disabled (0) / enabled (1)	PRM 1301#0
#5 RL3	The stored stroke check 3 release signal RLSOT3 is, disabled (0) / enabled (1)	
#6 LZR	When the stored stroke check immediately after power-on is enabled (parameter DOT(No.1311#0)=1), the stored stroke check is, performed even before a manual reference position return is made (0) / not performed until a manual reference position return is made (1)	
#7 BFA	When a stored stroke check alarm, inter-path interference alarm, or chuck/tail stock barrier alarm is issued, the tool stops, after entering the prohibited area (0) / before entering the prohibited area (1)	
1301	Stored limit check before move	
#0 DLM	The stored stroke limit switching signals G104 and G105 for each axial direction are, disabled (0) / enabled (1)	EXLM
#1 LMA	When the stored stroke limit 1 change signal EXLM is set to 1, the movement area of stored stroke check 1 is, stroke limit 1-II (0) / 1-I and -II (1)	1300#2
#2 NPC	As part of the stroke limit check performed before movement, the movement specified in G31 (skip) and G37 (automatic tool length measurement) blocks is, checked (0) / not checked (1)	Stroke before movement
#4 OF1	If the tool is moved into the range allowed on the axis after an OT alarm is raised by stored stroke check 1, the alarm is not canceled before a reset is made (0) / the alarm is immediately canceled (1)	
#6 OTS	When the overtravel alarm is issued, no signal is output to the PMC (0) / the overtravel alarm signal is output to the PMC (1)	
#7 PLC	Stroke check before movement is, not performed (0) / performed (1)	
1302	Stored limit check before move	
#0 SBA	Check of the tool path between blocks for movement command is, disabled (0) / enabled (1)	
1310	Stored stroke check for each axis	<Axis>
#0 OT2	Stored stroke check 2 for each axis is, disabled (0) / enabled (1)	
#1 OT3	Stored stroke check 3 for each axis is, disabled (0) / enabled (1)	
1311	Stored stroke check	<Axis>
#0 DOT	Stored stroke check immediately after power-on is, disabled (0) / enabled (1)	
1312	Stored stroke check	
#0 SLM	The stroke limit area changing function is, disabled (0) / enabled (1)	
1313	The first address of data table (D) that sets data that switches stored stroke limit	
1320	Coordinate value I of stored stroke check 1 in the positive direction on each axis [Increment system]	<Axis>
1321	Coordinate value I of stored stroke check 1 in the negative direction on each axis [Increment system]	<Axis>
1322	Coordinate value of stored stroke check 2 in the positive direction on each axis [Increment system]	<Axis>

1323	Coordinate value of stored stroke check 2 in the negative direction on each axis [Increment system]	<Axis>
1324	Coordinate value of stored stroke check 3 in the positive direction on each axis [Increment system]	<Axis>
1325	Coordinate value of stored stroke check 3 in the negative direction on each axis [Increment system]	<Axis>
1326	Coordinate value II of stored stroke check 1 in the positive direction on each axis [Increment system]	<Axis> PRM 1300#2 1301#0
1327	Coordinate value II of stored stroke check 1 in the negative direction on each axis [Increment system]	
1350	Coordinate value III of stored stroke check 1 in the positive direction on each axis [Increment system]	
1351	Coordinate value III of stored stroke check 1 in the negative direction on each axis [Increment system]	
1352	Coordinate value IV of stored stroke check 1 in the positive direction on each axis [Increment system]	
1353	Coordinate value IV of stored stroke check 1 in the negative direction on each axis [Increment system]	
1354	Coordinate value V of stored stroke check 1 in the positive direction on each axis [Increment system]	
1355	Coordinate value V of stored stroke check 1 in the negative direction on each axis [Increment system]	
1356	Coordinate value VI of stored stroke check 1 in the positive direction on each axis [Increment system]	
1357	Coordinate value VI of stored stroke check 1 in the negative direction on each axis [Increment system]	
1358	Coordinate value VII of stored stroke check 1 in the positive direction on each axis [Increment system]	
1359	Coordinate value VII of stored stroke check 1 in the negative direction on each axis[Increment syster	
1360	Coordinate value VIII of stored stroke check 1 in the positive direction on each axis [Increment system]	
1361	Coordinate value VIII of stored stroke check 1 in the negative direction on each axis[Increment syster	

7.2.10 Chuck and Tail Stock Barrier

1330	Profile of a chuck 0: Holds a workpiece on the inner surface 1: Holds a workpiece on the outer surface	T series
1331	Length (L) of the claw of the chuck [Increment system]	T series
1332	Width (W) of the claw of the chuck [Increment system]	T series
1333	Dimensions of the part of a claw at which a workpiece is held (L1) [Increment system]	T series
1334	Dimensions of the part of a claw at which a workpiece is held (W1) [Increment system]	T series
1335	X coordinate of a chuck (CX) [Increment system]	T series
1336	Z coordinate of a chuck (CZ) [Increment system]	T series
1341	Length (L) of the tail stock [Increment system]	T series
1342	Diameter (D) of the tail stock [Increment system]	T series Diameter
1343	Length (L1) of the tail stock [Increment system]	T series
1344	Diameter (D1) of the tail stock [Increment system]	T series Diameter
1345	Length (L2) of the tail stock [Increment system]	T series
1346	Diameter (D2) of the tail stock [Increment system]	T series Diameter
1347	Diameter (D3) of the tail stock [Increment system]	
1348	Z coordinate of a tail stock (TZ) [Increment system]	T series

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7.2.11 Feedrate

1401	Feedrate	
#0 RPD #1 LRP #2 JZR #4 RF0 #5 TDR #6 RDR	Manual rapid traverse before completion of return to the reference position is, disabled (0) / enabled (1) Positioning (G00) is, nonlinear (0) / linear (1) Manual return to the reference position at the JOG feedrate is, not performed (0) / performed (1) When cutting feedrate override is 0% during rapid traverse, the machine tool, does not stop moving (0) / stops moving (1) Dry run during thread cutting and canned cycles (G74, G84) is, enabled (0) / disabled (1) Dry run for a rapid traverse command is, disabled (0) / enabled (1)	
1402	Manual per revolution feed	
#0 NPC #1 JOV #3 OV2 #4 JRV	Feed per revolution without the position coder is, disabled (0) / enabled (1) Jog override is, enabled (0) / disabled (tied to 100%) (1) The secondary feedrate override is, 1% (0) / 0.01% (1) Jog feed or incremental feed is performed, at feed per minute (0) / at feed per revolution (1)	
1403	Thread cutting, Helical interpolation	
#4 ROC #5 HTG #7 RTV	Rapid traverse override for retraction after threading is, enabled (0) / disabled (100%) (1) The feedrate for helical interpolation/helical involute interpolation/3-dimensional circular interpolation is specified, using the feedrate along the tangent to an arc/involute curve/ 3-dimensional arc (0) / using the feedrate along axes including a helical axis (1) Overriding during retraction in a threading cycle, is enabled (0) / disabled (1)	T series T series
1404	Manual reference position return, Increment system	
#1 DLF #2 FM3 #7 FC0	After a reference position has been established, a manual reference position return operation is performed, at the rapid traverse rate (0) / at the manual rapid traverse rate (1) The increment system of an F command without a decimal point in feed per minute is, [1 mm/min] (0.01 inch/min for inch input) (0) / [0.001 mm/min] (0.00001 inch/min for inch input) (1) Specifies the behavior of the machine tool when a block (G01, G02, G03, etc.) containing a feedrate command (F command) that is 0 is issued during automatic operation, as follows, an alarm PS0011 occurs (0) / an alarm PS0011 does not occur, and the block is executed (1)	PRM 1420,1424 T series
1405	Increment system, Feedrate	
#1 FR3 #2 PCL #3 HFR #5 EDR	The increment system of an F command without a decimal point in feed per revolution is, [0.01 mm/rev] (0.0001 inch/rev for inch input) (0) / [0.001 mm/rev] (0.00001 inch/rev for inch input)(1) The function for constant surface speed control is, not used (0) / used (1) Feedrate command in rapid traverse is, a value of set in parameter (0) / synchronized with handle pulse by the handle-synchronous feed function (1) As the external deceleration rate for positioning of linear interpolation type, the external deceleration rate for cutting feed is used (0) / the external deceleration rate in rapid traverse for the 1st axis in the entire system is used (1)	M series PRM 1426,1427
1406	External deceleration	
#0 EX2	External deceleration function setting 2 is, invalid (0) / valid (1)	

#1 EX3 #7 F10	External deceleration function setting 3 is, invalid (0) / valid (1) For the cutting feedrate specified by a single-digit F code (F1 to F9), feedrate override, second feedrate override, and override cancellation are, disabled (0) / enabled (1)	 M series
1408	Feedrate on a rotary axis, Unit of cutting feedrate	<Axis>
#0 RFD #3 IRC	Feedrate control on a rotary axis is exercised, using the conventional method (0) / the method that specifies a feedrate on the virtual circle of the rotary axis (1) The increment system for a parameter (No. 1430/No. 1432) for specifying a maximum cutting feedrate is, not multiplied by 10 (0) / multiplied by 10 (1)	 PRM 11000#7=1
1410	Dry run rate [mm/min]	
1411	Cutting feedrate [mm/min]	M series
1414	Feedrate for retrace [mm/min]	<Axis> M series
1415	Manual synchronous feedrate for manual linear/circular interpolation continuous feed at override 100%	
1420	Rapid traverse rate for each axis [mm/min]	<Axis>
1421	F0 rate of rapid traverse override for each axis [mm/min]	<Axis>
1423	Feedrate in jog feed for each axis [mm/min]	<Axis>
1424	Manual rapid traverse rate for each axis [mm/min]	<Axis>
1425	FL rate of the reference position return for each axis [mm/min]	<Axis>
1426	External deceleration rate of cutting feed [mm/min]	PRM 1005#4,#5
1427	External deceleration rate of rapid traverse for each axis [mm/min]	<Axis> PRM 1005#4,#5
1428	Reference position return feedrate before a reference position is established	<Axis> M series

<table>
<tr><td colspan="2"></td><td colspan="2">Before reference position establishment</td><td colspan="2">After reference position establishment</td></tr>
<tr><td colspan="2">Reference position return feedrate (1428)</td><td>Not applied</td><td>Applied</td><td>Not applied</td><td>Applied</td></tr>
<tr><td colspan="2">G28</td><td rowspan="2">PRM 1420</td><td rowspan="4">PRM 1428</td><td colspan="2" rowspan="2">PRM 1420</td></tr>
<tr><td colspan="2">G00</td></tr>
<tr><td rowspan="2">Manual reference position return</td><td>Without dogs</td><td rowspan="2">PRM 1424</td><td colspan="2">PRM 1420, 1424 (*2)</td></tr>
<tr><td>With dogs</td><td>PRM 1424</td><td>PRM 1428</td></tr>
<tr><td colspan="2">Manual rapid traverse</td><td colspan="2">PRM 1423, 1424 (*1)</td><td colspan="2">PRM 1424</td></tr>
</table>

*1 Selected with parameter (No. 1401#0)
*2 Selected with parameter (No. 1404#1)

1430	Maximum cutting feedrate for each axis [mm/min]	<Axis>
1432	Maximum cutting feedrate for all axes in the acc./dec. before interpolation [mm/min]	<Axis> PRM1430
1434	Maximum manual handle feedrate for each axis [mm/min]	<Axis>
1440	External deceleration rate setting 2 in cutting feed [mm/min]	
1441	External deceleration rate setting 2 for each axis in rapid traverse [mm/min]	<Axis>
1442	Maximum manual handle feedrate setting 2 for each axis [mm/min]	<Axis>
1443	External deceleration rate setting 3 in cutting feed [mm/min]	
1444	External deceleration rate setting 3 for each axis in rapid traverse [mm/min]	<Axis>
1445	Maximum manual handle feedrate setting 3 for each axis [mm/min]	<Axis>

1450	Change of feedrate for one graduation on the manual pulse generator during 1-digit F code feed $\Delta F = \frac{Fmax1 \text{ or } Fmax2}{100 \times \text{setting}}$ Fmax1: PRM1460, Fmax2: PRM1461	
1451	Feedrate for F1 [mm/min]	M series
1452	Feedrate for F2 [mm/min]	M series
1453	Feedrate for F3 [mm/min]	M series
1454	Feedrate for F4 [mm/min]	M series
1455	Feedrate for F5 [mm/min]	M series
1456	Feedrate for F6 [mm/min]	M series
1457	Feedrate for F7 [mm/min]	M series
1458	Feedrate for F8 [mm/min]	M series
1459	Feedrate for F9 [mm/min]	M series
1460	Upper limit of feedrate for F1 to F4 [mm/min]	M series
1461	Upper limit of feedrate for F5 to F9 [mm/min]	M series
1465	Virtual radius for feedrate on a virtual circle about a rotary axis [Input unit]	<Axis> PRM 1408#0
1466	Feedrate for retraction in threading cycle G92 or G76 [mm/min]	T series PRM 1611#0=1 1420
1490	Threading start position compensation in changing spindle speed function	
#2 LMV #7 PGF	The offset value for Z-axis threading start position at a spindle speed change is set, by spindle resolution (lead/4096) (0) / in Z-axis least command increments (1) The feedrate specified for circular interpolation, involute interpolation, spiral/conical interpolation, and NURBS interpolation in the high-speed program check mode is, the dry run feedrate (at this time, manual feedrate override signals *JV0 to *JV15 <Gn010 to Gn011> can be used) (0) / the maximum feedrate specified by the CNC (1)	
1495	Torch rotation speed [mm/min]	M series

7.2.12 Acceleration/Deceleration Control

1601	Acceleration/deceleration control	
#4 RTO #5 NCI	Block overlap in rapid traverse is, disabled (0) / enabled (1) An in-position check confirms, acc./dec. delay and machine position (0) / only acc./dec. delay (1)	PRM1722 PRM1827
1602	Acceleration/deceleration control	
#2 CAF #3 BS2 #6 LS2	In cutter compensation mode or tool nose radius compensation mode, the circular cutting feedrate change is, performed on the inner arc only (0) / performed on the inner and outer arcs (1) Acc./dec. after interpolation during acc./dec. before interpolation BS2 / LS2 / Acceleration/deceleration: 0 / 0 / Exponetial acc./dec. 0 / 1 / Linear acc./dec. 1 / 0 / Bell-shaped acc./dec.	
1603	Acceleration/deceleration control	
#4 PRT	Acceleration/deceleration for rapid traverse of linear interpolation type is performed with, a constant acc./dec. rate (0) / a constant time (1)	
1604	AI contour control	
#0 SHP	When automatic operation is started, the state equivalent to the specification of G5.1Q1 for AI contour control is, not set (0) / set (1)	

<table>
<tr><td>1605</td><td>Axis immediate stop</td><td></td></tr>
<tr><td>#2 EST</td><td>Axis immediate stop function is, disabled (0) / enabled (1)</td><td>PRM 1673,1700</td></tr>
<tr><td>1606</td><td>Interrupt</td><td><Axis></td></tr>
<tr><td>#0 MNJ</td><td>In manual pulse generator interrupt or automatic manual simultaneous operation (interrupt type), only cutting feed acc./dec. is enabled (0) / both cutting feed acc./dec. and jog feed acc./dec. are applied (1)</td><td></td></tr>
<tr><td>1610</td><td>Acceleration/deceleration control</td><td><Axis></td></tr>
<tr><td>#0 CTL
#1 CTB</td><td>Acc./dec. after interpolation
<table><tr><th>CTBx</th><th>CTLx</th><th>Acceleration/deceleration</th></tr><tr><td>0</td><td>0</td><td>Exponetial acc./dec.</td></tr><tr><td>0</td><td>1</td><td>Linear acc./dec.</td></tr><tr><td>1</td><td>0</td><td>Bell-shaped acc./dec.</td></tr></table></td><td>PRM1622</td></tr>
<tr><td>#4 JGL

#5 THL</td><td>The type of acc./dec. in jog feed is, exponential type (0) / same as for cutting feed (1)

The type of acc./dec. in a threading cycle is, exponential type (0) / same as for cutting feed (1)</td><td>PRM 1610#0,#1 1624
PRM 1610#0,#1 1626</td></tr>
<tr><td>1611</td><td>Thread cutting, AI contour control</td><td></td></tr>
<tr><td>#0 CFR

#2 AOFF

#3 TCO</td><td>The type of acc./dec. used for retraction after threading in threading cycles G92 and G76 is, acc./dec. after interpolation for threading (0) / acc./dec. after interpolation for rapid traverse (1)
When AI contour control I and II are disabled and the parameter for the advanced preview feed-forward function is valid, this function is, enabled (0) / disabled (1)
In a threading cycle, rapid traverse overlap operation is, not performed (0) / performed (1)</td><td>T series PRM 1626,1627

PRM 1604#0=0

PRM1726</td></tr>
<tr><td>1612</td><td>Rapid traverse block overlap</td><td></td></tr>
<tr><td>#0 PRO

#1 AIR

#2 TOD

#4 MTA</td><td>For a deceleration reduction ratio for overlapping rapid traverse blocks, parameter No. 1722 is used (0) / system variables #100851[#_ROVLP[1]] to #100900[#_ROVLP[50]] are used (1)
The status display and mode signal in AI contour control mode is, enabled only when the conditions for executing AI contour control are satisfied (0) / enabled always in AI contour control mode (1)
Rapid traverse overlap in threading cycle is invalid (0) / valid (1)
When the maximum cutting feedrate is exceeded in threading, the alarm PS0530 is issued (0) / not issued (1)</td><td>PRM 1601#4=1</td></tr>
<tr><td>1620</td><td>Time constant T or T1 used for linear acc./dec. or bell-shaped acc./dec. in rapid traverse for each axis [ms]</td><td><Axis></td></tr>
<tr><td>1621</td><td>Time constant T2 used for bell-shaped acc./dec. in rapid traverse for each axis [ms]</td><td><Axis></td></tr>
<tr><td>1622</td><td>Time constant of acc./dec. in cutting feed for each axis [ms]</td><td><Axis>
PRM 1610#0,#1</td></tr>
<tr><td>1623</td><td>FL rate of exponential acc./dec. in cutting feed for each axis [mm/min]</td><td><Axis></td></tr>
<tr><td>1624</td><td>Time constant of acc./dec. in jog feed for each axis [ms]</td><td><Axis></td></tr>
<tr><td>1625</td><td>FL rate of exponential acc./dec. in jog feed for each axis [mm/min]</td><td><Axis></td></tr>
<tr><td>1626</td><td>Acceleration/deceleration time constant in threading cycles for each axis [ms]</td><td><Axis></td></tr>
<tr><td>1627</td><td>FL rate for acc./dec. in threading cycles for each axis [mm/min]</td><td><Axis></td></tr>
<tr><td>1660</td><td>Maximum allowable acceleration rate in acc./dec. before interpolation for each axis [mm/sec^2]</td><td><Axis></td></tr>
</table>

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1671	Maximum allowable acceleration rate in acc./dec. before interpolation for linear rapid traverse for each axis, or maximum allowable reference acceleration rate in optimum torque acc./dec. [mm/sec^2]	<Axis>
1672	Acceleration change time of bell-shaped acc./dec. before interpolation for linear rapid traverse, or acceleration change time of bell-shaped acc./dec. in optimum torque acc./dec. [ms]	PRM1671
1673	Maximum allowable acceleration rate in tangent direction at axis immediate stop [mm/sec^2]	PRM 1605#2
1700	Maximum allowable acceleration rate in the axis immediate stop for each axis [mm/sec^2]	<Axis> PRM 1605#2
1710	Minimum deceleration ratio (MDR) for inner circular cutting feedrate change by automatic corner override [%]	
1711	Inner determination angle (θp) for inner corner override [deg]	
1712	Override value for inner corner override [%]	
1713	Start distance (Le) for inner corner override	
1714	End distance (Ls) for inner corner override	
1722	Rapid traverse feedrate reduction ratio for overlapping rapid traverse blocks [%]	<Axis> PRM 1601#4=1
1726	Rapid traverse rate reduction ratio for overlapping threading cycle blocks [%]	<Axis> PRM 1611#3=1
1728	Distance of rapid traverse overlap between retraction and return in threading cycle [Increment system]	PRM 1612#2=1
1729	Distance of rapid traverse overlap between return and positioning of the next block in threading cycle [Increment system]	PRM 1612#2=1
1732	Minimum allowable feedrate for the deceleration function based on acceleration in circular interpolation [mm/min]	PRM1735 Involute interpolation
1735	Maximum allowable acceleration rate for the deceleration function based on acceleration in circular interpolation for each axis [mm/sec^2]	<Axis> Involute interpolation
1737	Maximum allowable acceleration rate for the deceleration function based on acceleration in AI contour control for each axis [mm/sec^2]	<Axis> PRM1735
1738	Minimum allowable feedrate for the deceleration function based on acceleration in AI contour control [mm/min]	
1763	FL rate for acc./dec. after cutting feed interpolation for each axis in the acc./dec. before interpolation mode [mm/min]	<Axis>
1769	Time constant for acc./dec. after cutting feed interpolation in the acc./dec. before interpolation mode [ms]	<Axis>
1772	Acceleration change time of bell-shaped acc./dec. before interpolation [ms]	PRM1660
1783	Maximum allowable feedrate difference for feedrate determination based on corner feedrate difference	<Axis>
1788	Maximum allowable acceleration change rate in feedrate determination based on acceleration change for each axis	<Axis>
1789	Maximum allowable acceleration change rate in feedrate determination based on acceleration change for each axis (linear interpolation)	<Axis> PRM1788
1790	Ratio of change time of the rate of change of acceleration in smooth bell-shaped acc./dec. before interpolation [%]	PRM 1672,1722
1791	Acceleration rate on each axis for the outage-time deceleration stop function [mm/sec^2]	<Axis>

7.2.13 Servo

<table>
<tr><td>1800</td><td>Backlash compensation applied separately for cutting feed and rapid traverse, DRDY alarm</td><td></td></tr>
<tr><td>#1 CVR

#3 FFR

#4 RBK</td><td>When velocity control ready signal VRDY is on before position control ready signal PRDY comes on, an alarm is generated (0) / no alarm is generated (1)
Feed-forward control in rapid traverse is, disabled (0) / enabled (1)
Backlash compensation applied separately for cutting feed and rapid traverse is, not performed (0) / performed (1)</td><td>ALM
SV0401

PRM
1851,1852</td></tr>
<tr><td>1801</td><td>In-position width at cutting</td><td></td></tr>
<tr><td>#4 CCI

#5 CIN</td><td colspan="2">Parameter number setting for in-position width at cutting time
<table>
<tr><th>CIN</th><th>CCI</th><th>PRM1826</th><th>PRM1827</th></tr>
<tr><td>0</td><td>0</td><td>Same as rapid traverse</td><td>(Not used)</td></tr>
<tr><td>1</td><td>0</td><td>Same as rapid traverse</td><td>(Not used)</td></tr>
<tr><td>0</td><td>1</td><td>When the next block specifies an operation other than cutting feed</td><td>When the next block specifies cutting feed</td></tr>
<tr><td>1</td><td>1</td><td>When rapid traverse is performed, independently of the next block</td><td>When cutting feed is performed, independently of the next block</td></tr>
</table>
</td></tr>
<tr><td>1802</td><td>Servo control</td><td><Axis></td></tr>
<tr><td>#1 DC4

#2 DC2

#4 BKL</td><td>When a reference position is established on a linear scale with reference marks, three reference marks are detected (0) / four reference marks are detected (1)
Reference position establishment operation for a linear scale with reference marks is performed, by following the setting of parameter (No.1802#1) (0) / by establishing an absolute position through detection of two reference marks (1)
In travel direction determination, the backlash compensation value is, not considered (0) / considered (1)</td><td>

PRM
1817#4</td></tr>
<tr><td>1803</td><td>Torque control</td><td></td></tr>
<tr><td>#0 TQI

#1 TQA

#4 TQF

#7 NFP</td><td>Within a torque limit, an in-position check is, made (0) / not made (1)
Within a torque limit, an excessive stop-time / move-time error is, checked (0) / not checked (1)
When torque control is performed by the PMC axis control, follow-up operation is, not performed (0) / performed (1)
If position matching between the machine position and absolute position detector is not performed even once, follow-up operation is, not performed (0) / performed (1)</td><td></td></tr>
<tr><td>1804</td><td>VRDY OFF ignore signal</td><td></td></tr>
<tr><td>#4 IVO

#5 ANA

#6 SAK</td><td>When an attempt is made to release an emergency stop state while the VRDY OFF alarm ignore signal is 1, the emergency stop state is not released until the signal is set to 0 (0) / the emergency stop state is released immediately (1)
When an unexpected disturbance torque is detected for an axis, movement along all axes is stopped and a servo alarm is issued (0) / no servo alarm is issued and movement along only the axes of the group containing the axis with the unexpected disturbance torque is stopped in interlock mode (1)
When the VRDY OFF alarm ignore signal IGNVRY is 1, or when the IGNVRY signals for all axes are 1, the servo ready signal SA is, "0" (0) / "1" (1)</td><td>

PRM1881</td></tr>
</table>

1805	PMC axis torque control	
#1 TRE #3 TSA #4 TSM	When parameter (No. 1803#4) is set to 0, the servo error counter is, updated (0) / not updated (1) As the unexpected disturbance torque detection level during dwell, M code execution, and automatic operation halt state, the threshold value for rapid traverse is used (0) / the threshold value for cutting feed is used (1) As the unexpected disturbance torque detection level in the jog feed mode (excluding manual rapid traverse) and manual handle feed mode, the threshold value for rapid traverse is used (0) / the threshold value for cutting feed is used (1)	PRM1885 ALM SV0423 SV0422 PRM 2142, 2104 2200#3=1 PRM 2142, 2104 2200#3=1
1807	Servo warning	<Axis>
#2 SWP	An alarm is, issued (0) / not issued (1), even when the αi series servo amplifier is placed in the warning state	
1814	Cs axis contour control	<Axis>
#1 EMF #7 ALG	In External machine zero point shift or Extended external machine zero point shift, the maximum shift value per one execution cycle is normal(0) / multiplied by 10(1) The servo axis loop gain in the Cs contour control mode is, not matched with the Cs contour control loop gain (0) / matched with the Cs contour control loop gain (1)	PRM 1816#2=1 1013#1-#3=1
1815	Position detector	<Axis>
#0 RVS #1 OPT #2 DCL #3 DCR #4 APZ #5 APC #6 RON	When the scale without rotary data is used, the CNC does not maintain the rotary data (0) / the CNC maintains the rotary data (1) The separate position detector is, not used (semi-closed system) (0) / used (full-closed system) (1) As a separate position detector, a linear scale with reference marks or a linear scale with an absolute address zero point is, not used (0) / used (1) As a scale with absolute address reference marks, a rotary encoder with absolute address reference marks is, not used (0) / used (1) When an absolute position detector is used, matching with the machine position is, not completed (0) / completed (1) The position detector is, not an absolute position detector (0) / an absolute position detector (1) In the case of rotation speed of A type, an absolute position detector with a scale that has no rotation speed data is, not used (0) / used (1)	 PRM 1815#2 PRM 1006#0=1 1006#1=0
1816	Detection multiplication factor (DMR)	<Axis>
#2 HPE	The compensation amount by the error compensation can be output based on, detection unit (0) / 1/1000 of the detection unit (1)	

<table>
<tr><td>#4 DM1
#5 DM2
#6 DM3</td><td>By using DM1, DM2, and DM3, a detection multiplication factor (DMR) is set. This parameter is valid when a separate position detector (AB phase) is used and parameter No. 2084 and No. 2085 are not set.
<table>
<tr><th>DM3</th><th>DM2</th><th>DM1</th><th>DMR</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1/2</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>3/2</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>5/2</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>3</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>7/2</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>4</td></tr>
</table></td><td></td></tr>
<tr><td>1817</td><td>Tandem control, Backlash</td><td><Axis></td></tr>
<tr><td>#2 SBL

#3 SCR

#4 SCP

#6 TAN</td><td>Smooth backlash compensation is, disabled (0) / enabled (1)
Specifies whether to convert scale data by using threshold position (parameter No. 1868) so that rotary axis B type is available, in the case of the axis B type that use a rotary scale without data (the number of rotation), whose movable range is under one rotation, not to convert (0) / to convert (1)
For two-point measurement, the scale zero point direction is, on the minus side (0) / on the plus side (1)
Tandem control is, not used (0) / used (1)</td><td>

PRM
1240=0

PRM
1802#2=1</td></tr>
<tr><td>1818</td><td>Linear scale I/F with absolute address referenced mark (A/B phase)
Linear scale with distance-coded reference marks (serial)</td><td><Axis></td></tr>
<tr><td>#0 RFS

#1 RF2

#2 DG0

#3 SDC

#5 APD</td><td>If G28 is specified for an axis for which a reference position is not established when a linear scale with absolute address reference marks or a linear scale with an absolute address zero point is used, a movement is made to the reference position after reference position establishment operation (0) / no movement is made to the reference position but the operation is completed (1)
If G28 is specified for an axis for which a reference position is already established when a linear scale with absolute address reference marks or a linear scale with an absolute address zero point is used, a movement is made to the reference position (0) / no movement is made to the reference position but the operation is completed (1)
When a linear scale function with absolute address reference marks is used, reference position establishment operation based on the G00 command and jog feed is, disabled (0) / enabled (1)
A linear scale with an absolute address zero point is, not used (0) / used (1)
In the axis with absolute position detector, setting the zero point of an absolute position detector when the axis is released from state of control axis detach is needed (0) / not needed(1)</td><td>

PRM1815#1</td></tr>
</table>

7

1819	Follow-up, Feed forward	<Axis>
#0 FUP #1 CRF #2 DAT	When the servo system is turned off, follow-up operation is, performed based on *FLWU (0) / not performed (1) When a servo alarm from SV0445 to SV447 or, servo alarm SV0421 is issued, the reference position established state is not affected (0) / the reference position unestablished state is assumed (1) When a linear scale with an absolute address zero point or a linear scale with absolute address reference marks is used, the automatic setting of parameter No. 1883 and No. 1884 at manual reference position return time is, not performed (0) / performed (1)	 PRM1815#4 PRM1815, 1821, 1882
1820	Command multiplier for each axis (CMR) $CMR = \frac{\text{Least command increment}}{\text{Detection unit}}$ CMR < 1 Setting = (1/CMR) + 100 CMR $\geq$ 1 Setting = 2 $\times$ CMR	<Axis>
1821	Reference counter size for each axis	<Axis>
1825	Servo loop gain for each axis [0.01sec^{-1}]	<Axis> Usually,3000
1826	In-position width for each axis [Detection unit]	<Axis>
1827	In-position width in cutting feed for each axis [Detection unit]	<Axis> PRM1801#4 =1
1828	Positioning deviation limit for each axis in movement [Detection unit] $\text{Setting} = \frac{\text{Rapid traverse}}{60 \times \text{Servo loop gain}} \times \frac{1}{\text{Detection unit}} \times 1.2$	<Axis> PRM 1420,1825
1829	Positioning deviation limit for each axis in the stopped state [Detection unit]	<Axis>
1830	Positional deviation limit at servo-off time for each axis [Detection unit]	<Axis> PRM1829
1836	Servo error amount where reference position return is possible [Detection unit]	<Axis> Usually set 0.
1838	See Dual Check Safety Connection Manual.	
1839	See Dual Check Safety Connection Manual.	
1840	See Dual Check Safety Connection Manual.	
1841	See Dual Check Safety Connection Manual.	
1842	See Dual Check Safety Connection Manual.	
1844	Distance to the 1st grid point when the reference position shift amount in the reference position shift function is 0 or when a reference position return is made by grid shift [Detection unit]	<Axis> PRM1850
1846	Distance for starting the 2nd stage of smooth backlash compensation [Detection unit]	<Axis>
1847	Distance for ending the 2nd stage of smooth backlash compensation [Detection unit]	<Axis>
1848	Value of the 1st stage of smooth backlash compensation [Detection unit]	<Axis>
1850	Grid shift and reference position shift for each axis [Detection unit]	<Axis> PRM1008#4
1851	Backlash compensating value for each axis [Detection unit]	<Axis>

1852	Backlash compensating value used for rapid traverse for each axis [Detection unit]	<Axis> PRM1800#4

	Cutting feed to cutting feed	Rapid traverse to rapid traverse	Rapid traverse to cutting feed	Cutting feed to rapid traverse
Same direction	0	0	$\pm\alpha$	$\pm(-\alpha)$
Opposite direction	$\pm$A	$\pm$B	$\pm(B+\alpha)$	$\pm(B+\alpha)$

	A: Backlash amount in cutting feed B: Backlash amount in rapid traverse α=(A-B)/2 (However, if α is not an integer, it is α= (A-(B-1)) / 2.) * The positive or negative direction for compensating values is the direction of movement.	
1860	Value 1 for the zero point of the absolute position detector	<Axis>
1861	Value 2 for the zero point of the absolute position detector	<Axis>
1862	Value 3 for the zero point of the absolute position detector	<Axis>
1868	Threshold position for converting scale data (each axis)	<Axis>
1869	The amount of one rotation of rotary axis B type (each axis)	<Axis>
1874	Numerator of the conversion coefficient for inductosyn position detection, or numerator of the flexible feed gear for the built-in operation detector in temporary absolute coordinate setting	<Axis>
1875	Denominator of the conversion coefficient for inductosyn position detection, or denominator of the flexible feed gear for the built-in position detector in temporary absolute coordinate setting	<Axis>
1876	One-pitch interval of the inductosyn	<Axis>
1880	Unexpected disturbance torque detection alarm timer [ms]	
1881	Group number when an unexpected disturbance torque is detected	<Axis> PRM 1804#5=1
1882	Interval of mark 2 of a linear scale with reference marks [Detection unit]	<Axis>
1883	Distance 1 from the scale zero point to reference position [Detection unit]	<Axis>
1884	Distance 2 from the scale zero point to reference position [Detection unit]	<Axis>
1885	Maximum allowable value for total travel during torque control [Detection unit]	<Axis> PRM1803#4
1886	Positional deviation when torque control is canceled [Detection unit]	<Axis> PRM1803#4
1895	Servo motor axis number used for a milling tool	
1898	Number of gear teeth on the servo motor axis side	<Axis> PRM1895≠0
1899	Number of gear teeth on the milling axis side	<Axis> PRM1895≠0
1902	FSSB, High-speed HRV, Dual check safety	
#0 FMD #1 ASE #6 DCE	The FSSB setting mode is, automatic setting mode (0) / manual setting 2 mode (1) When automatic setting mode is selected for FSSB setting, automatic setting is, not completed (0) / completed (1) See Dual Check Safety Connection Manual.	 PRM1902#0
1904	Dual check safety	<Axis>
#6 DCN	See Dual Check Safety Connection Manual.	
1945	See Dual Check Safety Connection Manual.	
1946	See Dual Check Safety Connection Manual.	
1948	See Dual Check Safety Connection Manual.	

<table>
<tr><td>1950</td><td>See Dual Check Safety Connection Manual.</td><td>*BRK</td></tr>
<tr><td>2000</td><td>Initial setting, Feedback pulse multiplied by 10</td><td><Axis></td></tr>
<tr><td>#0 PLC0

#1 DGPR

#4 PGEX</td><td>The values of parameter No. 2023 and No. 2024 are, directly used (0) / multiplied by 10 internally (1)
When the power is turned on, the standard digital servo parameter value is, set (0) / not set (1)
The position gain setting unit is, not multiplied by 8 (0) / multiplied by 8 (1)</td><td></td></tr>
<tr><td>2001</td><td>Arbitrary AMR</td><td><Axis></td></tr>
<tr><td>#0 AMR0
#1 AMR1
#2 AMR2
#3 AMR3
#4 AMR4
#5 AMR5
#6 AMR6</td><td><table><tr><th>AMR 6</th><th>AMR 5</th><th>AMR 4</th><th>AMR 3</th><th>AMR 2</th><th>AMR 1</th><th>AMR 0</th><th>Motor</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>$\alpha i/\beta i$ motor</td></tr></table></td><td>PRM
2112
2138</td></tr>
<tr><td>2002</td><td>Separate detector</td><td><Axis></td></tr>
<tr><td>#3 PFSE</td><td>A separate position detector is, not used (0) / used (1)</td><td>Automatically set by parameter (No. 1815#1)</td></tr>
<tr><td>2003</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#1 TGAL

#2 OBEN

#3 PIEN

#4 NPSP

#5 BLEN

#6 OVSC</td><td>The detection level for the position detection disconnection alarm is, set to the standard value (0) / set by another parameter (1)
The velocity control observer is, not used (0) / used (1)
Velocity control is based on, I-P control (0) / PI control (1)
The N pulse suppression function is, not used (0) / used (1)
The backlash acceleration function is, not used (0) / used (1)
Overshoot compensation is, not used (0) / used (1)</td><td>PRM2064

PRM2047, 2050, 2051

PRM2048

PRM2045</td></tr>
<tr><td>2004</td><td>Control method setting</td><td><Axis></td></tr>
<tr><td>#0 TIA0
#1 TIB0
#2 TRW0
#3 TRW1</td><td><table><tr><th>TRW1</th><th>TRW0</th><th>TIB0</th><th>TIA0</th><th>Control method</th></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>HRV2,3,4 control</td></tr></table></td><td>PRM
N2013#0
N2014#0</td></tr>
<tr><td>2005</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#1 FEED

#6 BRKC

#7 SFCM</td><td>The feed-forward function is, not used (0) / used (1)

The gravity shaft break control function is, not used (0) / used (1)
The static friction compensation function is, not used (0) / used (1)</td><td>PRM
2068, 2069, 2092, 2144
PRM2083

PRM
2071, 2072, 2073, 2347</td></tr>
<tr><td>2006</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#0 FCBL</td><td>In a closed loop, backlash compensation is, reflected in the position (0) / not reflected in the position (1)</td><td>PRM1851</td></tr>
<tr><td>2007</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#0 ESP2

#1 IGNV

#7 FRCA</td><td>The servo alarm two-axis simultaneous monitor function is, not used (0) / used (1)
When two seconds has elapsed after the servo alarm two-axis simultaneous monitor function holds the alarm state, the alarm state is, not reset (0) / reset (1)
Torque control is, not exercised (0) / exercised (1)</td><td>

PRM2203#4</td></tr>
<tr><td>2008</td><td>Tandem control</td><td><Axis></td></tr>
<tr><td>#1 TNDM</td><td>Tandem control is, disabled (0) / enabled (1)</td><td>Automatically set by PRM 1817#6</td></tr>
</table>

#2 VFBA	The feedrate feedback average function is, disabled (0) / enabled (1)	Main axis only
#7 LAXD	Damping compensation is, valid for the sub-axis only (0) / valid for both the main axis and sub-axis (1)	Main axis only
2009	Backlash acceleration, dummy functions	<Axis>
#0 SERD	The serial Pulsecoder dummy function is, not used (0) / used (1)	PRM2165
#6 BLCU	Backlash acceleration is valid, for rapid traverse and cutting (0) / for cutting only (1)	
#7 BLST	The backlash acceleration stop function is, not used (0) / used (1)	PRM2082
2010	Backlash acceleration, Punch/laser switching	<Axis>
#2 LINE	Linear motor control is, not exercised (0) / exercised (1)	
#3 BLTE	The backlash acceleration rate is, not multiplied by 10 (0) / multiplied by 10 (1)	PRM2048
#4 HBPE	A pitch error compensation is added to the error counter, on the closed loop side (0) / on the semi-closed loop side (1)	
#5 HBBL	A backlash compensation amount is added to the error counter, on the semi-closed loop side (0) / on the closed-loop side (1)	
#7 POLE	The punch/laser switch function is, not used (0) / used (1)	
2011	EGB functions, Torque limit variable function	<Axis>
#0 SYN	The EGB function is, not used (0) / used (1)	
#1 FFAL	Regardless of the mode, feed-forward control is, disabled at all times (0) / enabled at all times (1)	
#5 RCCA	The torque limit variable function based on the actual current is, not used (0) / used (1)	No change is required.
2012	Digital servo functions	<Axis>
#1 MSFE	The machine velocity feedback function is, not used (0) / used (1)	
#7 STNG	In velocity command mode, a software disconnection alarm is, detected (0) / ignored (1)	
2013	Digital servo functions	<Axis>
#0 HRV3	HRV3 current control is, not used (0) / used (1)	PRM 2334,2335
#7 APTG	α Pulsecoder software disconnection monitoring is, performed (0) / not performed (1)	
2015	High-speed positioning functions	<Axis>
#0 PGTW	The position gain switching function is, not used (0) / used (1)	PRM2028
#1 SSG1	The integration function for low speed is, not used (0) / used (1)	PRM 2029,2030
#6 BLAT	The two-stage backlash acceleration function is, not used (0) / used (1)	
#7 BZNG	When a separate position detector is used, the battery alarm for the built-in Pulsecoder is, ignored (0) / not ignored (1)	
2016	Digital servo functions	<Axis>
#0 ABNT	The unexpected disturbance torque detection function is, not used (0) / used (1)	PRM 2104, 2087
#3 PK2VDN	The function for changing the proportional gain in the stop state is, not used (0) / used (1)	PRM2119
#4 SPS	Servo motor spindle synchronous control is, disabled (0) / enabled (1)	
2017	Digital servo functions	<Axis>
#0 DBST	The stop distance reduction function is, not used (0) / used (1)	PRM 2005#6,2083
#4 HTNG	In velocity command mode, the hardware disconnection alarm of a separate detector is, detected (0) / ignored (1)	

<table>
<tr><td>#7 PK2V25</td><td>High-speed velocity loop proportional processing is, not used (0) / used (1)</td><td></td></tr>
<tr><td>2018</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#0 RVRSE
#1 MOVOBS
#2 OVR8

#7 PFBCPY</td><td>The signal direction of the separate detector is, not reversed (0) / reversed (1)
The observer stop time disable function is, not used (0) / used (1)
The two-stage backlash acceleration override format is, based on the 4096 standard (0) / based on the 256 standard (1)
The motor feedback signal for the main axis is, not shared by the sub-axis (0) / shared by the sub-axis (1)</td><td>

Sub-axis only</td></tr>
<tr><td>2019</td><td>Digital servo functions (option required)</td><td><Axis></td></tr>
<tr><td>#1 TANDMP
#7 DPFB</td><td>The tandem disturbance elimination control function is, not used (0) / used (1)
The dual feedback function is, not used (0) / used (1)</td><td></td></tr>
<tr><td>2020</td><td>Motor ID number</td><td><Axis></td></tr>
<tr><td>2021</td><td>Load inertia ratio</td><td><Axis></td></tr>
<tr><td>2022</td><td>Motor rotation direction
111: CW when viewed from the Pulsecoder
-111: CCW when viewed from the Pulsecoder</td><td><Axis></td></tr>
<tr><td>2023</td><td>Number of velocity pulses<table><tr><td></td><td>2000#0=0</td><td>2000#0=1</td></tr><tr><td>αi,βi Pulsecoder</td><td>8192</td><td>819</td></tr></table></td><td><Axis></td></tr>
<tr><td>2024</td><td>Number of position pulses
1 Position detection by a Pulsecoder built into the motor<table><tr><td></td><td>2000#0=0</td><td>2000#0=1</td></tr><tr><td>αi,βi Pulsecoder</td><td>12500</td><td>1250</td></tr></table>2 When a separate Pulsecoder is used, set the number of position feedback pulses per motor revolution. When parameter (No. 2000#0) is set to 1, set a value produced by division by 10.</td><td><Axis>
PRM2185</td></tr>
<tr><td>2028</td><td>Position gain switching speed</td><td><Axis>
PRM2015#0</td></tr>
<tr><td>2029</td><td>Effective speed for integral acceleration at low speed</td><td rowspan="2"><Axis>
PRM2015#1</td></tr>
<tr><td>2030</td><td>Effective speed for integral deceleration at low speed</td></tr>
<tr><td>2034</td><td>Vibration damping control gain</td><td><Axis></td></tr>
<tr><td>2036</td><td>Tandem control/damping compensation gain (main axis)
Tandem control/damping compensation phase coefficient (sub-axis)</td><td><Axis>
PRM2008#7</td></tr>
<tr><td>2038</td><td>Spindle feedback magnification (R)</td><td><Axis>
PRM2016#4</td></tr>
<tr><td>2039</td><td>2nd-stage acceleration for two-stage backlash acceleration</td><td><Axis>
PRM2015#6</td></tr>
<tr><td>2040</td><td>Current loop integral gain</td><td rowspan="3"><Axis>,
No change is required.</td></tr>
<tr><td>2041</td><td>Current loop proportional gain</td></tr>
<tr><td>2042</td><td>Current loop gain</td></tr>
<tr><td>2043</td><td>Velocity loop integral gain</td><td><Axis></td></tr>
<tr><td>2044</td><td>Velocity loop proportional gain</td><td><Axis></td></tr>
<tr><td>2045</td><td>Velocity loop incomplete integral gain</td><td><Axis></td></tr>
<tr><td>2046</td><td>Velocity loop gain</td><td><Axis>,
No change is required.</td></tr>
<tr><td>2047</td><td>Observer parameter</td><td><Axis></td></tr>
<tr><td>2048</td><td>Backlash acceleration</td><td><Axis></td></tr>
<tr><td>2049</td><td>Maximum dual position feedback amplitude</td><td><Axis></td></tr>
<tr><td>2050</td><td>Observer gain</td><td><Axis></td></tr>
</table>

2051	Observer gain	<Axis>
2053	Current dead zone compensation	<Axis>, No change is required.
2054	Current dead zone compensation	
2055	Current dead zone compensation	
2056	Variable current loop gain during deceleration	
2057	Phase D current at high-speed	
2058	Phase D current limit at high-speed	
2060	Torque limit	
2062	Overload protection coefficient	
2063	Overload protection coefficient	
2064	Soft disconnection alarm level	<Axis>
2065	Overload protection coefficient	<Axis>, No change is required.
2066	Acceleration feedback gain	<Axis>
2067	Torque command filter	<Axis>
2068	Feed forward coefficient [0.01%]	<Axis>
2069	Velocity feed forward coefficient [%]	<Axis>
2070	Backlash acceleration timing	<Axis>
2071	Time during which backlash acceleration is effective, Static friction compensation count	<Axis>
2072	Static friction compensation	<Axis>
2073	Static friction compensation: Stop judgment parameter	<Axis>
2074	Current loop gain variable with velocity	<Axis>, No change is required.
2077	Overshoot compensation counter	<Axis> PRM2003#6
2078	Conversion coefficient for dual position feedback (numerator)	<Axis>
2079	Conversion coefficient for dual position feedback (denominator)	<Axis>
2080	1st-order lag time constant for dual position feedback	<Axis>
2081	Zero width for dual position feedback	<Axis>
2082	Backlash acceleration stop amount	<Axis>
2083	Brake control timer [ms]	<Axis> PRM2005#6
2084	Flexible feed gear (numerator) (N)	<Axis>
2085	Flexible feed gear (denominator) (M)	<Axis>
2086	Rated current parameter	<Axis>, No change is required.
2087	Torque offset Tandem control/Preload value	<Axis>
2088	Machine speed feedback gain	<Axis> PRM2012#1
2089	2-stage backlash acceleration function : stage-2 end magnification	<Axis>
2091	Nonlinear control parameter	<Axis>
2092	Advanced preview feed forward coefficient[0.01%]	<Axis>
2094	Backlash acceleration amount in the negative direction	<Axis>
2095	Feed-forward timing adjustment coefficient	<Axis>
2097	Static friction compensation stop parameter	<Axis>
2099	N-pulse suppression level	<Axis> PRM2003#4
2101	Overshoot compensation effective level	<Axis>
2102	Final clamp value for actual current limit	<Axis>, No change is required.
2103	Amount of track back upon detection of unexpected disturbance torque	<Axis>

2104	Unexpected disturbance torque detection alarm level	<Axis>
2105	Torque constant for Torque control	<Axis>, No change is required.
2107	Override for velocity loop gain cutting	<Axis>
2110	Magnetic saturation compensation (base/coefficient)	<Axis>, No change is required.
2111	Deceleration torque limit (base/coefficient)	
2112	AMR conversion coefficient 1	<Axis>
2113	Resonance elimination filter 1: center frequency [Hz]	<Axis> PRM 2177, 2359
2114	Backlash acceleration function : acceleration amount override	<Axis>
2116	Unexpected disturbance torque detection: dynamic friction compensation value	<Axis>
2118	Excessive error level between semi-closed and closed loops	<Axis> PRM 2078, 2079
2119	Stop level with variable proportional gain	<Axis>
2126	Tandem control, time constant for switching position feedback	<Axis>
2127	Non-interacting control coefficient	<Axis>, No change is required.
2128	Weak magnetic flux compensation (coefficient)	
2129	Weak magnetic flux compensation (base/limit)	
2130	Smoothing compensation performed twice per pole pair	<Axis>
2131	Smoothing compensation performed four times per pole pair	<Axis>
2132	Smoothing compensation performed six times per pole pair	<Axis>
2133	Deceleration phase delay compensation coefficient	<Axis>, No change is required.
2134	Deceleration phase delay compensation coefficient	
2137	Stage 1 acceleration amount override for two-stage backlash acceleration	<Axis>
2138	AMR conversion coefficient 2	<Axis>
2139	AMR offset	<Axis>
2142	Unexpected disturbance torque detection alarm level in rapid traverse	<Axis>
2144	Position feed forward coefficient for cutting [0.01%]	<Axis>
2145	Velocity feed forward coefficient for cutting [%]	<Axis>
2146	End timer for two-stage backlash acceleration	<Axis>
2156	Torque command filter (at rapid traverse)	<Axis>
2161	OVC magnification at a stop	<Axis>, No change is required.
2162	2nd overload protection coefficient	
2163	2nd overload protection coefficient	
2164	2nd overload protection coefficient	
2165	Maximum amplifier current	
2167	Stage 2 acceleration amount offset for two-stage backlash acceleration	<Axis>
2177	Resonance elimination filter 1: attenuation bandwidth [Hz]	<Axis> PRM 2113, 2359
2179	Reference counter size (denominator)	<Axis> PRM1821
2185	Position pulses conversion coefficient	<Axis> PRM2024

2200	Digital servo functions	<Axis>
#0 OVSP	The feedback mismatch alarm is, detected (0) / not detected (1)	PRM2201#1
#2 IQOB	The effect of voltage saturation on unexpected disturbance torque detection is, not eliminated (0) / eliminated (1)	PRM2016#0
#3 ABGO	When an unexpected disturbance torque is detected, setting of a threshold separately for each of cutting and rapid traverse is, not performed (0) / performed (1)	
#6 P2EX	An action for internal velocity loop proportional gain overflow is, not taken (0) / taken (1)	PRM2044
2201	Digital servo functions	<Axis>
#0 CROF	The function for obtaining current offsets upon an emergency stop is, not used (0) / used (1)	
#1 RNLV	Feedback mismatch alarm detection is started with, 600min^{-1} or more (0) / 1000min^{-1} or more (1)	PRM2200#0
#6 CPEE	The actual current display peak hold function is, not used (0) / used (1)	
2202	Digital servo functions	<Axis>
#1 VGCCR	The velocity loop gain switch function for each of cutting and rapid traverse is, not used (0) / used (1)	PRM 2107,2335
#2 PIAL	When the velocity loop gain switch function for each of cutting and rapid traverse is used, the current 1/2PI function in rapid traverse is, disabled automatically (0) / enabled at all times (1)	PRM2203#2
#3 OVS1	Overshoot compensation is valid only once after the termination of a move command (1)	PRM2003#6
#4 DUAL0W	Dual position feedback zero width is determined, only by setting = 0 (0) / by a set value (1)	PRM2081
2203	Digital servo functions	<Axis>
#2 CRPI	The current loop 1/2PI function is, used (0) / not used (1)	PRM2202#2
#4 FRC2AX2	Torque control type 2 is, not exercised (0) / exercised (1)	PRM2007#7
2204	Digital servo functions	<Axis>
#1 HSTP10	The valid increment system for speed used with the high-speed positioning function is: 0: 0.01 min^{-1}(rotary motor), 0.01 mm/min (linear motor) 1: 0.1 min^{-1} (rotary motor), 0.1 mm/min (linear motor)	PRM 2028,2029, 2030
#5 PGTWN2	Position gain switch type 2 is, not used (0) / used (1)	PRM2028
#7 DBS2	At emergency stop time, the quick stop function is, not used (0) / used (1)	
2205	Digital servo functions	<Axis>
#2 FULDMY	The separate detector dummy function is, not used (0) / used (1)	
#3 HD2O	The axis to which the stop distance reduction function is applied at separate detector hardware disconnection time is, not a synchronization control axis (0) / a synchronization control axis (1)	
#4 HDIS	At separate detector hardware disconnection time, the stop distance reduction function is, not used (0) / used (1)	
2206	Digital servo functions	<Axis>
#4 HBSF	A backlash compensation amount and pitch error compensation are, selected with parameter (No. 2010) (0) / added simultaneously on both of the closed loop side and semi-closed loop side (1)	PRM 2010#5,#4
2207	Digital servo functions	<Axis>
#3 PK2D50	When the variable proportional gain function is used at stop time, the stop-time magnification is, 75% (0) / 50% (1)	PRM2016#3

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<table>
<tr><td>2210</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#2 PK12S2
#5 ESPTM0
#6 ESPTM1</td><td>The current gain internally 4 times function is, not used (0) / used (1)
Emergency stop delay timer setting
<table><tr><th>ESPTM1</th><th>ESPTM0</th><th>Delay time</th></tr><tr><td>0</td><td>0</td><td>50 ms</td></tr><tr><td>0</td><td>1</td><td>100 ms</td></tr><tr><td>1</td><td>0</td><td>200 ms</td></tr><tr><td>1</td><td>1</td><td>400 ms</td></tr></table></td><td>No change is required.
PRM 2005#6,2083</td></tr>
<tr><td>2211</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#1 PHCP</td><td>At deceleration time, the phase lag compensation function is, not used (0) / used (1)</td><td>No change is required.</td></tr>
<tr><td>2212</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#7 QVCK</td><td>When the OVC or OVL alarm is issued, the quick stop function is, not used (0) / used (1)</td><td></td></tr>
<tr><td>2213</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#7 MGPOS</td><td>The pole position detection function is, not used (0) / used (1)</td><td></td></tr>
<tr><td>2214</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#4 FFCHG
#7 QVCK</td><td>The feed-forward function for each of cutting and rapid traverse is, not used (0) / used (1)
When the OVC or OVL alarm is issued, the quick stop function is, not used (0) / used (1)</td><td></td></tr>
<tr><td>2215</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#1 TCPCLR
#7 ABT2</td><td>At emergency stop time, the torque offset cancel function is, disabled (0) / enabled (1)
Unexpected disturbance torque detection Type-2 for each of cutting and rapid traverse is, not used (0) / used (1)</td><td></td></tr>
<tr><td>2220</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#0 DECAMR</td><td>For a synchronous built-in servo motor, the αiCZ 768S sensor is, not used (0) / used (1)</td><td>PRM 2112,2138</td></tr>
<tr><td>2223</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#0 DISOBS
#7 BLCUT2</td><td>The disturbance elimination filter function is, not used (0) / used (1)
The backlash acceleration function is enabled, for both of cutting and rapid traverse (0) / for cutting feed only (1)</td><td></td></tr>
<tr><td>2229</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#0 ABSEN</td><td>The pole position detection function is based on, incremental detector (0) / absolute detector (1)</td><td></td></tr>
<tr><td>2270</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#0 AMR60
#3 ACREF
#5 DSTWAV
#6 DSTTAN
#7 DSTIN</td><td>The AMR offset setting range is, -45 to 45 deg (0) / -60 to 60 deg (1)
The adaptive disturbance elimination filter function is, not used (0) / used (1)
The input disturbance waveform is, SIN wave (0) / square wave (1)
Disturbance is input, for one axis at a time (0) / for two axes simultaneously (1)
The disturbance input function is, not used (0) / used (1)</td><td>PRM2139</td></tr>
<tr><td>2271</td><td>Digital servo functions</td><td><Axis></td></tr>
<tr><td>#2 RETR2</td><td>When an unexpected disturbance torque is detected, the simultaneous two-axis retraction function is, not used (0) / used (1)</td><td>PRM2016#0</td></tr>
</table>

2273	Digital servo functions	<Axis>
#1 WSVCPY #4 POA1NG #5 EGBEX #6 EGBFFG #7 DBTLIM	The position tandem integrator copy function is, not used (0) / used (1) For calculation of an observer coefficient (POA1), a load inertia ratio is, considered (0) / not considered (1) The automatic phase matching function of EGB is based on, the ordinary method (0) / the extended method (1) For the EGB ratio, FFG is, not considered (0) / considered (1) During brake control, the torque limit setting function is, not used (0) / used (1)	 PRM2047 PRM2375
2274	Digital servo functions	<Axis>
#0 HP2048	A 2048-fold internal circuit (position detection circuit H or C) is, not used (0) / used (1)	
2275	Digital servo functions	<Axis>
#0 800PLS #1 RCNCLR	When RCN723 or RCN223 is used, the setting of a reference counter is based on, 1/8 revolution (0) / 1 revolution (1) At APC time, speed data is, not cleared (0) / cleared (1) (Used with RCN723, RCN223, and so forth)	 PRM2394
2282	Digital servo functions	<Axis>
#3 ISE64	The feed-forward speed limitation is, applied as conventionally done (0) / extended by a factor of 64 (1)	
2283	Digital servo functions	<Axis>
#0 NOG5	To start the high-speed current control mode under servo HRV3 control, G5.4Q1 is, needed (0) / not needed (1)	PRM2013#0
2290	Digital servo functions	<Axis>
#0 ACCOUT	The acceleration feedback of acceleration sensor is, not displayed (0) / displayed (1), on the diagnostic screen	DGN data No.354
2294	Digital servo functions	<Axis>
#0 ITDOUT	The amplitude and offset status of αiCZ sensor is, not displayed (0) / displayed (1), on the diagnostic screen	DGN data No.353, 354
2300	Digital servo functions	<Axis>
#0 HRVEN #2 DD #7 CKLNOH	The HRV extension function is, not used (0) / used (1) A DD motor is, not used (0) / used (1) Overheat detection via the PMC is, not used (0) / used (1)	
2318	Disturbance elimination filter: gain	<Axis> PRM2223#0
2319	Disturbance elimination filter: inertia ratio	<Axis>
2320	Disturbance elimination filter: inverse function gain	<Axis>
2321	Disturbance elimination filter: time constant	<Axis>
2322	Disturbance elimination filter: acceleration feedback limit	<Axis>
2323	Variable current PI rate	<Axis> PRM2203#2
2324	Variable proportional gain function in the stop state : arbitrary magnification at a stop	<Axis> PRM2016#3
2325	Tandem disturbance elimination control function: integral gain (main axis) Tandem disturbance elimination control function: phase coefficient (sub-axis)	<Axis> PRM2019#1
2326	Disturbance input : gain	<Axis> PRM2270#7
2327	Disturbance input: start frequency [Hz]	<Axis>
2328	Disturbance input: end frequency [Hz]	<Axis>
2329	Number of disturbance input measurement points	<Axis>

2333	Tandem disturbance elimination control function: incomplete integral time constant (main axis)	<Axis>
2334	Current loop gain magnification (enabled only during high-speed HRV current control)	<Axis> PRM 2013, 2014
2335	Velocity loop gain magnification (enabled only during high-speed HRV current control)	
2338	Backlash acceleration function: acceleration amount limit value 2-stage backlash acceleration function: stage-2 acceleration amount limit value	<Axis>
2339	2-stage backlash acceleration function: stage-2 acceleration amount (negative direction)	<Axis>
2340	Backlash acceleration function: acceleration amount override (negative direction) Backlash acceleration function: Acceleration amount override (negative direction)	<Axis>
2341	2-stage backlash acceleration function: stage-2 acceleration amount limit value (negative direction) 2-stage backlash acceleration function: stage-2 acceleration amount limit value (negative direction)	<Axis>
2345	Disturbance estimation function: dynamic friction compensation value in the stop state	<Axis>
2346	Disturbance estimation function: dynamic friction compensation limit value	<Axis>
2347	Static friction compensation amount (- direction)	<Axis>
2352	Adaptive resonance elimination filter: detection level	<Axis> PRM2270#3
2359	Resonance elimination filter 1: damping [%]	<Axis> PRM 2113, 2177
2360	Resonance elimination filter 2: attenuation center frequency [Hz]	<Axis>
2361	Resonance elimination filter 2: attenuation bandwidth [Hz]	<Axis>
2362	Resonance elimination filter 2: damping [%]	<Axis>
2363	Resonance elimination filter 3: attenuation center frequency [Hz]	<Axis>
2364	Resonance elimination filter 3: attenuation bandwidth [Hz]	<Axis>
2365	Resonance elimination filter 3: damping [%]	<Axis>
2366	Resonance elimination filter 4: attenuation center frequency [Hz]	<Axis>
2367	Resonance elimination filter 4: attenuation bandwidth [Hz]	<Axis>
2368	Resonance elimination filter 4: damping [%]	<Axis>
2369	Smoothing compensation performed twice per pole pair (negative direction)	<Axis>
2370	Smoothing compensation performed four times per pole pair (negative direction)	<Axis>
2371	Smoothing compensation performed six times per pole pair (negative direction)	<Axis>
2373	Lifting function against gravity at emergency stop : distance to lift	<Axis> PRM2204#7
2374	Lifting function against gravity at emergency stop: Lifting time	<Axis>
2375	Torque limit magnification during brake control	<Axis> PRM2273#7
2394	Number of data mask digits	<Axis> PRM2275#1

2429	Digital servo functions	<Axis>
#1 FHRSV	Servo axis control of FSSB high-speed rigid tapping is disabled (0) / enabled (1).	PRM 24203#0 24204 2005#1 4549#1
#2 FSBSYN	Servo control by EGB (FSSB type) is disabled (0) / enabled (1)	PRM 24203#0 24204 4549#2
2455	Number of pulses per revolution, integer part (α)	<Axis>
2456	Number of pulses per revolution, exponent part (β)	<Axis>
2557	Designation of PS control axis	<Axis>
2572	Parameter of power supply	
#2 PFLPFB	Power failure detection same as PFB-R/PFB-C not active(0) / active(1)	
#3 EXTTH	Thermostat of external devices, not connected (0) / connected (1)	
#5 ESPREC	Power failure detection at ESP, not detect (0) / detect (1)	
2610	Position control loop gain for the tapping axis in FSSB high-speed rigid tapping	<Axis>
2684	Power failure detection level 1／Power failure detection time 1	
2685	Power failure detection level 2／Power failure detection time 2	

7.2.14 DI/DO 1

3001	ST signal, High-speed MST interface, RRW signal	
#1 SON	Automatic operation is started, on the falling edge ("1"→"0") of the automatic operation start signal ST (0) / on the rising edge ("0"→"1") of the automatic operation start signal ST (1)	
#2 RWM	When the start of a program is being found in the program memory, the rewind signal is, not output (0) / output (1)	
#6 PGS	In the high speed program check mode, M, S, T, and B codes are, not output (0) / output (1)	
#7 MHI	Exchange of strobe and completion signals for the M, S, T, and B codes is, normal (0) / high-speed (1)	
3002	Override polarity	
#0 CHM	For high-speed M/S/T/B, the distribution end signal DEN and an auxiliary function code signal M00 to M31 are, not turned off even upon completion of the execution of the auxiliary function (0) / turned off upon completion of the execution of the auxiliary function (1)	
#2 MFD	When the high-speed M, S, T, or B interface is used, and the block specifying the M code, S code, T code, or B code includes neither a move command nor a dwell command, the distribution completion signal (DEN) and the strobe signal (MF, SF, TF, or BF) of each function are, output with the distribution completion signal lagging (0) / output at the same time (1)	
#4 IOV	Override-related signal logic is used in such a way that, negative logic signals are used based on negative logic, and positive logic signals are used based on positive logic (0) / logic is reversed (1)	
#6 POV	The dwell/auxiliary function time override function is, disabled (0) / enabled (1)	
#7 OVM	When the dwell/auxiliary function time override function is used, override on M02 and M30 is, disabled (0) / enabled (1)	

3003	Interlock signals	
#0 ITL	The interlock signals for all axes are, valid (0) / invalid (1)	*IT
#2 ITX	The interlock signal for each axis is, valid (0) / invalid (1)	*IT1 - *IT8
#3 DIT	The interlock signal for each axis direction is, valid (0) / invalid (1)	
#4 DAU	When parameter (No. 3003#3) is set to 0, the interlock signal for each axis direction is, valid only in manual operation (0) / valid in either manual operation or automatic operation (1)	T series
#5 DEC	The deceleration signals for reference position return specify deceleration, when the signals are 0 (0) / when the signal are 1 (1)	*DEC1 - *DEC8
3004	Overtravel	
#0 BSL	The block start interlock signal and cutting block start interlock signal are, invalid (0) / valid (1)	*BSL *CSL
#1 BCY	When more than one operation is performed as in a canned cycle, the block start interlock signal is, checked only at the beginning of the 1st cycle (0) / checked at the beginning of every cycle (1)	
#5 OTH	The overtravel signal is, checked (0) / not checked (1)	
3006	Reference position return deceleration signal	
#0 GDC	As the reference position return deceleration signal, X0009 is used (0) / G0196 is used (1)	
#1 EPN	In external workpiece number search, signals for workpiece number specification are, external workpiece number search signals PN1…PN16 (0) / extended external workpiece number search signals EPN0… EPN13 (1)	
#2 EPS	As the signal for starting external workpiece number search, the automatic operation start signal is used (0) / the external workpiece number search start signal is used (1)	
#6 WPS	Each axis workpiece coordinate system preset signal, disabled (0) / enabled (1)	
3008	PMC signals	
#2 XSG	A signal assigned to an X address is, fixed at the address (0) / able to be reassigned to an arbitrary address (1)	PRM 3012,3013 3014,3019
3010	Time lag in strobe signals MF, SF, TF, and BF [ms]	
3011	Acceptable width of M, S, T, and B function completion signal (FIN) [ms]	
3012	Skip signal assignment address	PRM 3008#2＝1
3013	X address to which the deceleration signal for reference position return is assigned	<Axis> PRM 3008#2=1
3014	Bit position of an X address to which the deceleration signal for reference position return is assigned	<Axis> PRM 3008#2=1
3017	Output time of reset signal RST [16ms]	
3018	Percentage (%) when the 1% rapid traverse override signal for auxiliary function execution is 0% [%]	
3019	Address to which the PMC axis control skip signal, the measurement position arrival signal, and the tool offset write signal are assigned	
3020	Correspondence between workpiece numbers and program numbers in external workpiece number search (PN)	
3021	Address to which an axis signal is assigned	<Axis>
3022	Address to which a spindle signal is assigned	
3030	Allowable number of digits for the M code	
3031	Allowable number of digits for the S code	

3032	Allowable number of digits for the T code	
3033	Allowable number of digits for the B code (2nd auxiliary function)	PRM 3450#0
3037	Address to which the individual setting signal for peripheral axis control group 1 is assigned	
3038	Address to which the individual setting signal for peripheral axis control group 2 is assigned	
3039	Address to which the individual setting signal for peripheral axis control group 3 is assigned	
3040	Path number whose parameter and DI/DO apply to peripheral axis control group 1	
3041	Path number whose parameter and DI/DO apply to peripheral axis control group 2	
3042	Path number whose parameter and DI/DO apply to peripheral axis control group 3	

7.2.15 Display and Edit 1

3100	Key display	
#1 CEM	On the help and operation history screens, CE-marked MDI keys are displayed with, key names (0) / symbols (1)	
3101	Screen	
#1 KBF	When the screen or mode is changed, the contents of the key-in buffer are, cleared (0) / not cleared (1)	
3103	Screen display	
#2 NMH	System alarm history screen is, not displayed (0) / displayed (1)	
3104	Position display	
#0 MCN #3 PPD #4 DRL #5 DRC #6 DAL #7 DAC	The machine position is, not displayed according to the input system (0) / displayed according to the input system (1) When a coordinate system is set, the relative position display is, not preset (0) / preset (1) For relative position display, tool length compensation is, considered (0) / not considered (1) For relative position display, tool radius and tool nose radius compensation is, considered (0) / not considered (1) For absolute position display, tool length compensation is, considered (0) / not considered (1) For absolute position display, tool radius and tool nose radius compensation is, considered (0) / not considered (1)	PRM 0000#2 M series M series
3105	Data display	
#0 DPF #1 PCF #2 DPS	The actual speed is, not displayed (0) / displayed (1) The movements of the PMC controlled axes are, added to the actual speed display (0) / not added to the actual speed display (1) The spindle speed is, not displayed (0) / displayed (1)	PRM1010
3106	Operation history	
#0 DHD #4 OPH #5 SOV #6 DAK	On the program screen, only a selected path can be edited and displayed (0) / multiple paths can be edited and displayed at the same time (1) The operation history screen is, not displayed (0) / displayed (1) A spindle override value is, not displayed (0) / displayed (1) When absolute coordinates are displayed in the 3-dimensional coordinate system conversion mode, the tilted working plane Indexing mode, or the work setting error compensation mode, coordinates in the program coordinate system are displayed (0) / coordinates in the workpiece coordinate system are displayed (1)	PRM 3105#2

3107	Program display	
#3 GSC #4 SOR #7 MDL	The feedrate to be displayed, is a feedrate per minute (0) / follows the setting of parameter FSS (1) In program directory display, programs are listed, in the order of program registration (0) / in a sorted order (in the ascending order of program names by default) (1) Display of the modal state on the program edit screen in 8.4" display unit Not displayed (0) / Displayed (only in the MDI mode) (1)	PRM 3191#5
3108	T code display, Speed display	
#2 PCT #4 WCI #6 SLM #7 JSP	For modal T code display, a specified T value is displayed (0) / HD.T and NX.T are displayed (1) On the workpiece coordinate system screen, counter input is, disabled (0) / enabled (1) The spindle load meter is, not displayed (0) / displayed (1) On the current position display screen and program check screen, the jog feedrate of the 1st axis or dry run feedrate is, not displayed (0) / displayed (1)	PRM 13200#1 PRM 3105#2=1
3109	Display of tool compensation	
#1 DWT #2 IKY	When a tool wear/geometry compensation amount is displayed, the character G or W is, displayed to the left of each number (0) / not displayed (1) On the tool offset screen and workpiece shift screen (T series), soft key [INPUT] is, displayed (0) / not displayed (1)	Offset memory B
3110	Screen display	
#0 OFA	The axis names on the offset screen and fourth-axis/fifth-axis offset screen are, fixed to be "X", "Z", and "Y" ("E" and "5" on the fourth-axis/fifth-axis offset screen) (0) / parameter-set axis names (1)	T series
3111	Adjustment screen, Screen switching	
#0 SVS #1 SPS #2 SVP #5 OPM #6 OPS #7 NPA	The servo setting screen and servo tuning screen are, not displayed (0) / displayed (1) The spindle tuning screen is, not displayed (0) / displayed (1) As a spindle synchronization error displayed on the spindle tuning screen, an instantaneous value is displayed (0) / a peak-hold value is displayed (1) The operating monitor is, not displayed (0) / displayed (1) The speedometer on the operating monitor screen indicates, spindle motor speed (0) / spindle speed (1) When an operator message is entered in response to an issued alarm, the screen display is, switched to the alarm message screen (0) / not switched (1)	
3112	History	
#2 OMH #3 EAH	The external operator message history screen is, not displayed (0) / displayed (1) In the alarm/operation history, external alarm/macro alarm messages are, not recorded (0) / recorded (1)	 PRM 3196#7=0
3113	Soft key, Touch panel	
#0 HMC #5 DCL	The contents of the external operator message history, cannot be erased (0) / can be erased (1) The touch panel compensation screen is, disabled (0) / enabled (1)	PRM 11354#3=1 Usually, set 0.

#6 MS0 #7 MS1	The combination of the number of characters and the number of messages to be preserved in the external operator message history. <table><tr><th>MS0</th><th>MS1</th><th>Maximum number of characters</th><th>Number of messages</th></tr><tr><td>0</td><td>0</td><td>255</td><td>8</td></tr><tr><td>1</td><td>0</td><td>200</td><td>10</td></tr><tr><td>0</td><td>1</td><td>100</td><td>18</td></tr><tr><td>1</td><td>1</td><td>50</td><td>32</td></tr></table>	
3114	Changing the screens	
#0 IPO #1 IPR #2 IOF #3 ISY #4 IMS #5 IGR #6 ICU	When the [POS] function key is pressed while the position display screen is being displayed, the screen is, changed (0) / not changed (1) When the [PROG] function key is pressed while the program screen is being displayed, the screen is, changed (0) / not changed (1) When the [OFS/SET] function key is pressed while the offset/setting screen is being displayed, the screen is, changed (0) / not changed (1) When the [SYSTEM] function key is pressed while the system screen is being displayed, the screen is, changed (0) / not changed (1) When the [MESSAGE] function key is pressed while the message screen is being displayed, the screen is, changed (0) / not changed (1) When the [GRAPH] function key is pressed while the graphic screen is being displayed, the screen is changed (0) / not changed (1) When the [CUSTOM] function key is pressed while the custom screen is being displayed, the screen is, changed (0) / not changed (1)	
3115	Current position display	<Axis>
#0 NDP #1 NDA #3 NDF #4 PGA	The current position is, displayed (0) / not displayed (1) In the absolute coordinate system and relative coordinate system, the current position and remaining move amount are, displayed (0) / not displayed (1) In calculation for actual feedrate display, the feedrate on a selected axis is, considered (0) / not considered (1) In the high speed program check mode, the machine position is, displayed according to the setting of parameter PGM (0) / displayed with machine coordinates used for program checking (1)	 PRM 11320#7
3116	Clearing an alarm, Setting of screen display	
#2 PWR #7 MDC	Alarm SW0100 (PARAMETER ENABLE SWITCH ON) is cleared by "CAN"+"RESET" (0) / "RESET" or an external reset ON (1) All maintenance information, cannot be cleared (0) / can be cleared (1)	PRM 8900#0
3117	Position coder	
#1 SPP	When a serial spindle is used, position coder signal pulse data from the one-rotation signal is, not displayed (0) / displayed (1), on the diagnostic screen	
3119	Touch panel	
#2 DDS #3 TPA	The touch panel is, enabled (0) / disabled (1) When the option for the external touch panel interface is selected, the external touch panel interface connection is, valid (0) / invalid (1)	
3122	Time interval used to record time data in operation history [min]	
3123	Screen saver start time [min]	

3124	Modal G code display	
#0 D01 #1 D02 #2 D03 #3 D04 #4 D05 #5 D06 #6 D07 #7 D08	On the program check screen, G codes in group n are, displayed (0) / not displayed (1) D01 : n=01 D02 : n=02 · · · D08 : n=08	
3125	Modal G code display	
#0 D09 #1 D10 #2 D11 #3 D12 #4 D13 #5 D14 #6 D15 #7 D16	On the program check screen, G codes in group n are, displayed (0) / not displayed (1) D09 : n=09 D10 : n=10 · · · D16 : n=16	
3126	Modal G code display	
#0 D17 #1 D18 #2 D19 #3 D20 #4 D21 #5 D22 #6 D23 #7 D24	On the program check screen, G codes in group n are, displayed (0) / not displayed (1) D17 : n=17 D18 : n=18 · · · D24 : n=24	
3127	Modal G code display	
#0 D25 #1 D26 #2 D27 #3 D28 #4 D29 #5 D30 #6 D31 #7 D32	On the program check screen, G codes in group n are, displayed (0) / not displayed (1) D25 : n=25 D26 : n=26 · · · D32 : n=32	
3128	Retracement time for deleting alarm data from the alarm history [sec]	
3129	Position display	
#0 DRP	For relative coordinate display, a tool offset (tool movement) is, considered (0) / not considered (1)	T series
#1 DAP	For absolute coordinate display, a tool offset (tool movement) is, considered (0) / not considered (1)	T series
#2 MRE	When mirror image is used, relative coordinates are updated with respect to, the machine coordinates (0) / the absolute coordinates (1)	
#4 RPP	To the value of the preset(or origin) of relative coordinates, the difference below the least input increment between absolute coordinate point and relative coordinate point is not corrected(0) / corrected(1)	
3130	Display order on the current position display screen	<Axis>
3131	Subscript of axis name	<Axis>

Setting value	Meaning
0	Each axis is set as an axis other than a parallel axis, synchronization control axis, and tandem control axis.
1 to 9	A set value is used as a subscript.
65 to 90	A set letter (ASCII code) is used as a subscript.

3132	Axis name (absolute coordinate) for current position display	<Axis> GSB,GSC PRM1020

<table>
<tr><td>3133</td><td>Axis name (relative coordinate) for current position display</td><td><Axis>
GSB,GSC
PRM1020</td></tr>
<tr><td>3134</td><td>Data display order of each axis on the workpiece coordinate system screen and workpiece shift screen</td><td><Axis></td></tr>
<tr><td>3135</td><td>Number of decimal places in actual feedrate display</td><td></td></tr>
<tr><td>3137</td><td>Display of PMC axis control</td><td></td></tr>
<tr><td>#7 EAC</td><td>The PMC axis status display screen is, not displayed (0) / displayed (1)</td><td></td></tr>
<tr><td>3141</td><td>Path name (1st character)</td><td></td></tr>
<tr><td>3142</td><td>Path name (2nd character)</td><td></td></tr>
<tr><td>3143</td><td>Path name (3rd character)</td><td></td></tr>
<tr><td>3144</td><td>Path name (4th character)</td><td></td></tr>
<tr><td>3145</td><td>Path name (5th character)</td><td></td></tr>
<tr><td>3146</td><td>Path name (6th character)</td><td></td></tr>
<tr><td>3147</td><td>Path name (7th character)</td><td></td></tr>
<tr><td>3160</td><td>Setting of MDI unit type
<table>
<tr><th>Setting value</th><th>Type</th></tr>
<tr><td>0</td><td>Depends on the system type and indicator type.</td></tr>
<tr><td>1</td><td>Standard MDI unit for the lathe system</td></tr>
<tr><td>2</td><td>Standard MDI unit for the machining center system</td></tr>
<tr><td>3</td><td>Small MDI unit for the lathe system</td></tr>
<tr><td>4</td><td>Small MDI unit for the machining center system</td></tr>
</table>
When 3160 = 0
<table>
<tr><th>System</th><th>Type of indicator</th><th>Type</th></tr>
<tr><td rowspan="2">When T series is used with path 1</td><td>Type of 12 horizontal soft keys</td><td>Standard MDI unit for the lathe system</td></tr>
<tr><td>Type of 7 horizontal soft keys</td><td>Small MDI unit for the lathe system</td></tr>
<tr><td rowspan="2">When M series is used with path 1</td><td>Type of 12 horizontal soft keys</td><td>Standard MDI unit for the machining center system</td></tr>
<tr><td>Type of 7 horizontal soft keys</td><td>Small MDI unit for the machining center system</td></tr>
</table>
</td><td></td></tr>
<tr><td>3191</td><td>Data input</td><td></td></tr>
<tr><td>#2 WSI

#3 SSF

#5 FSS</td><td>On the workpiece origin offset screen, the soft key [INPUT] is, displayed (0) / not displayed (1)
When data is input on the setting screen, the soft key for confirming data input is, not displayed (0) / displayed (1)
Feedrate display is, switched between feedrate per minute and feedrate per revolution depending on the operating state (0) / fixed to feedrate per revolution (1)</td><td></td></tr>
<tr><td>3192</td><td>Touch panel, Screen display</td><td></td></tr>
<tr><td>#1 T2P

#2 TRA

#7 PLD</td><td>If two or more points are pressed on the touch panel, it is assumed that, the gravity center position is pressed (0) / the 1st pressed point is pressed (1)
If a point on the touch panel is held down for the time specified in parameter (No. 3197) or longer, no alarm is issued (0) / an alarm is issued (1)
In the current position display field on the left side of the single-path display screen, or on the program check screen for simultaneous multi-path display, the servo axis load meter and spindle load meter display function is, disabled (0) / enabled (1)</td><td>

ALM
SR5303

T series</td></tr>
<tr><td>3194</td><td>Diameter/radius programming</td><td></td></tr>
<tr><td>#2 DPA

#3 DPM</td><td>The absolute coordinates, relative coordinates, and remaining move amount during diameter/radius programming switching are displayed, according to the specification during switching (0) / according to the setting of parameter (No. 1006#3) (1)
The machine coordinates during diameter/radius programming switching are displayed, according to the setting of parameter (No. 1006#3) (0) / according to the specification during switching (1)</td><td></td></tr>
</table>

3195	Operation history	
#5 HKE #6 HDE #7 EKE	A key operation history is, recorded (0) / not recorded (1) A DI/DO history is, recorded (0) / not recorded (1) The soft key [CLEAR ALL] is, not displayed (0) / displayed (1)	
3196	History modification	
#0 HTO #1 HWO #2 HPM #3 HMV #5 HOA #6 HOM #7 HAL	A history of tool offset data modifications is, not recorded (0) / recorded (1) A history of workpiece offset data/extended workpiece offset data/workpiece shift amount (T series) modifications is, not recorded (0) / recorded (1) A parameter modification history is, not recorded (0) / recorded (1) A custom macro common variable modification history is, not recorded (0) / recorded (1) When an external operator message is issued, in the operation history and message history, modal data, absolute coordinates, and machine coordinates are, not recorded (0) / recorded (1) A history of external operator messages is, recorded (0) / not recorded (1) When an alarm is issued, in the operation history and alarm history, modal data, absolute coordinates, and machine coordinates are, recorded (0) / not recorded (1)	
3197	Detection time of continuous pressing on the touch panel [sec]	PRM 3192#2
3201	Program registration	
#0 RDL #1 RAL #2 REP #5 N99 #6 NPE	When a program is registered by input/output device external control, the new program is registered following the programs already registered (0) / all registered programs are deleted, then the new program is registered (1) When programs are registered by I/O external device control, all programs are registered (0) / only one program is registered (1) When an attempt is made to reregister a program that has an existing program number, an alarm is issued (0) / the existing program is replaced with the new one (1) When an M99 block is specified, program registration is, terminated (0) / not terminated (1) When M02, M30, or M99 is specified, program registration is, terminated (0) / not terminated (1)	 PRM 3201#6=0
3202	Program protection	
#0 NE8 #2 CND #4 NE9 #6 PSR	Editing of programs with program numbers 8000 to 8999 is, not inhibited (0) / inhibited (1) By using the [PROGRM CNDENS] soft key, the program condensing operation is not performed (0) / performed (1). Editing of programs with program numbers 9000 to 9999 is, not inhibited (0) / inhibited (1) Search for the program number of a protected program is, disabled (0) / enabled (1)	
3203	MDI operation	
#5 MZE #6 MER #7 MCL	During MDI operation, program editing is, enabled (0) / disabled (1) When MDI operation is terminated in single block mode, program deletion is, not performed (0) / performed (1) A program coded in the MDI mode is, not cleared by a reset (0) / cleared by a reset (1)	
3204	Small type MDI	
#0 PAR	When a small MDI unit is used, the keys "[" and "]" are used as, "[" and "]" (0) / "(" and ")" (1)	

#1 OPC	In MEM/EDIT/RMT mode, a program search or cueing operation, causes a warning when automatic operation has been started or paused (0) / causes a warning during automatic operation (1)	STL SPL OP
#3 P8E	Editing of subprograms with subprogram numbers 80000000 to 89999999 is, not inhibited (0) / inhibited (1)	
#4 P9E	Editing of subprograms with subprogram numbers 90000000 to 99999999 is, not inhibited (0) / inhibited (1)	
#5 SPR	To specific program numbers in the nine thousands, 90000000 is, not added (0) / added (1)	
#6 MKP	When M02, M30, or EOR(%) is executed during MDI operation, the created MDI program is, deleted (0) / not deleted (1)	
3205	Tool offset display	
#4 OSC	On the offset screen, offset value erasure by a soft key is, enabled (0) / disabled (1)	
#5 BGC	When background editing are started without entering a program name, select a program by soft key[PROGRM SEARCH], [NEW PROGRAM] or Program folder screen (0) / the editing of the previously edited program is continued (1)	
3206	Dual display based on the CNC screen display function	
#1 MIF	Editing on the maintenance information screen is, not prohibited (0) / prohibited (1)	
#4 PHS	Operation history signal selection, does not interact with parameters (0) / interacts with parameters (1)	PRM 12801- 12900 24901- 24920
#5 S2K	In dual display based on the CNC screen display function, key control switching is performed, by using the DI signal (G0295#7) (0) / by pressing the upper-left corner of the screen (with a touch panel needed) (1)	PRM 3206#5
#7 NS2	Dual display based on the CNC screen display function, twin display function with Ethernet is, not used (0) / used (1)	
3207	External operator messages	
#1 EXS	Soft key extension based on the machine menu function is, disabled (0) / enabled (1)	
#5 VRN	On the custom macro variable screen, the variable names of common variables #500 and up are, not displayed (0) / displayed (1)	
#6 TPP	When a virtual MDI key is pressed, signal TPPRS is, not output (0) / output (1)	
3208	Tool offset display	
#0 SKY	The function key <SYSTEM> on the MDI unit is, enabled (0) / disabled (1)	
#3 NOS	The one-touch menu is, displayed (0) / not displayed (1)	
#4 OFY	On the offset screen, display and input of a Y-axis offset is, disabled (0) / enabled (1)	T series
#5 PSC	At the time of path switching based on the path switching signal, the screen display is switched to the most recently selected screen (0) / the same screen as for the path selected before switching is displayed (1)	
3210	Program protection (PSW)	PRM3211
3211	Program protection key (KEY)	
3216	Increment in sequence numbers inserted automatically	
3220	Password (PSW)	

3221	Keyword (KEY)	
3222	Program protection range (minimum value) (PMIN)	PRM 3220,3221
3223	Program protection range (maximum value) (PMAX)	
3225	See Dual Check Safety Connection Manual.	
3226	See Dual Check Safety Connection Manual.	
3227	Machine menu data number selection (horizontal soft key)	
3228	Machine menu data number selection (vertical soft key)	
3233	Program editing	
#0 PCE #1 PDM #2 RKB	Program editing is performed, in the word editing mode (0) / in the character editing mode (1) On the program directory screen, in Data Server program directory display in the CNC file management format, M198 operation folders and DNC operation files can be set (0) / folders in the Data Server can be set as the foreground folder and background folder (1) By the reset operation, the content of the key-in buffer is, deleted (0) / not deleted (1)	
3241 3242 : 3247	Character blinking in the AI advanced preview control (M Series) / AI contour control I mode (1st character) Character blinking in the AI advanced preview control (M Series) / AI contour control I mode (2nd character) : Character blinking in the AI advanced preview control (M Series) / AI contour control I mode (7th character)	AIAPC AICC1
3251 3252 : 3257	Character blinking in the AI contour control II mode (1st character) Character blinking in the AI contour control II mode (2nd character) : Character blinking in the AI contour control II mode (7th character)	AICC2
3280	Display language	
#0 NLC	Dynamic display language switching is, enabled (0) / disabled (1)	PRM3281
3281	Display language	
3290	Protection of data input	
#0 WOF #1 GOF #2 MCV #3 WZO #4 IWZ #5 GO2 #6 MCM #7 KEY	Input of a tool wear offset data with MDI keys is, not inhibited (0) / inhibited (1) Input of a tool geometry offset value with MDI keys is, not inhibited (0) / inhibited (1) Input of a macro variable with MDI keys is, not inhibited (0) / inhibited (1) Input of a workpiece origin offset or workpiece coordinate system shift amount (T series) with MDI keys is, not inhibited (0) / inhibited (1) Input of a workpiece origin offset or workpiece coordinate system shift amount with MDI keys in the automatic operation halt state is, not inhibited (0) / inhibited (1) Input of a 2nd geometry tool offset value with MDI keys is, inhibited (0) / not inhibited (1) Macro variable input with the MDI keys is, enabled regardless of which mode is set (0) / enabled in the MDI mode only (1) For memory protection keys, the KEY1 to KEY4 signals are used (0) / only the KEY1 signal is used (1)	PRM 3294,3295 PRM 3294,3295 T series
3291	Protection of data input	
#0 WPT	A tool wear offset value is input, by using the KEY1 signal (0) / by not using the KEY1 signal (1)	
3294	Start number of tool offset values whose input by MDI is disabled	PRM 3290#0 3290#1
3295	Number of tool offset values (from the start number) whose input by MDI is disabled	

3299	Data input protection	
#0 PKY	"Parameter write enable" is, set on the setting screen (0) / set by the memory protection signal KEYP (1)	
3301	Screen hard copy	
#0 H16 #4 HCN #7 HDC	The bit map data of a screen hard copy is based on, 256 colors (0) / 16 colors (1) Bit map file name of the screen hard copy is "HDCPYxxx.BMP"(0) / "YYMMDDxx.BMP"(1) The screen hard copy function is, disabled (0) / enabled (1)	
3321 3322 : 3336	Screen number assigned to the 1st vertical soft key Screen number assigned to the 2nd vertical soft key : Screen number assigned to the 16th vertical soft key	

7.2.16 Programs 1

3400	Auxiliary functions, Positioning	
#0 MGO	If the program restart M/S/T/B code output function is used, an M code is output according to a combination with parameter MOA (No. 7300#6).	PRM 7300#7=1

MGO	MOA	Meaning
0	0	The last M code is output.
0	1	M codes are output in specification order.
1	0	The last M code of each group is output.
1	1	M codes are output in group order.

#1 MGC	When a single block specifies multiple M commands, an M code group check is, made (0) / not made (1)	PRM 3441-3444
#6 SMX	An S code specified in a block that specifies G92 (G code system A: G50 (T series)) is, regarded as a maximum spindle speed command (0) / regarded as a spindle speed command (1)	
3401	G code, Calculator-type input	
#0 DPI	When a decimal point is omitted, the least input increment is assumed (0) / the unit of mm, inches, or sec is assumed (1)	
#4 MAB	In MDI operation, switching between the absolute and incremental commands is performed, by G90 or G91 (0) / according to parameter (No. 3401#5) (1)	GSB,GSC
#5 ABS	In MDI mode, a move command is assumed, as an incremental command (0) / as an absolute command (1)	GSB,GSC PRM 3401#4=1
#6 GSB #7 GSC	The G code system of a lathe is A/B/C type.	T series

GSC	GSB	G code system
0	0	G code system A
0	1	G code system B
1	0	G code system C

3402	G code in the initial state	
#0 G01	At power-on time or in the cleared state, the mode is, G00 (0) / G01 (1)	
#1 G18	At power-on time or in the cleared state, the mode is, G17 (0) / G18 (1)	
#2 G19	At power-on time or in the cleared state, the mode, follows the setting of parameter (No. 3402#1) (0) / is G19 (1)	
#3 G91	At power-on time or in the cleared state, the mode is, G90 (0) / G91 (1)	
#4 FPM	At power-on time or in the cleared state, feed per revolution is set (0) / feed per minute is set (1)	T series
#5 G70	The commands for inch input and metric input are, G20 and G21 (0) / G70 and G71 (1)	M series
#6 CLR	The “RESET” key, external reset signal, RRW signal, and emergency stop signal cause, the reset state (0) / the cleared state (1)	

#7 G23	When the power is turned on, G22 is set (0) / G23 is set (1)	
3403	Circular interpolation	
#5 CIR #6 ADB	When none of R, I, J, and K is specified in circular interpolation or helical interpolation, a movement is made by linear interpolation (0) / an alarm is issued (1) When the same address two or more times are specified in one block, the address specified last is valid (0) / the alarm PS5074 is issued (1)	ALM PS0022 ALM PS5074
3404	M functions	
#0 NOB #1 POL #2 SBP #4 M30 #5 M02 #7 M3B	In program execution, a block consisting of only O, EOB, and N is, not ignored (0) / ignored (1) When a command is specified with a decimal point omitted in an address that can include a decimal point, the command is assumed to be valid as it is (0) / the alarm PS5073 is issued (1) P in M198 specifies, a file number (0) / a program number (1) When M30 is read, the cursor returns to the start of the program (0) / does not return to the start of the program (1) When M02 is read, the cursor returns to the start of the program (0) / does not return to the start of the program (1) The number of M codes that can be specified in one block is, one (0) / up to three (1)	 ALM PS5073
3405	Dwell, Calculator-type input, Direct drawing dimension programming	
#0 AUX #1 DWL #3 G36 #4 CCR #5 DDP	As the command unit of the 2nd auxiliary function specified with a decimal point, the same unit is used for metric input and inch input (0) / the unit for metric input is multiplied by 10 for inch input (1) Dwell operation is based on, dwell per second at all times (0) / dwell per second (G94) or dwell per rotation (G95) (1) As G codes for automatic tool compensation, G36 and G37 are used (0) / G37.1 and G37.2 are used (1) For chamfering, addresses "I", "J", and "K" are used, and ",R", ", C", and ",A" are used in direct drawing dimension programming (0) / address "C" is used, and "R", "C", and "A" are used in direct drawing dimension programming (1) For angle commands in direct drawing dimension programming, normal specification is used (0) / a supplementary angle is given (1)	 T series T series T series
3406	G code clearing	
#1 C01 #2 C02 #3 C03 #4 C04 #5 C05 #6 C06 #7 C07	When the CNC is reset, the G codes in group n are, placed in the cleared state (0) / not placed in the cleared state(1) C01 : n=01 C02 : n=02 · · · C07 : n=07	PRM 3402#6=1
3407	G code clearing	
#0 C08 #1 C09 #2 C10 #3 C11 #4 C12 #5 C13 #6 C14 #7 C15	When the CNC is reset, the G codes in group n are, placed in the cleared state (0) / not placed in the cleared state(1) C08 : n=08 C09 : n=09 · · · C15 : n=15	PRM 3402#6=1

3408	G code clearing	
#0 C16 #1 C17 #2 C18 #3 C19 #4 C20 #6 C22 #7 C23	When the CNC is reset, the G codes in group n are, placed in the cleared state (0) / not placed in the cleared state(1) C16 : n=16 C17 : n=17 ・・・ C23 : n=23	PRM 3402#6=1
3409	G code clearing	
#0 C24 #1 C25 #2 C26 #3 C27 #4 C28 #5 C29 #6 C30 #7 CFH	When the CNC is reset, the G codes in group n are, placed in the cleared state (0) / not placed in the cleared state(1) C24 : n=24 C25 : n=25 ・・・ C30 : n=30 Upon reset, the F, H, D, and T codes are cleared (0) or not cleared (1).	PRM 3402#6=1
3410	Tolerance of arc radius [Increment system]	
3411	M code 1 preventing buffering	
3412	M code 2 preventing buffering	
3413	M code 3 preventing buffering	
3414	M code 4 preventing buffering	
3415	M code 5 preventing buffering	
3416	M code 6 preventing buffering	
3417	M code 7 preventing buffering	
3418	M code 8 preventing buffering	
3419	M code 9 preventing buffering	
3420	M code 10 preventing buffering	
3421	Range specification 1 of M codes that do not perform buffering (lower limit)	
3422	Range specification 1 of M codes that do not perform buffering (upper limit)	
3423	Range specification 2 of M codes that do not perform buffering (lower limit)	
3424	Range specification 2 of M codes that do not perform buffering (upper limit)	
3425	Range specification 3 of M codes that do not perform buffering (lower limit)	
3426	Range specification 3 of M codes that do not perform buffering (upper limit)	
3427	Range specification 4 of M codes that do not perform buffering (lower limit)	
3428	Range specification 4 of M codes that do not perform buffering (upper limit)	
3429	Range specification 5 of M codes that do not perform buffering (lower limit)	
3430	Range specification 5 of M codes that do not perform buffering (upper limit)	
3431	Range specification 6 of M codes that do not perform buffering (lower limit)	
3432	Range specification 6 of M codes that do not perform buffering (upper limit)	
3436	Range specification 1 of 2nd auxiliary function codes that do not perform buffering (lower limit)	
3437	Range specification 1 of 2nd auxiliary function codes that do not perform buffering (upper limit)	
3438	Range specification 2 of 2nd auxiliary function codes that do not perform buffering (lower limit)	
3439	Range specification 2 of 2nd auxiliary function codes that do not perform buffering (upper limit)	
3441	Start number of M codes for which an M code group can be set (1)	

3442	Start number of M codes for which an M code group can be set (2)	
3443	Start number of M codes for which an M code group can be set (3)	
3444	Start number of M codes for which an M code group can be set (4)	
3450	2nd auxiliary function command	
#0 AUP #2 FGT #7 BDX	A 2nd auxiliary function command specified in the calculator-type decimal point input format, specified with a decimal point, or specified with a negative value is, disabled (0) / enabled (1) The GOTO statement in the forward direction during DNC operation is, disabled (0) / enabled (1) When ASCII code is called using the same address as for the 2nd auxiliary function, a combination of parameter (No. 3450#0) set to 1 with an option selection, changes the argument unit (0) / does not change the argument unit (1)	PRM3460
3451	Thread cutting, Local coordinate system	
#0 GQS #4 NBN	The threading start angle shift function (Q) is, disabled (0) / enabled (1) When parameter (No. 3404#0) is set to 1, a block consisting of a sequence number only is, ignored (0) / not ignored (1)	M series
3452	Thread cutting, Programmable data input, Macro call	
#7 EAP	When parameter (No. 3455#0) is set to 1, macro calling in the calculator-type decimal point input format is, enabled (0) / disabled (1)	PRM 3401#0=0
3453	Chamfering/corner R, Direct drawing dimension programming	
#0 CRD	When both of the chamfering/corner R option and the direct drawing dimension programming option are selected, chamfering/corner R is enabled (0) / direct drawing dimension programming is enabled (1)	T series
3454	Program parameter input	
#2 DTO #3 PGR #4 G1B	In the cylindrical interpolation mode, a rotary axis is specified, by angle (0) / by distance on the developed plane (1) In the high speed program check mode, data modified during automatic operation is, neither stored nor restored (0) / stored and restored (1) In programmable parameter input, specifying a change to a specific bit parameter is, disabled (0) / enabled (A bit number is specified with Q_) (1)	
3455	Handling of the decimal point	<Axis>
#0 AXD	If a decimal point is omitted for an axis address, the value is determined, in accordance with the least input increment (0) / in millimeters, inches, or seconds (1)	
3457	Search folder	
#0 LIB #1 MC2 #2 MC1 #3 SYS #6 SCC	The common program folder is, set as a search folder for subprogram call/macro call (0) / not set as a search folder for subprogram call/macro call (1) MTB dedicated folder 2 is, set as a search folder for subprogram call/macro call (0) / not set as a search folder for subprogram call/macro call (1) MTB dedicated folder 1 is, set as a search folder for subprogram call/macro call (0) / not set as a search folder for subprogram call/macro call (1) The system folder is, set as a search folder for subprogram call/macro call (0) / not set as a search folder for subprogram call/macro call (1) To the search order for subprogram call/macro call, the same folder as for the main program is, not added (0) / added (1)	

#7 SCF	A search folder for subprogram call/macro call is, not added (0) / added (1)	
3458	Plane selection	
#0 TPS #1 ARP #7 CRC	When a plane is selected on the lathe system in the power-on state or cleared state, G18 mode (Z-X plane) is selected (0) / parameters G18 and G19 (No.3402#1, #2) are followed (1) ARP In retrace function, when reverse execution is done during auxiliary function execution and then forward reexecution is done, the output of auxiliary function is Once (0) / Twice (1) In Direct drawing dimension programming function, when a minus value is commanded as a chamfering value / corner R value, alarm PS0055 is issued (0) / alarm is not issued. A minus value is converted to a plus value (1)	T series M series T series
3459	NC program containing lowercase alphabetic characters	
#0 ESL	When an NC program contains lowercase alphabetic characters, an alarm is issued (0) / the lowercase characters are converted into their uppercase equivalents (1)	
3460	2nd auxiliary function specification address	PRM1020
3467	A folder to be used for the external workpiece number search function, external program number search function, and macro executor program reference and write function	
3470	Programming	
#0 HNU	In helical interpolation, when the circular interpolation axes don't move and other specified axes don't move Alarm PS0021,"ILLEGAL PLANE SELECT" is issued (0) / Alarm is not issued (1)	

7.2.17 Pitch Error Compensation

3601	Cs contour control axis pitch error compensation during spindle command synchronization	
#1 EPC	The pitch error compensation on an axis of Cs contour control on the slave spindle side during simple spindle control is, the same as that on the master spindle (0) / just for the slave spindle (1)	
3602	Input type of Stored Pitch Error Compensation data	
#0 APE	The input type of Stored Pitch Error Compensation data is An incremental value (0) / A total value (1)	
3605	Error compensation function setting	<Axis>
#0 BDP #1 IPP #2 IPC	Bidirectional pitch error compensation is, not used (0) / used (1) Interpolation type pitch error compensation is, not used (0) / used (1) The interpolation type straightness compensation function is, not used (0) / used (1)	PRM3620 - 3627 PRM3620 - 3624 PRM3620 - 3624, 5700-, 13381 -
3620	Number of the pitch error compensation position for the reference position for each axis	<Axis>
3621	Number of the pitch error compensation position at extremely negative position for each axis	<Axis>
3622	Number of the pitch error compensation position at extremely positive position for each axis	<Axis>
3623	Magnification for pitch error compensation for each axis	<Axis>
3624	Interval between pitch error compensation positions for each axis [Increment system]	<Axis>

3625	Travel distance per revolution in pitch error compensation of rotary axis type [Detection unit] Travel distance per revolution = compensation value × compensation interval	<Axis> PRM 1006#0,#1
3626	Number of the bi-directional pitch error compensation position at extremely negative position (for movement in the negative direction)	<Axis> PRM3621
3627	Pitch error compensation at reference position when a movement to the reference position is made from the direction opposite to the direction of reference position return	<Axis> PRM 1006#5
3661	Number of a pitch error compensation position for the reference position for each slave axis when independent pitch error compensation is performed under spindle command synchronous control	PRM 3601#1
3666	Number of the pitch error compensation position at extremely negative position for each slave axis when independent pitch error compensation is performed under spindle command synchronous control	PRM 3601#1
3671	Number of the pitch error compensation position at extremely positive position for each slave axis when independent pitch error compensation is performed under spindle command synchronous control	PRM 3601#1
3676	Number of the pitch error compensation position at extremely negative position for each slave axis when independent bi-directional pitch error compensation is performed under spindle command synchronous control	PRM 3601#1
3681	Pitch error compensation value at the reference position when a movement is made to the reference position in the direction opposite to the reference position return direction for each slave axis in the case where independent bi-directional pitch error compensation is performed under spindle command synchronous control	PRM 1006#5 3601#1

7.2.18 Spindle Control

3700	Cs contour control	
#0 CRF #1 NRF #2 CNM	Reference position setting at an arbitrary position under Cs contour control is, not used (0) / used (1) For the 1st positioning after switching to the Cs contour control mode, a reference position return operation is once performed (0) / a normal positioning operation is performed (1) When an axis command of travel distance 0 is specified for the Cs axis in the origin unestablished state, the alarm PS0224 is, issued (0) / not issued (1)	PRM 3700#1
3702	Multi-spindle	
#1 EMS	The multi-spindle control function is, used (0) / not used (1)	
3703	Multi-spindle	
#0 2P2 #2 MPM #3 MPP	When a multi-path system is used, inter-path spindle control allows, configuration where the spindle that belongs to one path only is shared between path 1 and path 2 (0) / configuration where the spindles that belong to path 1 and path 2 are shared between the two paths (1) When a multi-path system is used, inter-path spindle control, follows the setting of parameter (No. 3703#0) (0) / allows the spindles of arbitrary paths to be shared among arbitrary paths (1) In multi-spindle control, a spindle selection using a programmed command instead of using the SWS1 to SWS4 signals, is not made (0) / made (1)	PRM 3703#2 G027.0 - 2 ,G026.3 PRM3781

<table>
<tr><td>#4 SPR</td><td>Rigid tapping using the spindle of another path is, not performed (0) / performed (1)</td><td></td></tr>
<tr><td>3704</td><td>Spindle synchronous control</td><td></td></tr>
<tr><td>#4 SSS</td><td>Synchronous spindle control by each spindle is, not performed (0) / performed (1)</td><td>PRM4831</td></tr>
<tr><td>#5 SSY</td><td>Spindle command synchronous control by each spindle is, not performed (0) / performed (1)</td><td>PRM4821</td></tr>
<tr><td>#7 CSS</td><td>On each spindle, Cs contour control is, not performed (0) / performed (1)</td><td></td></tr>
<tr><td>3705</td><td>Parameters for spindle gear switching</td><td></td></tr>
<tr><td>#0 ESF</td><td>When constant surface speed control is used with the spindle control function or when parameter (No. 3706#4) is set to 1, S codes and SF are output for all S commands (0) / S codes and SF are not output if constant surface speed control is used or the spindle speed is clamped (1)</td><td>PRM
3705#4</td></tr>
<tr><td>#1 GST</td><td>The SOR signal is used for, spindle orientation (0) / gear shift (1)</td><td>M series
PRM
3706#4
3751,3752</td></tr>
<tr><td>#2 SGB</td><td>The gear switching method is, method A (parameter No. 3741 to No. 3743) (0) / method B (parameter No. 3751 to No. 3752) (1)</td><td>M series</td></tr>
<tr><td>#3 SGT</td><td>The gear switching method during a tapping cycle is, method A (0) / method B (1)</td><td>M series
PRM
3761,3762</td></tr>
<tr><td>#4 EVS</td><td>When an S command is specified, the spindle control function, does not output S codes and SF (0) / outputs S codes and SF (1)</td><td>T series
PRM
3705#0</td></tr>
<tr><td>#5 NSF</td><td>When a T type gear is selected and an S command is specified, SF is output (0) / SF is not output (1)</td><td>M series
PRM
3706#4=1</td></tr>
<tr><td>#6 SFA</td><td>The SF signal is output, when gears are switched (0) / regardless of whether gears are switched (1)</td><td>M series</td></tr>
<tr><td>3706</td><td>Output polarity</td><td></td></tr>
<tr><td>#2 MPA</td><td>When a spindle is to be selected using a P command in multi-spindle control, and a P command is not specified together with an S command, an alarm is issued (0) / the last P command specified or the value of parameter No. 3775 is used (1)</td><td>PRM
3703#3=1</td></tr>
<tr><td>#3 PCS</td><td>When multi-spindle control is used with a multi-path system, the position coder selection signals are, the signals of the path selected by the inter-path spindle feedback selection signal (0) / the signals of the local path (1)</td><td></td></tr>
<tr><td>#4 GTT</td><td>The spindle gear selection method is, type M (0) / type T (1)</td><td>M series</td></tr>
<tr><td>#5 ORM</td><td>The voltage polarity during spindle orientation is, positive (0) / negative (1)</td><td></td></tr>
<tr><td>#6 CWM
#7 TCW</td><td>Voltage polarity when the spindle speed is output
<table>
<tr><th>TCW</th><th>CWM</th><th>Meaning</th></tr>
<tr><td>0</td><td>0</td><td>Both of M03 and M04 are positive.</td></tr>
<tr><td>0</td><td>1</td><td>Both of M03 and M04 are negative.</td></tr>
<tr><td>1</td><td>0</td><td>M03 is positive, and M04 is negative.</td></tr>
<tr><td>1</td><td>1</td><td>M03 is negative, and M04 is positive.</td></tr>
</table></td><td></td></tr>
<tr><td>3708</td><td>Spindle speed arrival signal, Spindle speed fluctuation detection</td><td></td></tr>
<tr><td>#0 SAR</td><td>The spindle speed arrival signal is, not checked (0) / checked (1)</td><td></td></tr>
<tr><td>#1 SAT</td><td>Check of the spindle speed arrival signal at the start of executing the thread cutting block is, performed according to the setting of SAR (0) / performed at all times (1)</td><td>T series</td></tr>
</table>

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#5 SOC	During constant surface speed control, the maximum spindle speed clamp command clamps the spindle, before spindle speed override (0) / after spindle speed override (1)	PRM3772
#6 TSO	During a threading or tapping cycle, the spindle override is, disabled (tied to 100%) (0) / enabled (1)	G30#0 - #7
3709	Spindle speed, Multi-spindle	
#0 SAM	The sampling frequency to obtain the average spindle speed is, 4 (0) / 1 (1)	Usually, 0
#1 RSC	In the constant surface speed control mode, the surface speed of a rapid traverse block is calculated, in accordance with the coordinates of the end point (0) / in accordance with the current value, as in cutting feed (1)	
#2 MSI	In multi-spindle control, the SIND signal is valid, only when the 1st spindle is selected (0) / for each spindle (1)	
#3 MRS	When the actual spindle speed signals and S 12-bit code signals are output in multi-spindle control, the signals common to the 1st spindle and 2nd spindles are used (0) / separate signals are used (1)	
3712		
#2 CSF	The coordinate system establishment function based on Cs contour control is, disabled (0) / enabled (1)	PRM 4353#5
#4 CSA	When the constant surface speed control command is issued, if no command for maximum spindle speed clamping has been executed, no alarm is issued (0) / alarm PS5557 is issued (1)	
#6 GMB	With type-M gear switching method B, the speed of each gear is clamped to, the maximum rotation speed of each gear or the maximum clamping speed of the spindle motor (0) / the spindle motor speed at the gear switching point between gear 1 and gear 2, and the spindle motor speed at the gear switching point between gear 2 and gear 3 (1)	
3713	Multi-spindle	
#3 MSC	Multi-spindle control type C is, not used (0) / used (1)	PRM 3709#2=1
#4 EOV	Each spindle override signal is, not used (0) / used (1)	PRM 3713#3=1
#6 MPC	In accordance with a selected spindle, the position coder feedback signal to be used for threading, feed per minute, and so forth is, not automatically switched (0) / automatically switched (1)	PRM 3713#3=1
3715	Spindle speed arrival signal	<Axis>
#0 NSA	When a move command is executed for an axis, the spindle speed arrival signal for the axis is, checked (0) / not checked (1)	
3716	Type of spindle motor	
#0 A/S	The type of spindle motor is, analog (0) / serial (1)	PRM 1000#0
#7 FBP	Changing the number of spindle position coder pulses is, not executed (0) / executed (1)	PRM 3720
3717	Motor number to each spindle	
3718	Subscript for display of a serial spindle (main spindle)	PRM 1000#0
3719	Subscript for display of a serial spindle (sub spindle)	
3720	Number of position coder pulses	
3721	Number of gear teeth on the position coder side	
3722	Number of gear teeth on the spindle side	

3729	Cs contour control, Spindle orientation	
#0 ORT #1 FPR #2 CSN #3 NCS #6 CHM #7 CSC	The spindle orientation function of stop position external setting type based on the position coder is, not used (0) / used (1) With each spindle, feed per revolution (without a position coder) is, not used (0) / used (1) When the Cs contour control mode is off, in-position check is, enabled (0) / disabled (1) When the Cs contour control mode is on, the completion of mode switching, waits for spindle activation to be turned on (0) / does not wait for spindle activation to be turned on (1) Manual reference position return after the reference position for the Cs contour control axis is established is performed as, spindle orientation operation (0) / high-speed type of reference position return operation (1) The increment system of the Cs contour control axis is, IS-B (0) / IS-C (1)	
3730	Data used for adjusting the gain of the analog output of spindle speed [0.1%] $\text{Set value} = \frac{10(\text{V})}{\text{Measured voltage (V)}} \times 1000$	
3731	Compensation value for the offset voltage of spindle speed analog output [V] $\text{Set value} = \frac{-8191 \times \text{Offset voltage (V)}}{12.5}$	
3732	The spindle speed during spindle orientation or the spindle motor speed during spindle gear shift $\text{Set value} = \frac{\text{Spindle speed during spindle gear shift}}{\text{Maximum spindle motor speed}} \times n$ Serial spindle: n=16383 Analog spindle: n=4095	PRM 3705#0 4020
3735	Minimum clamp speed of the spindle motor $\text{Set value} = \frac{\text{Minimum clamp speed of spindle motor}}{\text{Maximum spindle motor speed}} \times 4095$	M series
3736	Maximum clamp speed of the spindle motor $\text{Set value} = \frac{\text{Maximum clamp speed of spindle motor}}{\text{Maximum spindle motor speed}} \times 4095$	M series
3738	Spindle name 2 of each spindle	PRM 1000#0 3703#3 3798#1 3706#4
3739	Spindle name 3 of each spindle	
3740	Time elapsed prior to checking the spindle speed arrival signal [ms]	
3741	Maximum spindle speed for gear 1 [min^{-1}]	
3742	Maximum spindle speed for gear 2 [min^{-1}]	
3743	Maximum spindle speed for gear 3 [min^{-1}]	
3744	Maximum spindle speed for gear 4 [min^{-1}]	
3751	Spindle motor speed when switching from gear 1 to gear 2	M series PRM 3705#2
3752	Spindle motor speed when switching from gear 2 to gear 3 Setting value =(Spindle motor speed when the gears are switched / Maximum spindle motor speed) × 4095	
3761	Spindle speed when switching from gear 1 to gear 2 during tapping [min^{-1}]	M series PRM 3705#3=1
3762	Spindle speed when switching from gear 2 to gear 3 during tapping [min^{-1}]	
3770	Axis as the calculation reference in constant surface speed control	
3771	Minimum spindle speed in constant surface speed control mode (G96) [min^{-1}]	

3772	Maximum spindle speed for each spindle [min-1]	
3773	Start address of the R signal specifying maximum speed	
3775	Default P command value for spindle selection in multi-spindle control	PRM 3703#3=1 3706#2=1
3781	P code for selecting the spindle in multi-spindle control	PRM 3703#3=1
3785	Multi-spindle control, Constant surface speed control	
#0 CLM #1 G96 #7 HSC	When spindle selection by address P or extended spindle name of multi-spindle control is enabled, constant surface speed control command is the following specifications (0) / conventional specifications (1) - If extended spindle name is commanded in clamp command of maximum spindle speed, alarm PS0539 is issued. - If address P is commanded at selection of axis as the calculation reference in constant surface speed control, alarm PS0190 is issued. When spindle selection by address P in multi-spindle control, or extended spindle name is enabled, if G96 is commanded without surface speed, alarm PS5355 is not issued (0) / issued (1) The speed-up of changing Cs contour control mode is disabled (0) / enabled (1)	
3787	Spindle speed display	
#0 USG #1 SLG	When spindle speed calculated from spindle motor speed is displayed (bit 2 (ASD) of parameter No.3799), parameter Nos.4056 to 4059 is used for spindle speed calcularion (0) / parameter Nos.3741 to Nos.3744 is used for spindle speed calculation In spindle speed calculation, gear selection status is judged from clutch/gear signals (0) / gear selection signals (1)	
3790	Spindle speed display	
#0 KAS	In the thread cutting and polygon turning by using analog spindle, while until the one-rotation-signal is detected at the start of threading, the display value of spindle speed is lowered temporarily, or to zero in some cases (0) / not changed from the start (1)	
3791	Spindle speed command	
#0 SSE	The resolution enabled for the spindle speed command depend to the bit 4(SSI) of parameter No.3798(0) / is a maximum spindle speed/1048575 [min-1](1).	
3792	The sampling frequency to obtain the average spindle speed(2^(parameter data))	
3795	M code for high-speed switching of Cs contour control	
3797	Dual Check Safety function	
#0 DCN	See Dual Check Safety Connection Manual.	

<table>
<tr><td>3798</td><td>Spindle alarm, Spindle speed command</td><td></td></tr>
<tr><td>#0 ALM

#1 ESN

#3 SDP

#4 SSI</td><td>The spindle alarm for all spindles is, enabled (0) / ignored (1)
Programmed spindle command<table><tr><th>3798#1</th><th>3703#3</th><th>Selection method</th></tr><tr><td>0</td><td>0</td><td>Signal selection</td></tr><tr><td>0</td><td>1</td><td>P command (S_P_)</td></tr><tr><td>1</td><td>0</td><td>Signal selection</td></tr><tr><td>1</td><td>1</td><td>Spindle name
or
P command (S_P_)</td></tr></table>High-precision spindle speed control is, not used (0) / used (1)
The resolution enabled for the spindle speed command is, maximum spindle speed/4095 [min^{-1}] (0) / maximum spindle speed/16383 [min^{-1}] (1)</td><td>

PRM
1000#0
3738, 3739</td></tr>
<tr><td>3799</td><td>Spindle function check</td><td></td></tr>
<tr><td>#0 NAL

#1 NDP

#2 ASD

#3 SVP

#5 SSH

#6 SPC</td><td>An alarm detected on the spindle amplifier side is, displayed (0) / not displayed (1)
When an analog spindle is used, a position coder disconnection check is, made (0) / not made (1)

When a serial spindle is used, a spindle speed is calculated based on, feedback pulses from the position coder (0) / speed monitor (1)
As synchronization errors displayed on the spindle screen, monitor values are displayed (0) / peak-hold values are displayed (1)
Display of all spindle speed data on the diagnostic screen is, disabled (0) / enabled (1)
The position coder pulse to obtain the average spindle speed is, sampled without sign data(0) / sampled with sign data (1)</td><td>PRM
3798#0
PRM
3716#0
3799#0</td></tr>
<tr><td>3841</td><td>Servo motor spindle control number for Servo/Spindle synchronous control</td><td>PRM
2016#4</td></tr>
<tr><td>3842</td><td>Maximum speed under servo motor spindle control for Servo/Spindle synchronous control [Input unit]</td><td></td></tr>
<tr><td>3843</td><td>Acceleration/deceleration time constant under servo motor spindle control for Servo/Spindle synchronous control [ms]</td><td></td></tr>
<tr><td>3844</td><td>Master spindle number for Servo/Spindle synchronous control</td><td></td></tr>
<tr><td>3845</td><td>Shift value of phase synchronization for Servo/Spindle synchronous control [Detection unit]</td><td></td></tr>
<tr><td>3846</td><td>Feedrate during phase synchronization for Servo/Spindle synchronous control [deg/min]</td><td></td></tr>
<tr><td>3847</td><td>Allowable error pulse value on phase synchronization for Servo/Spindle synchronous control [Detection unit]</td><td></td></tr>
<tr><td>3900</td><td>Servo axis number used for interpolation with a Cs contour control axis (1st group)</td><td></td></tr>
<tr><td>3901</td><td>Loop gain for the servo axis used for interpolation with a Cs contour control axis (High gear) (1st group) [0.01/sec]</td><td></td></tr>
<tr><td>3902</td><td>Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium High gear) (1st group) [0.01/sec]</td><td></td></tr>
<tr><td>3903</td><td>Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium Low gear) (1st group) [0.01/sec]</td><td></td></tr>
<tr><td>3904</td><td>Loop gain for the servo axis used for interpolation with a Cs contour control axis (Low gear) (1st group) [0.01/sec]</td><td></td></tr>
<tr><td>3910</td><td>Servo axis number used for interpolation with a Cs contour control axis (2nd group)</td><td></td></tr>
<tr><td>3911</td><td>Loop gain for the servo axis used for interpolation with a Cs contour control axis (High gear) (2nd group) [0.01/sec]</td><td></td></tr>
<tr><td>3912</td><td>Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium High gear) (2nd group) [0.01/sec]</td><td></td></tr>
<tr><td>3913</td><td>Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium Low gear) (2nd group) [0.01/sec]</td><td></td></tr>
</table>

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3914	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Low gear) (2nd group) [0.01/sec]	
3920	Servo axis number used for interpolation with a Cs contour control axis (3rd group)	
3921	Loop gain for the servo axis used for interpolation with a Cs contour control axis (High gear) (3rd group) [0.01/sec]	
3922	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium High gear) (3rd group) [0.01/sec]	
3923	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium Low gear) (3rd group) [0.01/sec]	
3924	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Low gear) (3rd group) [0.01/sec]	
3930	Servo axis number used for interpolation with a Cs contour control axis (4th group)	
3931	Loop gain for the servo axis used for interpolation with a Cs contour control axis (High gear) (4th group) [0.01/sec]	
3932	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium High gear) (4th group) [0.01/sec]	
3933	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium Low gear) (4th group) [0.01/sec]	
3934	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Low gear) (4th group) [0.01/sec]	
3940	Servo axis number used for interpolation with a Cs contour control axis (5th group)	
3941	Loop gain for the servo axis used for interpolation with a Cs contour control axis (High gear) (5th group) [0.01/sec]	
3942	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium High gear) (5th group) [0.01/sec]	
3943	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Medium Low gear) (5th group) [0.01/sec]	
3944	Loop gain for the servo axis used for interpolation with a Cs contour control axis (Low gear) (5th group) [0.01/sec]	

7.2.19 Serial Spindle

4000	Setting of rotation direction	
#0 ROTA1	The spindle and spindle motor rotate, in the same direction (0) / in the opposite directions (1)	
#1 ROTA2	In Cs contour control, a command for movement in the positive (+) direction moves the spindle, in the counterclockwise direction (0) / in the clockwise direction (1)	
#3 RETRN	In Cs contour control, the direction of reference position return is, counterclockwise (0) / clockwise (1)	
#4 RETSV	In the servo mode, the direction of reference position return is, counterclockwise (0) / clockwise (1)	When viewed from the spindle
#5 DEFFNC	The differential speed control function is, not used (0) / used (1)	
#6 DEFDRT	In differential speed control, the direction of differential speed is, the same as the direction of the feedback signal (0) / opposite to the direction of the feedback signal (1)	
4001	Magnetic sensor, Spindle sensor, MRDY signal	
#0 MRDY1	The MRDY signal is, not used (0) / used (1)	
#3 MGDIR	The magnetic sensor and spindle motor rotate, in the opposite directions (0) / in the same direction (1)	
#4 SSDIRC	The spindle sensor and spindle motor rotate, in the same direction (0) / in the opposite directions (1)	

4002	Spindle sensor, Rotation direction function	
#0 SSTYP0 #1 SSTYP1 #2 SSTYP2 #3 SSTYP3	Type of spindle sensor	

SSTYP3	SSTYP2	SSTYP1	SSTYP0	Spindle sensor
0	0	0	0	None (Position control is not exercised.)
0	0	0	1	The motor sensor is used for position feedback.
0	0	1	0	αi position coder
0	0	1	1	Separate αiBZ sensor, αiCZ sensor (analog)
0	1	0	0	α position coder S
0	1	1	0	Separate αiCZ sensor (serial)

#4 CSDRCT	In Cs contour control, the rotation direction function is, enabled (0) / disabled (1)	
#5 SVMDRT	In the servo mode, the rotation direction function is, enabled (0) / disabled (1)	
#6 SYCDRT	In spindle synchronization control, the rotation direction function is, enabled (0) / disabled (1)	
4003	Spindle sensor, Orientation	
#0 PCMGSL	The system of orientation is, position coder system (0) / magnetic sensor system (1)	
#2 DIRCT1 #3 DIRCT2	Rotation direction at spindle orientation	

DIRCT 2	DIRCT 1	Rotation direction
0	0	Direction of rotation immediately before (Counterclockwise for the 1st time after power-on)
0	1	Direction of rotation immediately before (Clockwise for the 1st time after power-on)
1	0	Counterclockwise when viewed from the motor shaft
1	1	Clockwise when viewed from the motor shaft

#4 PCTYPE #5 PCPL0 #6 PCPL1 #7 PCPL2	Setting of the number of spindle sensor teeth	

PCPL2	PCPL1	PCPL0	PCTYPE	Number of spindle sensor teeth
0	0	0	0	256 λ/rev
0	0	0	1	128 λ/rev
0	1	0	0	512 λ/rev
0	1	0	1	64 λ/rev
1	0	0	0	768 λ/rev
1	0	0	1	1024 λ/rev
1	1	0	0	384 λ/rev

4004	External one-rotation signal	
#2 EXTRF	The external one-rotation signal is, not used (0) / used (1)	
#3 RFTYPE	The external one-rotation signal is detected, on its rising edge (0) / on its falling edge (1)	
4005	Resolution in Cs contour control	
#0 CS360M	The detection unit in Cs contour control is, 0.001° (0) / 0.0001° (1)	
4006	Gear ratio, Motor speed setting unit, Analog override	
#1 GRUNIT	The gear ratio resolution is, 0.01 (0) / 0.001 (1)	PRM 4056 - 4059
#2 SPDUNT	The unit of motor speed is, 1 min^{-1} (0) / 10 min^{-1} (1)	
#3 SYCREF	In spindle synchronization, the one-rotation signal is, automatically detected (0) / not automatically detected (1)	
#5 ALGOVR	The spindle analog override is, 0% to 100% (0) / 0% to 120% (1)	
#7 RGTCMR	In rigid tapping, the arbitrary gear ratio (CMR) function on the command side is, not used (0) / used (1)	
4007	Alarms related to feedback signals	
#5 PCLS	Detection of a feedback signal disconnection is, enabled (0) / disabled (1)	

#6 PCALCH	Detection of alarms (41, 42, 47, 81, 82, 83, 85, 86, 87) related to the position feedback signal (in a mode other than the Cs contour control mode) is, enabled (0) / disabled (1)	
#7 - EPFSIG	Induction (HRV): Not used Synchronous (HRV): As the pole position detection start signal, SFR or SRV is used (0) / EPFSTR is used (1)	
4008	SSM, Pole position	
#4 PLMALW	Output restriction method setting	
#5 - SSMUSE	Induction (HRV): Not used Synchronous (HRV): SSM (sub-module SM) is, not used (0) / used (1)	
#6 - NEGREF	Induction (HRV): Not used Synchronous (HRV): As a reference pole position in pole determination, the one-rotation signal is, used (0) / not used (1)	
4009	Unit of velocity loop gain setting	
#0 VLPGAN	The setting of a velocity loop gain is, used without modification (0) / used after division by 16 (1)	
#2 ALSP	When a serial communication alarm is issued, the power is, turned off after the motor stops (0) / turned off immediately (1)	
#4 LDTOUT	During acc./dec., the load detection signal is, not output (0) / output (1)	
#6 OVRTYP	The type of analog override is, linear function type (0) / quadratic function type (1)	
4010	Type of motor sensor	
#0 MSTYP0 #1 MSTYP1 #2 MSTYP2	Type of motor sensor	

MSTYP2	MSTYP1	MSTYP0	Type of motor sensor
0	0	0	αiM sensor
0	0	1	αiMZ, αiBZ, αiCZ sensor (analog)
0	1	1	αiCZ sensor (serial)

4011	Setting of the number of motor sensor teeth	
#0 VDT1 #1 VDT2 #2 VDT3	Setting of the number of motor sensor teeth	

VDT3	VDT2	VDT1	Number of motor sensor teeth
0	0	0	64 λ/rev
0	0	1	128 λ/rev
0	1	0	256 λ/rev
0	1	1	512 λ/rev
1	0	0	192 λ/rev
1	0	1	384 λ/rev

#3 POLE1	Number of motor poles	
#4 MXPW	Specification of maximum output at acceleration time	
#7 POLE2	Number of motor poles	

POLE2	POLE1	Number of motor poles
0	0	2 poles
0	1	4 poles
1	0	8 poles
1	1	6 poles

4012	Spindle HRV function setting, Induction motor/synchronous motor selection	
#0 PWM1 #1 PWM2 #2 PWM3	PWM setting	
#4 PWMCS	Setting of the cutting feed/rapid traverse PWM frequency switching function in Cs contouring control	
#5 CLPFRQ	Current control cycle setting	
#6 SYSP	Selection of induction motor (0) / synchronous motor (1)	
#7 SPHRV	The spindle HRV function is enabled (1)	
4013	Setting of current dead zone data	
#2 DS1 #3 DS2 #4 DS3 #5 DS4	Setting of current dead zone data	

Amplifier model		Parameter setting				
200 V input	400 V input (HV)	DS5	DS4	DS3	DS2	DS1
All models		0	0	0	1	1

#6 DS5 #7 PWM3K	 PWM setting	
4014	Spindle switching	
#0 AXISSL #2 AXSLCT #3 CHGSLT #6 SYCORI #7 DUALFB	Spindle switching is, disabled (0) / enabled (1) The spindle switching (between the main spindle and sub-spindle) MCC contact check function is based on, the power state signal MCFN (0) / the contacts of both magnetic poles (1) Output switching (between high speed and low speed) MCC contact check is based on, the power state check signal RCH (0) / the contacts of both magnetic contactors (1) During spindle synchronization control, the orientation function is, disabled (0) / enabled (1) The dual position feedback function is, disabled (0) / enabled (1)	
4015	Orientation function, Load monitor function, Output switching function	
#0 ORIENT #1 SPLDMT #2 SPDSW #3 SPDTDM #7 DCS	The orientation function is, not used (0) / used (1) The spindle load monitor function is, disabled (0) / enabled (1) The output switching function is, not used (0) / used (1) The spindle tandem function is, not provided (0) / provided (1) The dual check safety function is, not provided (0) / provided (1)	
4016	Cs contour control	
#0 DCEPH #3 FFSMTH #4 IDLPTN - #5 RFCHK1 #6 RFCHK2 #7 RFCHK3	Order of A/B phases of the distance coded sensor The feed-forward smoothing function is, disabled (0) / enabled (1) Induction (HRV): Usually (0) / when a value less than 100 is set as the motor voltage (No. 4086) in Cs contour control or as the motor voltage (No. 4085) in the servo mode (1) Synchronous (HRV): Not used The alarms (81, 82, 85, 86) related position feedback (in the Cs contour control mode) are, not detected (0) / detected (1) The alarm (46) related to threading position detection signal feedback is, not detected (0) / detected (1) The function for detecting the one-rotation signal again before the position control mode is entered is, disabled (0) / enabled (1)	
4017	Orientation, Differential speed control	
#0 VINTDC #7 NRROEN	Induction (HRV): Setting of an integral time constant operation in differential speed control (1) When a command for orientation from the stop state is specified, the shortcut function is, disabled (0) / enabled (1)	
4018	Orientation	
#3 ORTYP0 #6 ORTYP1 #4 OOTCMH #5 OOTCML	Orientation type setting ORTYP1 / ORTYP0 / Orientation type: 0 / 0 / Conventional orientation; 0 / 1 / Optimum orientation; 1 / 0 / High-speed orientation Optimum orientation: Velocity feed-forward setting is, disabled (0) / enabled (1) Optimum orientation: Velocity feed-forward setting is, disabled (0) / enabled (1) High-speed orientation: The speed command is, not compensated (0) / compensated (1)	
4019	Speed clamp, Automatic parameter setting function	
#2 SSTTRQ #4 SDTCHG	When the speed is 0, speed clamping is, enabled (0) / disabled (1) In switching from high speed to low speed at output switching time, the function for switching based on the speed detection signal SDT set to 1 is, disabled (0) / enabled (1)	

ORTYP1	ORTYP0	Orientation type
0	0	Conventional orientation
0	1	Optimum orientation
1	0	High-speed orientation

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#7 PRLOAD	Automatic parameter setting is, not performed (0) / performed (1)	
4020	Maximum motor speed $[min^{-1}]$	
4021	Maximum speed on Cs contour control mode $[min^{-1}]$	
4022	Speed arrival detection level [0.1%]	
4023	Speed detection level [0.1%]	
4024	Zero speed detection level [0.01%]	
4025	Limited torque [%]	
4026	Load detection level 1 [%]	
4027	Load detection level 2 [%]	
4028	Limited output pattern	
4029	Output limit [%]	
4030	Soft start/stop time $[min^{-1}/s]$	
4031	Stop position of position coder method orientation	
4032	Acceleration on spindle synchronous control $[min^{-1}/s]$	
4033	Spindle synchronous speed arrival level $[min^{-1}]$	
4034	Shift during synchronous control of spindle phase	
4035	Compensation data for spindle phase synchronous control	
4036	Feed-forward coefficient [%]	
4037	Feed-forward coefficient of velocity loop	
4038	Optimum orientation: Upper orientation speed $[min^{-1}]$ Conventional orientation, High-speed orientation: Spindle orientation speed $[min^{-1}]$	
4039	Induction (HRV): Slip compensation gain Synchronous (HRV): Not used	
4040	Velocity loop proportional gain on velocity control mode(High)	
4041	Velocity loop proportional gain on velocity control mode (Low)	
4042	Velocity loop proportional gain on orientation (High)	
4043	Velocity loop proportional gain on orientation (Low)	
4044	Velocity loop proportional gain on servo mode/spindle synchronous control (High)	
4045	Velocity loop proportional gain on servo mode/spindle synchronous control (Low)	
4046	Velocity loop proportional gain on Cs contour control(High)	
4047	Velocity loop proportional gain on Cs contour control (Low)	
4048	Velocity loop integral gain on velocity control mode (High)	
4049	Velocity loop integral gain on velocity control mode (Low)	
4050	Velocity loop integral gain on orientation (High)	
4051	Velocity loop integral gain on orientation (Low)	
4052	Velocity loop integral gain on servo mode/spindle synchronous control (High)	
4053	Velocity loop integral gain on servo mode/spindle synchronous control (Low)	
4054	Velocity loop integral gain on Cs contour control (High)	
4055	Velocity loop integral gain on Cs contour control (Low)	
4056	Motor speed per spindle revolution (High) $[\times 100]$	
4057	Motor speed per spindle revolution (Medium High) $[\times 100]$	
4058	Motor speed per spindle revolution (Medium Low) $[\times 100]$	
4059	Motor speed per spindle revolution (Low) $[\times 100]$	
4060	Position gain on orientation (High)	
4061	Position gain on orientation (Medium High)	
4062	Position gain on orientation (Medium Low)	
4063	Position gain on orientation (Low)	

4064	Ordinary orientation: Rate of change in position gain upon completion of orientation [%] High-speed orientation: Rate of change in position gain upon completion of orientation [%] Optimum orientation: Position feed forward coefficient [%]	
4065	Position gain on servo mode/spindle synchronous control (High)	
4066	Position gain on servo mode/spindle synchronous control (Medium High)	
4067	Position gain on servo mode/spindle synchronous control (Medium Low)	
4068	Position gain on servo mode/spindle synchronous control (Low)	
4069	Position gain on Cs contour control (High)	
4070	Position gain on Cs contour control (Medium High)	
4071	Position gain on Cs contour control (Medium Low)	
4072	Position gain on Cs contour control (Low)	
4073	Grid shift on servo mode	
4074	Reference position return speed on Cs contour control/servo mode [min^{-1}]	
4075	Detection level for orientation completion signal	
4076	Ordinary orientation: Motor speed limit value on orientation [%] High-speed orientation: Reserved Optimum orientation: Delay time for acceleration detection (H)/bell-shaped acc./dec. time constant (L) [(H): 10ms, (L): 1	
4077	Orientation stop position shift	
4078	MS signal constant	
4079	MS signal gain adjustment	
4080	Induction (HRV): Regenerative power limit for high-speed zone/regenerative power limit Synchronous (HRV): regenerative power limit	
4081	Delay time until motor power is cut off [10ms]	
4082	Setting of acc./dec. time [s]	
4083	Induction (HRV): Motor voltage on velocity control mode Synchronous (HRV): Thousands and hundreds digits: Current ratio in pole position detection operation [%] Tens and ones digits: Stop confirmation time in pole position detection operation [0.1sec]	
4084	Induction (HRV): Motor voltage on orientation Synchronous (HRV): AMR offset	
4085	Induction (HRV): Motor voltage on servo mode/spindle synchronous control mode Synchronous (HRV): Fine AMR offset tuning	
4086	Induction (HRV): Motor voltage on Cs contour control Synchronous (HRV): Inductance ratio	
4087	Overspeed level [%]	
4088	Level for detecting excess velocity error when motor is restrained [0.01%]	
4089	Level for detecting excess velocity error when motor rotates [0.1%]	
4090	Overload detection level [%]	
4091	Rate of change in position gain during reference position return on servo mode [%]	
4092	Rate of change in position gain during reference position return on Cs contour control [%]	
4093	Value displayed on load meter at maximum output	
4094	Acceleration feedback gain	
4095	Adjusted output voltage of speedometer [0.1%]	
4096	Adjusted output voltage of load meter [0.1%]	

4097	Feedback gain of spindle speed	
4098	Maximum speed for position feedback signal detection [min^{-1}]	
4099	Delay time for motor excitation [ms]	
4100	Induction (HRV): Base speed of motor output specifications Synchronous (HRV): Base speed of motor output specifications	
4101	Induction (HRV): Output limit for motor output specifications Synchronous (HRV): Output limit for motor output specifications	
4102	Induction (HRV): Excitation voltage saturation speed at no-load Synchronous (HRV): Base speed at maximum load	
4103	Induction (HRV): Base speed limit ratio Synchronous (HRV): Magnetic flux weakening start speed/current pattern switch speed	
4104	Induction (HRV): Current loop proportional gain Synchronous (HRV): Current loop proportional gain	
4106	Induction (HRV): Current loop integral gain Synchronous (HRV): Current loop integral gain	
4108	Induction (HRV): Velocity at which the current loop integral gain is zero Synchronous (HRV): Velocity at which the current loop integral gain is zero	
4109	Induction (HRV): Filter time constant for processing saturation related to the voltage command Synchronous (HRV): Not used	
4110	Induction (HRV): Current conversion constant Synchronous (HRV): Current conversion constant	
4111	Induction (HRV): Secondary current coefficient Synchronous (HRV): Maximum current coefficient	
4112	Induction (HRV): Criterion level for saturation related to the voltage command/PWM command clamp value Synchronous (HRV): Criterion level for saturation related to the voltage command/PWM command clamp value	
4113	Induction (HRV): Slip constant Synchronous (HRV): Current coefficient for magnetic flux weakening	
4114	Induction (HRV): Slip compensation coefficient for a high-speed zone/slip compensation coefficient at deceleration Synchronous (HRV): Not used	
4115	Induction (HRV): PWM command clamp value at deceleration Synchronous (HRV): PWM command clamp value at deceleration	
4116	Induction (HRV): Motor leakage constant Synchronous (HRV): Back electromotive voltage compensation coefficient	
4117	Induction (HRV): Regular-time voltage compensation coefficient for high-speed zone/regular-time motor voltage coefficient Synchronous (HRV): Interference voltage compensation coefficient	
4118	Induction (HRV): Acceleration-time voltage compensation coefficient for high-speed zone/acceleration-time motor voltage coefficient Synchronous (HRV): Not used	
4119	Induction (HRV): Deceleration-time excitation current change time constant/excitation current change time constant Synchronous (HRV): Interference voltage compensation	
4120	Induction (HRV): Dead-band rectangular wave component zero voltage/dead-band data Synchronous (HRV): Dead-band rectangular wave component zero voltage/dead-band data	

4121	Time constant for changing the torque (TCMD filter time constant) [0.5ms]	
4122	Time constant for velocity detecting filter [0.1ms]	
4123	Short-time overload detection time [s]	
4124	Induction (HRV): Not used Synchronous (HRV): Not used	
4127	Value displayed on load meter at maximum output	
4128	Induction (HRV): maximum torque curve compensation coefficient Synchronous (HRV): Not used	
4129	Induction (HRV): Secondary current coefficient for rigid tapping Synchronous (HRV): Not used	
4130	Induction (HRV): Current loop proportional gain speed coefficient/current phase delay compensation coefficient Synchronous (HRV): Current phase delay compensation coefficient	
4131	Time constant for velocity detecting filter (on Cs contour control) [0.1ms]	
4133	Motor model code	
4134	Motor overheat detect level (2-word)	
4135	Grid shift during Cs contour control mode (2-word)	
4136	Induction (HRV): Motor voltage on velocity control mode	
4137	Induction (HRV): Motor voltage on servo mode/spindle synchronous control mode	
4138	Induction (HRV): Base speed of motor output specifications	
4139	Induction (HRV): Output limit for motor output specifications	
4140	Induction (HRV): Excitation voltage saturation speed at no-load	
4141	Induction (HRV): Base speed limit ratio	
4142	Induction (HRV): Current loop proportional gain	
4143	Induction (HRV): Current loop integral gain	
4144	Induction (HRV): Velocity at which the current loop integral gain is zero	
4145	Induction (HRV): Filter time constant for processing saturation related to the voltage command	
4146	Induction (HRV): Current conversion constant	
4147	Induction (HRV): Secondary current coefficient	
4148	Induction (HRV): Criterion level for saturation related to the voltage command/PWM command clamp value	
4149	Induction (HRV): Slip constant	
4150	Induction (HRV): Slip compensation coefficient for a high-speed zone/slip compensation coefficient at deceleration	
4151	Induction (HRV): PWM command clamp value at deceleration	
4152	Induction (HRV): Motor leakage constant	
4153	Induction (HRV): Regular-time voltage compensation coefficient for high-speed zone/regular-time motor voltage coefficient	
4154	Induction (HRV): Acceleration-time voltage compensation coefficient for high-speed zone/acceleration-time motor voltage coefficient	
4155	Induction (HRV): Not used	
4156	Induction (HRV): Slip compensation gain	
4157	Time constant for changing the torque (TCMD filter time constant) [0.5ms]	
4158	Induction (HRV): maximum torque curve compensation coefficient	
4159	Induction (HRV): Secondary current coefficient for rigid tapping	
4160	Hysteresis of speed detection level [min^{-1}]	

4161	Induction (HRV): Current loop proportional gain speed coefficient/current phase delay compensation coefficient	
4162	Integral gain of velocity loop during cutting feed on Cs contour control mode (High)	
4163	Integral gain of velocity loop during cutting feed on Cs contour control mode (Low)	
4165	Induction (HRV): Excitation current change time constant	
4166	Induction (HRV): Regenerative power limit for high-speed zone/regenerative power limit	
4168	Current overload alarm detection level	
4169	Temperature monitoring time constant	
4170	Current overload alarm detection level	
4171	Denominator of arbitrary gear ratio between motor sensor and spindle (High)	
4172	Numerator of arbitrary gear ratio between motor sensor and spindle (High)	
4173	Denominator of arbitrary gear ratio between motor sensor and spindle (Low)	
4174	Numerator of arbitrary gear ratio between motor sensor and spindle (Low)	
4176	Setting of rotation direction	
#0 ROTA1 #4 RETSV	The spindle and spindle motor rotate, in the same direction (0) / in the opposite directions (1) In the servo mode, the direction of reference position return is, counterclockwise (0) / clockwise (1)	When viewed from the spindle
4177	Magnetic sensor, Spindle sensor, MRDY signal	
#0 MRDY1 #3 MGDIR #4 SSDIRC	The MRDY signal is, not used (0) / used (1) The magnetic sensor and spindle motor rotate, in the opposite directions (0) / in the same direction (1) The spindle sensor and spindle motor rotate, in the same direction (0) / in the opposite directions (1)	
4178	Spindle sensor, Rotation direction function	
#0 SSTYP0 #1 SSTYP1 #2 SSTYP2 #3 SSTYP3	Type of spindle sensor	

SSTYP3	SSTYP2	SSTYP1	SSTYP0	Spindle sensor
0	0	0	0	None (Position control is not exercised.)
0	0	0	1	The motor sensor is used for position feedback.
0	0	1	0	αi position coder
0	0	1	1	Separate αiBZ sensor, αiCZ sensor (analog)
0	1	0	0	α position coder S

#5 SVMDRT	In the servo mode, the rotation direction function is, enabled (0) / disabled (1)	
4179	Spindle sensor, Orientation	
#0 PCMGSL #2 DIRCT1 #3 DIRCT2	The system of orientation is, position coder system (0) / magnetic sensor system (1) Rotation direction at spindle orientation	

DIRCT2	DIRCT1	Rotation direction
0	0	Rotation direction immediately before (Counterclockwise for the 1st time after power-on)
0	1	Rotation direction immediately before (Clockwise for the 1st time after power-on)
1	0	Counterclockwise when viewed from the motor shaft
1	1	Clockwise when viewed from the motor shaft

#4 PCTYPE #5 PCPL0 #6 PCPL1 #7 PCPL2	Setting of the number of spindle sensor teeth	

PCPL2	PCPL1	PCPL0	PCTYPE	Number of spindle sensor teeth
0	0	0	0	256 λ/rev
0	0	0	1	128 λ/rev
0	1	0	0	512 λ/rev
0	1	0	1	64 λ/rev
1	0	0	0	768 λ/rev
1	0	0	1	1024 λ/rev
1	1	0	0	384 λ/rev

4180	External one-rotation signal	
#2 EXTRF #3 RFTYPE	The external one-rotation signal is, not used (0) / used (1) The external one-rotation signal is detected, on its rising edge (0) / on its falling edge (1)	
4182	Gear ratio, Motor speed setting unit, Analog override	
#1 GRUNIT #2 SPDUNT #5 ALGOVR #7 RGTCMR	The gear ratio resolution is, 0.01 (0) / 0.001 (1) The unit of motor speed is, 1 min^{-1} (0) / 10 min^{-1} (1) The spindle analog override is, 0% to 100% (0) / 0% to 120% (1) In rigid tapping, the arbitrary gear ratio (CMR) function on the command side is, not used (0) / used (1)	PRM 4216,4217
4183	Alarms related to feedback signals	
#5 PCLS #6 PCALCH	Detection of a feedback signal disconnection is, enabled (0) / disabled (1) Detection of alarms (41, 42, 47, 81, 82, 83, 85, 86, 87) related to the position feedback signal (in a mode other than the Cs contour control mode) is, enabled (0) / disabled (1)	
4184	Output restriction method	
#4 PLMALW	Output restriction method setting	
4185	Unit of velocity loop gain setting	
#0 VLPGAN #2 ALSP #4 LDTOUT #6 OVRTYP	The setting of a velocity loop gain is, used without modification (0) / used after division by 16 (1) When a serial communication alarm is issued, the power is, turned off after the motor stops (0) / turned off immediately (1) During acc./dec., the load detection signal is, not output (0) / output (1) The type of analog override is, linear function type (0) / quadratic function type (1)	
4186	Motor sensor type	
#0 MSTYP0 #1 MSTYP1 #2 MSTYP2	Motor sensor type	

MSTYP2	MSTYP1	MSTYP0	Spindle sensor type
0	0	0	αiM sensor
0	0	1	αiMZ, αiBZ, αiCZ sensor (analog)

4187	Number of teeth setting of motor sensor	
#0 VDT1 #1 VDT2 #2 VDT3	Number of teeth setting of motor sensor	

VDT3	VDT2	VDT1	Number of teeth setting of motor sensor
0	0	0	64 λ/rev
0	0	1	128 λ/rev
0	1	0	256 λ/rev
0	1	1	512 λ/rev
1	0	0	192 λ/rev
1	0	1	384 λ/rev

#3 POLE1 #4 MXPW #7 POLE2	Number of motor poles Specification of maximum output at acceleration time Number of motor poles	

POLE2	POLE1	Number of motor poles
0	0	2 poles
0	1	4 poles
1	0	8 poles
1	1	6 poles

4188	Spindle HRV function setting, Induction motor/synchronous motor selection	
#0 PWM1 #1 PWM2 #2 PWM3 #6 SYSP #7 SPHRV	PWM setting Induction motor (0) The spindle HRV function is enabled (1)	
4189	Setting of current dead zone data	
#2 DS1 #3 DS2 #4 DS3 #5 DS4 #6 DS5 #7 PWM3K	Setting of current dead zone data PWM setting	

Amplifier model		Parameter setting				
200 V input	400 V input (HV)	DS5	DS4	DS3	DS2	DS1
All models		0	0	0	1	1

4191	Orientation function, Load monitor function, Output switching function	
#0 ORIENT #1 SPLDMT #2 SPDSW #3 SPDTDM #7 DCS	The orientation function is, not used (0) / used (1) The spindle load monitor function is, disabled (0) / enabled (1) The output switching function is, not used (0) / used (1) The spindle tandem function is, not provided (0) / provided (1) The dual check safety function is, not provided (0) / provided (1)	
4192	Servo mode	
#3 FFSMTH #4 IDLPTN - #6 RFCHK2 #7 RFCHK3	The feed-forward smoothing function is, disabled (0) / enabled (1) Induction (HRV): Usually (0) / when a value less than 100 is set as the motor voltage (No. 4238) in the servo mode (1) Synchronous (HRV): Not used The alarm (46) related to threading position detection signal feedback is, not detected (0) / detected (1) The function for detecting the one-rotation signal again before the position control mode is entered is, disabled (0) / enabled (1)	
4193	Orientation	
#7 NRROEN	When a command for orientation from the stop state is specified, the shortcut function is, disabled (0) / enabled (1)	
4194	Orientation	
#3 ORTYP0 #6 ORTYP1	Orientation type setting	

ORTYP1	ORTYP0	Orientation type
0	0	Conventional orientation
0	1	Optimum orientation
1	0	High-speed orientation

#4 OOTCMH #5 OOTCML	Optimum orientation: Velocity feed-forward setting is, disabled (0) / enabled (1) Optimum orientation: Velocity feed-forward setting is, disabled (0) / enabled (1) High-speed orientation: The speed command is, not compensated (0) / compensated (1)	
4195	Speed clamp, Automatic parameter setting function	
#2 SSTTRQ #4 SDTCHG #7 PRLOAD	When the speed is 0, speed clamping is, enabled (0) / disabled (1) In switching from high speed to low speed at output switching time, the function for switching based on the speed detection signal SDT set to 1 is, disabled (0) / enabled (1) Automatic parameter setting is, not performed (0) / performed (1)	
4196	Maximum motor speed [min^{-1}]	
4197	Speed arrival detection level [0.1%]	
4198	Speed detection level [0.1%]	
4199	Zero speed detection level [0.01%]	

4200	Limited torque	[%]	
4201	Load detection level 1	[%]	
4202	Limited output pattern		
4203	Output limit	[%]	
4204	Stop position of position coder method orientation		
4205	Optimum orientation: Upper orientation speed Spindle orientation speed	[min^{-1}] [min^{-1}]	
4206	Velocity loop proportional gain on velocity control mode(High)		
4207	Velocity loop proportional gain on velocity control mode (Low)		
4208	Velocity loop proportional gain on orientation (High)		
4209	Velocity loop proportional gain on orientation (Low)		
4210	Velocity loop proportional gain on servo mode (High)		
4211	Velocity loop proportional gain on servo mode (Low)		
4212	Velocity loop integral gain on velocity control mode (common to High and Low)		
4213	Velocity loop integral gain on orientation (common to High and Low)		
4214	Velocity loop integral gain on servo mode/spindle synchronous control (common to High and Low)		
4215	Primary delay time constant in dual position feedback		
4216	Motor speed per spindle revolution (High)	[×100]	
4217	Motor speed per spindle revolution (Low)	[×100]	
4218	Position gain on orientation (High)		
4219	Position gain on orientation (Low)		
4220	Standard orientation: Ordinary orientation: Rate of change in position gain upon completion of orientation High-speed orientation: Acceleration limitation ratio at deceleration time Optimum orientation: Position feed forward coefficient	[%] [%] [%]	
4221	Position gain on servo mode (High)		
4222	Position gain on servo mode (Low)		
4223	Grid shift on servo mode		
4224	Maximum amplitude in dual position feedback		
4225	Dual position feedback zero width		
4226	Detection level for orientation completion signal		
4227	Ordinary orientation: Motor speed limit value on orientation High-speed orientation: Not used Optimum orientation: Delay time for acceleration detection (H)/bell-shaped acc./dec. time constant (L)	[%] [(H): 10ms, (L): 1 ms]	
4228	Orientation stop position shift		
4229	MS signal constant		
4230	MS signal gain adjustment		
4231	Induction (HRV)(H): Regenerative power limit for high-speed zone/regenerative power limit		
4232	Delay time until motor power is cut off	[10ms]	
4233	Setting of acc./dec. time	[s]	
4234	Spindle load monitor observer gain 1		
4235	Spindle load monitor observer gain 2		
4236	Induction (HRV): Motor voltage on velocity control mode		
4237	Induction (HRV): Motor voltage on orientation		
4238	Induction (HRV): Motor voltage on servo mode		
4239	Rate of change in position gain during reference position return on servo mode	[%]	
4240	Feed-forward coefficient	[%]	
4241	Feed-forward coefficient of velocity loop		

4243	Denominator of arbitrary gear ratio between motor sensor and spindle (High)	
4244	Numerator of arbitrary gear ratio between motor sensor and spindle (High)	
4245	Denominator of arbitrary gear ratio between motor sensor and spindle (Low)	
4246	Numerator of arbitrary gear ratio between motor sensor and spindle (Low)	
4248	Spindle load monitor torque constant	
4249	Spindle load monitor observer gain 1	
4250	Spindle load monitor observer gain 2	
4254	Induction (HRV): Slip compensation gain	
4255	Induction (HRV): Slip compensation gain	
4256	Induction (HRV): Base speed of motor output specifications	
4257	Induction (HRV): Output limit for motor output specifications	
4258	Induction (HRV): Excitation voltage saturation speed at no-load	
4259	Induction (HRV): Base speed limit ratio	
4260	Induction (HRV): Current loop proportional gain	
4261	Induction (HRV): Current loop integral gain	
4262	Induction (HRV): Velocity at which the current loop integral gain is zero	
4263	Induction (HRV): Filter time constant for processing saturation related to the voltage command	
4264	Induction (HRV): Current conversion constant	
4265	Induction (HRV): Secondary current coefficient	
4266	Induction (HRV): Criterion level for saturation related to the voltage command/PWM command clamp value	
4267	Induction (HRV): Slip constant	
4268	Induction (HRV): Slip compensation coefficient for a high-speed zone/slip compensation coefficient at deceleration	
4269	Induction (HRV): PWM command clamp value at deceleration	
4270	Induction (HRV): Motor leakage constant	
4271	Induction (HRV): Regular-time voltage compensation coefficient for high-speed zone/regular-time motor voltage coefficient	
4272	Induction (HRV): Acceleration-time voltage compensation coefficient for high-speed zone/acceleration-time motor voltage coefficient	
4273	Time constant for changing the torque (TCMD filter time constant) [0.5ms]	
4274	Value displayed on load meter at maximum output	
4275	Induction (HRV): Maximum torque curve compensation coefficient	
4276	Induction (HRV): Secondary current coefficient for rigid tapping	
4277	Induction (HRV): Current loop proportional gain speed coefficient/current phase delay compensation coefficient	
4278	Time constant for velocity detecting filter	
4279	Value displayed on load meter at maximum output	
4280	Induction (HRV): Deceleration-time excitation current change time constant/excitation current change time constant	
4281	Spindle load monitor torque constant	
4282	Spindle load monitor torque constant	
4283	Spindle load monitor torque constant	
4284	Induction (HRV): Motor voltage on velocity control mode	
4285	Induction (HRV): Motor voltage on servo mode	
4286	Induction (HRV): Base speed of motor output specifications	
4287	Induction (HRV): Output limit for motor output specifications	

4288	Induction (HRV): Excitation voltage saturation speed at no-load	
4289	Induction (HRV): Base speed limit ratio	
4290	Induction (HRV): Current loop proportional gain	
4291	Induction (HRV): Current loop integral gain	
4292	Induction (HRV): Velocity at which the current loop integral gain is zero	
4293	Induction (HRV): Filter time constant for processing saturation related to the voltage command	
4294	Induction (HRV): Current conversion constant	
4295	Induction (HRV): Secondary current coefficient	
4296	Induction (HRV): Criterion level for saturation related to the voltage command/PWM command clamp value	
4297	Induction (HRV): Slip constant	
4298	Induction (HRV): Slip compensation coefficient for a high-speed zone/slip compensation coefficient at deceleration	
4299	Induction (HRV): PWM command clamp value at deceleration	
4300	Induction (HRV): Motor leakage constant	
4301	Induction (HRV): Regular-time voltage compensation coefficient for high-speed zone/regular-time motor voltage coefficient	
4302	Induction (HRV): Acceleration-time voltage compensation coefficient for high-speed zone/acceleration-time motor voltage coefficient	
4303	Time constant for changing the torque (TCMD filter time constant) [0.5ms]	
4304	Induction (HRV): Compensation coefficient between the specification and true base/maximum torque curve compensation coefficient	
4305	Induction (HRV): Secondary current coefficient for rigid tapping	
4306	Induction (HRV): Current loop proportional gain speed coefficient/current phase delay compensation coefficient	
4307	Induction (HRV): Regenerative power limit for high-speed zone/regenerative power limit	
4308	Induction (HRV): Deceleration-time excitation current change time constant/excitation current change time constant	
4309	Motor model code	
4310	Motor overheat detect level (2-word)	
4320	Optimum orientation: Spindle acceleration command (High) [$10min^{-1}/s$] High-speed orientation: Motor acceleration at deceleration time (High) [$10min^{-1}/s$]	
4321	Optimum orientation: Spindle acceleration command (Low) [$10min^{-1}/s$] High-speed orientation: Motor acceleration at deceleration time (Medium High) [$10min^{-1}/s$]	
4322	Optimum orientation: Spindle acceleration command (High) [$10min^{-1}/s$] High-speed orientation: Motor acceleration at deceleration time (Medium Low) [$10min^{-1}/s$]	

4323	Optimum orientation: Spindle acceleration command (Low) [10min^{-1}/s] High-speed orientation: Motor acceleration at deceleration time (Low) [10min^{-1}/s]	
4324	Optimum orientation: One-rotation signal detection speed [min^{-1}] High-speed orientation: Motor acceleration at deceleration time (High) [10min^{-1}/s]	
4325	Optimum orientation: One-rotation signal detection speed [min^{-1}] High-speed orientation: Motor acceleration at deceleration time (Low) [10min^{-1}/s]	
4326	Optimum orientation: Time constant for overshoot compensation (H)/spindle acceleration command limit ratio (L) (High) [(H):ms, (L):%] High-speed orientation: Acceleration limitation start speed at deceleration time (High) [min^{-1}]	
4327	Optimum orientation: Time constant for overshoot compensation (H)/spindle acceleration command limit ratio (L) (Low) [(H):ms, (L):%] High-speed orientation: Acceleration limitation start speed at deceleration time (High) [min^{-1}]	
4328	Command multiplication for spindle orientation by position coder	
4329	Command multiplication for spindle orientation by position coder	
4330	Optimum orientation: Time constant for overshoot compensation (H)/spindle acceleration command limit ratio (L) (High) [(H):ms, (L):%] High-speed orientation: Acceleration limitation start speed at deceleration time (Low) [min^{-1}]	
4331	Optimum orientation: Time constant for overshoot compensation (H)/spindle acceleration command limit ratio (L) (Low) [(H):ms, (L):%] High-speed orientation: Acceleration limitation start speed at deceleration time (Low) [min^{-1}]	
4332	Induction (HRV): Not used	
4333	Induction (HRV): Not used	
4334	Number of motor sensor arbitrary teeth	
4335	Number of motor sensor arbitrary teeth	
4336	Switching point used for an acc./dec. time constant used for spindle synchronous control [min^{-1}]	
4340	Bell-shaped acc./dec. time constant during spindle synchronous control [ms]	
4341	Unexpected disturbance torque detection level [0.01%]	
4342	Velocity loop gain override in Cs contour control (High) [%]	
4343	Velocity loop gain override in Cs contour control (Low) [%]	
4344	Advanced preview feed-forward coefficient [0.01%]	
4345	Serial spindle motor detection speed	
4346	Incomplete integration factor	
4347	Master-slave speed difference state signal output setting [min^{-1}]	
4348	Current overload alarm detection level	
4349	Temperature monitoring time constant	
4350	Current overload alarm detection level	
4351	Current detection offset compensation	
4352	Valid feed-forward range, EGB	
#1 PKHALW	The load meter output peak hold function is, disabled (0) / enabled (1)	

#3 LMTYPE	Load meter (normalized by the maximum output/continuous rated output) switch bit	
#4 FFALWS	Feed-forward is enabled, only in cutting feed (0) / at all times (1)	
#6 SLAVE	Spindle-amplifier communication is, disabled (0) / slave axis (1)	Tandem slave axis specification when parameter (No. 4015#3) is set to 1
#7 MASTER	Spindle-amplifier communication is, disabled (0) / master axis (1)	Tandem master specification when parameter (No. 4015#3) is set to 1
4353	Tandem control	
#1 VFBAV	For the velocity feedback signal in the torque tandem mode, only the motor speed on the master side is used (0) / the average speed of the master and slave is used (1)	
#2 RVSVC2	In the torque tandem mode, the master motor and slave motor rotate, in the same direction (0) / in the opposite directions (1)	Functions in combination with parameter (No. 4009#1).
#5 CSPTRE	The position data transfer function for Cs origin establishment is, disabled (0) / enabled (1)	
4354	Excessive semi-closed loop/closed loop position error alarm (alarm 61) detection level	
4355	Motor sensor signal amplitude ratio compensation	
4356	Motor sensor signal phase difference compensation	
4357	Spindle sensor signal amplitude ratio compensation	
4358	Spindle sensor signal phase difference compensation	
4360	Preload value	
4361	Number of spindle sensor arbitrary teeth	
4362	Load meter compensation 1	
4363	Load meter compensation 2	
4364	Load meter compensation 3	
4365	Load meter compensation 1	
4366	Load meter compensation 2	
4367	Load meter compensation 3	
4368	Induction (HRV): Not used	
4369	Spindle synchronous orientation deceleration coefficient [%]	
4370	Time constant for spindle acceleration detecting filter [ms]	
4372	Safety limit speed 1 for each spindle [min^{-1}]	
4373	Load meter output	
#1 PKHALW	The load meter output peak hold function is, disabled (0) / enabled (1)	
4376	Load meter compensation 1	
4377	Load meter compensation 2	
4378	Load meter compensation 3	
4379	Load meter compensation 1	
4380	Load meter compensation 2	
4381	Load meter compensation 3	
4383	Time constant for spindle acceleration detecting filter [ms]	
4386	Spindle EGB: master side detector pulse count	
4387	Spindle EGB: synchronous ratio numerator	
4388	Spindle EGB: synchronous ratio denominator	
4391	Resonance elimination filter 1: attenuation center frequency [Hz]	

4392	Resonance elimination filter 1: attenuation bandwidth [Hz]	
4393	Resonance elimination filter 1: damping [%]	
4394	One-rotation signal detection	
#2 ZPHDTC #5 A21DEN	The lower limit of one-rotation signal detection speed is, spindle speed 10 min^{-1} or more (0) / not applicable (1) Detection of the spindle sensor polarity setting error alarm (alarm 21) is, enabled (0) / disabled (1)	
4395	Disturbance function setting	
#2 ESYEGB #3 PRIMED #6 DTQTRG #7 DTQFNC	The simple spindle EGB function is, disabled (0) / enabled (1) Parameters transferred from the CNC are, enabled one second later (0) / enabled immediately (1) The disturbance input function is, disabled (0) / enabled (1) When disturbance is input, a transition from 0 to 1 starts measurement and a transition from 1 to 0 ends measurement.	
4398	Pole detect method	
#2 SELMET #3 WNDTDM #6 A130DN	The pole detect method is based on, DC activation (0) / automatic mode (1) The twin-drive function is, not provided (0) / provided (1) In torque tandem mode, a speed polarity error (alarm 130) is, detected (0) / not detected (1)	
4399		
#1 CTLSTP #2 SOSALW #5 NCHAMR #6 MINUTE	When the safety speed exceeded alarm (alarm 69) is detected, a free-run stop occurs (0) / a controlled stop occurs (1) During emergency stop operation, the soft start/stop function is, disabled (0) / enabled (1) Synchronous (HRV): Detection of a pole position count error alarm (alarm 91) is, enabled (0) / disabled (1) Synchronous (HRV): For pole detection, the automatic selection mode is set (0) / the minute operation mode is set (1)	
4402		
#3 TTANEN	Torque tandem control is disabled (0) / enabled (1).	
4406	Acceleration/deceleration time constant for reference position return in Cs contour control [ms]	
4409	Feed-forward timing adjustment coefficient	
4410	Disturbance input function: measurement start frequency [Hz]	
4411	Disturbance input function: measurement end frequency [Hz]	
4412	Disturbance input function: measurement frequency interval [Hz]	
4413	Disturbance input function: number of measurements per frequency	
4414	Disturbance input function: disturbance torque command amplitude [%]	
4415	Disturbance input function: motor speed command for measurement [min^{-1}]	
4416	Resonance elimination filter 2: attenuation center frequency[H	
4417	Resonance elimination filter 2: attenuation bandwidth [Hz]	
4418	Resonance elimination filter 2: damping [%]	
4419	Resonance elimination filter 3: attenuation center frequency[H	
4420	Resonance elimination filter 3: attenuation bandwidth [Hz]	
4421	Resonance elimination filter 3: damping [%]	
4422	Resonance elimination filter 4: attenuation center frequency [Hz]	
4423	Resonance elimination filter 4: attenuation bandwidth [Hz]	
4424	Resonance elimination filter 4: damping [%]	
4438	Safety limit speed 2 for each spindle [min^{-1}]	
4440	Safety limit speed 3 for each spindle [min^{-1}]	

4442	Safety limit speed 4 for each spindle [min^{-1}]	
4443	Feed-forward coefficient of velocity loop	
4448	Spindle stop judgment level [min^{-1}]	
4449	Direction detection current/polarity determination current for automatic mode pole position detection	
4450	Allowable travel distance magnification/velocity feedback threshold for automatic mode pole position detection	
4464	Overspeed offset level depending on velocity command [0.1%]	
4465	Excessive speed deviation level 2 [min^{-1}]	
4466	Excessive speed deviation detection time 2 [0.1s]	
4467		
#2 ZPHDTC #5 A21DEN	Setting of the detection lower limit of the one-rotation signal Whether to detect the alarm (alarm 21) related to spindle sensor polarity erroneous setting	
4468		
#6 DTQTRG #7 DTQFNC	Triggering of the disturbance input function (vibration application function) Setting of the disturbance input function (vibration application function)	
4472		
#2 SOSALW	During emergency stop operation, the soft start/stop function is, disabled (0) / enabled(1)	
4481	Feed-forward timing adjustment coefficient	
4486	Feed-forward coefficient of velocity loop	
4498	Spindle EGB master side: denominator of arbitrary gear ratio between motor sensor and spindle	
4499	Spindle EGB master side: numerator of arbitrary gear ratio between motor sensor and spindle	
4500	Denominator of arbitrary gear ratio between spindle sensor and spindle (High)	
4501	Numerator of arbitrary gear ratio between spindle sensor and spindle (High)	
4502	Denominator of arbitrary gear ratio between spindle sensor and spindle (Low)	
4503	Numerator of arbitrary gear ratio between spindle sensor and spindle (Low)	
4508	Rate of change in acceleration at soft start/stop [$10min^{-1}/s^2$]	
4510	Power failure backup function Upper limit of the DC link voltage	
4511	Power failure backup function Lower limit of the DC link voltage	
4515	Excessive speed deviation alarm detection level on spindle synchronous control [min^{-1}]	
4516	Excessive positional deviation alarm detection level on spindle synchronous control	
4520	Primary delay time constant in dual position feedback [for servo mode]	
4521	Maximum amplitude in dual position feedback [for servo mode]	
4522	Dual position feedback zero width [for servo mode]	
4523	Excessive semi-closed loop/closed loop position error alarm (alarm 61) detection level [for servo mode]	
4527	Difference in detection temperature between overheat alarm and warning	
4532	Arbitrary data output function number (for displaying the diagnosis screen)	
4540		
#0 EXPTCS	Setting related to the motor voltage control characteristics on Cs contouring control	

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4541		
#0 POWCAL	Power consumption calculation of spindle is disabled (0) / enabled (1).	
#1 PWCBT0	Internal unit setting of power consumption monitor	
#2 PWCBT1	Internal unit setting of power consumption monitor	
4542		
#0 ORPUNT	Least input increment for Stop position of spindle orientation, Stop position shift amount, In-position width 0.8789(=360/4096) [deg] (0) / 0.1098 (=360/32768) [deg] (1).	
#4 FFCHG	Cutting/rapid feed-forward function selection bit	
#6 PFBTYP	Power failure backup function Operation setting	
4545		
#0 SFBRBT	Safety check pause signal is disabled (0) / enabled (1).	
4549		
#0 SPZENB	Leakage detection function is disabled (0) / enabled (1).	
#1 FHRSP	Spindle control of FSSB high-speed rigid tapping is disabled (0) / enabled (1).	PRM 24203#1 24204 2005#1 2429#1
#2 FHESP	Spindle control by EGB (FSSB type) is disabled (0) / enabled (1)	PRM 24203#1 24204 2429#2
4550	Velocity loop proportional gain on spindle synchronous control (High)	
4551	Velocity loop proportional gain on spindle synchronous control (Low)	
4552	Velocity loop integral gain on spindle synchronous control (High)	
4553	Velocity loop integral gain on spindle synchronous control (Low)	
4554	Position gain on spindle synchronous control（High）	
4555	Position gain on spindle synchronous control（Medium High）	
4556	Position gain on spindle synchronous control（Medium Low）	
4557	Position gain on spindle synchronous control（Low）	
4558	Motor voltage for spindle synchronous control (for high-speed characteristics)	
4559	Motor voltage for spindle synchronous control (for Low-speed characteristics)	
4590	Orientation speed restriction rate 1/orientation speed restriction rate 2 (HIGH)	
4591	Orientation speed restriction rate 1/orientation speed restriction rate 2 (LOW)	
4593	Loss coefficient E of spindle amplifier	
4594	Loss coefficient F of spindle amplifier	
4595	Loss coefficient C of power supply	
4596	Loss coefficient D of power supply	
4606	Preload time constant	
4607	Motor voltage after completion of optimum orientation	
4612	Parameter for load meter (normalized by the continuous rated output) <1>	
4613	Parameter for load meter (normalized by the continuous rated output) <2>	
4614	Parameter for load meter (normalized by the continuous rated output) <3>	
4615	Parameter for load meter (normalized by the continuous rated output) <4>	

4619	Cutting feed/rapid traverse PWM frequency switching in Cs contour control Setting related to the current limitation (for high-speed characteristics of speed range switching)	
4620	Cutting feed/rapid traverse PWM frequency switching in Cs contour control Setting related to the current limitation (for low-speed characteristics of speed range switching)	
4621	Cutting feed/rapid traverse PWM frequency switching in Cs contour control Velocity loop gain override	
4622	Cutting feed/rapid traverse PWM frequency switching in Cs contour control Current loop gain override	
4623	Distance coded sensor Nominal increment 1	
4624	Distance coded sensor Nominal increment 2	
4625	Distance coded sensor Z phase position compensation data	
4626	Output limitation value	
4627	Advanced preview feed-forward coefficient for cutting feed	
4629	Allowable acceleration for acceleration at a power failure (for high-speed characteristics)	
4630	Allowable acceleration for acceleration at a power failure (for low-speed characteristics)	
4657	Designation of PS control axis	
4672	Parameter of power supply	
#2 PFLPFB #3 EXTTH #5 ESPREC	Power failure detection same as PFB-R/PFB-C not active(0) / active(1) Thermostat of external devices, not connected (0) / connected (1) Power failure detection at ESP, not detect (0) / detect (1)	
4784	Power failure detection level 1／Power failure detection time 1	
4785	Power failure detection level 2／Power failure detection time 2	

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7.2.20 Spindle Control 2

4800	Spindle synchronous control, Spindle command synchronous control	
#5 SCB #6 EPZ #7 SPK	The master axis/slave axis combination in spindle synchronous control follows, the setting of parameter (No. 3704#4) (0) / compatibility with the conventional 16TT system (1) If the parking signal is switched in Cs contour control during spindle command synchronous control when a reference position is already established, the reference position establishment state is, continued (0) / canceled (1) The parking signals used for spindle command synchronous control are, Gn122.6, Gn122.7 (0) / Gn031.6, Gn031.7 (1)	
4801	Spindle rotation direction	
#0 SND	In spindle synchronous control, each spindle motor rotates, in the same direction as the sign of the command (0) / in the direction opposite to the sign of the command (1)	
4803	Arbitrary spindle position phase synchronization function	
#0 SM1 #1 SM2	Spindle position save to parameter No.4840 is not completed (0) / completed (1) Spindle position save to parameter No.4841 is not completed (0) / completed (1)	

#2 SM3	Spindle position save to parameter No.4842 is not completed (0) / completed (1)	
#3 SM4	Spindle position save to parameter No.4843 is not completed (0) / completed (1)	
4809	Spindle synchronous control	
#0 NSY	When the spindle speed changes during spindle synchronization control, resolution improvement is, disabled (0) / enabled (1)	
4810	Error pulse between two spindles when synchronizing phases in the spindle synchronization control mode	
4811	Allowable error count for the error pulses between two spindles in the spindle synchronization control mode	
4821	Master axis of each slave spindle under spindle command synchronous control	PRM 3704#5
4826	Allowable error count for the error pulses between two spindles in the spindle command synchronous control mode	F0043.0-3 Fn044.4
4831	Master axis of each slave spindle under spindle synchronous control	PRM 3704#4
4832	Master axis (logical spindle number) of each slave spindle in spindle synchronous control (spindle number common to the system)	
4840	Spindle position 1 used as phase shift amount	
4841	Spindle position 2 used as phase shift amount	
4842	Spindle position 3 used as phase shift amount	
4843	Spindle position 4 used as phase shift amount	
4900	Spindle speed fluctuation detection	
#0 FLR	The unit of an allowable ratio and fluctuation ratio set by parameter (No. 4911) and (No. 4912) is, 1% (0) / 0.1% (1)	
#4 FDE	Spindle speed fluctuation detection function is, enabled (0) / disabled (1)	
#7 FDT	Spindle speed fluctuation detect is started, when the set spindle speed range is reached or parameter (No. 4914) is satisfied (0) / only when parameter (No. 4914) is satisfied (1)	
4911	Allowable speed ratio (q) used to assume that the spindle has reached a specified speed	PRM 4900#0
4912	Spindle variation ratio (r) for not issuing a spindle speed fluctuation detection alarm	PRM 4900#0
4913	Spindle speed fluctuation width (i) for not issuing a spindle speed fluctuation detection alarm [min^{-1}]	
4914	Time (p) from the change of a specified speed until spindle speed fluctuation detection is started [ms]	
4950	Spindle positioning	
#0 IOR	Resetting the system in the spindle positioning mode, does not release the mode (0) / releases the mode (1)	
#1 IDM	The direction of spindle positioning using an M code is, positive (0) / negative (1)	
#2 ISZ	When an M code for spindle positioning is specified, spindle orientation is performed (0) / only switching to the spindle positioning mode is performed (1)	
#5 TRV	The rotation direction of spindle positioning is, not reversed (0) / reversed (1)	
#6 ESI	The unit of rapid traverse rate on the spindle positioning axis is, not increased by a factor of 10 (0) / increased by a factor of 10 (1)	
#7 IMB	Half-fixed angle positioning based on M codes uses, specification A (0) / specification B (1)	
4959	Spindle positioning	<Axis>
#0 DMD	A machine coordinate on the spindle positioning axis is displayed in, degrees (0) / pulses (1)	PRM 4950#0=1
4960	M code specifying the spindle orientation	
4961	M code releasing the spindle positioning mode	

4962	M code for specifying a spindle positioning angle	PRM 4963,4964
4963	Basic angle for half-fixed angle positioning [deg]	
4964	Number of M codes for specifying a spindle positioning angle	PRM4962
4970	Position gain	
4971	Position gain multiplier (1st stage)	
4972	Position gain multiplier (2nd stage)	
4973	Position gain multiplier (3rd stage)	
4974	Position gain multiplier (4th stage)	

7.2.21 Tool Compensation 1

<table>
<tr><td>5000</td><td>Tool compensation</td><td></td></tr>
<tr><td>#0 SBK

#1 MOF

#4 ASG</td><td>With a block created internally for tool radius and tool nose radius compensation, the single block mode is, disabled (0) / enabled (1)
If the tool length compensation shift type (parameter TOS (No. 5006#6) = 1 or parameter TOP(11400#2)=1) is used, and a tool length compensation amount change is made in the tool length compensation mode and block look-ahead state, compensation for the changed amount is performed as move type (0) / compensation for the changed amount is not performed until a tool length compensation command (offset number) and an absolute command for the compensation axis are specified (1)
When tool compensation memory B/C (M series) or the tool geometry/wear compensation function (T series) is valid, the compensation amount to be modified by the active offset value modification function based on manual feed is, geometry compensation value (0) / wear compensation value (1)</td><td></td></tr>
<tr><td>5001</td><td>Tool compensation</td><td></td></tr>
<tr><td>#0 TLC
#1 TLB</td><td>Selection of tool length compensation type<table><tr><th>TLB</th><th>TLC</th><th>Type</th></tr><tr><td>0</td><td>0</td><td>Tool length compensation A</td></tr><tr><td>1</td><td>0</td><td>Tool length compensation B</td></tr><tr><td>-</td><td>1</td><td>Tool length compensation C</td></tr></table></td><td>M series</td></tr>
<tr><td>#3 TAL</td><td>When two or more axes are offset in tool length compensation C, an alarm is issued (0) / no alarm is issued (1)</td><td>M series</td></tr>
<tr><td>#4 EVR</td><td>When a tool compensation value change is made in tool radius and tool nose radius compensation, the change is enabled starting from, the block where the next D or H code is specified (0) / the block where buffering is next performed (1)</td><td>M series</td></tr>
<tr><td>#6 EVO</td><td>If a tool compensation value modification is made for tool length compensation A or B, the new value becomes valid, in the block where the next G43, G44 or H code is specified (0) / in the block where buffering is next performed (1)</td><td></td></tr>
<tr><td>5002</td><td>Tool offset, Tool geometry/wear compensation</td><td>T series</td></tr>
<tr><td>#1 LGN</td><td>The geometry compensation number of tool offset is, the same as the wear compensation number (0) / tool selection number (1)</td><td>PRM5028</td></tr>
<tr><td>#2 LWT</td><td>Tool wear compensation is performed by, moving the tool (0) / shifting the coordinate system (1)</td><td></td></tr>
<tr><td>#3 ETC</td><td>When a T-code command is two digits or shorter, the T code is, not extended (0) / extended (1)</td><td></td></tr>
<tr><td>#4 LGT</td><td>Tool geometry compensation is performed by, shifting the coordinate system (0) / moving the tool (1)</td><td></td></tr>
<tr><td>#5 LGC</td><td>When tool geometry compensation based on coordinate system shifting is specified with offset number 0, the compensation is, not canceled (0) / canceled (1)</td><td></td></tr>
</table>

<table>
<tr><td>#6 LWM

#7 WNP</td><td>Tool offset operation based on tool movement is performed, in a block where a T code is specified (0) / together with a command for movement along an axis (1)
The imaginary tool tip number is, geometry compensation number (0) / wear compensation number (1)</td><td></td></tr>
<tr><td>5003</td><td>Tool radius compensation start-up/reset</td><td></td></tr>
<tr><td>#0 SUP

#1 SUV

#6 LVK

#7 TGC</td><td>Start-up/cancellation type of tool radius and tool noise radius compensation<table><tr><th>SUV</th><th>SUP</th><th>Type</th></tr><tr><td>0</td><td>0</td><td>Type A</td></tr><tr><td>0</td><td>1</td><td>Type B</td></tr><tr><td>1</td><td>-</td><td>Type C</td></tr></table>Tool length compensation vector is, canceled by reset (0) / not canceled by reset (1)
Tool geometry compensation based on coordinate system shifting is, not canceled by reset (0) / canceled by reset (1)</td><td>

M series

T series</td></tr>
<tr><td>5004</td><td>Tool offset, Tool radius and tool nose radius compensation</td><td></td></tr>
<tr><td>#1 ORC

#2 ODI

#3 TS1</td><td>A tool offset value is set by, diameter value (0) / radius value (1)

A tool radius and tool nose radius compensation value is set by, radius value (0) / diameter value (1)
For touch sensor contact detection with the function for direct input of offset value measured B, four-contact input is used (0) / one-contact input is used (1)</td><td>T series
PRM
1006#3
M series</td></tr>
<tr><td>5005</td><td>Tool offset value input</td><td></td></tr>
<tr><td>#0 CNI

#2 PRC

#5 QNI

#6 TLE</td><td>On the offset screen, Y-axis offset screen, and macro screen, the soft key [INP.C] is, used (0) / not used (1)
For direct input of a tool offset value or workpiece coordinate system shift amount, the position record signal PRC <Gn040.6> is not used (0) / the position record signal PRC <Gn040.6> is used (1)
When the tool length/workpiece zero point measurement function or the function for direct input of offset value measured B is used, a tool offset number is selected by, MDI key operation (0) / PMC signal (1)
The "direct input of tool offset value measured B" function updates the offset value in offset write mode, constantly (0) / during axis movement (1)</td><td>T series

T series

T series</td></tr>
<tr><td>5006</td><td>Tool offset, Tool length offset</td><td></td></tr>
<tr><td>#1 TGC

#3 LVC

#6 TOS</td><td>If a T code is specified in a block where G50, G04, or G10 is specified, no alarm is issued (0) / the alarm (PS0245) is issued (1)
Tool offset based on tool movement and wear compensation based on coordinate system shifting are, not canceled by reset (0) / canceled by reset (1)
Tool length compensation or tool offset operation is performed, by an axis movement (0) / by shifting the coordinate system (1)</td><td>T series

T series</td></tr>
<tr><td>5007</td><td>Tool length measurement, Workpiece origin offset measurement, 3-dimensional coordinate system conversion</td><td></td></tr>
<tr><td>#0 TC2
#1 TC3

#2 TMA</td><td>Tool change position of the tool changer<table><tr><th>TC3</th><th>TC2</th><th>Tool change position</th></tr><tr><td>0</td><td>0</td><td>1st reference position</td></tr><tr><td>0</td><td>1</td><td>2nd reference position</td></tr><tr><td>1</td><td>0</td><td>3rd reference position</td></tr><tr><td>1</td><td>1</td><td>4th reference position</td></tr></table>Tool length measurement is enabled, along the Z-axis only (0) / along each axis (1)</td><td>M series
PRM
1240-1243
11403#6

M series
PRM1022</td></tr>
</table>

<table>
<tr><td>#3 WMA</td><td>Surface-based measurement of a workpiece origin offset is enabled, along the Z-axis only (0) / along each axis (1)</td><td>M series</td></tr>
<tr><td>#4 WMH</td><td>Hole-based measurement of a workpiece origin offset value is, disabled (0) / enabled (1)</td><td>M series</td></tr>
<tr><td>#5 WMC</td><td>An axis for measurement of a workpiece origin offset value is selected by, entering the axis name (0) / using the cursor (1)</td><td>M series
PRM
5007#3=1</td></tr>
<tr><td>#6 3OC</td><td>If tool length compensation is not canceled before 3-dimensional coordinate system conversion is specified, no alarm is issued (0) / an alarm is issued (1)</td><td>ALM
PS0049</td></tr>
<tr><td>#7 3OF</td><td>If commands for 3-dimensional coordinate system conversion and for tool length compensation are not nested with each other, no alarm is issued (0) / an alarm is issued (1)</td><td>ALM
PS0049</td></tr>
<tr><td>5008</td><td>Tool radius and tool nose radius compensation</td><td></td></tr>
<tr><td>#1 CNC</td><td>Interference check during tool radius and tool noise radius compensation</td><td>PRM
19607#5</td></tr>
<tr><td>#3 CNV</td><td><table><tr><th>CNV</th><th>CNC</th><th>Type of check</th></tr><tr><td>0</td><td>0</td><td>Direction and arc angle check</td></tr><tr><td>0</td><td>1</td><td>Arc angle check only</td></tr><tr><td>1</td><td>-</td><td>Interference check disabled</td></tr></table></td><td></td></tr>
<tr><td>#4 MCR</td><td>If tool radius and tool nose radius compensation is specified in the MDI mode, no alarm is issued (0) / an alarm is issued (1)</td><td>ALM
PS5257</td></tr>
<tr><td>5009</td><td>Function for direct input of offset value measured B, Imaginary tool tip direction</td><td></td></tr>
<tr><td>#0 GSC</td><td>When the function for direct input of offset value measured B is used, an offset write input signal is input from, machine side (0) / PMC side (1)</td><td>T series
PRM
3003#3</td></tr>
<tr><td>#4 TSD</td><td>When the function for direct input of offset value measured B is used, the travel direction judgment specification is, invalid (0) / valid (1)</td><td>T series
PRM
5004#3=0</td></tr>
<tr><td>#5 TIP</td><td>The imaginary tool tip direction is, not used (0) / used (1)</td><td>M series</td></tr>
<tr><td>5010</td><td>Limit for ignoring the small movement resulting from tool radius and tool nose radius compensation</td><td></td></tr>
<tr><td>5013</td><td>Maximum value of tool wear compensation</td><td>PRM
5042#0 - 3</td></tr>
<tr><td>5014</td><td>Maximum value of incremental input for tool wear compensation</td><td>PRM
5042#0 - 3</td></tr>
<tr><td>5015</td><td>Distance to X-axis + contact surface of touch sensor 1 (X1P)</td><td>T series</td></tr>
<tr><td>5016</td><td>Distance to X-axis - contact surface of touch sensor 1 (X1M)</td><td>T series</td></tr>
<tr><td>5017</td><td>Distance to Z-axis + contact surface of touch sensor 1 (Z1P)</td><td>T series</td></tr>
<tr><td>5018</td><td>Distance to Z-axis - contact surface of touch sensor 1 (Z1M)</td><td>T series</td></tr>
<tr><td>5019</td><td>Chattering prevention distance for direct input of offset value measured B</td><td></td></tr>
<tr><td>5020</td><td>Tool offset number used with the function for direct input of offset value measured B</td><td>T series
PRM
5005#0</td></tr>
<tr><td>5021</td><td>Number of interpolation cycles of pulses stored until the tool is about to touch the touch sensor</td><td>T series
PRM
5004#3=1</td></tr>
<tr><td>5022</td><td>Distance (L) from reference tool tip position to the reference measurement surface</td><td><Axis>
M series</td></tr>
<tr><td>5024</td><td>Number of tool compensation values</td><td>PRM5029</td></tr>
<tr><td>5028</td><td>Number of digits of an offset number used with a T code command</td><td>T series
PRM3032</td></tr>
<tr><td>5029</td><td>Number of tool compensation value memories common to paths</td><td>PRM5024</td></tr>
<tr><td>5032</td><td>Direction of tool offset B</td><td>M series</td></tr>
</table>

5040	Automatic tool change	
#0 OWD	When a tool offset value is set based on radius programming, both geometry and wear compensation values are based on radius programming (0) / geometry compensation is based on radius programming and wear compensation is based on diameter programming for an axis based on diameter programming (1)	T series PRM 5004#1=1
#3 TCT	The tool change method is based on, turret rotation (0) / automatic tool changer (1)	T series
#4 TLG	When the automatic tool changer is used, tool offset operation is specified by, G43.7 (0) / G43 (1)	T series
#7 NO4	The 4th-axis offset function is, used (0) / not used (1)	T series
5041	Active offset value modification function based on manual feed	
#7 NM2	If overcutting can occur during tool offsetting because a block specifying no movement is specified, no alarm is issued (0) / an alarm is issued (1)	ALM PS0041
5042	Tool offset value	
#0 OFA #1 OFC	(see tables below)	

OFC	OFA	Unit (mm)	Valid data range (mm)
0	1	0.01	±9999.99
0	0	0.001	±9999.999
1	0	0.0001	±9999.9999

OFC	OFA	Unit (inch)	Valid data range (inch)
0	1	0.001	±999.999
0	0	0.0001	±999.9999
1	0	0.00001	±999.99999

5043	Axis number for which the Y-axis offset function is used	T series
5044	Axis number for which the 4th-axis offset function is used	T series PRM 5004#7
5045	Axis number for which 5th-axis offset is used	T series
5051	Tool setter function for one-turret/two-spindle lathes	T series
#0 2NR	When the tool setter function for one-turret/two-spindle lathes is used, one touch sensor is used (0) / two touch sensors are used (1)	
#1 2AT	When a workpiece coordinate system shift amount is set in the workpiece coordinate system memory with the tool setter function for one-turret/two-spindle lathes, a setting is made at the current cursor position (0) / an automatic selection is made (1)	
5053	Tool compensation number shift amount for the one-turret/two-spindle tool setter function	T series PRM5024
5054	Workpiece coordinate system memory for spindle 1	T series PRM 5051#1=1
5055	Workpiece coordinate system memory for spindle 2	
5056	Distance to X-axis + contact surface of touch sensor 2 (X2P)	T series
5057	Distance to X-axis - contact surface of touch sensor 2 (X2M)	T series
5058	Distance to Z-axis + contact surface of touch sensor 2 (Z2P)	T series
5059	Distance to Z-axis - contact surface of touch sensor 2 (Z2M)	T series

7.2.22 Canned Cycle

5101	Canned cycle	
#0 FXY	The drilling axis in the drilling canned cycle or the cutting axis in the grinding canned cycle is, Z-axis always in the drilling canned cycle or X-axis always in the grinding canned cycle (M series), Y-axis in the case of G75 and G77, or Z-axis in the case of G78 and G79 (T series) (0) / axis perpendicular to a specified plane (G17/G18/G19) (1)	

#1 EXC #2 RTR #7 M5B	G81 specifies, drilling canned cycle (0) / external operation command (1) G83 and G87 specify, high-speed peck drilling cycle (0) / peck drilling cycle (1) In drilling canned cycles G76 and G87, M05 is output before spindle orientation execution (0) / M05 is not output before spindle orientation execution (1)	 T series M series
5102	Format for FS10/11, Canned cycle	
#2 QSR #3 F16 #6 RAB #7 RDI	Before a multiple repetitive turning canned cycle (G70 to G73) is started, whether address Q is present is, not checked (0) / checked (1) When the Series10/11format is specified, a drilling canned cycle is specified using, Series 10/11format (0) / Series 16 format (1) When a drilling canned cycle using the Series 10/11format is specified, address R, specifies an incremental command (0) / specifies an absolute command with G code system A or follows G90 and G91 with G code system B or C (1) When a drilling canned cycle using the Series 10/11format is specified, address R is based on, radius programming (0) / diameter/radius programming of the drilling axis (1)	 T series PRM 0001#0=1 T series PRM 0001#0=1 5102#3=0 3401#6,#7 5161#2 T series PRM 0001#0=1 5102#3=0 1006#3 5161#2
5103	Format for FS10/11, Canned cycle	
#0 SIJ #2 DCY #3 PNA #6 TCZ	When the Series 10/11 format is used, a shift value for the drilling canned cycle G76 or G87 is specified by, address Q (0) / address I, J, or K (1) When an axis (different from the drilling axis) perpendicular to the positioning plane is specified in a drilling canned cycle, the drilling axis is, the specified axis (0) / the axis specified in the block where the G code is specified (1) When a plane where no axis is present is specified in a drilling canned cycle using the Series 10/11 format, an alarm is issued (0) / no alarm is issued (1) In a tapping cycle (excluding rigid tapping), a check for zero accumulated pulse is, not made (0) / made (1)	M series PRM 0001#0=1 5148 PRM 5101#0=1 T series PRM 0001#0=1 5102#3=0 PRM 2005#1
5104	Canned cycle	
#2 FCK #6 PCT	In a multiple repetitive turning canned cycle (G71/G72), the machining profile is, not checked (0) / checked (1) A Q command in a tapping cycle is, disabled (0) / enabled ((High-speed) peck tapping cycle is assumed.)(1)	 PRM 5123
5105	Canned cycle	
#0 SBC #1 RF1 #2 RF2 #3 M5T #4 K0D #5 TFA	In a drilling canned cycle, chamfer cycle, or corner rounding cycle, a single block stop is, not performed (0) / performed (1) In a multiple repetitive turning canned cycle (G71/G72) of type I, roughing is, performed (0) / not performed (1) In a multiple repetitive turning canned cycle (G71/G72) of type II, roughing is, performed (0) / not performed (1) When the rotation direction of the spindle is reversed in a tapping cycle, M05 is, output before M04 or M03 (0) / not output before M04 or M03 (1) When K0 is specified in a drilling canned cycle (G80 to G89), drilling data storage operation only is performed (0) / one drilling operation is performed (1) When a canned cycle is specified during tool center point control or during tool length compensation in the tool axis direction, the rotary axis position is, not checked (0) / checked (1)	 T series ALM PS5424

#6 GIJ	If the signs of I, J, and K do not match when a grinding canned cycle for M series is executed, an alarm is issued (0) / operation compatible with the FS16i is performed (1)	ALM PS0455
5106	Canned cycle G code	
#2 NT1 #3 NT2	When G40~G42 is commanded in the target figure program of G71~G73, alarm is occurred (0) / no alarm is occurred. However, G40~G42 command in the target figure program is ignored (1) When G40~G42 is commanded in the target figure program of G70, alarm is occurred (0) / no alarm is occurred. G40~G42 command is valid (1)	ALM PS0325 ALM PS0325 PS0538
5107	Canned cycle	
#0 ASU #1 ASC #2 OCM #5 GMC	For G71 (T series), G71.7 (M series), G72 (T series), or G72.7 (M series), movement to the last turning start position is performed by, cutting feed (0) / rapid traverse (1) The G71/G72 and G71.7/G72.7 TYPE1 commands execute the movement toward the current turning start position in, two cycles (0) / one cycle (1) In G70-G73, the cycle operation is executed by, conventional method (0) / improved method. If Multiple repetitive canned cycle (G70 to G76) is specified in Coordinate system rotation, Programmable mirror image or Scaling mode: Alarm is not issued (0) / Alarm (PS0327) "MODAL THAT MULTIPLE REPETIVE CYCLES CANNOT BE DONE" is issued (1)	T series T series T series T series
5108	Canned cycle	
#0 R16 #1 DTP #3 NSP #5 NIC #6 SPH	In cutting up movement of G71/G72 of type Ⅱ, cutting up movement is executed before the cutting of the first axis on the plane (0) / cutting up movement is not executed and cutting is continued along the finishing shape (1) In G71/G72 of type Ⅰ, when rough cutting is finished, the tool return to the cycle start point after the tool moves to (cycle start point + distance of the finishing allowance) (0) / directly from the end point of the finishing program(1) In G71/G72 of type Ⅱ, the cutting is executed by conventional path (0) / not to repeat the same cutting path (1) In G71/G72, in-position check between cutting blocks is, executed (0) / not executed (1) When positioning the axes to hole position in Small-hole peck drilling cycle, the spindle is, stopped (0) / not stopped (1)	T series T series T series T series M series
5109	Canned cycle	
#0 DSA #1 CCI #2 TAE	When an axis, which is not included in the specified plane, is commanded in the multiple repetitive cycle(G70-G76,G70.7-G76.7), an alarm does not occur (0) / an alarm PS0021,"ILLEGAL PLANE SELECT" occurs (1) In the canned cycle for turning(G90,G92,G94), the address of the taper amount, is dependent on the setting of bit 1 (FCV) of parameter No.0001 (0)／can be specified withI,J,K and R (1) When the Series 10/11 format is used (with bit 1 (FCV) of parameter No.0001 set to 1), address E of threading is, inch threading (The number of threads per inch) (0) ／thread lead (1)	T series T series PRM 0001#1=1
5110	M code for C-axis clamping in a drilling canned cycle	T series
5111	Dwell time when C-axis unclamping is specified in drilling canned cycle [ms]	T series PRM 1013#0-#3
5112	Spindle forward-rotation M code in drilling canned cycle	T series

5113	Spindle reverse-rotation M code in drilling canned cycle	T series
5114	Return value of high-speed peck drilling cycle	
5115	Clearance value in a peck drilling cycle	
5125	Canned cycle	
#2 PRS	In Pattern repeating cycle G73, the stop position of single block operation are, the end point of each cycles and the end point of each blocks in the finishing shape (0) / the end point of each cycles and the end point of escape from the cycle start point (FS16i compatible specification) (1)	
5130	Cutting value (chamfering value) in thread cutting cycles G92 and G76	
5131	Cutting angle in thread cutting cycles G92 and G76 [deg]	
5132	Depth of cut in multiple repetitive turning canned cycles G71 and G72	Radius
5133	Escape in multiple repetitive turning canned cycles G71 and G72	Radius
5134	Clearance value in multiple repetitive turning canned cycles G71 and G72	Radius
5135	Retraction distance in the multiple repetitive turning canned cycle G73 (2nd axis on the plane)	Radius
5136	Retraction distance in the multiple repetitive turning canned cycle G73 (1st axis on the plane)	Radius
5137	Number of divisions in the multiple repetitive turning canned cycle G73 [cycle]	
5139	Return in multiple repetitive turning canned cycles G74 and G75	Radius
5140	Minimum depth of cut in the multiple repetitive turning canned cycle G76	Radius
5141	Finishing allowance in the multiple repetitive turning canned cycle G76	Radius
5142	Repetition count of final finishing in multiple repetitive turning canned cycle G76 [cycle]	
5143	Tool nose angle in multiple repetitive turning canned cycle G76 [deg]	
5145	Allowable value 1 in multiple repetitive turning canned cycles G71 and G72	PRM 5104#2
5146	Allowable value 2 in multiple repetitive turning canned cycles G71 and G72	PRM 5104#2
5148	Tool retraction direction after orientation in a fine boring cycle or back boring cycle	M series <Axis>
5149	Override for retraction in a boring cycle (G85 and G89) [%]	
5160	Small-hole peck drilling cycle	
#1 OLS	When an overload torque detection signal is received in a small-hole peck drilling cycle, the feedrate and spindle speed are, not changed (0) / changed (1)	M series
#2 NOL	When the depth of cut per action is satisfied although no overload torque detection signal is received in a small-hole peck drilling cycle, the feedrate and spindle speed are, not changed (0) / changed (1)	M series
#3 CYM	When a subprogram call is specified in a block specifying other commands in the canned cycle mode, no alarm is issued (0) / an alarm is issued (1)	
#4 TSG	The overload torque detection signal for a small-hole peck drilling cycle, depends on the parameter settings for the skip function (0) / does not depend on the parameter settings for the skip function (1)	M series

5161	Small-hole peck drilling cycle	
#4 CME	For drilling canned cycles, the M code for C-axis clamping/unclamping is set to, value set by parameter No. 5110/value set by parameter No. 5110 + 1 (0) / value set by parameter No. 5110/value set by parameter No. 13543 (first pair), or the value set by parameter No. 13544/value set by parameter No. 13545 (second pair) (1)	T series
5162		
#0 RCK	When the command which relates to the reference position return such as G28 is commanded during the canned cycle for drilling: Alarm PS0044 is not detected (0) / Alarm PS0044 is detected (1)	M series
5163	M code that specifies the small-hole peck drilling cycle mode	M series
5164	Percentage of the spindle speed to be changed at the start of the next advancing after an overload torque detection signal is received [%] S2=S1×d1÷100 S1: Spindle speed to be changed S2: Spindle speed changed d1: Value set in parameter No. 5164 [%]	M series
5165	Percentage of the spindle speed to be changed at the start of the next advancing when no overload torque detection signal is received [%] S2=S1×d2÷100 S1: Spindle speed to be changed S2: Spindle speed changed d2: Value set in parameter No. 5165 [%]	M series
5166	Percentage of the cutting feedrate to be changed at the start of the next cutting after an overload torque detection signal is received [%] F2=F1×b1÷100 F1: Cutting feedrate to be changed F2: Cutting feedrate changed b1: Value set in parameter No. 5166 [%]	M series
5167	Percentage of the cutting feedrate to be changed at the start of the next cutting when no ovarload torque detection signal is received [%] F2=F1×b2÷100 F1: Cutting feedrate to be changed F2: Cutting feedrate changed b2: Value set in parameter No. 5167 [%]	M series
5168	Lower limit of the percentage of the cutting feedrate in a small-hole peck drilling cycle [%] FL=F×b3÷100 F: Specified cutting feedrate FL: Changed cutting feedrate b3: Value set in parameter No. 5168 [%]	M series
5170	Number of the macro variable to which to output the total number of retractions during cutting	M series
5171	Number of the macro variable to which to output the total number of retractions because of the reception of an overload torque detection signal	M series
5172	Feedrate of retraction to point R when no address I is specified [mm/min]	M series
5173	Feedrate of advancing to the position just before the bottom of a hole when no address I is specified[mm/min]	M series
5174	Clearance in a small-hole peck drilling cycle	M series
5176	Grinding axis number in traverse grinding cycle (G71) execution (T series)/grinding axis number in plunge grinding cycle (G75) execution (M series)	ALM PS0456

5177	Grinding axis number in traverse direct constant-sized grinding cycle (G72) execution (T series)/grinding axis number in plunge grinding cycle (G77) execution (M series)	ALM PS0456
5178	Grinding axis number in oscillation grinding cycle (G73) execution (T series)/grinding axis number in continuous feed plane grinding cycle (G78) execution (M series)	ALM PS0456
5179	Grinding axis number in oscillation direct constant-sized grinding cycle (G74) execution (T series)/grinding axis number in intermittent feed plane grinding cycle (G79) execution	ALM PS0456
5180	Dressing axis number in plunge grinding cycle G75 (M series)	M series ALM PS0456
5181	Dressing axis number in plunge direct constant-sized grinding cycle G77 (M series)	
5182	Dressing axis number in continuous feed plane grinding cycle G78 (M series)	
5183	Dressing axis number in intermittent feed plane grinding cycle G79 (M series)	
5184	In-position width for other than hole bottoms (regular)	PRM 5107#4
5185	In-position width for other than hole bottoms (for retraction in peck drilling cycle)	PRM 5107#4
5186	In-position width for other than hole bottoms (for shift in boring cycles)	PRM 5107#4
5187	In-position width for hole bottoms	PRM 5107#4

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7.2.23 Rigid Tapping

5200	Rigid tapping	
#0 G84	An M code specifying the rigid tapping mode is, used (0) / not used (1)	PRM5210
#2 CRG	When a rigid mode cancel command is executed, the rigid mode is canceled, after the RGTAP signal is set to 0 (0) / before the RGTAP signal is set to 0 (1)	
#3 SIG	When gears are changed, the use of the SIND signal is, not permitted (0) / permitted (1)	
#4 DOV	Override during extraction in rigid tapping is, disabled (0) / enabled (1)	PRM 5211,5381
#5 PCP	A high-speed peck tapping cycle is, used (0) / not used (1)	
#6 FHD	During rigid tapping, feed hold and single block operations are, disabled (0) / enabled (1)	
#7 SRS	To select a spindle used for rigid tapping in multi-spindle control, the spindle selection signals (shared for multi-spindle control) are used (0) / the rigid tapping spindle selection signals (dedicated to rigid tapping) are used (1)	T series
5201	Rigid tapping, Override	
#2 TDR	For a cutting time constant in rigid tapping, the same parameter is used for cutting and extraction (0) / a different parameter is used for each of cutting and extraction (1)	PRM 5261-5264 5271-5274
#3 OVU	The increment unit of override for rigid tapping extraction is, 1% (0) / 10% (1)	PRM 5211,5381
#4 OV3	Override programmed for extraction is, disabled (0) / enabled (1)	
5202	Rigid tapping	
#0 ORI	When rigid tapping is started, spindle orientation is, not performed (0) / performed (1)	PRM4073
#1 RG3	Retraction for rigid tapping is performed by:, rigid tapping retraction start signal RTNT <Gn062.6> (0) / one-shot G code G30 command (1)	

#4 IRR	At the time of movement from point I to point R in rigid tapping, the in-position width of point R is, dedicated to rigid tapping (0) / normal in-position width (1)	PRM 5300,5302 5304,5306 1826
5203	Rigid tapping by the manual handle	
#0 HRG	Rigid tapping by the manual handle is, disabled (0) / enabled (1)	
#1 HRM	When the tapping axis moves in the negative direction in rigid tapping by the manual handle, the spindle rotates, in the forward direction in the G84 mode and in the reverse direction in the G74 mode (0) / in the reverse direction in the G84 mode and in the forward direction in the G74 mode (1)	
#2 RFF	In rigid tapping, feed forward is, disabled (0) / enabled (1)	Serial
#4 OVS	In rigid tapping, override by the feedrate override select signal and cancellation of override by the override cancel signal are, disabled (0) / enabled (1)	
#5 RBL	As acc./dec. for rigid tapping cutting feed, linear acc./dec. is used (0) / bell-shaped acc./dec. is used (1)	
5208	Rigid tapping	
#0 RCT	High-speed rigid tapping is, invalid (0) / valid (1)	
5209	Rigid tapping	
#0 RTX	In rigid tapping in a lathe system, the tapping axis is, selected by selecting a plane (0) / always assumed to be the Z-axis for G84 or the X-axis for G88 (1)	T series
#1 RIP	When a movement from the initial point to point R is made, the in-position check is, dependent on the setting of parameter NCI(No.1601#5) (0) / performed (1)	PRM 1601#5 5202#4
#2 DWP	When a dwell (address P) command is not included in a block for lathe-system rigid tapping, dwelling at the bottom of a hole is not performed (0) / the dwell (address P) command specified in the block for drilling is valid (1)	T series
#6 CSA	If Constant surface speed control is commanded in Rigid tapping mode, alarm is not issued (0) / alarm PS0200 is issued (1)	
#7 PRA	On the peck rigid tapping, if the depth of cut (Q) is smaller than the cutting start distance (d), alarm is not issued(0) / alarm (PS5560) is issued (1)	PRM 5200#5=1
5210	Rigid tapping mode specification M code	
5211	Override value during rigid tapping extraction [%]	PRM 5200#4=1 5201#3
5213	Return in peck rigid tapping cycle	PRM 5200#5
5214	Setting of an allowable rigid tapping synchronization error range [Detection unit]	
5221	Number of gear teeth on the spindle side in rigid tapping (1st gear)	
5222	Number of gear teeth on the spindle side in rigid tapping (2nd gear)	
5223	Number of gear teeth on the spindle side in rigid tapping (3rd gear)	
5224	Number of gear teeth on the spindle side in rigid tapping (4th gear)	T series
5231	Number of gear teeth on the position coder side in rigid tapping (1st gear)	
5232	Number of gear teeth on the position coder side in rigid tapping (2nd gear)	
5233	Number of gear teeth on the position coder side in rigid tapping (3rd gear)	
5234	Number of gear teeth on the position coder side in rigid tapping (4th gear)	T series
5241	Maximum spindle speed in rigid tapping (1st gear) [min^{-1}]	

5242	Maximum spindle speed in rigid tapping (2nd gear) [min^{-1}]	
5243	Maximum spindle speed in rigid tapping (3rd gear) [min^{-1}]	
5244	Maximum spindle speed in rigid tapping (4th gear) [min^{-1}]	T series
5260	Minimum torque overrides at acceleration/deceleration in rigid tapping	
5261	Time constant for acc./dec. in rigid tapping for each gear (1st gear) [ms]	
5262	Time constant for acc./dec. in rigid tapping for each gear (2nd gear) [ms]	
5263	Time constant for acc./dec. in rigid tapping for each gear (3rd gear) [ms]	
5264	Time constant for acc./dec. in rigid tapping for each gear (4th gear) [ms]	T series
5271	Time constant for acc./dec. in rigid tapping extraction (1st gear) [ms]	
5272	Time constant for acc./dec. in rigid tapping extraction (2nd gear) [ms]	
5273	Time constant for acc./dec. in rigid tapping extraction (3rd gear) [ms]	
5274	Time constant for acc./dec. in rigid tapping extraction (4th gear) [ms]	T series
5280	Position control loop gain for the spindle and tapping axis in rigid tapping (common to gears) [0.01/sec]	
5281	Position control loop gain for the spindle and tapping axis in rigid tapping (1st gear) [0.01/sec]	
5282	Position control loop gain for the spindle and tapping axis in rigid tapping (2nd gear) [0.01/sec]	
5283	Position control loop gain for the spindle and tapping axis in rigid tapping (3rd gear) [0.01/sec]	
5284	Position control loop gain for the spindle and tapping axis in rigid tapping (4th gear) [0.01/sec]	T series
5291	Loop gain multiplier for the spindle in rigid tapping (1st gear)	
5292	Loop gain multiplier for the spindle in rigid tapping (2nd gear)	
5293	Loop gain multiplier for the spindle in rigid tapping (3rd gear)	
5294	Loop gain multiplier for the spindle in rigid tapping (4th gear)	T series
5300	Tapping axis in-position width in rigid tapping (1st spindle) [Detection unit]	<Axis>
5301	Spindle in-position width in rigid tapping [Detection unit]	
5302	Tapping axis in-position width in rigid tapping (2nd spindle) [Detection unit]	<Axis>
5304	Tapping axis in-position width in rigid tapping (3rd spindle) [Detection unit]	<Axis>
5306	Tapping axis in-position width in rigid tapping (4th spindle) [Detection unit]	<Axis>
5310	Positional deviation limit imposed during tapping axis movement in rigid tapping (1st spindle) [Detection unit]	<Axis>
5311	Limit value of spindle positioning deviation during movement in rigid tapping [Detection unit]	
5312	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (1st spindle) [Detection unit]	<Axis>
5313	Positional deviation limit imposed while the spindle is stopped in rigid tapping [Detection unit]	
5321	Spindle backlash in rigid tapping (1st-stage gear) [Detection unit]	
5322	Spindle backlash in rigid tapping (2nd-stage gear) [Detection unit]	

5323	Spindle backlash in rigid tapping (3rd-stage gear) [Detection unit]	
5324	Spindle backlash in rigid tapping (4th-stage gear) [Detection unit]	T series
5350	Positional deviation limit imposed during tapping axis movement in rigid tapping (2nd spindle) [Detection unit]	<Axis>
5352	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (2nd spindle) [Detection unit]	<Axis>
5354	Positional deviation limit imposed during tapping axis movement in rigid tapping (3rd spindle) [Detection unit]	<Axis>
5356	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (3rd spindle) [Detection unit]	<Axis>
5358	Positional deviation limit imposed during tapping axis movement in rigid tapping (4th spindle) [Detection unit]	<Axis>
5360	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (4th spindle) [Detection unit]	<Axis>
5365	Bell-shaped acc./dec. time constant in rigid tapping (1st-stage gear) [ms]	
5366	Bell-shaped acc./dec. time constant in rigid tapping (2nd-stage gear) [ms]	
5367	Bell-shaped acc./dec. time constant in rigid tapping (3rd-stage gear) [ms]	
5368	Bell-shaped acc./dec. time constant in rigid tapping (4th-stage gear) [ms]	T series
5381	Override value during rigid tapping return [%]	PRM 5200#4=1
5382	Amount of return for rigid tapping return	

7.2.24 Scaling/Coordinate Rotation

5400	Coordinate system rotation, Scaling	
#0 RIN	A command (R) for angle of coordinate system rotation (G68) is, specified by an absolute method (0) / based on G90 and G91 (1)	
#2 D3R	The 3-dimensional coordinate system conversion mode can be canceled by, G69(M), G69.1(T), a reset, or a CNC reset through signal input from the PMC (0) / G69(M) or G69.1(T) only (1)	
#5 LV3	During 3-dimensional coordinate system conversion, system variables #100101 to #100132 (current position coordinates) and #100151 to #100182 (skip coordinates) are read, in the workpiece coordinate system (0) / in the program coordinate system based on 3-dimensional coordinate system conversion (1)	
#6 XSC	Axis-by-axis scaling is, disabled (0) / enabled (1)	PRM 5401#0
#7 SCR	The scaling magnification unit is, 0.00001 times (0) / 0.001 times (1)	
5401	Axis-by-axis scaling	<Axis>
#0 SCL	Scaling on this axis is, disabled (0) / enabled (1)	PRM 5400#6
5402	Manual handle interruption screen	
#3 DMK	The manual handle interruption screen is displayed, using the program coordinate system (0) / using the workpiece coordinate system (1)	In 3-D coordinate system conversion mode In Tilted working plane indexing mode
#6 RCI	In case that Positioning has not been done after Coordinate system rotation, if Circular interpolation with R is specified, a center angle, might change by over 180 degrees (0) / does not chage (1)	

5410	Rotation angle used when no coordinate system rotation angle is specified [0.001 deg]	
5411	Scaling (G51) magnification	PRM 5400#6,#7
5412	Rapid traverse rate for a drilling cycle in 3-dimensional coordinate system conversion mode	
5421	Scaling magnification for each axis	<Axis> PRM 5400#6,#7

7.2.25 Single Direction Positioning

5431	Single direction positioning	
#0 MDL #1 PDI	The code for single direction positioning (G60) is, one-shot G code (group 00) (0) / modal G code (group 01) (1) In the G60 mode, an in-position check at a stop position is, not made (0) / made (1)	
5440	Positioning direction and overrun distance in single direction positioning	<Axis>

7.2.26 Polar Coordinate Interpolation

5450	Polar coordinate interpolation	
#0 PDI #2 PLS	When the 2nd axis on the plane in the polar coordinate interpolation mode is based on radius programming, radius programming is used (0) / diameter programming is used (1) The polar coordinate interpolation shift function is, not used (0) / used (1)	
5460	Axis (linear axis) specification for polar coordinate interpolation	
5461	Axis (rotary axis) specification for polar coordinate interpolation	
5463	Automatic override tolerance ratio for polar coordinate interpolation [%]	
5464	Compensation for error on hypothetical axis of polar coordinate interpolation	

7.2.27 Normal Direction Control

5480	Number of the axis for controlling the normal direction	
5481	Feedrate of rotation of the normal direction controlled axis [deg/min]	<Axis>
5482	Limit value concerning the rotation of the normal direction controlled axis [deg]	
5483	Limit value of movement that is executed at the normal direction angle of a preceding block	

7.2.28 Index Table

5500	Index table indexing	
#0 DDP	As the method for inputting a decimal point in a command for the index table indexing axis, the conventional method is used (0) / the calculator-type method is used (1)	PRM 3401#0
#1 REL	The position display of the index table indexing axis in the relative coordinate system is, not rounded by one rotation (0) / rounded by one rotation (1)	
#2 ABS	The position display of the index table indexing axis in the absolute coordinate system is, not rounded by one rotation (0) / rounded by one rotation (1)	PRM 5500#3
#3 INC	When the M code that specifies rotation in the negative direction is not set, rotation in the G90 mode is made, not in the shortcut direction (0) / in the shortcut direction (1)	PRM 5511
#4 G90	A command for the index table indexing axis, follows G90 and G91 (0) / is an absolute command at all times (1)	
#6 SIM	When the same block includes a command for the index table indexing axis and a command for another controlled axis, the setting of parameter (No. 5502#2) is followed (0) / the commands are executed (1)	

#7 IDX	Type of operation sequence of the index table indexing axis is, type A (0) / type B (1)	
5501	Index table indexing	
#0 ITI #1 ISP	The index table indexing function is, enabled (0) / disabled (1) Servo-off operation for an index axis at the time of completion of clamping is, processed by the CNC (0) / not processed by the CNC (1)	
5502	Index table indexing	
#0 IXS	When the same block includes a command for the index table indexing axis and a command for another controlled axis, alarm PS1564 is issued (0) / the commands are executed (1)	
5503	Index table indexing	
#0 RPA	In the index table indexing function, when No.5500#2 is set to 1, internal coordinate system is, not rounded by one rotation (0) / rounded by one rotation (1)	
5510	Controlled axis number of the index table indexing axis	
5511	M code that specifies rotation in the negative direction for index table indexing	PRM 5500#2 =1, #3
5512	Minimum positioning angle for the index table indexing axis	

7.2.29 Flexible Synchronization Control 1

5660	Master axis number in flexible synchronization control (group A)	
5661	Slave axis number in flexible synchronization control (group A)	
5662	Master axis number in flexible synchronization control (group B)	
5663	Slave axis number in flexible synchronization control (group B)	
5664	Master axis number in flexible synchronization control (group C)	
5665	Slave axis number in flexible synchronization control (group C)	
5666	Master axis number in flexible synchronization control (group D)	
5667	Slave axis number in flexible synchronization control (group D)	
5668	Flexible synchronization control	
#0 ACA #1 ACB #2 ACC #3 ACD	For slave axes in flexible synchronization control group A, machine coordinate updating is, performed (0) / not performed (1) For slave axes in flexible synchronization control group B, machine coordinate updating is, performed (0) / not performed (1) For slave axes in flexible synchronization control group C, machine coordinate updating is, performed (0) / not performed (1) For slave axes in flexible synchronization control group D, machine coordinate updating is, performed (0) / not performed (1)	
5669	Automatic phase synchronization for flexible synchronization control	
#0 PHA #1 PHB #2 PHC #3 PHD	The automatic phase synchronization for flexible synchronization control of group A is, disabled (0) / enabled (1) The automatic phase synchronization for flexible synchronization control of group B is, disabled (0) / enabled (1) The automatic phase synchronization for flexible synchronization control of group C is, disabled (0) / enabled (1) The automatic phase synchronization for flexible synchronization control of group D is, disabled (0) / enabled (1)	
5670	M code for turning on the flexible synchronization control mode (group A)	
5671	M code for turning off the flexible synchronization control mode (group A)	
5672	M code for turning on the flexible synchronization control mode (group B)	
5673	M code for turning off the flexible synchronization control mode (group B)	
5674	M code for turning on the flexible synchronization control mode (group C)	
5675	M code for turning off the flexible synchronization control mode (group C)	

5676	M code for turning on the flexible synchronization control mode (group D)	
5677	M code for turning off the flexible synchronization control mode (group D)	
5680	Numerator for determining the gear ratio for flexible synchronization control (group A) Gear ratio=q/(p×10^{k}) Numerator: q, Denominator: p, Denominator factor: k	
5681	Denominator for determining the gear ratio for flexible synchronization control (group A)	
5682	Numerator for determining the gear ratio for flexible synchronization control (group B)	
5683	Denominator for determining the gear ratio for flexible synchronization control (group B)	
5684	Numerator for determining the gear ratio for flexible synchronization control (group C)	
5685	Denominator for determining the gear ratio for flexible synchronization control (group C)	
5686	Numerator for determining the gear ratio for flexible synchronization control (group D)	
5687	Denominator for determining the gear ratio for flexible synchronization control (group D)	
5690	Exponent for the denominator for determining the gear ratio for flexible synchronization control (group A)	
5691	Exponent for the denominator for determining the gear ratio for flexible synchronization control (group B)	
5692	Exponent for the denominator for determining the gear ratio for flexible synchronization control (group C)	
5693	Exponent for the denominator for determining the gear ratio for flexible synchronization control (group D)	
5694	Flexible synchronization control	
#0 HOB	The command of G80 and G81 or G80.4 and G81.4 is used with "Electronic gear box" (0) / used with "Hob command by flexible synchronization control" (1)	
5695	Group number to which feed per revolution can be performed based on the rotation compensated with a synchronization coefficient of a slave axis of flexible synchronization control	

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7.2.30 Straightness Compensation

5700	Straightness compensation	
#2 SM2	When two or more moving axes are set using the same axis number, the valid parameter-set magnification used with the straightness compensation function is, the magnification for the 1st moving axis (0) / the magnification for each moving axis (1)	PRM 13391 - 13396
5711	Straightness compensation: Axis number of moving axis 1	
5712	Straightness compensation: Axis number of moving axis 2	
5713	Straightness compensation: Axis number of moving axis 3	
5714	Straightness compensation: Axis number of moving axis 4	
5715	Straightness compensation: Axis number of moving axis 5	
5716	Straightness compensation: Axis number of moving axis 6	
5721	Straightness compensation: Axis number of compensation axis 1 for moving axis 1	
5722	Straightness compensation: Axis number of compensation axis 2 for moving axis 2	
5723	Straightness compensation: Axis number of compensation axis 3 for moving axis 3	
5724	Straightness compensation: Axis number of compensation axis 4 for moving axis 4	
5725	Straightness compensation: Axis number of compensation axis 5 for moving axis 5	
5726	Straightness compensation: Axis number of compensation axis 6 for moving axis 6	

5731	Straightness compensation: Compensation point number a of moving axis 1	
5732	Straightness compensation: Compensation point number b of moving axis 1	
5733	Straightness compensation: Compensation point number c of moving axis 1	
5734	Straightness compensation: Compensation point number d of moving axis 1	
5741	Straightness compensation: Compensation point number a of moving axis 2	
5742	Straightness compensation: Compensation point number b of moving axis 2	
5743	Straightness compensation: Compensation point number c of moving axis 2	
5744	Straightness compensation: Compensation point number d of moving axis 2	
5751	Straightness compensation: Compensation point number a of moving axis 3	
5752	Straightness compensation: Compensation point number b of moving axis 3	
5753	Straightness compensation: Compensation point number c of moving axis 3	
5754	Straightness compensation: Compensation point number d of moving axis 3	
5761	Compensation corresponding compensation point number a of moving axis 1 [Detection unit]	
5762	Compensation corresponding compensation point number b of moving axis 1 [Detection unit]	
5763	Compensation corresponding compensation point number c of moving axis 1 [Detection unit]	
5764	Compensation corresponding compensation point number d of moving axis 1 [Detection unit]	
5771	Compensation corresponding compensation point number a of moving axis 2 [Detection unit]	
5772	Compensation corresponding compensation point number b of moving axis 2 [Detection unit]	
5773	Compensation corresponding compensation point number c of moving axis 2 [Detection unit]	
5774	Compensation corresponding compensation point number d of moving axis 2 [Detection unit]	
5781	Compensation corresponding compensation point number a of moving axis 3 [Detection unit]	
5782	Compensation corresponding compensation point number b of moving axis 3 [Detection unit]	
5783	Compensation corresponding compensation point number c of moving axis 3 [Detection unit]	
5784	Compensation corresponding compensation point number d of moving axis 3 [Detection unit]	

7.2.31 Inclination Compensation

5861	Inclination compensation: Compensation point number a for each axis	<Axis>
5862	Inclination compensation: Compensation point number b for each axis	<Axis>
5863	Inclination compensation: Compensation point number c for each axis	<Axis>
5864	Inclination compensation: Compensation point number d for each axis	<Axis>
5871	Inclination compensation: Compensation α at compensation point number a for each axis [Detection unit]	<Axis>
5872	Inclination compensation: Compensation β at compensation point number b for each axis [Detection unit]	<Axis>
5873	Inclination compensation: Compensation γ at compensation point number c for each axis [Detection unit]	<Axis>

5874	Inclination compensation: Compensation δ at compensation point number d for each axis [Detection unit]	<Axis>

7.2.32 Custom Macros

6000	Custom macros	
#0 G67	If G67 is specified when the modal macro call (G66/G66.1) mode is not set, an alarm is issued (0) / G67 is ignored (1)	ALM PS1100
#1 MGO	When a GOTO statement is executed, a high-speed branch to 20 sequence numbers executed from the start of the program is, not made (0) / made (1)	
#2 HMC	A custom macro is executed, at a normal speed(0)/at a high–speed(1)	
#3 V15	As system variable numbers for tool offset values, the standard system variable numbers for the Series 0i are used (0) / the same system variable numbers as those used for the Series 10/11 are used (1)	M series
#4 HGO	When a GOTO statement is executed, a branch to 30 sequence numbers just before the GOTO statement or to up to 10 sequence numbers saved by a sequence number search previously made with a GOTO statement is, not made at high speed (0) / made at high speed (1)	
#5 SBM	The custom macro statement, does not cause a single block stop (0) / causes a single block stop (1)	PRM 6000#7
#7 SBV	The custom macro statement, does not cause a single block stop (0) / follows system variable #3003 (1)	PRM 6000#5
6001	Custom macros	
#0 MIF	The custom macro interface signals are based on, standard specification (0) / extended specification (1)	
#1 PRT	For leading zeros at the time of data output using the DPRNT command, spaces are output (0) / no data is output (1)	
#3 PV5	The output custom macro common variables are, #500 to #549 (0) / #100 to #149 and #500 to #549 (1)	
#4 CRO	After completion of data output in ISO code with the BPRNT or DPRNT command, only ”LF” is output (0) / ”LF” and "CR” are output (1)	
#5 TCS	By using a T code, custom macros (subprograms) are, not called (0) / called (1)	
#6 CCV	Common variables #100 to #149 cleared by power-off are, cleared to <null> by a reset (0) / not cleared to <null> by a reset (1)	
6003	Custom macro interrupt	
#1 MSK	During a custom macro interrupt, absolute coordinates are, not set as skip coordinates (0) / set as skip coordinates (1)	#5061 or later
#2 MIN	When a custom macro is interrupted, the block currently being executed is interrupted (0) / the end of the block currently being executed is awaited (1)	
#3 TSE	The custom macro interrupt signal UINT is based on, edge trigger method (0) / status trigger method (1)	
#4 MPR	The M code for enabling/disabling a custom macro interrupt, is M96/M97 (0) / follows parameter No. 6033 and No. 6034 (1)	
#5 MSB	The local variable of the interrupt program is, of macro type (0) / of subprogram type (1)	
#7 MUS	Interrupt-type custom macros are, not used (0) / used (1)	
6004	Operation command, System variable	
#0 NAT	The results of the operation commands ATAN (with 2 arguments) and ASIN are, 0 to 360.0 (ATAN) and 270.0 to 0 to 90.0 (ASIN) (0) / -180.0 to 0 to 180.0 (ATAN) and -90.0 to 0 to 90.0 (ASIN) (1)	

#2 VHD #5 D15	With system variables #5121 to #5140, the tool offset value in the block currently being executed is read (0) / an interrupt travel distance based on manual handle interrupt is read (1) For reading or writing tool offset values for D code when tool compensation memory C is used, the same system variables, #2401 to #2800, as used with the Series 10/11 are, not used (0) / used (1)	T series Tool geometry / wear compen-sation M series PRM 6000#3
6005	Subprogram sequence number call	
#0 SQC	A subprogram sequence number call is, not used (0) / used (1)	
6007	Macro	
#0 DPG #1 SCS #2 BCS #3 MGE #4 CVA #7 SKM	Specifies whether to allow G codes with a decimal point to be called, do not allow (0) / allow (1) Specifies whether to call subprograms with S codes, do not call with S codes (0) / call with S codes (1) Specifies whether to call subprograms with the second auxiliary function codes, do not call with the second auxiliary function codes (0) / call with the second auxiliary function codes (1) Specifies whether a G code modal call is made after movement or for each block, make a call for each block (equivalent to G66.1) (0) / make a call after movement (equivalent to G66) (1) Macro call arguments are passed in, NC format (0) / macro format (1) After skip operation, with the workpiece coordinate system setting command (G92 for the M series or G50 for the T series) or select command (G54 to G59), the values of macro variables #100151 to #100200 (#5061 to #5080) holding the skip position, change (the workpiece coordinate system at the time of reading is reflected) (0) / do not change (1)	
6008	Operation command	
#0 F16 #1 MCA #3 KOP #4 ISO #5 ADD #6 GMP #7 IJK	The precision of operation results is based on, new specification (0) / FS16i-compatible specification (1) The alarm number displayed with a macro alarm using system variable #3000 is, the number obtained by adding 3000 to the value assigned to #3000 (0) / the number assigned to #3000 (1) When the NC is reset in the state where the line is made open by POPEN, communication continues with the line left open (0)/communication stops with the line closed (1) The code used to specify the bit patterns of codes that substitute for [,], #, *, =, ?, @, &, and _ by using parameters is, EIA (0) / ISO/ASCII (1) When the number of digits in the integer part, a, in the format specification [a,b] of the DPRNT statement is less than the number of digits in the integer part of an output variable value, just the specified number of digits are output (0) / an alarm for excessive digits is issued (1) The calling of M, S, T, a 2nd auxiliary function code, or a particular code during the calling of a G code, and the calling of a G code during the calling of M, S, T, a 2nd auxiliary function code, or a particular code are, not allowed (0) / allowed (1) For addresses I, J, and K specified as arguments, argument specification I or II is automatically determined (0) / argument specification I is used at all times (1)	 PRM 6010-6018
6009	Macro call	
#0 MSM	When the specified M code is not at the beginning of the block for a macro call, an alarm is issued (0) / a macro call using an M code is assumed (1)	

#2 MAA	When Special Macro Call using M code are executed: Address G does not become an argument. (0) / Address G becomes an argument. (1)	
6010	Code bit pattern "*"	
#0 *0 #1 *1 #2 *2 #3 *3 #4 *4 #5 *5 #6 *6 #7 *7	The bit of EIA or ISO/ASCII code indicating * is, 0(0)/1(1)	PRM 6008#4
6011	Code bit pattern "="	
#0 =0 #1 =1 #2 =2 #3 =3 #4 =4 #5 =5 #6 =6 #7 =7	The bit of EIA or ISO/ASCII code indicating = is, 0(0)/1(1)	PRM 6008#4
6012	Code bit pattern "#"	
#0 #0 #1 #1 #2 #2 #3 #3 #4 #4 #5 #5 #6 #6 #7 #7	The bit of EIA or ISO/ASCII code indicating # is, 0(0)/1(1)	PRM 6008#4
6013	Code bit pattern "["	
#0 [0 #1 [1 #2 [2 #3 [3 #4 [4 #5 [5 #6 [6 #7 [7	The bit of EIA or ISO/ASCII code indicating [is, 0(0)/1(1)	PRM 6008#4
6014	Code bit pattern "]"	
#0]0 #1]1 #2]2 #3]3 #4]4 #5]5 #6]6 #7]7	The bit of EIA or ISO/ASCII code indicating] is, 0(0)/1(1)	PRM 6008#4
6015	Code bit pattern "?"	
#0 ?0 #1 ?1 #2 ?2 #3 ?3 #4 ?4 #5 ?5 #6 ?6 #7 ?7	The bit of EIA or ISO/ASCII code indicating ? is, 0(0)/1(1)	PRM 6008#4

6016	Code bit pattern “@”	
#0 @0 #1 @1 #2 @2 #3 @3 #4 @4 #5 @5 #6 @6 #7 @7	The bit of EIA or ISO/ASCII code indicating @ is, 0(0)/1(1)	PRM 6008#4
6017	Code bit pattern “&”	
#0 &0 #1 &1 #2 &2 #3 &3 #4 &4 #5 &5 #6 &6 #7 &7	The bit of EIA or ISO/ASCII code indicating & is, 0(0)/1(1)	PRM 6008#4
6018	Code bit pattern “_”	
#0 _0 #1 _1 #2 _2 #3 _3 #4 _4 #5 _5 #6 _6 #7 _7	The bit of EIA or ISO/ASCII code indicating _ is, 0(0)/1(1)	PRM 6008#4
6019	Data output	
#0 MCO	When data is output, the real value of macro variable data is, not output simultaneously as a comment (0) / output simultaneously as a comment (1)	
#2 DPD	When argument D is specified for a macro call without a decimal point, the number of decimal places, is assumed to be 0 (0) / depends on the increment system of the reference axis (1)	T series
#3 OFN	The format of the name of a file output by the external output command (DPRNT or BPRNT) is, PRNTxxxx.DAT (xxxx: 0000 to 9999) (0) / MCR_PRNT.TXT (1)	
#4 MSV	At system variables, when tool length compensation shift type is used, tool length offset is, included in current positions and skip positions (0) / not included in current positions and skip positions (1)	M series
#5 EDP	Precision setting for macro relational operators is, dsabled (0) / enabled (1)	PRM 6100
#7 SFN	About the format of the name of a file output by the external output command after CNC reboots, the serial number is reset to 0000 (0) / the serial number is continued and the next number is applied (1)	PRM 6019#3
6020	Custom macro variables common to paths	
#0 NC1	The setting of the number of custom macro variables common to paths for #100 to #199 (#499) (parameter No. 6036) is, valid (0) / invalid (1)	PRM 6036
#1 NC2	The setting of the number of custom macro variables common to paths for #500 to #999 (parameter No. 6037) is, valid (0) / invalid (1)	PRM 6037
#2 IFR	The custom macro interface signal R address is, disabled (0) / enabled (1)	
#3 NCM	The specifications of the position in which comment section can be inserted and the order of message and comment section that are commanded in the block of a macro alarm or a massege are, conventional (0) / extended (1)	

6021	Custom macro	
#1 ARE	For rotation axes for which rollover function is enabled, the reading of block end point position by system variables #5001 to #5020 or #100001 to #100050 is, not available(0) / available (1)	
6030	M code to execute external device subprogram calls	
6031	Start number of common variables to be protected among the common variables (#500 to #999)	
6032	End number of common variables to be protected among the common variables (#500 to #999)	
6033	M code that validates a custom macro interrupt	PRM 6003#4
6034	M code that invalidates a custom macro interrupt	
6036	Number of custom macro variables common to tool path (for #100 to #199 (#499))	
6037	Number of custom macro variables common to tool path (for #500 to #999)	
6038	Start G code used to call a custom macro	
6039	Start program number of a custom macro called by G code	
6040	Number of G codes used to call custom macros	PRM 6007#3 6038, 6039
6041	Start G code with a decimal point used to call a custom macro	
6042	Start program number of a custom macro called by G code with a decimal point	
6043	Number of G codes with a decimal point used to call custom macros	PRM 6007#3 6041, 6042
6044	Start M code used to call a subprogram	
6045	Start program number of a subprogram called by M code	
6046	Number of M codes used to call subprograms (number of subprograms called by M codes)	PRM 6044, 6045
6047	Start M code used to call a custom macro	
6048	Start program number of a custom macro called by M code	
6049	Number of M codes used to call custom macros (number of custom macros called by M codes)	PRM 6047, 6048
6050 6051 : 6059	G code that calls the custom macro of program No. 9010 G code that calls the custom macro of program No. 9011 : G code that calls the custom macro of program No. 9019	
6060 6061 : 6069	G code with a decimal point used to call the custom macro of program No. 9040 G code with a decimal point used to call the custom macro of program No. 9041 : G code with a decimal point used to call the custom macro of program No. 9049	
6071 6072 : 6079	M code used to call the subprogram of program No. 9001 M code used to call the subprogram of program No. 9002 : M code used to call the subprogram of program No. 9009	
6080 6081 : 6089	M code used to call the custom macro of program No. 9020 M code used to call the custom macro of program No. 9021 : M code used to call the custom macro of program No. 9029	
6090	ASCII code that calls the subprogram of program No. 9004	

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6091	ASCII code that calls the subprogram of program No. 9005	
6093	Top address of custom macro interface signal R address (input signal)	
6094	Top address of custom macro interface signal R address (output signal)	
6095	Number of programs used with the one-touch macro call function	
6096	Start program number of programs used with the one-touch macro call function	
6100	Precision setting for relational operators	PRM 6019#5

7.2.33 Patter Data Input

6101	Macro variable number initially displayed when pattern menu 1 is selected	
6102	Macro variable number initially displayed when pattern menu 2 is selected	
6103	Macro variable number initially displayed when pattern menu 3 is selected	
6104	Macro variable number initially displayed when pattern menu 4 is selected	
6105	Macro variable number initially displayed when pattern menu 5 is selected	
6106	Macro variable number initially displayed when pattern menu 6 is selected	
6107	Macro variable number initially displayed when pattern menu 7 is selected	
6108	Macro variable number initially displayed when pattern menu 8 is selected	
6109	Macro variable number initially displayed when pattern menu 9 is selected	
6110	Macro variable number initially displayed when pattern menu 10 is selected	

7.2.34 Positioning by Optimum Acceleration

6131	Positioning by optimum acceleration	<Axis>
#0 OAD	The function for positioning by optimum acceleration (seven step switch of the rapid traverse rate, time constant, and loop gain by the positioning distance to rapid traverse by automatic operation) is, disabled (0) / enabled (1)	
6132	Positioning by optimum acceleration	
#0 ILG	In the function for positioning by optimum acceleration, the switch of the loop gain is, enabled (0) / disabled (1)	PRM 1825 6181-6187
6136	Distance D1 for level 1 of positioning by optimum acceleration for each axis	<Axis> PRM 6131#0 11230- 11232
6137	Distance D2 for level 2 of positioning by optimum acceleration for each axis	
6138	Distance D3 for level 3 of positioning by optimum acceleration for each axis	
6161	Level 1 rapid traverse rate	<Axis>
6162	Level 2 rapid traverse rate	
6163	Level 3 rapid traverse rate	
6164	Level 4 rapid traverse rate	
6165	Level 5 rapid traverse rate	
6166	Level 6 rapid traverse rate	
6167	Level 7 rapid traverse rate	

6171	Level 1 rapid traverse time constant	<Axis>
6172	Level 2 rapid traverse time constant	
6173	Level 3 rapid traverse time constant	
6174	Level 4 rapid traverse time constant	
6175	Level 5 rapid traverse time constant	
6176	Level 6 rapid traverse time constant	
6177	Level 7 rapid traverse time constant	
6181	Level 1 servo loop gain	<Axis>
6182	Level 2 servo loop gain	
6183	Level 3 servo loop gain	
6184	Level 4 servo loop gain	
6185	Level 5 servo loop gain	
6186	Level 6 servo loop gain	
6187	Level 7 servo loop gain	
6191	Time constant T2 of level 1 bell-shaped acceleration/deceleration in rapid traverse T2	<Axis>
6192	Time constant T2 of level 2 bell-shaped acceleration/deceleration in rapid traverse T2	
6193	Time constant T2 of level 3 bell-shaped acceleration/deceleration in rapid traverse T2	
6194	Time constant T2 of level 4 bell-shaped acceleration/deceleration in rapid traverse T2	
6195	Time constant T2 of level 5 bell-shaped acceleration/deceleration in rapid traverse T2	
6196	Time constant T2 of level 6 bell-shaped acceleration/deceleration in rapid traverse T2	
6197	Time constant T2 of level 7 bell-shaped acceleration/deceleration in rapid traverse T2	

7.2.35 Skip Functions

6200	Parameters for skip functions	
#0 GSK	As a skip signal, the skip signal SKIPP is, invalid (0) / valid (1)	
#1 SK0	The skip signal SKIP and multi-step skip signals SKIP2 to SKIP8 are assumed to be input when these signals are, set to 1 (0) / set to 0 (1)	
#4 HSS	For skip signal input, the skip function, does not use high-speed skip signals (0) / uses high-speed skip signals (1)	
#5 SLS	For skip signal input, the multi-step skip function, does not use high-speed skip signals (0) / uses high-speed skip signal (1)	PRM 6201#4
#6 SRE	When a high-speed skip signal is used, the signal is assumed to be input, on the rising edge (0) / on the falling edge (1)	
#7 SKF	Dry run, override, and automatic acc./dec. for the G31 skip command are, disabled (0) / enabled (1)	
6201	High-speed skip, skip functions	
#1 SEB	When the skip function is used and a skip signal is turned on, the accumulated pulses and positional deviation due to acc./dec. are, not considered (0) / considered and compensated (1)	
#2 TSE	When the torque limit skip command is specified, the skip position held in a system variables from #5061 to #5080 (#100151 to #100182) is, offset position that has considered a servo delay (0) / position that does not consider a servo delay (1)	
#4 IGX	When the high-speed skip function is used, SKIP, SKIPP, and SKIP2 to SKIP8 are, enabled as skip signals (0) / disabled as skip signals (1)	

#5 CSE	When the continuous high-speed skip command is used, high-speed skip signals are assumed to be input, on the rising edge or falling edge as set by parameter (No. 6200#6) (0) / on both of the rising edge and falling edge (1)	
#7 SKPXE	When the skip function is used, the skip signal SKIP is, enabled (0) / disabled (1)	PRM 6200#4, #5 6201#4
6202	High-speed skip signal/multi-step skip signal selection	
#0 1S1	As a high-speed skip signal, the HDI0 signal is, not used (0) / used (1). Alternatively, for G31P1/G04Q1, the SKIP signal is, not used (0) / used (1)	PRM 6200#0
#1 1S2	As a high-speed skip signal, the HDI1 signal is, not used (0) / used (1). Alternatively, for G31P1/G04Q1, the SKIP2 signal is, not used (0) / used (1)	
#2 1S3	As a high-speed skip signal, the HDI2 signal is, not used (0) / used (1). Alternatively, for G31P1/G04Q1, the SKIP3 signal is, not used (0) / used (1)	
#3 1S4	As a high-speed skip signal, the HDI3 signal is, not used (0) / used (1). Alternatively, for G31P1/G04Q1, the SKIP4 signal is, not used (0) / used (1)	
#4 1S5	As a high-speed skip signal, the HDI4 signal is, not used (0) / used (1). Alternatively, for G31P1/G04Q1, the SKIP5 signal is, not used (0) / used (1)	
#5 1S6	As a high-speed skip signal, the HDI5 signal is, not used (0) / used (1). Alternatively, for G31P1/G04Q1, the SKIP6 signal is, not used (0) / used (1)	
#6 1S7	As a high-speed skip signal, the HDI6 signal is, not used (0) / used (1). Alternatively, for G31P1/G04Q1, the SKIP7 signal is, not used (0) / used (1)	
#7 1S8	As a high-speed skip signal, the HDI7 signal is, not used (0) / used (1). Alternatively, for G31P1/G04Q1, the SKIP8 signal is, not used (0) / used (1)	
6203	Multi-step skip signal selection	
#0 2S1	For G31P2/G04Q2, the SKIP signal is, not used (0) / used (1)	PRM 6200#0
#1 2S2	For G31P2/G04Q2, the SKIP2 signal is, not used (0) / used (1)	
#2 2S3	For G31P2/G04Q2, the SKIP3 signal is, not used (0) / used (1)	
#3 2S4	For G31P2/G04Q2, the SKIP4 signal is, not used (0) / used (1)	
#4 2S5	For G31P2/G04Q2, the SKIP5 signal is, not used (0) / used (1)	
#5 2S6	For G31P2/G04Q2, the SKIP6 signal is, not used (0) / used (1)	
#6 2S7	For G31P2/G04Q2, the SKIP7 signal is, not used (0) / used (1)	
#7 2S8	For G31P2/G04Q2, the SKIP8 signal is, not used (0) / used (1)	
6204	Multi-step skip signal selection	
#0 3S1	For G31P3/G04Q3, the SKIP signal is, not used (0) / used (1)	PRM 6200#0
#1 3S2	For G31P3/G04Q3, the SKIP2 signal is, not used (0) / used (1)	
#2 3S3	For G31P3/G04Q3, the SKIP3 signal is, not used (0) / used (1)	
#3 3S4	For G31P3/G04Q3, the SKIP4 signal is, not used (0) / used (1)	
#4 3S5	For G31P3/G04Q3, the SKIP5 signal is, not used (0) / used (1)	
#5 3S6	For G31P3/G04Q3, the SKIP6 signal is, not used (0) / used (1)	
#6 3S7	For G31P3/G04Q3, the SKIP7 signal is, not used (0) / used (1)	

<table>
<tr><td>#7 3S8</td><td>For G31P3/G04Q3, the SKIP8 signal is, not used (0) / used (1)</td><td></td></tr>
<tr><td>6205</td><td>Multi-step skip signal selection</td><td></td></tr>
<tr><td>#0 4S1
#1 4S2
#2 4S3
#3 4S4
#4 4S5
#5 4S6
#6 4S7
#7 4S8</td><td>For G31P4/G04Q4, the SKIP signal is, not used (0) / used (1)
For G31P4/G04Q4, the SKIP2 signal is, not used (0) / used (1)
For G31P4/G04Q4, the SKIP3 signal is, not used (0) / used (1)
For G31P4/G04Q4, the SKIP4 signal is, not used (0) / used (1)
For G31P4/G04Q4, the SKIP5 signal is, not used (0) / used (1)
For G31P4/G04Q4, the SKIP6 signal is, not used (0) / used (1)
For G31P4/G04Q4, the SKIP7 signal is, not used (0) / used (1)
For G31P4/G04Q4, the SKIP8 signal is, not used (0) / used (1)</td><td>PRM 6200#0</td></tr>
<tr><td>6206</td><td>Multi-step skip signal selection</td><td></td></tr>
<tr><td>#0 DS1
#1 DS2
#2 DS3
#3 DS4
#4 DS5
#5 DS6
#6 DS7
#7 DS8</td><td>For G04, the SKIP signal is, not used (0) / used (1)
For G04, the SKIP2 signal is, not used (0) / used (1)
For G04, the SKIP3 signal is, not used (0) / used (1)
For G04, the SKIP4 signal is, not used (0) / used (1)
For G04, the SKIP5 signal is, not used (0) / used (1)
For G04, the SKIP6 signal is, not used (0) / used (1)
For G04, the SKIP7 signal is, not used (0) / used (1)
For G04, the SKIP8 signal is, not used (0) / used (1)</td><td>PRM 6200#0</td></tr>
<tr><td>6207</td><td>Feedrate during skip function execution</td><td></td></tr>
<tr><td>#1 SFP</td><td>The feedrate used when the skip function is being executed is, feedrate of a programmed F code (0) / feedrate set in parameter (No. 6281) (1)</td><td>PRM 6207#2</td></tr>
<tr><td>#2 SFN</td><td>The feedrate used when the skip function base on high-speed skip signals or the multi-step skip function is being executed is, feedrate of a programmed F code (0) / feedrate set in a parameter from parameter No. 6282 to (No. 6285) (1)</td><td>PRM 6200#4
6207#1</td></tr>
<tr><td>#5 RHB</td><td>The high-Speed skip status signals HDO is set to “1” when the contact of the high-speed skip signal is, closed (0) / open (1)</td><td>RPM 6200#6</td></tr>
<tr><td>6208</td><td>high-speed skip signal selection</td><td></td></tr>
<tr><td>#0 9S1
#1 9S2
#2 9S3
#3 9S4</td><td>For G31P90/G31.8, the HDI0 signal is, not used (0) / used (1)
For G31P90/G31.8, the HDI1 signal is, not used (0) / used (1)
For G31P90/G31.8, the HDI2 signal is, not used (0) / used (1)
For G31P90/G31.8, the HDI3 signal is, not used (0) / used (1)</td><td></td></tr>
<tr><td>6210</td><td>High-speed skip, Automatic tool length measurement (M series) / automatic tool compensation (T series)</td><td></td></tr>
<tr><td>#2 DSK</td><td>Skip position reading by the detection unit is, disabled (0) / enabled (1)</td><td></td></tr>
<tr><td>#3 ASL
#4 ASB</td><td>Settings of the type and time constant of acceleration/deceleration after interpolation in the skip function
<table>
<tr><th>ASB</th><th>ASL</th><th>Type of acceleration/ deceleration</th><th>Parameter No. for time constant</th></tr>
<tr><td>0</td><td>1</td><td>Linear type</td><td rowspan="2">Parameter No. 6280</td></tr>
<tr><td>1</td><td>-</td><td>Bell-shaped</td></tr>
<tr><td>0</td><td>0</td><td colspan="2">This function is disabled</td></tr>
</table></td><td>PRM 1610#0, #1
1622
6280</td></tr>
</table>

#6 MDC #7 CCM	The measurement result of automatic tool length measurement (M series) or automatic tool compensation (T series) is, added to the current compensation value (0) / subtracted from the current compensation value (1) The current offset amount of automatic tool length measurement (M series) is the offset amount, set to to the offset screen (0) / actually effected (1)	 M series
6215	Cs contour control axis	<Axis>
#0 CST	On a Cs contour control axis, torque limit skip operation is, not performed (0) / performed (1)	
6220	Period during which skip signal input is ignored for the continuous high-speed skip function and EGB axis skip function and the skip function for flexible synchronization control [8ms]	
6221	Torque limit dead zone time for a torque limit skip command [2ms]	<Axis>
6240	Automatic tool length measurement (M series) / automatic tool compensation (T series)	
#0 AE0 #7 IGA	Measurement position arrival is assumed when the measuring position reached signals XAE1, XAE2, GAE1<Gn517.0>, and GAE2<Gn517.1> or the measuring position reached signals XAE1, XAE2, XAE3, GAE1<Gn517.0>, GAE2<Gn517.1>, and GAE3<Gn517.2> are, 1 (0) / 0 (1) Automatic tool length measurement (M series) or automatic tool compensation (T series) is, used (0) / not used (1)	
6241	Feedrate during measurement of automatic tool length measurement	
6242	Feedrate in tool measurement 2 measurement	PRM6241
6243	Feedrate in tool measurement 3 measurement	
6251	Deceleration position (γ value) in automatic tool length measurement	
6252	Deceleration position (γ value) in tool measurement 2	PRM6251
6253	Deceleration position (γ value) in tool measurement 3	
6254	Allowable measurement position arrival signal range (ε value) in automatic tool length measurement	
6255	Allowable measurement position arrival signal range (ε value) in tool measurement 2	PRM6254
6256	Allowable measurement position arrival signal range (ε value) in tool measurement 3	
6280	Time constant for acceleration / deceleration after interpolation for the skip function for each axis	PRM 6210#3, #4
6281	Feedrate for the skip function (G31)	PRM 6207#1=1
6282	Feedrate for the skip function (G31, G31 P1)	PRM 6207#2=1
6283	Feedrate for the skip function (G31 P2)	
6284	Feedrate for the skip function (G31 P3)	
6285	Feedrate for the skip function (G31 P4)	
6286	Torque limit override function	<Axis>
#0 TQO	The torque limit override function is, disabled (100%) (0) / enabled (1)	
6287	Positional deviation limit in torque limit skip [Detection un	<Axis>

7.2.36 External Data Input

6300	Program number search	
#3 ESC #4 ESR #7 EEX	If a reset is input before the execution of a search using the external program number search function, the search is, executed (0) / not executed (1) The external program number search function is, disabled (0) / enabled (1) The PMC EXIN function is based on, conventional specification (0) / extended specification (1)	
6301	External alarm message	
#0 EXA #1 EXM #2 NNO #3 EED	An external alarm message number from 0 to 999 can be sent. (With the CNC, 1000 is added to each number.) (0) / An external alarm message number from 0 to 4095 can be sent. (With the CNC, "EX" is prefixed to each number.) (1) An external operator message number from 0 to 999 can be sent. (With the CNC, 2000 is added to each number.) (0) / An external operator message number from 0 to 4095 can be sent. (With the CNC, "EX" is prefixed to each number.) (1) When operator messages are set by external data input, a new line operation between one message set with a number and another message set with a different number is, performed (0) / not performed (1) To specify external tool compensation data and external workpiece coordinate system shift data, signals ED15 to ED0 are used (0) / signals ED31 to ED0 are used (1)	
6310	Setting for number addition to external operator messages	

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7.2.37 Manual Handle Retrace 1

6400	Manual handle retrace function	
#0 RPO #1 FWD	With the manual handle retrace function, the rapid traverse rate is clamped, assuming an override of, 10% (0) / 100% (1) With the manual handle retrace function, program execution can be performed, in both of the forward and backward directions (0) / only in the forward direction (1)	
#2 MC5 #3 MC8	The number of M code groups and the number of M codes per group are specified. MC5 MC8 0 0 4 codes × 20 groups 1 0 5 codes × 16 groups 0 1 8 codes × 10 groups	PRM 6411-6490
#4 HMP #5 RVN	When reverse or backward movement is disabled for a path, reverse or backward movement is, not disabled for other paths (0) / also disabled for other paths (1) With the manual handle trace function, backward movement of M codes other than grouped M codes is, not disabled (0) / disabled (1)	
#6 MGO	During measurement-related G code execution using the manual handle retrace function, handle pulses are, valid (0) / invalid (1)	PRM 3405#3 6200#7
#7 MG4	With the manual handle retrace function, backward movement of a block enabling multi-step skip (G04) is, not disabled (0) / disabled (1)	

6401	Manual handle retrace	
#0 ADC #2 CHS #6 HST #7 STO	With the manual handle retrace function, reverse movement of a block where a move command and auxiliary function are specified simultaneously is, disabled (0) / not disabled (1) To display manual handle retrace status, one of the following conditions is selected: 0: Check mode output signal MMMOD is set to 1. 1: Output signal STL is set to 1, input signal MMOD is set to 1, and input signal MCHK is set to 1 With the manual handle retrace function, status is, not displayed (0) / displayed (1), above the clock indication on the status display line of the CNC screen With the manual handle retrace function, the S code output timing and T code output timing in forward movement and backward movement are, different from each other (0) / same (1)	Option 6401#6=1
6402	Manual handle retrace	
#5 MWR	With the manual handle retrace function, handle operation performed during waiting based on an M code for waiting in backward movement, disables reverse movement (0) / enables reverse movement (1)	
6403	Program execution in the forward/backward direction with the manual handle retrace function	
#0 HRA #1 HRB #2 HRC #3 HRD #4 HRE #7 HAI	In rigid tapping and thread cutting, with the manual handle retrace function, program execution in the forward direction, cannot be performed (0) / can be performed (1) In PMC axis control, with the manual handle retrace, program execution in the forward direction, cannot be performed (0) / can be performed (1) During orientation operation according to G00 for a Cs contour control axis, with the manual handle retrace function, program execution in the backward direction, cannot be performed (0) / can be performed (1) In polygon machining with two spindles, with the manual handle retrace function, program execution in the backward direction, cannot be performed (0) / can be performed (1) In balanced cutting, with the manual handle retrace function, program execution in the backward direction, cannot be performed (0) / can be performed (1) In manual handle retrace mode, AI contour control is disabled (0) / enabled (1)	 PRM 6400#1=1
6404	Manual handle retrace	
#0 DMD	In manual handle retrace, when inversion or backward movement is inhibited, cause is, not displayed (0) / displayed (1)	
6405	Rapid traverse rate clamp override value (equivalent) when the manual handle retrace function is used [%]	PRM 6400#0
6410	Travel distance per pulse of the manual pulse generator [%] Travel distance = Specified speed × Number of handle pulses (sec^{-1}) × Handle magnification × ((parameter No. 6410)/100) × (8/1000)	
6411	M code (1) in group A for the manual handle retrace	
6412	M code (2) in group A for the manual handle retrace	
6413	M code (3) in group A for the manual handle retrace	
6414	M code (4) in group A for the manual handle retrace	
6415	M code (1) in group B for the manual handle retrace	
6416	M code (2) in group B for the manual handle retrace	
6417	M code (3) in group B for the manual handle retrace	
6418	M code (4) in group B for the manual handle retrace	
6419	M code (1) in group C for the manual handle retrace	
6420	M code (2) in group C for the manual handle retrace	

6421	M code (3) in group C for the manual handle retrace	
6422	M code (4) in group C for the manual handle retrace	
6423	M code (1) in group D for the manual handle retrace	
6424	M code (2) in group D for the manual handle retrace	
6425	M code (3) in group D for the manual handle retrace	
6426	M code (4) in group D for the manual handle retrace	
6427	M code (1) in group E for the manual handle retrace	
6428	M code (2) in group E for the manual handle retrace	
6429	M code (3) in group E for the manual handle retrace	
6430	M code (4) in group E for the manual handle retrace	
6431	M code (1) in group F for the manual handle retrace	
6432	M code (2) in group F for the manual handle retrace	
6433	M code (3) in group F for the manual handle retrace	
6434	M code (4) in group F for the manual handle retrace	
6435	M code (1) in group G for the manual handle retrace	
6436	M code (2) in group G for the manual handle retrace	
6437	M code (3) in group G for the manual handle retrace	
6438	M code (4) in group G for the manual handle retrace	
6439	M code (1) in group H for the manual handle retrace	
6440	M code (2) in group H for the manual handle retrace	
6441	M code (3) in group H for the manual handle retrace	
6442	M code (4) in group H for the manual handle retrace	
6443	M code (1) in group I for the manual handle retrace	
6444	M code (2) in group I for the manual handle retrace	
6445	M code (3) in group I for the manual handle retrace	
6446	M code (4) in group I for the manual handle retrace	
6447	M code (1) in group J for the manual handle retrace	
6448	M code (2) in group J for the manual handle retrace	
6449	M code (3) in group J for the manual handle retrace	
6450	M code (4) in group J for the manual handle retrace	
6451	M code (1) in group K for the manual handle retrace	
6452	M code (2) in group K for the manual handle retrace	
6453	M code (3) in group K for the manual handle retrace	
6454	M code (4) in group K for the manual handle retrace	
6455	M code (1) in group L for the manual handle retrace	
6456	M code (2) in group L for the manual handle retrace	
6457	M code (3) in group L for the manual handle retrace	
6458	M code (4) in group L for the manual handle retrace	
6459	M code (1) in group M for the manual handle retrace	
6460	M code (2) in group M for the manual handle retrace	
6461	M code (3) in group M for the manual handle retrace	
6462	M code (4) in group M for the manual handle retrace	
6463	M code (1) in group N for the manual handle retrace	
6464	M code (2) in group N for the manual handle retrace	
6465	M code (3) in group N for the manual handle retrace	
6466	M code (4) in group N for the manual handle retrace	
6467	M code (1) in group O for the manual handle retrace	
6468	M code (2) in group O for the manual handle retrace	
6469	M code (3) in group O for the manual handle retrace	
6470	M code (4) in group O for the manual handle retrace	
6471	M code (1) in group P for the manual handle retrace	
6472	M code (2) in group P for the manual handle retrace	
6473	M code (3) in group P for the manual handle retrace	
6474	M code (4) in group P for the manual handle retrace	
6475	M code (1) in group Q for the manual handle retrace	
6476	M code (2) in group Q for the manual handle retrace	
6477	M code (3) in group Q for the manual handle retrace	
6478	M code (4) in group Q for the manual handle retrace	
6479	M code (1) in group R for the manual handle retrace	
6480	M code (2) in group R for the manual handle retrace	
6481	M code (3) in group R for the manual handle retrace	
6482	M code (4) in group R for the manual handle retrace	

6483	M code (1) in group S for the manual handle retrace	
6484	M code (2) in group S for the manual handle retrace	
6485	M code (3) in group S for the manual handle retrace	
6486	M code (4) in group S for the manual handle retrace	
6487	M code (1) in group T for the manual handle retrace	
6488	M code (2) in group T for the manual handle retrace	
6489	M code (3) in group T for the manual handle retrace	
6490	M code (4) in group T for the manual handle retrace	
6495	Time constant T or T1 used for linear acceleration/deceleration or bell-shaped acceleration/deceleration in rapid traverse for each axis for manual handle retrace [ms]	<Axis>
6496	Time constant T2 used for bell-shaped acceleration/deceleration in rapid traverse for each axis for manual handle retrace [ms]	<Axis>
6497	Time constant of acceleration/deceleration in cutting feed for each axis for manual handle retrace [ms]	<Axis>

7.2.38 Graphic Display 1

6501	Tool path drawing	
#5 CSR	On the PATH GRAPHIC (TOOL POSITION) screen, the shape of the cursor indicating the tool position is:, a square (■) (0) / an x (×) (1)	
6510	Specifying the graphic coordinate system	

7.2.39 Screen Display Colors

6581	RGB value of color palette 1	
6582	RGB value of color palette 2	
6583	RGB value of color palette 3	
6584	RGB value of color palette 4	
6585	RGB value of color palette 5	
6586	RGB value of color palette 6	
6587	RGB value of color palette 7	
6588	RGB value of color palette 8	
6589	RGB value of color palette 9	
6590	RGB value of color palette 10	
6591	RGB value of color palette 11	
6592	RGB value of color palette 12	
6593	RGB value of color palette 13	
6594	RGB value of color palette 14	
6595	RGB value of color palette 15	

7.2.40 Run Hour and Parts Count Display

6700	Number of machined parts	
#0 PCM #1 PRT	The total number of machined parts and the number of machined parts are counted using, M02, M30, or the M code specified by parameter No. 6710 (0) / only the M code specified by parameter No. 6710 (1) Upon reset, the required parts count arrival signal (PRTSF) is, set to 0 (0) / not set to 0 (1)	
6710	M code that counts the number of machined parts	
6711	Number of machined parts	PRM 6700#0
6712	Total number of machined parts	PRM 6700#0
6713	Number of required parts	
6750	Integrated value of power-on period [min]	
6751	Operation time (integrated value of time during automatic operation) 1 [ms]	PRM6752
6752	Operation time (integrated value of time during automatic operation) 2 [min]	
6753	Integrated value of cutting time 1 [ms]	PRM6754

6754	Integrated value of cutting time 2 [min]	
6755	Integrated value of general-purpose integrating meter drive signal (TMRON) ON time 1 [ms]	PRM6756
6756	Integrated value of general-purpose integrating meter drive signal (TMRON) ON time 2 [min]	
6757	Operation time (integrated value of one automatic operation time) 1 [ms]	PRM6758
6758	Operation time (integrated value of one automatic operation time) 2 [min]	

7.2.41 Tool Life Management 1

6800	Number of tool life groups and number of tools	
#0 GS1	Setting the combination of the number of tool life groups and the number of tools	PRM6813
#1 GS2	(see table below)	When GS1, GS2, and LTM are changed, the data needs to be set again by specifying G10 L3;.

GS2	GS1	Number of groups	Number of tools
0	0	1/8 of the maximum number of sets (No. 6813)	32
0	1	1/4 of the maximum number of sets (No. 6813)	16
1	0	1/2 of the maximum number of sets (No. 6813)	8
1	1	Maximum number of sets (No. 6813)	4

#2 LTM	Tool life count type is specified by, count (0) / time (1)	
#3 SIG	When signal-based tool skip is performed, group number input using the tool group number selection signal is, not performed (0) / performed (1)	
#4 GRS	If the life of the group specified by the tool group number selection signal has expired when the tool change reset signal TLRST is input, the execution data of the group is cleared (0) / the execution data of all registered groups is cleared (1)	
#5 SNG	If the tool skip signal TLSKP is input while a tool not under tool life management is being used, the tools of the most recently used group or the specified group are skipped (0) / the signal is ignored (1)	PRM 6800#3
#6 IGI	The back number of a tool is, not ignored (0) / ignored (1)	
#7 M6T	A T code included in a block specifying M06 specifies, back number (0) / next tool group (1)	
6801	Tool life management functions, Tool management functions	
#1 TSM	When multiple offsets are specified with the tool life management function, life count operation is performed, for each identical tool number (0) / for each tool (1)	T series
#2 LVF	When the value of life is counted based on time with the tool management function or the tool life management function, the tool life count override signals *TLV0 to *TLV9 are, invalid (0) / valid (1)	
#3 EMD	The mark "*" used with the tool life management function to indicate the expiration of life is displayed, when the next tool is used (0) / when the tool life has expired (1)	
#7 M6E	If a T code is specified in a block including M06, the T code specifies a return number or the group number to be selected next (0) / life counting of the tool group is started immediately (1)	PRM 6800#7
6802	Tool life management	
#0 T99	When M99 of the main program is executed, and there is a life was expired tool group, the tool change signal TLCH is not output (0) / TLCH is output, and the automatic operation becomes stopped state.	

<table>
<tr><td>#1 TCO
#2 E17</td><td>These parameters make a selection concerning information about the tools of the group currently used or the group to be used next during automatic operation using FOCAS2 and the PMC window function.
<table>
<tr><th colspan="3" rowspan="4">Condition</th><th colspan="3">6802#1(TCO)</th></tr>
<tr><th rowspan="3">0</th><th colspan="2">1</th></tr>
<tr><th colspan="2">6802#2 (E17)</th></tr>
<tr><th>1</th><th>0</th></tr>
<tr><td rowspan="3">During automatic operation</td><td rowspan="2">Group currently used/group to be used next</td><td>Tool being used</td><td>×</td><td>△</td><td>○</td></tr>
<tr><td>Tool not being used</td><td>×</td><td>○</td><td>○</td></tr>
<tr><td colspan="2">Not currently used/not group to be used next</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td colspan="3">Not using automatic operation</td><td>○</td><td>○</td><td>○</td></tr>
</table>
○: Tool information can be written.
×: Tool information cannot be written.
When the PMC window is used, completion code 13 (REJECT ALARM) is returned.
△: Tool information cannot be changed to the cleared state.</td><td></td></tr>
<tr><td>#3 GRP</td><td>The management data of the tool life notice signal TLCHB is, managed using the remaining value set in parameter (No. 6844) and (No. 6845) (0) / managed using the remaining value in tool life management data (1)</td><td>PRM
6805#4=1</td></tr>
<tr><td>#4 ARL</td><td>The tool life arrival notice signal TLCHB for tool life management is, output for each tool (0) / output for the last tool in a group (1)</td><td>PRM
6802#3=1</td></tr>
<tr><td>#5 TGN</td><td>With the tool life management function, the arbitrary group number function is, not used (0) / used (1)</td><td>PRM
6805#4=1
5040#3
(T series)</td></tr>
<tr><td>#6 TSK</td><td>If signal-based tool skip operation is performed for the last tool in a group when the life counting by tool life management is based on time, the counted life of the last tool is, changed to the same as the life value (0) / not changed (1)</td><td></td></tr>
<tr><td>#7 RMT</td><td>The condition for turning on and off the tool life arrival notice signal TLCHB is such that, the signal is turned on when Remaining tool life ≤ Set remaining value, and the signal is turned off when Remaining tool life > Set remaining value (0) / the signal is turned on when Remaining tool life = Set remaining value, and the signal is turned off when Remaining tool life ≠ Set remaining value (1)</td><td>PRM
6805#0</td></tr>
<tr><td>6804</td><td>Editing of tool life data</td><td></td></tr>
<tr><td>#1 TCI

#2 ETE

#6 LFI</td><td>During automatic operation, tool life data editing operation is, disabled (0) / enabled (1)
In the tool life management screen, the mark of the tool at the life was expired of the final tool in the group, depends on setting parameter EMD(No.6801#3) (0) / is "*" mark (1)
In tool life management, counting of the life of a selected tool is, enabled (0) / enabled or disabled according to the status of tool life counting disable signal LFCIV <Gn048.2> (1)</td><td></td></tr>
<tr><td>6805</td><td>Life count type</td><td></td></tr>
<tr><td>#0 FCO</td><td>When life counting is based on time specification, life is counted, at intervals of 1 second (0) / at intervals of 0.1 second (1)</td><td></td></tr>
</table>

#1 FGL #4 LFB #5 TRS #6 TRU #7 TAD	When life counting is based on time specification, life data registration using G10 is performed, in units of 1 minute (0) / in units of 0.1 second (1) The tool life management B function is, disabled (0) / enabled (1) The tool change reset signal TLRST is, valid when RST signal ≠ 1 and only the reset state is set (0) / valid when RST signal ≠ 1 and the reset state, automatic operation stop state, or automatic operation halt state is set (1) When life counting is based on time specification and is performed at intervals of 1 second, a cutting time less than 1 second is not counted (0) / a cutting time less than 1 second is rounded upward to 1 second and counted (1) When tool change method D is used, and a block specifying M06 includes no T command, the alarm (PS0153) is issued (0) / no alarm is issued (1)	PRM 5040#3 (T series) PRM 6805#0 PRM 6801#7=1
6810	Tool life management ignore number	
6811	M code for tool life count restart	
6813	Maximum number of tool life management sets [set] The maximum number of sets of each path is set as a multiple of 8 so that the total number of sets of all paths does not exceed the total number of sets of the entire system (256 sets).	To use tool life management, this parameter needs to be set.
6844	Remaining tool life (use count)	
6845	Remaining tool life (use time) [min]	PRM 6805#0
6846	Remaining tool number in a group	M series

7.2.42 Position Switch

6901	Position switch functions	
#1 EPW #2 PSA	The number of position switches is, not extended (0) / extended (1) In determination of a position switch function operation range, a servo positional deviation and a delay amount in acc./dec. control are, not considered (0) / considered (1)	
6910 6911 : 6925	Controlled axis for which the 1st position switch function is performed (PSWA01) Controlled axis for which the 2nd position switch function is performed (PSWA02) : Controlled axis for which the 16th position switch function is performed (PSWA16)	
6930 6931 : 6945	Maximum value of the operating range of the 1st position switch (PSW101) Maximum value of the operating range of the 2nd position switch (PSW102) : Maximum value of the operating range of the 16th position switch (PSW116)	PRM 1006#3
6950 6951 : 6965	Minimum value of the operating range of the 1st position switch (PSW201) Minimum value of the operating range of the 2nd position switch (PSW202) : Minimum value of the operating range of the 16th position switch (PSW216)	PRM 1006#3

6966 6967 : 6973	Controlled axis for which the 17th position switch function is performed (PSWA17) Controlled axis for which the 18th position switch function is performed (PSWA18) : Controlled axis for which the 24th position switch function is performed (PSWA24)	
6974 6975 : 6981	Maximum value of the operating range of the 17th position switch (PSW117) Maximum value of the operating range of the 18th position switch (PSW118) : Maximum value of the operating range of the 24th position switch (PSW124)	PRM 1006#3
6982 6983 : 6989	Minimum value of the operating range of the 17th position switch (PSW217) Minimum value of the operating range of the 18th position switch (PSW218) : Minimum value of the operating range of the 24th position switch (PSW224)	PRM 1006#3

7.2.43 Manual/Automatic Operation Functions 1

7001	Manual intervention, Manual numerical command	
#0 MIT	Manual intervention and return function is, disabled (0) / enabled (1)	
#1 ABS	For the move command after manual intervention in the manual absolute on state, a different path is used for each of G90 and G91 (0) / the same path is used for G90 and G91 (1)	
#2 JST	During operation based on manual numerical specification, the STL signal indicating that automatic operation is being started is, not output (0) / output (1)	
#4 JSN	When an S code is specified with the manual numerical specification function, the modal display of the S code is, not updated (0) / updated (1)	
#6 JEX	The number of simultaneously controlled axes for jog feed, follows the setting of parameter (No. 1002#0) (0) / is the maximum number of simultaneously controlled axes (1)	
#7 MFM	For the manual interpolation function, modifying a value specified with a command during jog feed in the guidance direction (approach direction), immediately starts moving according to the new value (0) / stops moving (1)	
7002	Manual numerical command	
#0 JMF	In manual numerical specification, M function specification is, allowed (0) / not allowed (1)	
#1 JSF	In manual numerical specification, S function specification is, allowed (0) / not allowed (1)	
#2 JTF	In manual numerical specification, T function specification is, allowed (0) / not allowed (1)	
#3 JBF	In manual numerical specification, B function specification is, allowed (0) / not allowed (1)	
#6 TNR	When the updated compensation value in the tool retract and recover function is effective, The updated compensation value is effective in the recovery operation (0) / The updated compensation value is effective in the re-positioning operation (1)	PRM 7002#7
#7 TNR	When the compensation value is updated while the tool retract and recover function is executing, invalid. (0) / effective. (1)	

7003	Manual intervention	
#0 MCP	When the manual absolute is on and manual operation is executed in reset state or automatic operation stop state, the movement amount of the manual operation is reflected to, the movement amount of the first absolute command (0) / the coordinate system at the cycle start (1)	
7010	Manual numerical command	<Axis>
#0 JMV	In manual numerical specification, axis movement specification is, allowed (0) / not allowed (1)	
7040	Tool retract and recover	
#0 TRI #1 TRS #2 RPS #3 TRC	The G10.6 command for tool retract and recover is, assumed to be an absolute or incremental command according to the setting of the absolute/incremental mode (0) / assumed to be an incremental command at all times (1) After the completion of repositioning in tool retract and recover, automatic operation is restarted (0) / operation stops when the single block switch is on. When a cycle start is executed again, automatic operation is started. (1) When the tool retract signal TRESC is set to 1 after G10.6 is specified alone, the tool is, not retracted (0) / retracted (1) When automatic operation is restarted after tool retract and recover operation is executed during the execution of a drilling canned cycle, the same drilling cycle is performed (0) / the next drilling cycle is performed (1)	PRM 7041
7041	Retraction distance in tool retract and recover	<Axis> PRM 7040#2
7042	Feedrate for each axis in tool retract and recover	
7055	Bell-shaped acc./dec. before interpolation	
#3 BCG	The bell-shaped acc./dec. time constant change function before interpolation is, disabled (0) / enabled (1)	
7066	Acceleration/deceleration reference speed for the bell-shaped acc./dec. time constant change function	

7.2.44 Manual Handle

<table>
<tr><td>7100</td><td>Manual handle feed</td><td></td></tr>
<tr><td>#0 JHD
#1 THD
#3 HCL
#5 MPX</td><td>The enabling of manual handle feed in the JOG mode or the enabling of incremental feed in the manual handle feed mode is, invalid (0) / valid (1)
In the TEACH IN JOG mode, the manual pulse generator is, disabled (0) / enabled (1)
The clearing of handle interrupt amount display by the soft key [INTRPT CANCEL] is, disabled (0) / enabled (1)
For manual handle travel distance selection, MP1 and MP2 are used as common signals (0) / signals dependent on the manual pulse generator are used (1)
<table>
<tr><th>Manual pulse generator</th><th>Manual handle travel distance selection signal</th></tr>
<tr><td>1st unit</td><td>MP1,MP2<G019.4,.5></td></tr>
<tr><td>2nd unit</td><td>MP21,MP22<G087.0,.1></td></tr>
<tr><td>3rd unit</td><td>MP31,MP32<G087.3,.4></td></tr>
<tr><td>4th unit</td><td>MP41,MP42<G087.6,.7></td></tr>
<tr><td>5th unit</td><td>MP51,MP52<G380.0,.1></td></tr>
</table></td><td></td></tr>
<tr><td>7102</td><td>Rotation direction</td><td><Axis></td></tr>
<tr><td>#0 HNG
#1 HNA</td><td>The move direction on each axis is, same as the rotation direction of the manual pulse generator (0) / opposite to the rotation direction of the manual pulse generator (1)
When the manual handle feed direction inversion signal HDN <Gn0347.1> is set to 1, the move direction on each axis is, same as the rotation direction of the manual pulse generator (0) / opposite to the rotation direction of the manual pulse generator (1)</td><td></td></tr>
</table>

7103	Manual handle feed	
#1 RTH #2 HNT #3 HIT	By a reset or emergency stop, the manual handle interrupt amount is, not canceled (0) / canceled (1) The travel distance magnification for incremental feed/manual handle feed is, same as the combination of MP1 and MP2 (0) / 10 times greater than the combination of MP1 and MP2 (1) The travel distance magnification for manual handle interrupt is, same as the combination of MP1 and MP2 (0) / 10 times greater than the combination of MP1 and MP2 (1)	 PRM 7113, 7114 PRM 7113, 7114
7105	I/O Link connection	
#1 HDX #5 LBH #6 BHS	The manual handle for I/O Link connection is, automatically set (0) / manually set (1) Manual handle feed for the βi servo unit using the I/O Link manual pulse generator is, disabled (0) / enabled (1) When the I/O Link βi is operated using the manual pulse generator on the host, whether to perform manual handle feed is, not automatically determined (0) / automatically performed (1)	PRM 12300 - 12304, 12340 - 12344 PRM 12330-12337
7106	Manual linear/circular interpolation, handle-synchronous feed	
#3 MRI #4 MRO #5 HSR	Internal relay (the R signal) of PMC that uses it with input data in manual linear/circular interpolation, R960 to R979 are used (0) / the address that bound it with the parameter No. 13541 is used (1) Internal relay (the R signal) of PMC that uses it with output data in manual linear/circular interpolation, R980 to R989 are used (0) / the address that bound it with the parameter No. 13542 is used (1) The direction of manual pulse generator rotation in the handle-synchronous feed function is, effective in both (0) / effective in one direction. The effective direction is selected by selecting direction of manual handle rotation signal HDSR <Gn193.3> (1)	PRM 13541 PRM 13542
7107	Manual handle feed	
#1 FJH	When JHD No.7100#0 = 1, jog feed and manual handle feed in jog feed mode, or incremental feed and manual handle feed in manual handle feed mode is, superimposed (0) / not superimposed (1)	
7113	Manual handle feed magnification m	
7114	Manual handle feed magnification n	
7117	Allowable number of pulses that can be accumulated during manual handle feed	MP1, MP2
7131	Manual handle feed magnification m2 / 2nd manual pulse generator	
7132	Manual handle feed magnification n2 / 2nd manual pulse generator	
7133	Manual handle feed magnification m3 / 3rd manual pulse generator	
7134	Manual handle feed magnification n3 / 3rd manual pulse generator	
7135	Manual handle feed magnification m4 / 4th manual pulse generator	
7136	Manual handle feed magnification n4 / 4th manual pulse generator	
7137	Manual handle feed magnification m5 / 5th manual pulse generator	
7138	Manual handle feed magnification n5 / 5th manual pulse generator	

7.2.45 Manual Linear/Circular Interpolation

7160	Approach handle clamp feedrate	
7161	Guidance handle clamp feedrate	

7.2.46 Reference Point with Mechanical Stopper

7181	1st withdrawal distance in reference point setting with mechanical stopper	<Axis> PRM 1006#5
7182	2nd withdrawal distance in reference point setting with mechanical stopper	
7183	1st butting feedrate in reference point setting with mechanical stopper	<Axis>
7184	2nd butting feedrate in reference point setting with mechanical stopper or butting feedrate in reference point setting with mechanical stopper by Grid Method	
7185	Withdrawal feedrate (common to the 1st and 2nd butting operations) in reference point setting with mechanical stopper	
7186	Torque limit value in reference point setting with mechanical stopper	<Axis>
7187	Torque limit value in reference point setting with mechanical stopper or reference point setting with mechanical stopper by Grid Method	<Axis> PRM 7186
7188	Reference point setting with mechanical stopper by Grid Method	<Axis>
#0 GRS	Reference point setting with mechanical stopper by Grid Method is, not performed (0) / performed (1)	
#7 RNW	During reference point setting with mechanical stopper by Grid Method, until the sign of servo position deviation is inverted, the grid is, not ignored (0) / ignored (1)	

7.2.47 Software Operator's Panel

7200	Function selection	
#0 OP1	Mode selection on the software operator's panel is, not performed (0) / performed (1)	
#1 OP2	Jog feed axis selection and manual rapid traverse selection on the software operator's panel are, not performed (0) / performed (1)	
#2 OP3	Manual pulse generator axis selection and manual pulse generator magnification selection on the software operator's panel are, not performed (0) / performed (1)	
#3 OP4	Jog feedrate override selection, feedrate override selection, and rapid traverse rate override selection on the software operator's panel are, not performed (0) / performed (1)	
#4 OP5	Optional block skip selection, single block selection, machine lock selection, and dry run selection on the software operator's panel are, not performed (0) / performed (1)	
#5 OP6	Protect key operation on the software operator's panel is, not performed (0) / performed (1)	
#6 OP7	Feed hold on the software operator's panel is, not performed (0) / performed (1)	
7201	General-purpose switch	
#0 JPC	For the name of a general-purpose switch function on the software operator's panel, the use of full-size character is, not allowed (0) / allowed (1)	
7210 7211 7212 7213 7214 7215 7216 7217	Jog-movement axis and its direction on software operator's panel	

Setting value	Feed axis and direction
0	Not moved
1	1st axis, positive direction
2	1st axis, negative direction
3	2nd axis, positive direction
4	2nd axis, negative direction
5	3rd axis, positive direction
6	3rd axis, negative direction
7	4th axis, positive direction
8	4th axis, negative direction

7220	Name of general-purpose switch 1 on software operator's panel (1st character)	
7221 : 7227	Name of general-purpose switch 1 on software operator's panel (2nd character) : Name of general-purpose switch 1 on software operator's panel (8th character)	
7228 7229 : 7235	Name of general-purpose switch 2 on software operator's panel (1st character) Name of general-purpose switch 2 on software operator's panel (2nd character) : Name of general-purpose switch 2 on software operator's panel (8th character)	
:	:	
7292 7293 : 7299	Name of general-purpose switch 10 on software operator's panel (1st character) Name of general-purpose switch 10 on software operator's panel (2nd character) : Name of general-purpose switch 10 on software operator's panel (8th character)	

7.2.48 Program Restart 1

7300	Program restart	
#5 CSS #6 MOA #7 MOU	When the Cs contour control axis is in the spindle mode or origin unestablished state, a program restart is, disabled (0) / enabled (1) Before moving to the machining restart position in program restart operation, the last M, S, T, and B codes are output (0) / all M codes and the last S, T, and B codes are output (1) Before finding a block to be restarted then moving to the machining restart position, the M, S, T, and B codes are, not output (0) / output (1)	PRM 7300#7=1
7301	Program restart screen	
#0 ROF #1 3DD #3 RPR	In restart coordinate display on the program restart screen, values considering tool length compensation, tool offset, tool radius compensation, and tool nose radius compensation are displayed (0) / the settings of parameters (No. 3104#7 and #6) and parameter (No. 3129#1) are followed (1) In 3-dimensional coordinate system conversion mode, a movement to the restart position is made in dry run in the, program coordinate system (0) / workpiece coordinate system (1) When the search is completed in program restart or quick program restart, relative coordinate values are not preset (0) / preset by absolute coordinate values (1)	
7310	Ordinal number of an axis along which a movement is made in dry run after program restart	<Axis>
7330	Quick program restart	
#0 OMC	While executing One-touch macro, restart block information on Quick program restart is memorized (0) / not memorized (1).	
7331	Quick program restart	
#0 MPD #1 RPS	In the multi path quick program restart function, the target path for a dry run movement after restart search is specified by parameter No.7338 (0) / specified by path select signal HEAD<G0063.0> and HEAD2<G0062.7>. In moving to the restart point of quick program restart, when the single block operation is invalid, the axes do not stop by the restart point (0) / stop in state of the single block by the restart point (1)	

7335	The first O number of program not memorized in program restart memory	PRM 7336
7336	The number of programs not memorized in program restart memory	PRM 7335
7337	Group number of multi path quick program restart	
7338	Ordinal number of a path when moving by dry run in multi path quick program restart	

7.2.49 Software Operator's Panel 2

7352	Name of general-purpose switch 11 on software operator's panel (1st character)	
7353 : 7359	Name of general-purpose switch 11 on software operator's panel (2nd character) : Name of general-purpose switch 11 on software operator's panel (8th character)	
7360	Name of general-purpose switch 12 on software operator's panel (1st character)	
7361 : 7367 : 7392	Name of general-purpose switch 12 on software operator's panel (2nd character) : Name of general-purpose switch 12 on software operator's panel (8th character) : Name of general-purpose switch 16 on software operator's panel (1st character)	
7393 : 7399	Name of general-purpose switch 16 on software operator's panel (2nd character) : Name of general-purpose switch 16 on software operator's panel (8th character)	

7

7.2.50 Polygon Turning

7600	Feed forward, Reference position return	
#0 PFF	In spindle-servo polygon turning, feed forward for the tool rotary axis (servo axis) during polygon turning is always, disabled (0) / enabled (1)	
#7 PLZ	Reference position return based on a G28 command on the tool rotary axis for polygon turning is, performed in the same sequence as manual reference position return (0) / performed by positioning using the rapid traverse rate (1)	
7602	Polygon machining with two spindles	
#0 MNG	The rotation direction of the master axis in the spindle-spindle polygon turning mode is, not reversed (0) / reversed (1)	
#1 SNG	The rotation direction of the synchronization axis in the spindle-spindle polygon turning mode is, not reversed (0) / reversed (1)	
#2 HDR	The phase shift direction is, not reversed (0) / reversed (1)	PRM 7602#5=0
#3 HSL	The spindle that is subject to phase shift operation for phase synchronization is, polygon synchronization axis (0) / master axis (1)	PRM 7602#5=0
#4 HST	When phase control is applied in the spindle-spindle polygon turning mode, and spindle-spindle polygon turning is specified, spindle-spindle polygon is performed, without changing the spindle speed (0) / after stopping the spindle automatically (1)	PRM 4016#7 7602#5=0
#5 COF	In the spindle-spindle polygon turning mode, phase control is, enabled (0) / disabled (1)	PRM 7602#2,#3
7603	Polygon machining with two spindles	
#0 RPL	Upon reset, the spindle-spindle polygon turning mode is, released (0) / not released (1)	

#1 QDR #2 SBR #3 PLROT #5 RDG #7 PST	The rotation direction of the synchronization axis, depends on the sign of Q (0) / is the rotation direction of the 1st spindle (1) For spindle synchronization, speed ratio control is, not used (0) / used (1) The machine coordinates of a tool rotary axis for polygon turning are, rounded by the setting in parameter (No. 7620) (0) / rounded by 360° (or the setting in parameter (No. 1260) when parameter (No. 1008#0) is set to 1) (1) The diagnostic data No. 476 (spindle-spindle polygon phase command value (R)) displays, the specified value (0) / the actual number of shift pulses (1) The polygon spindle stop signal *PLSST is, not used (0) / used (1)	ALM PS0218
7604		
#7 PCG	If both the spindle-spindle polygon turning option and the polygon turning option are specified, spindle-spindle polygon turning is performed (0) / ether of the options is enabled depending on the setting of parameter No. 7605 (1)	
7605	Polygon turning type selection	
7610	Control axis number of tool rotary axis for polygon turning	ALM PS0314
7620	Movement of tool rotary axis per revolution for polygon turning [deg]	
7621	Maximum allowable speed for the tool rotary axis for polygon turning [min^{-1}]	ALM PS5018
7631	Allowable spindle speed deviation level in polygon machining with two spindles [min^{-1}]	
7632	Steady state confirmation time duration in polygon machining with two spindles [ms]	PRM7631
7635	Ratio of slave spindle speed in spindle synchronization control	PRM 7603#2=1
7636	Maximum allowable slave spindle speed in spindle synchronization control [min^{-1}]	
7640	Master axis in polygon machining with two spindles	PRM 7641,3411 or later
7641	Polygon synchronous axis in polygon machining with two spindles	PRM 7640,3411or later
7642	Master axis in polygon machining with two spindles (spindle number common to the system)	PRM 7640,7641 7643,3411or later
7643	Polygon synchronous axis in polygon machining with two spindles (spindle number common to the system)	PRM 7640,7641 7642,3411or later

7.2.51 Electric Gear Box (EGB)

7700	EGB synchronization, Helical compensation	
#0 HBR #2 HDR	Upon reset, EGB synchronization is, canceled (0) / not canceled (1) Direction of helical gear compensation (Usually, set 1.)	
7701	EGB synchronization	
#3 LZR	When L (number of hob threads) = 0 is specified at the start of EGB synchronization or the start (G81) of flexible synchronization control, synchronization is started assuming that L = 1 is specified (0) / synchronization is not start (1)	

7702	Electric gear box	
#0 TDP #1 UAX #3 ART #6 PHS #7 PHD	The specifiable number of teeth, T, of the EGB or flexible synchronization control is, 1 to 5000 (0) / 0.1 to 500 (1) U-axis control with the electric gear box is, disabled (0) / enabled (1) The alarm-based retract function is, disabled (0) / enabled (1) When the G81/G80 block contains no R command, acc./dec. is not performed at the start or cancellation of the EGB (0) / acc./dec. is performed at the start or cancellation of the EGB for automatic phase synchronization (1) The direction of movement for automatic phase synchronization is, positive (+) (0) / negative (-) (1)	
7703	EGB synchronization	
#0 ERV #1 ARE #2 ARO	During EGB synchronization, feed per revolution is performed for, feedback pulses (0) / pulses converted to the speed for the workpiece axis (1) Alarm-based retract operation is performed, during the function mode or automatic operation (0) / during the function mode (1) Alarm-based retract operation is performed, during the function mode (0) / during the function mode and automatic operation (1) The function mode described in the parameter ARE and the parameter ARO is a mode of the following functions. - Electronic gear box(EGB) - Flexible synchronization control	
7704	General-purpose retract function	
#0 ACR #3 UOC	In the AI contour control mode, the general-purpose retract function is, not used (0) / used (1) When the U-axis control mode is released, the tool is, not moved (0) / moved (1), along the U-axis to the position where the reference counter is 0	
7705	Simple spindle EGB function	
#0 SEG	The simple spindle EGB function is, not used (0) / used (1)	
7709	Number of the axial feed axis for helical compensation	
7710	Synchronous axis number	
7731	G code for EGB specification	
#0 EFX #3 ECN #5 HBR #6 EPA	For EGB specification or hob command by flexible synchronization control, G80 and G81 are used (0) / G80.4 and G81.4 are used (1) When the automatic phase synchronization function for the EGB is disabled, alarm PS1595 is issued for the G81 or G81.5 command specified during EGB synchronization (0) / the G81 or G81.5 command specified during EGB synchronization is allowed (1) When the EGB synchronization start command G81.4 or flexible synchronization control start command G81.4 is specified, the number of teeth is specified, by T (0) / by R (1) The automatic phase synchronization function for the EGB or the aoutomatic phase synchronization function for flexible synchronization control by hob command aligns the one-rotation signal position of the master axis, with the position at which machine coordinates of the slave axis are 0 (0) / with the slave axis position at the start of synchronization (FS16 specification) (1)	Canned cycle

#7 HAD	The timing for reflecting helical gear compensation and travel distance of automatic phase synchronization to absolute coordinates is when synchronization is canceled (0) / during helical gear compensation and automatic phase synchronization (1)	
7740	Feedrate during retraction	<Axis>
7741	Retracted distance	<Axis>
7745	Time constant for linear acc./dec. in axis-by-axis retract operation [ms]	<Axis> PRM 7704#0, 7740
7772	Number of position detector pulses per rotation about the tool axis [Detection unit]	4 pulses with the A/B phase detector
7773	Number of position detector pulses per rotation about the workpiece axis [Detection unit]	
7776	Feedrate during automatic phase synchronization for the workpiece axis [deg/min]	PRM1420
7777	Angle shifted from the spindle position (one-rotation signal position) the workpiece axis uses as the reference of phase synchronization [deg]	
7778	Acceleration for acc./dec. for the workpiece axis [deg/sec^2]	<Axis>
7782	Number of pulses from the position detector per EGB or flexible synchronization control master axis rotation [Detection unit]	<Axis> 4 pulses with the A/B phase detector
7783	Number of pulses from the position detector per EGB or flexible synchronization control slave axis rotation [Detection unit]	<Axis>
7784	Numerator of a signal-based servo EGB synchronization ratio	<Axis>
7785	Denominator of a signal-based servo EGB synchronization ratio	<Axis>
7786	Signal-based servo EGB synchronization	
#0 SVE #1 UFF	Signal-based servo EGB synchronization is, disabled (0) / enabled (1) During U-axis synchronization, a interpolation command to between the U-axis and the other axes is, not available (0) / available (1)	

7.2.52 PMC Axis Control 1

8001	Function selection	
#0 MLE	For PMC-controlled axes, the all axis machine lock signal MLK is, valid (0) / invalid (1)	PRM 8006#1
#2 OVE	The signals related to dry run and override in PMC axis control are, the same as those used for the CNC (0) / signals specific to PMC axis control (1)	*FV0E - *FV7E OVCE, DRNE ROV1E, ROV2E, RTE
#3 RDE	Dry run for rapid traverse in PMC axis control is, invalid (0) / valid (1)	
#5 NCC	When the program specifies a move command for a PMC controlled axis (with *EAX=1) not placed under PMC axis control, the CNC command is valid (0) / an alarm is issued (1)	ALM PS0130
#6 AUX	In PMC axis control, the auxiliary function command (12H) output size is, 1 byte (0) / 2 bytes (1)	
#7 SKE	As a skip signal In PMC axis control, the SKIP signal is used (0) / the ESKIP signal is used (1)	

8002	Unit of feedrate	
#0 RPD	The rapid traverse rate in PMC axis control follows, the setting of parameter (No. 1420) (0) / the feedrate data specified by a PMC axis control command (1)	
#1 DWE	When IS-C is used in PMC axis control, the unit of a dwell command is, 1 ms (0) / 0.1 ms (1)	
#3 F10	Unit of feedrate specification for cutting feed (feed per minute) in PMC axis control	PRM 8002#4=0 8002#5=0

	F10	IS-A	IS-B	IS-C	IS-D	IS-E
Metric input	0	10	1	0.1	0.01	0.001
	1	100	10	1	0.1	0.01
Inch input	0	0.1	0.01	0.001	0.0001	0.00001
	1	1	0.1	0.01	0.001	0.0001

#4 PF1	Unit of feedrate specification for cutting feed (feed per revolution) in PMC axis control	
#5 PF2		

PF2	PF1	Feedrate unit
0	0	1/1
1	1	1/10
0	1	1/100
1	0	1/1000

#6 FR1	Unit of feedrate data specification for cutting feed (feed per revolution) in PMC axis control	
#7 FR2		T series

FR2	FR1	Metric input	Inch input
0	0	0.0001	0.000001
1	1		
0	1	0.001	0.00001
1	0	0.01	0.0001

M series

FR2	FR1	Metric input	Inch input
0	0	0.01	0.0001
1	1		
0	1	0.1	0.001
1	0	1	0.01

8003	Feedrate	<Axis>
#3 FEX	The maximum feedrate for cutting feed and continuous feed in PMC axis control, or spindle control with servo motor is, not extended (0) / extended (1)	

8004	Alarm, Speed command unit, In-position check	
#2 JFM	Unit of feedrate data specification for continuous feed in PMC axis control	

Increment system	JFM	Metric input	Inch input	Rotary axis
IS-B	0	1	0.01	1
	1	200	2.0	200
IS-C	0	0.1	0.001	0.1
	1	20	0.2	20

#5 DSL	If the selection of an axis is changed when axis selection is disabled in PMC axis control, an alarm is issued (0) / an axis selection is made (1)	ALM PS0139
#6 NCI	In PMC axis control, an in-position check at the time of deceleration is, performed (0) / not performed (1)	PRM1826

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8005	Travel distance on PMC-controlled axes	
#0 EDC	In PMC axis control, the external deceleration function is, disabled (0) / enabled (1)	
#1 CDI	When a PMC-controlled axis is specified by diameter programming, a travel distance is based on radius specification (0) / a travel distance is based on diameter specification and a feedrate command is base on radius specification (1)	PRM 1006#3=1
#2 R10	When parameter (No. 8002#0) is set to 1, the unit for specifying a rapid traverse rate for the PMC axis is, 1 mm/min (0) / 10 mm/min (1)	
#3 DRR	For cutting feed (feed per revolution) in PMC axis control, dry run is, disabled (0) / enabled (1)	
#4 EVP	A speed command in PMC axis control is based on, speed specification (0) / position specification (1)	PRM 8007#2=1
#5 IFV	When parameter (No. 8001#2) is set to 1 in PMC axis control, the feedrate override signal *EFOVx and the override cancel signal OVC are, used on a path-by-path basis (0) / used on a group-by-group basis (1)	
8006	Machine lock for each axis	
#1 MLS	When the all axis machine lock signal is disabled in PMC axis control, axis-by-axis machine lock is, disabled (0) / enabled (1)	PRM 8001#0=1
#4 EFD	When cutting feed (feed per minute) is used in PMC axis control, the specification unit of feedrate data is, unchanged (1 times) (0) / 100 times greater (1)	PRM 8002#3
#6 EZR	In PMC axis control, parameter (No. 1005#0) is, invalid (0) / valid (1)	
8007	Speed command	
#2 VCP	The PMC axis control speed command is based on, FS15 specification (0) / FS16 specification (1)	
#3 ESY	In PMC axis control, external pulse synchronization (serial spindle synchronization) is, disabled (0) / enabled (1)	
#5 PSA	Acceleration/deceleration after interpolation for skip command of PMC axis control is, invalid (0) / valid (1)	
8008	Function selection	<Axis>
#0 EMR	When a PMC axis control command is issued in mirror image mode, the mirror image is, not considered (0) / considered (1)	MI1 to MI8 PRM12#0
#1 PFE	If G531.4 is set to 1, advanced preview feed-forward for PMC axis control (command 00h, 01h, 02h, or 21h) is, disabled (0) / enabled (1)	
8010	Selection of the DI/DO group for each axis controlled by the PMC	<Axis>
8011	Real time custom macros	<Axis>
#0 XRT	The axis that uses the group specified by parameter (No. 8010) is, not controlled by the real time custom macro (0) / controlled by the real time custom macro (1)	
8013	PMC axis control	<Axis>
#1 OVR	When OVE(No.8001#2) is set to 1, for rapid traverse override in PMC axis control, rapid traverse override signals EROV2 and EROV1 <G150.1 and G150.0> for PMC axis control are used (0) / 1% step rapid traverse override signals *EROV7 to *EROV0 <G151> for PMC axis control are used (1)	
#3 ROP	When rotation axis rollover is enabled for an axis controlled in PMC axis control, the direction in which a movement (rotation) is performed to reach an end point by a reference position return command 07H to 0AH (equivalent to G28, G30P2/P3/P4) is, determined by the sign of the specified value (0) / the direction in the shortest path (1)	

#4 R20	When the machine coordinate system selection (20h) is commanded with the PMC axis control for the rotary axis to which the roll-over function is valid (bit 0 (ROAx) of parameter No.1008 is set to 1), setting the bit 1 (RABx) of parameter No.1008 which specifies the direction of the rotation for an absolute command is, invalid(0) / valid(1)	
8019	PMC axis control	
#0 EOS #1 PIA #2 EZC	In external pulse synchronization (serial spindle synchronization) in PMC axis control, the serial spindle to be synchronized is, the first spindle of path 1 (0) / any spindle (1) After the move command of PMC axis control is interrupted by reset signal ECLRg, If different acceleration/deceleration type command without waiting for a deceleration stop generates not alarm (0) / alarm DS1451 (1) If the controlled axis selection signals EAX1 to EAX8 are "0" or PMC controlled-axis selection variable (#8700) is 0, the PMC axis control command generates not alarm (0) / alarm DS1451 (1)	
8020	FL feedrate for reference position return along each axis in PMC axis control	<Axis> PRM1425
8022	Upper limit rate of feed per revolution during PMC axis control	<Axis>
8028	Time for acc./dec. calculation when a feedrate is specified under PMC axis control [ms]	<Axis>
8029	Acceleration change time of bell-shaped acceleration/deceleration for the speed command under PMC axis control [ms]	<Axis>
8030	Time constant for exponential acc./dec. in cutting feed or continuous feed under PMC axis control [ms]	<Axis>
8031	FL feedrate for exponential acc./dec. in cutting feed or continuous feed under PMC axis control	<Axis>
8032	Feedrate for acc./dec. calculation when a feedrate is specified under PMC axis control [min^{-1}]	<Axis>
8040	Travel distance per motor revolution viewed in the least command increment when a position is specified with a PMC axis control speed command	<Axis>

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7.2.53 Multi-path

8100	Multi-path control	
#0 RST #1 IAL #6 DSB #7 NWP	The pressing of the [RESET] key on the MDI unit is, valid for all paths within the same machine group (0) / valid only for a selected path (1) When an alarm is issued with one path during automatic operation, the other path is, stopped (0) / not stopped (1) The inter-path single block check function is, disabled (0) / enabled (1) Servo activation is turned on, together with other machine groups (0) / independently of other machine groups (1)	
8101	Waiting function	
#1 STW	Waiting function by specifying start point is not effective (0) / effective. (The option of the waiting function by specifying start point is necessary) (1)	
8103	Waiting M code	
#0 MWT #1 MWP	As the signal interface for the waiting M code, the signal interface for three paths is used (0) / the signal interface for two paths is used (1) To specify a P command for the waiting M code/balance cut, a binary value is used (0) / a path number combination is used (1)	PRM 8103#0
8104	Lorder control	
#6 NL2	Setting of enable or disable the function for loader control	

<table>
<tr><td>#7 NLC</td><td><table><tr><td>NLC</td><td>NL2</td><td>Loader path 1</td><td>Loader path 2</td></tr><tr><td>0</td><td>0</td><td>Enable</td><td>Enable</td></tr><tr><td>0</td><td>1</td><td>Enable</td><td>Disable</td></tr><tr><td>1</td><td>0/1</td><td>Disable</td><td>Disable</td></tr></table></td><td></td></tr>
<tr><td>8106</td><td></td><td></td></tr>
<tr><td>#0 MGR</td><td>When the RESET key on the MDI unit is pressed, all machine groups are reset (0) / only the machine groups to which the path selected by the path selection signal belongs are reset (1)</td><td></td></tr>
<tr><td>#2 CVP</td><td>By a reset in path other than path 1, the custom macro variables common to paths set to the common variables #100 to #499 cleared by power-off is, not cleared to <null> (0) / cleared to <null> (1)</td><td>PRM 6001#6</td></tr>
<tr><td>#3 SCD</td><td>When the function for loader control is valid, path selection by pressing MDI keys SHIFT and HELP at the same time is enabled (0) / disabled (1)</td><td></td></tr>
<tr><td>8107</td><td>Multi-path control</td><td></td></tr>
<tr><td>#0 ESB</td><td>External subprogram calls on the Data Server, do not support multipath operations (0) / support multipath operations (1)</td><td>PRM 0020</td></tr>
<tr><td>8110</td><td>Waiting M code range (minimum value)</td><td></td></tr>
<tr><td>8111</td><td>Waiting M code range (maximum value)</td><td></td></tr>
<tr><td>8114</td><td>Top number of waiting M codes of high-speed type</td><td></td></tr>
<tr><td>8115</td><td>Number of waiting M codes of high-speed type</td><td></td></tr>
</table>

7.2.54 0*i*-F / 0*i* Mate-F Basic functions

8131	Basic functions	
#0 HPG	Manual handle feed is, not used (0) / used (1)	
#1 F1D	One-digit F code feed is, not used (0) / used (1)	M series
#2 EDC	External deceleration is, not used (0) / used (1)	
#3 AOV	Automatic corner override is, not used (0) / used (1)	M series
8132	Basic functions	
#0 TLF	Tool life management is, not used (0) / used (1)	
#1 YOF	Y-axis offset is, not used (0) / used (1)	T series
#2 BCD	Second auxiliary function is, not used (0) / used (1)	
#3 IXC	Index table indexing is, not used (0) / used (1)	M series
#4 SPK	Small diameter peck drilling cycle is, not used (0) / used (1)	M series
#5 SCL	Scaling is, not used (0) / used (1)	M series
8133	Basic functions	
#0 SSC	Constant surface speed control is, not used (0) / used (1)	
#1 AXC	Spindle positioning is, not used (0) / used (1)	T series
#2 SCS	Cs contour control is, not used (0) / used (1)	
#3 MSP	Multi-spindle is, not used (0) / used (1)	
#4 SYC	Spindle synchronization is, not used (0) / used (1)	
#5 SSN	Spindle serial output is, used (0) / not used (1)	
#6 SPG	Polygon turning with two spindles is, not used (0) / used (1)	T series
8134	Basic functions	
#0 IAP	Conversational programming with graphic function is, not used (0) / used (1)	
#1 BAR	Chuck and tail stock barrier function (T series) is, not used (0) / used (1) Stored stroke limits 2 and 3 are, used (0) / not used (1)	
#2 CCR	Chamfering / corner R is, not used (0) / used (1)	T series
#3 NGR	Graphic display is, used (0) / not used (1)	
#6 NBG	Background editing is, used (0) / not used (1)	
#7 NCT	Run hour and parts count display is, used (0) / not used (1)	
8135	Basic functions	
#1 NHI	Manual handle interruption is, used (0) / not used (1)	
#2 NSQ	Program restart is, used (0) / not used (1)	
#3 NRG	Rigid tapping is, used (0) / not used (1)	
#4 NOR	Spindle orientation is, used (0) / not used (1)	

#5 NMC #6 NCV #7 NPD	Custom macro is, used (0) / not used (1) Addition of custom macro common variables is, used (0) / not used (1) Pattern data input is, used (0) / not used (1)	
8136	Basic functions	
#0 NWZ #1 NWC #2 NWN #3 NOP #4 NOW #6 NGW #7 NCR	Workpiece coordinate system is, used (0) / not used (1) Workpiece coordinate system preset is, used (0) / not used (1) Addition of workpiece coordinate system pair (48 pairs) is, used (0) / not used (1) Software operator's panel is, used (0) / not used (1) Software operator's panel general purpose switch is, used (0) / not used (1) Tool offset memory C (M series) or tool geometry / wear compensation (T series) is, used (0) / not used (1) Tool nose radius compensation is, used (0) / not used (1)	 M series T series
8137	Basic functions	
#0 NVC #1 NVL #2 NDD #3 NMR #4 NCD #5 NPI #6 NCL	Balance cutting is, used (0) / not used (1) Variable lead thread cutting is, used (0) / not used (1) Direct drawing dimension programming is, used (0) / not used (1) Multiple repetitibe cycle is, used (0) / not used (1) Canned cycles for drilling is, used (0) / not used (1) Polar coordinate interpolation is, used (0) / not used (1) Cylindrical interpolation is, used (0) / not used (1)	T series T series T series T series T series

7.2.55 Interference Check for Each Path

8140	Interference check for each path	T series
#0 TY0 #1 TY1 #2 IT0 #3 IFM #4 IFE #5 ZCL #7 IPF	These parameters set the coordinate system relationship between two tool posts based on the tool post of path 1. When offset number 0 is specified by a T code, checking interference between paths is stopped until an offset number other than 0 is specified by the next T code (0) / checking interference between paths is continued according to the previously specified offset number (1) In the manual mode, an interference check between paths is, not performed (0) / performed (1) An interference check between paths is, performed (0) / not performed (1) An interference check between paths is, made along the Z-axis (0) / not made along the Z-axis (made along the X-axis only) (1) In inter-path interference checking, interference between two paths is checked (0) / interference among multiple paths is checked (1)	
8141	Distance along the X axis between the reference positions of tool post 1 and tool post n in the same machine group	
8143	Distance along the Z axis between the reference positions of tool post 1 and tool post n in the same machine group	
8151	Distance along the X axis between the reference positions of tool posts 1 and 2	T series
8152	Distance along the Z axis between the reference positions of tool posts 1 and 2	T series
8158	Coordinate system pattern with the reference position based on the tool post of path 1 in the same machine group	T series

7.2.56 Synchronous/Composite Control and Superimposed Control 1

8160	Synchronous, composite, and superimposed control	
#4 AXS	When the axis moving signals MV1 to MV8 (Fn102) or the axis moving direction signals MVD1 to MVD8 (Fn106) of the slave axis in superimposed control is output, state output is performed, according to the result of superimposition (0) / according to the result of movement on each axis (1)	
#5 NCS	If an overtravel occurs on an axis under synchronous, composite, or superimposed control, synchronous, composite, or superimposed control is, released (0) / not released (1)	
#6 SPE	The synchronization deviation is, the difference between the positional deviation of the master axis and that of the slave axis (0) / the difference between the positional deviation of the master axis and that of the slave axis plus the acc./dec. delay difference (1)	PRM 8162#1=1 8181
#7 NRS	By a reset, synchronous, composite, or superimposed control is, released (0) / not released (1)	
8161	Synchronous/composite control	
#0 NMR	When an axis subject to composite control is placed in servo-off state, composite control is, canceled (0) / not canceled if follow-up operation for the axis is disabled (1)	PRM 1819#0
#5 CRZ	If the state of the composite control axis selection signal is switched in composite control on two axes under Cs contour control, the reference position establishment state of the two axes in composite control is, maintained (0) / assumed to be unestablished (1)	
#7 NSR	When servo-off state occurs with an axis in synchronous control, synchronous control, is canceled (0) / not canceled if follow-up operation for the axis is disabled (1)	PRM 1819#0
8162	Mirror image, Synchronous, composite, and superimposed control	<Axis>
#0 SMR	Synchronous mirror-image control is, not applied (0) / applied (1)	
#1 SER	The synchronization deviation is, not detected (0) / detected (1)	PRM8181
#2 PKU	In the parking state, the absolute, relative, and machine coordinates are not updated (0) / the absolute and relative coordinates are updated but the machine coordinates are not updated (1)	PRM 8167#1
#3 OMR	Superimposed mirror-image control is, not applied (0) / applied (1)	
#4 MPM	When composite control is started, the workpiece coordinate system is, not set automatically (0) / set automatically (1)	PRM 8184
#5 MPS	When composite control is terminated, the workpiece coordinate system is, not set automatically (0) / set automatically (1)	PRM1250
#6 MCD	When composite control is applied, the coordinate system direction for the relevant axes, remains the same without applying mirror image (0) / is reversed by applying mirror image (1)	
#7 MUM	In composite control, move command specification for the axis is, not prohibited (0) / prohibited (1)	
8163	Synchronous/composite control	<Axis>
#1 SPM	When synchronous control is started, automatic workpiece system setting for the master axis is, not performed (0) / performed (1)	PRM8185
#2 SPS	When synchronous control is terminated, automatic workpiece coordinate setting for the master axis is, not performed (0) / performed (1)	PRM1250

#3 SCM	When workpiece coordinates are calculated in synchronous control, the workpiece coordinates are calculated, from the machine coordinates for the slave axis (0) / from the machine coordinates of the master axis and slave axis (1)	
#4 SCD	The positive (+) directions of the master axis and slave axis in the coordinate system in synchronous control are, identical (0) / opposite (1)	
#5 SMI	In synchronous control, the manual handle interrupt amount for the master axis or the mirror image mode is, reflected in the slave axis (0) / not reflected in the slave axis (1)	
#6 MMI	For a composite control axis, manual handle interrupt under composite control is, enabled (0) / disabled (1)	
#7 NUM	When neither synchronous control nor composite control is applied, a move command for the axis is, not disabled (0) / disabled (1)	ALM PS0353
8164	Synchronous, composite, and superimposed control	<Axis>
#0 MWS	In automatic workpiece coordinate system setting performed when composite control is started, a workpiece shift and position offset are, not considered (0) / considered (1)	T series PRM 8162#4=1
#1 MWE	In automatic workpiece coordinate system setting performed when composite control is canceled, a workpiece shift and position offset are, not considered (0) / considered (1)	T series PRM 8162#5=1
#2 MCS	In automatic workpiece coordinate system setting performed when composite control is started, a workpiece coordinate system is set in the normal way (0) / the coordinate system of the other path subject to composite control is used (1)	PRM 8162#4=1
#3 MCE	In automatic workpiece coordinate system setting performed when composite control is canceled, a workpiece coordinate system is automatically set in the normal way (0) / the coordinate system of the other path subject to composite control is used (1)	PRM 8162#5=1
#5 OPS	When superimposed control is canceled, control in which an amount of movement along the master axis subject to superimposed control is added to the workpiece coordinate of the slave axis is, not applied (0) / applied (1)	
#6 SOK	If a master axis subject to superimposed control is also subject to synchronous control, and superimposed control is started during synchronous control, an alarm is issued (0) / no alarm is issued (1)	
8166	Composite control interface	
#1 MIX	For composite control, an interface for three paths or more is used (0) / the conventional two-path interface is used (1)	PRM8183
8167	Automatic workpiece coordinate system setting	<Axis>
#1 SYW	The axis is, not used as a master axis and slave axis at the same time (0) / used as a master axis and slave axis at the same time (1)	
#2 SGM	In automatic workpiece coordinate system setting at the start of synchronous control, a tool offset is, considered (0) / not considered (1)	T series PRM 8163#1
#3 SGS	In automatic workpiece coordinate system setting at the end of synchronous control, a tool offset is, considered (0) / not considered (1)	T series PRM 8163#2 8167#6
#4 SWM	In automatic workpiece coordinate system setting at the start of synchronous control, a workpiece shift is, not considered (0) / considered (1)	T series PRM 8163#1

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#5 SWS #6 SPV	In automatic workpiece coordinate system setting at the end of synchronous control, a workpiece shift is, not considered (0) / considered (1) At the end of synchronous control, automatic workpiece coordinate system setting for the slave axis is, not performed (0) / performed (1)	T series PRM 8163#2 8167#6 PRM1250
8168	Emergency stop, servo off, servo alarm	
#0 MPA #1 MSO #2 SVF #6 WST	If an alarm concerning synchronous control, composite control, or superimposed control is issued, all paths of the machine group to which the alarm occurrence path belongs are placed in the feed hold state (0) / only the path including the axis with which the alarm is issued is place in the feed hold state (1) When an emergency stop, servo-off state, or servo-off alarm occurs in synchronous control, composite control, or superimposed control, the synchronous control, composite control, or superimposed control state is canceled and follow-up operation is not performed (0) / the synchronous control, composite control, or superimposed control state is not canceled and follow-up operation is performed (1) When an axis under composite control is placed in the servo-off state, composite control is canceled (0) / composite control is not canceled and follow-up operation follows the setting of parameter (No. 1819#0) (1) When a workpiece coordinate system is automatically set up for a slave axis at the end of synchronous control, workpiece coordinate system presetting is, not performed (0) / performed (1)	 PRM 8168#2 PRM 8161#0 8168#1
8169	Position display, rapid traverse	<Axis>
#0 MDM #1 MVM #2 MRF #6 SES	As machine coordinates in composite control, coordinates for the local path are displayed (0) / coordinates for the other path in composite control are displayed (1) When machine coordinates are read in composite control, machine coordinates for the local path are read (0) / machine coordinates for the other path in composite control are read (1) The rapid traverse rate used in composite control is, rapid traverse rate for the specified axis (0) / rapid traverse rate for the move axis (1) If a synchronization error is out of the tolerable range (parameter No. 8181), alarm SV0407, “EXCESS ERROR”, is issued (0) / no alarm is issued. Instead, the excess synchronization error signal SEO<Fn559> is output (1)	 PRM 8162#1 8181
8180	Master axis with which an axis is synchronized under synchronous control	<Axis>
8181	Synchronization error limit of each axis [Detection unit]	<Axis> PRM 8162#1
8183	Composite control axis of the other path in composite control for each axis	<Axis>
8184	Coordinates of the reference point of an axis on the coordinate system of another axis under composite control	<Axis> PRM 8162#4=1
8185	Workpiece coordinates on each axis at the reference position	<Axis> PRM 8163#1=1
8186	Master axis for each axis under superimposed control	<Axis>
8190	Rapid traverse rate for each axis under superimposed control [mm/min]	<Axis>
8191	F0 velocity of rapid traverse override for an axis under superimposed control [mm/min]	<Axis>

8192	Linear acc./dec. time constant in rapid traverse for each axis under superimposed control [ms]	<Axis>
8194	Maximum cutting feedrate for each axis under superimposed control [mm/min]	<Axis>

7.2.57 Angular Axis Control

<table>
<tr><td>8200</td><td>Angular axis control</td><td></td></tr>
<tr><td>#0 AAC
#2 AZR
#3 AZP</td><td>Angular axis control is, not exercised (0) / exercised (1)
During manual reference position return along the slanted axis under angular axis control, the tool is, moved also along the Cartesian axis (0) / not moved along the Cartesian axis (1)
When a movement is made along the Cartesian axis due to a movement along the slanted axis, reference position return end signals for the Cartesian axis ZP1 to ZP8 are, not cleared (0) / cleared (1)</td><td></td></tr>
<tr><td>8201</td><td>Angular axis control, Stored stroke limit check</td><td></td></tr>
<tr><td>#0 AOT
#1 AO2
#2 AO3
#6 A53
#7 ADG</td><td>Stored stroke limit 1 under angular axis control is handled as, value in the slanted coordinate system (0) / value in the Cartesian coordinate system (1)
Stored stroke limit 2 under angular axis control is handled as, value in the slanted coordinate system (0) / value in the Cartesian coordinate system (1)
Stored stroke limit 3 under angular axis control is handled as, value in the slanted coordinate system (0) / value in the Cartesian coordinate system (1)
If a slanted axis is singly specified by a machine coordinate command (G53) in angular axis control, this parameter, when set to either 0 or 1, specifies that "a movement is made along the slanted axis only".
The contents of diagnostic data Nos. 306 and 307 are displayed, in the order from the slanted axis to the Cartesian axis (0) / in the order from the Cartesian axis to the slanted axis (1)</td><td></td></tr>
<tr><td>8209</td><td>Angular axis control</td><td></td></tr>
<tr><td>#0 ARF
#5 SPE</td><td>In angular axis control, a movement from an intermediate point to the reference position in the G28 command is, made in the angular coordinate system (0) / made in the Cartesian coordinate system (1)
The superimposed control of the normal axis and the cartesian axis in angular axis control is invalid (0) / valid (1)</td><td></td></tr>
<tr><td>8210</td><td>Slant angle of a slanted axis in angular axis control [deg]</td><td></td></tr>
<tr><td>8211</td><td>Axis number of a slanted axis subject to angular axis control</td><td></td></tr>
<tr><td>8212</td><td>Axis number of a Cartesian axis subject to slanted axis control
If 0 is set in either of the two parameters, the settings are made as indicated in the following table:
<table>
<tr><th></th><th>Slanted axis</th><th>Cartesian axis</th></tr>
<tr><td>M series</td><td>Y-axis (PRM1022=2) of basic three axes</td><td>Z-axis (PRM1022=3) of basic three axes</td></tr>
<tr><td>T series</td><td>X-axis (PRM1022=1) of basic three axes</td><td>Z-axis (PRM1022=3) of basic three axes</td></tr>
</table></td><td></td></tr>
<tr><td>8240</td><td>Peripheral axis control</td><td></td></tr>
<tr><td>#5 SOV
#7 MST</td><td>G110 block is overlapped with the next block(0) / not overlapped with the next block(1)
If M code to start peripheral axis control is commanded, peripheral axis control is started after waiting for end signal (FIN)(0) / peripheral axis control is started without waiting for end signal (FIN)(1)</td><td></td></tr>
</table>

8242	Peripheral axis control	
#0 COF #4 G90 #5 GIN #6 AOP #7 AOM	Setting of offset value of peripheral axis is individual among peripheral axis control group 1 to 3(0) / common to peripheral axis control group 1 to 3(1) Movement command of peripheral axis control depends on bit 0 (IA1, IA2, IA3) of the parameters Nos.11854, 11855 and 11856(0) / does not depend on bit 0 (IA1, IA2, IA3) of the parameters Nos.11854, 11855 and 11856 (depends on modal information or program command)(1) Initial modal data of peripheral axis control depends on bit 1 (MG1, MG2, MG3) of the parameters Nos.11854, 11855 and 11856, and bit 2 (MF1, MF2, MF3) of the parameters Nos.11854, 11855 and 11856(0) / does not depend on bit 1 (MG1, MG2, MG3) of the parameters Nos.11854, 11855 and 11856, and bit 2 (MF1, MF2, MF3) of the parameters Nos.11854, 11855 and 11856 (depends on modal information)(1) If an alarm is issued in the path using peripheral axis control, the alarm DS2096 is issued to peripheral axis control(0) / not issued to peripheral axis control(1) If an alarm is issued to peripheral axis control, the alarm DS2097 is issued in the path using peripheral axis control(0) / not issued in the path using peripheral axis control(1)	
8243	Peripheral axis control	
#0 MSA	In M code to start the first to sixth peripheral axis control program (peripheral axis control group 1 to 3), the same value in each group can not be set(0) / can be set(1)	

7.2.58 Axis Synchronous Control

8301	Axis synchronous control	
#4 SYA	In the servo-off state during axis synchronous control, the positional deviation limit values of the master axis and slave axis are, checked (0) / not checked (1)	PRM8323
8302	Position matching between the machine position and absolute position detector	
#7 SMA	When an absolute position detector is attached, and parameter APZ (No. 1815#4) for an axis in synchronous operation is set to OFF, APZ of the pairing axis in synchronous operation is, not to set to OFF (0) / set to OFF (1)	
8303	Axis synchronous control	<Axis>
#0 ATE #1 ATS #2 SAF #4 SYP #7 SOF	In axis synchronous control, automatic setting for grid positioning is, disabled (0) / enabled (1) In axis synchronous control, automatic setting for grid positioning is, not started (0) / started (1) In axis synchronous control, a movement along a slave axis is, not added to actual feedrate display (0) / added to actual feedrate display (1) If the same value needs to be set in the parameter for the master axis and the parameter for the slave axis, and a value is set in the parameter for the master axis, the value is, not automatically set for the slave axis (0) / set automatically for the slave axis (1) In axis synchronous control, the synchronization establishment function based on machine coordinates is, disabled (0) / enabled (1)	Slave axis Slave axis Slave axis Slave axis
8304	Modification mode, Uni-directional synchronization, External machine coordinate system shift	<Axis>
#0 SSA	When the uni-directional synchronization establishment function under axis synchronous control is used, the axis with a larger machine coordinate is used as the reference (0) / the axis with a smaller machine coordinate is used as the reference (1)	

#2 ADJ	In axis synchronous control, this parameter specifies, an axis along which a movement is not made in the modification mode (0) / an axis along which a movement is made in the modification mode (1)	
#3 CLP	In axis synchronous control, synchronization error compensation is, disabled (0) / enabled (1)	Slave axis
#4 MVB	In the modification mode, a move command in a direction that increases a synchronization error is, invalid (0) / valid (1)	PRM 8304#2
#5 SCA	In axis synchronous control, synchronous operation is, performed when the axis synchronous control selection signal SYNC for slave axes or the axis synchronous control manual feed selection signal SYNCJ is set to 1 (0) / performed at all times (1)	Slave axis
#6 SMS	The synchronization error smooth suppress function is, disabled (0) / enabled (1)	Slave axis
#7 SYE	When external machine coordinate system shift is specified by external data input/output for the master axis in synchronous control, the slave axis is, not shifted (0) / shifted by the same amount as specified for the master axis (1)	Slave axis
8305	Uni-directional synchronization function	
#0 SSO	The uni-directional synchronization function in axis synchronous control is, disabled (0) / enabled (1)	
#1 SSE	After an emergency stop, the uni-directional synchronization function in axis synchronous control is, enabled (0) / disabled (1)	
#2 SRF	In axis synchronous control, G28, G30, or G53, synchronizes the slave axis with the master axis (0) / makes movements along the slave axis and master axis independently to specified positions (1)	
#4 SLR	When G28 is specified for an axis under axis synchronous control for which the reference position is not established, alarm PS0213 is issued (0) / reference position return is performed at low speed type(1)	
8306	Axis movement in synchronization establishment	
#0 SJR	In synchronization establishment, a machine coordinate difference is output at a time as command pulses (0) / axis movements are executed with the feedrate of manual rapid traverse and the acc./dec. after interpolation in rapid traverse (1).	
8307	Axis synchronous control	
#0 FSS	The slave axis of flexible synchronization control or the slave axis of superimposed control is not used as the master axis of axis synchronous control (0) / used as the master axis of axis synchronous control (1)	
#1 TWN	Axis synchronous control is used (0) / not used(1)	
8311	Axis number of master axis in axis synchronous control/twin table control	<Axis>
8312	Enabling/disabling mirror image in axis synchronous control	<Axis> Slave axis
8314	Maximum allowable error in synchronization error check based on machine coordinates	<Axis> Slave axis
8323	Limit in positional deviation check in axis synchronous control [Detection unit]	<Axis> Slave axis PRM 8301#4
8325	Maximum compensation value in synchronization establishment based on machine coordinates	<Axis> Slave axis PRM 8303#7
8326	Difference between master axis and slave axis reference counters [Detection unit]	<Axis> Slave axis
8327	Torque difference alarm detection timer [ms]	

8330	Multiplier for a maximum allowable synchronization error immediately after power-on	PRM8332
8331	Maximum allowable synchronization error for synchronization error excessive alarm 1 [Detection unit]	<Axis> Slave axis
8332	Maximum allowable synchronization error for synchronization error excessive alarm 2 [Detection unit]	<Axis> Slave axis
8333	Synchronization error zero width for each axis [Detection unit]	<Axis> Slave axis
8334	Synchronization error compensation gain for each axis Compensation pulses = Synchronization error × (Compensation gain/1024)	<Axis> Slave axis
8335	Synchronization error zero width 2 for each axis [Detection unit]	<Axis> Slave axis PRM8333
8336	Synchronization error compensation gain 2 for each axis	<Axis> Slave axis PRM8334
8337	M code for turning off synchronization in axis synchronous control/twin table control	
8338	M code for turning on synchronization in axis synchronous control/twin table control	

7.2.59 Sequence Number Comparison and Stop

8341	Program number subject to comparison and stop	PRM8342
8342	Sequence number subject to comparison and stop	

7.2.60 High precision oscillation function (1/2)

8360	Oscillation	
#0 ROV #2 CVC #7 CHF	As rapid traverse override for a section from the oscillation start point to point R, oscillation override is used (0) / rapid traverse override is used (1) The feedrate along the oscillation axis is changed, at the upper or lower dead point immediately after the feedrate change command is issued (0) / at the upper dead point immediately after the feedrate change command is issued (1) On the oscillation screen, a oscillation feedrate, can be set (0) / cannot be set (1)	
8370	Oscillation axis	
8371	Oscillation reference point (point R)	
8372	Oscillation upper dead point	
8373	Oscillation lower dead point	
8374	Oscillation base feedrate	
8375	Maximum Oscillation feedrate	<Axis> PRM1420

7.2.61 AI Contour Control

8451	AI contour control	
#4 ZAG #7 NOF	The deceleration function based on cutting load in AI contour control II (deceleration based on Z-axis fall angle) is, not performed (0) / performed (1) In AI contour control II, an F command is, not ignored (0) / ignored (1)	PRM 8456-8458 PRM 8465
8456	Override for range 2 that is applied during deceleration according to the cutting load in AI contour control II [%]	PRM 19515#1 19516
8457	Override for range 3 that is applied during deceleration according to the cutting load in AI contour control II [%]	
8458	Override for range 4 that is applied during deceleration according to the cutting load in AI contour control II [%]	
8459	Override	
#3 OVRB	For deceleration based on a feedrate difference or acceleration rate in AI contour control, override is, disabled (0) / enabled (1)	

8465	Maximum allowable feedrate for AI contour control	PRM 8451#7
8466	Maximum allowable feedrate for AI contour control (when a rotary axis is specified singly)	PRM 8451#7, 8465
8486	Maximum travel distance of a block where smooth interpolation or Nano smoothing is applied	
8487	Angle at which smooth interpolation or Nano smoothing is turned off [deg]	
8490	Minimum travel distance of a block where smooth interpolation or Nano smoothing is applied	

7.2.62 High-speed Position Switch

8500	Number of switches	
#7 HPE	The maximum number of high-speed position switches is, 6 (0) / 16 (1)	
8501	Function setting	
#0 HPF	The output signal of a high-speed position switch is output to, address Y (0) / address F (1)	
#1 HPS	The current position used with a high-speed position switch, considers a servo error (0) / does not consider a servo error (1)	
8504	Switch setting	
#0 E01 #1 E02 #2 E03 #3 E04 #4 E05 #5 E06 #6 E07 #7 E08	The n-th high-speed position switch is, enabled (0) / disabled (1) E01 : n=1 E02 : n=2 : E08 : n=8	
8505	Switch setting	
#0 E09 #1 E10 #2 E11 #3 E12 #4 E13 #5 E14 #6 E15 #7 E16	The n-th high-speed position switch is, enabled (0) / disabled (1) E09 : n=9 E10 : n=10 : E16 : n=16	
8508	Switch operation setting	
#0 D01 #1 D02 #2 D03 #3 D04 #4 D05 #5 D06 #6 D07 #7 D08	The output type of the n-th high-speed position switch is, normal type (0) / direction decision type (1) D01 : n=1 D02 : n=2 : D08 : n=8	
8509	Switch operation setting	
#0 D09 #1 D10 #2 D11 #3 D12 #4 D13 #5 D14 #6 D15 #7 D16	The output type of the n-th high-speed position switch is, normal type (0) / direction decision type (1) D09 : n=9 D10 : n=10 : D16 : n=16	

8512	Switch operation setting (Direction setting of direction decision type when the signal is on)	
#0 A01 #1 A02 #2 A03 #3 A04 #4 A05 #5 A06 #6 A07 #7 A08	The passage direction in which the n-th high-speed position switch is turned on is, Negative (-) direction (0) / positive (+) direction (1) A01 : n=1 A02 : n=2 : A08 : n=8	
8513	Switch operation setting (Direction setting of direction decision type when the signal is on)	
#0 A09 #1 A10 #2 A11 #3 A12 #4 A13 #5 A14 #6 A15 #7 A16	The passage direction in which the n-th high-speed position switch is turned on is, Negative (-) direction (0) / positive (+) direction (1) A09 : n=9 A10 : n=10 : A16 : n=16	
8516	Switch operation setting (Direction setting of direction decision type when the signal is off)	
#0 B01 #1 B02 #2 B03 #3 B04 #4 B05 #5 B06 #6 B07 #7 B08	The passage direction in which the n-th high-speed position switch is turned off is, Negative (-) direction (0) / positive (+) direction (1) B01 : n=1 B02 : n=2 : B08 : n=8	
8517	Switch operation setting (Direction setting of direction decision type when the signal is off)	
#0 B09 #1 B10 #2 B11 #3 B12 #4 B13 #5 B14 #6 B15 #7 B16	The passage direction in which the n-th high-speed position switch is turned off is, Negative (-) direction (0) / positive (+) direction (1) B09 : n=9 B10 : n=10 : B16 : n=16	
8565	Output address of the high-speed position switch signal	PRM 8501#0
8570 8571 : 8579	Controlled axis for which the 1st high-speed position switch function is performed Controlled axis for which the 2nd high-speed position switch function is performed : Controlled axis for which the 10th high-speed position switch function is performed	
8580 8581 : 8589	Maximum value of the operation range of the 1st high-speed position switch Maximum value of the operation range of the 2nd high-speed position switch : Maximum value of the operation range of the tenth high-speed position switch	
8590 8591 : 8599	Minimum value of the operation range of the 1st high-speed position switch Minimum value of the operation range of the 2nd high-speed position switch : Minimum value of the operation range of the tenth high-speed position switch	

7.2.63 Others

8650	Setting for the C Language Executor	
#0 RSK #1 CNA #2 EKY	When the <RESET> key is pressed, the key code is, not passed to the application (0) / passed to the application (1) If a CNC alarm is issued when the user screen for the C Language Executor is displayed, the screen display is, automatically switched to the alarm screen (depending on the setting of parameter (No. 3111#7)) (0) / not switched to the alarm screen (1) The extended portion of the MDI keys is, not read (0) / read (1)	
8654	Setting for the C Language Executor	
#0 NVS #1 CXW #2 CGC #3 CTM #5 DCC #7 WGS	When an MDI unit with a 10.4-inch LCD unit is used, the vertical soft keys on the CNC screen, can be used (0) / cannot be used (1) If no display unit is used, C Language Executor is started, simultaneously when the CNC screen display function is started (0) / simultaneously when the CNC is started (1) When the crt_setmode function is called, the graphic plane is, cleared (0) / not cleared (1) The task execution status monitor screen is, not displayed (0) / displayed (1) With the rs_status function of C Language Executor, the transmission stop status and reception stop status are, posted (0) / not posted (1) When C Language Executor is used, the win_getstat function for acquiring the status of multiwindow display is based on, Series 30*i*/31*i*/32*i* specification (0) / Series 16*i*/18*i*/21*i* specification (1)	
8655	Setting for the C Language Executor	
#3 CTS #7 RCC	When the crt_cncscrn function is executed from the main task of C Language Executor, the main task is, not stopped at the end of the function (is stopped after processing is performed for a very short time) (0) / stopped at the end of the function (1) When the rs_close function is executed in RS232-C communication of C Language Executor with DC control exercised in the transmission/reception mode, communication is ended after checking the DC code of the communication destination device (0) / communication is ended without checking the DC code of the communication destination device (1)	
8661	Size of the variable area used by the C Language Executor [K bytes]	
8662	Size of the SRAM disk used by the C Language Executor [K bytes]	
8663	Time zone setting [sec]	
8706	Time zone setting	
#6 MRD	The remote machine diagnosis is used by Embedded Ethernet (0) / used by Fast Ethernet board (1)	
8760	Program number of data input/output (Power Mate CNC manager)	
8781	DRAM size used for the C Language Executor	
8783	Size of DRAM used with C Language Executor (for application program with "EXP_DRAMSIZE = ON" enabled in MAKEFILE setting)	
8801	Parameter for the machine tool builder (Bit path 1)	
8802	Parameter for the machine tool builder (Bit path 2)	
8803	Parameter for the machine tool builder (Bit path 3)	
8804	Parameter for the machine tool builder (Bit path 4)	
8805	Parameter for the machine tool builder (Bit path 5)	
8811	Parameter 1 for the machine tool builder (2-word)	
8812	Parameter 2 for the machine tool builder (2-word)	
8813	Parameter 3 for the machine tool builder (2-word)	
8814	Parameter 4 for the machine tool builder (2-word path)	
8815	Parameter 5 for the machine tool builder (2-word path)	
8816	Parameter 6 for the machine tool builder (2-word path)	
8820	Parameter 7 for the machine tool builder (Byte path)	

8821	Parameter 8 for the machine tool builder (Byte path)	
8822	Parameter 9 for the machine tool builder (Byte path)	
8823	Parameter 10 for the machine tool builder (Byte path)	
8824	Parameter 11 for the machine tool builder (Byte path)	
8825	Parameter 12 for the machine tool builder (Byte path)	
8826	Parameter 13 for the machine tool builder (Byte path)	
8827	Parameter 14 for the machine tool builder (Byte path)	
8828	Parameter 15 for the machine tool builder (Byte path)	
8829	Parameter 16 for the machine tool builder (Byte path)	

7.2.64 Maintenance

8850	Trouble diagnosis function	
#0 MDG	Trouble diagnosis function is, available(0) / not available(1)	
8855	Trouble diagnosis function	
#0 TRS #1 TRF	Trouble forecast of thermal simulation of servo axis is, not available(0) / available(1) Trouble forecast of disturbance level of servo axis is, not available(0) / available(1)	
8860	Trouble forecast level for thermal simulation	
8861	Trouble forecast level for disturbance level	
8880	Trouble forecast level for disturbance level	
#0 IPW	Setting of FANUC recommendation setting parameter (fixed type) is, Disabled.(0) / Enabled.(1)	
8900	Parameter setting	
#0 PWE #3 PLC	The setting, from an external device and MDI panel, of those parameters that cannot be set by setting input is, disabled (0) / enabled (1) When the remaining time of an item falls to a value less than the percentage of the life specified in parameter No.8911, the life warning status is displayed at timer area on CNC status display area (0) / alarm area on CNC status display area (1)	
8901	Maintenance	
#0 FAN #7 MEN	A fan motor error is, detected (0) / not detected (1) The periodic maintenance screen is, displayed (0) / not displayed (1)	Usually, set 0.
8906	Maintenance 2	
#0 LNG #6 MPM	When multiple alarms without NC alarm are issued, ighest priority alarm is displayed on CNC status display area (0) / all alarms are displayed by turns on CNC status display area (1) On the periodic maintenance screen, the life time is counted in each path (0) / the life time is not counted in each path (1)	
8911	Percentage for life warning display on the periodic maintenance screen [%]	
8940	Initial screen titile character code 1	
8941	Initial screen titile character code 2	
8942	Initial screen titile character code 3	
8943	Initial screen titile character code 4	
8944	Initial screen titile character code 5	
8945	Initial screen titile character code 6	
8946	Initial screen titile character code 7	
8947	Initial screen titile character code 8	
8948	Initial screen titile character code 9	
8949	Initial screen titile character code 10	
8950	The memory contents display	
#0 MEM	The memory contents display screen is, not displayed (0) / displayed (1)	

7.2.65 Macro Executor

9000	P-CODE macro, Program display	
#0 SQN #1 NDP #2 STP #4 RSC	During execution of a registered program, only the program number/sequence number of the calling user program is displayed (0) / the program number/sequence number of the macro being executed is displayed (1) The P-CODE variable screen is, not displayed (0) / displayed (1) When a conversational macro/auxiliary macro is executed from the debug function, the continuous execution mode is used (0) / the single block execution mode is used (1) Upon reset, the P-CODE macro common variables are, not set to <null> (0) / set to <null> (1)	 #100-#199 PRM6001#6
9002	Program number of a conversational macro/auxiliary macro subject to break operation	PRM9003
9003	Sequence number of a conversational macro/auxiliary macro subject to break operation	
9010	Macro call from an axis address	
#0 01M #1 02M #2 03M #3 04M #4 05M #5 06M #6 07M #7 08M	Macro call from the address of the n-th axis in the path is, enabled (0) / disabled (1) 01M : n=1 02M : n=2 : 08M : n=8	PRM9020 9021
9011	Conversational macro	
#0 MTC #2 VRM	Calling of a special macro/subprogram by using a T code is, enabled (0) / disabled (1) The conversational macro screen is, displayed with a background color (0) / not displayed with a background color (1)	PRM9002#0 9005#7
9012	Special macro	
#0 MDC #1 MHC #2 MSC	Calling of a special macro by using a D code is, enabled (0) / disabled (1) Calling of a special macro by using an H code is, enabled (0) / disabled (1) Calling of a special macro by using an S code is, enabled (0) / disabled (1)	
9013	Program call by a macro	
#1 MCA	When the code set in a parameter for calling a custom macro is the same as the code set in a compile parameter for calling an execution macro, the program called is, the execution macro(0) / the custom macro(1)	
9020	Macro call from an axis address	
#0 09M #1 10M #2 11M #3 12M #4 13M #5 14M #6 15M #7 16M	Calling of a macro from the address of the n-th axis in the path is,enabled (0) / disabled (1) 09M : n=9 10M : n=10 : 16M : n=16 16M : n=16	PRM9010 9021
9021	Macro call from an axis address	
#0 17M #1 18M #2 19M #3 20M #4 21M #5 22M #6 23M #7 24M	Calling of a macro from the address of the n-th axis in the path is, enabled (0) / disabled (1) 17M : n=17 18M : n=18 : 24M : n=24	PRM9010 9020

9026	Linear interpolation	<Axis>
#0 NDT	Inclusion in a calculated cutting distance value is, performed (0) / not performed (1)	Linear interpolation only
9033	P-CODE macro	
#0 DBG #1 SEP #3 EV2 #4 EVF #5 SHS	Conversational macros are placed in, normal mode (0) / debug mode (1) Auxiliary macros/conversational macros are executed, in series (0) / in parallel (1) P-CODE variables (#10000 and up) hold, floating-point numbers (0) / integers (1) The extended P-CODE variables (#20000 and up) hold, floating-point numbers (0) / integers (1) When the high-speed cycle cutting function is enabled, #20000 and up are, high-speed cycle cutting variables (0) / P-CODE variables (1)	
9034	P-CODE macro common variable	
#0 MV0 #1 MV1 #2 MV2 #3 MV3 #4 MV4 #5 MV5 #6 MV6 #7 MV7	The P-CODE macro common variables are, independent common variables (0) / shared as custom macro common variables (1) MV0 : #100 to 149 MV1 : #150 to 199 MV2 : #500 to 549 MV3 : #550 to 599 MV4 : #600 to 699 MV5 : #700 to 799 MV6 : #800 to 899 MV7 : #900 to 999	
9035	Interlock for each axis direction, P-CODE macro	
#0 XIT #1 RCN #3 EUI #4 CWB #5 NPA	Interlock for each axis direction is, disabled (0) / enabled (1) Upon NC reset, RS232-C control based on conversational macros is, not interrupted (0) / interrupted with completion code (#8539) = 12 (1) For P-CODE macros, UI00 to UI15 and UO00 to UO15 are used (0) / EUI00 to EUI15 and EUO00 to EUO15 are used (1) If RS232-C interface control data transmission (G336) or macro variable data output (G338) is specified, the data is output, when an EOB is detected (0) / when the transmit buffer is full or the line is closed (1) If automatic operation is performed without selecting a main program when P-CODE workpiece number search is enabled, the operation is not performed (0) / an alarm is issued (1)	PRM9070 ALM PS1079
9036	Auxiliary macro	
#2 AFT #3 AMP #4 NOB	Forced termination of the auxiliary macro function is, disabled (0) / enabled (1) When an auxiliary macro is used for input/output based on the RS232-C interface/memory card control function, status is, displayed (0) / not displayed (1) A G310 (relative coordinate preset and PMC data read/write function) block in an execution macro is executed, as an NC statement (0) / as a macro statement (1)	Usually, set 0.
9038	Macro executor	
#2 TFT	Forced termination of Conversational macro function is, enabled (0) / disabled (1)	
9048	P-CODE macro number of an execution macro	
9049	P-CODE macro number of a conversation macro	
9050	P-CODE macro number of an auxiliary macro	
9051	Area number for P-CODE variables (#10000 and up)	
9052	Area number for extended P-CODE variables (#20000 and up)	
9053	Number of P-CODE variables (#10000 and up)	

9054	Number of extended P-CODE variables (#20000 and up)	
9066	Number of auxiliary macro execution blocks	PRM9033#1
9067	Protection range of P-CODE macro common variables (#500 to #999) (start)	PRM9068
9068	Protection range of P-CODE macro common variables (#500 to #999) (end)	
9069	PMC internal relay (R area) address of an interlock mode signal for each axis direction	
9070	PMC internal relay (R area) bit position of an interlock mode signal for each axis direction	PRM9035#0
9072	Number of blocks that execute macro statements in an execution macro program successively	

7.2.66 Wrong Operation Prevention Function

10000 10001 : 10019	Lower limit 1 of tool offsets No.01 Lower limit 1 of tool offsets No.02 : Lower limit 1 of tool offsets No.20	
10020 10021 : 10039	Upper limit 1 of tool offsets No.01 Upper limit 1 of tool offsets No.02 : Upper limit 1 of tool offsets No.20	
10040 10041 : 10059	Lower limit 2 of tool offsets No.01 Lower limit 2 of tool offsets No.02 : Lower limit 2 of tool offsets No.20	
10060 10061 : 10079	Upper limit 2 of tool offsets No.01 Upper limit 2 of tool offsets No.02 : Upper limit 2 of tool offsets No.20	
10080 10081 : 10099	Lower limit 3 of tool offsets No.01 Lower limit 3 of tool offsets No.02 : Lower limit 3 of tool offsets No.20	
10100 10101 : 10119	Upper limit 3 of tool offsets No.01 Upper limit 3 of tool offsets No.02 : Upper limit 3 of tool offsets No.20	
10120 10121 : 10139	Lower limit 4 of tool offsets No.01 Lower limit 4 of tool offsets No.02 : Lower limit 4 of tool offsets No.20	
10140 10141 : 10159	Upper limit 4 of tool offsets No.01 Upper limit 4 of tool offsets No.02 : Upper limit 4 of tool offsets No.20	
10160 10161 : 10179	Lower limit 5 of tool offsets No.01 Lower limit 5 of tool offsets No.02 : Lower limit 5 of tool offsets No.20	
10180 10181 : 10199	Upper limit 5 of tool offsets No.01 Upper limit 5 of tool offsets No.02 : Upper limit 5 of tool offsets No.20	
10200 10201 : 10219	Lower limit 6 of tool offsets No.01 Lower limit 6 of tool offsets No.02 : Lower limit 6 of tool offsets No.20	
10220 10221 : 10239	Upper limit 6 of tool offsets No.01 Upper limit 6 of tool offsets No.02 : Upper limit 6 of tool offsets No.20	

10240 10241 : 10259	Lower limit 1 of a tool offset number range No.01 Lower limit 1 of a tool offset number range No.02 : Lower limit 1 of a tool offset number range No.20	PRM 10000 - 10239
10260 10261 : 10279	Upper limit 1 of a tool offset number range No.01 Upper limit 1 of a tool offset number range No.02 : Upper limit 1 of a tool offset number range No.20	PRM 10000 - 10239
10280	Lower limit 7 of tool offsets No.01	
10281	Lower limit 7 of tool offsets No.02	
10282	Lower limit 7 of tool offsets No.03	
10283	Lower limit 7 of tool offsets No.04	
10284	Upper limit 7 of tool offsets No.01	
10285	Upper limit 7 of tool offsets No.02	
10286	Upper limit 7 of tool offsets No.03	
10287	Upper limit 7 of tool offsets No.04	
10288	Lower limit 8 of tool offsets No.01	
10289	Lower limit 8 of tool offsets No.02	
10290	Lower limit 8 of tool offsets No.03	
10291	Lower limit 8 of tool offsets No.04	
10292	Upper limit 8 of tool offsets No.01	
10293	Upper limit 8 of tool offsets No.02	
10294	Upper limit 8 of tool offsets No.03	
10295	Upper limit 8 of tool offsets No.04	
10296	Lower limit 2 of a tool offset number range No.01	PRM 10280 - 10295
10297	Lower limit 2 of a tool offset number range No.02	
10298	Lower limit 2 of a tool offset number range No.03	
10299	Lower limit 2 of a tool offset number range No.04	
10300	Upper limit 2 of a tool offset number range No.01	PRM 10280 - 0295
10301	Upper limit 2 of a tool offset number range No.02	
10302	Upper limit 2 of a tool offset number range No.03	
10303	Upper limit 2 of a tool offset number range No.04	
10304 10305 : 10309	Lower limit of workpiece origin offsets No.01 Lower limit of workpiece origin offsets No.02 : Lower limit of workpiece origin offsets No.06	<Axis>
10310 10311 : 10315	Upper limit of workpiece origin offsets No.01 Upper limit of workpiece origin offsets No.02 : Upper limit of workpiece origin offsets No.06	<Axis>
10316 10317 : 10321	Lower limit of a workpiece origin offset range No.01 Lower limit of a workpiece origin offset range No.02 : Lower limit of a workpiece origin offset range No.06	PRM 10304 - 10315
10322 10323 : 10327	Upper limit of a workpiece origin offset range No.01 Upper limit of a workpiece origin offset range No.02 : Upper limit of a workpiece origin offset range No.06	PRM 10304 - 10315
10328	Lower limit of workpiece shifts	<Axis>
10329	Upper limit of workpiece shifts	<Axis>
10330	Confirmation message	
#0 IIC #1 PDC #2 ADC #3 HSC #4 MID #5 EBC #6 ASD	At the time of incremental input, a confirmation message is, displayed (0) / not displayed (1) At the time of program deletion, a confirmation message is, displayed (0) / not displayed (1) At the time of deletion of all data, a confirmation message is, displayed (0) / not displayed (1) When a cycle start is executed halfway in the program, a confirmation message is, displayed (0) / not displayed (1) Updated modal information is, highlighted (0) / not highlighted (1) Program sum checking is, disabled (0) / enabled (1) Axis state display is, enabled (0) / disabled (1)	
10331	Lower limit of external workpiece origin offsets	<Axis>

10332	Upper limit of external workpiece origin offsets	<Axis>
10334	Incorrect operation prevention function	
#1 WMD	When a reset occurs during program operation, the warning "MODAL DATA IS CHANGED BY BLOCK STOP" is not displayed(0) / displayed(1)	
10335	Incorrect operation prevention function	
#0 MSC	A recheck on the intermediate block start of the incorrect operation prevention function is, enabled independently for each path (0) / enabled for the local path and those paths for this parameter is set to 1 (1)	
10336	Incorrect operation prevention function	
#0 MBO	Middle block start signal MBSO<Fn534.4> is, disabled (0) / enabled (1)	
10337	Incorrect operation prevention function	
#0 MRW	In manual mode, the rewind of a program by reset & rewind signal RRW <Gn008.6> is, disabled (0) / enabled (1)	

7.2.67 Automatic Data Backup

10340	Backup	
#0 ABP	Automatic data backup at power-on time is, disabled (0) / enabled (1)	
#1 ABI	Overwrite-prohibited backup data is, disabled (0) / enabled (1)	
#2 AAP	Backup of directory information and NC programs in the FROM is, disabled (0) / enabled (1)	
#6 EIB	When the power to the CNC is turned on next time, overwrite-prohibited backup data is, not updated (0) / updated (1)	PRM 10342 10340 #1
#7 EEB	In the emergency stop state, backup operation is, not executed (0) / executed (1)	
10341	Interval of automatic and periodical data backup	
10342	Number of times backup data is held	

7.2.68 Axis Control

10345	Axis control	
#1 L2D	When the forbidden area of the stored stroke check 2, 3 is set or it is changed by G22 command, the setting value for axes with diameter specification is, half of command value (0) / command value (1)	
10350	Axis control	
#1 PWR	The servo loop gain for each axis (parameter No. 1825) and the In-position width for each axis (parameter No. 1826) are, write-disabled during axis moving (0) / write-enabled if the corresponding axis is stopped (1)	
10351	Axis control	
#2 DWS	Dwell status signal DWL <Fn526.5> is, disabled (0) / enabled (1)	
#5 PCC	In Polar coordinate command, the specification of which the address in the selected plane 1st axis (radius) or 2nd axis (angle) is omitted is FS30i specification (0) / is FS16i compatible specification (1)	
10359	Axis control	
#0 KVA	The gear ratio override signal of flexible synchronization group A is, disabled (fixed at 100%) (0) / enabled (1)	M series
#1 KVB	The gear ratio override signal of flexible synchronization group B is, disabled (fixed at 100%) (0) / enabled (1)	M series
#2 KVC	The gear ratio override signal of flexible synchronization group C is, disabled (fixed at 100%) (0) / enabled (1)	M series
#3 KVD	The gear ratio override signal of flexible synchronization group D is, disabled (fixed at 100%) (0) / enabled (1)	M series

7.2.69 PMC Axis Control 2

10410	PMC axis control	
#0 NRT #1 EAX	In tool retract and recover or manual intervention and return, the axis is, subject (0) / not subject (1), to tool retract and recover or manual intervention and return When other axis is preset with the workpiece coordinate system preset signal while this axis is moving under the PMC axis control, an alarm occurs (0) / an alarm doesn't occur (1)	

7.2.70 Screen Display Colors 2

10421 10422 : 10435	RGB value of color palette 1 for text for color set 2 RGB value of color palette 2 for text for color set 2 : RGB value of color palette 15 for text for color set 2	
10461 10462 : 10475	RGB value of color palette 1 for text for color set 3 RGB value of color palette 2 for text for color set 3 : RGB value of color palette 15 for text for color set 3	

7.2.71 Manual/Automatic Operation Functions 2

10480	Manual/Automatic Operation	
#0 NIR #1 RMI	Three-dimension handle interrupt in the positioning mode is, possible for the axis which is not commanded (0) / not accepted. The amount of three-dimension handle interrupt is ignored (1) Manual handle interrupt for an axis specified in rapid traverse (G00) mode is, disabled (0) / enabled (1)	

7.2.72 Dual Check Safety

10500 : 10597	See Dual Check Safety Connection Manual. : See Dual Check Safety Connection Manual.	

7.2.73 Diagnosis

10600	Waveform diagnosis	
#0 IOF	Waveform diagnostic data is output in, 30i/31i/32i format (0) / 16i/18i/21i format (1)	

7.2.74 Trouble diagnosis function

10720 - 10727	These parameters hold initial values and values set by screen operations in Trouble diagnosis function. These parameters are set by the CNC. So, never input values from the parameter screen.	

7.2.75 Spindle Control with Servo Motor 1

11000	Spindle Control Based on Servo motor	<Axis>
#0 SPC #1 FSR #5 SOA #7 SRV	The type of rotation control used with the servo motor-based spindle control function is, position control (0) / velocity control (1) The axis to be subjected to servo motor-based spindle control is of a, semi-closed system (0) / full-closed system (1) The servo axis used by the spindle control with servo motor is, used as a control axis (move command is enabled)(0) / used as a servo axes for spindle use (move command is disabled)(1) The rotary tool control function based on the servo motor is, disabled (0) / enabled (1)	 Only effective on 32*i*-B PRM11010

11001	Rigid tapping based on the servo motor	<Axis>
#0 SRB #1 TCR #2 DDM #6 DCS	Acceleration/deceleration after interpolation for cutting feed in rigid tapping based on the servo motor is, linear acc./dec. (0) / bell-shaped acc./dec. (1) When spindle control based on servo motor is performed with velocity control, for acceleration/deceleration after interpolation, the, parameter of the acc./dec. time constant in cutting feed for each axis is used (0) / parameter of the time constant in velocity control mode is used (1) The motor used for rotary tool control base on the servo motor is, not a DD motor (0) / a DD motor (1) Acc./dec. only at deceleration time is, disabled (0) / enabled (1)	 PRM 1622, 11016 PRM 2455, 2456
11002	Spindle indexing function	<Axis>
#0 NSP #1 HSP	When SV speed control mode is canceled, spindle indexing is executed (0) / not executed (1) Speed-up of Spindle indexing is, disabled (0) / enabled (1)	
11003	Rigid tapping with servo motor	
#0 NCL #1 FEN	In AI contour control, feedrate of rigid tapping with servo motor is limited by maximum allowable feedrate of parameter No.8465 (0) / not limited by maximum allowable feedrate of parameter No.8465. When ignoring feedrate commands is enabled, feedrate of rigid tapping with servo motor is specified by parameter No.8465 (0) / machining program (1)	
11005	Spindle synchronization in Servo motor	
#0 SIC #1 CSC #3 SSY #6 CSA	Spindle indexing is, performed based on absolute coordinates (0) / performed based on machine coordinates (1) Phase synchronization of spindle synchronization using Servo motor is performed based on, absolute coordinates (0) / machine coordinates (1) Spindle synchronous control with servo motor is , disabled (0) / enabled (1) As acceleration/deceleration for spindle synchronization using Servo motor, acc./dec. for spindle control based on Servo motor is used (0) / acc./dec. for spindle synchronization using Servo motor is used (1)	
11010	Spindle number with which the rotary tool control function based on the servo motor/the spindle control function based on Servo motor is performed	<Axis> PRM 11000#7,#6
11011	Travel distance per rotary tool axis revolution [deg]	<Axis>
11012	Spindle indexing speed [min^{-1}]	<Axis>
11013	Positional deviation limit during axis-by-axis movement [Detection unit]	<Axis>
11014	Positional deviation limit at axis-by-axis stop time [Detection unit]	<Axis>
11015	Maximum motor speed [min^{-1}]	<Axis>
11016	Time constant of acceleration/deceleration in SV speed control mode for each axis [min^{-1}]	<Axis> PRM 1610#0,#1
11017	FL rate of exponential acceleration/deceleration in SV speed control mode for each axis [mm/min]	<Axis>
11019	Allowable spindle speed of spindle indexing [min^{-1}]	<Axis>
11020	Acceleration/deceleration switching speed for each axis (1st step) [min^{-1}]	<Axis>
11021	Acceleration/deceleration switching speed for each axis (2nd step) [min^{-1}]	<Axis>
11030	Acceleration/deceleration for each axis 1 (section 1) [min^{-1}/s]	<Axis>
11031	Acceleration/deceleration for each axis 2 (section 2) [min^{-1}/s]	<Axis>

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11032	Acceleration/deceleration for each axis 3 (section 3) [min^{-1}/s]	<Axis>
11040	Spindle phase synchronization compensation data based on the servo motor [Pulse]	
11041	Spindle phase synchronization control shift amount based on the servo motor [deg]	
11042	Spindle synchronization speed arrival level based on the servo motor [min^{-1}]	
11050	Maximum allowable acceleration in acc./dec. before interpolation for each axis	<Axis>
11051	Acceleration change time in bell-shaped acc./dec. before interpolation [ms]	PRM11050
11052	Time constant for acc./dec. after cutting feed interpolation in the mode of acc./dec. before interpolation [ms]	<Axis>
11060	Time constant for rigid tapping based on the servo motor (1st gear stage) [ms]	<Axis>
11061	Time constant for rigid tapping based on the servo motor (2nd gear stage) [ms]	<Axis>
11062	Time constant for rigid tapping based on the servo motor (3rd gear stage) [ms]	<Axis>
11063	Time constant for rigid tapping based on the servo motor (4th gear stage) [ms]	<Axis>
11065	Time constant for retraction in rigid tapping based on the servo motor (1st gear stage) [ms]	<Axis>
11066	Time constant for retraction in rigid tapping based on the servo motor (2nd gear stage) [ms]	<Axis>
11067	Time constant for retraction in rigid tapping based on the servo motor (3rd gear stage) [ms]	<Axis>
11068	Time constant for retraction in rigid tapping based on the servo motor (4th gear stage) [ms]	<Axis>
11070	Acceleration/deceleration switching speed for spindle synchronization for each axis (1st step) [min^{-1}]	<Axis> PRM 11001#6, 11005#6
11071	Acceleration/deceleration switching speed for spindle synchronization for each axis (2nd step) [min^{-1}]	<Axis>
11072	Acceleration/deceleration switching speed for spindle synchronization for each axis (3rd step) [min^{-1}]	<Axis>
11073	Acceleration/deceleration switching speed for spindle synchronization for each axis (4th step) [min^{-1}]	<Axis>
11074	Acceleration/deceleration switching speed for spindle synchronization for each axis (5th step) [min^{-1}]	<Axis>
11075	Acceleration/deceleration switching speed for spindle synchronization for each axis (6th step) [min^{-1}]	<Axis>
11076	Acceleration/deceleration switching speed for spindle synchronization for each axis (7th step) [min^{-1}]	<Axis>
11080	Acceleration/deceleration for spindle synchronization for each axis 1 (section 1) [min^{-1}/s]	<Axis>
11081	Acceleration/deceleration for spindle synchronization for each axis 2 (section 2) [min^{-1}/s]	<Axis>
11082	Acceleration/deceleration for spindle synchronization for each axis 3 (section 3) [min^{-1}/s]	<Axis>
11083	Acceleration/deceleration for spindle synchronization for each axis 4 (section 4) [min^{-1}/s]	<Axis>
11084	Acceleration/deceleration for spindle synchronization for each axis 5 (section 5) [min^{-1}/s]	<Axis>
11085	Acceleration/deceleration for spindle synchronization for each axis 6 (section 6) [min^{-1}/s]	<Axis>
11086	Acceleration/deceleration for spindle synchronization for each axis 7 (section 7) [min^{-1}/s]	<Axis>
11087	Acceleration/deceleration for spindle synchronization for each axis 8 (section 8) [min^{-1}/s]	<Axis>

11090	Path with which a rotation command is specified for each axis	PRM 3702#2=0 3703#3=1

7.2.76 Tilted Working Plane Indexing

11220	Minimum distance used for determining a plane when a tilted working plane indexing with three points is specified [mm]	
11221	Tilted working plane indexing / 3-dimensional coordinate system conversion	
#0 MTW	Multiple tilted working plane commands are, not used (0) / used (1)	
#1 D3R	In the 3-dimensional coordinate system conversion mode, tilted working plane indexing mode, or workpiece setting error compensation mode, rapid traverse in canned cycle for drilling is, performed in the cutting feed mode (0) / performed in the rapid traverse mode (1)	
#2 3DW	If, in the 3-dimensional coordinate system conversion mode, workpiece coordinate system selection using a G code is specified, the selection, operates in accordance with conventional specifications (0) / operates in accordance with the same specifications as those of workpiece coordinate system selection during the tilted working plane indexing (1)	PRM 1205#6
#3 TLC	During tool length compensation, 3-dimensional coordinate conversion, cannot be used (0) / can be used (1)	
#4 CFW	If the end point of tool axis direction control (G53.1/G53.6) directed using the tilted working plane indexing is a singular point, the second rotation axis does not operate (0) / the second rotation axis is controlled in such a way that the second feature coordinate system and workpiece coordinate system match with each other in direction (1)	
#6 3CS	The spindle speed calculation of constant surface speed control during 3-dimensional coordinate system conversion / tilted working plane indexing is based on workpiece (0) / program or feature (1) coordinate system.	
#7 AIR	If the movement range of rotation axis is set to the roll-over axis, or roll-over function is set to rotary axis (B type), when tool axis direction controll is executed, alarm is not issued (0) / alarm is issued (1)	PS5459

7.2.77 Axis Control / Increment System 2

11222	Inch/metric conversion command, function for dynamic switching of diameter/radius specification	
#0 NIM	Automatic conversion of a coordinate system by an inch/metric conversion command (G20 or G21) is, not performed (0) / performed (1)	
#1 CIM	When an inch/metric conversion command (G20 or G21) is specified, if the workpiece coordinate system is shifted by the shift amount as described below, an alarm is issued (0) / clearing of the shift amount is performed (1)	PS1298
#2 IMG	Inch/metric conversion is, performed with the G20/G21 (G70/G71) (0) / not performed with the G20/G21 (G70/G71) (1)	

7.2.78 DI/DO 2

11223	DI/DO	
#1 TRS	In threading cycle retraction, when a block that specifies return to the start point of the threading cycle is executed, threading signal THRD <Fn002.3> is set to, “0” (0) / “1” (1)	
#2 IMG	Inch/metric conversion is, performed with the G20/G21 (G70/G71) (0) / not performed with the G20/G21 (G70/G71) (1)	
#5 ITM	When bit 2 (D3IT) of parameter No.11600 = 1, during 3-dimensional coordinate conversion, the following signals are enabled for axis of programming coordinate system (0) / Enabled for axis of machine coordinate system (1) (Intended signals) - Interlock signal for each axis direction during manual intervention / manual handle interrupt in 3-dimensional coordinate system conversion mode - Interlock signal for each axis during manual intervention / manual handle interrupt in 3-dimensional coordinate system conversion mode - External deceleration signal during manual intervention / manual handle interrupt in 3-dimensional coordinate system conversion mode - External deceleration signal during 3-dimensional coordinate conversion	

7.2.79 Feedrate Control and Acceleration/Deceleration Control 2

11230	Distance to the 4th step in positioning by optimum acceleration for each axis D4 [mm]	<Axis> PRM 6131#0=1
11231	Distance to the 5th step in positioning by optimum acceleration for each axis D5 [mm]	<Axis> PRM 6131#0=1
11232	Distance to the 6th step in positioning by optimum acceleration for each axis D6 [mm]	<Axis> PRM 6131#0=1
11240	AI contour control mode cancel state/ Acceleration/deceleration before interpolation for rapid traverse	
#0 FAE	In positioning when the AI contour control mode cancel state is set, optimum torque acc./dec. is, disabled (0) / enabled (1)	
#4 ARB	Acceleration/deceleration before interpolation for rapid traverse in AICC mode off is, disabled (0) / enabled (1)	PRM 19501#5
#5 RRB	Acceleration/deceleration before interpolation for rapid traverse in rigid tap is, disabled (0) / enabled (1)	PRM 19501#5
11242	Time constant of acceleration/deceleration after interpolation of acceleration/deceleration before interpolation in rapid traverse [msec]	

7.2.80 Program Restart 2

11250	Program restart, quick program restart	
#1 TOU	When codes are output to the MDI program with auxiliary function output in the program restart, T codes are, not output to the MDI program (0) / output to the MDI program (1)	T series
#2 BOU	When codes are output to the MDI program with auxiliary function output in the program restart, B (secondary auxiliary function) codes are, not output to the MDI program (0) / output to the MDI program (1)	T series

#3 MCO	When multiple M, S, T, and B codes specified in a single block are output to the MDI program with auxiliary function output in the program restart, they are output to, one block at a time (0) / the same block (1)	
#4 MTO	When codes are output to the MDI program with auxiliary function output in the program restart, modal T codes are, not output to the MDI program (0) / output to the MDI program (1)	
#5 SPR	Suppress motion is, disabled (0) / enabled (1)	
#6 SAV	The suppress motion state is, not saved to a parameter (0) / saved to a parameter (1)	
#7 OAA	Approach to the program restart position per arbitrary axis is, disabled (0) / enabled (1)	
11251 #4 NPN	In the quick program restart function, when restarting operations on the way of the subprogram, the subprogram name is, specified(0) / not specified(1)	

7.2.81 Coordinate System 2

11275	The top number of M code used to turn on each axis workpiece coordinate system preset signal	
11276	The number of M code used to turn on each axis workpiece coordinate system preset signal	
11277	Workpiece coordinate system preset	
#0 WPA	When an M code for turning on the workpiece coordinate system preset signal for an axis is specified, but the signal is not turned on, or an auxiliary function lock is provided, an alarm is, issued (0) / not issued (1)	PS1820
#5 PWR	When parameter PPD is set to 0, the axis is preset with, 0 (0) / machine coordinates (1)	PRM 3104#3=0
#6 WMR	In Direct input of workpiece origin offset value measured, if measured axis is rotation axis and is roll-over axis, workpiece origin offset value is not rounded (0) / rounded (1).	
11279	Workpiece coordinate system	
#0 WAB	When the incremental mode (G91) is selected in the G-code system B/C of the lathe system, if the setting of the workpiece coordinate system (G92) is commanded, the setting of the workpiece coordinate system is executed with incremental value(0) / absolute value (1)	T series
#6 MSB	When single block signal SBK <Gn046.1> is set to “1”, single block stop in G code preventing buffering (G04.1) is, performed (0) / not performed (1)	
#7 HMA	When waiting M codes of high-speed are specified during Smooth TCP, high-speed smooth TCP, Smooth interpolation, Nano smoothing, Relation of cutter compensation, or when non-buffering command by G code is specified during Smooth TCP, high-speed smooth TCP, Smooth interpolation, Nano smoothing, Relation of cutter compensation, Multiple repetitive canned cycle G70 to G73, alarm occurs (0) / alarm not occurs (1)	

7.2.82 Synchronous/Composite Control and Superimposed Control 2

11284	Synchronous/composite control and superimposed control	
#0 SSH	During superimposed control, manual handle interruption to the slave axis is, disabled (0) / enabled (1)	

7.2.83 Programs 2

11290	M code preventing buffering 11	
11291	M code preventing buffering 12	
11292	M code preventing buffering 13	
11293	M code preventing buffering 14	
11294	M code preventing buffering 15	
11295	M code preventing buffering 16	
11296	M code preventing buffering 17	
11297	M code preventing buffering 18	
11298	M code preventing buffering 19	
11299	M code preventing buffering 20	

7.2.84 Display and Edit 2

11300	Information screen/FOCAS2	
#3 ASH	When "actual speed" is called through FOCAS2 and the PMC window, data updated at the conventional intervals (about 32 msec) is read (0) / data updated at high-speed intervals is read (1)	PRM 11313#7
#4 FPI	The number of already registered programs obtained with the cnc_rdproginfo() function, includes the number of initial folders (0) / does not include the number of initial folders (1)	
#5 MPH	When "machine coordinate in the machine unit not considering acc./dec. delay and servo delay" is read through FOCAS2 and the PMC window, data updated at the conventional intervals (about 32 msec) is read (0) / data updated at high-speed intervals is read (1)	
#6 ATH	When "disturbance load torque" is read through FOCAS2 and the PMC window, data updated at the conventional intervals (about 32 msec) is read (0) / data updated at high-speed intervals is read (1)	
#7 MUC	When "modal data" is read through FOCAS2 and the PMC window, data with a maximum delay of about 32 msec is read (0) / data that causes no delay in automatic operation is read (1)	
11302	Screen display in the initial state	
#0 SPG	In the initial state, the program screen provides, full-screen display (0) / small-screen display (1)	
#1 SPR	In the initial state, the parameter screen provides, full-screen display (0) / small-screen display (1)	
#2 SDG	In the initial state, the diagnosis screen provides, full-screen display (0) / small-screen display (1)	
#3 SMD	The MDI program screen is, displayed according to the setting of parameter SPG(No.11302#0) (0) / displayed in a window (1)	
#4 ADC	The function for switching to the previous screen when an alarm is reset on the alarm screen, and the function for switching to the alarm screen when the MESSAGE key is pressed then switching to the previous screen when the MESSAGE key is pressed again are, disabled (0) / enabled (1)	
#5 PES	When a program search is made on the program directory screen, the cursor moves to the found program on the program directory screen (0) / the screen display is switched to the editing screen after the specified program is selected as a main program (1)	
#6 FPF	For each path, a folder-fixed program directory is, not displayed (0) / displayed (1)	
#7 CPG	The program-related screen is, not switched according to the CNC mode (0) / switched according to the CNC mode (1)	

11303	Servo load meter axis display, Program display	
#0 LDP	Servo load meter axis display, interacts with coordinate axis display (0) / does not interact with coordinate axis display (1)	
#1 SRC	Upon reset in program character editing, blocks not saved yet are, not saved (0) / saved (1)	
#2 DVP	On the program directory screen, folders for the maximum number of paths that can be set in the system are displayed (0) / folders for the number of valid paths are displayed (1)	
#3 BDP	The program display position at single block stop time is, the start of the block that has been just executed (0) / the start of the next block (1)	MEM operation
#4 DPM	In MDI program execution, a block for calling an execution macro is, not displayed (0) / displayed (1)	
#5 ISQ	In MDI editing, automatic sequence number insertion is, disabled (0) / enabled (1)	
11304	Multi-path simultaneous display group	
#0 PGR	At the time of path selection signal switching, display of a multi-path simultaneous display group is, not switched (0) / switched to the group that includes a selected path (1)	
#1 GGD	The G code guidance screen is, not displayed (0) / displayed (1)	
#3 ON8	Program numbers are, 4 digits long (0) / 8 digits long (1)	
#7 CFP	Folders that can be used by program management are, not limited (0) / limited (1), to the path folder corresponding to a selected path.	PRM 11302#6
11305	Extension of the number of axes displayed simultaneously	
0: 5 axes, 1: 10 axes, 2: 20 axes		
11307	Coordinate display order	PRM 11305 13131 13132

Value	Coordinate display order 1	2	3	4
0	Relative coordinate	Absolute coordinate	Machine coordinate	Remaining move distance
1	Relative coordinate	Machine coordinate	Absolute coordinate	Remaining move distance
2	Relative coordinate	Remaining move distance	Absolute coordinate	Machine coordinate
3	Absolute coordinate	Machine coordinate	Relative coordinate	Remaining move distance
4	Absolute coordinate	Remaining move distance	Relative coordinate	Machine coordinate
5	Machine coordinate	Remaining move distance	Relative coordinate	Absolute coordinate

11308	Alarm, Data output, Spindle name	
#0 DOP	If an alarm is issued with a path not currently displayed, the screen display, does not switch to the alarm screen (0) / switches to the alarm screen (1)	
#1 COW	If the memory card already holds a file with a name specified for output to the memory card, the file is, not overwritten (0) / overwritten (1)	ALM SR1973
#2 EAS	If the name of an extended axis or extended spindle is used, the axis names and spindle names of the path, must not be used (0) / may be used (1)	
#3 FPD	On the program screen and program check screen, blocks already executed are, not displayed (0) / displayed (1)	
#4 PGS	In program search operation, a specified program name is searched for (0) / an O number program is searched for with "O" omitted (1)	
#5 SPH	Spindle speed data is read with FOCAS2 or on the PMC window at, conventional intervals (approximately 32 msec) (0) / short intervals (1)	
#6 ABH	Absolute coordinates data is read with FOCAS2 or on the PMC window at, conventional intervals (approximately 32 msec) (0) / short intervals (1)	

#7 DGH	Remaining travel distance data is read with FOCAS2 or on the PMC window at, conventional intervals (approximately 32 msec) (0) / short intervals (1)	
11310	Selection of a PMC for performing read/write operation with the external touch panel	
0,1: 1st PMC, 2: 2nd PMC, 3: 3rd PMC		

7.2.85 Embedded Macro 1

11311	Password for the embedded macro function	PRM 11312
11312	Keyword for the embedded macro function	PRM 11311

7.2.86 Display and Edit 3

11313		
#7 EMP	When the machine coordinates of the machine unit with the delay in acceleration/deceleration and the servo delay considered are cannot be read (0) / can be read with the PMC window (1)	
11317	Program number O8-digit	
#0 PON	Program number O8-digit is, invalid (0) / valid (1)	
11318	Program list screen	
#0 POC	When the pattern data input function is used, on the custom macro screen a comment is, displayed in the lower part of the screen (0) / displayed on the right side of the screen (1)	
#1 MLD	On the program list screen, division of the screen display is, disabled (0) / enabled (1)	
#2 DFM	On the program list screen, character strings related to memory cards are, not changed (0) / changed (1)	
#3 FIL	When you operate Get/Put of the data server, the forwarded file name is specified at the cursor position of the list screen (0) / the file name specification is enabled from the keyin buffer (1)	
#6 RTC	On the program list screen, a file selected by a selection operation, can be copied repeatedly (0) / cannot be copied repeatedly (1)	
11320	Screen display	
#0 DHN	On the program check screen, HD.T and NX.T, and a T number are, not displayed at the same time (0) / displayed at the same time (1)	PRM 3108#2
#1 IDC	The soft key, which updates ID information on the servo or spindle information screen as a batch, is, not displayed (0) / displayed (1)	PRM 13112#0
#6 DTS	The actual spindle speed and T code are not displayed (0) / always displayed (1)	
#7 PGM	In the high speed program check mode, the machine position is displayed with, actual machine coordinates (0) / machine coordinates for the program check (1)	
11321	Spindle tool name (1st character)	
11322	Spindle tool name (2nd character)	
11323	Spindle tool name (3rd character)	
11324	Spindle tool name (4th character)	
11325	Next machining tool name (1st character)	
11326	Next machining tool name (2nd character)	
11327	Next machining tool name (3rd character)	
11328	Next machining tool name (4th character)	

7.2.87 Graphic Display 2

11329	Dynamic graphic display1	
#1 DPC	The coordinates displayed on each of the PATH GRAPHIC, ANIMATION GRAPHIC, and PATH GRAPHIC (TOOL POSITION) screens of the dynamic graphic display function are, absolute coordinates (0) / machine coordinates (1)	
#2 GTL	When animated simulation is performed with the dynamic graphic display function, drawing at positions with tool length compensation considered is, not performed (0) / performed (1)	
#3 BGM	Coordinates used by the dynamic graphic display function are, absolute coordinates (0) / machine coordinates (1)	
#4 GTF	When the tool path is drawn with the dynamic graphic display function, drawing at positions with tool compensation considered is, performed (0) / not performed (1)	
#5 AER	When the tool path is drawn with the dynamic graphic display function, automatic erasure at the start of drawing is, not performed (0) / performed (1)	
#6 ACT	In tool path drawing with the dynamic graphic display function, the drawing color of a tool path is not changed automatically (0) / changed automatically (1)	
#7 GST	When drawing cannot be performed for a command with the dynamic graphic display function, the command is ignored, and drawing continues without stopping drawing (0) / drawing stops (1)	
11330	Magnification of drawing in dynamic graphic display	
11331	Screen center coordinate value in the drawing range in dynamic graphic display	<Axis> PRM 11329#3
11334	Rotation angle of the drawing coordinate system in dynamic graphic display (vertical direction)	
11335	Rotation angle of the drawing coordinate system in dynamic graphic display (horizontal direction)	
11336	Drawing color of the tool path in tool path drawing in dynamic graphic display	
11337	Color of the cursor indicating the tool position on the PATH GRAPHIC (TOOL POSITION) screen of dynamic graphic display	
11341	Drawing color of a blank figure in dynamic graphic display	
11342	Rotation angle of the drawing coordinate system of dynamic graphic display (screen center)	
11343	Blank figure in dynamic graphic display	
11344	Blank reference position in dynamic graphic display	<Axis> PRM 11329#3
11345	Blank dimension I in dynamic graphic display	
11346	Blank dimension J in dynamic graphic display	
11347	Blank dimension K in dynamic graphic display	
11348	Drawing color of a tool in animated simulation in dynamic graphic display	
11349	Dynamic graphic display 2	
#1 ABC	In animated simulation in the dynamic graphic display function, when a boring cycle is performed, the movement for a shift at the hole bottom is, not drawn (0) / drawn (1)	
#2 GSP	In tool path drawing in the dynamic graphic display function, the drawing start position is, the end position of a block that makes a movement for the first time (0) / the current position (1)	
#3 WNS	In the dynamic graphic display function, P-CODE workpiece number search is, disable (0) / enabled (1)	

#4 YGW	If Y-axis offset geometry and wear compensation is enabled, switching between the tool geometry and wear compensation screens is performed with, soft key [SWITCH] (0) / soft key [WEAR]/[GEOMETRY] (1)	
#7 PDM	When the pattern data input function is enabled, variable name and comment are, displayed on the custom macro screen only if the menu is selecting (0) / always displayed on the custom macro screen (1)	

7.2.88 Display and Edit 4

11350	Display	
#1 APD	The display of the program under execution is, a display containing look-ahead blocks (0) / a text display (1)	
#2 PNE	Path name expansion display function is, disabled (0) / enabled (1)	
#4 9DE	On 8.4-inch display unit, the maximum number of axes that can be displayed on a single screen is, 4 (0) / 5 (1)	
#5 PAD	On the pitch error compensation screen, axis names are, not displayed (0) / displayed (1)	
#6 QLS	The machining quality level adjustment screen is, not displayed (0) / displayed (1)	
11351	Display	
#1 COL	At the detail off screen of program list, the comment of program is not displayed (0) / displayed (1)	
#6 GTD	On the parameter screen, group names are, not displayed (0) / displayed (1)	
11352	Enlarged display	
#0 PNI	The display by the path name enlarged display function is, a normal display (0) / a reverse display (1)	
#5 SPT	When spindle alarm occurred, recording CNC information by machine state monitoring is, Disabled (0) / Enabled (1)	
#6 SVT	When servo alarm occurred, recording CNC information by machine state monitoring is, Disabled (0) / Enabled (1)	
#7 ABT	When unexpected abnormal torque is detected, recording CNC information by machine state monitoring is, isabled (0) / Enabled (1)	
11353	Display	
#0 SEK	When the power is turned on, or when the clear state is present, sequence numbers are, not maintained (0) / maintained (1)	
#1 SDE	Sequence numbers on the screen are displayed with, 5 digits (0) / 8 digits (1)	
11354	Display, history data	
#1 CRS	While data transmission is awaited using the DPRNT/BPRNT of the custom macro or macro executor, screen switching is, not possible (0) / possible (1)	
#2 SAH	When the storage capacity for history data is exceeded due to non-alarm history, alarm history will be, erased (0) / erased, except the most recent 50 items of history data (1)	
#3 SOH	When the storage capacity for history data is exceeded due to data other than external operator message history, external operator message history will be, erased (0) / retained (1)	PRM 11354#2
#4 DPC	In the screen title, program comments corresponding to O-numbers are, displayed (0) / not displayed (1)	
#7 HPM	High-speed program management is disabled (0) / enabled (1).	

11355	Display	
#0 DSN #1 CDA #3 MTS #4 SCM	The spindle names displayed on the spindle setting screen, the spindle adjustment screen, and the spindle monitor screen are, spindle numbers in the path plus the numbers indicating types such as MAIN and SUB (0) / names set in parameters (1) When a 15- or 19-inch display unit are used, a normal screen display is employed (0) / a screen display specifically for CNC display units for automotive is employed (1) The function for switching between simultaneous multi-path display and single-path display is, disabled (0) / enabled (1) In the initial state, the custom macro screen is, a small screen display (0) / a full screen display (1)	
11356	Screen display in the initial state	
#0 TLD #3 DCT #4 SFS #5 EPC #7 DPD	When the protection signal is enabled, the deletion of the tool life management screen is, disabled (0) / enabled (1) In the displaying the program being executed, the comment control statement display is not available (0) / available (1) The soft key of 8.4” screen is displayed up to 6 characters (0) / up to 12 characters (1) Display prepared and original programs on the same screen is, not available (0) / available (1) When the external subprogram is executed, the display of look-ahead blocks are analyzed blocks (0) / input blocks (1)	
11358	Power-On Checksum	
11359	Standard Checksum	
11360	Calculation Data	
11361	Calculation Time	
11362	Lathe/machining center G code system switching function	
#0 GSF #1 LCI	In the lathe/machining center G code system switching function, the mode display is, shown in T-MODE (turning mode)/M-MODE (milling mode) (0) / not shown (1) When the function for loader control is valid, a path name at the lower right of the screen is displayed in normal display (0) / reverse display (1)	

11364	Display	
#3 FDR #4 FLD #5 NSM #6 FLC #7 FLI	If a program or a folder exists in the target folder when the deletion operation is done specifying the folder, the folder is not deleted (0) / the folder amd programs/folders in the target folder are deleted (1) In input operation on the program editing screen and the program folder screen, the registration folder of the program is the folder that has been selected on each screen (0) / the folder shown by folder information in input file (1) When the program is read, the main program is changed (0) / the main program is not changed (1) On the program folder screen, when the program folder screen is displayed again after the screen switching, path switching and the device switching are done the cursor position moves to the head of the folder (0) / the cursor position stays at original position (1) On the program editing screen and the program folder screen, input/output operation of the program targets the foreground or background folder (0) / the folder that has been selected on each screen (1)	
11365	Modal display	
#0 D33 #1 D34 #2 D35 #3 D36 #4 D37 #5 D38 #6 D39 #7 D40	On the modal information display screen, the G codes in group n are, displayed (0) / not displayed (1) D33 : n=33 D34 : n=34 : D40 : n=40	
11366	Modal display	
#0 D41 #1 D42 #2 D43 #3 D44 #4 D45 #5 D46 #6 D47 #7 D48	On the modal information display screen, the G codes in group n are, displayed (0) / not displayed (1) D41 : n=41 D42 : n=42 : D48 : n=48	
11367	Modal display	
#0 D49 #1 D50 #2 D51 #3 D52 #4 D53 #5 D54 #6 D55 #7 D56	On the modal information display screen, the G codes in group n are, displayed (0) / not displayed (1) D49 : n=49 D50 : n=50 : D56 : n=56	
11368	Display	
#3 DAA #4 FNA #5 PWC #6 APM	The axis name used with axis type alarms is one set using parameter No.,1020 (0) / 3132 (1) On the fixture offset screen all axis are displayed (0) / Only the axis necessary for setting is displayed (1) Power consumption monitoring screen is, disabled (0) / enabled (1) Bar-graph display that shows the total of power consumption is, enabled (0) / disabled (1)	
11369	Display	
#0 MDC #1 MDL	MODIFICATION WARNING SETTING screen for C Language Executor is, not displayed (0) / displayed (1) MODIFICATION WARNING SETTING screen for PMC ladder is, not displayed (0) / displayed (1)	

#2 MDP #4 CSD	MODIFICATION WARNING SETTING screen parameters and non-protected parameters is, not displayed (0) / displayed (1) System variable is, not displayed on the custom macro screen (0) / displayed on the custom macro screen (1)	
11370	Display	
#2 RPD #5 DHS #6 STT	During executing the program backward by manual handle retrace, the block displayed at the start of the program is, the block being executed (0) / the block just before the block being executed (1) When the program is not save in the high-speed program management function, warning is not displayed in the status display (0) / displayed in the status display (1) Display sequence of an external operator message is not sorted in order of generation of the message (0) / sorted in order of generation of the message (1)	
11371	Scale of entire power consumption bar-graph in power consumption monitoring screen	
11372	Display	
#3 MSM #7 MSH	The machine state monitoring screen is not displayed (0) / is displayed (1) The machine state history screen is not displayed (0) / is displayed (1)	
11373	Display	
#7 WSE	CNC screen Web server function is, disabled (0) / enabled (1)	
11734	Display	
#0 AIC #4 PCB #5 CDE	If EOB code is included in comment block when program is read, alarms are not generated (0) / the alarm PS0518 is generated (1) In the program folder screen, the programs are copied or moved by the new method (0) / by the old method (1) Call stack display is available (0) / not available (1)	
11375	FOCAS2	
#0 DMP #6 ECD #7 AMW	The program protection function on the data server is enabled (0) / disabled (1) Function cnc_condense and cnc_pdf_cond are not effective (0) / effective (1). The accuracy of writing the custom macro or the P code macro variable with FOCAS2 function is not improved (0) / improved (1)	

11376	Time-out period of USB memory	
11378	PMC path number of PMC signal No.1 for the machine state monitoring function	
11379	PMC path number of PMC signal No.2 for the machine state monitoring function	
11380	PMC path number of PMC signal No.3 for the machine state monitoring function	
11381	PMC path number of PMC signal No.4 for the machine state monitoring function	
11382	Address kind of PMC signal No.1 for the machine state monitoring function	
11383	Address kind of PMC signal No.2 for the machine state monitoring function	
11384	Address kind of PMC signal No.3 for the machine state monitoring function	
11385	Address kind of PMC signal No.4 for the machine state monitoring function	
11386	Address number of PMC signal No.1 for the machine state monitoring function	
11387	Address number of PMC signal No.2 for the machine state monitoring function	
11388	Address number of PMC signal No.3 for the machine state monitoring function	
11389	Address number of PMC signal No.4 for the machine state monitoring function	
11391	Display	
#1 TRE #2 ZSS #6 RPW #7 2CF	In the folder screen, the program folder tree is available (0) / not available (1) In outputting CNC parameters, whether parameters, which equal to zero are output or not is, not decided by soft-keys (0) / decided by soft-keys (1) When changing a password on Parameter screen, confirmation message is not displayed (0) / displayed (1) In direct input of offset value measured B for 2 spindle lathe, when the setting that a workpiece coordinate system shift amount is set in the workpiece coordinate system memory is an automatic selection is made, and Workpiece coordinate system shift value write mode select signal WOQSM is 1, the cursor movement by the MDI operation is not prohibited (0) / prohibited (1)	
11392	Scale of axis power consumption bar-graph in power consumption monitoring screen	
11393	Scale of spindle power consumption bar-graph in power consumption monitoring screen	
11394	Display	
#0 AND	Power consumption of each servo axis is, displayed (0) / not displayed (1)	
11395	Display	
#0 SND	Power consumption of each spindle axis is, displayed (0) / not displayed (1)	
11397	Minimum torque overrides at acceleration/deceleration in spindle speed control mode	
11398	Minimum torque overrides at acceleration/deceleration in spindle synchronization control mode	
11399	Conversion factor from power consumption (kWh) to carbon-dioxide emission (kg)	

7.2.89 Tool Compensation 2

11400	T code for tool offset	
#1 NO5 #2 TOP #3 CTO	The fifth axis offset function is, not used (0) / used (1) Tool length compensation and tool position compensation are performed by, moving the tool along axes (0) / shifting coordinates (1) Select the behavior of following system variable related to tool length offset by reset operation. Not clear the system variable (0) / clear the system variable (1)	T series
11401	Distance to the plus (+) contact surface of the touch sensor	M series <Axis>
11402	Distance to the minus (-) contact surface of the touch sensor	M series <Axis>
11403	Tool compensation	
#2 OFN	In Y-axis offset and 4th / 5th offset, the specification address of the data input/output and the programable data input is, default specification address 'Y','E' and 'F' (0) / address of axis name (parameter No.1020) (1)	
11411	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 01	
11412	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 02	
11413	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 03	
11414	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 04	
11415	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 05	
11416	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 06	
11417	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 07	
11419	The interval of the tool offset number with tool compensation memory A and B, when the following function is used - Cutting point command - 3-dimentional cutter compensation taking into account the tool figure	

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7.2.90 Optimum Torque Acceleration/Deceleration for Rigid Tapping

11420	Optimum torque acceleration/deceleration for rigid tapping	
#0 RAU	Optimum torque acceleration/deceleration function for rigid tapping is, disabled (0) / enabled (1)	
11421	Maximum acceleration of the optimum acceleration/deceleration for rigid tapping (gear 1)	
11422	Maximum acceleration of the optimum acceleration/deceleration for rigid tapping (gear 2)	
11423	Maximum acceleration of the optimum acceleration/deceleration for rigid tapping (gear 3)	
11424	Maximum acceleration of the optimum acceleration/deceleration for rigid tapping (gear 4)	
11425	Acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (gear 1)	
11426	Acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (gear 2)	
11427	Acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (gear 3)	

11428	Acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (gear 4)	
11429 11430 11431 11432 : 11440	Spindle speed at P1 in optimum acceleration/deceleration for rigid taping (gear 1) Spindle speed at P2 in optimum acceleration/deceleration for rigid taping (gear 1) Spindle speed at P3 in optimum acceleration/deceleration for rigid taping (gear 1) Spindle speed at P1 in optimum acceleration/deceleration for rigid taping (gear 2) : Spindle speed at P3 in optimum acceleration/deceleration for rigid taping (gear 4)	
11441 11442 : 11445 11446 : 11460	Permissible acceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 1) Permissible acceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 1) : Permissible acceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 1) Permissible acceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 2) : Permissible acceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 4)	
11461 11462 : 11465 11466 : 11480	Permissible deceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 1) Permissible deceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 1) : Permissible deceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 1) Permissible deceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 2) : Permissible deceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 4)	

7.2.91 Arbitrary Speed Threading

11485	Arbitrary speed threading 1	
#0 AST #1 RMT	Arbitrary speed threading is, disabled (0) / enabled (1) Re-machining thread is, disabled (0) / enabled (1)	
11486	Arbitrary speed threading 2	
#0 ADQ #1 ART #2 AMM	Command for shifting the threading start angle by address Q in re-machining thread is, disabled (0) / enabled (1) Arbitrary speed threading mode is, canceled by reset (0) / not canceled by reset (1) In arbitrary speed threading mode, M code to start arbitrary speed threading mode is, disabled to command (0) / enabled to command (1)	
11487	M code to start arbitrary speed threading mode	
11488	Mcode to cancel arbitrary speed threading mode	
11489	Acceleration in arbitrary speed threading	
11490	Spindle speed arrival level in arbitrary speed threading	
11492	Adjusting parameter 1 for arbitrary speed threading (position error of servo)	
11493	Adjusting parameter 2 for arbitrary speed threading (position error of spindle)	
11496	Measurement result of thread groove	

7.2.92 Programs 3

11500		
#1 IPO	Cutting feed-forward flag is output immediately when it comes in-position state (0) / output after waiting for 1 interpolation period after becoming in-position state (1)	
11501		
#2 MSC #3 NWT #5 SUR #6 SUM	The machine lock shift value check in automatic operation is, not applied (0) / applied (1). At a start of the automatic operation, the time from a falling edge of the cycle start signal ST to a start of the automatic operation is conventional (0) / reduced (1) The timing of starting detection of a one-rotation signal in threading is conventional (0) / high-speed execution (1) Speed-up of G28, G30 and G53 commands is disabled (0) / enabled (1)	
11502	Input/output	
#2 WPP #3 CMS #4 PSU #6 CTC #7 IPW	Programmable parameter input (G10)-based parameter re-setting that requires power-off is, disabled (0) / enabled (1) If the cycle start of MEM/RMT mode is commanded without reset while executing subprogram/macro call of the MDI mode, the alarm is not generated (0) / the alarm (PS0525)"subprogram/macro calling." is generated (1) Programmable parameter input(G10L50/52) is, executed by normal speed.(conventional specification) (0) / executed by high speed. (1) During axis moving, the time constant of rapid traverse linear acceleration/deceleration for each axis (parameter No. 1620) is, write-disabled (0) / write-enabled (1) The advanced preview feed-forward coefficient (parameter (No. 2092)) and parameter No. 8162#0 for specifying whether to apply a mirror image during synchronization control are, write-disabled during axis moving (0) / write-enabled if the corresponding axis is stopped (1)	
11503		
#4 HIC	When the axis controlled with a servo motor enters in-position check the next block is begun at the next interpolation cycle that entered in-position (0) / the next block is begun at the interpolation cycle when entering in-position (1)	
11504		
#5 BST	Operating time reduction of command of preventing buffering is disabled. (0) / enabled. (1)	
11505	USB memory interface	
#0 ISU	When an USB memory card is selected as an I/O device, data input/output is performed using ASCII codes (0) / ISO codes (1)	
11506	USB memory interface	
#0 PCU	When the NC has a USB memory interface and the CNC screen display function is active, the valid USB memory interface is on the, NC (0) / personal computer (1)	
11507		
#3 HSR #6 PNT #7 SAC	Speed-up of processing related to RS232-C is disabled (0) / enabled (1) If BPRNT/DPRNT of the custom macro is commanded continuously, TV check is executed since the 2nd times (0) / not executed (1) When the spindle speed arrival SAR<Gn029.4> is checked in canned cycle for drilling, It is waiting for elapsing time that is set parameter No.3740 at the starting of all drilling. (0) / It is waiting for elapsing time that is set parameter No.3740 at the starting of only first drilling. (1)	PRM3470

11530	Warning value (common to ch1, ch2, and ch3) for I/O link retry counter	
11531	Warning value for the ECC correction counter (SRAM)	
11532	Warning value for the number of Embedded Ethernet error detection occurrences	
11533	Warning value for the number of Fast Ethernet error detection occurrences	
11534	Warning value (common to FL-net PORT 1 and 2) for the number of FL-net error detection occurrences	
11538		
#6 WT1	In automatic operation, the speed-up between blocks is invalid (0) / valid (1)	
11539		
#3 ICX	Display of C language executor/FANUC PICTURE on iPendant is not possible (0) / possible (1)	
11549		
#0 APS #6 AP5	Automatic setting function of PS control axis, automatic setting of parameter is, not performed (0) / performed (1) In multi-path system, AI contour control is, not executed simultaneously by more than 5 paths (0) / executed simultaneously by more than 5 paths (1)	
11550	M code of removal command for Flexible path axis assignment	
11551	M code of removal command for Flexible path axis assignment	
11552	M code of removal command for Flexible path axis assignment	
11553	The address of command in user area of internal relay(R)	
11554	Internal relay user area (R) address for individual-axis information	
11555	Flexible path axis assignment specified axis name	
11556	Flexible path axis assignment specified axis name 2	
11557	Flexible path axis assignment specified axis name 3	
11560	Identification number for an axis to be subjected to arbitrary axis switching	
11561		
#0 FAR #1 FAW #2 FAO #3 FAM #4 FAC	The arbitrary axis switching function is, disabled (0) / enabled (1) If an axis acquisition command is issued for an axis yet to be freed in arbitrary axis switching, the command waits for the axis to be freed (0) / alarm PS0514 is issued (1) If the power is turned off and on again with arbitrary axis switching in effect, the axis configuration is, returned to the initial state (0) / kept in the most recent state (1) The method of command specification used by programs in arbitrary axis switching is, identification number method (0) / axis name method (1) If the axis removal command is issued for an axis which already removed, or assigned to the another path in flexible path axis assignment, Alarm PS0514 is issued (0) / the command is ignored (1)	ALM PS0514
11562		
#1 FAN	In arbitrary axis switching, axis names used after exchange are, those previously set for each axis (0) / those set for the other axes in exchange pairs (1)	
11563		
#0 CSG #2 NMF #3 WUA	Flexible path axis assignment is commanded by G code command (0) / by PMC signal setting (1) Direct assignment mode signal DASN<G0536.5> is not used (0) / used (1) In direct assign mode of the flexible path axis assignment, if removal command could not execute, The alarm DS0080 occurs (0) / wait execution of the axis removal (1)	

#4 FAX #6 RRS	In flexible path axis assignment, if the target axis of the assignment command is already exists on the target path, The alarm PS0514 occurs (0) / the command is ignored (1) When reset is executed, the axis assignment changed by Flexible path axis assignment is not changed (0) / is returned to its initial assignment (1)	
11564		
#0 PAN	The name of the axis which assigned to each path is not changed (0) / Changed to the specific name selected in each path (1)	
11565		
#1 RTC	In Flexible path axis assignment, tool geometry offset value and tool wear offset value and tool offset value are not canceled and alarm PS0514 occurs when flexible path axis assignment command is issued (0) / canceled only for the commanded axis when flesible path axis command is issued (1)	
11600	Rotary axis rotation direction	
#1 D3MV #2 D3IT #4 D3A #5 AX1	In following modes, axis moving signals is, the signals for axes on programing coordinate system (0) / the signals for axes on workpiece coordinate system (1) - 3-dimensional coordinate system conversion - Tilted working plane indexing - Workpiece setting error compensation - Tool center point control In the 3-dimensional coordinate system conversion mode, the valid interlock signals are, the signals for all of the target axes for 3-dimensional coordinate system conversion (0) / the signals for axes along which a movement is made during 3-dimensional coordinate system conversion (1) If a compensation vector is not canceled in 3-dimensional coordinate system conversion cancellation, an alarm is issued (0) / no alarm is issued (1) If, in coordinate system rotation mode, a 1-axis command is issued in absolute mode, the specified position is calculated in the coordinate system before rotation, and then the coordinate system is rotated (0) / the coordinate system is rotated, and then the tool moves to the specified position in the coordinate system (1)	 ALM PS5462
11601		
#6 SBN	When the dual position feedback and the monitoring semi-full error is used in servo function, the smooth backlash compensation is executed, according to the setting of parameter No.2206#4 and No.2010#5 (0) / in the semi-closed loop side (1)	
11602		
#3 TFO #4 NDO	When the rapid traverse is linear interpolation type and time constant acceleration/decerelation type, the rapid overlap is invalid (0) / valid (1) If a normal direction control cancel command (G40.1) block contains a cutting feed command and the next block also contains a cutting feed command, the next block performs movement, after a deceleration stop (0) / without waiting for a deceleration stop (1)	

7

#5 NCP	If there is a non-threading block between two threading blocks, the second threading block waits until the spindle one-rotation signal and the spindle speed arrival signal (SAR) are detected (0) / does not wait unless a G code in non-threading group 01 is issued. (FS16*i* compatible specification) (1)	
11630		
#0 FRD #1 MDE #2 TFR #5 M5B	The minimum command unit of the rotation angles of coordinate rotation and 3-dimensional coordinate system conversion is, 0.001 degree (0) / 0.00001 degree (1) In the MDI mode, the external device subprogram call (M198) is, disabled (0) / enabled (1). The minimum command unit of the rotation angles of the tilted working plane indexing is, 0.001 degree (0) / 0.00001 degree (1) The number of M codes that can be specified in one block one (0) / up to five (1)	
11631 11632 : 11640	M code 1 to protect M code 2 to protect : M code 10 to protect	
11641	M code start number to protect (1st set)	
11642	Number of M codes to protect (1st set)	
11643	M code start number to protect (2nd set)	
11644	Number of M codes to protect (2nd set)	
11645	M code start number to protect (3rd set)	
11646	Number of M codes to protect (3rd set)	
11647	The local variable number corresponding to the axis address	
11648		
#0 M99 #2 ESE	In M99 block, single block stop is, not performed(0) / performed(1) ELSE statement of IF statement is, not used(0) / used(1)	
11651		
#1 SMI #7 DCO	When GOTO statement using stored sequence numbers is enabled and memory operation of a program on Data Server/Memory card is executed, sequence numbers in the program are, Stored (0) / Not stored (1) In dry run, cutting time is, not counted (0) / counted (1)	PRM 6000#4 6000#1
11656	Top program number which single block stop at M99 is effective	PRM 11648#0
11657	Number of programs which single block stop at M99 is effective	PRM 11648#0

7.2.93 Machining Quality Level Adjustment

11681	Smoothing level currently selected when nano smoothing is used	
11682	Tolerance when nano smoothing is used (smoothing level 1)	
11683	Tolerance when nano smoothing is used (smoothing level 10)	
11684	Tolerance of rotary axes when nano smoothing 2 is used (smoothing level 1)	<Axis>
11685	Tolerance of rotary axes when nano smoothing 2 is used (smoothing level 10)	<Axis>
11686	Standard value of smoothing level when nano smoothing is used	
11687	Standard value of precision level when AI contour control is used	

7.2.94 Smooth tolerance control 1

11785	Smooth tolerance control	<Axis>
#0 CAT	On startup of automatic operation, smooth tolerance control is ineffective on an axis (0) / effective on an axis (1).	
11786	Tolerance for linear axis in smooth tolerance control mode	

7.2.95 Servo 2

11802		<Axis>
#0 CPY #2 SWF #4 KSV #6 RVL	When a change from a semi-closed loop to a closed loop is made by the SEMIx signal, and when the SEMIx signal indicates a closed loop at power-on, the absolute coordinate value in the semi-closed loop is, not replaced by the absolute coordinate value in the closed loop (0) / replaced by the absolute coordinate value in the closed loop (1) When switching between the semi-closed loop and closed loop is performed by the SEMIx signal, re-creation of coordinate values on the detector on the loop side set after switching is, not performed (0) / performed (1) Servo axis is, enabled (0) / disabled (1) In case of using the rotary scale without rotary data to the linear axis type, an absolute position detector or a rotary scale with distance-coded reference marks (serial) is, not available (0) / available (1)	PRM1023 PRM 11810
11803	Dual position feedback	<Axis>
#0 STH #1 CDP #2 TSF	The dual position feedback turning mode is, disabled (0) / enabled (1) Dual position feedback compensation clamping is, not performed (0) / performed (1) In tandem control, the slave axis is placed in the servo-off state, simultaneously with the master axis (0) / independently of the master axis (1)	
11807	VRDY-OFF alarm detection time when emergency stop is canceled	
11810	The amount of the movement per one motor rotation of linear axis type	<Axis> PRM 11802#6

7.2.96 PMC Axis Control 3

11850	PMC axis control	
#0 CMI #7 IFH	If, in PMC axis control, a rapid traverse rate is specified with the axis control block data signal, with parameter RPD(No.8002#0) being set to 1, the rapid traverse rate is, always treated as being in millimeters (0) / dependent on the setting of parameter INM(No.1001#0) (1) When parameter OVE(No.8001#2) is set to 1 in PMC axis control, the 1% rapid traverse override signals *EROVs are, on a path-by-path basis (0) / on a group-by-group basis (1)	PRM 8013#1
11851-11853	Peripheral axis control	
#0 SO1 SO2 SO3	When S command is commanded in peripheral axis control program of peripheral axis control group 1 (group 2, group 3), S code is outputted, but the speed command is not outputted to the spindle(0) / S code is outputted, and the speed command is outputted to the spindle(1)	

<table>
<tr><td>#1 TC1
TC2
TC3</td><td>Specification of T code command of peripheral axis control group 1 (group 2, group 3) is the same specification as the parameter No.11860 (No.11861, No.11862)(0) / the same specification as normal T code command(1)</td><td></td></tr>
<tr><td>11854-
11856</td><td>Peripheral axis control</td><td></td></tr>
<tr><td>#0 IA1
IA2
IA3
#1 MG1
MG2
MG3

#2 MF1
MF2
MF3

#3 WT1
WT2
WT3
#4 GT1
GT2
GT3</td><td>Peripheral axis control program of peripheral axis control group 1 (group 2, group 3) is incremental programming(0) / absolute programming(1)
When peripheral axis control is started, initial modal data of peripheral axis control group 1 (group 2, group 3) is G00 mode (rapid traverse)(0) / G01 mode (cutting feed)(1)
When peripheral axis control is started, initial modal data of peripheral axis control group 1 (group 2, group 3) is G94(M series)/G98(T series) (feed per minute)(0) / G95(M series)/G99(T series) (feed per revolution)(1)
Tool wear compensation of peripheral axis control group 1 (group 2, group 3) is performed by moving the tool(0) / shifting the coordinate system(1)
Tool geometry compensation of peripheral axis control group 1 (group 2, group 3) is performed by moving the tool(0) / shifting the coordinate system(1)</td><td></td></tr>
<tr><td>11857-
11859</td><td>Peripheral axis control</td><td></td></tr>
<tr><td>#0 GB1
GB2
GB3
#1 GC1
GC2
GC3</td><td>Setting of G code system of peripheral axis control group 1 (group 2, group 3) is depended on setting the parameter bit 6 (GSB) and bit 7 (GSC) of the parameter (No.3401).
<table>
<tr><th>GB1
GB2
GB3</th><th>GC1
GC2
GC3</th><th>G code system</th></tr>
<tr><td>0</td><td>0</td><td>G code system depends on setting the parameter bit 6 (GSB) and bit 7 (GSC) of the parameter (No.3401).</td></tr>
<tr><td>1</td><td>0</td><td>G code system B</td></tr>
<tr><td>0</td><td>1</td><td>G code system C</td></tr>
<tr><td>1</td><td>1</td><td>G code system A</td></tr>
</table></td><td></td></tr>
<tr><td>#2 DI1
DI2
DI3

#3 FM1
FM2
FM3</td><td>The each override signal that is applied peripheral axis control group 1(group 2, group3) is the signal of path that is set by parameter No.3040 (No.3041, No.3042)(0) / the signal of area that is set by parameter No.3037 (No.3038, No.3039)(1)
Program format of peripheral axis control group 1(group 2, group3) is series 15 format(0) / series 16 format(1)</td><td></td></tr>
<tr><td>11860</td><td>T code of tool offset cancel of peripheral axis control group 1</td><td></td></tr>
<tr><td>11861</td><td>T code of tool offset cancel of peripheral axis control group 2</td><td></td></tr>
<tr><td>11862</td><td>T code of tool offset cancel of peripheral axis control group 3</td><td></td></tr>
<tr><td>11863</td><td>Clearance value in peck drilling cycle G83 for peripheral axis of peripheral axis control group 1</td><td></td></tr>
<tr><td>11864</td><td>Clearance value in peck drilling cycle G83 for peripheral axis of peripheral axis control group 2</td><td></td></tr>
<tr><td>11865</td><td>Clearance value in peck drilling cycle G83 for peripheral axis of peripheral axis control group 3</td><td></td></tr>
<tr><td>11866</td><td>M code to start the first peripheral axis control program(peripheral axis control group 1)</td><td></td></tr>
<tr><td>11867</td><td>M code to start the second peripheral axis control program(peripheral axis control group 1)</td><td></td></tr>
</table>

11868	M code to start the third peripheral axis control program(peripheral axis control group 1)	
11869	M code to start the fourth peripheral axis control program(peripheral axis control group 1)	
11870	M code to start the fifth peripheral axis control program(peripheral axis control group 1)	
11871	M code to start the sixth peripheral axis control program(peripheral axis control group 1)	
11872	M code to start the first peripheral axis control program(peripheral axis control group 2)	
11873	M code to start the second peripheral axis control program(peripheral axis control group 2)	
11874	M code to start the third peripheral axis control program(peripheral axis control group 2)	
11875	M code to start the fourth peripheral axis control program(peripheral axis control group 2)	
11876	M code to start the fifth peripheral axis control program(peripheral axis control group 2)	
11877	M code to start the sixth peripheral axis control program(peripheral axis control group 2)	
11878	M code to start the first peripheral axis control program(peripheral axis control group 3)	
11879	M code to start the second peripheral axis control program(peripheral axis control group 3)	
11880	M code to start the third peripheral axis control program(peripheral axis control group 3)	
11881	M code to start the fourth peripheral axis control program(peripheral axis control group 3)	
11882	M code to start the fifth peripheral axis control program(peripheral axis control group 3)	
11883	M code to start the sixth peripheral axis control program(peripheral axis control group 3)	
11884	Peripheral axis 1 (peripheral axis control group 1)	
11885	Peripheral axis 2 (peripheral axis control group 1)	
11887	Peripheral axis 1 (peripheral axis control group 2)	
11888	Peripheral axis 2 (peripheral axis control group 2)	
11890	Peripheral axis 1 (peripheral axis control group 3)	
11891	Peripheral axis 2 (peripheral axis control group 3)	
11893	Waiting M codes of peripheral axis control group 1	
11894	Waiting M codes of peripheral axis control group 2	
11895	Waiting M codes of peripheral axis control group 3	

7.2.97 PMC

11900	PMC of execution order 1 in the multi-PMC function	
11901	PMC of execution order 2 in the multi-PMC function	
11902	PMC of execution order 3 in the multi-PMC function	
11905	Execution time percentage (%) of PMC of execution order 1 in the multi-PMC function	
11906	Execution time percentage (%) of PMC of execution order 2 in the multi-PMC function	
11907	Execution time percentage (%) of PMC of execution order 3 in the multi-PMC function	
11910	I/O Link channel 1 input/output addresses	
11911	I/O Link channel 2 input/output addresses	
11912	I/O Link channel 3 input/output addresses	
11915	Input/output address of the 2nd block of I/O Link channel 1	
11916	Input/output address of the 2nd block of I/O Link channel 2	
11917	Input/output address of the 2nd block of I/O Link channel 3	
11920	Input/output addresses of CNC-PMC interface 1	
11921	Input/output addresses of CNC-PMC interface 2	
11922	Input/output addresses of CNC-PMC interface 3	
11923	Input/output addresses of CNC-PMC interface 4	
11924	Input/output addresses of CNC-PMC interface 5	

11925	Input/output addresses of CNC-PMC interface 6	
11926	Input/output addresses of CNC-PMC interface 7	
11927	Input/output addresses of CNC-PMC interface 8	
11928	Input/output addresses of CNC-PMC interface 9	
11929	Input/output addresses of CNC-PMC interface 10	
11930	PMC execution period, Execution period of ladder level 1	
11931	Ladder execution with the PMC, External message	
#0 PCC #1 M16	For a multi-path PMC, ladder execution and stop are, controlled individually for each PMC path (0) / controlled simultaneously for all PMC paths (1) In external data input or external message display, the number of displayable external alarm messages or external operator messages is, 4 (0) / 16 (1)	
#2 DTM	Monitoring of the DeviceNet communication normal signal is not available (0) / available (1)	
#5 LDV #7 NMC	Ladder dividing management function is not available(0) / available(1). When the PMC alarm "ER09 PMC LABEL CHECKERROR" occurs, the nonvolatile memory of PMC is cleared by turning on power of CNC with pressing "O" and "Z" MDI keys (0) / turning on power of CNC without any operation (1)	
11932	PMC inter-path interface	
11933	I/O Link / I/O Link *i*	
#0 C1T #1 C2T	For communication with channel 1, I/O Link is used (0) / I/O Link *i* is used (1) For communication with channel 2, I/O Link is used (0) / I/O Link *i* is used (1)	
11934	DeviceNet communication normal signal monitoring start time	
11936	The number of PMC paths	
11937 : 11939	Assignment of network devices to X / Y address	
#0 #1 #2 #3 #4 #5 #6 #7	Assignment of network devices to X / Y address are not used (0) / used (1) P11 : X / Y 0 to 127 of the 1st-path PMC P12 : X / Y 200 to 327 of the 1st-path PMC P13 : X / Y 400 to 527 of the 1st-path PMC P14 : X / Y 600 to 727 of the 1st-path PMC P21 : X / Y 0 to 127 of the 2nd-path PMC : P54 : X / Y 600 to 727 of the 5th-path PMC	
11940	Type of PMC memory of the 1st-path PMC	
11941	Type of PMC memory of the 2nd-path PMC	
11942	Type of PMC memory of the 3rd-path PMC	

7.2.98 Dual Check Safety 2

11950 : 11957	See Dual Check Safety Connection Manual.	
11960 : 11967	See Dual Check Safety Connection Manual.	
11970 : 11977	See Dual Check Safety Connection Manual.	
11980 : 11987	See Dual Check Safety Connection Manual.	

7.2.99 Embedded Macro Functions 2

12020	G code number for the embedded macro function (1st set)	
12021	Macro program number for the embedded macro function (1st set)	
12022	Number of G code macros for the embedded machine function (1st set)	

12023	G code number for the embedded macro function (2nd set)	
12024	Macro program number for the embedded macro function (2nd set)	
12025	Number of G code macros for the embedded machine function (2nd set)	
12026	G code number for the embedded macro function (3rd set)	
12027	Macro program number for the embedded macro function (3rd set)	
12028	Number of G code macros for the embedded machine function (3rd set)	
12029	G code number for the embedded macro function (4th set)	
12030	Macro program number for the embedded macro function (4th set)	
12031	Number of G code macros for the embedded machine function (4th set)	
12032	G code number for the embedded macro function (5th set)	
12033	Macro program number for the embedded macro function (5th set)	
12034	Number of G code macros for the embedded machine function (5th set)	
12035	G code number for the embedded macro function (6th set)	
12036	Macro program number for the embedded macro function (6th set)	
12037	Number of G code macros for the embedded machine function (6th set)	
12038	G code number for the embedded macro function (7th set)	
12039	Macro program number for the embedded macro function (7th set)	
12040	Number of G code macros for the embedded machine function (7th set)	
12041	G code number for the embedded macro function (8th set)	
12042	Macro program number for the embedded macro function (8th set)	
12043	Number of G code macros for the embedded machine function (8th set)	
12044	G code number for the embedded macro function (9th set)	
12045	Macro program number for the embedded macro function (9th set)	
12046	Number of G code macros for the embedded machine function (9th set)	
12047	G code number for the embedded macro function (10th set)	
12048	Macro program number for the embedded macro function (10th set)	
12049	Number of G code macros for the embedded machine function (10th set)	

7

7.2.100 High-speed Position Switch 2

12201	Controlled axis for which the 11th high-speed position switch function is performed	PRM 8500#7=1
12202	Controlled axis for which the 12th high-speed position switch function is performed	
12203	Controlled axis for which the 13th high-speed position switch function is performed	
12204	Controlled axis for which the 14th high-speed position switch function is performed	
12205	Controlled axis for which the 15th high-speed position switch function is performed	
12206	Controlled axis for which the 16th high-speed position switch function is performed	
12221	Maximum value of the operation range of the 11th high-speed position switch	
12222	Maximum value of the operation range of the 12th high-speed position switch	
12223	Maximum value of the operation range of the 13th high-speed position switch	
12224	Maximum value of the operation range of the 14th high-speed position switch	
12225	Maximum value of the operation range of the 15th high-speed position switch	
12226	Maximum value of the operation range of the 16th high-speed position switch	
12241	Minimum value of the operation range of the 11th high-speed position switch	
12242	Minimum value of the operation range of the 12th high-speed position switch	
12243	Minimum value of the operation range of the 13th high-speed position switch	
12244	Minimum value of the operation range of the 14th high-speed position switch	
12245	Minimum value of the operation range of the 15th high-speed position switch	

12246	Minimum value of the operation range of the 16th high-speed position switch	

7.2.101 Malfunction Protection

12255	Maximum servo motor speed	<Axis>
12256	Maximum servo motor acceleration rate	<Axis>

7.2.102 Manual Handle 2

12300	X address of the 1st manual handle	PRM 7105#1=1
12301	X address of the 2nd manual handle	
12302	X address of the 3rd manual handle	
12303	X address of the 4th manual handle	
12304	X address of the 5th manual handle	
12310	States of the 1st manual handle feed axis selection signals when tool axis direction handle feed/interrupt and table-based vertical direction handle feed/interrupt are performed	
12311	States of the 1st manual handle feed axis selection signals when a movement is made in the 1st axis direction in tool axis normal direction handle feed/interrupt and table-based horizontal direction handle feed/interrupt	
12312	States of the 1st manual handle feed axis selection signals when a movement is made in the 2nd axis direction in tool axis normal direction handle feed/interrupt and table-based horizontal direction handle feed/interrupt	
12313	States of the 1st manual handle feed axis selection signals when the 1st rotary axis is turned in tool tip center rotation handle feed/interrupt	
12314	States of the 1st manual handle feed axis selection signals when the 2nd rotary axis is turned in tool tip center rotation handle feed/interrupt	
12318	Tool length in 3-dimensional manual feed	
12319	Coordinate system for the rotation axis used for calculation	
#0 CAC	If a workpiece coordinate system offset is set for the rotation axis, the coordinate system of the rotation axis used to calculate the 3-dimensional manual feed is, machine coordinate system (0) / workpiece coordinate system (1)	PRM 19680-19714
12320	3-dimensional manual feed	
#0 TWD	The directions of 3-dimensional manual feed (other than tool tip center rotation feed) when the tilted working plane indexing is issued are, the same as those not in the tilted working plane indexing (0) / X, Y, and Z directions in the feature coordinate system (1)	
#1 FLL	The directions of tool axis normal direction feed or table-based horizontal direction feed in the 3-dimensional manual feed mode are, tool axis normal direction 1 (table-based horizontal direction 1) and tool axis normal direction 2 (table-based horizontal direction 2) (0) / longitude direction and latitude direction (1)	
#2 JFR	As the feedrate of 3-dimensional machining manual feed (jog feed or incremental feed), the dry run rate is used (0) / the jog feedrate is used (1)	PRM 1410,1423
#7 EM4	Manual handle feed amount selection signal MP4<Gn019.6> is, disabled (0) / enabled (1)	

12321	Normal axis direction 1: Positive (+) X-axis direction / 2: Positive (+) Y-axis direction / 3: Positive (+) Z-axis direction / 0: Reference tool axis direction(Parameter(No.19697))	
12322	Angle used to determine whether to assume the tool axis direction to be parallel to the normal direction (Parameter(No.12321)) [deg]	
12323	Manual handle number subject to 3-dimensional manual feed	
12330	Pulse (channel 1) 1 of the manual pulse generator	
#0 G10 #1 G11 #2 G12 #3 G13 #4 G14 #5 G15 #6 G16 #7 G17	When PMC group n (channel m) uses PowerMate or I/O Link βi, the pulses from the manual pulse generator connected with I/O Link are, transferred to the target group (0) / not transferred to the target group (1) G10 : m=1, n=0 G11 : m=1, n=1 : G17 : m=1, n=7	
12331	Pulse (channel 1) 2 of the manual pulse generator	
#0 G18 #1 G19 #2 G1A #3 G1B #4 G1C #5 G1D #6 G1E #7 G1F	When PMC group n (channel m) uses PowerMate or I/O Link βi, the pulses from the manual pulse generator connected with I/O Link are, transferred to the target group (0) / not transferred to the target group (1) G18 : m=1, n=8 G19 : m=1, n=9 : G1F : m=1, n=15	
12332	Pulse (channel 2) 1 of the manual pulse generator	
#0 G20 #1 G21 #2 G22 #3 G23 #4 G24 #5 G25 #6 G26 #7 G27	When PMC group n (channel m) uses PowerMate or I/O Link βi, the pulses from the manual pulse generator connected with I/O Link are, transferred to the target group (0) / not transferred to the target group (1) G20 : m=2, n=0 G21 : m=2, n=1 : G27 : m=2, n=7	
12333	Pulse (channel 2) 2 of the manual pulse generator	
#0 G28 #1 G29 #2 G2A #3 G2B #4 G2C #5 G2D #6 G2E #7 G2F	When PMC group n (channel m) uses PowerMate or I/O Link βi, the pulses from the manual pulse generator connected with I/O Link are, transferred to the target group (0) / not transferred to the target group (1) G28 : m=2, n=8 G29 : m=2, n=9 : G2F : m=2, n=15	
12334	Pulse (channel 3) 1 of the manual pulse generator	
#0 G30 #1 G31 #2 G32 #3 G33 #4 G34 #5 G35 #6 G36 #7 G37	When PMC group n (channel m) uses PowerMate or I/O Link βi, the pulses from the manual pulse generator connected with I/O Link are, transferred to the target group (0) / not transferred to the target group (1) G30 : m=3, n=0 G31 : m=3, n=1 : G37 : m=3, n=7	
12335	Pulse (channel 3) 2 of the manual pulse generator	
#0 G38 #1 G39 #2 G3A #3 G3B #4 G3C #5 G3D #6 G3E #7 G3F	When PMC group n (channel m) uses PowerMate or I/O Link βi, the pulses from the manual pulse generator connected with I/O Link are, transferred to the target group (0) / not transferred to the target group (1) G38 : m=3, n=8 G39 : m=3, n=9 : G3F : m=3, n=15	

12336	Pulse (channel 4) 1 of the manual pulse generator	
#0 G40 #1 G41 #2 G42 #3 G43 #4 G44 #5 G45 #6 G46 #7 G47	When PMC group n (channel m) uses PowerMate or I/O Link βi, the pulses from the manual pulse generator connected with I/O Link are, transferred to the target group (0) / not transferred to the target group (1) G40 : m=4, n=0 G41 : m=4, n=1 : G47 : m=4, n=7	
12337	Pulse (channel 4) 2 of the manual pulse generator	
#0 G48 #1 G49 #2 G4A #3 G4B #4 G4C #5 G4D #6 G4E #7 G4F	When PMC group n (channel m) uses PowerMate or I/O Link βi, the pulses from the manual pulse generator connected with I/O Link are, transferred to the target group (0) / not transferred to the target group (1) G48 : m=4, n=8 G49 : m=4, n=9 : G4F : m=4, n=15	
12340	PMC path number of the 1st manual handle connected to the I/O Link	PRM 12300 - 12304
12341	PMC path number of the 2nd manual handle connected to the I/O Link	
12342	PMC path number of the 3rd manual handle connected to the I/O Link	
12343	PMC path number of the 4th manual handle connected to the I/O Link	
12344	PMC path number of the 5th manual handle connected to the I/O Link	
12350	Manual handle feed magnification, m, for each axis	<Axis> PRM7113
12351	Manual handle feed magnification, n, for each axis	<Axis> PRM7114

7.2.103 Synchronous/Composite Control and Superimposed Control 3

12600	Axis identification number for a programmed synchronous, composite, or superimposed control command	

7.2.104 PMC Axis Control 4

12730	Acceleration/deceleration constant in PMC axis control	
#0 PTC	The linear acc./dec. time constant for speed-specified continuous feed in PMC axis control is, not extended (0) / extended (1)	PRM 8007#2
12731	Linear acc./dec. time constant 2 for speed-specified continuous feed in PMC axis control [msec/1000 min^{-1}]	<Axis>
12732	Linear acc./dec. time constant 3 for speed-specified continuous feed in PMC axis control [msec/1000 min^{-1}]	<Axis>
12733	Linear acc./dec. time constant 4 for speed-specified continuous feed in PMC axis control [msec/1000 min^{-1}]	<Axis>
12734	Linear acc./dec. time constant 5 for speed-specified continuous feed in PMC axis control [msec/1000 min^{-1}]	<Axis>
12735	Time constant switch speed 1 for speed-specified continuous feed in PMC axis control [min^{-1}]	<Axis>
12736	Time constant switch speed 2 for speed-specified continuous feed in PMC axis control [min^{-1}]	<Axis>
12737	Time constant switch speed 3 for speed-specified continuous feed in PMC axis control [min^{-1}]	<Axis>
12738	Time constant switch speed 4 for speed-specified continuous feed in PMC axis control [min^{-1}]	<Axis>

7.2.105 External Deceleration Positions Expansion

12750	External deceleration function	
#0 EX4 #1 EX5	External deceleration function setting 4 is, disabled (0) / enabled (1) External deceleration function setting 5 is, disabled (0) / enabled (1)	
12751	External deceleration rate setting 4 in cutting feed	
12752	External deceleration rate setting 4 for each axis in rapid traverse	<Axis>
12753	Maximum manual handle feedrate setting 4 for each axis	<Axis>
12754	External deceleration rate setting 5 in cutting feed	
12755	External deceleration rate setting 5 for each axis in rapid traverse	<Axis>
12756	Maximum manual handle feedrate setting 5 for each axis	<Axis>

7.2.106 Display and Edit 5

12801	Operation history signal selection address type (No. 01)	PRM 12841-12860, 12881-12900, 24901-24920
12802	Operation history signal selection address type (No. 02)	
:		
12820	Operation history signal selection address type (No. 20)	
12841	Operation history signal selection address number (No. 01)	PRM 12801-12820, 12881-12900, 24901-24920
12842	Operation history signal selection address number (No. 02)	
:		
12860	Operation history signal selection address number (No. 20)	
12881	Operation history signal selection bit history (No. 01)	PRM 12801-12820, 12881-12900, 24901-24920
#0 RB0 #1 RB1 : : #7 RB7	A history for bit 0 of operation history signal selection (No. 01) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1) A history for bit 1 of operation history signal selection (No. 01) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1) : A history for bit 7 of operation history signal selection (No. 01) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1)	
12882	Operation history signal selection bit history (No. 02)	PRM 12801-12820, 12881-12900, 24901-24920
#0 RB0 #1 RB1 : : #7 RB7	A history for bit 0 of operation history signal selection (No. 02) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1) A history for bit 1 of operation history signal selection (No. 02) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1) : A history for bit 7 of operation history signal selection (No. 02) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1)	
:		

12900	Operation history signal selection bit history (No. 20)	
#0 RB0 #1 RB1 : : #7 RB7	A history for bit 0 of operation history signal selection (No. 20) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1) A history for bit 1 of operation history signal selection (No. 20) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1) : A history for bit 7 of operation history signal selection (No. 20) corresponding to the address set by parameter Nos. 12801 to 12860 is, not recorded (0) / recorded (1)	
12990	G code modal group (1st) recorded in a history when an alarm is issued	
12991	G code modal group (2nd) recorded in a history when an alarm is issued	
12992	G code modal group (3rd) recorded in a history when an alarm is issued	
12993	G code modal group (4th) recorded in a history when an alarm is issued	
12994	G code modal group (5th) recorded in a history when an alarm is issued	
12995	G code modal group (6th) recorded in a history when an alarm is issued	
12996	G code modal group (7th) recorded in a history when an alarm is issued	
12997	G code modal group (8th) recorded in a history when an alarm is issued	
12998	G code modal group (9th) recorded in a history when an alarm is issued	
12999	G code modal group (10th) recorded in a history when an alarm is issued	
13101	Baud rate	
#1 TPB #2 15M	As the baud rate used with the external touch panel, the default (fixed at 19200 bps) is used (0) / the value set in parameter (No. 123) for channel 2 is used (1) On a 15" display unit, the simultaneous multi-path display program check screen, does not display modal information (0) / displays modal information (1)	
13102	Program editing	
#0 TAD #5 BGD #6 BGI #7 EDT	The current position display section of an axis not subject to current position display (parameter NDPx(No.3115#0) = 1) and that of an axis for which a display position is specified (Parameter (No. 3130)) are, displayed as blanks (0) / replaced by the current position display section of the next axis subject to current position display (1) When the option for background editing is selected, background editing on the program editing screen of the CNC is, enabled (0) / disabled (1) When the INPUT key is pressed with the cursor placed on a program on the program directory screen, background editing is, started (0) / not started (1) During memory operation, program editing is, enabled (0) / disabled (1)	PRM 3115#0=1, 3130
13112	Servo or spindle information screen	
#0 IDW #1 SVI #2 SPI	Editing on the servo or spindle information screen is, prohibited (0) / not prohibited (1) The servo information screen is, displayed (0) / not displayed (1) The spindle information screen is, displayed (0) / not displayed (1)	

#6 NTA #7 NTD	On the 3-dimensional manual feed screen, a table-based pulse amount is, displayed (0) / not displayed (1) On the 3-dimensional manual feed screen, a tool axis based pulse amount is, displayed (0) / not displayed (1)	
13113	Display of travel distance and feedrate for 3-dimensional manual feed	
#0 CLR #3 CFD #4 MDS	Upon reset, the display of a travel distance by 3-dimensional manual feed is, not cleared (0) / cleared (1) As feedrate F, the 3-dimensional manual feed screen displays, composite feedrate at the linear axis/rotary axis control point (0) / feedrate at the tool tip (1) If a reset is made during execution of a block including the S code, modal information (S code) in an executing block is displayed (0) / modal information (S code) in a previous block is displayed (1)	
13115	MDI key input	
#0 ICT #1 IAT #2 ITB #3 IAU #4 SI1 #5 SI2 #6 KBC #7 P10	For MDI key input, the <CTRL> key is, enabled (0) / disabled (1) For MDI key input, the <ALT> key is, enabled (0) / disabled (1) For MDI key input, the <TAB> key is, enabled (0) / disabled (1) For MDI key input, the <AUX> key is, enabled (0) / disabled (1) Soft key input of <, >, ¥, %, $, !, ~, :, ", and ' is, disabled (0) / enabled (1) Input of (,), ?, *, &, @,and _ by soft keys, and switching of uppercase/lowercase input mode by soft keys are, disabled (0) / enabled (1) When lowercase letters are input on the standard ONGP-MDI unit, '[' and ']' are, not converted to '<' and '>' respectively (0) / converted to '<' and '>' respectively (1) With the 30*i*/31*i*/32*i* (with personal computer function with Windows XP) with a 15" display unit, when the CNC screen display function is used, the mode for displaying the screen is, the 15" mode (0) / the 10.4" mode (1)	
13117	Program restart	
#4 INT #5 PMP #6 SQB #7 SQP	During a program restart, the interference check on cutter/tool nose radius compensation is, enabled (0) / disabled (1) To the MDI program that is output due to a program restart, the memory protection signals KEY1 and KEY3 <G0046.3,5> are, not effective (0) / effective (1) A program restart with a block number specification is, enabled (0) / disabled (1) A program restart with the P type is, enabled (0) / disabled (1)	PRM 3290#7
13131	Group number for simultaneous display of multiple paths	
13132	Simultaneous multi-path display order number	
13140	1st character in spindle load meter display	T series
13141	2nd character in spindle load meter display	
13151	Serial Number of a file output by the external output command (DPRNT or BPRNT)	PRM 6019#7

7.2.107 Tool Management Functions

13200	Tool management functions	
#0 TCF	When a T code is specified with the tool management function, a cartridge number and pot number found by the NC are output (0) / the specified T code is output without modification (1)	
#1 THN	When NX.T and HD.T are displayed with the tool management function, the tool type numbers at the 1st spindle position and the 1st standby position are displayed (0) / the values specified from the PMC window are displayed (1)	
#2 TRT	As the remaining lifetime value for outputting the tool life arrival notice signal, the remaining lifetime of the last tool is used (0) / the sum of the remaining lifetimes of the tools with the same type number is used (1)	PRM 13200#3=0
#3 ETE	The tool life arrival notice signal is output, for each tool type (0) / for each tool (1)	
#4 TP2	The output format of cartridge management data is, new registration format (0) / modification format (1)	
#5 T0O	When T0 is specified, a tool search is made assuming that the tool type number is 0 (0) / the cartridge number and pot number are assumed to be 0 (1)	
#6 NAM	When a T code is specified, but a valid tool with a remaining lifetime cannot be found, an alarm is issued (0) / the tool with the maximum tool management number is selected from the tools of the specified tool type number, and the TMFNFD signal <Fn315.6> is set to 1 (1)	ALM PS5317
#7 NFD	When a T code is specified, but a valid tool with a remaining lifetime cannot be found in the cartridge, the spindle position and standby position are also searched (0) / the spindle position and standby position are not searched (1)	
13201	Tool management function screen display	
#0 TDC	The function for customizing the tool management data screen is, disabled (0) / enabled (1)	
#1 TDN	On the screen dedicated to the tool management function, tool life status is displayed using, up to 6 characters (0) / up to 12 characters (1)	
#2 TDB	Tool information is displayed, in conventional mode (0) / in 1/0 mode (1)	
#3 TME	Support for multi-edge tools with the tool management function is, disabled (0) / enabled (1)	
#4 TFT	Data extraction using those items that are specified on the tool management table screen is, disabled (0) / enabled (1)	
#6 TDS	A tool data search using a tool type number is, not performed (0) / performed (1)	
13202	Tool management function screen display	
#1 DCR	On the tool management function screen, tool nose radius compensation data is, displayed (0) / not displayed (1)	T series Combined type
#2 DOY	On the tool management function screen, Y-axis offset data is, displayed (0) / not displayed (1)	T series Combined type
#4 DO2	On the tool management function screen, the 2nd geometry tool offset data is, displayed (0) / not displayed (1)	T series Combined type
#6 DOT	On the tool management function screen, the tool offset data (X, Z) of the T series is, displayed (0) / not displayed (1)	T series Combined type
#7 DOM	On the tool management function screen, the offset data of the M series is, displayed (0) / not displayed (1)	M series Combined type

13203	Cartridge search	
#0 NM1 #1 NM2 #2 NM3 #3 NM4 #4 TSI #5 NTS #6 SWC #7 TCN	The 1st cartridge is, searched (0) / not searched (1) The 2nd cartridge is, searched (0) / not searched (1) The 3rd cartridge is, searched (0) / not searched (1) The 4th cartridge is, searched (0) / not searched (1) When support for multi-edge tools with the tool management function is enabled, a tool is found by remaining lifetime (0) / the tool placed at the spindle position or standby position has priority in selection (1) In tool search operation performed when support for multi-edge tools with the tool management function is enabled, the edge group including a tool whose edge life has expired is, searched (0)/not searched (1) When a tool is found from those with the same tool type number, a tool with a short lifetime is found (0) / a tool with a small customization data number is found (1) Tool life count operation is triggered by, M06/restart M code (0) / T code (1)	 PRM 13201#3=1 PRM 13201#3=1 PRM13260
13204	Tool management data protection key, Attach/detach signal	
#0 TDL #1 ATA #2 DTA	The key-based protection function for tool management data is, disabled (0) / enabled (1) The tool attach signal, cartridge number signal, and pot number signal are, used (0) / not used (1) The tool detach signal, cartridge number signal, and pot number signal are, used (0) / not used (1)	
13205	Cartridge search	
#5 M6F	In Tool management function, when following G codes and M6 are commanded in the same block, axes move to the end position of the block after FIN signal returned (0) / before FIN signal returned (1) - G53 Machine coordinate system setting (except for high speed G53) - G28 Automatic return to reference position - G29 Movement from reference position - G30 2nd, 3rd and 4th reference position return	
13206	Screen display of the tool management function	
#1 SSM #4 OVI	As a chapter selection soft key of the tool management function, a soft key for changing the screen display to the MANUAL GUIDE i screen is, not displayed (0) / displayed (1) When tool management data is output, it includes, no offset value (0) / offset values (1)	
13208		
#6 TSW	In case of tool management function, if T code is commanded when either of following PMC window is executing, edge number change and tool search by T code command are not kept waiting (0) / kept waiting until PMC window is finished (1) - PMC window for tool exchange (Function code 329) - PMC window for tool moving (Function code 329) - PMC window for shifting tool management data (Function code 367)	
13210	Screen display of the tool management function	
#7 FNS	Acquisition of unused multi-edge group numbers and tool offset numbers and their display on the tool management screen are, not performed (0) / performed (1)	
13220	Number of valid tools in tool management data	

7.2.108 Tool Life Management 2

13221	M code for tool life count restart	
13222	Number of data items in the 1st cartridge	
13223	Start pot number of the 1st cartridge	
13227	Number of data items in the 2nd cartridge	

13228	Start pot number of the 2nd cartridge	
13232	Number of data items in the 3rd cartridge	
13233	Start pot number of the 3rd cartridge	
13237	Number of data items in the 4th cartridge	
13238	Start pot number of the 4th cartridge	
13240	Cartridge type	
#0 MT1 #1 MT2 #2 MT3 #3 MT4	The 1st cartridge is of, chain type (0) / matrix type (1) The 2nd cartridge is of, chain type (0) / matrix type (1) The 3rd cartridge is of, chain type (0) / matrix type (1) The 4th cartridge is of, chain type (0) / matrix type (1)	PRM13222 PRM13227 PRM13232 PRM13237
13241	Number of rows of the 1st cartridge (when the cartridge is of the matrix type)	PRM 13240#0
13242	Number of columns of the 1st cartridge (when the cartridge is of the matrix type)	PRM 13240#0
13243	Number of rows of the 2nd cartridge (when the cartridge is of the matrix type)	PRM 13240#1
13244	Number of columns of the 2nd cartridge (when the cartridge is of the matrix type)	PRM 13240#1
13245	Number of rows of the 3rd cartridge (when the cartridge is of the matrix type)	PRM 13240#2
13246	Number of columns of the 3rd cartridge (when the cartridge is of the matrix type)	PRM 13240#2
13247	Number of rows of the 4th cartridge (when the cartridge is of the matrix type)	PRM 13240#3
13248	Number of columns of the 4th cartridge (when the cartridge is of the matrix type)	PRM 13240#3
13250	Number of valid spindles	
13251	Number of valid standby positions	
13252	M code for specifying a particular tool	
13260	Customization data number to be searched for	PRM 13203#6
13265	H code for enabling the number for selecting the offset number at the spindle position in tool management and tool length compensation in tool life management	

7.2.109 Straightness Compensation 2

13301	Straightness compensation: Compensation point number a of moving axis 4	
13302	Straightness compensation: Compensation point number b of moving axis 4	
13303	Straightness compensation: Compensation point number c of moving axis 4	
13304	Straightness compensation: Compensation point number d of moving axis 4	
13311	Straightness compensation: Compensation point number a of moving axis 5	
13312	Straightness compensation: Compensation point number b of moving axis 5	
13313	Straightness compensation: Compensation point number c of moving axis 5	
13314	Straightness compensation: Compensation point number d of moving axis 5	
13321	Straightness compensation: Compensation point number a of moving axis 6	
13322	Straightness compensation: Compensation point number b of moving axis 6	
13323	Straightness compensation: Compensation point number c of moving axis 6	
13324	Straightness compensation: Compensation point number d of moving axis 6	
13351	Compensation corresponding compensation point number a of moving axis 4 [Detection unit]	
13352	Compensation corresponding compensation point number b of moving axis 4 [Detection unit]	

13353	Compensation corresponding compensation point number c of moving axis 4 [Detection unit]	
13354	Compensation corresponding compensation point number d of moving axis 4 [Detection unit]	
13361	Compensation corresponding compensation point number a of moving axis 5 [Detection unit]	
13362	Compensation corresponding compensation point number b of moving axis 5 [Detection unit]	
13363	Compensation corresponding compensation point number c of moving axis 5 [Detection unit]	
13364	Compensation corresponding compensation point number d of moving axis 5 [Detection unit]	
13371	Compensation corresponding compensation point number a of moving axis 6 [Detection unit]	
13372	Compensation corresponding compensation point number b of moving axis 6 [Detection unit]	
13373	Compensation corresponding compensation point number c of moving axis 6 [Detection unit]	
13374	Compensation corresponding compensation point number d of moving axis 6 [Detection unit]	
13381	Number of the straightness compensation point at the farthest end on the minus (-) side on moving axis 1	
13382	Number of the straightness compensation point at the farthest end on the minus (-) side on moving axis 2	
13383	Number of the straightness compensation point at the farthest end on the minus (-) side on moving axis 3	
13384	Number of the straightness compensation point at the farthest end on the minus (-) side on moving axis 4	
13385	Number of the straightness compensation point at the farthest end on the minus (-) side on moving axis 5	
13386	Number of the straightness compensation point at the farthest end on the minus (-) side on moving axis 6	
13391	Straightness compensation: Compensation magnification of moving axis 1	
13392	Straightness compensation: Compensation magnification of moving axis 2	
13393	Straightness compensation: Compensation magnification of moving axis 3	
13394	Straightness compensation: Compensation magnification of moving axis 4	
13395	Straightness compensation: Compensation magnification of moving axis 5	
13396	Straightness compensation: Compensation magnification of moving axis 6	

7.2.110 Flexible Synchronization Control 2

13420	Automatic phase synchronization in flexible synchronization control	
#0 DIA	The movement direction of the automatic phase synchronization of group A is, + direction (0) / - direction (1)	PRM 5669#0
#1 DIB	The movement direction of the automatic phase synchronization of group B is, + direction (0) / - direction (1)	PRM 5669#1
#2 DIC	The movement direction of the automatic phase synchronization of group C is, + direction (0) / - direction (1)	PRM 5669#2
#3 DID	The movement direction of the automatic phase synchronization of group D is, + direction (0) / - direction (1)	PRM 5669#3
13421	Flexible synchronization	
#0 FRS	In a program containing an M code for turning the flexible synchronization mode on/off, a program restart is, disabled (0) / enabled (1)	PRM 13421#1

#1 FCN	In the emergency stop/servo off state, Inter-Path flexible synchronization control is, canceled (0) / not canceled (1)	
#2 FRF	If G27/G28/G29/G30/G30.1/G53 is specified during flexible synchronization control, alarm is, issued (0) / not issued (1)	ALM PS0010
#3 FSV	When the axis related to synchronization is servo off state while flexible synchronization control or inter-path flexible synchronization control, an automatic operation is, stopped (0) / stopped if the axis related to synchronization moves (1)	
#4 FPA	For a synchronization group for which a PMC axis is a master axis, when the controlled axis selection signal EAXn<G0136> for PMC axis control is set to "1" after starting flexible synchronization control mode, and the master axis is specified by PMC axis control, or for a synchronization group for which spindle control with servo motor is a master axis, when SV speed control mode of the master axis is turned on after starting flexible synchronization control mode, an alarm is, issued (0) / not issued (1)	ALM PS5381
13425	Acceleration/deceleration time constant of the slave axis when synchronization is started/canceled (group A)	PRM 5669#0
13426	Acceleration/deceleration time constant of the slave axis when synchronization is started/canceled (group B)	PRM 5669#1
13427	Acceleration/deceleration time constant of the slave axis when synchronization is started/canceled (group C)	PRM 5669#2
13428	Acceleration/deceleration time constant of the slave axis when synchronization is started/canceled (group D)	PRM 5669#3
13429	Automatic phase synchronization rate for the slave axis (group A)	PRM 5669#0
13430	Automatic phase synchronization rate for the slave axis (group B)	PRM 5669#1
13431	Automatic phase synchronization rate for the slave axis (group C)	PRM 5669#2
13432	Automatic phase synchronization rate for the slave axis (group D)	PRM 5669#3
13433	Machine coordinates of the master axis used as the reference for phase synchronization (group A)	PRM 5669#0
13434	Machine coordinates of the master axis used as the reference for phase synchronization (group B)	PRM 5669#1
13435	Machine coordinates of the master axis used as the reference for phase synchronization (group C)	PRM 5669#2
13436	Machine coordinates of the master axis used as the reference for phase synchronization (group D)	PRM 5669#3
13437	Threshold value for automatic phase synchronization error detection signal output (group A)	PRM 5669#0
13438	Threshold value for automatic phase synchronization error detection signal output (group B)	PRM 5669#1
13439	Threshold value for automatic phase synchronization error detection signal output (group C)	PRM 5669#2
13440	Threshold value for automatic phase synchronization error detection signal output (group D)	PRM 5669#3

7.2.111 Programs 4

13450	Reset, Feedrate F	
#4 MFC	When the cutting is executed without specifying a feedrate (F) after the modal G code of group 05 was changed by G93(inverse time feed) / G94(feed per minute) / G95(feed per revolution) command, the feedrate (F) is inherited as a modal (0) / alarm is issued (1)	ALM PS0011
13451	Format for tilted working plane indexing	

#1 ATW	When I, J, and K are all set to 0 in a block that specifies a feature coordinate system setup command (G68.2), which is a tilted working plane indexing, an alarm is issued (0) / a feature coordinate system with a tilted plane angle of 0 degrees is assumed for operation (1)	ALM PS5457

7.2.112 Manual Liner/Circular Interpolation

13541	The head address of the R signal used by the input data in the manual linear/circular interpolation	PRM 7106#3=1
13542	Head address of the R signal used by the output data in the manual linear/circular interpolation	PRM 7106#4=1

7.2.113 Canned Cycles for Drilling M Code Output Improvement

13543	M code for C-axis unclamping in canned cycles for drilling (1st set)	T series PRM 5161#4=1
13544	M code for C-axis clamping in canned cycles for drilling (2nd set)	T series PRM 5161#4=1
13545	M code for C-axis unclamping in canned cycles for drilling (2nd set)	T series PRM 5161#4=1

7.2.114 Machining Condition Selection Functions

13600	Machining condition selection functions	
#0 MCR	When an allowable acceleration rate adjustment is made with the machining condition selection function or machining quality level adjustment function, the deceleration function based on acceleration in circular interpolation is, modified (0) / not modified (1)	PRM 1735
#7 MSA	When the machining condition selection function or machining quality level adjustment function is used, the acceleration rate change time (bell-shaped) (LV1, LV10) is set using parameters, Nos. 13612 and 13613 (0) / Nos. 13662 and 13663 (1)	PRM 13612 13613 13662 13663
13601	Machining parameter adjustment screen	
#0 MPR	The machining parameter adjustment screen is, displayed (0) / not displayed (1)	
13610	Acceleration rate for look-ahead acc./dec. before interpolation in AI contour control (precision level 1)	<Axis>
13611	Acceleration rate for look-ahead acc./dec. before interpolation in AI contour control (precision level 10)	<Axis>
13612	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 1) [ms]	PRM 13600 #7
13613	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 10) [ms]	PRM 13600 #7
13614	Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration (precision level 1)	<Axis>
13615	Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration (precision level 10)	<Axis>
13616	Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration in successive linear interpolation operations (precision level 1)	<Axis>

13617	Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration in successive linear interpolation operations (precision level 10)	<Axis>
13618	Rate of change time of the rate of change of acceleration in smooth bell-shaped acc./dec. before interpolation when AI contour control is used (precision level 1) [%]	
13619	Rate of change time of the rate of change of acceleration in smooth bell-shaped acc./dec. before interpolation when AI contour control is used (precision level 10) [%]	
13620	Allowable acceleration rate when AI contour control is used (precision level 1)	<Axis>
13621	Allowable acceleration rate when AI contour control is used (precision level 10)	<Axis>
13622	Time constant for acc./dec. after interpolation when AI contour control is used (precision level 1) [ms]	<Axis>
13623	Time constant for acc./dec. after interpolation when AI contour control is used (precision level 10) [ms]	<Axis>
13624	Corner speed difference when AI contour control is used (precision level 1)	<Axis>
13625	Corner speed difference when AI contour control is used (precision level 10)	<Axis>
13626	Maximum cutting speed when AI contour control is used (precision level 1)	<Axis>
13627	Maximum cutting speed when AI contour control is used (precision level 10)	<Axis>
13628	Parameter number corresponding to arbitrary item 1 when AI contour control is used	
13629	Parameter number corresponding to arbitrary item 2 when AI contour control is used	
13630	Value with emphasis on speed (precision level 1) of the parameter corresponding to arbitrary item 1 when AI contour control is used	<Axis>
13631	Value with emphasis on speed (precision level 1) of the parameter corresponding to arbitrary item 2 when AI contour control is used	<Axis>
13632	Value with emphasis on speed (precision level 10) of the parameter corresponding to arbitrary item 1 when AI contour control is used	<Axis>
13633	Value with emphasis on speed (precision level 10) of the parameter corresponding to arbitrary item 2 when AI contour control is used	<Axis>
13634	Precision level currently selected when AI contour control is used	
13662	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 1), range extended [ms]	PRM 13600 #7
13663	Acceleration rate change time (bell-shaped) when AI co ntour control is used (precision level 10), range extended [ms]	PRM 13600 #7

7.2.115 Parameters of Check Sum Function

13730	Parameter check sum	
#0 CKS #7 CSR	A power-on, a parameter check sum check is not performed (0) / performed (1) Alarm DS5340 is cleared with <RESET> + <CAN> keys (0) / <RESET> key (1)	

13731 13732 : 13750	Number to be excluded from the NC parameter check sum, 01 Number to be excluded from the NC parameter check sum, 02 : Number to be excluded from the NC parameter check sum, 20	
13751 13752 : 13770	Start number of the range to be excluded from the NC parameter check sum, 01 Start number of the range to be excluded from the NC parameter check sum, 02 : Start number of the range to be excluded from the NC parameter check sum, 20	

7.2.116 Dual Check Safety 3

13805	See Dual Check Safety Connection Manual.	
13806	See Dual Check Safety Connection Manual.	
13810	See Dual Check Safety Connection Manual.	
13811	See Dual Check Safety Connection Manual.	
13821 : 13829	See Dual Check Safety Connection Manual.	
13831 : 13838	See Dual Check Safety Connection Manual.	
13840 : 13843	See Dual Check Safety Connection Manual.	
13880 : 13911	See Dual Check Safety Connection Manual.	
13920 : 13951	See Dual Check Safety Connection Manual.	
13960 : 13991	See Dual Check Safety Connection Manual.	

7.2.117 Parameters of Axis Control/Increment System 3

14000	Inch/metric switching at a point other than the reference position	
#1 INA #2 IRF	When inch/metric switching is performed at a point other than the reference position, operation is performed as conventionally done (0) / an alarm is issued (1) An inch-metric switch command (G20, G21) at the reference position is, disabled (0) / enabled (1)	<Axis> PS5362 <Axis>

7.2.118 Linear Scale with Absolute Address Reference Position

14010	Maximum allowable travel distance when a reference position is established for a linear scale with an absolute address reference position [Detection unit]	<Axis> ALM DS0017

7.2.119 FSSB 1

14476	FSSB	
#5 SSC	One connector of the separate detector interface unit is, not shared among two or more axes (0) / shared among two or more axes (1)	

7.2.120 SERVO GUIDE Mate

14500 - 14637	These parameters hold initial values and values set by screen operations in SERVO GUIDE Mate. These parameters are set by the CNC. So, never input values from the parameter screen.	

7.2.121 Graphic Display 3

14706	The directions of the axes of the machine 16 : Right-handed coordinate system Right = +Z, up = +X 17 : Right-handed coordinate system Right = -Z, up = +X 18 : Right-handed coordinate system Right = -Z, up = -X 19 : Right-handed coordinate system Right = +Z, up = -X 20 : Right-handed coordinate system Right = +X, up = +Z	
14713	Unit of magnification by which enlargement and reduction is performed with the dynamic graphic display function Unit of magnification = 64 / setting	
14714	Unit of horizontal movement when a movement is made with the dynamic graphic display function	
14715	Unit of vertical movement when a movement is made with the dynamic graphic display function	
14716	Unit of rotation angle when rotation is performed with the dynamic graphic display function	
14717	Axis number of the rotation axis to be drawn with the dynamic graphic display function	

7.2.122 Embedded Ethernet

14880	Embedded Ethernet	
#0 ETH #1 PCH #4 UNM #5 DNS #6 DHC	Embedded Ethernet is, used (0) / not used (1) At the start of communication of the FTP file transfer function for built-in port, checking for the presence of the server using PING is, performed (0) / not performed (1) With a built-in port, the CNC Unsolicited Messaging function is, not used (0) / used (1) With a built-in port, the DNS client function is, not used (0) / used (1) With a built-in port, the DHCP client function is, not used (0) / used (1)	
14882	Embedded Ethernet	
#0 ERD	On Embedded Ethernet, Machine Remote Diagnosis function is not used (0) / used (1)	
#1 MOD #4 UNS #7 WAL	The Modbus/TCP Server function is used on a hardware option (0) / on built-in port (1) In the CNC Unsolicited Messaging function of a built-in port, when the end of the function is requested by other than the CNC Unsolicited Messaging server currently connected, the request for the end of the function is, rejected (0) / accepted (1) In CNC screen Web server function, when failing in login continuously five times, this function becomes, disabled (0) / enabled (1)	
14883	FTP file transfer function	
#7 PSV	FTP client of FTP file transfer function operates as the active mode (0) / operates as the passive mode (1)	
14884	CNC Status Notification function	
#0 SNL #5 SNP	When failing in login continuously five times from a portable terminal, CNC Status Notification function becomes disabled (0) / still enabled (1) The total number of machined parts, number of machined parts and number of parts required is not included int the status mail (0) / is included in the status mail (1)	

#6 SNM #7 SNE	When the displayed language of CNC screen is Japanese, English or Simplified Chinese, the alarm message is not included in the alarm mail (0) / is included in the alarm mail (1) CNC Status Notification function is not used (0) / is used (1)	
14885 #0 ISO #1 EDE	Embedded Ethernet When the embedded Ethernet is selected as an I/O device, data is input or output using ASCII codes (0) / ISO codes (1) DNC operation from the embedded Ethernet and external device subprogram call from the embedded Ethernet are not performed (0) / performed (1)	
14890	Selects the host computer 1 OS.	
14891	Selects the host computer 2 OS.	
14892	Selects the host computer 3 OS.	

No.14890-No.14892:

Settings	Description
0	Windows95/98/Me/NT/2000/XP/Vista/7
1	UNIX,VMS
2	Linux

7.2.123 Manual Handle Retrace 2

18000	Manual handle retrace	
#1 RTW	At the start of a re-forward movement operation of the manual handle retrace function in a multi-path system, the re-forward movement operation is performed immediately on each path (0) / those paths for which reverse movement is prohibited are synchronized at the stop position (1)	
18050	PMC axis control	
#7 OTW	If an axis move command is executed with PMC axis control during automatic operation, and the NC block under execution is stopped by a feed hold when the axis moving due to PMC axis control is completed, the amount of movement due to PMC axis control in that block is, not reflected in the NC coordinate system (0) / reflected in the NC coordinate system (1)	
18060	M code that prohibits backward movement	
18065	M code 1 that prohibits backward movement and is output as an M code	
18066	M code 2 that prohibits backward movement and is output as an M code	

7.2.124 AI Contour Control 2

19500	Feedrate for AI contour control	
#6 FNW #7 FCC	When a feedrate is determined according to a feedrate difference and acceleration in AI contour control, the maximum feedrate at which the allowable feedrate difference and allowable acceleration for each axis are not exceeded is used. (0) / The maximum feedrate at which the allowable feedrate difference and allowable acceleration for each axis are not exceeded is used. Moreover, the feedrate is determined so that the decreased feedrate is constant regardless of the move direction when the profile is the same. (1) When there is an axis that requires one or more seconds for acceleration in look-ahead acc./dec. before interpolation, emphasis is placed on precision (the specified feedrate may not be reached) (0) / emphasis is placed on speed (to ensure that the specified feedrate is produced) (1)	

19501	Acceleration/deceleration in AI contour control	
#5 FRP	Linear rapid traverse is based on, acc./dec. after interpolation (0) / acc./dec. before interpolation (1)	PRM 1401#1,1671
19503	Acceleration/deceleration in AI contour control	
#0 HPF #4 ZOL	When a feedrate is determined based on acceleration in AI contour control II, smooth feedrate control is, not used (0) / used (1) The deceleration function based on cutting load in AI contour contro II l is, enabled for all commands (0) / enabled for linear interpolation commands only (1)	
19515	Deceleration function based on cutting load in AI contour control II	
#1 ZG2	When the deceleration function based on cutting load in AI contour control II is used, stepwise override values are applied (0) / inclined override values are applied (1)	PRM 8451#4 8456 - 8458 19516
19516	Override for area 1 in deceleration based on cutting load in AI contour contro II l [%]	PRM 19515#1
19517	Speed control with acceleration in AI contour control	
#0 SNG #1 HNG	When smooth speed control is effective, by block length of the linear interpolation, smooth speed control and speed control with change of acceleration on each axis are, not invalidated (0) / invalidated (1) By block length of the linear interpolation, speed control with acceleration on each axis and speed control with change of acceleration on each axis are, not invalidated (0) / invalidated (1)	PRM 19518 PRM 19518
19518	Block length in speed control with acceleration or smooth speed control and speed control with change of acceleration are invalidated	PRM 19517#0, #1

7.2.125 Cylindrical Interpolation

19530	Cylindrical interpolation cutting point compensation	
#5 CYA #6 CYS	With the cylindrical interpolation command (G7.1), cylindrical interpolation cutting point compensation is, not performed (0) / performed (1) When the cylindrical interpolation cutting point compensation function is used, cutting point compensation is, performed between blocks (0) / performed together with a block movement if the cutting point compensation value is less than the setting of parameter (No. 19534) (1)	
19531	Tool offset axis number for the XY plane	
19532	Tool offset axis number for the ZX plane	
19533	Tool offset axis number for the YZ plane	
19534	Limit for changing cylindrical interpolation cutting point compensation in a single block	PRM 1430,19530
19535	Limit of travel distance moved with the cylindrical interpolation cutting point compensation in the previous block unchanged	

7.2.126 Optimum Torque Acceleration/Deceleration

19540	Optimum torque acc./dec.	
#0 FAP	Optimum torque acc./dec. is, disabled (0) / enabled (1)	
19541	Optimum torque acc./dec. (speed at P1) [0.01%]	<Axis> PRM1420
19542	Optimum torque acc./dec. (speed at P2) [0.01%]	
19543	Optimum torque acc./dec. (speed at P3) [0.01%]	
19544	Optimum torque acc./dec. (speed at P4) [0.01%]	

19545	Optimal torque acc./dec. (acceleration at P0 during movement in + direction and acceleration) [0.01%]	<Axis>
19546	Optimal torque acc./dec. (acceleration at P1 during movement in + direction and acceleration) [0.01%]	PRM1671
19547	Optimal torque acc./dec. (acceleration at P2 during movement in + direction and acceleration) [0.01%]	
19548	Optimal torque acc./dec. (acceleration at P3 during movement in + direction and acceleration) [0.01%]	
19549	Optimal torque acc./dec. (acceleration at P4 during movement in + direction and acceleration) [0.01%]	
19550	Optimal torque acc./dec. (acceleration at P5 during movement in + direction and acceleration) [0.01%]	
19551	Optimal torque acc./dec. (acceleration at P0 during movement in - direction and acceleration) [0.01%]	
19552	Optimal torque acc./dec. (acceleration at P1 during movement in - direction and acceleration) [0.01%]	
19553	Optimal torque acc./dec. (acceleration at P2 during movement in - direction and acceleration) [0.01%]	
19554	Optimal torque acc./dec. (acceleration at P3 during movement in - direction and acceleration) [0.01%]	
19555	Optimal torque acc./dec. (acceleration at P4 during movement in - direction and acceleration) [0.01%]	
19556	Optimal torque acc./dec. (acceleration at P5 during movement in - direction and acceleration) [0.01%]	
19557	Optimal torque acc./dec. (deceleration at P0 during movement in + direction and acceleration) [0.01%]	
19558	Optimal torque acc./dec. (deceleration at P1 during movement in + direction and acceleration) [0.01%]	
19559	Optimal torque acc./dec. (deceleration at P2 during movement in + direction and acceleration) [0.01%]	
19560	Optimal torque acc./dec. (deceleration at P3 during movement in + direction and acceleration) [0.01%]	
19561	Optimal torque acc./dec. (deceleration at P4 during movement in + direction and acceleration) [0.01%]	
19562	Optimal torque acc./dec. (deceleration at P5 during movement in + direction and acceleration) [0.01%]	
19563	Optimal torque acc./dec. (deceleration at P0 during movement in - direction and acceleration) [0.01%]	
19564	Optimal torque acc./dec. (deceleration at P1 during movement in - direction and acceleration) [0.01%]	
19565	Optimal torque acc./dec. (deceleration at P2 during movement in - direction and acceleration) [0.01%]	
19566	Optimal torque acc./dec. (deceleration at P3 during movement in - direction and acceleration) [0.01%]	
19567	Optimal torque acc./dec. (deceleration at P4 during movement in - direction and acceleration) [0.01%]	
19568	Optimal torque acc./dec. (deceleration at P5 during movement in - direction and acceleration) [0.01%]	

7.2.127 Nano Smoothing

19581	Tolerance smoothing for nano smoothing	
19582	Minimum amount of travel of a block that makes a decision based on an angular difference between blocks for nano smoothing	PRM8490

7.2.128 Smooth tolerance control 2

19594	Smooth tolerance control	
#0 ATC	When G05.1 Q3 is specified, Nano smoothing is effective (0) / Tolerance control is effective (1)	
19595	Maximum block length for small line segments in tolerance control mode	
19596	Tolerance for linear axis in tolerance control mode	

19599	Maximum allowable acceleration rate for the deceleration function based on acceleration in tolerance control mode for each axis	

7.2.129 Tool Compensation 3

19602	3-dimensional coordinate system conversion, Tilted working plane indexing	
#5 D3D	When the distance to go is displayed in the 3-dimensional coordinate system conversion mode or the tilted working plane Indexing mode, the distance in the program coordinate system is displayed (0) / the distance in the workpiece coordinate system is displayed (1)	
19605	Tilted working plane indexing, Interference check in 3-dimensional cutter compensation	
#0 NSC	When a tilted working plane indexing of machine type with no tool rotary axis (parameter No. 19680 = 12) is specified, control point shift operation is, enabled (0) / disabled (1)	PRM 19665#4, #5
19607	Table rotary axis, Interference check	
#2 CCC	In the tool radius and tool nose radius compensation mode, the outer corner connection method is based on, linear connection (0) / circular connection (1)	
#5 CAV	When an interference check for cutter compensation/tool nose radius compensation finds that interference occurred, machining stops with an alarm (0) / machining is continued by changing the tool path to prevent interference from occurring (1)	ALM PS0041
#6 NAA	When the interference check avoidance function for cutter compensation/tool nose radius compensation considers that avoidance operation is dangerous, the alarm PS5447 is issued, and when the function further considers that interference to the interference avoidance vector occurs, the alarm PS5448 is issued (0) / avoidance operation is continued without issuing any alarm (1)	Usually, set 0.
#7 NAG	If the gap vector length is 0 when the interference check avoidance function for tool radius and tool noise radius compensation is used, avoidance operation is, performed (0) / not performed (1)	
19609	Cancellation of the G codes in group 08	
#1 CCT	The cancellation of the G codes in group 08 is, specified by G49 (0) / able to be specified by G49.1 as well (1)	
19625	Number of blocks to be read in the tool radius and tool noise radius compensation mode	
19631	Angle determination fluctuation value for leading edge offset [deg]	
19640	Setting of Tool nose rotation axis and Swivel head axis	
#0 RS1 #1 RS2 #2 RS3	(see table below)	

RS3	RS2	RS1	Tool nose rotation axis	Swivel head axis
0	0	0	1st axis	2nd axis
0	0	1	1st axis	3rd axis
0	1	0	2nd axis	1st axis
0	1	1	2nd axis	3rd axis
1	0	0	3rd axis	1st axis
1	0	1	3rd axis	2nd axis
1	1	0		
1	1	1		

19641	Setting of Tool offset conversion function	
#0 TRD	Reference angle of the tool nose rotation axis is 0 degree (0) / 180 degree (1)	

#1 SRD #2 INW	Direction of rotation of the swivel head axis is counter-clockwise (0) / clockwise (1) Amount of wear is taken into account in the offset calculate (0) / not taken into account in the offset calculate (1)	
19642	Reference angle of the swivel head axis [deg]	

7.2.130 5-axis Machining Function

19656	Tool axis direction	
19657	Master rotary axis number	
19665	Controlled point shift, Tool holder offset function	
#4 SPR #5 SVC #7 ETH	The controlled point is shifted by, automatic calculation (0) / using parameter (No. 19667) (1) The controlled point is, not shifted (0) / shifted (1) The tool holder offset function in tool length compensation is, disabled (0) / enabled (1)	PRM 19665#4
19666	Tool holder offset value	PRM19665 #7 Radius
19667	Controlled-point shift vector	<Axis> PRM19665 #4,#5 Radius
19680	Mechanical unit type	PRM19696 #0,#1
19681	Controlled-axis number for the 1st rotary axis	PRM19696 #0
19682	Axis direction of the 1st rotary axis	
19683	Inclination angle when the 1st rotary axis is an inclined axis [deg]	
19684	Rotation direction of the 1st rotary axis	PRM19682
19685	Rotation angle when the 1st rotary axis is a hypothetical axis [deg]	PRM 19696#0
19686	Controlled-axis number for the 2nd rotary axis	PRM 19696#1
19687	Axis direction of the 2nd rotary axis	
1: On X-axis 2: On Y-axis 3: On Z-axis 4: On an axis tilted a certain angle from the X-axis from the positive X-axis to positive Y-axis 5: On an axis tilted a certain angle from the Y-axis from the positive Y-axis to positive Z-axis 6: On an axis tilted a certain angle from the Z-axis from the positive Z-axis to positive X-axis		
19688	Inclination angle when the 2nd rotary axis is inclined [deg]	PRM19687
19689	Rotation direction of the 2nd rotary axis	PRM19687
19690	Rotation angle when the 2nd rotary axis is a hypothetical axis [deg]	PRM 19696#1
19696	Rotary axis, Hypothetical axis	
#0 IA1 #1 IA2 #3 NPC	The 1st rotary axis is, an ordinary rotary axis (0) / a hypothetical axis (1) The 2nd rotary axis is, an ordinary rotary axis (0) / a hypothetical axis (1) When a modification to the tool attitude at the end of the block that provides a tool attitude close to the singular point attitude is suppressed by parameters (No. 19738 and No. 19739) in tool attitude control based on tool center point control (type 2), the program is executed without modifying the tool attitude (0) / an alarm is issued (1)	ALM PS5421

#5 WKP	For a 5-axis machine having a table rotary axis, the programming coordinate system used for tool center point control or 3-dimensional cutter compensation is, the table coordinate system (0) / the workpiece coordinate system (1)	PRM 19746#4
#6 RFC	When a command that does not move the tool tip point with respect to the workpiece is issued in tool center point control, the feedrate on the rotary axis is, maximum cutting feedrate (0) / specified feedrate (1)	PRM1432
19697	Reference tool axis direction	
19698	Angle when the reference tool axis direction is tilted (reference angle RA) [deg]	
19699	Angle when the reference tool axis direction is tilted (reference angle RB) [deg]	
19700	Rotary table position (X-axis of the basic three axes)	PRM 19680 Radius
19701	Rotary table position (Y-axis of the basic three axes)	
19702	Rotary table position (Z-axis of the basic three axes)	
19703	Intersection offset vector between the 1st and 2nd rotation axes of the table (X-axis of the basic three axes)	PRM 19680 Radius
19704	Intersection offset vector between the 1st and 2nd rotation axes of the table (Y-axis of the basic three axes)	
19705	Intersection offset vector between the 1st and 2nd rotation axes of the table (Z-axis of the basic three axes)	
19709	Intersection offset vector between the tool axis and tool rotary axis (X-axis of the basic three axes)	PRM 19680 Radius
19710	Intersection offset vector between the tool axis and tool rotary axis (Y-axis of the basic three axes)	
19711	Intersection offset vector between the tool axis and tool rotary axis (Z-axis of the basic three axes)	
19712	Intersection offset vector between the 2nd and 1st rotation axes of the tool (X-axis of the basic three axes)	Radius
19713	Intersection offset vector between the 2nd and 1st rotation axes of the tool (Y-axis of the basic three axes)	Radius
19714	Intersection offset vector between the 2nd and 1st rotation axes of the tool (Z-axis of the basic three axes)	Radius
19741	Upper limit of the movement range of the 1st rotary axis	[deg]
19742	Lower limit of the movement range of the 1st rotary axis	[deg]
19743	Upper limit of the movement range of the 2nd rotary axis	[deg]
19744	Lower limit of the movement range of the 2nd rotary axis	[deg]
19746	3-dimensional cutter compensation	
#2 LOD	As the tool length for 3-dimensional manual feed, the value of parameter (No. 12318) is used (0) / the tool length currently used for tool length compensation is used (1)	
#3 LOZ	When parameter LOD(No. 19746#2) is set to 1 and tool length compensation is not applied, the tool length value for 3-dimensional manual feed is, specified in parameter (No. 12318) (0) / zero (1)	
19752	Limit of the deviation from the path (for cutting feed)	
19754	AI contour control, table coordinate system, rotation axis position	
#7 SPM	The rotation axis position used as the reference when the parameters related to the functions below, parameters (Nos. 19681 to 19714), are set is, absolute coordinates (0) / machine coordinates (1) Tool center point control, smooth TCP, tool posture control, 3-dimensional tool compensation, cutting point command, wWorkpiece setting error compensation, tilted working plane indexing, tilted working plane indexing with guidance	

7.2.131 FSSB 2

24000 24001 : 24031	ATR value corresponding to slave 01 on first FSSB line ATR value corresponding to slave 02 on first FSSB line : ATR value corresponding to slave 32 on first FSSB line	PRM 1902 #0,#1
24032 24033 : 24063	ATR value corresponding to slave 01 on second FSSB line ATR value corresponding to slave 02 on second FSSB line : ATR value corresponding to slave 32 on second FSSB line	PRM 1902 #0,#1
24064 24065 : 24095	ATR value corresponding to slave 01 on third FSSB line ATR value corresponding to slave 02 on third FSSB line : ATR value corresponding to slave 32 on third FSSB line	PRM 1902 #0,#1
24096 24097 : 24099	Connector number for the first or ninth separate detector interface unit Connector number for the second or tenth separate detector interface unit : Connector number for the fourth or twelfth separate detector interface unit	PRM 1902 #0,#1
24100 24101 : 24103	Connector number for the fifth separate detector interface unit Connector number for the sixth separate detector interface unit : Connector number for the eighth separate detector interface unit	PRM 1902 #0,#1
24104 24105 : 24111	ATR value corresponding to connector 1 on the first separate detector interface unit ATR value corresponding to connector 2 on the first separate detector interface unit : ATR value corresponding to connector 8 on the first separate detector interface unit	PRM 14476 #5
24112 : 24119	ATR value corresponding to connector 1 on the second separate detector interface unit : ATR value corresponding to connector 8 on the second separate detector interface unit	PRM 14476 #5
24120 : 24127	ATR value corresponding to connector 1 on the third separate detector interface unit : ATR value corresponding to connector 8 on the third separate detector interface unit	PRM 14476 #5
24128 : 24135	ATR value corresponding to connector 1 on the fourth separate detector interface unit : ATR value corresponding to connector 8 on the fourth separate detector interface unit	PRM 14476 #5
24136 : 24143	ATR value corresponding to connector 1 on the fifth separate detector interface unit : ATR value corresponding to connector 8 on the fifth separate detector interface unit	PRM 14476 #5

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24144 : 24151	ATR value corresponding to connector 1 on the sixth separate detector interface unit : ATR value corresponding to connector 8 on the sixth separate detector interface unit	PRM 14476 #5
24152 : 24159	ATR value corresponding to connector 1 on the seventh separate detector interface unit : ATR value corresponding to connector 8 on the seventh separate detector interface unit	PRM 14476 #5
24160 : 24167	ATR value corresponding to connector 1 on the eighth separate detector interface unit : ATR value corresponding to connector 8 on the eighth separate detector interface unit	PRM 14476 #5
24168 : 24175	ATR value corresponding to connector 1 on the ninth separate detector interface unit : ATR value corresponding to connector 8 on the ninth separate detector interface unit	PRM 14476 #5
24176 : 24183	ATR value corresponding to connector 1 on the tenth separate detector interface unit : ATR value corresponding to connector 8 on the tenth separate detector interface unit	PRM 14476 #5
24184 : 24191	ATR value corresponding to connector 1 on the eleventh separate detector interface unit : ATR value corresponding to connector 8 on the eleventh separate detector interface unit	PRM 14476 #5
24192 : 24199	ATR value corresponding to connector 1 on the twelfth separate detector interface unit : ATR value corresponding to connector 8 on the twelfth separate detector interface unit	PRM 14476 #5
24203	FSSB	
#0 FHR	Position data transmission by FSSB is disabled (0) / enabled (1)	PRM 24204 2005#1 2429#1 2429#2 4549#1 4549#2
24204	The index number of spindle axis that synchronizes to each servo axis	<Axis> PRM 24203#0

7.2.132 Display and Edit 6

24300	Time for One-touch menu to be closed (before switching screen)	
24301	Time for One-touch menu to be closed (after switching screen)	
24302	Delay time from trigger signal to storing operation history for the machine state monitoring function	

24303	Display	
#0 ELV #1 EEP #3 HD8 #4 ODE #5 BGS	Divisions of Eco levels are 4 levels (0) / 8 lev els (1) An Eco level is not specified in each path (0) / specified in each path (1) On tool compensation screen of Tool offset memory C of 8.4-inch display unit, tool length and tool radius compensation value is displaye d separately on two pages (0) / on one page (FS16i compatible) (1) In the operation history screen ,detailed information is Not displayed (0) / Displayed (1) Program screen of background editing is full screen (0) / window (1).	 PRM 11302#0
24305	Range of tool offset change	
24306	Display	
#2 STP #3 LVD	When path is switched on Servo tuning screen, page and cursor are displayed at, same position (0) / maintained position by each system (1) In macro screen, display/setting of the variable is conventional specification (0) / FS16*i* compatible specification (1)	
24308	Display	
#0 MMP #1 SMH #2 CNE #3 SLS #4 NPI	The program displayed on the program screen in HNDL, INC, JOG or REF mode is a program which is the last displayed in MEM or RMT mode (0) / a program which is the last displayed in MEM mode (1) The waiting M code for simultaneous multi path program editing is not highlighted (0) / highlighted (1) On the outline screen of program list, the number of comments of programs is not enhanced(0) / enhanced(1) On the program list screen, the soft key that moves the cursor to the top line and the bottom line is not displayed(0) / displayed(1) While the execution macro is being executed, making the data for displaying program being executed is processing (0) / not processing (1)	
24309	Display	
#0 DSC	When the text data (program, parameter and offset etc.) which includes semicolon code (;) are input to the CNC only the semicolon code(;) is not input (0) / The character string between semicolon(;) and EOB(LF)/CR/EOR(%) is not input as comments (1)	
24310	Display	
#0 WOC	While the additional workpiece coordinate system is selecting and the parameter ABH (No.11308#6)=1, changing the workpiece origin offset value, external workpiece origin offset or the workpiece coordinate system shift value is reflect to the display of absolute coordinate value when the program start or reset (0) / the offset is changed (1)	
24311	Display	
#7 TPP	When 8.4-inch display unit or vitual MDI key function is used, the current position on program screen of TEACH IN mode is not displayed (0) / displayed (1)	

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24312	Offset screen display	
#6 AXN	The axis names on offset screen, tool offset / 2nd geometry data screen, Y-axis offset screen, and tool offset range setting screen are, axis name of basic three axes (0) / displayed according to the following order of priority (1) - For X and Z axis of basic three axes 1 X and Z axis names of basic three axes 2 Axis names parallel to X and Z axes of basic three axes 3 'X', 'Z' - For Y axis of basic three axes 1 Y axis name set in parameter No.5043 2 Y axis name of basic three axes 3 Axis name parallel to Y axis of basic three axes 4 'Y'	PRM 3110#0=1
24314	Display	
#7 CSS	In the modal display, SPRM, SSPM and SMAX are not displayed (0) / displayed (1)	
24316	Protection of data folder in data server (PSW)	
24317	Protection key for data folder in data server (Key)	
24318	Display	
#0 WDT #1 SPT	Servo / spindle waveform data output function is effective (0) / not effective (1) In Trouble diagnosis function and Servo / spindle waveform data output function, Trouble diagnosis data monitoring signal and Trouble diagnosis data latching signal are not effective (0) / effective (1)	
24319	Sampling time of waveform data before trouble	
24320	Sampling time of waveform data after trouble	
24321	Display	
#0 CMP	In Servo / spindle waveform data output function, accumulated command pulse of a servo axis is output (0) / not output (1)	
#1 FBP	In Servo / spindle waveform data output function, accumulated feedback pulse of a servo axis is output (0) / not output (1)	
#2 PER	In Servo / spindle waveform data output function, position error of a servo axis is output (0) / not output (1)	
#3 REF	In Servo / spindle waveform data output function, reference counter of a servo axis is output (0) / not output (1)	
#4 ASD	In Servo / spindle waveform data output function, actual speed of a servo axis is output (0) / not output (1)	
#5 TCM	In Servo / spindle waveform data output function, torque command of a servo axis is output (0) / not output (1)	
#6 HTS	In Servo / spindle waveform data output function, heat simulation of a servo axis is output (0) / not output (1)	
#7 MCR	In Servo / spindle waveform data output function, motor current of a servo axis is output (0) / not output (1)	
24322	Display	
#0 DLV	In Servo / spindle waveform data output function, disturbance level of a servo axis is output (0) / not output (1)	
#1 AR1	In Servo / spindle waveform data output function, arbitrary data 1 of a servo axis is output (0) / not output (1)	
#2 EFC	In Servo / spindle waveform data output function, effective current of a servo axis is output (0) / not output (1)	

#3 AMR	In Servo / spindle waveform data output function, AMR data of a servo axis is output (0) / not output (1)	
#4 AR2	In Servo / spindle waveform data output function, arbitrary data 2 of a servo axis is output (0) / not output (1)	
24323	Display	
#0 SPD	In Servo / spindle waveform data output function, actual motor speed of a spindle axis is output (0) / not output (1)	
#1 LDM	In Servo / spindle waveform data output function, load meter of a spindle axis is output (0) / not output (1)	
#2 PER	In Servo / spindle waveform data output function, position error of a spindle axis is output (0) / not output (1)	
#3 TCM	In Servo / spindle waveform data output function, torque command of a spindle axis is output (0) / not output (1)	
#4 MCR	In Servo / spindle waveform data output function, motor current of a spindle axis is output (0) / not output (1)	
24326	Display	
#0 MSG	When an operator message is entered, the status “MSG” on CNC status display area is not displayed (0) / displayed (1)	
#1 NCO	When an operator message is entered, automatic switching to the message screen is determined by the setting of parameter NPA (bit 7 of No.3111) (0) / determined by the setting of parameter No.24327 (1)	
24327	Operator message number that does not automatically switch to the message screen	
24901 : 24920	Operation history signal selection PMC path number (No. 01) : Operation history signal selection PMC path number (No. 20)	PRM 12801-12820 12841-12860 12881-12900

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7.2.133 High precision oscillation function

25650	High precision oscillation function	
#0 SSO	High precision oscillation function is disabled (0) / enabled (1)	
25651	High precision oscillation function	
#0 OST	During oscillation motion, if G80 command or reset is specified, oscillation axis moves to point R and stops (0) / decelerates and stops (1)	
#1 FFS	When oscillation motion is started by G81.1 command, oscillation motion is begun, after the oscillation axis passes point R and the center point between upper and lower dead points are passed (0) / oscillation motion can be immediately started (1)	PRM 25651#0
#2 SGS	If oscillation motion is canceled by oscillation start signal CHPST<Gn051.6>, oscillation axis moves to point R and stops (0) / decelerates and stops (1)	PRM 25651#0
#3 HST	During oscillation motion, if oscillation hold signal *CHLD<Gn051.7> is set to"0" from "1", oscillation axis moves to point R and suspends (0) / decelerates and suspends (1)	PRM 25651#0,#2
25652	Maximum allowable acceleration rate of oscillation motion	<Axis>
25653	Acceleration rate of starting or cancellation oscillation motion	<Axis>

7.2.134 Spindle Control with Servo Motor 2

25700	Acceleration/deceleration switching speed (S_{10}) for deceleration [min^{-1}]	<Axis> PRM 11001#6
25701	Acceleration/deceleration switching speed (S_{11}) for deceleration [min^{-1}]	<Axis>
25710	Special acceleration for deceleration (0 to S_{10}) [min^{-1}/s]	<Axis>
25711	Special acceleration for deceleration (S_{10} to S_{11}) [min^{-1}/s]	<Axis>
25712	Special acceleration for deceleration (S_{11} to maximum speed) [min^{-1}/s]	<Axis>
25720	Acceleration/deceleration switching speed (S_{10}) of spindle synchronous for deceleration [min^{-1}]	<Axis> PRM 11001#6 11005#6
25721	Acceleration/deceleration switching speed (S_{11}) of spindle synchronous for deceleration [min^{-1}]	<Axis>
25730	Individual acceleration / deceleration of spindle synchronous for deceleration (0 to S_{10}) [min^{-1}/s]	<Axis>
25731	Individual acceleration / deceleration of spindle synchronous for deceleration (S_{10} to S_{11}) [min^{-1}/s]	<Axis>
25732	Individual acceleration / deceleration of spindle synchronous for deceleration (S_{11} to Maximum speed) [min^{-1}/s]	<Axis>

7.2.135 Graphic Display (4 OF4)

27350	General-purpose tool	
#0 GTP	When a general-purpose tool is drawn in animated simulation, the tip is, positioned on the front (0) / positioned on the rear (1)	
27351	Cutting edge length applied when a general-purpose tool is drawn in animated simulation	
27352	Holder length applied when a general-purpose tool is drawn in animated simulation	
27353	Holder width applied when a general-purpose tool is drawn in animated simulation	
27354	Holder length 2 applied when a general-purpose tool is drawn in animated simulation	
27355	Holder width 2 applied when a general-purpose tool is drawn in animated simulation	
27356	Threading tool	
#0 TTP	When a threading tool is drawn in animated simulation, the tip is, positioned on the front (0) / positioned on the rear (1)	
27357	Cutting edge width applied when a threading tool is drawn in animated simulation	
27358	Holder length applied when a threading tool is drawn in animated simulation	
27359	Holder width applied when a threading tool is drawn in animated simulation	
27360	Groove cutting tool	
#0 GVP	When a groove cutting tool is drawn in animated simulation, the tip is, positioned on the front (0) / positioned on the rear (1)	
27361	Holder length applied when a groove cutting tool is drawn in animated simulation	
27362	Holder width applied when a groove cutting tool is drawn in animated simulation	
27363	Round-nose tool	
#0 BTP	When a round-nose tool is drawn in animated simulation, the tip is, positioned on the front (0) / positioned on the rear (1)	

27364	Holder length applied when a round-nose tool is drawn in animated simulation	
27365	Holder width applied when a round-nose tool is drawn in animated simulation	
27366	Point nose straight tool	
#0 STP	When a point nose straight tool is drawn in animated simulation, the tip is, positioned on the front (0) / positioned on the rear (1)	
27367	Cutting edge length applied when a point nose straight tool is drawn in animated simulation	
27368	Holder length applied when a point nose straight tool is drawn in animated simulation	
27369	Holder width applied when a point nose straight tool is drawn in animated simulation	
27370	Holder length 2 applied when a point nose straight tool is drawn in animated simulation	
27371	Holder width 2 applied when a point nose straight tool is drawn in animated simulation	
27372	Length of cut applied when a drill tool is drawn in animated simulation	
27373	Length of cut applied when a flat end milling cutter is drawn in animated simulation	
27374	Length of cut applied when a tapping tool is drawn in animated simulation	
27375	Included angle applied when a chamfering tool is drawn in animated simulation	
27376	Length of cut applied when a chamfering tool is drawn in animated simulation	
27377	Cutter length applied when a chamfering tool is drawn in animated simulation	
27378	Shank length applied when a chamfering tool is drawn in animated simulation	
27379	Shank diameter applied when a chamfering tool is drawn in animated simulation	
27380	Length of cut applied when a ball end mill is drawn in animated simulation	
27381	Length of cut applied when a reamer is drawn in animated simulation	
27382	Length of cut applied when a boring tool is drawn in animated simulation	
27383	Length of cut applied when a face milling cutter is drawn in animated simulation	
27384	Multifunction tool	
#0 VRP	When a multifunction tool is drawn in animated simulation, the tip is, positioned on the front (0) / positioned on the rear (1)	
27385	Holder length applied when a multifunction tool is drawn in animated simulation	
27386	Holder width applied when a multifunction tool is drawn in animated simulation	

8.1 ALARM LIST (CNC)

8.1.1 Alarms on Program and Operation (PS Alarm), Background Edit Alarms (BG Alarm), Communication Alarms (SR Alarm)

Alarm numbers are common to all these alarm types.
Depending on the state, an alarm is displayed as in the following examples:
PS"alarm number" Example: PS0003
BG"alarm number" Example: BG0085
SR"alarm number" Example: SR0001

No.	Message	Description
0001	TH ERROR	A TH error was detected during reading from an input device. The read code that caused the TH error and how many statements it is from the block can be verified in the diagnostics screen.
0002	TV ERROR	An error was detected during the single–block TV error. The TV check can be suppressed by setting parameter TVC (No. 0000#0) to “0”.
0003	TOO MANY DIGIT	Data entered with more digits than permitted in the NC instruction word. The number of permissible digits varies according to the function and the word.
0004	INVALID BREAK POINT OF WORDS	NC word(s) address + numerical value not in word format. This alarm is also generated when a custom macro does not contain a reserved word, or does not conform to the syntax.
0005	NO DATA AFTER ADDRESS	NC word(s) address + numerical value not in word format. This alarm is also generated when a custom macro does not contain a reserved word, or does not conform to the syntax.
0006	ILLEGAL USE OF MINUS SIGN	A minus sign (–) was specified at an NC instruction word or system variable where no minus signal may be specified.
0007	ILLEGAL USE OF DECIMAL POINT	A decimal point (.) was specified at an address where no decimal point may be specified, or two decimal points were specified.
0009	IMPROPER NC-ADDRESS	An illegal address was specified, or parameter No. 1020 is not set.
0010	IMPROPER G-CODE	An unusable G code is specified.
0011	FEED ZERO (COMMAND)	1) The cutting feedrate instructed by an F code has been set to 0. 2) This alarm is also generated if the F code instructed for the S code is set extremely small in a rigid tapping instruction as the tool cannot cut at the programmed lead.
0015	TOO MANY SIMULTANEOUS AXES	A move command was specified for more axes than can be controlled by simultaneous axis control. Either add on the simultaneous axis control extension option, or divide the number of programmed move axes into two blocks.
0020	OVER TOLERANCE OF RADIUS	An arc was specified for which the difference in the radius at the start and end points exceeds the value set in parameter No. 3410. Check arc center codes I, J and K in the program. The tool path when parameter No. 3410 is set to a large value is spiral.

No.	Message	Description
0021	ILLEGAL PLANE SELECT	1) In the selected plane (by G17, G18 or G19 command), the basic axis(X,Y, or Z) and its parallel axis are commanded at the same time. Modify the program. 2) In the following functions, an axis not included in the selected plane was commanded, or the selected plane was not correct. Modify the program : - circular interpolation - multiple repetitive cycle (if parameter DSA(No.5109#0) is set to 1.) etc. 3) In the helical interpolation, the number of axes that can be commanded simultaneously is exceeded . Modify the program. Or add the helical interpolation option.
0022	R OR I,J,K COMMAND NOT FOUND	The command for circular interpolation lacks arc radius R or coordinate I, J, or K of the distance between the start point to the center of the arc.
0025	CIRCLE CUT IN RAPID (F0)	F0 (rapid traverse in inverse feed or 1-digit F code feed) was specified during circular interpolation (G02, G03).
0027	NO AXES COMMANDED IN G43/G44	No axis is specified in G43 and G44 blocks for the tool length offset type C. Offset is not canceled but another axis is offset for the tool length offset type C. Multiple axes were specified for the same block when the tool length compensation type is C.
0029	ILLEGAL OFFSET VALUE	Illegal offset No.
0030	ILLEGAL OFFSET NUMBER	An illegal offset No. was specified.
0031	ILLEGAL P COMMAND IN G10	The relevant data input or option could not be found for the L No. of G10. No data setting address such as P or R was specified. An address command not concerned with data setting was specified. An address varies with the L No. The sign or decimal point of the specified address is in error, or the specified address is out of range.
0032	ILLEGAL OFFSET VALUE IN G10	In setting an offset amount by G10 or in writing an offset amount by system variables, the offset amount was excessive.
0033	NO INTERSECTION AT CUTTER COMPENSATION	The intersection cannot be obtained by the intersection calculation in tool radius or tool-nose radius compensation. Modify the program.
0034	NO CIRC ALLOWED IN STUP/EXT BLK	In tool radius or tool-nose radius compensation, a startup or cancellation is performed in the G02 or G03 mode. Modify the program.
0035	CAN NOT COMMANDED G31	- G31 cannot be specified. This alarm is generated when a G code (such as for tool radius or tool-nose radius compensation) of group 07 is not canceled. - A torque limit skip was not specified in a torque limit skip command (G31P98 or P99). Specify the torque limit skip in the PMC window or the like. Or, specify the torque limit override by address Q.
0037	CAN NOT CHANGE PLANE IN G41/G42	The compensation plane G17/G18/G19 was changed during tool radius or tool-nose radius compensation. Modify the program.

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No.	Message	Description
0041	INTERFERENCE IN CUTTER COMPENSATION	In tool radius or tool-nose radius compensation, excessive cutting may occur. Modify the program.
0042	G45/G48 NOT ALLOWED IN CRC	Tool offset (G45 to G48) is commanded in tool compensation. Modify the program.
0044	G27-G30 NOT ALLOWED IN FIXED CYC	The command which relates to the reference position return is commanded in canned cycle mode for drilling. Modify the program.
0045	ADDRESS Q NOT FOUND (G73/G83)	In a high-speed peck drilling cycle (G73) or peck drilling cycle (G83), the amount of each-time cutting is not specified by address Q, or Q0 is specified. Modify the program.
0046	ILLEGAL REFERENCE RETURN COMMAND	A command for a return to the second, third or fourth reference position is error. (The address P command is in error.).
0047	ILLEGAL AXIS SELECT	Two or more parallel axes (in parallel with a basic axis) have been specified upon start-up of 3-dimensional coordinate conversion.
0048	BASIC 3 AXIS NOT FOUND	Start-up of 3-dimensional coordinate conversion has been attempted, but the three basic axes used when Xp, Yp, or Zp is omitted are not set in parameter No. 1022.
0049	ILLEGAL COMMAND (G68,G69)	When 3-dimensional coordinate conversion (G68 or G69) was specified, the tool compensation was not canceled. Or, programs of 3-dimensional coordinate conversion (G68, G69) and tool compensation (G43, G44 or G49) were not nested. Or, the 3-dimensional coordinate conversion was specified during the tool length compensation and another tool length compensation was specified.
0050	CHF/CNR NOT ALLOWED IN THRD BLK	Chamfering or corner R is commanded in the thread cutting block. Modify the program.
0051	MISSING MOVE AFTER CNR/CHF	Improper movement or the move distance was specified in the block next to the chamfering or corner R block. Modify the program.
0052	CODE IS NOT G01 AFTER CHF/CNR	The block next to the chamfering or corner R block is not G01 (or vertical line). Modify the program.
0053	TOO MANY ADDRESS COMMANDS	In the chamfering and corner R commands, two or more of I, J, K and R are specified.
0054	NO TAPER ALLOWED AFTER CHF/CNR	A block in which chamfering in the specified angle or the corner R was specified includes a taper command. Modify the program.
0055	MISSING MOVE VALUE IN CHF/CNR	In chamfering or corner R block, the move distance is less than chamfer or corner R amount. Modify the program.
0056	NO END POINT & ANGLE IN CHF/CNR	In direct dimension drawing programming, both an end point and an angle were specified in the block next to the block in which only an angle was specified (Aa). Modify the program.
0057	NO SOLUTION OF BLOCK END	Block end point is not calculated correctly in direct dimension drawing programming. Modify the program.
0058	END POINT NOT FOUND	Block end point is not found in direct dimension drawing programming. Modify the program.

No.	Message	Description
0060	SEQUENCE NUMBER NOT FOUND	[External data input/output] The specified number could not be found for program number and sequence number searches. Although input/output of a pot number of tool data or offset input was requested, no tool number was input after power on. The tool data corresponding to the entered tool number could not be found. [External workpiece number search] The program corresponding to the specified workpiece number could not be found. [Program restart] In the program restart sequence number specification, the specified sequence number could not be found. Check the restart block.
0061	P OR Q COMMAND IS NOT IN THE MULTIPLE REPETIVE CYCLES BLOCK	Address P or Q is not specified in multiple repetitive cycle (G70, G71, G72, or G73) command.
0062	THE CUTTING AMOUNT IS ILLEGAL IN THE ROUGH CUTTING CYCLE	A zero or a negative value was specified in a multiple repetitive canned rough-cutting cycle (G71 or G72) as the depth of cut.
0063	THE BLOCK OF A SPECIFIED SEQUENCE NUMBER IS NOT FOUND	The sequence number specified by addresses P and Q in multiple repetitive cycle (G70, G71, G72, or G73) command cannot be searched.
0064	THE FINISHING SHAPE IS NOT A MONOTONOUS CHANGE (FIRST AXES)	In a shape program for the multiple repetitive canned rough-cutting cycle (G71 or G72), the command for the first plane axis was not a monotonous increase or decrease.
0065	G00/G01 IS NOT IN THE FIRST BLOCK OF SHAPE PROGRAM	In the first block of the shape program specified by P of the multiple repetitive canned cycle (G70, G71, G72, or G73), G00 or G01 was not specified.
0066	UNAVAILABLE COMMAND IS IN THE MULTIPLE REPETIVE CYCLES BLOCK	An unavailable command was found in a multiple repetitive canned cycle (G70, G71, G72, or G73) command block.
0067	THE MULTIPLE REPETIVE CYCLES IS NOT IN THE PART PROGRAM STORAGE	A multiple repetitive canned cycle (G70, G71, G72, or G73) command is not registered in a tape memory area.
0069	LAST BLOCK OF SHAPE PROGRAM IS AN ILLEGAL COMMAND	In a shape program in the multiple repetitive canned cycle (G70, G71, G72, or G73), a command for the chamfering or corner R in the last block is terminated in the middle.
0070	NO PROGRAM SPACE IN MEMORY	The memory area is insufficient. Delete any unnecessary programs, then retry.
0071	DATA NOT FOUND	- The address to be searched was not found. - The program with specified program number was not found in program number search. - In the program restart block number specification, the specified block number could not be found. Check the data.

No.	Message	Description
0072	TOO MANY PROGRAMS	The number of programs to be stored exceeded 400(1 path system) or 800(2 path system). Delete unnecessary programs and execute program registration again.
0073	PROGRAM NUMBER ALREADY IN USE	The commanded program number has already been used. Change the program number or delete unnecessary programs and execute program registration again.
0074	ILLEGAL PROGRAM NUMBER	The program number is other than 1 to 9999. Modify the program number.
0075	PROTECT	An attempt was made to register a program whose number was protected. In program matching, the password for the encoded program was not correct. An attempt was made to select a program being edited in the background as the main program. An attempt was made to call a program being edited in the background as a subprogram.
0076	PROGRAM NOT FOUND	The specified program is not found in the subprogram call, macro call or figure copy. The M, G, T or S codes are called by a P instruction other than that in an M98, G65, G66, G66.1 or interrupt type custom macro, and a program is called by a second auxiliary function code. This alarm is also generated when a program is not found by these calls.
0077	TOO MANY SUB,MACRO NESTING	The total number of subprogram and macro calls exceeds the permissible range. Another subprogram call was executed during an external memory subprogram call.
0078	SEQUENCE NUMBER NOT FOUND	The specified sequence No. was not found during sequence number search. The sequence No. specified as the jump destination in GOTO– and M99P– was not found.
0079	PROGRAM NOT MATCH	The program in memory does not match the program stored on memory. Multiple programs cannot be matched continuously when parameter NPE (No. 3201#6) is set to “1”. Set parameter NPE (No. 3201#6) to “0” before executing a match.
0080	G37 MEASURING POSITION REACHED SIGNAL IS NOT PROPERLY INPUT	- For machining center system When the automatic tool length measurement function (G37) is performed, a measuring position reached signal goes 1 in front of the area determined by the ε value specified in parameter No.6254. Alternatively, the signal does not go 1. - For lathe system When the automatic tool compensation function (G36, G37) is used, a measuring position reached signals (XAE1, XAE2) does not go 1 within the range determined by the ε value specified in parameters No.6254 and No.6255.
0081	G37 OFFSET NO. UNASSIGNED	- For machining center system The automatic tool length measurement function (G37) is specified without specifying an H code. Correct the program. - For lathe system The automatic tool compensation function (G36, G37) is specified without specifying an T code. Correct the program.

No.	Message	Description
0082	G37 SPECIFIED WITH H CODE	- For machining center system The automatic tool length measurement function (G37) is specified together with an H code in the same block. Correct the program. - For lathe system The automatic tool compensation function (G36, G37) is specified together with an T code in the same block. Correct the program.
0083	G37 IMPROPER AXIS COMMAND	- For machining center system An error has been found in axis specification of the automatic tool length measurement function (G37). Alternatively, a move command is specified as an incremental command. Correct the program. - For lathe system An error has been found in axis specification of the automatic tool compensation function (G36, G37). Alternatively, a command is specified as an incremental command. Correct the program.
0085	OVERRUN ERROR	The next character was received from the I/O device connected to RS232-C interface 1 before it could read a previously received character. During a read by RS232-C interface 1, an overrun, parity, or framing error has been found. The number of bits of input data does not match, or the baud rate setting or the I/O device specification number is not correct.
0086	DR OFF	During I/O process by RS232-C interface 1, the data set ready input signal of the I/O device (DR) was OFF. Possible causes are an I/O device not turn on, a broken cable, and a defective printed circuit board.
0087	BUFFER OVERFLOW	During a read by RS232-C interface 1, although a read stop command was issued, more than 10 characters were input. The I/O device or printed circuit board was defective.
0090	REFERENCE RETURN INCOMPLETE	1. The reference position return cannot be performed normally because the reference position return start point is too close to the reference position or the speed is too slow. Separate the start point far enough from the reference position, or specify a sufficiently fast speed for reference position return. 2. An attempt was made to set the zero position for the absolute position detector by return to the reference position when it was impossible to set the zero point. Rotate the motor manually at least one turn, and set the zero position of the absolute position detector after turning the CNC and servo amplifier off and then on again.
0091	MANUAL REFERENCE POSITION RETURN IS NOT PERFORMED IN FEED HOLD	Manual return to the reference position cannot be performed when automatic operation is halted. Perform the manual return to the reference position when automatic operation is stopped or reset.
0092	ZERO RETURN CHECK (G27) ERROR	The axis specified in G27 has not returned to zero. Reprogram so that the axis returns to zero.

No.	Message	Description
0094	P TYPE NOT ALLOWED (COORD CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the coordinate system setting operation was performed.) Perform the correct operation according to the OPERATOR'S MANUAL.
0095	P TYPE NOT ALLOWED (EXT OFS CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the external workpiece offset amount changed.) Perform the correct operation according to the OPERATOR'S MANUAL.
0096	P TYPE NOT ALLOWED (WRK OFS CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the workpiece offset amount changed.) Perform the correct operation according to the OPERATOR'S MANUAL.
0097	P TYPE NOT ALLOWED (AUTO EXEC)	P type cannot be directed when the program is restarted. (After power ON, after emergency stop or alarms 0094 to 0097 reset, no automatic operation is performed.) Perform automatic operation.
0098	G28 FOUND IN SEQUENCE RETURN	A command of the program restart was specified without the reference position return operation after power ON or emergency stop, and G28 was found during search. Perform the reference position return.
0099	MDI EXEC NOT ALLOWED AFT. SEARCH	After completion of search in program restart, a move command is given with MDI.
0109	FORMAT ERROR IN G08	A value other than 0 or 1 was specified after P in the G08 code, or no value was specified.
0110	OVERFLOW :INTEG ER	An integer went out of range during arithmetic calculations.
0111	OVERFLOW :FLOAT ING	A decimal point (floating point number format data) went out of range during arithmetic calculations.
0112	ZERO DIVIDE	An attempt was made to divide by zero in a custom macro.
0114	ILLEGAL EXPRESSION FORMAT	The format used in an expression in a custom macro statement is in error. The parameter program format is in error.
0115	VARIABLE NO. OUT OF RANGE	A number that cannot be used for a local variable, common variable, or system variable in a custom macro is specified. In the EGB axis skip function or skip function for flexible synchronization control (G31.8), a non-existent custom macro variable number is specified. Or, the number of custom macro variables used to store skip positions is not sufficient.
0116	WRITE PROTECTED VARIABLE	An attempt was made in a custom macro to use on the left side of an expression a variable that can only be used on the right side of an expression.
0118	TOO MANY BRACKET NESTING	Too many brackets "[ ]" were nested in a custom macro. The nesting level including function brackets is 5.
0119	ARGUMENT VALUE OUT OF RANGE	The value of an argument in a custom macro function is out of range.
0122	TOO MANY MACRO NESTING	Too many macro calls were nested in a custom macro.
0123	ILLEGAL MODE FOR GOTO/WHILE/DO	A GOTO statement or WHILE–DO statement was found in the main program in the MDI or DNC mode.

No.	Message	Description
0124	MISSING END STATEMENT	The END instruction corresponding to the DO instruction was missing in a custom macro.
0125	MACRO STATEMENT FORMAT ERROR	The format used in a macro statement in a custom macro is in error.
0126	ILLEGAL LOOP NUMBER	DO and END Nos. in a custom macro are in error, or exceed the permissible range (valid range: 1 to 3).
0127	DUPLICATE NC,MACRO STATEMENT	An NC statement and macro statement were specified in the same block.
0128	ILLEGAL MACRO SEQUENCE NUMBER	The specified sequence No. could not be found for sequence number search. The sequence No. specified as the jump destination in GOTO- and M99P- could not be found.
0129	USE 'G' AS ARGUMENT	Illegal address is commanded in a custom macro call. Confirm whether the address is valid in the macro call. When using the axis name expansion, confirm the setting of the parameter No.11647.
0130	NC AND PMC AXIS ARE CONFLICTED	The NC command and the PMC axis control command were conflicted. Modify the program or ladder.
0136	SPOS AXIS - OTHER AXIS SAME TIME	The spindle positioning axis and another axis are specified in the same block.
0137	M-CODE & MOVE CMD IN SAME BLK.	The spindle positioning axis and another axis are specified in the same block.
0139	CANNOT CHANGE PMC CONTROL AXIS	The PMC axis was selected for the axis for which the PMC axis is being controlled.
0140	PROGRAM NUMBER ALREADY IN USE	In the background, an attempt was made to select or delete the program being selected in the foreground. Perform the correct operation for the background edition.
0142	ILLEGAL SCALE RATE	The scaling rate is 0 times or 10000 times or more. Modify the setting of the scaling rate. (G51P_ … or G51I_J_K_ … or parameter (No. 5411 or 5421))
0143	COMMAND DATA OVERFLOW	An overflow occurred in the storage length of the CNC internal data. This alarm is also generated when the result of internal calculation of scaling, coordinate system rotation and cylindrical interpolation overflows the data storage. It also is generated during input of the manual intervention amount.
0144	ILLEGAL PLANE SELECTED	The coordinate rotation plane and arc or tool radius·tool nose radius compensation plane must be the same. Modify the program.
0145	ILLEGAL USE OF G12.1/G13.1	The axis No. of plane selection parameter No. 5460 (linear axis) and No. 5461(rotary axis) in the polar coordinate interpolation mode is out of range (1 to number of controlled axes).
0146	ILLEGAL USE OF G-CODE	The modal G code group contains an illegal G code in the polar coordinate interpolation mode or when a mode was canceled. Only the following G codes are allowed: G40, G50, G69.1 An illegal G code was specified while in the polar coordinate interpolation mode. The following C codes are not allowed: G27, G28, G30, G31 to G31.4, G37 to G37.3, G52, G92, G53, G17 to G19, G81 to G89, G68 In the 01 group, G codes other than G01, G02, and G03 cannot be specified.

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No.	Message	Description
0149	FORMAT ERROR IN G10L3	In registration (G10L3 to G11) of tool life management data, an address other than Q1, Q2, P1, and P2 or an unusable address was specified.
0150	ILLEGAL LIFE GROUP NUMBER	The tool group number exceeded the maximum allowable value. The tool group number (P after specification of G10 L3;) or the group number given by the tool life management T code in a machining program.
0151	GROUP NOT FOUND AT LIFE DATA	The tool group specified in a machining program is not set in tool life management data.
0152	OVER MAXIMUM TOOL NUMBER	The number of tools registered in one group exceeded the maximum allowable registration tool number.
0153	T-CODE NOT FOUND	In registration of tool life data, a block in which the T code needs to be specified does not include the T code. Alternatively, in tool exchange method D, M06 is specified solely. Modify the program.
0154	NOT USING TOOL IN LIFE GROUP	- For the tool management command H99 or D99 was specified when no tool management data number is assigned to the spindle position. Modify the program. - For the tool life management command The H99 command, D99 command, or the H/D code set by parameters Nos. 13265 and 13266 was specified when no tool belonging to a group is used.
0155	ILLEGAL T-CODE COMMAND	In the machining program, the T code that is present in the block containing M06 does not correspond to the group currently being used. Modify the program.
0156	P/L COMMAND NOT FOUND	The P and L commands are not specified in the beginning of a program for setting a tool group. Modify the program.
0157	TOO MANY TOOL GROUPS	In registration of tool life management data, the group setting command block counts of P (group number) and L (tool life) exceeded the maximum group count.
0158	TOOL LIFE VALUE OUT OF RANGE	The life value that is being set is too large. Change the setting.
0159	ILLEGAL TOOL LIFE DATA	Tool life management data is corrupted for some reason. Register the tool data in the tool group or the tool data in the group again by G10L3; or MDI input.

No.	Message	Description
0160	MISMATCH WAITING M-CODE	A waiting M-code is in error. <1> When different M codes are specified for path 1 and path 2 as waiting M codes without a P command. <2> When the waiting M codes are not identical even though the P commands are identical <3> When the waiting M codes are identical and the P commands are not identical (This occurs when a P command is specified with binary value.) <4> When the number lists in the P commands contain a different number even though the waiting M codes are identical (This occurs when a P command is specified by combining path numbers.) <5> When a waiting M code without a P command (2-path waiting) and a waiting M code with a P command (3-or-more-path waiting) were specified at the same time <6> When a waiting M code without a P command was specified for 3 or more paths. <7> When the waiting function by specifying start point and a waiting M code without a P command (2-path waiting) were specified at the same time. <8> Waiting M code which is set by the parameter No.8110 and No.8111 was specified in peripheral axis control.
0161	ILLEGAL P OF WAITING M-CODE	P in a waiting M-code is incorrect. <1> When address P is negative <2> When a P value inappropriate for the system configuration was specified <3> When a waiting M code without a P command (2-path waiting) was specified in the system having 3 or more paths. <4> When P7 and L0 were specified at the same time.
0163	ILLEGAL COMMAND IN G68/G69	G68 and G69 are not independently commanded i balance cut. An illegal value is commanded in a balance cut combination (address P).
0169	ILLEGAL TOOL GEOMETRY DATA	Incorrect tool figure data in interference check. Set correct data, or select correct tool figure data.
0175	ILLEGAL G07.1 AXIS	An axis which cannot perform cylindrical interpolation was specified. More than one axis was specified in a G07.1 block. An attempt was made to cancel cylindrical interpolation for an axis that was not in the cylindrical interpolation mode. For the cylindrical interpolation axis, set not “0” but one of 5, 6 or 7 (parallel axis specification) to parameter No. 1022 to instruct the arc with axis of rotation (ROT parameter No. 1006#1 is set to “1” and parameter No. 1260 is set) ON.
0176	ILLEGAL G-CODE USE (G07.1 MODE)	A G code was specified that cannot be specified in the cylindrical interpolation mode. This alarm also is generated when an 01 group G code was in the G00 mode or code G00 was instructed. Cancel the cylindrical interpolation mode before instructing code G00.
0177	CHECK SUM ERROR (G05)	A checksum error occurred.

No.	Message	Description
0178	ILLEGAL COMMAND G05	This alarm is issued in the following cases. 1) The settings of bits 4 to 6 of parameter No.7501 are invalid. 2) G05 was specified in any of the following mode. - Hypothetical axis interpolation (G07) - Cylindrical interpolation (G07.1) - Polar coordinate interpolation (G12.1) - Polar coordinates command (G16) - Spindle speed fluctuation detection (G26) - Tool radius · tool nose radius compensation (G41/G42) - Normal direction control (G41.1/G42.1) - Scaling (G51) - Programmable mirror image (G51.1) - Coordinate system rotation (G68) - Canned cycle (G81 to G89) - Constant surface speed control (G96) - Macro interruption(M96) 3) G05 was specified while the Servo invalidation function and the Pole position detection function are effective at the same time.
0190	ILLEGAL AXIS SELECTED (G96)	An illegal value was specified in P in a G96 block or parameter No. 3770. When spindle selection by address P or extended spindle name of multi-spindle control is enabled, selection of axis as the calculation reference in constant surface speed control “G96 P_ ;” cannot be commanded.
0194	SPINDLE COMMAND IN SYNCHRO-MODE	A Cs contour control mode, spindle positioning command, or rigid tapping mode was specified during the spindle synchronous control mode or spindle command synchronous control mode.
0197	C-AXIS COMMANDED IN SPINDLE MODE	The program specified a movement along the Cs-axis when the Cs contour control switching signal was off.
0200	ILLEGAL S CODE COMMAND	1) In the rigid tapping, an S value was out of range or was not specified. The parameter (Nos. 5241 to 5243) setting is an S value which can be specified for the rigid tapping. Correct the parameters or modify the program. 2) Rigid tapping is commanded during constant surface speed control. Command rigid tapping after canceling constant surface speed control.
0201	FEEDRATE NOT FOUND IN RIGID TAP	The command F code for a cutting feedrate is a zero. If the value of F command is much smaller than that of the S command, when a rigid tapping command is specified, this alarm is generated. This is because cutting is not possible by the lead specified by the program.
0202	POSITION LSI OVERFLOW	In the rigid tapping, spindle distribution value is too large.(System error)

No.	Message	Description
0203	PROGRAM MISS AT RIGID TAPPING	(1) In the rigid tap, position for a rigid M code (M29) or an S command is incorrect. Modify the program. (2) FSSB high-speed rigid tapping cannot be used on the rigid tapping with one servo motor and multiple spindle motors by spindle command synchronous control. (3) In FSSB high-speed rigid tapping, parameter setting is wrong (bits 1 and 2 of parameter No.2429, and bits 1 and 2 of parameter No.4549).
0204	ILLEGAL AXIS OPERATION	In the rigid tapping, an axis movement is specified between the rigid M code (M29) block and G84 (or G74) block. Modify the program.
0205	RIGID MODE DI SIGNAL OFF	Although a rigid M code (M29) is specified in rigid tapping, the rigid mode DI signal (G061.0) is not ON during execution of the G84 (or G74) block. Check the PMC ladder diagram to find the reason why the DI signal is not turned on.
0206	CAN NOT CHANGE PLANE (RIGID TAP)	Plane changeover was instructed in the rigid mode. Modify the program.
0207	RIGID DATA MISMATCH	The specified distance was too short or too long in rigid tapping.
0210	CAN NOT COMMAND M198/M99	1 The execution of an M198 or M99 command was attempted during scheduled operation. Alternatively, the execution of an M198 command was attempted during DNC operation. Modify the program. 2 The execution of an M99 command was attempted by an interrupt macro during pocket machining in a multiple repetitive canned cycle.
0213	ILLEGAL COMMAND IN SYNCHRO-MODE	In feed axis synchronization control, the following errors occurred during the synchronous operation. 1) The program issued the move command to the slave axis. 2) The program issued the manual operation (jog feed or incremental feed) to the slave axis. 3) The program issued the automatic reference position return command without specifying the manual reference position return after the power was turned on.
0214	ILLEGAL COMMAND IN SYNCHRO-MODE	Coordinate system is set or tool compensation of the shift type is executed in the synchronous control. Correct the program.
0217	DUPLICATE G51.2 (COMMANDS)	G51.2 is further commanded in the G51.2 mode. Modify the program.
0218	NOT FOUND P/Q COMMAND	P or Q is not commanded in the G51.2 block, or the command value is out of the range. Modify the program. For a polygon turning between spindles, more information as to why this alarm occurred is indicated in diagnosis data No. 471.
0219	COMMAND G51.2/G50.2 INDEPENDENTLY	G51.2 and 50.2 were specified in the same block for other commands. Modify the program in another block.
0220	ILLEGAL COMMAND IN SYNCHR-MODE	In the synchronous operation, movement is commanded by the NC program or PMC axis control interface for the synchronous axis. Modify the program or check the PMC ladder.
0221	ILLEGAL COMMAND IN SYNCHR-MODE	Polygon machining synchronous operation and Cs axis control or balance cutting are executed at a time. Modify the program.

No.	Message	Description
0224	ZERO RETURN NOT FINISHED	Reference position return has not been performed before the automatic operation starts. Perform reference position return only when the parameter ZRNx (No. 1005#0) is set to 0.
0230	R CODE NOT FOUND	Cut depth R is not specified in the block including G161. Alternatively, the value specified for R is negative. Modify the program.
0231	ILLEGAL FORMAT IN G10 L52	Errors occurred in the specified format at the programmable-parameter input.
0232	TOO MANY HELICAL AXIS COMMAND	Three or more axes were specified as helical axes in the helical interpolation mode. Five or more axes were specified as helical axes in the helical interpolation B mode.
0233	DEVICE BUSY	When an attempt was made to use a unit such as that connected via the RS232-C interface, other users were using it.
0245	T-CODE NOT ALLOWED IN THIS BLOCK	One of the G codes, G50, G10, G04, G28, G28.2, G29, G30, G30.2, G30.1, and G53, which cannot be specified in the same block as a T code, was specified with a T code.
0247	THE MISTAKE IS FOUND IN THE OUTPUT CODE OF DATA.	When an encrypted program is output, EIA is set for the output code. Specify ISO.
0250	TOOL CHANGE ILLEGAL Z AXIS COMMAND	A Z-axis move command was performed in the same block for M06 command.
0251	TOOL CHANGE ILLEGAL T COMMAND	An unusable T code was specified in M06Txx.
0253	G05 CAN NOT BE COMMANDED	A binary operation was specified during advanced preview control mode.
0300	ILLEGAL COMMAND IN SCALING	An illegal G code was specified during scaling. Modify the program. For the T system, one of the following functions is specified during scaling, this alarm is generated. - Finishing cycle (G70 or G72) - Outer surface rough-cutting cycle (G71 or G73) - End side rough-cutting cycle (G72 or G74) - Closed loop cutting cycle (G73 or G75) - End side cutting-off cycle (G74 or G76) - Outer surface or inner surface cutting-off cycle (G75 or G77) - Multiple repetitive threading cycle (G76 or G78) - Face drill cycle (G83 or G83) - Face tap cycle (G84 or G84) - Face boring cycle (G85 or G85) - Side drill cycle (G87 or G87) - Side tap cycle (G88 or G88) - Side boring cycle (G89 or G89) - Outer surface turning cycle or inner surface boring cycle (G77 or G20) - Threading cycle (G78 or G21) - End side turning cycle (G79 or G24) (Specify G codes for systems B and C in that order.)
0301	RESETTING OF REFERENCE RETURN IS INHIBITED	Although bit 0 (IDGx) of parameter No. 1012 was set to 1 to inhibit the reference position from being set again for a return to the reference position without a dog, an attempt was made to perform a manual return to the reference position.

No.	Message	Description
0302	SETTING THE REFERENCE POSITION WITHOUT DOG IS NOT PERFORMED	The reference position could not be set for a return to the reference position without a dog. Possible causes are: - The axis was not moved in the direction of a return to the reference position for jog feeding. - The axis was moved in the direction opposite to the direction of a manual return to the reference position. - Since the one-rotation signal sent from the position detector is not detected, the grid for manual reference position return is not established. (Bit 6 of diagnostic data No. 0201 must be 1.)
0303	REFERENCE POSITION RETURN IS NOT PERFORMED	When the setting of a reference position at any position was possible in Cs contour control (parameter CRF (No. 3700#0) = 1), a G00 command was issued for the Cs contour axis without a return to the reference position after the serial spindle was switched to Cs contour control mode. Perform a reference position return with a G28 command before issuing a G00 command.
0304	G28 IS COMMANDED WITHOUT ZERO RETURN	Although a reference position was not set, an automatic return to the reference position (G28) was commanded.
0305	INTERMEDIATE POSITION IS NOT ASSIGNED	Although a G28 (automatic return to the reference position), G30 (return to the 2nd, 3rd, or 4th reference position), or G30/1 (return to the floating reference position) command was not issued after power-up, G29 (return from the reference position) was commanded.
0306	MISMATCH AXIS WITH CNR/CHF	The correspondence between the moving axis and the I, J, or K command is incorrect in a block in which chamfering is specified.
0307	CAN NOT START REFERENCE RETURN WITH MECHANICAL STOPPER SETTING	An attempt was made to set a butt-type reference position for an axis for which to use the function to set a reference position without a dog.
0308	G72.1 NESTING ERROR	G72.1 was specified again during G72.1 rotation copying.
0309	G72.2 NESTING ERROR	G72.2 was specified again during G72.2 parallel copying.
0310	FILE NOT FOUND	The specified file could not be found during a subprogram or macro call.
0311	CALLED BY FILE NAME FORMAT ERROR	An invalid format was specified to call a subprogram or macro using a file name.
0312	ILLEGAL COMMAND IN DIRECT DRAWING DIMENSIONS PROGRAMMING	Direct input of drawing dimensions was commanded in an invalid format. An attempt was made to specify an invalid G code during direct input of drawing dimensions. Two or more blocks not to be moved exist in consecutive commands that specify direct input of drawing dimensions. Although non-use of commas (,) (parameter CCR (No. 3405#4) = 1) was specified for direct input of drawing dimensions, a comma was specified.
0313	ILLEGAL LEAD COMMAND	The variable-lead threading increment specified in address K exceeds the specified maximum value in variable-lead threading. Or, a negative lead value was specified.

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No.	Message	Description
0314	ILLEGAL SETTING OF POLYGONAL AXIS	An axis was specified invalidly in polygon turning. For polygon turning: A tool rotary axis is not specified. (Parameter No. 7610) For polygon turning between spindles: Valid spindles are not specified. (Parameter Nos. 7640 to 7643) - A spindle other than the serial spindle. - A spindle is not connected. For concurrent use of polygon turning and polygon turning with two spindles: - In the polygon turning mode, the value of parameter No. 7605 (selecting the type of polygon turning) was changed. - An attempt is made to use a spindle used for polygon turning also for polygon turning with two spindles.
0315	ILLEGAL NOSE ANGLE COMMAND IS IN THE THREAD CUTTING CYCLE	An invalid tool tip angle is specified in a multiple repetitive canned threading cycle (G76).
0316	ILLEGAL CUTTING AMOUNT IS IN THE THREAD CUTTING CYCLE	An minimum depth of cut higher than the thread height is specified in a multiple repetitive canned threading cycle (G76).
0317	ILLEGAL THREAD COMMAND IS IN THE THREAD CUTTING CYCLE	A zero or a negative value is specified in a multiple repetitive canned threading cycle (G76) as the thread height or the depth of cut.
0318	ILLEGAL RELIEF AMOUNT IS IN THE DRILLING CYCLE	Although an escape directions is set in a multiple repetitive canned cutting-off cycle (G74 or G75), a negative value is specified for Δd.
0319	THE END POINT COMMAND IS ILLEGAL IN THE DRILLING CYCLE	Although the Δi or Δk travel distance is set to 0 in a multiple repetitive canned cutting-off cycle (G74 or G75), a value other than 0 us specified for a U or W.
0320	ILLEGAL MOVEMENT AMOUNT/CUTTING AMOUNT IS IN THE DRILLING CYCLE	A negative value is specified in a multiple repetitive canned cutting-off cycle (G74 or G75) as Δi or Δk (travel distance/the depth of cut).
0321	ILLEGAL REPEATED TIME IS IN THE PATTERN REPEATING CYCLE	A zero or a negative value is specified in a multiple repetitive canned closed loop cycle (G73) as a repeated time.
0322	FINISHING SHAPE WHICH OVER OF STARTING POINT	An invalid shape which is over the cycle starting point is specified in a shape program for a multiple repetitive canned rough-cutting cycle (G71 or G72).
0323	THE FIRST BLOCK OF SHAPE PROGRAM IS A COMMAND OF TYPE II	Type II is specified in the first block of the shape program specified by P in a multiple repetitive canned rough-cutting cycle (G71 or G72). Z (W) command is for G71. X (U) command is for G72.
0324	THE INTERRUPTION TYPE MACRO WAS DONE IN THE MULTIPLE REPETIVE CYCLES	An interruption type macro was issued during the multiple repetitive canned cycle (G70, G71, G72, or G73).

No.	Message	Description
0325	UNAVAILABLE COMMAND IS IN SHAPE PROGRAM	1) An usable command was issued in a shape program for a multiple repetitive cycle (G70, G71, G72, or G73). 2) In the multiple repetitive cycle (G70), when the tool nose radius compensation can be commanded in the target figure program (parameter NT2(No.5106#3)=1), G41 or G42 is commanded at the target figure program other than the first block.
0326	LAST BLOCK OF SHAPE PROGRAM IS A DIRECT DRAWING DIMENSIONS	In a shape program in the multiple repetitive canned cycle (G70, G71, G72, or G73), a command for direct input of drawing dimensions in the last block is terminated in the middle.
0327	MODAL THAT MULTIPLE REPETIVE CYCLES CANNOT BE DONE	A multiple repetitive canned cycle (G70, G71, G72, or G73) was commanded in a modal state in which a multiple repetitive canned cycle could not be commanded.
0328	ILLEGAL WORK POSITION IS IN THE TOOL NOSE RADIUS COMPENSATION	The specification for the blank side for a tool-nose radius compensation (G41 or G42) is incorrect in a multiple repetitive canned cycle (G71 or G72).
0329	THE FINISHING SHAPE IS NOT A MONOTONOUS CHANGE (SECOND AXES)	In a shape program for the multiple repetitive canned rough-cutting cycle (G71 or G72), the command of the second plane axis was not a monotonous increase or decrease.
0330	ILLEGAL AXIS COMMAND IS IN THE TURNING CANNED CYCLE	An axis other than the plane is specified n a canned cycle(G90, G92, or G94).
0331	ILLEGAL AXIS NUMBER IN AX[ ]	An illegal value is specified for an AX[ ] axis number.
0332	ILLEGAL AXIS ADDRESS IN AXNUM[ ]	An illegal value is specified for an AXNUM[ ] axis address.
0333	TOO MANY SPINDLE COMMANDS	Multiple spindle commands could be found in the same block in using an expansion spindle name. Only one spindle could be commanded in the same block.
0334	INPUT VALUE OUT OF EFFECTIVE RANGE	An offset data which was out of the effective range was specified. (malfunction prevention function)
0335	PLURAL M CODE	Multiple M codes are commanded simultaneously in a block for a wait function with peripheral devices by an M code.
0336	TOOL COMPENSATION COMMANDED MORE TWO AXES	For a tool length compensation C, an attempt was made to command the offset to other axes without canceling the offset. Or, for a tool length compensation C, multiple axes are specified in G43 or G44 block.
0337	EXCESS MAXIMUM INCREMENTAL VALUE	The command value exceeded the maximum amount of incremental. (malfunction prevention function)
0340	ILLEGAL RESTART(NANO SMOOTHING)	With manual absolute turned on, an attempt was made to restart the operation in nano smoothing mode after performing the manual interaction.
0341	TOO MANY COMMAND BLOCK (NANO SMOOTHING)	There are more blocks than can be commanded consecutively in nano smoothing mode.

No.	Message	Description
0342	CUSTOM MACRO INTERRUPT ENABLE IN NANO SMOOTHING	A custom macro interrupt was enabled in nano smoothing mode. Or, nano smoothing mode was commanded with a custom macro interrupt enabled.
0343	ILLEGAL COMMAND IN NANO SMOOTHING	1) G43, G44, or G49 was commanded during a nano smoothing. 2) Non-buffering command by G code was commanded during Nano smoothing.
0344	CANNOT CONTINUE NANO SMOOTHING	An illegal command or operation by which a nano smoothing could not be continued was performed.
0345	TOOL CHANGE ILLEGAL Z AXIS POS	A tool change position on the Z-axis is incorrect.
0346	TOOL CHANGE ILLEGAL TOOL NUM	A tool change position is not set.
0347	TOOL CHANGE ILLEGAL COMMAND IN SAME BLK.	Tool changing is commanded twice or more in the same block.
0348	TOOL CHANGE Z AXIS POS NOT ESTABLISHED	A tool change spindle on the Z-axis is not set.
0349	TOOL CHANGE SPINDLE NOT STOP	A tool change spindle stop is not stopped.
0350	PARAMETER OF THE INDEX OF THE SYNCHRONOUS CONTROL AXIS SET ERROR.	An illegal synchronous control axis number (parameter No. 8180) is set.
0351	BECAUSE THE AXIS IS MOVING, THE SYNC CONTROL IS CAN'T BE USED.	While the axis being subject to synchronous control was moving, an attempt was made to start or cancel the synchronous control by a synchronous control axis selection signal.
0352	SYNCHRONOUS CONTROL AXIS COMPOSITION ERROR.	This error occurred when: 1) An attempt was made to perform synchronous control for the axis during a synchronization, composition, or superimposing. 2) An attempt was made to synchronize a further great-grandchild for a parent-child-grandchild relation. 3) An attempt was made to operate synchronous control although a parent-child-grandchild relation was not set.
0353	THE INSTRUCTION WAS DONE FOR THE AXIS WHICH WAS NOT ABLE TO MOVE.	This error occurred when: - For synchronization 1) A move command was issued to the axis for which parameter No. 8163#7NUMx is set to 1. 2) A move command was issued to the slave axis. - For composition 1) A move command was issued to the axis for which parameter No. 8163#7NUMx is set to 1. 2) A move command was issued to the axis for which parameter No. 8162#7MUMx is set to 1.
0354	THE G28 WAS INSTRUCTED IN WITH THE REF POS NOT FIXED IN SYNC MODE	This error occurred when G28 was specified to the master axis being parking during synchronous control, but an axis reference position is not set for the slave axis.

No.	Message	Description
0355	PARAMETER OF THE INDEX OF THE COMPOSITE CONTROL AXIS SET ERROR.	An illegal composite control axis number (parameter No. 8183) is specified.
0356	BECAUSE THE AXIS IS MOVING, THE COMP CONTROL IS CAN'T BE USED.	While the axis being subject to composite control was moving, an attempt was made to start or cancel the composite control by a composite control axis selection signal.
0357	COMPOSITE CONTROL AXIS COMPOSITION ERROR.	This error occurred when an attempt was made to perform composite control for the axis during a synchronization, composition, or superimposing.
0359	THE G28 WAS INSTRUCTED IN WITH THE REF POS NOT FIXED IN COMP MODE	This error occurred when G28 was specified to the composite axis during composite control, but a reference position is not set to the other part of the composition.
0360	PARAMETER OF THE INDEX OF THE SUPERPOS CONTROL AXIS SET ERROR.	An illegal superimposed control axis number (parameter No. 8186) is specified.
0361	BECAUSE THE AXIS IS MOVING, THE SUPERPOS CONTROL IS CAN'T BE USED.	While the axis being subject to superimposed control was moving, an attempt was made to start or cancel the superimposed control by a superimposed control axis selection signal.
0362	SUPERPOSITION CONTROL AXIS COMPOSITION ERROR.	This error occurred when: 1) An attempt was made to perform superimposed control for the axis during a synchronization, composition, or superimposing. 2) An attempt was made to synchronize a further great-grandchild for a parent-child-grandchild relation.
0363	THE G28 WAS INSTRUCTED IN TO THE SUPERPOS CONTROL SLAVE AXIS.	This error occurred when G28 was specified to the superimposed control slave axis during superimposed control.
0364	THE G53 WAS INSTRUCTED IN TO THE SUPERPOS CONTROL SLAVE AXIS.	This error occurred when G53 was specified to the slave axis being moved during superimposed control.
0365	TOO MANY MAXIMUM SV/SP AXIS NUMBER PER PATH	The maximum control axis number or maximum control spindle number which could be used within a path was exceeded.
0366	IMPROPER G-CODE IN TURRET METHOD	When the turret change tools method was selected (parameter No. 5040#3 (TCT) = 0), G43, G43.1, G43.4, G43.5, or G43.7 was commanded.
0367	3-D CONV. WAS COMMANDED IN SYNC MODE AS THE PARAMETER PKUx(NO.8162#2) IS 0.	A 3-dimensional coordinate conversion was commanded during synchronous control when the parameter PKUx (No.8162#2) was 0.

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No.	Message	Description
0368	OFFSET REMAIN AT OFFSET COMMAND	1) When the ATC change tools method was selected (parameter TCT (No. 5040#3) = 1) during G43, G43.1, G43.4, or G43.5 mode, G43.7 was commanded. Or, G43, G43.1, G43.4, or G43.5 was commanded during G43.7 mode. 2) After the setting of parameter TCT (No. 5040#3) was changed in a state in which tool offset remained, the tool offset command was specified.
0369	G31 FORMAT ERROR	1) No axis is specified or tow or more axes are specified in the torque limit switch instruction (G31P98/P99). 2) The specified torque Q value in the torque limit switch instruction is out of range. The torque Q range is 1 to 254. 3) The high-speed continuous skip option is not present.
0370	G31P/G04Q ERROR	1) The specified address P value for G31 is out of range. The address P range is 1 to 4 in a multistage skip function. 2) The specified address Q value for G04 is out of range. The address Q range is 1 to 4 in a multistage skip function. 3) P1-4 for G31, or Q1-4 for G04 was commanded without a multistage skip function option. 4) <T series > The specified value of address P of G72 or G74 falls outside the range. Address P ranges from 1 to 4 in the multistage skip function. P1-4 was specified in G72 or G74 even though the multistage skip function option is not present.
0371	ILLEGAL FORMAT IN G10 OR L50	In a command format for a programmable parameter input, an attempt was made to change the parameter for an encryption (No. 3220), key (No. 3221), or protection range (No.3222 or No.3223) as a "the encryption function for the key and program." Modify the program.
0373	ILLEGAL HIGH-SPEED SKIP SIGNAL	In the skip commands (G31, G31P1 to G31P4) and dwell commands (G04, G04Q1 to G04Q4), the same high-speed signal is selected in different paths.
0374	ILLEGAL REGISTRATION OF TOOL MANAGER (G10)	G10L75 or G10L76 data was registered during the following data registration: - From the PMC window. - From the FOCAS2. - By G10L75 or G10L76 in another system. Command G10L75 or G10L76 again after the above operation is completed.
0376	SERIAL DCL: ILLEGAL PARAMETER	1) When parameter No.1815#1 (for separate type Pulsecoder) is set to “1”, parameter No.2002#3 is set to “0” 2) The absolute-position detection function is enabled. (Parameter No.1815#5 is set to “1”.)
0377	ILLEGAL MODE FOR GOTO/WHILE/DO	The GOTO statement, WHILE statement, and DO statement cannot be executed in a program created in the MDI mode. When a program including those statements is to be executed, register the program in the program memory then call the program for execution.
0387	ILLEGAL RTM DI/DO VAR	There is no DI/DO variable that has a specified signal address (alphabet, number).
0389	ILLEGAL RTM SIGNAL BIT	Bits other than bits 0 to 7 cannot be specified with a DI/DO signal.

No.	Message	Description
0390	ILLEGAL MACRO VAR	A macro variable which was not supported by the real time custom macro function was used.
0391	RTM BRANCH OVER	The number of branches supported with real time custom macros was exceeded.
0392	TOO MANY SENTENCE CONTROL	Many reserved words (ZONCE, ZEDGE, ZWHILE, ZDO, ZEND, G65, M99) for RTM control were used in a real time macro command.
0393	NO SENTENCE CONTROL	In a real time macro command, there is no data to be assigned.
0394	ILLEGAL SENTENCE CONTROL	The matching of reserved words (ZONCE, ZEDGE, ZWHILE, ZDO, ZEND, G65, M99) for RTM control is incorrect.
0395	ILLEGAL NC WORD CONTROL	Control code G65 or M99 for calling a subprogram or returning from a subprogram is not coded correctly.
0396	ILLEGAL RTM SENTENCE CONTROL	In other than a real time macro command, a reserved word (ZONCE, ZEDGE, ZWHILE, ZDO, or ZEND) for RTM control is used.
0397	RTM BUFFER OVER	There is no buffer available for real time macro commands. Too many blocks read in advance are buffered as triggers used by real time macro commands.
0398	ID OVER IN BUFFER	In blocks read in advance, there are too many real time macro commands with the same ID.
0399	ID EXECUTION IN SAME TIME	An attempt was made to execute real time macro commands with the same ID by using the same NC statement as a trigger.
0400	ONE SHOT COMMAND OVER	Too many one-shot real time macro commands are specified.
0401	EXEC CMD NUM OVER IN SAME TIME	The number of real time macro commands that can be executed simultaneously was exceeded
0402	ILLEGAL TOKEN FOR RTM	A token, variable, or function that is not supported by the real time custom macro function was detected.
0403	ACCESS TO RTM PROTECT VAR	An attempt was made to access a protected variable.
0404	RTM ERROR	An error related to a real time macro command occurred.
0406	CODE AREA SHORTAGE	The storage size of the real time macro area is insufficient.
0407	DOULE SLASH IN RTM MODE	In the compile mode, an attempt was made to set the compile mode again.
0408	G90 IS NOT PERMITTED	The absolute command cannot be specified.
0409	ILLEGAL AXIS NO	An invalid axis number is specified.
0410	MIDDLE POINT IS NOT ZERO	An intermediate point other than 0 is specified with G28.
0411	SIMULTANEOUSLY AXES OVER	The maximum number of axes that can be controlled simultaneously was exceeded.
0412	ILLEGAL G CODE	An unusable G code was used.
0413	ILLEGAL ADDRESS	An unusable address was used.
0415	GROUP IS IN USE	The group to which the specified axis belongs is already in used.
0416	UNABLE TO USE THE AXIS	The specified axis cannot be used.
0417	AXIS IS UNABLE TO MOVE	The specified axis is placed in the inoperative state.
0418	ILLEGAL FEED SETTING	An incorrect feedrate is set.
0419	ILLEGAL DISTANCE SETTING	A travel distance beyond the specifiable range is specified.

No.	Message	Description
0420	CONSTANT NUMBER P	A subprogram is specified not by using a constant.
0421	ILLEGAL ARGUMENT G54	With G65, an invalid argument, L, is used.
0422	ILLEGAL ARGUMENT G54	With G65, an invalid argument is used.
0424	MULTIPLE AXES IN ONE GROUP	Multiple axes are using one group.
0429	ILLEGAL COMMAND IN G10.6	When retract was started in a threading block, a retract command had been issued for the long axis direction of threading.
0430	TOOL LIFE PAIRS ZERO	Tool life management group number parameter No.6813 is 0.
0431	ILLEGAL T/R DATA OF TOOL LIFE	The arbitrary group number (T) or remaining amount setting (R) is invalid.
0445	ILLEGAL AXIS OPERATION	The positioning command was issued in the speed control mode. Check the SV speed control mode signal.
0446	ILLEGAL COMMAND IN G96.1/G96.2/G96.3/ G96.4	G96.1, G96.2, G96.3, and G96.4 are specified in the block that includes other commands. Modify the program.
0447	ILLEGAL SETTING DATA	The live tool axis is incorrectly set. Check the parameter for the spindle control function with servo motor.
0455	ILLEGAL COMMAND IN GRINDING	In grinding canned cycles: 1) <M series> The signs of the I, J, and K commands do not match. 2) <M series/T series > The amount of travel of the grinding axis is not specified.
0456	ILLEGAL PARAMETER IN GRINDING	Parameters related to grinding canned cycles are incorrectly set. Probable causes are given below. 1) <M series/T series> The axis number of the grinding axis is incorrectly set (parameters Nos. 5176 to 5179). 2) <M series> The axis number of the dressing axis is incorrectly set (parameters Nos. 5180 to 5183). 3) <M series/T series> The axis numbers of the cut axis, grinding axis, and dressing axis (only for the M series) overlap.
0501	THE COMMANDED M-CODE CAN NOT BE EXECUTED	The M code specified in parameter Nos. 11631 to 11646 was specified in other than an execution macro, macro interrupt, macro call using a G or M code, or subprogram call using a T, S, or second auxiliary function code.
0502	ILLEGAL G-CODE	1) A G code unavailable in the inter-path flexible synchronization mode was specified. 2) A G code unavailable in the advanced superimposition state was specified.
0503	ILLEGAL MODAL IN SUPERIMPOSED MODE	Modal state of a G code that cannot be superimposed.
0509	TOOL OFFSET COMMAND IS NOT AVAILABLE	- Tool offset (for the lathe system) was specified in the thread cutting block. - Tool offset was specified (lathe system) in the scaling mode, coordinate system rotation mode, or programmable mirror image mode.
0511	CS HI-SPEED SWITCHING FORMAT ERROR	The format of Cs contour control high speed switching is invalid.

No.	Message	Description
0512	IMPOSSIBLE COMMAND FOR CS HI-SPEED SWITCHING	The following commands cannot be specified in Cs contour control high speed switching: - Move command not for high-speed cycle machining - Synchronous/composite control, superimposed control - Spindle command synchronous control - Simple spindle electronic gear box - Manual reference position return
0513	CS HI-SPEED SWITCHING SETTING ERROR	The setting for Cs contour control high speed switching is invalid. Possible causes are: - An M code value for Cs contour control high speed switching is used for multiple Cs contour control axes. - FIN is returned for the M code for high-speed switching of Cs contour control when the Cs contour control high speed switching completion signal CSMCx does not become 1. - The spindle software does not support the spindle control switching function for high-speed cycle machining.
0514	ILLEGAL COMMAND IN FLEXIBLE PATH AXIS ASSIGNMENT	1) An assignment command in flexible path axis assignment was issued for an axis yet to be removed. 2) The P, Q, R, I, J, K, or L value specified by G52.1, G52.2, or G52.3 is invalid. 3) The value of the parameter No. 11560 is duplicated. 4) An attempt was made to execute a removal command (G52.1) for an axis already removed. 5) An attempt was made to exchange axes having different settings of bit 1 (FAN) of parameter No. 11562. 6) An attempt was made to perform flexible path axis assignment without canceling the offset.
0525	SUB PROGRAM/ MACRO CALLING	The mode was changed and the cycle start was executed while executing subprogram call or macro call. Reset and cycle start is executed again.
0527	ILLEGAL DATA IN PITCH ERROR	In the effective pitch error compensation points that is decided by considering the setting of the parameters, the difference between two consecutive data exceeds the range of -128～+127. Please correct the pitch error compensation data or change the parameter.
0528	THREADING FORMAT ERROR	The format of arbitrary speed threading is invalid.

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No.	Message	Description
0529	THREADING COMMAND IMPOSSIBLE	1) The following commands cannot be specified in arbitrary speed threading mode. - Threading command except for threading (G32), threading cycle (G92), and multiple threading cycle (G76, G76.7). - Taper angle is smaller than that of the last block in the case of continuous threading. Chamfering angle is smaller than the taper angle in the case of threading cycle. - Infeed axis cannot be decelerated to 0 with acceleration which is calculated automatically in continuous threading. - Synchronous control, composite control, and superimposed control - Manual reference position return - Spindle command synchronous control - Simple spindle electronic gear box 2) Arbitrary speed threading is specified in Cs contour control. 3) Spindle software does not support arbitrary speed threading. 4) Cs contour control change signal is not set to “0” after resetting CNC in arbitrary speed threading mode.
0530	EXCESS VELOCITY IN THREADING	Feedrate exceeds the maximum cutting feedrate.
0531	THREADING PARAMETER ERROR	Parameter setting for arbitrary speed threading is invalid. Possible causes are: - An M code value to start arbitrary speed threading is used for multiple Cs contour control axes. - An M code value to cancel arbitrary speed threading is used for multiple Cs contour control axes. - Acceleration of feed axis (parameter No.11492) is smaller than that of spindle (Cs contour control axis) (parameter No.11030 to No.11032, No.25710 to No.25712).
0532	RE-MACHINING OF THREAD CUTTING IMPOSSIBLE	Re-machining thread cannot be executed. Possible causes are: - Groove of thread is not measured. - Measured data is outside of threading path. - Mirror image is applied to the first axis on the plane or the second axis on the plane.
0538	OFFSET IS NOT CANCELED	In the multiple repetitive cycle (G70), when the tool nose radius compensation can be commanded in the target figure program (parameter NT2 (No.5106#3)=1), G40 is not commanded at the end block in the target figure program.
0539	MAX SP SPEED CLAMP COMMAND ERROR	Clamp of maximum spindle speed is illegal. Extended spindle name cannot be commanded for clamp of maximum spindle speed.
0601	ILLEGAL AXIS COMMAND FOR SERVO MOTOR SPINDLE	The move command was executed to the servo axes for spindle use of the spindle control with servo motor. Modify the program.
0602	ILLEGAL AXIS OPERATION FOR SERVO MOTOR SPINDLE	The spindle controlled with the serve motor is not selected correctly. - When multi-spindle control is enabled, check whether the selected spindle is servo motor spindle. - When multi-spindle control is disabled, check whether 1st spindle in commanded path is a servo motor spindle.

No.	Message	Description
1001	AXIS CONTROL MODE ILLEGAL	Axis control mode is illegal.
1013	ILLEGAL POS. OF PROGRAM NO.	Address O or N is specified in an illegal location (e.g. after a macro statement).
1014	ILLEGAL FORMAT OF PROGRAM NO.	Address O or N is not followed by a number.
1016	EOB NOT FOUND	EOB (End of Block) code is missing at the end of a program input in the MDI mode.
1059	COMMAND IN BUFFERING MODE	The manual intervention compensation request signal MIGET became “1” when a advanced block was found during automatic operation. To input the manual intervention compensation during automatic operation, a sequence for manipulating the manual intervention compensation request signal MIGET is required in an M code instruction without buffering.
1077	PROGRAM IN USE	An attempt was made in the foreground to execute a program being edited in the background. The currently edited program cannot be executed, so end editing and restart program execution.
1079	PROGRAM FILE NOT FOUND	The program of the specified file No. is not registered in an external device. (external device subprogram call)
1080	DUPLICATE DEVICE SUB PROGRAM CALL	Another external device subprogram call was made from a subprogram after the subprogram called by the external device subprogram call.
1081	EXT DEVICE SUB PROGRAM CALL MODE ERROR	The external device subprogram call is not possible in this mode.
1090	PROGRAM FORMAT ERROR	A lowercase alphabetic character is found in other than an NC program statement comment section, program name, or folder name.
1091	DUPLICATE SUB-CALL WORD	More than one subprogram call instruction was specified in the same block.
1092	DUPLICATE MACRO-CALL WORD	More than one macro call instruction was specified in the same block.
1093	DUPLICATE NC-WORD & M99	An address other than O, N, P or L was specified in the same block as M99 during the macro modal call state.
1095	TOO MANY TYPE-2 ARGUMENT	More than ten sets of I, J and K arguments were specified in the type–II arguments (A, B, C, I, J, K, I, J, K, ...) for custom macros.
1096	ILLEGAL VARIABLE NAME	An illegal variable name was specified. A code that cannot be specified as a variable name was specified. [#_OFSxx] does not match the tool offset memory option configuration.
1097	TOO LONG VARIABLE NAME	The specified variable name is too long.
1098	NO VARIABLE NAME	The specified variable name cannot be used as it is not registered.
1099	ILLLEGAL SUFFIX [ ]	A suffix was not specified to a variable name that required a suffix enclosed by [ ]. A suffix was specified to a variable name that did not require a suffix enclosed by [ ]. The value enclosed by the specified [ ] was out of range.
1100	CANCEL WITHOUT MODAL CALL	Call mode cancel (G67) was specified even though macro continuous–state call mode (G66) was not in effect.
1101	ILLEGAL CNC STATEMENT IRT.	An interrupt was made in a state where a custom macro interrupt containing a move instruction could not be executed.

No.	Message	Description
1115	READ PROTECTED VARIABLE	An attempt was made in a custom macro to use on the right side of an expression a variable that can only be used on the left side of an expression.
1120	ILLEGAL ARGUMENT FORMAT	The specified argument in the argument function (ATAN, POW) is in error.
1124	MISSING DO STATEMENT	The DO instruction corresponding to the END instruction was missing in a custom macro.
1128	SEQUENCE NUMBER OUT OF RANGE	The jump destination sequence No. in a custom macro statement GOTO instruction was out of range (valid range: 1 to 99999999).
1131	MISSING OPEN BRACKET	The number of left brackets ([) is less than the number of right brackets (]) in a custom macro statement.
1132	MISSING CLOSE BRACKET	The number of right brackets (]) is less than the number of left brackets ([) in a custom macro statement.
1133	MISSING '='	An equal sign (=) is missing in the arithmetic calculation instruction in a custom macro statement.
1137	IF STATEMENT FORMAT ERROR	The format used in the IF statement in a custom macro is in error.
1138	WHILE STATEMENT FORMAT ERROR	The format used in the WHILE statement in a custom macro is in error.
1139	SETVN STATEMENT FORMAT ERROR	The format used in the SETVN statement in a custom macro is in error.
1141	ILLEGAL CHARACTER IN VAR. NAME	The SETVN statement in a custom macro contacts a character that cannot be used in a variable name.
1142	TOO LONG V-NAME (SETVN)	The variable name used in a SETVN statement in a custom macro exceeds 8 characters.
1143	BPRNT/DPRNT STATEMENT FORMAT ERROR	The format used in the BPRINT statement or DPRINT statement is in error.
1144	G10 FORMAT ERROR	The G10 L No. contains no relevant data input or corresponding option. Data setting address P or R is not specified. An address not relating to the data setting is specified. Which address to specify varies according to the L No. The sign, decimal point or range of the specified address are in error.
1145	G10.1 TIME OUT	The response to a G10.1 instruction was not received from the PMC within the specified time limit.
1146	G10.1 FORMAT ERROR	The G10.1 instruction format is in error.
1152	G31.9/G31.8 FORMAT ERROR	The format of the G31.9(continuous high-speed skip function) or G31.8(EGB skip function / skip function for flexible synchronization control) block is erroneous in the following cases: The format of the G31.9 or G31.8 block is erroneous in the following cases: - The axis was not specified in the G31.9 or G31.8 block. - Multiple axes were specified in the G31.9 or G31.8 block. - The P code was specified in the G31.9 or G31.8 block. - G31.8 was commanded out of flexible synchronization control mode. - The Q was specified out of range in flexible synchronization control mode.

No.	Message	Description
1153	CANNOT USE G31.9	G31.9 cannot be specified in this modal state. This alarm is also generated when G31.9 is specified when a group 07 G code (e.g. tool radius compensation) is not canceled.
1160	COMMAND DATA OVERFLOW	An overflow occurred in the position data within the CNC. This alarm is also generated if the target position of a command exceeds the maximum stroke as a result of calculation such as coordinate conversion, offset, or introduction of a manual intervention amount.
1196	ILLEGAL DRILLING AXIS SELECTED	An illegal axis was specified for drilling in a canned cycle for drilling. If the zero point of the drilling axis is not specified in a block containing a G code in a canned cycle.
1200	PULSCODER INVALID ZERO RETURN	The grid position could not be calculated during grid reference position return using the grid system as the one–revolution signal was not received before leaving the deceleration dog. This alarm is also generated when the tool does not reach a feedrate that exceeds the servo error amount preset to parameter No. 1841 before the deceleration limit switch is left (deceleration signal *DEC returns to “1”).
1202	NO F COMMAND AT G93	F codes in the inverse time specification mode (G93) are not handled as modal, and must be specified in individual blocks.
1223	ILLEGAL SPINDLE SELECT	An attempt was made to execute an instruction that uses the spindle although the spindle to be controlled has not been set correctly.
1298	ILLEGAL INCH/METRIC CONVERSION	(1) When the bit 1 (CIM) of parameter No.11222 set to 0, and the workpiece coordinate system has been shifted from the machine coordinate system by the following, the inch/metric conversion has been performed. - Manual intervention performed with the manual absolute signal being off - Machine locked - Handle interrupt - Mirror image - Workpiece coordinate system shift caused by local coordinate system setting (G52) or workpiece coordinate system setting (G92) (2) The inch/metric conversion cannot be commanded in a present mode.
1300	ILLEGAL ADDRESS	The axis No. address was specified even though the parameter is not an axis–type while loading parameters or pitch error compensation data from a tape or by entry of the G10 parameter. Axis No. cannot be specified in pitch error compensation data.
1301	MISSING ADDRESS	The axis No. was not specified even though the parameter is an axis–type while loading parameters or pitch error compensation data from a tape or by entry of the G10 parameter. Or, data No. address N, or setting data address P or R are not specified.

No.	Message	Description
1302	ILLEGAL DATA NUMBER	A non–existent data No. was found while loading parameters or pitch error compensation data from a tape or by entry of the G10 parameter. An invalid address R value is specified in a pattern program for each machining purpose on the high–speed high–precision setting screen. This alarm is also generated when illegal word values are found.
1303	ILLEGAL AXIS NUMBER	An axis No. address exceeding the maximum number of controlled axes was found while loading parameters from a tape or by entry of the G10 parameter.
1304	TOO MANY DIGIT	Data with too many digits was found while loading parameters or pitch error compensation data from a tape.
1305	DATA OUT OF RANGE	Out–of–range data was found while loading parameters or pitch error compensation data from a tape. The values of the data setting addresses corresponding to L Nos. during data input by G10 was out of range. This alarm is also generated when NC programming words contain out–of–range values.
1306	MISSING AXIS NUMBER	A parameter which requires an axis to be specified was found without an axis No. (address A) while loading parameters from a tape.
1307	ILLEGAL USE OF MINUS SIGN	Data with an illegal sign was found while loading parameters or pitch error compensation data from a tape, or by entry of the G10 parameter. A sign was specified to an address that does not support the use of signs.
1308	MISSING DATA	An address not followed by a numeric value was found while loading parameters or pitch error compensation data from a tape.
1332	DATA WRITE LOCK ERROR	Could not load data while loading parameters, pitch error compensation data and work coordinate data from tape.
1333	DATA WRITE ERROR	Could not write data while loading data from tape.
1370	PARAMETER SETTING ERROR (DM3H-1)	Out–of–range data was set during setting of the 3-dimensional handle feed parameter.
1371	PARAMETER SETTING ERROR (DM3H-2)	An illegal rotary axis was set during setting of the 3-dimensional handle feed parameter.
1372	PARAMETAR SETTING ERROR (DM3H-3)	An illegal master axis was set during setting of the 3-dimensional handle feed parameter.
1470	G40.1 –G42.1 PARAMETER MISS	A parameter setting related to normal direction control is illegal. The axis number of a normal direction controlled axis is set in parameter No. 5480, but that axis number is in the range of the number of controlled axes. The axis set as a normal direction controlled axis is not set as a rotary axis (parameter ROTx (No. 1006#0)) = 1 and No.1022=0).
1471	ILLEGAL COMMAND IN G40.1 –G42.1	An invalid G code was specified in the normal direction control mode.
1508	DUPLICATE M-CODE (INDEX TABLE REVERSING)	A function to which the same code as this M code is set exists. (index table indexing)
1509	DUPLICATE M-CODE (SPOS AXIS ORIENTATION)	A function to which the same code as this M code is set exists. (spindle positioning, orientation)

No.	Message	Description
1510	DUPLICATE M-CODE (SPOS AXIS POSITIONING)	A function to which the same code as this M code is set exists. (spindle positioning, positioning)
1511	DUPLICATE M-CODE (SPOS AXIS RELEASE)	A function to which the same code as this M code is set exists. (spindle positioning, mode cancel)
1537	ADDRESS F UNDERFLOW (OVERRIDE)	The speed obtained by applying override to the F instruction is too slow.
1538	ADDRESS F OVERFLOW (OVERRIDE)	The speed obtained by applying override to the F instruction is too fast.
1543	ILLEGAL GEAR SETTING	The gear ratio between the spindle and position coder, or the set position coder number of pulses is illegal in the spindle positioning function.
1561	ILLEGAL INDEXING ANGLE	The specified angle of rotation is not an integer multiple of the minimum indexing angle.
1564	INDEX TABLE AXIS – OTHER AXIS SAME TIME	The index table indexing axis and another axis have been specified in the same block.
1567	INDEX TABLE AXIS DUPLICATE AXIS COMMAND	Index table indexing was specified during axis movement or on an axis for which the index table indexing sequence was not completed.
1580	ENCODE ALARM (PSWD&KEY)	When an attempt was made to read a program, the specified password did not match the password on the tape and the password on tape was not equal to 0. When an attempt was made to output an encrypted tape, the password was not in the range 1 to 99999999. The password parameter is No. 3220.
1581	ENCODE ALARM (PARAMETER)	When an attempt was made to output an encrypted tape, the output code parameter was set to EIA. Set parameter ISO (No. 0000#1) to “1”. An incorrect instruction was specified for program encryption or protection. This alarm is generated if an attempt is made to perform program editing, deletion, or range-specified output in the protected range in the lock state. Or, a program outside the protected range is specified in rage specification output in the unlock state. The protected range is defined from the program No. preset by parameter No. 3222 up to the program No. preset to parameter No. 3223. When both parameters are set to 0, the protected range becomes O9000 to O9999.
1590	TH ERROR	A TH error was detected during reading from an input device. The read code that caused the TH error and how many statements it is from the block can be verified in the diagnostics screen.
1591	TV ERROR	An error was detected during the single–block TV error. The TV check can be suppressed by setting bit 0 (TVC) of parameter No. 0000 to 0.

No.	Message	Description
1593	EGB PARAMETER SETTING ERROR	Error in setting a parameter related to the EGB (1) The setting of bit 0 (SYNx) of parameter No. 2011, is not correct. (2) The slave axis specified with G81 is not set as a rotary axis. (bit 0 (ROTx) of parameter No. 1006) (3) Number of pulses per rotation (Parameter (No. 7772 or 7773) or (No. 7782 or 7783) is not set.) (4) For a hobbing-machine-compatible command, parameter No. 7710 is not specified. (5) No signal-based EGB synchronization ratio (parameters Nos. 7784 and 7785) has been set.
1594	EGB FORMAT ERROR	Error in the format of the block of an EGB command (1) T (number of teeth) is not specified in the G81 block. (2) In the G81 block, the data specified for one of T, L, P, and Q is out of its valid range. (3) In the G81 block, only one of P and Q is specified.
1595	ILL-COMMAND IN EGB MODE	During synchronization with the EGB, a command that must not be issued is issued. (1) Slave axis command using G27, G28, G29, G30,G30.1, G33, G53, etc. (2) Inch/metric conversion command using G20, G21, etc. (3) Synchronization start command using G81 when bit 3 (ECN) of parameter No. 7731 is 0
1596	EGB OVERFLOW	An overflow occurred in the calculation of the synchronization coefficient.
1597	EGB AUTO PHASE FORMAT ERROR	Format error in the G80 or G81 block in EGB automatic phase synchronization (1) R is outside the permissible range.
1598	EGB AUTO PHASE PARAMETER SETTING ERROR	Error in the setting of a parameter related to EGB automatic phase synchronization (1) The acc./dec. parameter is not correct. (2) The automatic phase synchronization parameter is not correct.
1805	ILLEGAL COMMAND	[I/O Device] An attempt was made to specify an illegal command during I/O processing on an I/O device. [G30 Zero Return] The P address Nos. for instructing No. 2 to No. 4 zero return are each out of the range 2 to 4. [Single Rotation Dwell] The specified spindle rotation is “0” when single rotation dwell is specified.
1806	DEVICE TYPE MISS MATCH	An operation not possible on the I/O device that is currently selected in the setting was specified. This alarm is also generated when file rewind is instructed even though the I/O device is not a FANUC Cassette.
1807	PARAMETER SETTING ERROR	An I/O interface option that has not yet been added on was specified. The external I/O device and baud rate, stop bit and protocol selection settings are erroneous.
1808	DEVICE DOUBLE OPENED	An attempt was made to open a device that is being accessed.

No.	Message	Description
1809	ILLEGAL COMMAND IN G41/G42	Specified direction tool length compensation parameters are incorrect. A move instruction for a axis of rotation was specified in the specified direction tool length compensation mode.
1820	ILLEGAL DI SIGNAL STATE	(1) An each axis workpiece coordinate system preset signal was turned “1” in the state in which all axes on the path including the axis on which to perform preset with the each axis workpiece coordinate system were not stopped or in which a command was in execution. (2) When an M code for performing preset with an each axis workpiece coordinate system preset signal was specified, the each axis workpiece coordinate system preset signal was not turned “1”. (3) The auxiliary function lock is enabled. (4) When bit 6 (PGS) of parameter No. 3001 was set to 0 (M, S, T, and B codes are not output in the high speed program check mode), an M code for turning “1” an each axis workpiece coordinate system preset signal in the high speed program check mode was specified.
1823	FRAMING ERROR(1)	The stop bit of the character received from the I/O device connected to RS232-C interface 1 was not detected.
1830	DR OFF(2)	The data set ready input signal DR of the I/O device connected to RS232-C interface 2 turned OFF. Possible causes are an I/O device not turned on, a broken cable, and a defective printed circuit board.
1832	OVERRUN ERROR(2)	During input by RS232-C interface 2, an overrun, parity, or framing error has been found. The number of bits of input data does not match, or the baud rate setting or the I/O device specification number is not correct.
1833	FRAMING ERROR(2)	The stop bit of the character received from the I/O device connected to RS232-C interface 2 was not detected.
1834	BUFFER OVERFLOW(2)	During input of data by RS232-C interface 2, although a read stop command was issued, more than 10 characters were input. The I/O device or printed circuit board was defective.
1889	ILLEGAL COMMAND IN G54.3	An illegal command was issued in G54.3 block. (1) An attempt was made to command G54.3 in a mode in which it cannot be accepted. (2) The command was not issued in a single block.
1912	V-DEVICE DRIVER ERROR (OPEN)	An error occurred during device driver control.
1919	FATAL ERROR(USB MEMORY)	A fatal error occurred in the USB file system. To restore the file system, turn the power off.
1924	UNEXPECTED ERROR(USB MEMORY)	An unexpected error occurred in the USB file system.
1925	ILLEGAL PATH/FILE(USB MEMORY)	An invalid path or file name was specified.
1926	ACCESS DENIED(USB MEMORY)	The USB memory could not be accessed.

No.	Message	Description
1927	DEVICE IN FORMATTING(USB MEMORY)	The USB memory is being formatted.
1928	DEVICE NOT FOUND(USB MEMORY)	No USB memory is inserted. Check the connection.
1930	ILLEGAL COMMAND AFTER RESTART	The restart block does not satisfy either of the following conditions: (1) An absolute command is specified in the block. (2) The G00 or G01 command is specified in the block. Select a block satisfying conditions (1) and (2) as the restart block.
1931	ILLEGAL MODE AFTER RESTART	Suppress motion is specified in a mode in which suppress motion is not available. Select a block in a mode in which suppress motion is available as the restart block.
1932	DEVICE IS FULL(USB MEMORY)	The capacity of the USB memory is insufficient.
1937	RECOGNITION ERROR(USB MEMORY)	The format of the USB memory is invalid. Format the USB memory in FAT or FAT32 format. If the alarm is still issued, replace the USB memory.
1938	END OF FILE FOUND(USB MEMORY)	The end of file was detected before EOR(%) was read. The file may be damaged.
1939	UNDEFINED ERROR(USB MEMORY)	An undefined error occurred.
1951	DEVICE IS BUSY(USB MEMORY)	The USB memory is busy.
1952	TOO MANY FILES(USB MEMORY)	The maximum number of files that can be opened concurrently is exceeded.
1953	REMOVED IN ACCESSING(USB MEMORY)	The USB memory was removed while being accessed.
1954	PATH/FILE EXIST(USB MEMORY)	The specified path or file already exists.
1955	PATH/FILE NOT FOUND(USB MEMORY)	The specified path or file is not found.
1956	DEVICE OVERCURRENT(USB MEMORY)	Overcurrent was detected in the USB memory. Replace the USB memory.
1957	PARITY ERROR(USB MEMORY)	A parity error occurred in the USB memory. Turn the power to the CNC off.
1960	ACCESS ERROR (MEMORY CARD)	Illegal memory card accessing This alarm is also generated during reading when reading is executed up to the end of the file withou detection of the EOR code.
1961	NOT READY (MEMORY CARD)	The memory card is not ready.
1962	CARD FULL (MEMORY CARD)	The memory card has run out of space.
1963	CARD PROTECTED (MEMORY CARD)	The memory card is write–protected.
1964	NOT MOUNTED (MEMORY CARD)	The memory card could not be mounted.

No.	Message	Description
1965	DIRECTORY FULL (MEMORY CARD)	The file could not be generated in the root directory for the memory card.
1966	FILE NOT FOUND (MEMORY CARD)	The specified file could not be found on the memory card.
1967	FILE PROTECTED (MEMORY CARD)	The memory card is write–protected.
1968	ILLEGAL FILE NAME (MEMORY CARD)	Illegal memory card file name
1969	ILLEGAL FORMAT (MEMORY CARD)	Check the file name.
1970	ILLEGAL CARD (MEMORY CARD)	This memory card cannot be handled.
1971	ERASE ERROR (MEMORY CARD)	An error occurred during memory card erase.
1972	BATTERY LOW (MEMORY CARD)	The memory card battery is low.
1973	FILE ALREADY EXIST	A file having the same name already exists on the memory card.
2032	EMBEDDED ETHERNET/DATA SERVER ERROR	An error was returned in the Embedded Ethernet/Data Server function. For details, see the error message screen of the Embedded Ethernet/Data Server.
2038	WRONG COMMUNICATION COMBINATION	The combination of the hardware and the software about communication function is wrong. The detail information is indicated to diagnosis information 4400 and 4401.
2052	#500-#549P-CODE MACRO COMMON SELECT(CANNOT USE SETVN)	The variable name cannot be entered. The SETVN command cannot be used with the P-CODE macro common variables #500 to #549.
2053	P-CODE VARIABLE NUMBER IS OUTSIDE OF RANGE	An attempt was made to enter a P-CODE-only variable not existing in the system.
2054	EXTENDED P-CODE VARIABLE NUMBER IS OUTSIDE OF RANGE	An attempt was made to enter an extended P-CODE-only variable not existing in the system.
2070	G02.1/ G03.1 FORMAT ERROR	- The format is invalid. - The specified arc exceeds the interpolation enable range.
2090	INTERRUPTED BLOCK NOT FOUND	The coordinates of the end point of the interrupted block in temporary execution and the coordinates of the memorized end point of interrupted block are different. The followings are assumed as a cause. - The number of blocks counted during temporary execution and the number of blocks counted during a normal operation are different. - Because number of the blocks or travel distance were changed by editing the program before interruption block, the coordinates of the end point of the interruption block were changed. - Amount of the offset was changed. - Coordinate system was changed.

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No.	Message	Description
2095	ILLEGAL REGISTER OF PEAX PROGRAM	The peripheral axis control program cannot be registered because of the following factors. - G100 was not commanded after the G101 (or G102, G103) was commanded. - The block including the starting command of registration of the peripheral axis control program (G101, G102, G103) not includes the Q command. (Only when the axis of certain path is assigned as peripheral axis of two or more peripheral axis control.)
4010	ILLEGAL REAL VALUE OF OBUF :	The real value for a output buffer is in error.
4500	REPOSITIONING COMMAND ERROR	(1) M code for clamping a workpiece or M code for releasingthe workpiece is not set. (2) A repositioning command(G75) and M/T code is commanded in the same block. (3) A repositioning command(direct command of M code for clamping a workpiece) was specified in the circular interpolation(G02, G03) mode. (4) A repositioning command(direct command of M code forclamping a workpiece) was specified in the coordinate system rotation(G84) mode. (5) A repositioning command(direct command of M code for clamping a workpiece) was specified in the offset(G41, G42) mode.
4502	ILLEGAL COMMAND IN BOLT HOLE	The bolt hole circle (G26) was executed in the following state, ・I, J or K was not specified. ・I ≦ 0 ・K = 0
4503	ILLEGAL COMMAND IN LINE AT ANGLE	The line at angle (G76) was executed in the following state, ・I, J or K was not specified. ・K ≦ 0
4504	ILLEGAL COMMAND IN ARC	The arc (G77) was executed in the following state, ・I, J, P or K was not specified. ・I ≦ 0 ・K ≦ 0
4505	ILLEGAL COMMAND IN GRID	The grid (G78, G79) was executed in the following state, ・I, J, P or K was not specified. ・P ≦ 0 ・K ≦ 0
4506	ILLEGAL COMMAND IN SHARE PROOFS	The shear proof (G86) was executed in the following state, ・I, J or P was not specified. ・In case of parameter AIP (No.16202#0) = 0 |I|< 1.5×|P| ・In case of parameter AIP (No.16202#0) = 1 |I|< |P| ・P = 0
4507	ILLEGAL COMMAND IN SQUARE	The square (G87) was executed in the following state, ・I, J or P was not specified. ・P ≦ 0 ・Q ≦ 0 ・|I| < 3×|P| ・|J| < 3×|Q|

No.	Message	Description
4508	ILLEGAL COMMAND IN RADIUS	The radius (G88) was executed in the following state, ・I, J, K, P or Q was not specified. ・I ≦ 0 ・Q ≦ 0 ・In case of specifying negative value for P 　| P | ＞ 2.0 × I ・Commanded arc length ＜ Q
4509	ILLEGAL COMMAND IN CUT AT ANGLE	The cut at angle (G89) was executed in the following state, ・I, J, P or Q was not specified. ・Q ≦ 0 ・I ＜ Q
4510	ILLEGAL COMMAND IN LINE-PUNCH	The linear punching (G45) was executed in the following state, ・X, Y or P was not specified. ・Line length ＜ 1.5 × P ・P ≦ 0 ・Q ≦ 0
4511	ILLEGAL COMMAND IN CIRCLE-PUNCH	The circular punching (G46,G47) was executed in the following state, ・R or Q was not specified. ・R = 0 ・Q ≦ 0 ・Start point = End point ・Arc length ＜ Q
4520	INHIBITED IN NIBBLING-MODE	T code, M code, G04, G05, G05.1, G08, G28, G30.1, G70 or G75 was specified in the nibbling mode.
4521	EXCESS NIBBLING MOVEMENT (X,Y)	In the nibbling mode, the X-axis or Y-axis traveling distance was larger than or equal to the limit (No.16188 to 16192)
4522	EXCESS NIBBLING MOVEMENT (C)	In the nibbling mode, the C-axis traveling distance was larger than or equal to the limit (No.16194)
4523	ILLEGAL COMMAND IN CIRCLE-NIBBL	The circular nibbling (G68) was executed in the following state, ・I, J, K, P or Q was not specified. ・I, J, K, P or Q was out of range. ・In case of specifying negative value for P 　|P| ≧ 2I ・Q ＞ Maximum pitch (parameter No.16186)
4524	ILLEGAL COMMAND IN LINE-NIBBL	The linear nibbling (G69) was executed in the following state, ・I, J, P or Q was not specified. ・I, J, P or Q was out of range. ・Q ＞ Maximum pitch (parameter No.16186)
4530	A/B MACRO COMMAND ERROR	(1) M code for clamping a workpiece or M code for releasing the workpiece is not set. (2) A repositioning command(G75) and M/T code is commanded in the same block. (3) A repositioning command(direct command of M code for clamping a workpiece) was specified in the circular interpolation(G02, G03) mode. (4) A repositioning command(direct command of M code for clamping a workpiece) was specified in the coordinate system rotation(G68) mode. (5) A repositioning command(direct command of M code for clamping a workpiece) was specified in the offset(G41, G42) mode.

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No.	Message	Description
4531	U/V MACRO FORMAT ERROR	An attempt was made to store a macro while storing another macro using a U or V macro. A V macro was specified although the processing to store a macro was not in progress. A U macro number and V macro number do not correspond with each other.
4532	IMPROPER U/V MACRO NUMBER	The number of an inhibited macro was specified in a U or V macro command.
4533	U/V MACRO MEMORY OVERFLOW	An attempt was made to store too many macros with a U or V macro command.
4534	W MACRO NUMBER NOT FOUND	Macro number W specified in a U or V macro command is not stored.
4536	NO W,Q COMMAND IN MULTI-PIECE	W or Q was not specified in the command for taking multiple workpieces.
4537	ILLEGAL Q VALUE IN MULTI-PIECE	In the command for taking multiple workpieces, Q is set to a value beyond the range from 1 to 4.
4538	W NO. NOT FOUND IN MULTI-PIECE	Macro number W specified in the command for taking multiple workpieces is not stored.
4539	MULTI-PIECE SETTING IS ZERO	The command for taking multiple workpieces was specified although zero is specified for the function to take multiple workpieces (No. 16206 or signals MLP1 and MLP2<Gn231.0,.1>).
4540	MULTI-PIECE COMMAND WITHIN MACRO	The command for taking multiple workpieces was specified when a U or V macro was being stored.
4542	MULTI-PIECE COMMAND ERROR	Although G98 P0 was specified, the G73 command was issued. Although G98 K0 was specified, the G74 command was issued.
4543	MULTI-PIECE Q COMMAND ERROR	Although G98 P0 was specified, the Q value for the G74 command was not 1 or 3. Although G98 P0 was specified, the Q value for the G73 command was not 1 or 2.
4544	MULTI-PIECE P/R COMMAND ERROR	(1) In the command for resuming taking multiple workpieces, the resume position (P) is set to a value beyond the range from 1 to total number of workpieces to be machined. (2) In the command for end position of taking multiple workpieces, the end position (R) is set to a value beyond the range from 1 to total number of workpieces to be machined. (3) In the command for end position of taking multiple workpieces, the end position (R) is set to a smaller value than the resume position (P).
4600	T,C COMMAND IN INTERPOLATION	In the linear interpolation (G01) mode or circular interpolation (G02, G03) mode, a T command or C-axis command was specified.
4601	INHIBITED T,M COMMAND	In the block of G10, G22, G23, G52, G53, G72, G73, G74, G75, G92, G98 a T or M command was specified.
4602	ILLEGAL T-CODE	The specified T command in not cataloged on the tool register screen.
4604	ILLEGAL AXIS OPERATION	A C-axis command was specified in the block containing a T command for multiple tools.
4606	INHIBITED T COMMAND	A T command was specified during normal line control.
4630	ILLEGAL COMMAND IN LASER MODE	In the laser mode, a nibbling command or pattern command was specified.
4650	IMPROPER G-CODE IN OFFSET MODE	In the cutter compensation mode, an inhibited G code was specified.
4751	CAN NOT COMMAND C AXIS	The C axis was commanded at the C axis command invalid block.

No.	Message	Description
4872	AUTO SETTING COMMAND ERROR	M code, S code or T code is specified with safety zone auto setting command (G32). G32 is specified in the nibbling mode, in the cutter compensation, in the rotation mode or the scaling mode.
5006	TOO MANY WORD IN ONE BLOCK	The number of words in a block exceeds the maximum. The maximum is 26 words. However, this figure varies according to NC options. Divide the instruction word into two blocks.
5007	TOO LARGE DISTANCE	Due to compensation, point of intersection calculation, interpolation or similar reasons, a movement distance that exceeds the maximum permissible distance was specified. Check the programmed coordinates or compensation amounts.
5009	PARAMETER ZERO (DRY RUN)	The dry run rate parameter No. 1410 or the parameter No. 1430 for the maximum cutting feedrate for each axis is 0.
5010	END OF RECORD	The EOR (End of Record) code is specified in the middle of a block. This alarm is also generated when the percentage at the end of the NC program is read.
5011	PARAMETER ZERO (CUT MAX)	The setting of the parameter No. 1430 for the maximum cutting feedrate is 0.
5016	ILLEGAL COMBINATION OF M CODES	M codes which belonged to the same group were specified in a block. Alternatively, an M code which must be specified without other M codes in the block was specified in a block with other M codes.
5018	POLYGON SPINDLE SPEED ERROR	In G51.2 mode, the speed of the spindle or polygon synchronous axis either exceeds the clamp value or is too small. The specified rotation speed ratio thus cannot be maintained. For polygon turning between spindles: More information as to why this alarm occurred is indicated in diagnosis data No. 471.
5020	PARAMETER OF RESTART ERROR	The setting of parameter No. 7310 for specifying the order of the axes on which to move to the machining restart position in a dry run is invalid. The valid range is from 1 to the number of controlled axes.
5030	ILLEGAL COMMAND (G100)	The end command (G100) was specified before the registration start command (G101, G102, or G103) was specified for the peripheral axis control.
5031	ILLEGAL COMMAND (G101, G102, G103)	While a registration start command (G101, G102, or G103) was being executed, another registration start command was specified for the peripheral axis control.
5032	NEW PRG REGISTERED IN PEAX MOVE	While the peripheral axis control is being executed, an attempt to register another move command was made.
5033	NO PROG SPACE IN MEMORY PEAX	The program of the peripheral axis control was not registered because of insufficient program memory.
5034	PLURAL COMMAND IN G110	Multiple movements were specified by G110 code of the peripheral axis control.
5038	TOO MANY START M-CODE COMMAND	More than six M codes to start the peripheral axis control were specified.
5039	START UNREGISTERED PEAX PROG	An attempt was made to execute a program for the peripheral axis control which had not been registered.

No.	Message	Description
5040	CAN NOT COMMANDED PEAX MOVE	The machine could not start the peripheral axis control. The following reasons can be considered. - The parameters Nos.11884 to 11891 were incorrectly specified. - The parameters Nos.3037 to 3039 and Nos.3040 to 3042 were incorrectly specified. - The data, which is required to be deleted, was not deleted after setting the parameters Nos.11884 to 11891. - The system type of the path which operates peripheral axis control is different from the parameter No.0983 of the path which is set by parameters Nos.3040 to 3042 when peripheral axis control is operated by the path which is not set by the parameters Nos.3040 to 3042. - Command mode of the path which uses peripheral axis control has been switched by lathe/machining center G code system switching function. - Peripheral axis control can not be started when automatic operation stop signal *SP of peripheral axis control is set to "1".
5043	TOO MANY G68 NESTING	3-dimensional coordinate conversion has been specified three or more times. To perform another coordinate conversion, perform cancellation, then specify the coordinate conversion.
5044	G68 FORMAT ERROR	Errors for 3-dimensional coordinate conversion command are: (1) No I, J, or K command was issued in 3-dimensional coordinate conversion command block. (without coordinate system rotation option) (2) All of I, J, or K command were 0 in 3-dimensional coordinate conversion command block. (3) No rotation angle R was not commanded in 3-dimensional coordinate conversion command block.
5050	ILL-COMMAND IN G81.1 MODE	- During chopping/oscillation, a move command has been issued for the chopping/oscillation axis. - Chopping/oscillation is specified for Cs contour control axis. - Machine lock for the axis while oscillation motion is executed. - Oscillation is specified for the slave axis of Superimposed control.
5058	G35/G36 FORMAT ERROR	A command for switching the major axis has been specified for circular threading. Alternatively, a command for setting the length of the major axis to 0 has been specified for circular threading.
5065	DIFFERRENT AXIS UNIT(PMC AXIS)	Axes having different increment systems have been specified in the same DI/DO group for PMC axis control. Modify the setting of parameter No. 8010.
5068	FORMAT ERROR IN G31P90	No travel axis was specified. Two or more travel axes were specified.
5073	NO DECIMAL POINT	No decimal point has been specified for an address requiring a decimal point.
5074	ADDRESS DUPLICATION ERROR	The same address has been specified two or more times in a single block. Alternatively, two or more G codes in the same group have been specified in a single block.

No.	Message	Description
5085	SMOOTH IPL ERROR 1	A block for specifying smooth interpolation contains a syntax error.
5110	IMPROPER G-CODE (AICC MODE)	A G code unspecifiable in AI contour control mode was specified.
5130	NC AND SUPERIMPOSE AXIS CONFLICT	In the PMC superimposed axis control, the NC command and The PMC axis control command were conflicted. Modify the program and the ladder.
5131	NC COMMAND IS NOT COMPATIBLE	The PMC axis control and 3-dimensional coordinate conversion or a polar coordinate interpolation were specified simultaneously. Modify the program and the ladder.
5132	CANNOT CHANGE SUPERIMPOSED AXIS	The superimposed axis was selected for the axis for which the PMC superimposed axis is being controlled.
5195	DIRECTION CAN NOT BE JUDGED	Measurement is invalid in the tool compensation measurement value direct input B function. [For 1-contact input] 1. The recorded pulse direction is not constant. - The machine is at a stop in the offset write mode. - The servo power is off. - Pulse directions are diverse. 2. The tool is moving along the two axes (X-axis and Y-axis). [For the movement direction discrimination specification] 1. The recorded pulse direction is not constant. - The machine is at a stop in the offset write mode. - The servo power is off. - Pulse directions are diverse. 2. The tool is moving along the two axes (X-axis and Z-axis). 3. The direction indicated by the tool compensation write signal does not match the movement direction of the axis.
5219	CAN NOT RETURN	Manual intervention and return cannot be performed during execution of 3-dimensional coordinate system conversion, tilted working plane indexing.
5220	REFERENCE POINT ADJUSTMENT MODE	In case of distance coded linear scale I/F, the reference point auto setting parameter bit 2 (DATx) of parameter No.1819 is set to 1. Move the machine to reference position by manual operation and execute manual reference position return.
5242	ILLEGAL AXIS NUMBER	A master axis number or a slave axis number was not set correctly when the flexible synchronization control mode was turned from off to on during automatic operation. In inter-path flexible synchronization control, this alarm is issued in either of the following cases. (The alarm is issued at the start of inter-path flexible synchronization control.) 1. The axis number of the master or slave axis is incorrect. 2. The master and slave axis settings make a loop.
5243	DATA OUTRANGE	A gear ratio was not set correctly when the flexible synchronization control mode was turned from off to on during automatic operation.

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No.	Message	Description
5244	TOO MANY DI ON	- When an attempt was made to change the flexible synchronization control status, the select signal was not turned on or off after the execution of the M code. - An attempt was made to turn flexible synchronization control on or off without stopping the tool along all axes. (Except when automatic phase synchronization for flexible synchronization control is used) - Flexible synchronization control was turned off in any of the following function modes: - Tilted working plane indexing
5245	OTHER AXIS ARE COMMANDED	- For a flexible synchronization control group for which a PMC axis was a master axis, an attempt was made to turn on the synchronization mode during time other than automatic operation. - An attempt was made to turn on a synchronization group for which an PMC axis was a master axis when there existed a flexible synchronization control group for which a non-PMC, normal axis was a master axis. - The master and slave axes as synchronization axes overlap the EGB dummy axis. - The master and slave axes as synchronization axes overlap the oscillation axis. - The master and slave axes as synchronization axes overlap the axis related to angular axis control. - The master and slave axes as synchronization axes overlap the axis related to composite control. - The master and slave axes as synchronization axes overlap the axis related to superposition control. - The slave axis as a synchronization axis overlaps the axis related to synchronization control. - The reference position return mode is turned on (was turned on). - Over travel alarm occurs on slave axis. - A servo alarm occurred in a path in inter-path flexible synchronization control. - An emergency stop was applied in another path in inter-path flexible synchronization control. - When an attempt was made to execute flexible synchronization between different paths during automatic operation, the inter-path flexible synchronization mode was not enabled.
5257	G41/G42 NOT ALLOWED IN MDI MODE	Tool nose radius and tool nose radius compensation was specified in MDI mode. (Depending on the setting of the bit 4 (MCR) of parameter No. 5008)
5303	TOUCH PANEL ERROR	The touch panel is not connected correctly, or the touch panel cannot be initialized when the power is turned on. Correct the cause then turn on the power again.

No.	Message	Description
5305	ILLEGAL SPINDLE NUMBER	In a spindle select function by address P for a multiple spindle control, 1) Address P is not specified. 2) Parameter No.3781 is not specified to the spindle to be selected. 3) An illegal G code which cannot be commanded with an S_P_; command is specified. 4) A multi spindle cannot be used because the bit 1 (EMS) of parameter No. 3702 is 1. 5) The spindle amplifier number of each spindle is not set in parameter No. 3717. 6) A prohibited command for a spindle was issued (parameter No. 11090). 7) An invalid value is set in parameter No. 11090.
5312	ILLEGAL COMMAND IN G10 L75/76/77	One of formats in G10L75, G10L76, or G10L77 to G11 commands is in error, or the command value is out of data range. Modify the program.
5316	TOOL TYPE NUMBER NOT FOUND	A tool with the specified tool-type number could not be found. Modify the program or register the tool.
5317	ALL TOOL LIFE IS OVER	The lives of all tools with the specified tool-type number have expired. Replace the tool.
5320	DIA./RAD. MODE CAN'T BE SWITCHED	In any of the following states, diameter/radius programming was switched: 1) When a buffered program is being executed 2) When a movement is being made on the axis
5324	REFERENCE RETURN INCOMPLETE	Manual reference position return cannot be performed during three-dimensional coordinate conversion, execution of the tilted working plane indexing.
5329	M98 AND NC COMMAND IN SAME BLOCK	A subprogram call which is not a single block was commanded during canned cycle mode. Modify the program.
5330	G50.9 FORMAT ERROR	- There is not coordinates value specification in G50.9 block. - There is not M code, B code command in the G50.9 block. - G50.9 is commanded in canned cycle mode. - 3 blocks of G50.9 block are commanded consecutively.
5331	ILLEGAL COMMANDED POSITION	It didn't reach a commanded absolute coordinate value. The movement command or absolute coordinates at G50.9 block are wrong.
5339	ILLEGAL FORMAT COMMAND IS EXECUTED IN SYNC/MIX/OVL CONTROL.	(1) The value of P, Q, or L specified by G51.4/G50.4/G51.5/G50.5/G51.6/G50.6 is invalid. (2) A duplicate value is specified by parameter No. 12600.

No.	Message	Description
5346	RETURN TO REFERENCE POINT	The coordinate establishment of the Cs contour control axis is not made. Perform a manual reference position return. (1) When Cs coordinate establishment is made for the Cs-axis for which the Cs-axis reference position status signal CSPENx is 0 (2) When positional information is not sent from the spindle amplifier (3) When the servo off state is entered during the start of Cs-axis coordinate establishment (4) When the Cs-axis is subjected to synchronous control or superposition control (5) When the emergency stop state is entered during coordinate establishment (6) When an attempt is made to release composite control for the Cs axis being subjected to coordinate establishment (7) When an attempt is made to start synchronous, composite, or superposition control for the Cs axis being subjected to coordinate establishment.
5355	S CODE IS NOT COMMANDED AT G96	S code is not commanded at G96. Command S code at G96 block.
5356	IMPROPER G-CODE	Illegal G code was commanded in the hypothetical axis command mode or in the real axis command mode.
5357	ILLEGAL AXIS SELECT	The real axis is commanded in the hypothetical axis commanded mode. The hypothetical axis is commanded in the real axis command mode.
5359	MODE CHANGE ERROR	This alarm is generated in the following cases. (1) Mode switching was executed without using non-buffering M code in automatic operation. (2) Mode was switched to the hypothetical axis command mode in case that any axis in the hypothetical plane loses the reference position. (3) During the hypothetical axis command mode, any axis in the hypothetical plane loses the reference position. (4) Mode was switched in case the parameter LRP (No.1401#1) is set to 0. (5) Mode switching was executed during the following mode. - Cutter radius compensation - Tool length compensation - Tool offset - Scaling - Programmable mirror image - Coordinate system rotation - Canned cycle (6) Mode switching was executed when real axis in the hypothetical plane is moving.
5360	TOOL INTERFERENCE CHECK ERROR	This alarm is issued when interference with another tool is caused by a data modification based on G10 data input or file reading or when an attempt is made to modify the tool figure data of a tool registered in the cartridge.

No.	Message	Description
5361	ILLEGAL MAGAZINE DATA	Tools stored in the cartridge are interfering with each other. Reregister the tools in the cartridge, or modify the tool management data or tool figure data. If this alarm is issued, no tool interference check is made when tools are registered in the cartridge management table. Moreover, empty pot search operation does not operate normally. If this alarm is issued, the power must be turned off before operation is continued.
5362	CONVERT INCH/MM AT REF-POS	(1) When the bit 1 (INA) of parameter No. 14000 set to 1, the inch-metric switch command is executed at a position other than the machine coordinate system origin (position = zero). (2) When the bit 2 (IRF) of parameter No. 14000 set to 1, the inch-metric switch command is executed at the other than reference position (parameter No. 1240). Perform an inch/metric conversion after returning to the reference position.
5364	ILLEGAL COMMAND IN PROGRAM CHECK	(1) An unspecifiable G code was specified in the high-speed program check mode. (2) The angular axis control option is enabled. (3) One of the following operations was performed. - High precision oscillation in the high-speed program check mode - Starting the high-speed program check mode during high precision oscillation - Reference position return of an axis for which the reference position is not established, in the high-speed program check mode (4) Switching of PMC axis selection signal EAX*<G0136> was performed. (5) G10 was specified for bit 3 (PGR) of parameter No. 3454 in the high-speed program check mode. (6) G10 was specified for bit 6 (PGS) of parameter No. 3001 in the high-speed program check mode.
5365	NOT CHANGE OF PROGRAM CHECK MODE	(1) Switching of high-speed program check input signal PGCK<Gn290.5> was performed during execution of the program.
5372	IMPROPER MODAL G-CODE (G53.2)	In a block in which G53.2 is specified, a G code in group 01 other than G00 and G01 is specified. Or, G53.2 is specified when the modal G code in group 01 is in a state other than the G00 and G01 states.
5373	ARGUMENT CONVERSION ERROR	For outputting a target MDI program for program restart, a macro call argument cannot be converted to a 9-digit number.
5374	FSC MODE MISMATCH IN RESTART	The current flexible synchronization mode differs from the flexible synchronization mode specified in a programmed command in the program restart block.
5375	FSC MODE CAN NOT CHANGED	The flexible synchronization mode was changed during the execution of program restart.
5376	FSC SLAVE AXIS CAN NOT COMMANDED	In the flexible synchronization mode, a command was specified for the slave axis.
5377	INVALID COMMAND AFTER FSC OFF	After the flexible synchronization mode was canceled, an incremental command was specified before an absolute command for the axis specified as the slave axis.

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No.	Message	Description
5378	INVALID RESTART BLOCK	The block specified as the restart block after the flexible synchronization mode was canceled was not a block after an absolute command for the axis specified as the slave axis.
5379	WRITE PROTECTED TO SLAVE AXIS	You cannot directly set parameters for a slave axis under axis synchronous control.
5381	INVALID COMMAND IN FSC MODE	An attempt was made to issue the following commands: (1) When the reference position for the master axis under flexible synchronization control has not been established, G28 command for the master axis. (2) G27/G28/G29/G30/G53 command for a slave axis.
5384	RETRACT FOR RIGID CANNOT BE CMD	In retraction for 3-dimensional rigid tapping by the G30 command, different program coordinate system are used at the stop of rigid tapping and in retraction for rigid tapping. The program coordinate system, is the coordinate system for the program after conversion is determined by the rotation center, the direction of rotation, and the rotation angle that was commanded by the arguments of the G68 or G68.2 command. In other words, the arguments of G68 or G68.2 command are different at the stop of rigid tapping and in retraction for rigid tapping. Modify the program.
5391	CAN NOT USE G92	Workpiece coordinate system setting G92 (or G50 for the lathe system G-code system A) cannot be specified. (1) After tool length compensation was changed by tool length compensation shift type, G92 was specified when no absolute command is present. (2) G92 was specified in the block in which G49 is present.
5425	ILLEGAL OFFSET VALUE	The offset number is incorrect.
5445	CAN NOT COMMAND MOTION IN G39	Corner circular interpolation (G39) of tool radius and tool nose radius compensation is not specified alone but is specified with a move command. Modify the program.
5446	NO AVOIDANCE AT G41/G42	Because there is no interference evade vector, the interference check evade function of tool radius and tool nose radius compensation cannot evade interference.
5447	DANGEROUS AVOIDANCE AT G41/G42	The interference check evade function of tool radius and tool nose radius compensation determines that an evade operation will lead to danger.
5448	INTERFERENCE TO AVD. AT G41/G42	In the interference check evade function of tool radius and tool nose radius compensation, a further interference occurs for an already created interference evade vector.
5456	TOO MANY G68.2 NESTING	Tilted working plane indexing G68.2 was specified more than once. To perform another coordinate conversion, perform cancellation, then specify the coordinate conversion.
5457	G68.2 FORMAT ERROR	A G68.2 format error occurred.

No.	Message	Description
5458	ILLEGAL USE OF G53.1/G53.6	- G53.1/G53.6 was specified preceding G68.2. - G53.1/G53.6 needs to be specified solely. - There is no angle solution for the rotation axis that controls the tool direction in the +Z-axis direction of the feature coordinate system. - No tool is specified with a G53.6 command.
5462	ILLEGAL COMMAND (G68.2/G69)	(1) The modal setting used when G68.2 or G69 is specified is incorrect. (2) An unspecifiable G code was specified in the G68.2 mode. (3) The offset vector of tool radius/tool nose radius compensation is not canceled when G68.2 or G69 is specified.
5559	ILL. AXIS OPERATION (COORD SYS)	When the bit 2 (MSC) of parameter No. 11501=1, and the workpiece coordinate system is shifted from the machine coordinate system by the movement command in the machine lock state, the axis movement was commanded. Please operate "reference position return" or "workpiece coordinate system preset" etc.
5560	ILLEGAL DEPTH OF CUT	On the peck rigid tapping, the depth of cut (Q) is smaller than the cutting start distance (d).

8.1.2 Parameter Writing Alarm (SW Alarm)

No.	Message	Description
SW0100	PARAMETER ENABLE SWITCH ON	The parameter setting is enabled (bit 0 (PWE) of parameter No. 8900 is set to 1). To set the parameter, turn this parameter ON. Otherwise, set to OFF.

8.1.3 Servo Alarms (SV Alarm)

No.	Message	Description
SV0001	SYNC ALIGNMENT ERROR	In axis synchronous control, the amount of compensation for synchronization exceeded the parameter No. 8325 setting value. This alarm occurs for a master or slave axis.
SV0002	SYNC EXCESS ERROR ALARM 2	In axis synchronous control, the amount of synchronization error exceeded the parameter No. 8332 setting value. When the synchronization is not completed after power-up, the determination is made by the value of parameter No. 8332 multiplied by the parameter No. 8330 multiplier. This alarm occurs only for a slave axis only.
SV0003	SYNCHRONOUS/ COMPOSITE/ SUPERIMPOSED CONTROL MODE CAN'T BE CONTINUED	Since as axis in synchronization, composition, or superimposed mode caused a servo alarm, the mode could not be continued. If one of the axes in a mode causes a servo alarm, all axes relating to the axis enter the servo-off state. This alarm is generated to enable the cause of the servo-off state to be checked.
SV0004	EXCESS ERROR (G31)	The amount of positional deviation during torque limit skip command operation exceeded the limit value of the parameter No. 6287.
SV0005	SYNC EXCESS ERROR (MCN)	In axis synchronous control, for synchronization, the difference value of the machine coordinate between a master and slave axes exceeded the parameter No. 8314 setting value. This alarm occurs for a master or slave axis.
SV0006	ILLEGAL TANDEM AXIS	For the slave axis under tandem control, absolute position detection is set (parameter bit 5 (APCx) of parameter No. 1815 = 1).

No.	Message	Description
SV0007	SV ALM ANOTHER PATH (MULTI AMP.)	When a multi-axis amplifier was used in a multi-path system across paths, a servo alarm occurred on an axis belonging to another path. When a system with two or more paths and multiple servo axes between paths are controlled by a multi-axis amplifier, if a servo alarm occurs on an axis belonging to another path of the same amplifier, the MCC of the amplifier goes down and alarm SV0401 “IMPROPER V_READY OFF“ occurs on an axis belonging to the local path in the same amplifier. Since alarm SV0401 is caused by a servo alarm occurred on an axis in another path, alarm SV0007 is caused together to clearly indicate the fact. The axis belonging to another path in the same amplifier resolves the cause of the servo alarm.
SV0010	SV OVERHEAT	Amplifier internal overheat
SV0011	SV MOTOR OVER CURRENT(SOFT)	The digital servo software detected an abnormal specified value. Possible causes include an unconnected power cable, cable disconnection (open phase), and short-circuit.
SV0012	SV DRIVE OFF CIRCUIT FAILURE	The two drive off inputs are not in the same status or a drive off circuit error occurred.
SV0013	SV CPU BUS FAILURE	An error was found in CPU bus data in the amplifier.
SV0014	SV CPU WATCH DOG	An error occurred in CPU operation in the amplifier.
SV0015	SV LOW VOLT DRIVER	The driver power supply voltage has dropped in the amplifier. Possible causes include improper insertion of the control PC board and amplifier failure.
SV0016	SV CURRENT DETECT ERROR	An error was found in motor current detection data in the amplifier. Possible causes include improper insertion of the control PC board and amplifier failure.
SV0017	SV INTERNAL SERIAL BUS FAILURE	An error occurred in serial bus communication in the amplifier. Possible causes include improper insertion of the control PC board and amplifier failure.
SV0018	SV ROM DATA FAILURE	An error was found in ROM data in the amplifier.
SV0019	SV MOTOR OVER CURRENT(GND FAULT)	A ground fault occurred in the motor, power cable, or amplifier.
SV0024	PS SOFT THERMAL	A load higher than the rating was applied.
SV0031	PS ILLEGAL PARAMETER	An invalid value is set for a PS control parameter.
SV0032	PS CONTROL AXIS ERROR 1	An invalid value is set for parameter No. 2557. Set parameter APS (No.11549#0) to 1 and execute automatic setting.
SV0033	PS CONTROL AXIS ERROR 2	An invalid value is set for parameter No. 2557. Set parameter APS (No.11549#0) to 1 and execute automatic setting.
SV0034	PS HARDWARE ERROR	A PS hardware error was detected.
SV0040	PS EXTERNAL INPUT COMPONENT ERROR	There is something trouble in control parameter for PS, cable, PS itself, or the external component such as input filter or transducer.
SV0041	PS PFB-R ERROR	A PFB-R error is detected.
SV0042	PS PFB-C ERROR	A PFB-C error is detected.

No.	Message	Description
SV0043	PS SUB MODULE ERROR	The wiring or the combination of components is illegal.
SV0044	MISMATCHED FUNCTION CODE	CNC, SV, SP or PS software has been update. Turn the power off, then restart.
SV0301	APC ALARM: COMMUNICATION ERR	Since the absolute-position detector of the phase A/B caused a communication error, the correct machine position could not be obtained. (data transfer error) The absolute-position detector, cable, or servo interface module is thought to be defective.
SV0302	APC ALARM: OVER TIME ERR	Since the absolute-position detector of the phase A/B caused an overtime error, the correct machine position could not be obtained. (data transfer error) The absolute-position detector, cable, or servo interface module is thought to be defective.
SV0303	APC ALARM: FRAMING ERR	Since the absolute-position detector of the phase A/B caused a framing error, the correct machine position could not be obtained. (data transfer error) The absolute-position detector, cable, or servo interface module is thought to be defective.
SV0304	APC ALARM: PARITY ERR	Since the absolute-position detector of the phase A/B caused a parity error, the correct machine position could not be obtained. (data transfer error) The absolute-position detector, cable, or servo interface module is thought to be defective.
SV0305	APC ALARM: PULSE ERR	Since the absolute-position detector of the phase A/B caused a pulse error, the correct machine position could not be obtained. The absolute-position detector, or cable is thought to be defective.
SV0306	APC ALARM: OVER FLOW ERR	Since the amount of positional deviation overflowed, the correct machine position could not be obtained. Check to see the parameter No. 2084 or No. 2085.
SV0307	APC ALARM: MOVEMENT EXCESS ERR	Since the machine moved excessively, the correct machine position could not be obtained.
SV0360	ABNORMAL CHECKSUM(INT)	The checksum alarm occurred on the built–in Pulsecoder.
SV0361	ABNORMAL PHASE DATA(INT)	The phase data abnormal alarm occurred on the built–in Pulsecoder.
SV0363	ABNORMAL CLOCK(INT)	The clock alarm occurred on the built–in Pulsecoder.
SV0364	SOFT PHASE ALARM(INT)	A digital servo soft detected an abnormality on the built in Pulsecoder.
SV0365	BROKEN LED(INT)	The digital servo software detected abnormal data on the built–in Pulsecoder.
SV0366	PULSE MISS(INT)	A pulse error occurred on the built–in Pulsecoder.
SV0367	COUNT MISS(INT)	A count error occurred on the built–in Pulsecoder.
SV0368	SERIAL DATA ERROR(INT)	The communications data could not be received from the built–in Pulsecoder.
SV0369	DATA TRANS. ERROR(INT)	A CRC error or stop bit error occurred in the communications data from the built–in Pulsecoder.
SV0380	BROKEN LED(EXT)	Separate detector error
SV0381	ABNORMAL PHASE(EXT)	An abnormal alarm in the position data occurred on the separate detector.
SV0382	COUNT MISS(EXT)	A count error occurred on the separate detector.

No.	Message	Description
SV0383	PULSE MISS(EXT)	A pulse error occurred on the separate detector.
SV0384	SOFT PHASE ALARM(EXT)	The digital servo software detected abnormal data on the separate detector.
SV0385	SERIAL DATA ERROR(EXT)	The communications data could not be received from the separate detector.
SV0386	DATA TRANS. ERROR(EXT)	A CRC error or stop bit error occurred in the communications data from the standalone detector.
SV0387	ABNORMAL ENCODER(EXT)	An abnormality occurred on a separate detector. For more information, contact the scale manufacturer.
SV0401	IMPROPER V_READY OFF	Although the ready signal (PRDY) of the position control was ON, the ready signal (VRDY) of the velocity control was OFF.
SV0403	CARD/SOFT MISMATCH	The combination of the axis control card and the servo software is incorrect. Probable causes are given below. (1) The correct axis control card is not attached. (2) The correct servo software is not installed in flash memory.
SV0404	IMPROPER V_READY ON	Although the ready signal (PRDY) of the position control was OFF, the ready signal (VRDY) of the velocity control was ON.
SV0407	EXCESS ERROR	The difference value of the amount of positional deviation for the synchronization axis exceeded the setting value. (during synchronous control only)
SV0409	DETECT ABNORMAL TORQUE	An unexpected disturbance torque was detected on the servo motor, or during Cs axis or spindle positioning. The alarm can be canceled by RESET.
SV0410	EXCESS ERROR (STOP)	The amount of positional deviation during stopping exceeded the parameter No. 1829 setting value.
SV0411	EXCESS ERROR (MOVING)	The amount of positional deviation during traveling became excessive than the parameter setting value.
SV0413	LSI OVERFLOW	The counter for the amount of positional deviation overflowed
SV0415	MOTION VALUE OVERFLOW	The velocity exceeding the travel velocity limit was commanded.
SV0417	ILL DGTL SERVO PARAMETER	A digital serve parameter setting is incorrect. When bit 4 of diagnosis data No. 203 is 1, an illegal parameter was detected by the servo software. Identify the cause with reference to diagnosis data No. 352. When bit 4 of diagnosis data No. 203 is 0, the CNC software detected an illegal parameter. Probable causes are given below (see diagnosis data No. 280). 1) The value specified in parameter No. 2020 as the motor model falls outside the specified range. 2) The motor rotation direction in parameter No. 2022 is not set to a correct value (111 or -111). 3) The speed feedback pulse count per motor rotation in parameter No. 2023 is set to a negative or other incorrect value. 4) The position feedback pulse count per motor rotation in parameter No. 2024 is set to a negative or other incorrect value.

No.	Message	Description
SV0420	SYNC TORQUE EXCESS	In axis synchronous control, for synchronization, the difference value of torque between a master and slave axes exceeded the parameter (No. 2031) setting value. This alarm occurs for a master axis.
SV0421	EXCESS ERROR(SEMI-FULL)	The difference between the feedback from the semi and full sides exceeded the setting of parameter No. 2118.
SV0422	EXCESS VELOCITY IN TORQUE	In torque control, the commanded permissible velocity was exceeded.
SV0423	EXCESS ERROR IN TORQUE	In torque control, the total permissible move value specified as a parameter was exceeded.
SV0430	SV MOTOR OVERHEAT	The servo motor has overheated.
SV0431	PS OVERLOAD	Overheat
SV0432	PS LOW VOLT. CONTROL	The control power supply voltage has dropped.
SV0433	PS LOW VOLT. DC LINK	Low DC link voltage
SV0434	SV LOW VOLT CONTROL	Low control power voltage
SV0435	SV LOW VOLT DC LINK	Low DC link voltage
SV0436	SOFTTHERMAL(OVC)	The digital servo software detected a software thermal (OVC).
SV0437	PS OVERCURRENT	Overcurrent on input circuit section.
SV0438	SV ABNORMAL CURRENT	Motor overcurrent
SV0439	PS OVER VOLT. DC LINK	The DC link voltage is too high.
SV0440	PS EXCESS-REGENERATION2	Excessive generative discharge
SV0441	ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.
SV0442	PS PRE-CHARGE FAILURE	The spare charge circuit for the DC link is abnormal.
SV0443	PS INTERNAL FAN FAILURE	Internal cooling fan failure.
SV0444	SV INTERNAL FAN FAILURE	Internal cooling fan failure.
SV0445	SOFT DISCONNECT ALARM	The digital servo software detected a disconnected Pulsecoder.
SV0446	HARD DISCONNECT ALARM	The hardware detected a disconnected built–in Pulsecoder.
SV0447	HARD DISCONNECT(EXT)	The hardware detected a disconnected separate detector.
SV0448	UNMATCHED FEEDBACK ALARM	The sign of the feedback signal from the standalone detector is opposite to that from the feedback signal from the built–on Pulsecoder.
SV0449	SV IPM ALARM	The IPM (Intelligent Power Module) detected an alarm.
SV0453	SPC SOFT DISCONNECT ALARM	Software disconnection alarm of the built-in Pulsecoder. Turn off the power to the CNC, then remove and insert the Pulsecoder cable. If this alarm is issued again, replace the Pulsecoder.

No.	Message	Description
SV0454	ILLEGAL ROTOR POS DETECT	The magnetic pole position detection function terminated abnormally. The magnetic pole could not be detected because the motor did not run.
SV0456	ILLEGAL CURRENT LOOP	An attempt was made to set the current loop that could not be set. The amplifier pulse module in use does not comply with high-speed HRV. Or, requirements to control are not satisfied in the system.
SV0458	CURRENT LOOP ERROR	The specified current loop differs from the actual current loop.
SV0459	HI HRV SETTING ERROR	For two axes whose servo axis numbers (parameter No. 1023) are consecutively even and odd numbers, high-speed HRV control is possible for one axis and impossible for the other.
SV0460	FSSB DISCONNECT	The FSSB connection was discontinued. Probable causes are: 1. The FSSB connection cable was disconnected or broken. 2. The amplifier was turned off . 3. In the amplifier, the low-voltage alarm occurred.
SV0462	SEND CNC DATA FAILED	The correct data could not be received on a slave side because of the FSSB communication error.
SV0463	SEND SLAVE DATA FAILED	The correct data could not be received in the servo software because of the FSSB communication error.
SV0465	READ ID DATA FAILED	A read of the ID information for the amplifier has failed at power-on.
SV0466	MOTOR/AMP. COMBINATION	The maximum current of an amplifier is different to that of a motor. Probable causes are: 1. The connection command for an amplifier is incorrect. 2. The parameter (No. 2165) setting is incorrect.
SV0468	HI HRV SETTING ERROR(AMP)	An attempt was made to set up high-speed HRV control for use when the controlled axis of an amplifier for which high-speed HRV control could not be used.
SV0474	EXCESS ERROR (STOP:SV)	On the n-th axis, the servo detected that the value of the positioning deviation limit for each axis when stopped exceeded the setting (parameters Nos. 1839 and 1842).
SV0475	EXCESS ERROR (MOVE:SV)	On the n-th axis, the servo detected that the value of the positioning deviation limit for each axis in movement exceeded the setting (parameters Nos. 1838 and 1841).
SV0476	ILLEGAL SPEED CMD. (SV)	On the n-th axis, the servo detected that during safety monitoring (the safety monitoring request signal *VLDVx is 0), the velocity command exceeded the safety speed (parameters Nos. 13821 to 13824 (during position control) or Nos. 13826 to 13829 (during velocity control). Operate the system within the safety speed.

No.	Message	Description
SV0477	ILLEGAL MACHINE POS.(SV)	On the n-th axis, the servo detected that during safety monitoring (the safety monitoring request signal *VLDVx is 0), the machine position is outside the safety area (range set with parameters Nos. 13831 to 13838). Operate the system within the safety area. A machine position check is performed only on an axis on which a reference position has been established. A machine position check is not performed on an axis on which a reference position is not yet established.
SV0478	ILLEGAL AXIS DATA (SV)	The servo detected that an error occurred during transfer of axis data in the n-axis. When an alarm occurred because the configuration of the servo amplifier was changed, set the axis number for the servo amplifier (set bit 4 of parameter No. 2212 of the corresponding axis to 1 and then 0 and turn off the power of the entire system). When using a multiaxis amplifier, this operation may not clear the alarm. In this case, repeat this operation for the axes on which the alarm persists. If an alarm occurs due to a cause other than the above, replace the servo amplifier.
SV0481	SAFETY PARAM ERROR (SV)	On the n-th axis, the servo detected that an error occurred in a safety parameter.
SV0484	SAFETY FUNCTION ERR (SV)	A safety function error related to the servo was detected in the n-axis. (1) The servo or CNC detected that the safety function was not executed in the servo. (2) The result of a servo safety function check did not match the result of a CNC safety function check. (3) An error occurred during a test of the CPU of the servo. (4) An error occurred during a check of RAM of the servo.
SV0488	SAFE TEST OVER TIME	The MCC shutoff set was not completed within the set time (parameter No. 1946). Check the MCC contact.
SV0489	SAFETY PARAM ERROR(CNC)	On the n-th axis, the CNC detected that an error occurred in a safety parameter.
SV0490	SAFETY FUNCTION ERR (CNC)	On the n-th axis, an error occurred in a safety function for the CNC. - The servo detected that a safety function was not executed in the CNC. - The results of a safety function check on the CNC did not match those of a safety function check on the servo.
SV0494	ILLEGAL SPEED CMD. (CNC)	On the n-th axis, the CNC detected that during safety monitoring (the safety monitoring request signal *VLDVx is 0), the velocity command exceeded the safety speed (parameters Nos. 13821 to 13824 (during position control) or Nos. 13826 to 13829 (during velocity control). Operate the system within the safety speed.
SV0495	ILLEGAL MACHINE POS.(CNC)	On the n-th axis, the CNC detected that during safety monitoring (the safety monitoring request signal *VLDVx is 0), the machine position is outside the safety area (range set with parameters Nos. 13831 to 13838). Operate the system within the safety area. A machine position check is performed only on an axis on which a reference position has been established.

No.	Message	Description
SV0496	ILLEGAL AXIS DATA (CNC)	The CNC detected that an error occurred during transfer to axis data. When an alarm occurred because the configuration of the servo amplifier was changed, set the axis number for the servo amplifier (set bit 4 of parameter No. 2212 of the corresponding axis to 1 and 0 again and turn off the power of the entire system). When using a multiaxis amplifier, this operation may not clear the alarm. In this case, repeat this operation for the axes on which the alarm persists. If an alarm occurs due to a cause other than the above, replace the servo amplifier.
SV0498	AXIS NUMBER NOT SET (CNC)	The CNC detected that the axis number of axis n was not set in the servo amplifier. Because the axis number is automatically set, turn off the power to the entire system.
SV0600	SV DC LINK OVER CURRENT	DC link overcurrent.
SV0601	SV EXTERNAL FAN FAILURE	Radiator cooling fan failure.
SV0602	SV RADIATOR OVERHEAT	The servo amplifier radiator has overheated.
SV0603	SV IPM ALARM(OH)	The IPM (Intelligent Power Module) detected an overheat alarm.
SV0604	AMP COMMUNICATION ERROR	The communication between Servo Amplifier (SV) and Common Power Supply (PS) is in error.
SV0605	PS EXCESS-REGENERATION1	The motor regenerative power is too much.
SV0606	PS EXTERNAL FAN FAILURE	External radiator cooling fan failure.
SV0607	PS IMPROPER INPUT POWER	An abnormality was found with the input power supply.
SV0646	ABNORMAL ANALOG SIGNAL(EXT)	An error occurred in the analog 1Vp-p output of the separate detector. The separate detector, cable, or separate detector interface unit may be failed.
SV0649	MOTOR OVER SPEED	The motor speed exceeds the permissible level in the n-axis.
SV0652	TEMP. ERROR	Communication between the separate detector interface unit and temperature sensor was disconnected.
SV0653	EXCESS ERROR(SV)	Regarding position error during moving, the difference between ideal value and real value exceeds the parameter value specified No.2460 in the n-axis.
SV0654	DB RELAY FAILURE	A failure occurs in the dynamic brake relay of the servo amplifier. Replace the amplifier.
SV0657	CARD/SV FUNCTION MISMATCH	The combination of the axis control card and the servo function is incorrect. Identify the cause with reference to diagnosis data No.3508.
SV0659	ILLEGAL SETTING OF SSM	The setting for SSM is invalid. The followings are assumed as a cause. 1) The servo amplifier does not support SSM. 2) The setting of parameters related to SSM is invalid.
SV1025	V_READY ON (INITIALIZING)	The ready signal (VRDY) of the velocity control which should be OFF is ON while the servo control is ON.

No.	Message	Description
SV1026	ILLEGAL AXIS ARRANGE	The parameter for servo axis arrange is not set correctly. (1) Parameter No. 1023 (servo axis number of each axis) is set to a negative value or a duplicate value. (2) The settings for parameter No. 1023 (servo axis number of each axis) were made with a certain setting skipped among 1 to 6, 9 to 14, or 17 to 22. (3) A setting of a multiple of 8 or a multiple of 8 minus 1 was made.
SV1051	ILLEGAL SYNCHRONOUS AXIS	In axis synchronous control, the parameter setting for the axis for which distance coded linear scale I/F is used, is incorrect. Set the following parameters to the same values for the master axis and slave axis. - Parameter No. 1821 (mark-1 interval) - Parameter No. 1882 (mark-2 interval) - Bit 2 (DC2x) and Bit 1 (DC4x) of parameter No.1802 (the number of marks)
SV1055	ILLEGAL TANDEM AXIS	In tandem control, the setting of the parameter No. 1023 is incorrect. In tandem control, the setting of the bit 6 (TDM) of parameter No. 1817 is incorrect.
SV1067	FSSB:CONFIGURATION ERROR(SOFT)	An FSSB configuration error occurred (detected by software). The connected amplifier type is incompatible with the FSSB setting value.
SV1068	DUAL CHECK SAFETY ALARM	In a dual check safety function, an alarm was generated that caused the MCC for the entire system to be off.
SV1069	EXCESS ERROR (SERVO OFF:CNC)	On the n-th axis, the CNC detected that the value of the position error during servo off exceeded the value (parameter No. 1840).
SV1070	EXCESS ERROR (SERVO OFF:SV DSP)	On the n-th axis, the servo detected that the value of the positioning deviation limit during servo off exceeded the setting (parameter No. 1840).
SV1071	EXCESS ERROR (MOVE:CNC)	On the n-th axis, the CNC detected that the value of the positioning deviation limit for each axis in movement exceeded the setting (parameters Nos. 1838 and 1841).
SV1072	EXCESS ERROR (STOP:CNC)	On the n-th axis, the CNC detected that the value of the positioning deviation limit for each axis when stopped exceeded the setting (parameters Nos. 1839 and 1842).
SV1100	S-COMP. VALUE OVERFLOW	The amount of compensation for the straightness exceeded a maximum value of 32767.
SV5134	FSSB:OPEN READY TIME OUT	In the initialization, the FSSB could not be in an open ready sate. The axis card is thought to be defective.
SV5136	FSSB:NUMBER OF AMP. IS INSUFFICIENT	The number of amplifier identified by the FSSB is insufficient than the number of control axes. Or, the setting of the number of axes or the amplifier connection is in error.
SV5137	FSSB:CONFIGURATION ERROR	An FSSB configuration error occurred. The connecting amplifier type is incompatible with the FSSB setting value.
SV5139	FSSB:ERROR	Servo initialization has not completed successfully. It is probable that an optical cable failed or a connection between the amplifier and another module failed.

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No.	Message	Description
SV5197	FSSB:OPEN TIME OUT	The FSSB could not be opened although the CNC permitted the opening of the FSSB. Check the connection between the CNC and the amplifier.
SV5311	FSSB:ILLEGAL CONNECTION	Different current loops (HRV) are set for FSSB lines. Specify the same current loop for the FSSB lines.

8.1.4 Overtravel Alarms (OT Alarm)

No.	Message	Description
OT0500	+ OVERTRAVEL (SOFT 1)	Exceeded the positive side stored stroke check 1.
OT0501	- OVERTRAVEL (SOFT 1)	Exceeded the negative side stored stroke check 1.
OT0502	+ OVERTRAVEL (SOFT 2)	Exceeded the positive side stored stroke check 2. Or, in the chuck tail stock barrier, an entry to the entry-inhibition area was made during movement in the positive direction.
OT0503	- OVERTRAVEL (SOFT 2)	Exceeded the negative side stored stroke check 2. Or, in the chuck tail stock barrier, an entry to the entry-inhibition area was made during movement in the negative direction.
OT0504	+ OVERTRAVEL (SOFT 3)	Exceeded the positive side stored stroke check 3.
OT0505	- OVERTRAVEL (SOFT 3)	Exceeded the negative side stored stroke check 3.
OT0506	+ OVERTRAVEL (HARD)	The stroke limit switch in the positive direction was triggered. This alarm is generated when the machine reaches the stroke end. When this alarm is generated, feed of all axes is stopped during automatic operation. During manual operation, only the feed of the axis on which the alarm occurred is stopped.
OT0507	- OVERTRAVEL (HARD)	The stroke limit switch in the negative direction was triggered. This alarm is generated when the machine reaches the stroke end. When this alarm is generated, feed of all axes is stopped during automatic operation. During manual operation, only the feed of the axis on which the alarm occurred is stopped.
OT0508	INTERFERENCE: +	A tool moving in the positive direction along the n axis has fouled another tool post.
OT0509	INTERFERENCE: -	A tool moving in the negative direction along the n axis has fouled another tool post.
OT0510	+ OVERTRAVEL (PRE-CHECK)	The block end point or the tool path between blocks was found in the + side stroke limit forbidden area during Stroke limit check before move. Modify the program.
OT0511	- OVERTRAVEL (PRE-CHECK)	The block end point or the tool path between blocks was found in the - side stroke limit forbidden area during Stroke limit check before move. Modify the program.
OT1710	ILLEGAL ACC. PARAMETER(OPTIMUM TORQUE ACC/DEC)	The permissible acceleration parameter for the optimum torque acc./dec. is in error. A possible cause is either of the following: (1) The ratio of a negative acceleration to a positive acceleration is not more than the limit value. (2) The time to reduce to a velocity of 0 exceeded the maximum time.

8.1.5 Memory File Alarms (IO Alarm)

No.	Message	Description
IO1001	FILE ACCESS ERROR	The resident–type file system could not be accessed as an error occurred in the resident–type file system.
IO1002	FILE SYSTEM ERROR	The file could not be accessed as an error occurred in the CNC file system.
IO1030	CHECK SUM ERROR	The checksum of the CNC part program storage memory is incorrect.
IO1032	MEMORY ACCESS OVER RANGE	Accessing of data occurred outside the CNC part program storage memory range.
IO1034	PROG-FOLDER FILE IS BROKEN	Abnormality of data was detected in the program folder file. It is necessary to initialize the program file to recover. Please refer to the paragraph of the maintenance manual "IPL monitor" for the initialization operation of the program file.
IO1035	PROG-MANAGEMENT FILE IS BROKEN	Abnormality of data was detected in the program management file. It is necessary to initialize the program file to recover. Please refer to the paragraph of the maintenance manual "IPL monitor" for the initialization operation of the program file.
IO1104	OVER MAXIMUM TOOL LIFE PAIRS	The maximum number of tool life management pairs is exceeded. Modify the setting of the maximum number of tool life management pairs in parameter No. 6813.

8.1.6 Alarms Requiring Power to be Turned Off (PW Alarm)

No.	Message	Description
PW0000	POWER MUST BE OFF	A parameter was set for which the power must be turned OFF then ON again.
PW0001	X-ADDRESS IS NOT ASSIGNED.	The X address of the PMC could not be assigned correctly. This alarm may occur in the following case: - During the setting of parameter No. 3013, the X address could not be assigned correctly for the deceleration dog (*DEC) for a return to the reference position.
PW0002	PMC address is not correct(AXIS).	The address to assign the axis signal is incorrect. This alarm may occur in the following case: - The parameter No. 3021 setting is incorrect.
PW0003	PMC address is not correct(SPINDLE).	The address to assign the spindle signal is incorrect. This alarm may occur in the following case: - The parameter No. 3022 setting is incorrect.
PW0004	SETTING THE LOADER SYSTEM PATH NUMBER IS NOT CORRECT.	The loader system could not be assigned correctly. The parameter No. 984 setting is incorrect. - The number of loader systems and the number of systems specified to the loader system in the parameter LCP (No. 984#0) does not match. - The parameter LCP (No. 984#0) of the path 1 is set to 1.
PW0006	POWER MUST BE OFF (ILL-EXEC-CHK)	The malfunction prevention function detected an alarm to require the power off.

No.	Message	Description
PW0007	X-ADDRESS(SKIP) IS NOT ASSIGNED	The X address of PMC could not be assigned correctly. Possible causes are: - During the set of parameter No. 3012, the skip signal of the X address was not assigned correctly. - During the set of parameter No. 3019, the address other than the skip signal of the X address was not assigned correctly. When there are four or more paths, the signals must be assigned by bit 2 (XSG) of parameter No. 3008, parameter No. 3012, and parameter No. 3019.
PW0008	CPU SELF TEST ERROR(DCS PMC)	On the DCS PMC, the CPU self diagnosis function detected an error; or the RAM check function detected an error.
PW0009	CPU SELF TEST ERROR(PMC)	On the PMC, the CPU self diagnosis function detected an error; or the RAM check function detected an error.
PW0010	SAFE I/O CROSS CHECK ERROR(DCS PMC)	On the DCS PMC, the I/O cross-check function detected a system definition safety-related DI/DO error.
PW0011	SAFE I/O CROSS CHECK ERROR(PMC)	On the PMC, the I/O cross-check function detected a system definition safety-related DI/DO error.
PW0012	USER I/O CROSS CHECK ERROR(DCS PMC)	On the DCS PMC, the I/O cross-check function detected a user definition safety-related DI/DO error.
PW0013	USER I/O CROSS CHECK ERROR(PMC)	On the PMC, the I/O cross-check function detected a user definition safety-related DI/DO error.
PW0014	CPU TEST ALARM (CNC)	An error occurred in a CPU test on the CNC.
PW0015	SAFETY PARAM ERROR	The CNC detected that an error occurred in a safety parameter other than those of servo and spindle types.
PW0016	RAM CHECK ERROR	An error was detected in a RAM check on the CNC.
PW0017	INEXECUTION OF SAFETY FUNCTIONS	Safety functions was not executed normally in the CNC.
PW0018	CRC CHECK ERROR	An error occurred in a CRC check on the CNC.
PW0036	ILLEGAL SETTING FOR SERVO MOTOR SPINDLE	The parameter setting for the servo axes for spindle use of the spindle control with servo motor is illegal. - The servo axes number for spindle use has exceeded 4 axes. - Servo axes number for spindle use are fewer than the axes number of designation of servo axes for spindle use. - The servo axes for spindle use is not set as a spindle control with servo motor axis. - The servo axes for spindle use is not set as a rotation axis.. - The servo axis number (parameter No. 1023) is a negative value.

No.	Message	Description
PW0037	SV/SP COMBINATION ERROR	- The servo axis might be a setting of the dummy axis. Check to see the parameters No. 1023, No. 2009#0, and No. 11802#4. - The index number of spindle axis that synchronizes servo axis might be illegal.Check to see the parameters No. 3716#0, No. 3717, and No. 24204. - FSSB high-speed rigid tapping cannot be used with the rigid tapping by the analog spindle or the spindle control with servo motor.
PW0041	DATA TABLE(D) SETTING IS ILLEGAL	The address of data table (D) PMC caculated from parameter (No.1313), stored stroke limit range switching data selection signal (OTD0-OTD15), and the switching data area is illegal. (1) The specified first address is illegal. (2) It is not a multiple of four. (3) The range of the specified data table is illegal.
PW0050	POWER MUST BE OFF (INITIALIZED COMMUNICATIO N)	When the power is turned on, the hardware of the communication function was initialized. The power must be turned off to be effective. This alarm may occur in the following cases: - When the option board is added or replaced - When the software option is changed
PW0060	PS CONTROL AXIS ERROR 3	Amplifier group number duplication. Set parameter APS (No. 11549#0) to 1 and execute automatic setting.
PW1102	ILLEGAL PARAMETER (I-COMP.)	The parameter for setting inclination compensation is incorrect. This alarm occurs in the following cases: - When the number of pitch error compensation points on the axis on which inclination compensation is executed exceeds 128 between the most negative side and most positive side - When the size relationship between the inclination compensation point Nos. is incorrect - When the inclination compensation point is not located between the most negative side and most positive side of pitch error compensation - When the compensation per compensation point is too small or too large.
PW1103	ILLEGAL PARAMETER (S-COMP.128)	The parameter for setting 128 straightness compensation points or the parameter compensation data is incorrect.
PW5046	ILLEGAL PARAMETER (S-COMP.)	The setting of a parameter related to straightness compensation is invalid. Possible causes are: - A nonexistent axis number is set in a moving or compensation axis parameter. - More than 128 pitch error compensation points are set between the furthest points in the negative and positive regions. - The straightness compensation point numbers do not have correct magnitude relationships. - No straightness compensation point is found between the furthest pitch error compensation point in the negative region and that in the positive region. - The compensation per compensation point is either too large or too small.

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No.	Message	Description
PW5390	R-ADDRESS SETTING IS ILLEGAL	One of the R address range of the PMC set by parameters No. 3773, No. 13541 and No. 13542 or the first address of the range is invalid.

8.1.7 Spindle Alarms (SP Alarm)

No.	Message	Description
SP0740	RIGID TAP ALARM : EXCESS ERROR	The positional deviation of the stopped spindle has exceeded the set value of parameter No.5313 during rigid tapping.
SP0741	RIGID TAP ALARM : EXCESS ERROR	The positional deviation of the moving spindle has exceeded the set value of parameter No.5311 during rigid tapping.
SP0742	RIGID TAP ALARM : LSI OVERFLOW	An LSI overflow has occurred for the spindle during rigid tapping.
SP0752	SPINDLE MODE CHANGE ERROR	This alarm is generated if the system does not properly terminate a mode change. The modes include the Cs contour control, spindle positioning, rigid tapping, and spindle control modes. The alarm is activated if the spindle control unit does not respond correctly to the mode change command issued by the NC.
SP0754	ABNORMAL TORQUE	An unexpected disturbance torque was detected in a spindle motor. The alarm can be canceled by RESET.
SP0755	SAFETY FUNCTION ERROR	The CNC CPU detected that the safely function of the n-th spindle was not executed. Alternatively, the result of a CNC safety function check did not match the result of a spindle safety function check.
SP0756	ILLEGAL AXIS DATA	The CNC CPU detected an error during transfer of spindle data in the nth spindle. When this alarm is issued because the configuration of the spindle amplifiers was changed, set the spindle number for the spindle amplifier (set bit 7 of parameter No. 4541 to 1 and then 0, and turn the power to the entire system off).
SP0757	SAFETY SPEED OVER	The CNC CPU detected that during safety monitoring (when safety monitoring request signal *VLDPs is 0), the spindle motor speed was greater than the safety speed (parameter No. 4372, 4438, 4440, or 4442) on the n-th spindle. Operate within the safety speed.
SP1202	SPINDLE SELECT ERROR	In a multi spindle control, the spindle number other than the valid spindle number was selected by a position coder select signal. An attempt was made to select the spindle number of the system having no valid spindle.
SP1220	NO SPINDLE AMP.	Either the cable connected to a serial spindle amplifier is broken, or the serial spindle amplifier is not connected.
SP1221	ILLEGAL MOTOR NUMBER	The spindle No. and the motor No. are incorrectly matched.
SP1224	ILLEGAL SPINDLE-POSITION CODER GEAR RATIO	The spindle–position coder gear ratio was incorrect.
SP1225	CRC ERROR (SERIAL SPINDLE)	A CRC error (communications error) occurred in communications between the CNC and the serial spindle amplifier.
SP1226	FRAMING ERROR (SERIAL SPINDLE)	A framing error occurred in communications between the CNC and the serial spindle amplifier.

No.	Message	Description
SP1227	RECEIVING ERROR (SERIAL SPINDLE)	A receive error occurred in communications between the CNC and the serial spindle amplifier.
SP1228	COMMUNICATION ERROR (SERIAL SPINDLE)	A communications error occurred between the CNC and the serial spindle amplifier.
SP1229	COMMUNICATION ERROR SERIAL SPINDLE AMP.	A communications error occurred between serial spindle amplifiers (motor Nos. 1 and 2, or motor Nos. 3–4).
SP1231	SPINDLE EXCESS ERROR (MOVING)	The position deviation during spindle rotation was greater than the value set in parameters.
SP1232	SPINDLE EXCESS ERROR (STOP)	The position deviation during spindle stop was greater than the value set in parameters.
SP1233	POSITION CODER OVERFLOW	The error counter/speed instruction value of the position coder overflowed.
SP1234	GRID SHIFT OVERFLOW	Grid shift overflowed.
SP1240	DISCONNECT POSITION CODER	The analog spindle position coder is broken.
SP1241	D/A CONVERTER ERROR	The D/A converter for controlling analog spindles is erroneous.
SP1243	ILLEGAL SPINDLE PARAMETER SETTING(GAIN)	The setting for the spindle position gain is incorrect.
SP1244	MOTION VALUE OVERFLOW	The amount of distribution to a spindle is too much
SP1245	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP1246	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP1247	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP1252	ILLEGAL SPINDLE PARAMETER SETTING(TANDEM)	Setting of parameter No. 4597 is invalid. Possible causes are : - A value that is larger than the maximum number of controlled spindle axes is set in parameter No. 4597. - A negative value except for –1 is set in parameter No. 4597. - Relationship of master axis and slave axis that is set in parameter No. 4597 is illegal. - When the spindle amplifier that is not applicable the function is used, a value except for 0 is set in parameter No. 4597.
SP1255	CAN NOT CHANGE SPINDLE MODE	In the analog spindle control, rigid tapping and spindle positioning can not be used except when the number of pulses output from the position coder of the spindle is 4096pulse/rev.
SP1256	SPINDLE PHASE-SYNC IMPOSSIBLE	Arbitrary spindle position phase synchronous control cannot be executed. Save the spindle position.

SP1257	ILLEGAL PARAMETER (No.3791#0)	Bit 0(SSE) of parameter No.3791 is illegal setting. Causes of the alarm are as follows.
		- The setting of parameter SSE is different because of the master and slave. Please change the following function to the same setting.
		  - Spindle synchronous control
		  - Spindle command synchronous control
		  - Polygon turning with two spindles
		- The parameter SSE is set to 1 the spindle control software that does not support this function. Please set 0 to parameter SSE.

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No.	Message	Description
SP1258	ILLEGAL SPINDLE PARAMETER SETTING(SOFT)	The parameter is an illegal setting. Please check as follows. - Bit 0 of parameter No.4542 is set to 1 the spindle control software that does not support this function. Please set 0 to the bit 0 of parameter No.4542.
SP1700	SAFETY PARAM ERROR	On the n-th spindle, the CNC detected that an error occurred in a safety parameter.
SP1969	SPINDLE CONTROL ERROR	An error occurred in the spindle control on the CNC. Report the conditions (the system configuration, the operation, the frequency of error occurrence and so on) to FANUC.
SP1970	SPINDLE CONTROL ERROR	An initialization of a spindle didn't complete in the spindle control on the CNC. Check a state of the connection between CNC and the spindle amplifier. If this alarm still occurs even after the check of the connection, report the conditions (the system configuration, the operation, the frequency of error occurrence and so on) to FANUC.
SP1971	SPINDLE CONTROL ERROR	An error occurred in the spindle control on the CNC. Report the conditions (the system configuration, the operation, the frequency of error occurrence and so on) to FANUC.
SP1972	SPINDLE CONTROL ERROR	An error occurred in the spindle control on the CNC. For machining center system, confirm whether or not it isn't selecting the 4th gear in the rigid tapping. If this alarm occurred in other case, or for lathe system, report the conditions (the system configuration, the operation, the frequency of error occurrence and so on) to FANUC.
SP1975	ANALOG SPINDLE CONTROL ERROR	An position coder error was detected on the analog spindle.
SP1976	SERIAL SPINDLE COMMUNICATION ERROR	The amplifier No. could not be set to the serial spindle amplifier.
SP1977	SERIAL SPINDLE COMMUNICATION ERROR	An error occurred during communications with the serial spindle amplifier. The trouble of the hardware for the serial spindle control or influences of the noise might be the cause.
SP1978	SERIAL SPINDLE COMMUNICATION ERROR	A time–out was detected during communications with the serial spindle amplifier.
SP1979	SERIAL SPINDLE COMMUNICATION ERROR	The communications sequence was no longer correct during communications with the serial spindle amplifier.
SP1980	SERIAL SPINDLE AMP. ERROR	Defective SIC–LSI on serial spindle amplifier
SP1981	SERIAL SPINDLE AMP. ERROR	An error occurred during reading of the data from SIC–LSI on the serial spindle amplifier side.
SP1982	SERIAL SPINDLE AMP. ERROR	An error occurred during reading of the data from SIC–LSI on the serial spindle amplifier side.
SP1983	SERIAL SPINDLE AMP. ERROR	Could not clear on the spindle amplifier side.
SP1984	SERIAL SPINDLE AMP. ERROR	An error occurred during the re-initialization of the serial spindle amplifier. The trouble of the hardware for the serial spindle control or influences of the noise might be the cause.

No.	Message	Description
SP1985	SERIAL SPINDLE CONTROL ERROR	Failed to automatically set parameters
SP1986	SERIAL SPINDLE CONTROL ERROR	An error occurred during the reading of the spindle parameters. The trouble of the hardware for the serial spindle control or influences of the noise might be the cause.
SP1987	SERIAL SPINDLE CONTROL ERROR	Defective SIC–LSI on the CNC
SP1988	SPINDLE CONTROL ERROR	An error occurred in the spindle control on the CNC. Report the conditions (the system configuration, the operation, the frequency of error occurrence and so on) to FANUC.
SP1989	SPINDLE CONTROL ERROR	An error occurred during communications with the serial spindle amplifier. The trouble of the hardware for the serial spindle control or influences of the noise might be the cause.
SP1996	ILLEGAL SPINDLE PARAMETER SETTING	The spindle was assigned incorrectly. Check to see the following parameter. (No. 3716 or 3717)
SP1999	SPINDLE CONTROL ERROR	An error occurred in the spindle control on the CNC. Report the conditions (the system configuration, the operation, the frequency of error occurrence and so on) to FANUC.

8.1.8 Overheat Alarms (OH Alarm)

No.	Message	Description
OH0700	LOCKER OVERHEAT	CNC cabinet overheat
OH0701	FAN MOTOR STOP	PCB cooling fan motor abnormality
OH0704	OVERHEAT	Spindle overheat due to detection of changes in the spindle speed (1) When the cutting load is large, offload the cutting conditions. (2) Check if the cutting tool became dull. (3) Check if the spindle amplifier malfunctions.

8.1.9 Other Alarms (DS Alarm)

No.	Message	Description
DS0001	SYNC EXCESS ERR (POS DEV)	In feed axis synchronization control, the difference in the amount of positional deviation between the master and slave axes exceeded the parameter No. 8323 setting value. This alarm occurs for the master or slave axis.
DS0002	SYNC EXCESS ERROR ALARM 1	In axis synchronous control, the difference in the amount of synchronization between the master and slave axes exceeded the parameter (No. 8331) setting value. This alarm occurs only for the slave axis.
DS0003	SYNCHRONIZE ADJUST MODE	The system is in the axis synchronous control mode.
DS0004	EXCESS MAXIMUM FEEDRATE	The malfunction prevention function detected the command in which a value exceeding the maximum speed was specified.
DS0005	EXCESS MAXIMUM ACCELERATION	The malfunction prevention function detected the command in which a value exceeding the maximum acceleration was specified.
DS0006	ILLEGAL EXECUTION SEQUENCE	The malfunction prevention function detected an illegal execution sequence.

No.	Message	Description
DS0007	ILLEGAL EXECUTION SEQUENCE	The malfunction prevention function detected an illegal execution sequence.
DS0008	ILLEGAL EXECUTION SEQUENCE	The malfunction prevention function detected an illegal execution sequence.
DS0009	ILLEGAL EXECUTION SEQUENCE	The malfunction prevention function detected an illegal execution sequence.
DS0010	ILLEGAL REFERENCE AREA	The malfunction prevention function detected an invalid reference area.
DS0011	ILLEGAL REFERENCE AREA	The malfunction prevention function detected an invalid reference area.
DS0012	ILLEGAL REFERENCE AREA	The malfunction prevention function detected an invalid reference area.
DS0013	ILLEGAL REFERENCE AREA	The malfunction prevention function detected an invalid reference area.
DS0014	TOOL CHANGE DETECT MACHINE LOCK	A machine lock is turned on for the Z axis for which the tool is being changed.
DS0015	TOOL CHANGE DETECT MIRROR IMAGE	A mirror image is turned on for the Z axis for which the tool is being changed.
DS0016	SERIAL DCL: FOLLOW-UP ERROR	(1) The specification of parameter No. 1883 or 1884 is out of range. (2) During the establishment of an origin, the distance between the current position and the reference position (detection unit) exceeded ±2147483647. To avoid this situation, modify either the current position or the reference position.
DS0017	SERIAL DCL: REF-POS ESTABLISH ERR	During the establishment of an origin, the amount of travel at the FL feedrate exceeded the setting of parameter No. 14010.
DS0018	SERIAL DCL: MISMATCH(SSYNC CTRL)	On axis synchronous control, one of the master/slave axes is the scale with ref-pos, and the other is not the scale with ref-pos. In such a configuration, an origin cannot be established unless the axis synchronous control selection signal (SYNC<Gn138> or SYNCJ <Gn140>) is set 0.
DS0019	SERIAL DCL: MISMATCH(ANGL-AXIS)	On angular axis control, one of the angular/perpendicular axes is the scale with ref-pos, and the other is not the scale with ref-pos. You cannot use the system in this configuration.
DS0020	REFERENCE RETURN INCOMPLETE	An attempt was made to perform an automatic return to the reference position on the perpendicular axis before the completion of a return to the reference position on the angular axis. However, this attempt failed because a manual return to the reference position during angular axis control or an automatic return to the reference position after power-up was not commanded. First, return to the reference position on the angular axis, then return to the reference position on the perpendicular axis.
DS0022	DUAL CHECK SAFETY IS NOT WORKED	Because of parameter DCE (No. 1902#6), a dual check safety function is disabled.
DS0023	ILLEGAL PARAMETER (I-COMP VAL)	The setting of the inclination compensation parameter is incorrect. The compensation per compensation point is too large or too small.

No.	Message	Description
DS0024	UINT SIGNAL WAS ILLEGALLY INPUT	In movement to a program restart position, an interruption type custom macro was called.
DS0025	G60 CANNOT BE EXECUTED	Single direction positioning cannot be executed because the state of the mirror image when a single direction positioning block was looked ahead differs from that when the execution of that block started. Modify the program.
DS0026	MISMATCH OF ANGULAR AXIS (D.C.S)	On angular axis control, one of the angular/perpendicular axes is the scale with ref-pos, and the other of them is not the scale with ref-pos. Such system is not admired.
DS0027	MISMATCH OF SYNCHRONOUS AXIS (D.C.S)	- One of the master/slave axes of axis synchronous control is the linear scale with distance-coded reference marks, and the other is not the linear scale with distance-coded reference marks. Please establish reference position with the input signal SYNCn<G138>, SYNCJn<G140> or parameter setting to 0. - The slave axis of the axis synchronous control is two or more settings. Such system is not admired.
DS0050	TOO MANY SIMULTANEOUS AXES	A movement was performed along more axes than can be controlled simultaneously. Check whether a command in the program is specified for more axes than can be controlled simultaneously.
DS0059	SPECIFIED NUMBER NOT FOUND	[External data I/O] The No. specified for a program No. or sequence No. search could not be found. There was an I/O request issued for a pot No. or offset (tool data), but either no tool numbers have been input since power ON or there is no data for the entered tool No. [External workpiece No. search] The program corresponding to the specified workpiece No. could not be found.
DS0071	START OR RELEASE CANNOT BE DONE	(1) To start or cancel the inter-path flexible synchronous mode, the tool must be stopped along all axes. (2) To start or cancel advanced superimposition, movement along axes must stop.
DS0072	MANUAL REFERENCE RETURN CANNOT BE DONE	Manual reference position return cannot be performed in the advanced superimposition state.
DS0131	TOO MANY MESSAGE	An attempt was made to display an external operator message or external alarm message, but five or more displays were required simultaneously.
DS0132	MESSAGE NUMBER NOT FOUND	An attempt to cancel an external operator message or external alarm message failed because the specified message number was not found.
DS0133	TOO LARGE NUMBER	A value other than 0 to 4095 was specified as the external operator message or the external alarm message number.

No.	Message	Description
DS0300	APC ALARM: NEED REF RETURN	A setting to zero position for the absolute position detector (association with reference position and the counter value of the absolute position detector) is required. Perform the return to the reference position. This alarm may occur with other alarms simultaneously. In this case, other alarms must be handled first.
DS0306	APC ALARM: BATTERY VOLTAGE 0	The battery voltage of the absolute position detector has dropped to a level at which data can no longer be held. Or, the power was supplied to the Pulsecoder for the first time. The battery or cable is thought to be defective. Replace the battery with the machine turned on.
DS0307	APC ALARM: BATTERY LOW 1	The battery voltage of the absolute position detector has dropped to a level at which a replacement is required. Replace the battery with the machine turned on.
DS0308	APC ALARM: BATTERY LOW 2	The battery voltage of the absolute position detector dropped to a level at which a replacement was required in the past. (including during power off) Replace the battery with the machine turned on.
DS0309	APC ALARM: REF RETURN IMPOSSIBLE	An attempt was made to set the zero point for the absolute position detector by MDI operation when it was impossible to set the zero point. Rotate the motor manually at least one turn, and set the zero position of the absolute position detector after turning the CNC and servo amplifier off and then on again.
DS0310	NOT ON RETURN POINT	The return position recorded during retraction is not reached during recovery. The position may be displaced during recovery due to a machine lock or mirror image.
DS0405	ZERO RETURN END NOT ON REF	The axis specified in automatic zero return was not at the correct zero point when positioning was completed. Perform zero return from a point whose distance from the zero return start position to the zero point is 2 or more revolutions of the motor. Other probable causes are: - The positional deviation after triggering the deceleration dog is less than 128. - Insufficient voltage or malfunctioning Pulsecoder.
DS0608	SV COOLING FAN FAILURE	Internal agitating fan failure.
DS0609	SV RADIATOR FAN FAILURE	Radiator cooling fan failure.
DS0610	PS INTERNAL FAN FAILURE	Internal agitating fan failure.
DS0611	PS EXTERNAL FAN FAILURE	External radiator cooling fan failure.
DS0612	PS OVERLOAD	Overheat
DS0613	PS IMPROPER INPUT POWER	Input power supply fault
DS0614	PS EXTERNAL INPUT COMPONENT ERROR	There is something trouble in control parameter for PS, cable, PS itself, or the external component such as input filter or transducer.

No.	Message	Description
DS0650	POLE DETECTION REQUEST	With an absolute detection axis (bit 5 (APCx) of parameter No.1815=1), pole position detection is not completed (RPFIN1 to RPFIN8 <Fn159> ="0"). With a non-absolute detection axis (bit 5 (APCx) of parameter No.1815=0), pole position detection is once completed then the state is changed to the pole position detection uncompleted state (RPFIN1 to RPFIN8 <Fn159>=0).
DS0651	ACC.ERROR	Communication between the separate detector interface unit and acceleration sensor was disconnected.
DS1120	UNASSIGNED ADDRESS (HIGH)	The upper 4 bits (EIA4 to EIA7) of an external data I/O interface address signal are set to an undefined address (high bits).
DS1121	UNASSIGNED ADDRESS (LOW)	The lower 4 bits (EIA0 to EIA3) of an external data I/O interface address signal are set to an undefined address (low bits).
DS1124	OUTPUT REQUEST ERROR	An output request was issued during external data output, or an output request was issued for an address that has no output data.
DS1128	DI.EIDLL OUT OF RANGE	The numerical value input by external data input signals ED0 to ED31 has exceeded the permissible range.
DS1130	SEARCH REQUEST NOT ACCEPTED	No requests can be accepted for a program No. or a sequence No. search as the system is not in the memory mode or the reset state.
DS1131	EXT-DATA ERROR (OTHER)	[External Data I/O] An attempt was made to input tool data for tool offset by a tool No. during loading by the G10 code.
DS1150	A/D CONVERT ALARM	A/D converter malfunction
DS1184	PARAMETER ERROR IN TORQUE	An invalid parameter was set for torque control. The torque constant parameter is set to 0.
DS1185	OVER MAXIMUM FEED	The maximum cutting feedrate or rapid traverse rate was exceeded in G54.3.
DS1448	ILLEGAL PARAMETER (D.C.S.)	The setting value of parameter for distance coded linear scale I/F is satisfied the following any conditions. - The absolute position detector is enabled. - Either parameter No. 1821 (mark-1 interval) or No. 1882 (mark-2 interval) is set to 0. - The setting of parameter No. 1821 is equal to or greater than the setting of parameter No. 1882. - The difference between the settings made for parameters 1821 and 1882 is greater than or equal to twice either setting. - The setting value of parameters No. 1883 and No. 1884 are over the valid data range.
DS1449	REFERENCE MARKS ARE DIFFERENT FROM PARAMETER	In case of distance coded linear scale I/F, the actual interval of reference marks is different from parameters (Nos. 1821,1882) setting value.
DS1450	ZERO RETURN NOT FINISHED	1st reference position return (CDxX7 to CDxX0: 17h (Hex)) was specified when the manual reference position return was not executed with the reference position return function enabled (parameter ZRN (No. 1005#0) set to 0).

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No.	Message	Description
DS1451	IMPROPER PMC AXIS COMMAND	1. During deceleration of PMC axis control, next PMC axis control command is commanded. Please correct PMC ladder sequence to execute the next command after the PMC axis control is stopped. 2. While the controlled axis selection signals EAX1 to EAX8 or PMC controlled-axis selection variable (#8700) are “0”, PMC axis control command is commanded. Please correct PMC ladder sequence or macro executor program so that the signal or variable is set to 1.
DS1512	EXCESS VELOCITY	The feedrate of the linear axis during polar coordinate interpolation exceeded the maximum cutting feedrate.
DS1514	ILLEGAL MOTION IN G12.1 MODE	In a hypothetical axis direction compensation during the polar coordinate interpolation mode, an attempt is made to travel to the area in which the travel cannot be made.
DS1710	ILLEGAL ACC. PARAMETER (OPTIMUM TORQUE ACC/DEC)	There are errors in the parameters of permissible acceleration for pptimum torque acc./dec. One of the following is the cause. (1) The ratio of the acceleration for deceleration to the acceleration for the acceleration is lower than the limited value. (2) The time to decelerate to 0 is larger than the maximum.
DS1711	ILLEGAL ACC. PARAMETER (RIGID TAPPING OPTIMUM ACC/DEC)	The permissible acceleration parameter for rigid tapping optimum acceleration/deceleration contains an error. The cause is one of the following: (1) The ratio of the deceleration to the acceleration is less than 1/3. (2) The time required to slow down to a speed of 0 exceeds the maximum. (3) The maximum acceleration (parameters Nos. 11421 to 11424) is 0.
DS1931	MACHINE PARAMETER INCORRECT	- One of parameters Nos. 19665 to 19667 and Nos.19680 to 19744 used to configure the machine contains an error. - 5-axis machining function which can not be used in the machine which has two linear axes (bit 6 (HAL) of parameter No. 11269 = 1) is executed. - In the machine which has two linear axes (bit 6 (HAL) of parameter No. 11269 = 1), some motion of nonexistent liner axis is generated.
DS1933	NEED REF RETURN (SYNC:MIX:OVL)	The relation between a machine coordinate of an axis in synchronization, composition, or superimposed control, and the absolute, or relative coordinate was displaced. Perform the manual return to the reference position.
DS2003	ILLEGAL USE FOR SERVO MOTOR SPINDLE	The servo axes for spindle use of the spindle control with servo motor was used by the following functions. - PMC axis control - Chopping
DS2091	CAN NOT RETURN TO BREAKPOINT	It was not possible to return to the machine position of the interruption point because of machine lock.

No.	Message	Description
DS2096	ALARM OCCURRED IN MAIN PATH	The alarm occurred in the path that used the peripheral axis control.
DS2097	ALARM OCCURRED IN PERIPHERAL	The alarm occurred in the peripheral axis control.
DS5259	INTERRUPTED POSITION NOT FOUND	The interruption point was not found. (Coordinates of the processing interruption point by temporary execution and coordinates of the memorized processing interruption point are different.) The following is assumed as a cause. - During feed hold state or single block stop, manual intervention was executed.
DS5340	PARAMETER CHECK SUM ERROR	Since a parameter was changed, the parameter checksum did not match the reference checksum. Set the original value to the parameter or set the reference checksum again.
DS5387	CAN NOT START REFERENCE RETURN WITH MECHANICAL STOPPER SETTING	The slave axis is not within the in-position width, for example, when the distance between the mechanical stoppers for the master and slave axes is larger than the withdrawal distance specified in parameter No. 7181 or 7182 for the master axis. Adjust the position of the mechanical stoppers or the setting of parameter No. 7181 or 7182.
DS5550	AXIS IMMEDIATE STOP	The movement along an axis was stopped immediately by the axis immediate stop function.

8.1.10 Malfunction Prevention Function Alarms (IE Alarm)

No.	Message	Description
IE0001	+ OVERTRAVEL (SOFT 1)	The malfunction prevention function detected that stored stroke check 1 on the positive side was exceeded.
IE0002	- OVERTRAVEL (SOFT 1)	The malfunction prevention function detected that stored stroke check 1 on the negative side was exceeded.
IE0003	+ OVERTRAVEL (SOFT 2)	The malfunction prevention function detected that stored stroke check 2 on the positive side was exceeded.
IE0004	- OVERTRAVEL (SOFT 2)	The malfunction prevention function detected that stored stroke check 2 on the negative side was exceeded.
IE0005	+ OVERTRAVEL (SOFT 3)	The malfunction prevention function detected that stored stroke check 3 on the positive side was exceeded.
IE0006	- OVERTRAVEL (SOFT 3)	The malfunction prevention function detected that stored stroke check 3 on the negative side was exceeded.
IE0007	EXCESS MAXIMUM REV. DATA	The malfunction prevention function detected the command in which a value exceeding the maximum speed was specified.
IE0008	ILLEGAL ACC/DEC	The malfunction prevention function detected the acc./dec. error.

8.2 ALARM LIST (SERIAL SPINDLE)

When a serial spindle alarm occurs, the following number is displayed on the CNC.

NOTE

*1 Note that the meanings of the Spindle Amplifier (SP) indications differ depending on which LED, the red or yellow LED, is on. When the red LED is on, the spindle amplifier indicates a 2-digit alarm number. When the yellow LED is on, the spindle amplifier indicates an error number that designates a sequence problem (for example, when a rotation command is entered with the emergency stop state not released).
See "Error Codes (Serial Spindle)."

*2 For information about serial spindle alarms for numbers that are not listed below, refer to the following documents according to the actual spindle motor to be connected.

- FANUC AC SPINDLE MOTOR αi series MAINTENANCE MANUAL (B-65285EN)
- Technical reports etc.

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9001	MOTOR OVERHEAT	01	1 Check and correct the peripheral temperature and load status. 2 If the cooling fan stops, replace it.	The internal temperature of the motor exceeds the specified level. The motor is used in excess of the continuous rating, or the cooling component is abnormal.
SP9002	EX DEVIATION SPEED	02	1 Check and correct the cutting conditions to decrease the load. 2 Correct parameter No. 4082.	The motor speed cannot follow a specified speed. An excessive motor load torque is detected. The acceleration/deceleration time in parameter No. 4082 is insufficient.
SP9003	DC-LINK FUSE IS BROKEN	03	1 Replace the Spindle Amplifier (SP). 2 Check the motor insulation status.	The Power Supply becomes ready (00 is indicated), but the DC link voltage is too low in the Spindle Amplifier (SP). The fuse in the DC link section in SP is blown. (The power device is damaged or the motor is ground-fault.)
SP9004	PS IMPROPER INPUT POWER		Check the state of the input power supply to the Power Supply (PS).	The power supply (PS) detected a power supply failure. (Power Supply alarm 14)
SP9006	THERMAL SENSOR DISCONNECT	06	1 Check and correct the parameter. 2 Replace the feedback cable.	The temperature sensor of the motor is disconnected.

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9007	OVER SPEED	07	Check for a sequence error. (For example, check whether spindle synchronization was specified when the spindle could not be turned.)	The motor speed has exceeded 115% of its rated speed. When the spindle axis was in position control mode, position error was accumulated excessively (SFR and SRV were turned off during spindle synchronization.)
SP9009	OVERHEAT MAIN CIRCUIT	09	1 Improve the heat sink cooling status. 2 If the heat sink cooling fan stops, replace the Spindle Amplifier (SP).	The temperature in the power semiconductor cooling radiator is abnormally high.
SP9010	LOW VOLT INPUT POWER	10	1 Replace the cables. 2 Replace the SP control printed circuit board.	A drop in the input power voltage in the Spindle Amplifier (SP) is detected.
SP9011	PS OVER VOLT. DC LINK		1 Check the selected Power Supply (PS). 2 Check the input power voltage and change in power during motor deceleration. If the voltage exceeds 253 VAC (for the 200-V system) or 530 VAC (for the 400-V system), improve the power supply impedance.	Overvoltage of the DC link section of the Power Supply (PS) was detected. (Power Supply alarm indication: 07) PS selection error. (The maximum output specification of the PS is exceeded.)
SP9012	OVERCURRENT POWER CIRCUIT	12	1 Check the motor insulation status. 2 Check the spindle parameters. 3 Replace the Spindle Amplifier (SP).	The motor current is abnormally high. A motor-specific parameter does not match the motor model. Poor motor insulation
SP9013	CPU DATA MEMORY FAULT	13	Replace the Spindle Amplifier (SP) control printed circuit board.	Abnormality in a Spindle Amplifier (SP) control circuit component is detected. (RAM within the Spindle Amplifier (SP) is abnormal.)

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No.	Message	SP indi- cation (*1)	Faulty location and remedy	Description
SP9014	SOFTWARE SERIES MISMATCH	14	Replace the Spindle Amplifier (SP).	The mismatch of the spindle software and a Spindle Amplifier (SP) is detected.
SP9015	SPINDLE SWITCHING FAULT	15	1 Check and correct the ladder sequence. 2 Replace the switching MCC.	The switch sequence in spindle switching/speed range switching operation is abnormal. The switching MCC contact status check signal and command do not match.
SP9016	RAM ERROR	16	Replace the Spindle Amplifier (SP) control printed circuit board.	Abnormality in a Spindle Amplifier (SP) control circuit component is detected. (RAM for external data is abnormal.)
SP9017	ID NUMBER PARITY ERROR	17	Replace the Spindle Amplifier (SP)	Abnormality in Spindle Amplifier (SP) ID data is detected.
SP9018	SUMCHECK ERROR PROGRAM ROM	18	Replace the Spindle Amplifier (SP) control printed circuit board.	Abnormality in a Spindle Amplifier (SP) control circuit component is detected. (Program ROM data is abnormal.)
SP9019	EXCESS OFFSET CURRENT U	19	Replace the Spindle Amplifier (SP).	Abnormality in a Spindle Amplifier (SP) component is detected. (The initial value for the U phase current detection circuit is abnormal.)
SP9020	EXCESS OFFSET CURRENT V	20	Replace the Spindle Amplifier (SP).	Abnormality in a Spindle Amplifier (SP) component is detected. (The initial value of the V phase current detection circuit is abnormal.)
SP9021	POS SENSOR POLARITY ERROR	21	Check and correct the parameters. (parameters Nos. 4000#0, 4001#4)	The polarity parameter setting of the position sensor is wrong.
SP9022	SP AMP OVER CURRENT	22	1 Review operation conditions (acceleration/ deceleration and cutting) to reduce the load. 2 Check and correct the parameters.	A Spindle Amplifier (SP) overload current was detected.

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9024	SERIAL TRANSFER ERROR	24	1 Place the CNC-to-spindle cable away from the power cable. 2 Replace the cable.	The CNC power is turned off (normal power-off or broken cable). An error is detected in communication data transferred to the CNC.
SP9027	DISCONNECT POSITION CODER	27	Replace the cable.	The spindle position coder (connector JYA3) signal is abnormal.
SP9029	OVERLOAD	29	Check and correct the load status.	Excessive load has been applied continuously for a certain period of time. (This alarm is issued also when the motor shaft has been locked in the excitation state.)
SP9030	PS OVERCURRENT		Check and correct the power supply voltage.	Overcurrent is detected in Power Supply (PS) main circuit input. (Power Supply alarm indication: 01) Unbalanced power supply. PS selection error (The maximum PS output specification is exceeded.)
SP9031	MOTOR LOCK	31	1 Check and correct the load status. 2 Replace the motor sensor cable (connector JYA2).	The motor cannot rotate at a specified speed. (A level not exceeding the SST level for the rotation command has existed continuously.)
SP9032	SIC-LSI RAM FAULT	32	Replace the Spindle Amplifier (SP) control printed circuit board.	Abnormality in a Spindle Amplifier (SP) control circuit component is detected. (The LSI device for serial transfer is abnormal.)
SP9033	PS PRE-CHARGE FAILURE		1 Check and correct the power supply voltage. 2 Replace the Power Supply (PS).	Charging of direct current power supply voltage in the power circuit section is insufficient when the magnetic contractor is turned on (such as open phase and defective charging resistor). (Power Supply alarm indication: 05)

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9034	ILLEGAL PARAMETER	34	Correct a parameter value according to FANUC AC SPINDLE MOTOR αi series PARAMETER MANUAL (B-65280EN). If the parameter number is unknown, connect the spindle check board, and check the indicated parameter.	Parameter data exceeding the allowable limit is set.
SP9036	OVERFLOW ERROR COUNTER	36	Check whether the position gain value is too large, and correct the value.	An error counter overflow occurred.
SP9037	ILLEGAL SETTING VELOCITY DETECTOR	37	Correct the parameter value according to FANUC AC SPINDLE MOTOR αi series PARAMETER MANUAL (B-65280EN).	The setting of the parameter for the number of pulses in the speed detector is incorrect.
SP9041	ILLEGAL 1REV SIGN OF POSITION CODER	41	1 Check and correct the parameter. 2 Replace the cable.	1 The 1-rotation signal of the spindle position coder (connector JYA3) is abnormal. 2 Parameter setting error
SP9042	NO 1REV SIGN OF POSITION CODER	42	Replace the cable.	The 1-rotation signal of the spindle position coder (connector JYA3) is disconnected.
SP9043	DISCONNECT POSITION CODER DEF. SPEED	43	Replace the cable.	The differential speed position coder signal (connector JYA3S) in the submodule SW is abnormal.
SP9046	ILLEGAL 1REV SIGN OF SCREW CUT	46	1 Check and correct the parameter. 2 Replace the cable. 3 Re-adjust the BZ sensor signal.	The 1-rotation signal in threading is abnormal.

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9047	ILLEGAL SIGNAL OF POSITION CODER	47	1 Replace the cable. 2 Correct the cable layout (vicinity of the power line).	The A/B phase signal of the spindle position coder (connector JYA3) is abnormal. The relationship between the A/B phase and 1-rotation signal is incorrect (Pulse count mismatch).
SP9049	DEF. SPEED IS OVER VALUE	49	Check whether the calculated differential speed value exceeds the maximum motor speed.	In differential speed mode, the speed of the other spindle converted to the speed of the local spindle has exceeded the allowable limit (the differential speed is calculated by multiplying the speed of the other spindle by the gear ratio).
SP9050	SYNCRONOUS VALUE IS OVER SPEED	50	Check whether the calculated value exceeds the maximum motor speed.	In spindle synchronization, the speed command calculation value exceeded the allowable limit (the motor speed is calculated by multiplying the specified spindle speed by the gear ratio).
SP9051	PS LOW VOLT. DC LINK		1 Check and correct the power supply voltage. 2 Replace the MC.	Input voltage drop was detected. (Power Supply alarm (PS) indication: 04) (Momentary power failure or poor MCC contact)
SP9052	ITP FAULT 1	52	1 Replace the Spindle Amplifier (SP) control printed circuit board. 2 Replace the main board or additional spindle board in the CNC.	An abnormality is detected in the interface between the CNC and spindle amplifier (the ITP signal stopped).
SP9053	ITP FAULT 2	53	1 Replace the Spindle Amplifier (SP) control printed circuit board. 2 Replace the main board or additional spindle board in the CNC.	An abnormality is detected in the interface between the CNC and spindle amplifier (the ITP signal stopped).

8

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9054	OVERCURRENT	54	Review the load state.	An overload current was detected.
SP9055	ILLEGAL POWER LINE	55	1 Replace the magnetic contactor. 2 Check and correct the sequence.	The power line state signal of the magnetic contactor for spindle switching/speed range switching is abnormal.
SP9056	COOLING FAN FAILURE	56	Replace the internal cooling fan.	The internal cooling fan stopped.
SP9057	PS EXCESS-REGENERATION2		1 Decrease the acceleration/deceleration duty. 2 Check the cooling condition (peripheral temperature). 3 If the cooling fan stops, replace the resistor. 4 If the resistance is abnormal, replace the resistor.	An overload was detected in the regenerative resistance. (Power Supply alarm indication: 16) Thermostat operation or short-time overload was detected. The regenerative resistor was disconnected, or an abnormal resistance was detected.
SP9058	PS OVERLOAD		1 Check the Power Supply (PS) cooling status. 2 Replace the Power Supply (PS).	The temperature of the radiator of the Power Supply (PS) has increased abnormally. (Power Supply (PS) alarm indication: 03)
SP9059	PS INTERNAL FAN FAILURE		Replace the Power Supply (PS).	The internal cooling fan for the Power Supply (PS) stopped. (Power Supply alarm indication: 02)
SP9061	SEMI-FULL ERROR EXCESS	61	Check parameter settings.	The error between the semi-closed and full-closed sides when the dual position feedback function is used is too large.
SP9065	SERIAL SPINDLE ALARM	65	1 Check parameter settings. 2 Check sensor connections and signals. 3 Check power line connections.	The move distance is too long when the magnetic pole is confirmed (Synchronous spindle motor)
SP9066	COM. ERROR BETWEEN SP AMPS	66	1 Replace the cable. 2 Check and correct the connection.	An error was found in communication (connector JX4) between Spindle Amplifiers (SP).
SP9067	FSC/EGB COMMAND ERROR	67	Check the sequence (reference position return command).	In the spindle EGB mode, reference position return was specified.

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9068	ILLEGAL SPINDLE PARAMETER	68	Check parameter setting.	Invalid parameter
SP9069	SAFETY SPEED OVER	69	1 Check the speed command. 2 Check parameter settings. 3 Check the sequence.	In the state in which safety speed monitoring was enabled, the system detected that the motor speed exceeded the safety speed or detected an error during a free-run stop.
SP9070	ILLEGAL AXIS DATA	70	1 When this alarm is issued because the configuration of the spindle amplifiers (SPs) was changed, set the spindle number for the spindle amplifier (bit 7 of parameter No. 4541 to 1 and then 0, and turn the power to the entire system off). 2 Replace the spindle amplifier.	An error was detected during transfer of spindle data of a spindle.
SP9071	SAFETY PARAMETER ERROR	71	1 Input the safety parameter again. 2 Replace the Spindle Amplifier (SP) control printed-circuit board.	An error was detected in an axis parameter check.
SP9072	MISMATCH RESULT OF MOTOR SPEED CHECK	72	1 Replace the Spindle Amplifier (SP) control printed-circuit board. 2 Replace the main board or additional spindle board in the CNC.	A mismatch was detected between the safety speed check results of the Spindle Amplifier (SP) and those of the CNC.
SP9073	MOTOR SENSOR DISCONNECTED	73	1 Replace the feedback cable. 2 Check the shield. 3 Check and correct the connection. 4 Adjust the sensor.	The motor sensor feedback signal is not present. (connector JYA2)

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9074	CPU TEST ERROR	74	Replace the Spindle Amplifier (SP) control printed-circuit board.	An error was detected in a CPU test.
SP9075	CRC ERROR	75	Replace the Spindle Amplifier (SP) control printed circuit board.	An error was detected in a ROM CRC test.
SP9076	INEXECUTION OF SAFETY FUNCTIONS	76	Replace the Spindle Amplifier (SP) control printed-circuit board.	The spindle amplifier (SP) detected that the safety function was not executed.
SP9077	MISMATCH RESULT OF AXIS NUMBER CHECK	77	1 Replace the Spindle Amplifier (SP) control printed-circuit board. 2 Replace the main board or additional spindle board in the CNC.	A mismatch was detected between the axis number check results of the Spindle Amplifier (SP) and those of the CNC.
SP9078	MISMATCH RESULT OF SAFETY PARAMETER CHECK	78	1 Replace the Spindle Amplifier (SP) control printed-circuit board. 2 Replace the main board or additional spindle board in the CNC.	The result of a safety parameter check by the spindle amplifier (SP) conflicts with that of a safety parameter check by the CNC.
SP9079	INITIAL TEST ERROR	79	Replace the Spindle Amplifier (SP) control printed-circuit board.	An error was detected in a initial test operation.
SP9080	ALARM AT THE OTHER SP AMP.	80	Remove the cause of the alarm of the remote Spindle Amplifier (SP).	During inter-Spindle Amplifier (SP) communication, an alarm was generated on the remote Spindle Amplifier (SP).
SP9081	1-ROT MOTOR SENSOR ERROR	81	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one-rotation signal of the motor sensor cannot be correctly detected. (connector JYA2)
SP9082	NO 1-ROT MOTOR SENSOR	82	1 Replace the feedback cable. 2 Adjust the sensor.	The one-rotation signal of the motor sensor is not generated. (connector JYA2)

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9083	MOTOR SENSOR SIGNAL ERROR	83	1 Replace the feedback cable. 2 Adjust the sensor.	An irregularity was detected in a motor sensor feedback signal. (connector JYA2)
SP9084	SPNDL SENSOR DISCONNECTED	84	1 Replace the feedback cable. 2 Check the shield. 3 Check and correct the connection. 4 Check and correct the parameter. 5 Adjust the sensor.	The spindle sensor feedback signal is not present. (connector JYA4)
SP9085	1-ROT SPNDL SENSOR ERROR	85	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one-rotation signal of the spindle sensor cannot be correctly detected. (connector JYA4)
SP9086	NO 1-ROT SPNDL SENSOR	86	1 Replace the feedback cable. 2 Adjust the sensor.	The one-rotation signal of the spindle sensor is not generated. (connector JYA4)
SP9087	SPNDL SENSOR SIGNAL ERROR	87	1 Replace the feedback cable. 2 Adjust the sensor.	An irregularity was detected in a spindle sensor feedback signal. (connector JYA4)
SP9088	COOLING RADI FAN FAILURE	88	Replace the Spindle Amplifier radiator cooling fan.	The radiator cooling fan stopped.
SP9089	SUB MODULE SM (SSM) ERROR	89	1 Check the connection between the Spindle Amplifier (SP) and the submodule SM (SSM). 2 Replace the submodule SM(SSM). 3 Replace the Spindle Amplifier (SP) control printed-circuit board.	Submodule SM (SSM) error (Synchronous spindle motor)
SP9090	UNEXPECTED ROTATION	90	1 Check magnetic pole detection operation. 2 Check whether the rotor and sensor are aligned correctly.	Unexpected rotation of the synchronous spindle motor was detected.

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No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9091	POLE POSITION COUNT MISS	91	Replace the motor sensor cable.	Count error of the magnetic pole position of the synchronous spindle motor
SP9092	OVER SPEED TO VELOCITY COMMAND	92	Check the sequence (whether SFR or SRV is turned on and off in the position control mode).	The motor speed exceeds the overspeed level corresponding to the velocity command.
SP9110	AMP COMMUNICATION ERROR	b0	1 Replace the communication cable between Spindle Amplifier (SP) and Power Supply (PS). 2 Replace the Spindle Amplifier (SP) or Power Supply (PS) control printed circuit board.	Communication error between Spindle Amplifier (SP) and Power Supply (PS)
SP9111	PS LOW VOLT. CONTROL		Replace the Power Supply (PS) control printed circuit board.	Low converter control power supply voltage (Power Supply indication : 06)
SP9112	PS EXCESS-REGENERATION1		1 Check the regenerative resistance. 2 Check the motor selection. 3 Replace the Power Supply (PS).	Excessive converter regenerative power (Power Supply indication : 08)
SP9113	PS EXTERNAL FAN FAILURE		Replace the external radiator cooling fan for Power Supply (PS).	Stopped the external radiator cooling fan for Power Supply (PS) (Power Supply indication = 10)
SP9114	PS CONTROL AXIS ERROR 1	b4	Set parameter No. 4657 to 0. Or set parameter APS (No.11549#0) to 1 and execute automatic setting.	Invalid parameter
SP9115	PS CONTROL AXIS ERROR 2	b5	Set parameter No. 4657 to other than 0. Or set parameter APS (No.11549#0) to 1 and execute automatic setting.	Invalid parameter

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9120	COMMUNICATION DATA ERROR	C0	1 Replace the communication cable between CNC and Spindle Amplifier (SP). 2 Replace the Spindle Amplifier (SP) control printed circuit board. 3 Replace the main board or additional spindle board in the CNC.	Communication data alarm
SP9121	COMMUNICATION DATA ERROR	C1	1 Replace the communication cable between CNC and Spindle Amplifier (SP). 2 Replace the Spindle Amplifier (SP) control printed circuit board. 3 Replace the main board or additional spindle board in the CNC.	Communication data alarm
SP9122	COMMUNICATION DATA ERROR	C2	1 Replace the communication cable between CNC and Spindle Amplifier (SP). 2 Replace the Spindle Amplifier (SP) control printed circuit board. 3 Replace the main board or additional spindle board in the CNC.	Communication data alarm
SP9123	SPINDLE SWITCH CIRCUIT ERROR	C3	Replace the submodule SW(SSW).	Submodule SW (SSW) error (spindle switching)

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9128	SP SYNC VELOCITY ERROR EXCESS	C8	1 Check the sequence (whether SFR or SRV is turned off or on in position control). 2 Check and correct the load status. 3 Check the parameter setting.	In spindle synchronous control, velocity error exceeds the setting.
SP9129	SP SYNC POSITION ERROR EXCESS	C9	1 Check the sequence (whether SFR or SRV is turned off or on in position control). 2 Check and correct the load status. 3 Check the parameter setting.	In spindle synchronous control, position error exceeds the setting.
SP9130	TORQUE TANDEM POLARITY ERROR	d0	Check the setting of the parameter for the rotation direction (bit 2 of No. 4353).	In tandem control, the rotation directions of the master and slave motors are invalid.
SP9131	SPINDLE TUNING FUNCTION ALARM	d1	Check the message displayed by SERVO GUIDE. Set “0” to the parameter for spindle tuning function (No. 4402#7, #6, No.4125, No.4126, No.4410~4415) and input alarm reset signal (ARSTx).	Spindle tuning function alarm
SP9132	SER.SENSOR DATA ERROR	d2	1 Replace the feedback cable. 2 Replace the sensor. 3 Replace the Spindle Amplifier (SP).	Serial data error between a serial sensor and spindle amplifier (SP)
SP9133	SER. SENSOR TRANSFER ERROR	d3	1 Replace the feedback cable. 2 Replace the sensor. 3 Replace the Spindle Amplifier (SP).	Serial data error between a serial sensor and spindle amplifier (SP)

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9134	SER.SENSOR SOFT PHASE ERROR	d4	1 Check and correct the sensor parameter setting. 2 Take action against noise. 3 Replace the sensor.	The change in serial sensor positional data is too large.
SP9135	SAFETY SPEED ZERO ERROR(SP)	d5	Perform operation within the safety speed zero range.	The motor position exceeded the safety speed zero monitoring width.
SP9136	MISMATCH RESULT OF SAFETY SPEED ZERO CHECK(SP)	d6	Replace the Spindle Amplifier (SP) control printed circuit board.	The Spindle Amplifier (SP) speed zero determination result did not match the CNC speed zero determination result.
SP9137	SP DEVICE COMMUNICATIO N ERROR	d7	Replace the Spindle Amplifier (SP) control printed circuit board.	Device communication error in the spindle amplifier (SP)
SP9138	CURRENT LIMIT SETTING ERROR	d8	Check the parameter.	The current limit level setting is out of the specified range.
SP9139	SER.SENSOR PULSE MISS	d9	Replace the sensor.	An error occurred in the serial sensor interpolation circuit.
SP9140	SER.SENSOR COUNT MISS	E0	1 Take action against noise. 2 Replace the sensor.	The number of feedback pulses per one-rotation signal of the serial sensor is outside the specified range.
SP9141	SER.SENSOR NO 1-ROT SIGNAL	E1	1 Check and correct the sensor parameter setting. 2 Replace the sensor.	The serial sensor is not placed in the status in which the one-rotation signal has been detected.
SP9142	SER.SENSOR ABNORMAL	E2	Replace the sensor.	A serial sensor error occurred.
SP9143	CS HIGH SPEED CHANGE CMD ERROR	E3	Check the sequence.	A command was issued though the one-rotation signal had not been detected.
SP9144	CURRENT DETECT CIRCUIT ERROR	E4	Replace the Spindle Amplifier (SP).	An error was found in the current detection circuit.
SP9145	LOW VOLTAGE DRIVER	E5	Replace the Spindle Amplifier (SP).	The driver circuit voltage has dropped.

No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9146	SP:INTERNAL OVERHEAT	E6	1 Check that the temperature in the power magnetics cabinet is within the specification range. 2 If this alarm is issued immediately after power-on, replace the spindle amplifier (SP).	The internal temperature of the spindle amplifier (SP) exceeds the specified value.
SP9147	SP:GROUND FAULT	E7	Replace the motor or amplifier.	A ground fault occurred in the motor or amplifier.
SP9148	AXIS NUMBER NOT SET	E8	Turn the power to the entire system off.	The spindle number of the spindle (SP) is not set.
SP9149	EXT.CURRENT FB U-OFFSET	E9	Replace the Spindle Amplifier (SP) control printed circuit board.	An error was detected in the part of spindle amplifier (SP).
SP9150	EXT.CURRENT FB V-OFFSET	F0	Replace the Spindle Amplifier (SP) control printed circuit board.	An error was detected in the part of spindle amplifier (SP).
SP9151	FILTER MODULE ERROR	F1	Replace the filter module.	A filter module error was detected.
SP9152	EXT.CUR.FB DISCONNECT	F2	Replace the cable (JYA4).	Disconnection of the external current sensor was detected.
SP9153	SP NO FAILURE	F3	Check the parameter.	No hardware error is determined by a self check.
SP9154	PHASE OPEN	F4	Replace the motor.	A motor error was detected.
SP9155	FAILURE OF SP (OPEN)	F5	Replace the Spindle Amplifier (SP).	An error was detected in the spindle amplifier (SP).
SP9156	FAILURE OF CURRENT CTRL.	F6	Replace the Spindle Amplifier (SP) control printed circuit board.	An error was detected in the part of spindle amplifier (SP).
SP9157	FAILURE OF SP (SHORT)	F7	Replace the Spindle Amplifier (SP).	An error was detected in the spindle amplifier (SP).
SP9159	MISMATCHED FUNCTION CODE	F9	Turn the power off, then restart.	CNC, SV, SP or PS software has been update.
SP9160	THERMISTOR DISCONNECTIO N	G0	Replace the Spindle Amplifier (SP).	An error was found in the thermistor signal on Spindle Amplifier (SP).
SP9161	POW. CABLE SHORT CIRCUIT	G1	1 Check the connection of power cables. 2 Replace the motor.	Short circuit of power cable was detected.

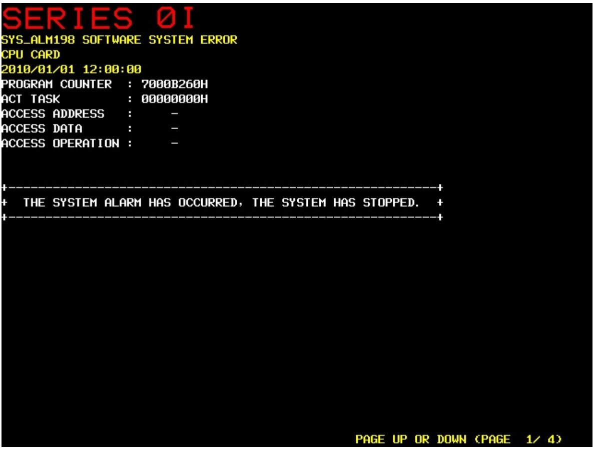
No.	Message	SP indi-cation (*1)	Faulty location and remedy	Description
SP9204	PS SOFT THERMAL		Review the current condition.	Overload was detected in the power supply (PS). (Power Supply (PS) alarm indication: 15)
SP9211	PS ILLEGAL PARAMETER		Change the parameter to an appropriate value.	An invalid value was set in a parameter for controlling the power supply (PS). (Power Supply (PS) alarm indication: 23)
SP9212	PS HARDWARE ERROR		Replace the Power Supply (PS).	A hardware error was detected in the power supply (PS). (Power Supply (PS) alarm indication: 24)
SP9213	PS EXTERNAL INPUT COMPONENT ERROR		1. Change parameters to proper value 2. Change cables (K1, K127, K143) 3. Replace the Power Supply (PS) or the external component such as input filter or transducer	There is something trouble in control parameter for PS, cable, PS itself, or the external component such as input filter or transducer.
SP9214	PS PFB-R ERROR		Replace PFB-R	A PFB-R error is detected.
SP9215	PS PFB-C ERROR		Replace PFB-C	A PFB-C error is detected.
SP9216	PS SUB MODULE ERROR		Confirm the wiring or the combination of PS, PFB-R, and PFB-C.	The wiring or the combination of PS, PFB-R, and PFB-C is illegal.

8.3 SYSTEM ALARMS

8.3.1 Overview

The FANUC 0*i*-F series makes a transition to the special processing state called the system alarm state when a state that disables the continuation of normal system operation is detected.
When the system alarm state is entered, the CNC screen display is switched and the following operations are performed:

- Servo and spindle amplifier excitation is turned off.
- Disconnection of I/O link communication



Example of system alarm screen

Types of System Alarms

System alarms are classified into three types according to the following causes:

- Software causes
- Hardware causes
- Others

- **Software causes**

Mainly, the CNC system software detects software errors.
Typical causes are as follows:

- Conflict in processing/data detected by the internal state monitoring software
- Access to outside of the valid data/instruction ranges
- Division by zero
- Stack overflow
- Stack underflow
- DRAM checksum error

- **Hardware causes**

Mainly, hardware detects hardware errors.
Typical causes are as follows:

- Parity error (DRAM, SRAM, cache)
- Bus error
- Power supply alarm
- FSSB cable disconnection

- **Others**

Moreover, system alarms are caused by the following:

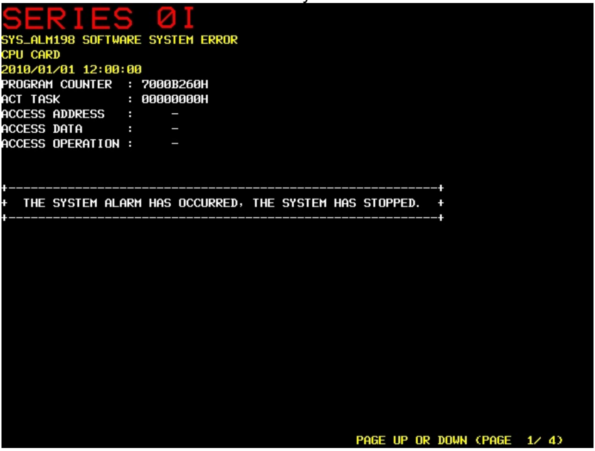
- Causes detected by peripheral software
- Servo software (such as watchdog)
- PMC software (such as an I/O link communication error)

8.3.2 Operations on the System Alarm Screen

(1) Description of system alarm screen

When a system alarm is issued, the screen display is switched to a screen as shown below.

This screen is referred to as the system alarm screen.



The system alarm screen consists of several pages of information.

The following key operations are used:

<PAGE UP>,<PAGE DOWN>

Switches between pages.

<RESET>

Executes the IPL monitor.

(2) Saving of system alarm information

Various information items related to a system alarm are saved in the SRAM.

The SRAM can store information about the latest two system alarms.

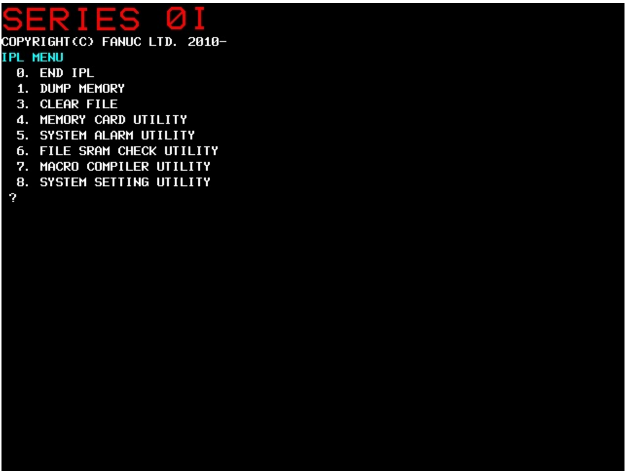
If a third system alarm is issued when information about the latest two system alarms is stored, the information about the oldest system alarm is discarded, and information about the new system alarm is saved.

Saved system alarm information can be output from the IPL screen to the memory card.

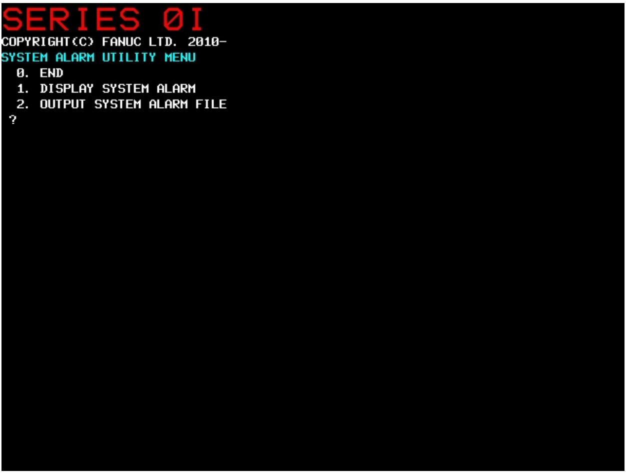
(3) Output of system alarm information

For the FANUC Series 0*i*-F, system alarm information saved from the IPL screen can be output to the memory card.

1. Start the IPL monitor.
   If the system alarm screen is displayed when a system alarm is issued, press the reset key.
   If the power is turned off, turn on the power while holding down "-" and ".".
2. On the IPL monitor screen, enter 5 to select "5. SYSTEM ALARM UTILITY".



3. Enter 2 to select "2. OUTPUT SYSTEM ALARM FILE".



4. If the IPL monitor is executed on the system alarm screen, enter 2 to select "2. OUTPUT SYSTEM ALARM FILE FROM DRAM".
   If the power is turned off, enter 1 to select "1. OUTPUT SYSTEM ALARM FILE FROM FILE-RAM".

```
SERIES 0I
COPYRIGHT(C) FANUC LTD. 2010-
CHECK SYSTEM LABEL : END
OUTPUT SYSTEM ALARM FILE MENU
 0. END
 1. OUTPUT SYSTEM ALARM FILE FROM FILE-RAM
 2. OUTPUT SYSTEM ALARM FILE FROM DRAM
 ?
```

5. If 1 is selected in step 4, a list of saved system alarms is displayed. Enter the number of a file to be output.

```
SERIES 0I
COPYRIGHT(C) FANUC LTD. 2010-
CHECK SYSTEM LABEL : END
OUTPUT SYSTEM ALARM FILE MENU
 0. END
 1. OUTPUT SYSTEM ALARM FILE FROM FILE-RAM
 2. OUTPUT SYSTEM ALARM FILE FROM DRAM
 ? 1

SYSTEM ALARM FILE INFORMATION
 0. END
 1. SYS_ALM198 SOFTWARE SYSTEM ERROR
    ERROR OCCURRED AT 2010/01/01 12:00:00
 2. SYS_ALM114 FSSB DISCONNECTION
    ERROR OCCURRED AT 2010/01/01 12:00:00
 ?
```

6. Enter the file name to output the file.

```
SERIES 0I
COPYRIGHT(C) FANUC LTD. 2010-
CHECK SYSTEM LABEL : END
OUTPUT SYSTEM ALARM FILE MENU
 0. END
 1. OUTPUT SYSTEM ALARM FILE FROM FILE-RAM
 2. OUTPUT SYSTEM ALARM FILE FROM DRAM
 ? 1

SYSTEM ALARM FILE INFORMATION
 0. END
 1. SYS_ALM198 SOFTWARE SYSTEM ERROR
    ERROR OCCURRED AT 2010/01/01 12:00:00
 2. SYS_ALM114 FSSB DISCONNECTION
    ERROR OCCURRED AT 2010/01/01 12:00:00
 ? 1

MEM_CARD FILE NAME ? SYS_ALM1.TXT
```

8.3.3 System Alarms Detected by Hardware

System alarm 400 and subsequent system alarms indicate errors detected by hardware.

The basic screen configuration is shown below:

```
(1) SERIES 0I DXXX
(2) SYS_ALM401 EXTERNAL BUS INVALID ADDRESS
(3) MAIN BOARD
(4) 2015/04/22 17:09:53

(5) PROGRAM COUNTER  : 1000B52CH
 |  ACT TASK         : 01000010H
 |  ACCESS ADDRESS   :     -
 |  ACCESS DATA      :     -
 ↓  ACCESS OPERATION :     -


(6) BUS MASTER PCB   : MAIN BOARD
 |    +--+----------+------------------------------------------------------+
 |     02 MAIN BOARD 03012003 22110000 80010000 00000000 00010000 00000000
 |                   FFFFFFFF FFFFFFFF 68C08216 70FE0000 00000000 00000000
 |                   00000000 00000000 00000000 00000000 00000000
 |
 |  BUS SLAVE PCB    : CPU CARD
 |    +--+----------+------------------------------------------------------+
 |     00 CPU CARD   02071004 20100000 00000000 00000000 00000000 00000000
 |                   FFFFFFFF FFFFFFFF 10B0FC00 CFF90001 68C30061 82160010
 |                   000000F0 00000000 00010000 00000000 00000000
 |
 |  INFORMATION REGISTER
 |    +--+----------+------------------------------------------------------+
 ↓     02 MAIN BOARD 00000000 00000000 00000000 00000000

                                             PAGE UP OR DOWN (PAGE  1/8)
```

[Description of the message screen]

(1) Device name, and series and edition of CNC system software
(2) System alarm number and error message
(3) Most possibly faulty component
(4) Date and time when the error occurred
(5) Software error and other information when the error occurred
(6) Bus information when the error occurred

Item (3) indicates the most possibly faulty component. Mainly, check the component to see whether it is defective.

You can output information from the system alarm screen via the PCMCIA port on the LCD (for a stand-alone type, the PCMCIA port on the main unit) as a text file.

For details of how to output it, see " Operations on the System Alarm Screen".

8.3.4 System Alarms 114 to 160 (Alarms on the FSSB)

Causes

An alarm was detected on the FSSB.

NOTE

The alarm message states the location of a faulty component. The location is indicated using the following character strings.

MAIN : Servo card in the CNC

AMPx : The xth servo amplifier or spindle amplifier as counted from the CNC of each line.
A 2-axis amplifier and 3-axis amplifier are each counted as one unit.

SDUx : The xth separate detector interface unit as counted from the CNC of each line

LINEx : FSSB line where an alarm arose

"/LINEx" following a message if displayed indicates the number of an optical connector on the main board (Basic unit A) or on the servo card (Basic unit G).

LINE1 : COP10A on the main board or COP10A-1 on the servo card

SYS_ALM114 FSSB DISCONNECTION (MAIN -> AMP1) /LINEx SYS_ALM115 FSSB DISCONNECTION (MAIN -> SDU1) /LINEx SYS_ALM116 FSSB DISCONNECTION (AMPn -> AMPm) /LINEx SYS_ALM117 FSSB DISCONNECTION (AMPn -> SDUm) /LINEx SYS_ALM118 FSSB DISCONNECTION (SDUn -> AMPm) /LINEx SYS_ALM119 FSSB DISCONNECTION (SDUn -> SDUm) /LINEx SYS_ALM120 FSSB DISCONNECTION (MAIN <- AMP1) /LINEx SYS_ALM121 FSSB DISCONNECTION (MAIN <- SDU1) /LINEx SYS_ALM122 FSSB DISCONNECTION (AMPn <- AMPm) /LINEx SYS_ALM123 FSSB DISCONNECTION (AMPn <- SDUm) /LINEx SYS_ALM124 FSSB DISCONNECTION (SDUn <- AMPm) /LINEx SYS_ALM125 FSSB DISCONNECTION (SDUn <- SDUm) /LINEx	114: Communication between the servo card and 1st amplifier failed. 115: Communication between the servo card and 1st separate detector interface unit failed. 116: Communication between the nth and mth amplifiers failed. 117: Communication between the nth amplifier and mth separate detector interface unit failed. 118: Communication between the nth separate detector interface unit and mth amplifier failed. 119: Communication between the nth and mth separate detector interface units failed. 120: Communication between the servo card and 1st amplifier failed. 121: Communication between the servo card and 1st separate detector interface unit failed. 122: Communication between the nth and mth amplifiers failed. 123: Communication between the nth amplifier and mth separate detector interface unit failed. 124: Communication between the nth separate detector interface unit and mth amplifier failed. 125: Communication between the nth and mth separate detector interface units failed. Replace the optical cable for the relevant connection. If the error still occurs after replacement, replace the relevant servo card, amplifier(s), and/or separate detector interface unit(s). When the arrow points to the left, a power fault may occur in the amplifier or separate detector interface unit at the base of the arrow. Check the +24 V power supply input to the relevant unit and the +5 V power supply for the pulse coder output from the relevant unit for an error such as a ground fault.
SYS_ALM126 SERVO AMP INTERNAL DISCONNECTION (AMPn) -> /LINEx SYS_ALM127 SERVO AMP INTERNAL DISCONNECTION (AMPn) <- /LINEx	126: Internal communication in the nth amplifier failed. 127: Internal communication in the nth amplifier failed. Replace the relevant amplifier.
SYS_ALM129 ABNORMAL POWER SUPPLY (SERVO:AMPn) /LINEx SYS_ALM130 ABNORMAL POWER SUPPLY (SERVO:SDUn) /LINEx	129: A fault was detected in the power supply of the nth amplifier. 130: A fault was detected in the power supply of the nth separate detector interface unit. Check the power supply of the relevant amplifier or separate detector interface unit.

SYS_ALM134 FSSB LINE DATA ERROR (AMPn) > .. > MAIN /LINEx SYS_ALM135 FSSB LINE DATA ERROR (SDUn) > .. > MAIN /LINEx	134: A data error occurred on the FSSB line and the nth servo amplifier received abnormal data. 135: A data error occurred on the FSSB line and the nth separate detector interface unit received abnormal data. Replace the relevant amplifier or separate detector interface unit. If the machine does not recover from the error after replacement, also replace the slave preceding the relevant slave. If the error still occurs, replace the servo card.
SYS_ALM138 FSSB OUT OF CORRECTION (MAIN <- AMPn) /LINEx SYS_ALM139 FSSB OUT OF CORRECTION (MAIN <- SDUn) /LINEx SYS_ALM140 FSSB OUT OF CORRECTION (AMPn <- AMPm) /LINEx SYS_ALM141 FSSB OUT OF CORRECTION (AMPn <- SDUm) /LINEx SYS_ALM142 FSSB OUT OF CORRECTION (SDUn <- AMPm) /LINEx SYS_ALM143 FSSB OUT OF CORRECTION (SDUn <- SDUm) /LINEx	138: The servo card could not receive correct data due to an FSSB communication error between the servo card and 1st amplifier. 139: The servo card could not receive correct data due to an FSSB communication error between the servo card and 1st separate detector interface unit. 140: The nth amplifier could not receive correct data due to an FSSB communication error between the nth and mth amplifiers. 141: The nth amplifier could not receive correct data due to an FSSB communication error between the nth amplifier and mth separate detector interface unit. 142: The nth separate detector interface unit could not receive correct data side due to an FSSB communication error between the nth separate detector interface unit and mth amplifier. 143: The nth separate detector interface unit could not receive correct data due to an FSSB communication error between the nth and mth separate detector interface units. Replace the optical cable for the relevant connection. If the error still occurs after replacement, replace the relevant servo card, amplifier(s), and/or separate detector interface unit(s).

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SYS_ALM144 FSSB OUT OF CORRECTION (MAIN -> AMPn) /LINEx SYS_ALM145 FSSB OUT OF CORRECTION (MAIN -> SDUn) /LINEx SYS_ALM146 FSSB OUT OF CORRECTION (AMPn -> AMPm) /LINEx SYS_ALM147 FSSB OUT OF CORRECTION (AMPn -> SDUm) /LINEx SYS_ALM148 FSSB OUT OF CORRECTION (SDUn -> AMPm) /LINEx SYS_ALM149 FSSB OUT OF CORRECTION (SDUn -> SDUm) /LINEx	144 : The amplifier could not receive correct data due to an FSSB communication error between the servo card and 1st amplifier. 145 : The separate detector interface unit could not receive correct data due to an FSSB communication error between the servo card and 1st separate detector interface unit. 146 : The mth amplifier could not receive correct data due to an FSSB communication error between the nth and mth amplifiers. 147 : The mth separate detector interface unit could not receive correct data due to an FSSB communication error between the nth amplifier and mth separate detector interface unit. 148 : The mth amplifier could not receive correct data side due to an FSSB communication error between the nth separate detector interface unit and mth amplifier. 149 : The mth separate detector interface unit could not receive correct data due to an FSSB communication error between the nth and mth separate detector interface units. Replace the optical cable for the relevant connection. If the error still occurs after replacement, replace the relevant servo card, amplifier(s), and/or separate detector interface unit(s).

SYS_ALM150 SLAVE DMA BUS FAILURE (AMPn) /LINEx SYS_ALM151 SLAVE DMA BUS FAILURE (SDUn) /LINEx SYS_ALM152 SLAVE LSI DMA BUS FAILURE (AMPn) /LINEx SYS_ALM153 SLAVE LSI DMA BUS FAILURE (SDUn) /LINEx SYS_ALM154 SLAVE LOCAL ERROR NO.1 (AMPn) /LINEx SYS_ALM155 SLAVE WATCH DOG ALARM (AMPn) /LINEx SYS_ALM156 SLAVE LOCAL ERROR NO.2 (SDUn) /LINEx SYS_ALM157 SLAVE LOCAL ERROR NO.3 (AMPn) /LINEx SYS_ALM158 SLAVE LOCAL ERROR NO.3 (SDUn) /LINEx SYS_ALM159 SPINDLE RAM FAILURE (AMPn) /LINE X SYS_ALM160 SPINDLE WATCH DOG ALARM (AMPn) /LINE X	150-160: An error was detected in the internal circuit of the relevant amplifier or separate detector interface unit. Replace the relevant amplifier or separate detector interface unit.

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8.4 SYSTEM ALARMS RELATED TO THE PMC AND I/O LINK

```
SERIES 0I DXXX

SYS_ALM197 EMBEDDED SOFTWARE SYSTEM ERROR ←(Type of system alarm)
PLEASE CHECK THE FOLLOWING INFORMATION:
2015/04/18 12:00:00
EMBEDDED SOFTWARE SYSTEM ERROR:(40xx-xxxx)
PC097 LADDER CRC ERROR (DCSPMC)          ←(alarm No.)


-----< ERROR POSITION >------------------------------
CPU CARD
--------------------------------------------
```

The system alarms related to the PMC and I/O Link have a system alarm number (SYS_ALM194, SYS_ALM195, SYS_ALM196, SYS_ALM197 or SYS_ALM199) and an alarm number (PCxxx) as listed below. Possible causes include an I/O Link communication error and PMC control circuit failure.
The following tables detail the system alarms.

SYS_ALM199 error messages (PMC general)

Message	Faulty location / corrective action	Contents
PC004 CPU INVALID INSTRUCTION -----< ERROR POSITION >----- MAIN BOARD	This alarm may be due to a main board fault.	A CPU error occurred in the PMC system.
PC006 CPU INVALID SLOT INSTRUCTION -----< ERROR POSITION >----- MAIN BOARD		
PC009 CPU ADDRESS ERROR -----< ERROR POSITION >----- MAIN BOARD		
PC010 DMA ADDRESS ERROR -----< ERROR POSITION >----- MAIN BOARD		
PC012 CPU USER BREAK EXCEPTION -----< ERROR POSITION >----- MAIN BOARD		
PC030 RAM PARITY PC030 S-RAM PARITY -----< ERROR POSITION >----- MAIN BOARD		A RAM parity error occurred in the PMC system.
PC060 BUS ERROR -----< ERROR POSITION >----- MAIN BOARD		A BUS error occurred in the PMC system.
PC070 ILLEGAL LADDER SPE (PMCn) PC070 LADDER SPE(PMCm) -----< ERROR POSITION >----- MAIN BOARD		A stack error occurred with the SPE functional instruction of the ladder program of m path.
PC071 ILLEGAL LADDER FBE (PMCm) -----< ERROR POSITION >----- MAIN BOARD		A stack error occurred with the FBE instruction of the ladder program of path m. (Path m PMC)

Message	Faulty location / corrective action	Contents
PC072 STACK OVERFLOW (TASK:xx) PC072 STACK OVERFLOW (INT:xx) -----< ERROR POSITION >----- MAIN BOARD		A stack error occurred (detected by the software).
PC080 SYSTEM EMERGENCY -----< ERROR POSITION >----- MAIN BOARD		System emergency state of the PMC LSI.
PC090 SYSTEM EMERGENCY (SOFTWARE) PC090 NON MASKABLE INTERRUPT (SOFTWARE) PC090 NON MASKABLE INTERRUPT (UNKNOWN) -----< ERROR POSITION >----- MAIN BOARD		An NMI of unknown cause occurred with the PMC management software.
PC093 UNEXPECTED INTERRUPT (xx) -----< ERROR POSITION >----- MAIN BOARD		An interrupt of unknown cause occurred with the PMC management software.
PC094 UNEXPECTED TRAP EXCEPTION (xx) -----< ERROR POSITION >----- MAIN BOARD		A trap exception of unknown cause occurred with the PMC management software.
PC095 MESSAGE CRC ERROR (PMCm) -----< ERROR POSITION >----- MAIN BOARD		A RAM check error occurred.
PC096 LADDER CODE ERROR (___) -----< ERROR POSITION >----- MAIN BOARD		
PC097 LADDER CRC ERROR (PMCm) -----< ERROR POSITION >----- MAIN BOARD		
PC098 PMC SOFTWARE CRC ERROR PC098 PMC SOFTWARE ECC ERROR (_____:_) -----< ERROR POSITION >----- MAIN BOARD		
PC501 CNC/PMC INTERFACE ERROR (PATHx) -----< ERROR POSITION >----- MAIN BOARD		The read or write operation between CNC and PMC failed.

SYS_ALM197 error messages (PMC general)

Message	Faulty location / corrective action	Contents
PC070 ILLEGAL LADDER SPE (DCSPMC) -----< ERROR POSITION >-- CPU CARD	This alarm may be due to a CPU card fault.	A stack error occurred with the SPE functional instruction of the ladder program of DCSPMC.
PC071 ILLEGAL LADDER FBE (DCSPMC) -----< ERROR POSITION >-- CPU CARD		A stack error occurred with the FBE instruction of the ladder program of DCSPMC

Message	Faulty location / corrective action	Contents
PC095 MESSAGE CRC ERROR (DCSPMC) -----< ERROR POSITION >-- CPU CARD		A RAM check error occurred.
PC097 LADDER CRC ERROR (DCSPMC) -----< ERROR POSITION >-- CPU CARD		

SYS_ALM196 error messages (PMC watchdog)

Message	Faulty location / corrective action	Contents
PC073 WATCH-DOG ALARM(CNC<->PMC) ---< ERROR POSITION >--- MAIN BOARD	This alarm may be due to a main board fault.	The PMC CPU is not running.

SYS_ALM195 error messages (related to the I/O Link)

Message	Faulty location / corrective action	Contents
PC050 I/O LINK ER1 CHn:Grxx:yy COMMUNICATION ALARM AT CHn : GROUP xx -< ERROR POSITION>- CHn / GROUPxx --------------------------------	1) Check the I/O device of group “xx” in channel “n”: - Instantaneous power failure - Unstable power line 2) Check the I/O Link cable between JD1B of group “xx” and JD1A of group “xx-1” - faulty wiring - incomplete contact 3) The I/O Link device of group “xx” in channel “n” is faulty.	An I/O Link communication error occurred. “n” is a channel number (1 to 3). “xx” is a group number (0 to 15). “yy” is a internal error code. This error occurs when the communication with the device of group “xx” in channel “n” is stopped. The causes are as follows: - Instantaneous power failure, unstable voltage or unstable power line of the device - Faulty wiring or incomplete contact of communication cable - Faulty device Please note that It may not show an accurate group number with some conditions of the problem.

Message	Faulty location / corrective action	Contents
PC051 I/O LINK ER2 CHn:xx:yy:ww:vv COMMUNICATION ALARM AT CHn -< ERROR POSITION>- CHn -------------------------------	1) When you use an I/O Unit-Model A, no base extension unit is connected corresponding to an I/O assignment data. Check connection of I/O devices and I/O assignment data. 2) When you use Power Mate as I/O Link slave device and/or Servo Motor Beta series I/O Link option, some system alarm occurs in such devices. 3) A Communication may be influenced by noise. Check the ground wire and the shield of the communication cables. 4) The output of the I/O Link devices is short-circuited. 5) The power of the I/O Link master and/or slave devices is faulty. - Instantaneous power failure - Unstable power line 6) Incomplete contact of the communication cable 7) Faulty wiring of the communication cable 8) Check the grounding of the shield wire of the earth terminal or the communication cable of I/O devices. 9) I/O Link devices are faulty. 10) I/O Link master is faulty. n=1,2: main board n=3: CPU card	An I/O Link communication error occurred. "n" is a channel number (1 to 3). "xx", "yy", "ww" and "vv" are internal error code. There are various causes as for this error.

SYS_ALM194 error messages (related to the I/O Link *i*)

Message	Faulty location / corrective action	Contents
PC052 I/O LINK I PMC LSI RAM PARITY ERROR -< ERROR POSITION>- MAIN BORAD	Change the main board.	A RAM parity error occurred in PMC LSI on the main board.
PC053 I/O LINK I SLAVE LSI RAM PARITY ERROR -< ERROR POSITION>- CHn/ UNITy(GROUPx) : "unit name" (Note 1)	Change the I/O device of the unit.	A RAM parity error occurred in "y"th unit (group "x") of channel "n".

Message	Faulty location / corrective action	Contents
PC054 I/O LINK I ABNORMAL POWER SUPPLY -< ERROR POSITION>- CHn/ UNITy(GROUPx) : “unit name” (Note 1)	Check the power supply of the I/O unit.	A power disconnection alarm occurred in the “y”th unit (group “x”) of channel “n”.
PC055 I/O LINK I I/O LINK I SENDING DATA FAILURE -< ERROR POSITION>- CHn / CNC <-> UNIT1(GROUP0) CNC : MAIN BOARD UNIT1 : “unit name” (Note 1)	Check whether there is a possibility that noise is inserted between the CNC and 1st unit. Check the ground status of the slave device and the contact of the connection cable.	A communication error occurred between the CNC and 1st unit (group 0) of channel “n”.
PC055 I/O LINK I I/O LINK I SENDING DATA FAILURE -< ERROR POSITION>- CHn / UNITy-1(GROUPx-1) <-> UNITy(GROUPx) UNITy –1 : “unit name” (Note 1) UNITy : “unit name” (Note 1)	Check whether there is a possibility that noise is inserted between the “y-1”th unit (group “n-1”) and “y”th unit (group “n”). Check the ground status of the slave device and the contact of the connection cable.	A communication error occurred between the “y-1”th unit (group “x-1”) and the “y”th unit (group “x”) of channel “n”.
PC056 I/O LINK I I/O LINK I DISCONNECTION -< ERROR POSITION>- CHn / CNC <-> UNIT1(GROUP0) CNC : MAIN BOARD UNITy : “unit name” (Note 1)	Check whether there is disconnection or incomplete contact for the cable between the CNC and 1st unit (group 0).	Connection error occurred between the CNC and 1st unit (group 0) of channel “n”.
PC056 I/O LINK I I/O LINK I DISCONNECTION -< ERROR POSITION>- CHn / UNITy-1(GROUPx-1)<-> UNITy(GROUPx) UNITy –1 : “unit name” (Note 1) UNITy : “unit name” (Note 1)	Check whether there is disconnection or incomplete contact of the cable between the “y-1”th unit (group “x-1”) and “y”th unit (group “x”).	Connection error occurred between the “y-1”th unit (group “x-1”) and “y”th unit (group “x”) of channel “n”.
PC057 I/O LINK I SAFETY I/O ALARM -< ERROR POSITION>- UNITy : “unit name” (Note 1)	Change the I/O device of the unit. If the error still occurs, change the main board.	A hardware failure of the safety I/O occurred between the CNC and the “y”th unit.
PC058 I/O LINK I SLAVE LSI EXTERNAL ALARM -< ERROR POSITION>- CHn/ UNITy(GROUPx) : “unit name” (Note 1)	Change the I/O device of the unit.	A hardware failure occurred on the “y”th unit (group “x”) of channel “n”.

NOTE

1. When the unit name of the connected I/O device is unknown, its hardware ID is displayed.
2. For some I/O devices, one unit such as a safety I/O unit may consist of two groups. If a connection failure occurs between groups containing units of the same type, PC058 instead of PC056 indicating a connection failure occurs as a unit failure.

8.5 PMC ALARM MESSAGES

The following table lists the PMC alarm messages that may be displayed on the PMC alarm screen.

Alarm number	Faulty location / corrective action	Contents
ER01 PROGRAM DATA ERROR	(1) Enter the sequence program again. (2) If this error recurs even after you have entered the sequence program again, the error may be due to a hardware fault. In that case, contact us.	The sequence program is invalid.
ER02 PROGRAM SIZE OVER	(1) Reduce the size of the sequence program. (2) Contact us, and specify a ladder step count option that allows you to set a larger program size.	The sequence program is larger than the program storage area. The sequence program is invalid.
ER03 PROGRAM SIZE ERROR (OPTION)	(1) Reduce the size of the sequence program. (2) Contact us, and specify a ladder step count option that allows you to set a larger program size.	The sequence program exceeds the size specified by the ladder step count option.
ER04 PMC TYPE UNMATCH	Change the sequence program so that it specifies the adequate PMC type, by using the programmer.	The PMC type specified in the sequence program does not match the type of the PMC actually in use.
ER08 OBJECT UNMATCH	Contact us.	An unsupported function is used in the sequence program.
ER09 PMC LABEL CHECK ERROR. PLEASE TURN ON POWER AGAIN WITH PRESSING 'O'&'Z'. (CLEAR PMC SRAM)	(1) Turn on the power of the CNC again, by holding down the ‘O’ and ‘Z’ keys at the same time. (2) Replace the backup batteries.	The nonvolatile memory of the PMC system needs to be initialized in such cases as when you have changed the PMC model.
ER17 PROGRAM PARITY	(1) Enter the sequence program again. (2) If this error recurs even after you have entered the sequence program again, the error may be due to a hardware fault. In that case, contact us.	The parity of the sequence program is invalid.
ER18 PROGRAM DATA ERROR BY I/O	Enter the sequence program again.	An interrupt was specified while the sequence program was being read.
ER19 LADDER DATA ERROR	Display the LADDER DIAGRAM EDITOR screen again, and terminate the editing operation by pressing the [EXIT] soft key.	The CNC screen was forcibly displayed by the relevant function key during the editing of a ladder program.
ER22 NO PROGRAM	Enter the sequence program again.	The sequence program is empty.
ER27 LADDER FUNC. PRM IS OUT OF RANGE	Correct the sequence program; change the parameter number specified in a functional instruction to a value that is within the allowable range.	An out-of-range parameter number is specified in the TMR, TMRB, CTR, CTRB, DIFU, or DIFD functional instruction.

Alarm number	Faulty location / corrective action	Contents
ER33 I/O Link ERROR(CHn) (Note3)	Contact us; replace the faulty hardware.	The LSI for the I/O Link is faulty.
ER34 I/O Link ERROR(CHn Gxx) (Note1)(Note3)	(1) Check the cable connections to the devices of group xx. (2) Check whether the power of each I/O device has been turned on before the CNC. (3) Replace any device of group xx in which the PMC control module is embedded.	An I/O device communication error occurred on the slave side of group xx.
ER35 TOO MUCH OUTPUT DATA IN GROUP(CHn Gxx) (Note1) (Note3)	Reduce the output data count of group xx.	The output data count of I/O Link group xx exceeds the upper limit (33 bytes). Alternatively, the output data count of I/O Link *i* group xx exceeds the upper limit (65 bytes by default or 29 bytes for the safety I/O device). The superfluous data is regarded as invalid.
ER36 TOO MUCH INPUT DATA IN GROUP(CHn Gxx) (Note1) (Note3)	Reduce the input data count of group xx.	The input data count of I/O Link group xx exceeds the upper limit (33 bytes). Alternatively, the input data count of I/O Link *i* group xx exceeds the upper limit (65 bytes by default or 29 bytes for the safety I/O device). The superfluous data is regarded as invalid.
ER37 TOO MUCH SLOT IN BASE(CHn) (Note3)	Correct the slot number to a value of 10 or less.	The slot number for the I/O Link exceed the upper limit (10). The slot number larger than 11 is regarded as invalid.
ER38 MAX SETTING OUTPUT DATA OVER(CHn Gxx) (Note1) (Note3)	(1) In case of I/O Link, reduce the total amount of output data of all groups to 128 bytes or less. (2) For I/O Link *i*, reduce the total amount of output data of all groups to 256 bytes or less.	The I/O area for the I/O Link is insufficient. (The area allocated to the group xx and later on the output side is regarded as invalid.) In case of I/O Link *i*, the I/O area is insufficient in the normal update cycle mode.
ER39 MAX SETTING INPUT DATA OVER(CHn Gxx) (Note1) (Note3)	(1) In case of I/O Link, reduce the total amount of input data of all groups to 128 bytes or less. (2) For I/O Link *i*, reduce the total amount of output data of all groups to 256 bytes or less.	The I/O area for the I/O Link is insufficient. (The area allocated to the group xx and later on the input side is regarded as invalid.) In case of I/O Link *i*, The I/O area is insufficient in the normal update cycle mode.

Alarm number	Faulty location / corrective action	Contents
ER43 PROGRAM DATA ERROR(PT/NT)	(1) Store sequence program which is compiled again after recompilations using FANUC LADDER-III. (2) If you see the same alarm again after <1>, contact us.	The sequence program is invalid.
ER45 NO OPTION(FUNCTON BLOCK)	Add a required function block option.	No function block option is specified.
ER46 MESSAGE DATA UPDATE ERROR. PLEASE TRUN OFF POWER AFTER SAVING DATA.	Save the corrected sequence program or message data for multi-language display to F-ROM. Moreover, turn the power off/on.	The message data in the sequence program or the message data for multi-language display cannot be updated. It is necessary to turn off/on the power. The ladder program cannot be executed when this alarm occurs.
ER47 ILLEGAL OVERRIDE FUNCTION SETTING (TOO MANY PMC PATHS)	The “override mode” of the forced I/O function is available for up to three paths simultaneously. Make the “override mode” of the forced I/O function for several PMC paths and restart the CNC.	The “override mode” of the forced I/O function is enabled for four or more PMC paths.
ER48 STEP SEQUENCE TIME OVER(xxH)	Remove the setting of exceeding setting time in the Step Sequence Time Monitor Setting screen.	The activated condition of step sequence exceeds the time limit, which is set in the screen.
ER49 POSITIVE/NEGATIVE TRANSITION (PT/NT) INSTRUCTION INITIALIZE ERROR. PLEASE TRUN OFF POWER AFTER SAVING PROGRAM.	Modify the sequence program and save the program to flash ROM. Then, reboot the CNC.	The work memory of positive / negative transition (PT/NT) instruction cannot be initialized. It is necessary to reboot the CNC. The ladder program stops when this alarm occurs.
ER50 PMC EXECUTION ORDER ERROR	Check CNC parameter Nos. 11900 to 11904.	The set execution order of the multi-path PMC function is invalid.
ER51 PMC EXECUTION PERCENTAGE ERROR	Check CNC parameter Nos. 11905 to 11909.	The set execution percentage of the multi-path PMC function is invalid.
ER52 I/O Link CHANNEL ASSIGNMENT ERROR (Note3)	Check CNC parameter Nos. 11910 to 11912 .	The I/O Link channel assignment to the PMC system is invalid.
ER54 NC-PMC I/F ASSIGNMENT ERROR	Check CNC parameter Nos. 11920 to 11929.	The interface assignment between NC and PMC is invalid.
ER55 LEVEL1 EXECUTION CYCLE ERROR	Check CNC parameter No. 11930.	The set ladder level 1 execution cycle is invalid.
ER57 MULTI PATH PMC I/F ASSIGNMENT ERROR	Check CNC parameter No. 11932.	Assignment of PMC path interface is invalid.

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Alarm number	Faulty location / corrective action	Contents
ER58 PMC MEMORY TYPE SETTING ERROR	Check CNC parameter Nos. 11940 to 11942.	Setting of the PMC memory type is invalid.
ER60 I/O Link i ERROR(CHn) (Note3)	Contact us and replace the hardware.	The LSI for I/O Link *i* is faulty.
ER61 I/O Link i ERROR(CHn Gxx) (Note1) (Note3)	(1) Check the cable connections to the devices in group xx. (2) Check whether the power to each I/O device has been turned on before the CNC. (3) Replace any device in group xx in which the PMC control module is embedded.	An I/O device communication error occurred on the slave side of group xx.
ER62 I/O Link i DCS ERROR (Note3)	Contact us and replace the hardware.	The LSI for the I/O Link *i* DCS is faulty.
ER63 I/O Link CHANNEL SETTING ERROR (Note3)	Change the communication mode to modify the channel configuration with fewer points. Use bit 0 or 1 of NC parameter No. 11933 to specify whether to use I/O Link or I/O Link *i* for communication with each channel.	The I/O points in the entire system exceed 4096/4096. For the I/O Link, the points are 1024/1024 per channel. For I/O Link *i*, they are 2048/2048 per channel.
ER64 I/O Link i TOO MANY CONNECTED GROUPS(CHn) (Note3)	Reduce the number of connected I/O devices to 24 or less.	In CHn, 25 or more I/O devices are connected.
ER65 I/O Link i TOO MANY SLOTS(CHn) (Note3)	Reduce the number of connected I/O device modules to 256 or less.	In CHn, 257 or more slots of I/O device modules are connected.
ER66 I/O Link i PMC ADDRESS OVERLAPPED (PMCm X(Y)nnnn) (Note3)	Enter the PMC address or size again so that any address is not used by multiple PMCs that share PMC memory.	I/O Link *i* assignment data is allocated at the PMCm X(Y)nnnn address and X(Y)nnnn address of the PMC for which the PMC memory share mode is set.
ER67 I/O Link i TOO MANY SAFETY I/O GROYPS (Note3)	Reduce the group number of safety I/O.	The total group number of safety I/O in PMC paths exceed 4 or the total group number of safety I/O in DSCPMC exceed 4 for I /O Link *i*.
ER68 I/O Link i TOO MANY ASSIGNMENTS IN HIGH SPEED MODE (CHn,Gyy) (Note1) (Note3)	When a group in the high-speed transfer cycle mode is connected to I/O Link *i*, correct assignment so that the assignment for each group is performed within the quartered transfer timing with referencing the PMC programming manual (B-64513EN).	In CHn, assignment could not be made to group yy and following because the transfer capacity limit was exceeded in transfer timing assignment processing when the high-speed mode of I/O Link *i* is used.

Alarm number	Faulty location / corrective action	Contents
ER69 I/O Link i ASSIGNMENT ADDRESS INVALID(CHx Gyy) (Note2) (Note3)	Modify I/O Link *i* assignment data.	I/O Link *i* assignment data for group yy in CHx contains a nonexistent PMC path address.
ER70 PMC ADDRESS BLOCK OVERLAPPED BETWEEN I/O Link AND I/O Link i (PMCm X(Y)nnnn) (Note3)	(1) Delete the relevant I/O Link *i* assignment or change the assignment address. (2) Change the PMC address block of the relevant I/O Link channel. (Machine signal interface setting) (3) Check the I/O Link communication mode. (Bit 0 or 1 of NC parameter No. 11933) (4) Check the setting of the I/O Link *i* assignment selection function.	The I/O Link and I/O Link *i* are assigned to the same PMC address block.
ER71 I/O Link i STATUS ALARM LENGTH OVER IN GROUP(CHn Gxx) (Note1) (Note3)	Modify the I/O device configuration so that the total length of status alarm data does not exceed 64 bytes.	The total length of status alarm data for I/O device modules connected to group xx of CHn exceeds the limit (64 bytes).
ER89 EDITING I/O CONFIGURATION DATA IS NOT COMPLETED	Complete the editing of I/O configuration data.	I/O configuration data is invalid because it is being edited.
ER90 TOO LARGE I/O CONFIGURATION DATA (Note3)	Reduce the size of the I/O configuration file.	I/O configuration data is larger than the save area.
ER91 I/O CONFIGURATION DATA PARITY (Note3)	(1) Enter the I/O configuration file again. (2) If this error still occurs after reentry, a hardware failure may occur. Contact us.	The parity of I/O configuration data is invalid.
ER92 I/O CONFIGURATION DATA ERROR BY I/O	Enter the I/O configuration file again.	An interrupt was specified while the I/O configuration file was being read.
ER93 UNSUPPORTED I/O CONFIGURATION DATA (Note3)	Modify the type of I/O configuration data and enter the data again.	I/O configuration data is of an unrecognizable type.
ER94 I/O CONFIGURATION DATA ERROR (Note3)	Compile the I/O configuration data using FL-III again and enter it again.	A data structure error was found in I/O configuration data.

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Alarm number	Faulty location / corrective action	Contents
ER95 IO DEVICE MISMATCH(CHn) (Note3)	When this alarm is issued with a machine which has operated normally, possible causes are: (1) The communication cable is broken or a connection failure occurs in the cable. (2) The power to an I/O device is off or is turned on too late. (3) A failure occurs in an I/O device. (4) When the power to the CNC is turned off, then on again, the power to an I/O device is kept on. When turning the power to the CNC off, then on again, be sure to turn the power to all I/O devices off, then on. When this alarm is issued during debugging of a sequence program, there are the following possible causes in addition to the above: (5) The connected I/O device configuration (type, sequence, or number of units) is invalid. (6) An invalid I/O device configuration is registered. When this alarm is issued, any inconsistent I/O device can be checked in the I/O device connection diagnosis screen.	This alarm is issued when the I/O devices actually connected to the CNC is inconsistent with the I/O device configuration registered in the I/O device connection diagnosis screen. The ladder program is run even when this alarm is issued.
ER96 IO Link MAX GROUP OVER(CHn) (Note3)	(1) Check the PMC paths and addresses of blocks 1 and 2 in channel n in the CONFIG PARAM screen. (2) Check the total number of groups in blocks 1 and 2 in I/O module allocation setting. (3) Check the parameter setting for the I/O Link assignment data selection function.	When 2-path allocation for the I/O Link channel is used, the total number of groups in blocks 1 and 2 exceeds 16. The ladder program is run even when this alarm is issued.

Alarm number	Faulty location / corrective action	Contents
ER97 IO Link FAILURE(CHn Gxx) (Note1)(Note3)	When this alarm is issued with a machine which has operated normally, possible causes are: (1) The communication cable from group xx-1 to group xx is broken or a connection failure occurs in the cable. (2) The power to an I/O device in group xx or following is off or is turned on too late. (3) A failure occurs in an I/O device in group xx or xx-1. (4) When the power to the CNC is turned off, then on again, the power to an I/O device is kept on. When turning the power to the CNC off, then on again, be sure to turn the power to all I/O devices off, then on. When this alarm is issued during debugging of a sequence program, there are the following possible causes in addition to the above: (5) The number of groups of connected I/O devices is invalid. (6) The I/O module allocation setting is invalid. (7) The parameter setting for the I/O Link assignment data selection function is invalid. (8) The machine signal interface is invalid. When this alarm is issued, details can be checked in the I/O device connection diagnosis screen.	This alarm is generated if the number of I/O units is insufficient. This alarm is generated if the number of I/O units, set with the I/O module allocation and I/O link allocation selection functions differs from the number of I/O units actually connected to the CNC. The ladder program runs regardless of the occurrence of this alarm.
WN02 OPERATE PANEL ADDRESS ERROR	Correct the Series 0 operator's panel address that is set in the PMC system parameter.	The Series 0 operator's panel address that is set in the PMC system parameter is invalid.
WN03 ABORT NC-WINDOW/EXIN	Correct the ladder program and reboot the power of CNC. For details, see PMC programming manual.	The ladder program was stopped while communication was in progress between CNC and PMC. This alarm may cause the WINDR, WINDW, EXIN, and DISPB functional instructions to malfunction.

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Alarm number	Faulty location / corrective action	Contents
WN07 LADDER SP ERROR(STACK)	Correct the sequence program so that the subprogram has eight or fewer levels of nesting.	There are too many levels of nesting (levels more than 8) for the CALL or CALLU functional instruction to call the subprogram.
WN09 SEQUENCE PROGRAM IS NOT WRITTEN TO FLASH ROM	If you want to use a changed sequence program again next time you power on the system, write the sequence program to flash ROM. If you have made any unwanted change to the sequence program by mistake, read the original sequence program from flash ROM.	You have changed the sequence program using the LADDER DIAGRAM EDITOR screen or DATA I/O screen, but you have not yet written the changed sequence program to flash ROM. If you shut down the system without writing the changed sequence program to flash ROM, the changes you have made will be nowhere next time you turn on the power.
WN10 NO OPTION (STEP SEQUENCE)	(1) Add the step sequence option. (2) Arrange so that the step sequence subprogram will not be called.	No step sequence option was found when the system attempted to execute a step sequence.
WN11 INCOMPATIBLE FUNCTION	Re-compile the program, using FANUC LADDER-III or a ladder editing package.	There is a functional instruction that does not conform to this PMC.
WN57 OVERRIDE FUNCTION IS ACTIVE	The override function is for ladder debugging purposes, so be sure to disable it before shipment.	The override function is enabled.
WN58 UNSUPPORTED FUNCTION	Modify the program, using the built-in ladder editing function.	There is an unsupported functional instruction. This instruction was not processed.
WN59 MESSAGE FILE SYMBOL UNDEFINED	Correct the error in the message file for multi-language display.	In the message file for multi-language display, a symbol that does not exist in the ladder is defined.
WN60 MESSAGE FILE SYMBOL INVALID	Correct the error in the message file for multi-language display.	In the message file for multi-language display, a symbol other than an A address is defined.
WN61 MESSAGE FILE ADDRESS DUPLICATE	Correct the error in the message file for multi-language display.	“A” address is defined more than once in a symbol and an address or in symbols.
WN62 MESSAGE FILE NUMBER ERROR	Correct the error in the message file for multi-language display.	For the same “A” address, the message number in the ladder differs from that in the message file for multi-language display.

Alarm number	Faulty location / corrective action	Contents
WN63 MESSAGE FILE IS NOT WRITTEN TO FLASH ROM	If you want to use the changed message file for multi-language display the next time you turn on the power, write the message file to the flash ROM.	On the data I/O screen, the message data for multi-language display was changed, but the changed message data for multi-language display is not yet written to the flash ROM. The changed message data for multi-language display will be lost the next time the power is turned on.
WN64 MESSAGE FILE SIZE OVER	(1) Reduce the message file for multi-language display. (2) Contact us, and specify an option of a larger size.	The message file for multi-language display is larger than the program storage area. The message file for multi-language display is illegal.
WN65 MESSAGE FILE MISMATCH	Contact us.	An unsupported function is used in the message file for multi-language display.
WN66 MESSAGE FILE PARITY	(1) Re-enter the message file for multi-language display. (2) If this error recurs even after you have entered the sequence program again, the error may be due to a hardware fault. In that case, contact us.	The parity of the message file for multi-language display is illegal.
WN67 MESSAGE FILE ERROR BY I/O	Re-enter the message file for multi-language display.	An interrupt was specified while the message for multi-language display was being read.
WN68 I/O CONFIGURATION DATA IS NOT WRITTEN TO FLASH ROM	If you want to use changed I/O configuration data again next time you power on the system, write the I/O configuration data to flash ROM.	You have changed I/O configuration data using the I/O configuration data editing or DATA I/O screen, but you have not yet written the changed I/O configuration data to flash ROM. If you shut down the system without writing the changed I/O configuration data to flash ROM, the changes you have made will be nowhere next time you turn on the power.

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Alarm number	Faulty location / corrective action	Contents
WN69 I/O Link i DO ALARM (CHn Gxx Syy zz : PMCm Ybbb = **H) (Note1)	Check DO of the relevant device.	The DO alarm (ex. a short circuit with the ground) occurs at “zz” bytes of slot “yy” of group “xx” in channel “n”. Y “bbbb” of PMC path ”m” is the address at which the alarm occurred. DCSPMC Y”bbbb” is the address for DCSPMC. Display of “PMC*Y****” is the case of occurrence of unassigned address. The “**H” shows some bits at which the alarm occurs by hexadecimal. (Ex. “PMC1Y115=28H” shows the alarm occurs at Y115.3 and Y115.5 in PMC1. “28H” means “00101000” in binary.) For the details of the alarm of I/O devices, refer to the “Connection manual (HARDWARE)”.
WN70 I/O Link i STATUS ALARM (CHn Gxx Syy zz = **H) (Note1)	Check the alarm information of applied I/O device.	The status alarm except for the DO alarm occurs at “zz” bytes of slot “yy” of group “xx” in channel “n”. The “**H” shows some bits at which the alarm occurs by hexadecimal. For the details of the alarm of I/O devices, refer to the “Connection manual (HARDWARE)”.

NOTE
1 The displayed group number in ER34, ER35, ER36, ER38, ER39, ER61, ER68, ER71, ER97, WN69 and WN70 is wiring number of I/O device.
2 The group number displayed in ER69 is the number of I/O Link *i* assignment data.
3 When some PMC alarms related to I/O Link and I/O Link *i* occur, all of I/O devices in all of channels do not be liked with the CNC.

8.6 POWER MATE CNC MANAGER FUNCTION

When the I/O Link Option for the FANUC servo unit β*i* series (called I/O Link β*i* below) is used for CNC additional axes (slaves), the Power Mate CNC manager function can be used to display and set up various types of data of these slaves on the CNC.

The Power Mate CNC manager function enables the following display and setting operations:
(1) Current position display (absolute/machine coordinates)
(2) Parameter display and setting
(3) Alarm display
(4) Diagnosis data display
(5) System configuration screen display
Up to eight slaves can be connected to each I/O Link channel.

Warning

If an alarm is issued for the Power Mate CNC manager, a warning message is displayed.

Message	Description
DATA ERROR	An attempt was made to execute [F OUTPUT] (NC → β) for a program not found in the program area.
WRITE PROTECTED	An attempt was made to execute [F INPUT] (β → NC) for a program area when the memory protection signal (KEY) is off.
EDIT REJECTED	An attempt was made to execute [F INPUT] (β → NC) when the program area already contained a program with the same name as that to be created by executing [F INPUT] (β → NC). An attempt was made to execute [F INPUT] (β → NC) when the number of the program to be created by executing [F INPUT] (β → NC) was selected. An attempt was made to execute [F INPUT] (β → NC) when CNC parameter TVC (No. 0000#0) was set to 1. (Parameters Nos. 0000 to 0019 are output, but parameter No. 0020 and subsequent parameters are not output.) An attempt was made to execute [F OUTPUT] (NC → β) when a memory card did not contain any program for which [F OUTPUT] (NC → β) could be executed. An attempt was made to execute [F INPUT] (β → NC) for a protected memory card.
NO MORE SPACE	An attempt was made to execute [F INPUT] (β → NC) when the program area did not have enough unused space.
FORMAT ERROR	Data other than digits, signs, CAN, and INPUT was entered as the setting of a parameter.
TOO MANY FIGURES	Data consisting of 9 or more digits was entered for a bit-type parameter.
DATA IS OUT OF RANGE	The setting exceeds the valid data range.

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8.7 ERROR DISPLAY ON THE SPINDLE AMPLIFIER

NOTE (*1)

Note that the meanings of the Spindle Amplifier (SP) indications differ depending on which LED, the red or yellow LED, is on. When the yellow LED is on, an error code is indicated with a 2-digit number. An error code is indicated in the CNC diagnosis data No.710. When the red LED is on, the spindle amplifier indicates the number of an alarm generated in the serial spindle.

→ See "ALARM LIST (SERIAL SPINDLE)."

SP indi-cation (*1)	Description	Remedy
01	Although neither *ESP (emergency stop signal; there are two types of signals including the input signal and Power Supply (PS) contact signal) nor MRDY (machine ready signal) is input, SFR (forward rotation signal)/SRF (reverse rotation signal)/ORCM (orientation command) is input.	Check the *ESP and MRDY sequence. For MRDY, pay attention to the parameter setting regarding the use of the MRDY signal (parameter No. 4001#0).
03	The parameter settings are such that a position sensor is not used (position control not performed) (bits 3, 2, 1, 0 of parameter No. 4002 = 0, 0, 0, 0), but a Cs contour control command is input. In this case, the motor is not excited.	Check the parameter settings.
04	The parameter settings are such that a position sensor is not used (position control not performed) (bits 3, 2, 1, 0 of parameter No.4002 = 0, 0, 0, 0), but a servo mode (rigid tapping, spindle positioning, etc.) or spindle synchronization command is input. In this case, the motor is not excited.	Check the parameter settings.
05	The orientation function option parameter is not specified, but ORCM (orientation command) is input.	Check the orientation function parameter settings.
06	The speed range switching control function option parameter is not specified, but low-speed characteristic winding is selected (RCH = 1).	Check the speed range switching control function parameter settings and the power line state check signal (RCH).
07	A Cs contour control command is input, but SFR (forward rotation command)/SRV (reverse rotation command) is not input.	Check the sequence.
08	A servo mode (rigid tapping, spindle positioning, etc.) control command is input, but SFR (forward rotation command)/SRV (reverse rotation command) is not input.	Check the sequence.
09	A spindle synchronization command is input, but SFR (forward rotation command)/SRV (reverse rotation command) is not input.	Check the sequence.
10	A Cs contour control command is input, but another mode (servo mode, spindle synchronization, or orientation) is specified.	Do not switch to another mode during a Cs contour control command. Before moving to another mode, cancel the Cs contour control command.

SP indi-cation (*1)	Description	Remedy
11	A servo mode (rigid tapping, spindle positioning, etc.) command is input, but another mode (Cs contour control, spindle synchronization, or orientation) is specified.	Do not switch to another mode during a servo mode command. Before moving to another mode, cancel the servo mode command.
12	A spindle synchronization command is input, but another mode (Cs contour control, servo mode, or orientation) is specified.	Do not switch to another mode during a spindle synchronization command. Before moving to another mode, cancel the spindle synchronization command.
13	An orientation command is input, but another mode (Cs contour control, servo mode, or spindle synchronization control) is specified.	Do not switch to another mode during an orientation command. Before moving to another mode, cancel the orientation command.
14	Both SFR (forward rotation command) and SRV (reverse rotation command) are input at the same time.	Issue either of them.
16	The parameter settings are such that the differential speed control function is not used (No.4000#5=0), but DEFMD (differential speed mode command) is input.	Check the parameter settings and differential speed mode command.
17	The speed detector parameter settings (bits 2, 1, and 0 of parameter No. 4011) are not valid. There is no corresponding speed detector.	Check the parameter settings.
18	The parameter settings are such that a position sensor is not used (position control not performed (bits 3, 2, 1, and 0 of parameter No. 4002), but position coder system orientation is issued.	Check the parameter settings and the input signal.
19	The magnetic sensor orientation command is input, but another mode (Cs contour control, servo mode, or spindle synchronization control) is specified.	Do not switch to another mode during an orientation command. Before moving to another mode, cancel the orientation command.
21	The tandem operation command was input in the spindle synchronization control enable state.	Input the tandem operation command when spindle synchronization control is canceled.
22	Spindle synchronization control was specified in the tandem operation enable state.	Specify spindle synchronization control when torque tandem operation is canceled.
23	The tandem operation command is input without the required option.	Torque tandem control requires a CNC software option. Check the option.
24	If index is performed continuously in position coder method orientation, an incremental operation is performed first (INCMD = 1), then an absolute position command (INCMD = 0) is input.	Check INCMD (incremental command). If an absolute position command is to follow, be sure to perform absolute position command orientation first.
26	The parameter settings are such that both spindle switch and three-stage speed range switch are used.	Check the parameter settings and the input signal.

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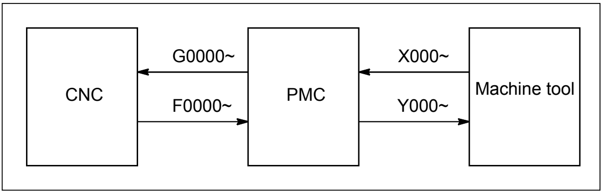
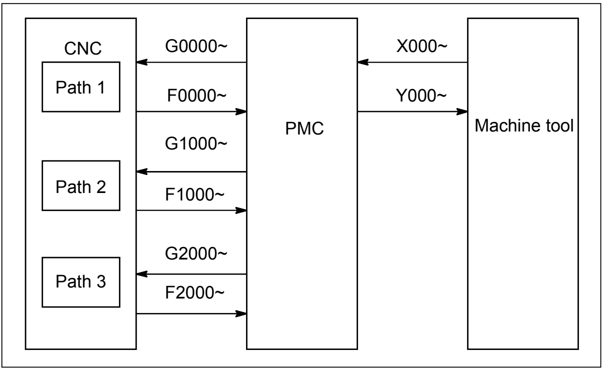
SP indi-cation (*1)	Description	Remedy
29	The parameter settings are such that the shortest-time orientation function is used (bit 6 of parameter No. 4018 = 0, Nos. 4320 to 4323 ≠ 0).	In the αi series spindle amplifier, the shortest-time orientation function cannot be used. Use normal-system orientation.
30	The magnetic pole has not been detected, but a command is input.	In the magnetic pole undetected state (EPFIXA = 0), the motor cannot be driven even when a command is input. Input a command in the magnetic pole detected state (EPFIXA = 1). When EPFSTR is set to 1, any command is ignored and this error is displayed even in the magnetic pole detected state. After the completion of magnetic pole detection, set EPFSTR to 0.
31	The hardware configuration is such that the spindle FAD function cannot be used. In this case, the motor is not activated.	Check the CNC model. With the FS30i series, the spindle FAD function is not used.
32	S0 is not specified in the velocity mode, but the disturbance input function is enabled (No.4395#7=1).	Specify S0 in the velocity mode before enabling the disturbance input function (No.4395#7=1).
33	The hardware configuration is such that the spindle EGB function cannot be used. In this case, the motor is not activated.	Check the CNC model.
34	Both the spindle FAD function and the spindle EGB function are enabled. In this case, the motor is not activated.	The two functions cannot be used at the same time. Enable either function only.
35	Spindle Amplifier (SP) ID information cannot be obtained.	Replace the spindle amplifier with one with correct ID information.
36	The submodule SM (SSM) is faulty.	For action to be taken, refer to the FANUC AC SPINDLE MOTOR αi series PARAMETER MANUAL (B-65280EN).
37	The current loop setting (No. 4012) has been changed.	Check the setting of parameter No. 4012, and turn the power off, then on again.
38	A parameter related to communication between spindle amplifiers is specified incorrectly. Alternatively, a function unavailable with the torque tandem function is set.	Check the parameters.
39	Although SFR (forward rotation command), SRV (reverse rotation command), or ORCM (orientation command) is input, DSCN (disconnection detection disable signal) is input.	Check the sequence. Do not input DSCN (disconnection detection disable signal) during the input of a command which excites the motor.
43	A setting which does not support the αiCZ sensor (serial) is used.	Check the parameter settings.
44	The spindle amplifier does not support the control period setting.	Check the setting of parameter No. 4012.

Relationships between interface signals and address between CNC and PMC are as shown below.

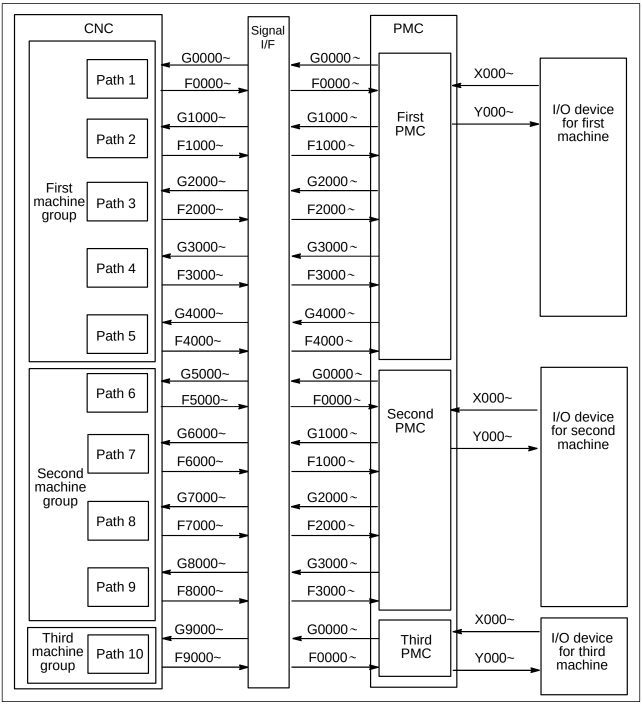
[Example of controlling one path using one PMC]



[Example of controlling three path using one PMC]



[Example of controlling multi-path CNC using PMC system]



NOTE

Each PMC of a multi-path PMC system has an independent signal area. The F, G, X, and Y signal addresses of each PMC begin with 0. On the other hand, the F and G signal addresses from the viewpoint of the CNC are fixed for each path number. Note that the F and G signal addresses used in programming of each ladder are different from those from the viewpoint of the CNC.

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9.1 LIST OF SIGNALS

9.1.1 List of Signals (in Order of Symbols)

T: Tseries / M: M series

○: Available / ●: Available only with multi-path control / -: Unavailable

Symbol	Signal name	Address	T	M
*+ED1 - *+ED8	External deceleration signals 1	G118	○	○
*+ED21 - *+ED28	External deceleration signals 2	G101	○	○
*+ED31 - *+ED38	External deceleration signals 3	G107	○	○
*+ED41 - *+ED48	External deceleration signals 4	G341	○	○
*+ED51 - *+ED58	External deceleration signals 5	G343	○	○
*+L1 - *+L8	Overtravel signals	G114	○	○
*-ED1 - *-ED8	External deceleration signals 1	G120	○	○
*-ED21 - *-ED28	External deceleration signals 2	G103	○	○
*-ED31 - *-ED38	External deceleration signals 3	G109	○	○
*-ED41 - *-ED48	External deceleration signals 4	G342	○	○
*-ED51 - *-ED58	External deceleration signals 5	G344	○	○
*-L1 - *-L8	Overtravel signals	G116	○	○
*ABSM	Manual absolute signal	G006.2	○	○
*ACTF1 - *ACTF8	Actual speed display axis selection signals	G580	○	○
*AFV0 - *AFV7	2nd feedrate override signals	G013	○	○
*BSL	Block start interlock signal	G008.3	○	○
*BECLP	B axis clamp completion signal	G038.7	-	○
*BEUCP	B axis unclamp completion signal	G038.6	-	○
*CDZ	Chamfering signal	G053.7	○	-
*CGROV0 - *CGROV7	Continuous circle motion feedrate override signals	G220.0 - G220.7	-	○
*CHLD	Oscillation hold signal	G051.7	○	○
*CHP1 - *CHP8	Oscillation feedrate override signals	G051.0 - G051.3	○	○
*CL1 - *CL8	Dual position feedback compensation clamp signals	G548	○	○
*CSL	Cutting block start interlock signal	G008.1	○	○
*DEC1 - *DEC8	Reference position return deceleration signals	X009	○	○
		G196	○	○
*EAXSL	Controlled axis selection status signals (PMC axis control)	F129.7	○	○
*ESP	Emergency stop signals	X008.4, .0, .1	○	○
		G008.4	○	○
*ESPA	Emergency stop signals (serial spindle)	G071.1	○	○
*ESPB		G075.1	○	○
*ESPC		G205.1	○	○
*ESPD		G267.1	○	○
*EFOV0A - *EFOV7A	Feedrate override signals (for group 1 to 4) (PMC axis control)	G151	○	○
*EFOV0B - *EFOV7B		G163	○	○
*EFOV0C - *EFOV7C		G175	○	○
*EFOV0D - *EFOV7D		G187	○	○
*EROV0A - *EROV7A	1% rapid traverse override signals (for group 1 to 4) (PMC axis control)	G151	○	○
*EROV0B - *EROV7B		G163	○	○
*EROV0C - *EROV7C		G175	○	○
*EROV0D - *EROV7D		G187	○	○
*FHRO0 - *FHRV9	0.1% rapid traverse override signals	G352.0 - G352.7 G353.0 - G353.1	○	○
*FLWU	Follow-up signal	G007.5	○	○
*FV0 - *FV7	Feedrate override signals	G012	○	○
*FV0O - *FV7O	Software operator's panel signal (*FV0 to *FV7)	F078	○	○
*HROV0 - *HROV6	1% rapid traverse override signals	G096.0 - G096.6	○	○
*IT	Interlock signal for all axes	G008.0	○	○

Symbol	Signal name	Address	T	M
*IT1 - *IT8	Interlock signal for each axis	G130	○	○
*JV0 - *JV15	Manual feedrate override signals	G010,G011	○	○
*JV0O - *JV15O	Software operator’s panel signal (*JV0 to *JV15)	F079,F080	○	○
*KAV0 - *KAV7	Override signals of gear ratio for flexible synchronization	G570	-	○
*KBV0 - *KBV7		G571	-	○
*KCV0 - *KCV7		G572	-	○
*KDV0 - *KDV7		G573	-	○
*PLSST	Polygon spindle stop signal	G038.0	○	○
*SCPFA	Spindle clamp completion signal	G028.5	○	○
*SCPFB		G401.1	○	○
*SCPFC		G401.2	○	○
*SCPFD		G401.3	○	○
*SP	Feed hold signal	G008.5	○	○
*SSTP	Spindle stop signal	G029.6	○	○
*SSTP1	Individual spindle stop signals	G027.3	○	○
*SSTP2		G027.4	○	○
*SSTP3		G027.5	○	○
*SSTP4		G026.6	○	○
*SUCPFA	Spindle unclamp completion signal	G028.4	○	○
*SUCPFB		G400.1	○	○
*SUCPFC		G400.2	○	○
*SUCPFD		G400.3	○	○
*TLV0 - *TLV9	Tool life count override signals	G049.0 - G050.1	○	○
*TSB	Tail stock barrier selection signal	G060.7	○	-
+EXL1 - +EXL8	Stored stroke limit switching signals in axis direction	G104	○	○
+J1 - +J8	Feed axis and direction selection signals	G100	○	○
+J1O - +J4O	Software operator’s panel signal (+J1 to +J4)	F081.0,F081.2, F081.4,F081.6	○	○
+Jg,+Ja	Feed axis and direction selection signals	G086.0,G086.2	○	○
+LM1 - +LM8	Stroke limit external setting signals	G110	○	○
+MIT1,+MIT2	Tool offset write signals	X004.2,X004.4 G132.0,G132.1	○	-
+MIT1	Tool offset write signals	G132.0	-	○
+MIT1 - +MIT8	Interlock signal for each axis direction	G132	-	○
+OT1 - +OT8	Overtravel alarm signals	F124	○	○
+OT11	Stored stroke limit range switching selection signals	G597.0	○	○
+OT12		G597.2	○	○
+OT2		G597.4	○	○
+OT3		G597.6	○	○
+OT11C	Stored stroke limit range switching cancellation signals	G598.0	○	○
+OT12C		G598.2	○	○
+OT2C		G598.4	○	○
+OT3C		G598.6	○	○
+OT11O	Stored stroke limit range switching confirmation signals	F598.0	○	○
+OT12O		F598.2	○	○
+OT2O		F598.4	○	○
+OT3O		F598.6	○	○
-EXL1 - -EXL8	Stored stroke limit switching signals in axis direction	G105	○	○
-J1 - -J8	Feed axis and direction selection signals	G102	○	○
-J1O - -J4O	Software operator’s panel signal (-J1 to -J4)	F081.1,F081.3, F081.5,F081.7	○	○
-Jg,-Ja	Feed axis and direction selection signals	G086.1,G086.3	○	○
-LM1 - -LM8	Stroke limit external setting signals	G112	○	○
-MIT1,-MIT2	Tool offset write signals	X004.3,X004.5 G134.0,G134.1	○	-
-MIT1 - -MIT8	Interlock signal for each axis direction	G134	-	○
-OT1 - -OT8	Overtravel alarm signals	F126	○	○

Symbol	Signal name	Address	T	M
-OT11	Stored stroke limit range switching selection signals	G597.1	○	○
-OT12		G597.3	○	○
-OT2		G597.5	○	○
-OT3		G597.7	○	○
+OT11C	Stored stroke limit range switching cancellation signals	G598.1	○	○
+OT12C		G598.3	○	○
+OT2C		G598.5	○	○
+OT3C		G598.7	○	○
-OT11O	Stored stroke limit range switching confirmation signals	F598.1	○	○
-OT12O		F598.3	○	○
-OT2O		F598.5	○	○
-OT3O		F598.7	○	○
ABDT1 - ABDT8	Unexpected disturbance torque detection signal	F184	○	○
ABTQSV	Servo axis unexpected disturbance torque detection signal	F090.0	○	○
ABTSP1	1st spindle unexpected disturbance torque detection signal	F090.1	○	○
ABTSP2	2nd spindle unexpected disturbance torque detection signal	F090.2	○	○
ABTSP3	3rd spindle unexpected disturbance torque detection signal	F090.3	○	○
ABTSP4	4th spindle unexpected disturbance torque detection signal	F091.4	○	○
ACDEC	In-acceleration/deceleration signal	F520.3	-	○
ADCO	Auxiliary function output block reverse movement enable output signal	F091.5	○	○
AFL	Auxiliary function lock signal	G005.6	○	○
AICC	AI contour control mode signal	F062.0	○	○
AL	Alarm signal	F001.0	○	○
ALLO	NC data output signal	F578.5	○	○
ALMA	Alarm signals (serial spindle)	F045.0	○	○
ALMB		F049.0	○	○
ALMC		F168.0	○	○
ALMD		F266.0	○	○
ALNGH	Tool axis direction feed mode signal	G023.7	○	○
AR00 - AR15	Actual spindle speed signals	F040,F041	○	○
AR002 - AR152		F202,F203	○	○
AR003 - AR153		F206,F207	○	○
AR004 - AR154		F272,F273	○	○
ARE00 - ARE31	Extended actual spindle speed signals	F580 - F583	○	○
ARE002 - ARE312		F584 - F587	○	○
ARE003 - ARE313		F588 - F591	○	○
ARE004 - ARE314		F592 - F595	○	○
ARSTA	Alarm reset signals (serial spindle)	G071.0	○	○
ARSTB		G075.0	○	○
ARSTC		G205.0	○	○
ARSTD		G267.0	○	○
ASNED	Assignment completion signal	F536.3	○	○
ASNST	Assignment start signal	G536.3	○	○
ATBK	Automatic data backup executing signal	F520.0	○	○
AUTPHA - AUTPHD	Flexible synchronization control automatic phase synchronization signals	G381.0 - G381.3	○	○
B00 - B31	2nd auxiliary function code signals	F030 - F033	○	○
BAL	Battery alarm signal	F001.2	○	○
BCAN	Block cancel signal	G297.0	○	○
BCLP	B axis clamp signal	F061.1	-	○
BDT1	Optional block skip signals	G044.0	○	○
BDT2 - BDT9		G045	○	○
BDTO	Software operator’s panel signal (BDT)	F075.2	○	○
BF	2nd auxiliary function strobe signal	F007.7	○	○
BFIN	2nd auxiliary function completion signal	G005.7	○	○
BGEACT	Background editing signal	F053.4	○	○
BUCLP	B axis unclamp signal	F061.0	-	○

Symbol	Signal name	Address	T	M
C2SEND	Dual display forcible end request signal	G295.6	○	○
C2SENO	Dual display forcible end status signal	F295.6	○	○
CDCEX	Notification signal for modification of C Language Executor program	F558.0	○	○
CDDCL	Notification signal for modification of Dual Check Safety PMC Ladder program	F558.4	○	○
CDLAD1	Notification signal for modification of 1st path PMC Ladder program	F558.1	○	○
CDLAD2	Notification signal for modification of 2nd path PMC Ladder program	F558.2	○	○
CDLAD3	Notification signal for modification of 3rd path PMC Ladder program	F558.3	○	○
CDLAD4	Notification signal for modification of 4th path PMC Ladder program	F558.6	○	○
CDLAD5	Notification signal for modification of 5th path PMC Ladder program	F558.7	○	○
CDPRM	Notification signal for modification of CNC parameter	F558.5	○	○
CFINA	Spindle switch completion signals (serial spindle)	F046.1	○	○
CFINB		F050.1	○	○
CFINC		F169.1	○	○
CFIND		F267.1	○	○
CGREN	Groove cutting by continuous circle motion enable signal	G067.1	-	○
CGRMD	Groove cutting by continuous circle motion mode signal	F082.1	-	○
CHPA	Power line switch signals (serial spindle)	F046.0	○	○
CHPB		F050.0	○	○
CHPC		F169.0	○	○
CHPD		F267.0	○	○
CHPCYL	Oscillation cycle signal	F039.3	○	○
CHPMD	Oscillation -in-progress signal	F039.2	○	○
CHPST	Oscillation start signal	G051.6	○	○
CLRCH1 - CLRCH8	Torque limit reach signals for reference point setting with mechanical stopper	F180	○	○
CNCKY	Key control selection signal	G295.7	○	○
CNCKYO	Key control selection status signal	F295.7	○	○
CON	Cs contour control change signal	G027.7	○	○
CONH1	Cs contour control high speed switching signals	G549.0	○	○
CONH2		G549.1	○	○
CONH3		G549.2	○	○
CONH4		G549.3	○	○
CONS1	Cs contour control change signal (for each spindle)	G274.0	○	○
CONS2		G274.1	○	○
CONS3		G274.2	○	○
CONS4		G274.3	○	○
COSP	Path spindle command confirmation signal	F064.5	●	●
COSP1	Path spindle command confirmation signal	F063.3	●	●
COSP2		F063.4	●	●
COSP3		F404.0	●	●
COSP4		F404.1	●	●
CS1DTA	One-rotation signal detection status signal for Cs contour control (serial spindle)	F047.6	○	○
CS1DTB		F051.6	○	○
CS1DTC		F170.6	○	○
CS1DTD		F268.6	○	○
CSFI1	Cs axis coordinate establishment request signals	G274.4	○	○
CSFI2		G274.5	○	○
CSFI3		G274.6	○	○
CSFI4		G274.7	○	○
CSFO1	Cs axis coordinate establishment alarm signals	F274.4	○	○
CSFO2		F274.5	○	○
CSFO3		F274.6	○	○
CSFO4		F274.7	○	○
CSMC1	Cs contour control high speed switching completion signals	F546.0	○	○
CSMC2		F546.1	○	○
CSMC3		F546.2	○	○
CSMC4		F546.3	○	○

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Symbol	Signal name	Address	T	M
CSPENA	Cs axis origin established state signals	F048.4	○	○
CSPENB		F052.4	○	○
CSPENC		F171.4	○	○
CSPEND		F269.4	○	○
CSS	Constant surface speed signal	F002.2	○	○
CSYCA	Reference position establishment starting signal (serial spindle)	G304.3	○	○
CSYCB		G308.3	○	○
CSYCC		G312.3	○	○
CSYCD		G316.3	○	○
CSYFNA	Reference position establishment completion signal (serial spindle)	F047.7	○	○
CSYFNB		F051.7	○	○
CSYFNC		F170.7	○	○
CSYFND		F268.7	○	○
CTH1A,CTH2A	Clutch/gear signals (serial spindle)	G070.3,G070.2	○	○
CTH1B,CTH2B		G074.3,G074.2	○	○
CTH1C,CTH2C		G204.3,G204.2	○	○
CTH1D,CTH2D		G266.3,G266.2	○	○
CUT	Cutting feed signal	F002.6	○	○
D3MI	3-dimensional coordinate conversion manual interrupt mode in-progress signal	F347.7	○	○
D3ROT	Three-dimensional coordinate conversion mode signal	F062.6	○	○
DASN	Direct assignment mode signal	G536.5	○	○
DEFMDA	Differential speed mode command signals (serial spindle)	G072.3	○	○
DEFMDB		G076.3	○	○
DEFMDC		G206.3	○	○
DEFMDD		G268.3	○	○
DEN	Distribution completion signals	F001.3	○	○
DFSYC	Differential speed synchronization command signal	G022.4	○	○
DM00	Decode M signals	F009.7	○	○
DM01		F009.6	○	○
DM02		F009.5	○	○
DM30		F009.4	○	○
DMMC	Direct operation select signal	G042.7	○	○
DNCI	DNC operation select signal	G043.5	○	○
DNTCLR	DeviceNet communication error clear signal	G518.4	○	○
DNTCM	DeviceNet communication normal signal	F290.2	○	○
DNTER	DeviceNet communication abnormal signal	F545.4	○	○
DNCIR	Mode notification signal	F513.5	○	○
DRN	Dry run signal	G046.7	○	○
DRNO	Software operator’s panel signal (DRN)	F075.5	○	○
DTCH1 - DTCH8	Controlled axis detach signals	G124	○	○
DVCPR	External device program execution signal	F531.6	○	○
DWL	Dwell status signal	F526.5	○	○
EA6 - EA0	Address signals for external data input	G002.6 - G002.0	○	○
EABUFA	Buffer full signals (for group 1 to 4) (PMC axis control)	F131.1	○	○
EABUFB		F134.1	○	○
EABUFC		F137.1	○	○
EABUFD		F140.1	○	○
EACNT1 - EACNT8	Controlling signals (PMC axis control)	F182	○	○
EADEN1 - EADEN8	Distribution completion signals (PMC axis control)	F112	○	○
EAX1 - EAX8	Control axis selection signals (PMC axis control)	G136	○	○
EBSYA	Axis control command read completion signals (for group 1 to 4) (PMC axis control)	F130.7	○	○
EBSYB		F133.7	○	○
EBSYC		F136.7	○	○
EBSYD		F139.7	○	○
EBUFA	Axis control command read signals (for group 1 to 4) (PMC axis control)	G142.7	○	○
EBUFB		G154.7	○	○
EBUFC		G166.7	○	○
EBUFD		G178.7	○	○

Symbol	Signal name	Address	T	M
EC0A - EC6A	Axis control command signals (for group 1 to 4) (PMC axis control)	G143.0 - G143.6	○	○
EC0B - EC6B		G155.0 - G155.6	○	○
EC0C - EC6C		G167.0 - G167.6	○	○
EC0D - EC6D		G179.0 - G179.6	○	○
ECKZA	Following zero checking signals (for group 1 to 4) (PMC axis control)	F130.1	○	○
ECKZB		F133.1	○	○
ECKZC		F136.1	○	○
ECKZD		F139.1	○	○
ECLRA	Reset signals (for group 1 to 4) (PMC axis control)	G142.6	○	○
ECLRB		G154.6	○	○
ECLRC		G166.6	○	○
ECLRD		G178.6	○	○
ED31 - ED0	Data signals for external data input	G211,G210, G001,G000	○	○
EDENA	Auxiliary function executing signals (for group 1 to 4) (PMC axis control)	F130.3	○	○
EDENB		F133.3	○	○
EDENC		F136.3	○	○
EDEND		F139.3	○	○
EDRN	Dry run signal (PMC axis control)	G150.7	○	○
EFINA	Auxiliary function completion signal (for group 1 to 4) (PMC axis control)	G142.0	○	○
EFINB		G154.0	○	○
EFINC		G166.0	○	○
EFIND		G178.0	○	○
EGENA	Axis moving signals (for group 1 to 4) (PMC axis control)	F130.4	○	○
EGENB		F133.4	○	○
EGENC		F136.4	○	○
EGEND		F139.4	○	○
EGBM1 - EGBM8	EGB mode confirmation signals	F208	○	○
EGBS	EGB synchronization mode selection signal	G067.4	○	○
EGBS1 - EGBS8	EGB synchronization start signals	G530	○	○
EGBSM	EGB synchronization mode confirmation signal	F082.6	○	○
EIALA	Alarm signal (for group 1 to 4) (PMC axis control)	F130.2	○	○
EIALB		F133.2	○	○
EIALC		F136.2	○	○
EIALD		F139.2	○	○
EID0A - EID31A	Axis control data signals (for group 1 to 4) (PMC axis control)	G146 - G149	○	○
EID0B - EID31B		G158 - G161	○	○
EID0C - EID31C		G170 - G173	○	○
EID0D - EID31D		G182 - G185	○	○
EIF0A - EIF15A	Axis control feedrate signals (for group 1 to 4) (PMC axis control)	G144,G145	○	○
EIF0B - EIF15B		G156,G157	○	○
EIF0C - EIF15C		G168,G169	○	○
EIF0D - EIF15D		G180,G181	○	○
EINPA	In-position signals (for group 1 to 4) (PMC axis control)	F130.0	○	○
EINPB		F133.0	○	○
EINPC		F136.0	○	○
EINPD		F139.0	○	○
EKC0 - EKC7	Key code signals	G098	○	○
EKENB	Key code read completion signal	F053.7	○	○
EKSET	Key code read signal	G066.7	○	○
ELCKZA	Accumulated zero check signal (for group 1 to 4) (PMC axis control)	G142.1	○	○
ELCKZB		G154.1	○	○
ELCKZC		G166.1	○	○
ELCKZD		G178.1	○	○
EM11A - EM48A	Auxiliary function code signals (for group 1 to 4) (PMC axis control)	F132,F142	○	○
EM11B - EM48B		F135,F145	○	○
EM11C - EM48C		F138,F148	○	○
EM11D - EM48D		F141,F151	○	○
EMBUFA	Buffering disable signals (for group 1 to 4) (PMC axis control)	G142.2	○	○
EMBUFB		G154.2	○	○

Symbol	Signal name	Address	T	M
EMBUFC		G166.2	○	○
EMBUFD		G178.2	○	○
EMFA	Auxiliary function strobe signals (for group 1 to 4) (PMC axis control)	F131.0	○	○
EMFB		F134.0	○	○
EMFC		F137.0	○	○
EMFD		F140.0	○	○
EMF2A	Auxiliary function 2nd strobe signals (for group 1 to 4) (PMC axis control)	F131.2	○	○
EMF2B		F134.2	○	○
EMF2C		F137.2	○	○
EMF2D		F140.2	○	○
EMF3A	Auxiliary function 3rd strobe signals (for group 1 to 4) (PMC axis control)	F131.3	○	○
EMF3B		F134.3	○	○
EMF3C		F137.3	○	○
EMF3D		F140.3	○	○
EMSBKA	Block stop disable signals (for group 1 to 4) (PMC axis control)	G143.7	○	○
EMSBKB		G155.7	○	○
EMSBKC		G167.7	○	○
EMSBKD		G179.7	○	○
EMZ0 - EMZ15	Extended external machine zero point shift signal	Specifying by parameter No.1280.	○	○
ENB	Spindle enable signal	F001.4	○	○
ENB2		F038.2	○	○
ENB3		F038.3	○	○
ENB4		F039.1	○	○
ENBKY	External key input mode selection signal	G066.1	○	○
EOTNA	Negative-direction overtravel signals (for group 1 to 4) (PMC axis control)	F130.6	○	○
EOTNB		F133.6	○	○
EOTNC		F136.6	○	○
EOTND		F139.6	○	○
EOTPA	Positive-direction overtravel signals (for group 1 to 4) (PMC axis control)	F130.5	○	○
EOTPB		F133.5	○	○
EOTPC		F136.5	○	○
EOTPD		F139.5	○	○
EOV0	Override 0% signal (PMC axis control)	F129.5	○	○
EOVCA	Override cancel signal (for group 1 to 4) (PMC axis control)	G150.5	○	○
EOVCB		G162.5	○	○
EOVCC		G174.5	○	○
EOVCD		G186.5	○	○
EPN0 - EPN13	Extended external workpiece number search signals	G024.0 - G025.5	○	○
EPNS	External workpiece number search start signal	G025.7	○	○
EREND	Read completion signal for external data input	F060.0	○	○
EROV1,EROV2	Rapid traverse override signals (PMC axis control)	G150.0,G150.1	○	○
ERS	External reset signal	G008.7	○	○
ERT	Manual rapid traverse selection signal (PMC axis control)	G150.6	○	○
ERTVA	Automatic screen erasing signal	F006.2	○	○
ESBKA	Block stop signals (for group 1 to 4) (PMC axis control)	G142.3	○	○
ESBKB		G154.3	○	○
ESBKC		G166.3	○	○
ESBKD		G178.3	○	○
ESCAN	Search cancel signal for external data input	F060.2	○	○
ESEND	Search completion signal for external data input	F060.1	○	○
ESKIP	Skip signal (PMC axis control)	X004.6	○	○
ESOFA	Servo off signals (for group 1 to 4) (PMC axis control)	G142.4	○	○
ESOFB		G154.4	○	○
ESOFC		G166.4	○	○
ESOFD		G178.4	○	○
ESRSYC	spindle command synchronous control signal	G064.6	○	○

Symbol	Signal name	Address	T	M
ESSYC1	spindle command synchronous control signal (for each spindle)	G264.0	O	O
ESSYC2		G264.1	O	O
ESSYC3		G264.2	O	O
ESSYC4		G264.3	O	O
ESTB	Read signal for external data input	G002.7	O	O
ESTPA	Axis control temporary stop signals (for group 1 to 4) (PMC axis control)	G142.5	O	O
ESTPB		G154.5	O	O
ESTPC		G166.5	O	O
ESTPD		G178.5	O	O
ESTPR	Axis immediate stop start signal	G203.3	O	O
EUI00 - EUI15	Input signals for P-code macro	G082,G083	O	O
EUO00 - EUO15	Output signals for P-code macro	F084,F085	O	O
EXCED	Exchange completion signal	F536.4	O	O
EXCST	Exchange start signal	G536.4	O	O
EXINP	External input start signal	G058.1	O	O
EXLM, EXLM2, EXLM3	Stored stroke check 1 select signal	G007.6, G0531.6, G0531.7	O	O
EXOUT	External output start signal	G058.3	O	O
EXPF1 - EXPF8	External power failure detection signals (for servo axes)	G680.0-G680.7	O	O
EXPFA	External power failure detection signals (for spindle)	G307.4	O	O
EXPFB		G311.4	O	O
EXPFC		G315.4	O	O
EXPFD		G319.4	O	O
Gn307EXSTP	External input/output stop signal	G058.2	O	O
F1D	One-digit F code feed signal	G016.7	-	O
FEED0	Feed zero signal	F066.2	O	O
FHROV	0.1% step rapid traverse override selection signals	G353.7	O	O
FIN	End signal	G004.3	O	O
FCSS1	Cs contour control change completion signal (for each spindle)	F274.0	O	O
FCSS2		F274.1	O	O
FCSS3		F274.2	O	O
FCSS4		F274.3	O	O
FLANG	Display language switch completion signal	F545.0	O	O
FSCSL	Cs contour control change completion signal	F044.1	O	O
FSPPH	Spindle phase synchronous control completion signal	F044.3	O	O
FSPPH1	Spindle phase synchronous control completion signal (for each spindle)	F289.0	O	O
FSPPH2		F289.1	O	O
FSPPH3		F289.2	O	O
FSPPH4		F289.3	O	O
FSPSY	Spindle synchronous speed control completion signal	F044.2	O	O
FSPSY1	Spindle synchronous speed control completion signal (for each spindle)	F288.0	O	O
FSPSY2		F288.1	O	O
FSPSY3		F288.2	O	O
FSPSY4		F288.3	O	O
FWSTP	Forward movement prohibition signal	G531.0	O	O
G2RVX	Tool offset direction signal	G090.0	O	-
G2RVY		G090.2	O	-
G2RVZ		G090.1	O	-
G2SLC	2nd geometry tool offset signal	G090.7	O	-
G2X	2nd geometry tool offset axis select signal	G090.4	O	-
G2Y		G090.6	O	-
G2Z		G090.5	O	-
GAE1	Measuring position reached signals	G517.0	O	O
GAE2		G517.1	O	O
GAE3		G517.2	-	O
GOQSM	Tool offset write mode select signal	G039.7	O	—
GR1, GR2	Gear selection signals (input)	G028.1, G028.2	O	O
GR1O, GR2O, GR3O	Gear selection signals (output)	F034.0 – F034.2	-	O

Symbol	Signal name	Address	T	M
GR21, GR22	Gear selection signals (input)	G029.0, G029.1	○	○
GR31, GR32		G029.2, G029.3	○	○
GR41, GR42		G031.4, G031.5	○	○
GTMC	Groove of thread measurement completion signal	F546.4	○	○
GTME	Groove of thread measurement error signal	F546.5	○	○
GTMSR	Groove of thread measurement signal	G549.4	○	○
HBTRN	Dual position feedback turning mode selection signal	G531.3	○	○
HCAB2	Hard copy cancellation request reception signal	F061.2	○	○
HCABT	Hard copy cancellation request signal	G067.6	○	○
HCEXE	Hard copy execution status signal	F061.3	○	○
HCREQ	Hard copy execution request signal	G067.7	○	○
HDN	Manual handle feed direction inversion signal	G347.1	○	○
HDO0 - HDO3	High-speed skip status signals	F122.0–F122.3	○	○
HDSR	Selecting direction of manual handle rotation signal	G193.3	○	○
HEAD	Path select signal (Tool post select signal)	G063.0	●	●
HNDLF	Maximum manual handle feedrate switch signal	G023.3	○	○
HNDMP	Manual pulse magnification change signal	G088.3	○	○
HPS01 - HPS16	High-speed position switch signals	F293, F294	○	○
		Y***, Y***+1	○	○
HROV	1% step rapid traverse override selection signals	G096.7	○	○
HREV	Handle-synchronous feed signal	G023.4	○	○
HS1A - HS1D, HS1E	Manual handle feed axis selection signals	G018.0 - G018.3, G411.0	○	○
HS1AO	Software operator’s panel signal (HS1A)	F077.0	○	○
HS1BO	Software operator’s panel signal (HS1B)	F077.1	○	○
HS1CO	Software operator’s panel signal (HS1C)	F077.2	○	○
HS1DO	Software operator’s panel signal (HS1D)	F077.3	○	○
HS1IA - HS1ID, HS1IE	Manual handle interrupt axis selection signals	G041.0 - G041.3, G411.4	○	○
HS2A - HS2D, HS2E	Manual handle feed axis selection signals	G018.4 - G018.7, G411.1	○	○
HS2IA - HS2ID, HS2IE	Manual handle interrupt axis selection signals	G041.4 - G041.7, G411.5	○	○
HS3A - HS3D, HS3E	Manual handle feed axis selection signals	G019.0 - G019.3, G411.2	○	○
HS3IA - HS3ID, HS3IE	Manual handle interrupt axis selection signals	G042.0 - G042.3, G411.6	○	○
HS4A - HS4D, HS4E	Manual handle feed axis selection signals	G020.0 - G020.3, G411.3	○	○
HS4IA - HS4ID, HS4IE	Manual handle interrupt axis selection signals	G088.4 - G088.7, G411.7	○	○
HS5A - HS5D, HS5E	Manual handle feed axis selection signals	G379.0 - G379.3, G412.0	○	○
HS5IA - HS5ID, HS5IE	Manual handle interrupt axis selection signals	G379.4 - G379.7, G412.4	○	○
IGNVRY	All-axis VRDY off alarm ignore signal	G066.0	○	○
IGVRY1 - IGVRY8	Each-axis VRDY off alarm ignore signal	G192	○	○
INCH	Inch input signal	F002.0	○	○
INCMDA	Incremental command externally set orientation signals (serial spindle)	G072.5	○	○
INCMDB		G076.5	○	○
]INCMDC		G206.5	○	○
INCMDD		G268.5	○	○

Symbol	Signal name	Address	T	M
INCSTA	Incremental orientation mode signals (serial spindle)	F047.1	○	○
INCSTB		F051.1	○	○
INCSTC		F170.1	○	○
INCSTD		F268.1	○	○
INDXA	Orientation stop position change command signals (serial spindle)	G072.0	○	○
INDXB		G076.0	○	○
INDXC		G206.0	○	○
INDXD		G268.0	○	○
INFD	In-feed control cut start signal	G063.6	-	○
INHKY	Key input disable signal	F053.0	○	○
INIST	Initial axis assignment signal	F536.7	○	○
INP1 - INP8	In-position signals	F104	○	○
INTGA	Speed integral signals (serial spindle)	G071.5	○	○
INTGB		G075.5	○	○
INTGC		G205.5	○	○
INTGD		G267.5	○	○
IOALM	Input/output alarm signal	F053.3	○	○
IOBSY	Input/output busy signal	F053.2	○	○
IOLBH1, IOLBH2	Manual handle generators selection signal	G199.0, G199.1	○	○
IOLBR	β ready signal	F531.7	○	○
ITF01 - ITF04	Path interference check association signal	G406.0 - G406.3	●	-
IUDD1 - IUDD8	Unexpected disturbance torque detection ignore signal	G125	○	○
KEY1 - KEY4	Memory protection signals	G046.3 - G046.6	○	○
KEYO	Software operator's panel signal (KEY1 to KEY4)	F075.6	○	○
KEYP	Memory protection signal	G046.0	○	○
LANG1 - LANG7	Display language setting signals	G581.0 - G581.6	○	○
LCBS	Loader control selection signal	G251.1	○	○
LCB2	Loader control 2 selection signal	G251.2	○	○
LDT1A	Load detection signals 1 (serial spindle)	F045.4	○	○
LDT1B		F049.4	○	○
LDT1C		F168.4	○	○
LDT1D		F266.4	○	○
LDT2A	Load detection signals 2(serial spindle)	F045.5	○	○
LDT2B		F049.5	○	○
LDT2C		F168.5	○	○
LDT2D		F266.5	○	○
LFCIF	Tool life counting disable signal	F093.2	○	○
LFCIV	Tool life counting disable signal	G048.2	○	○
LIFOVR	Periodic maintenance service life expiration signal	F093.0	○	○
M00 - M31	Auxiliary function code signals	F010 - F013	○	○
M200 - M215	2nd M function code signals	F014 - F015	○	○
M300 - M315	3rd M function code signals	F016 - F017	○	○
M400 – M431	4th M function code signals	F568 - F571	○	○
M500 – M531	5th M function code signals	F572 - F575	○	○
M3R	Three-dimensional coordinate system conversion manual interruption switch signal	G031.3	○	○
MA	CNC ready signal	F001.7	○	○
MABSM	Manual absolute check signal	F004.2	○	○
MAFL	Auxiliary function lock check signal	F004.4	○	○
MBCAN	Block cancel acknowledgement signal	F297.0	○	○
MBDT1	Optional block skip check signals	F004.0	○	○
MBDT2 - MBDT9		F005	○	○
MBSO	Middle block start signal	F534.4	○	○
MCEX1 - MCEX16	Call program confirmation signals	F514, F515	○	○
MCEXE	Macro call executing signal	F512.0	○	○
MCFIN	Mode change completion signal	G514.0	○	○

Symbol	Signal name	Address	T	M
MCFNA	Power line switch completion signals (serial spindle)	G071.3	○	○
MCFNB		G075.3	○	○
MCFNC		G205.3	○	○
MCFND		G267.3	○	○
MCHK	Manual handle check sugnal	G067.3	○	○
MCRQ	Mode change request signal	F512.1	○	○
MCSP	Abnormal end signal	F512.2	○	○
MCST1 - MCST16	Macro call start signal	G512, G513	○	○
MD1, MD2, MD4	Mode selection signals	G043.0 - G043.2	○	○
MD1O	Software operator’s panel signal (MD1)	F073.0	○	○
MD1R	Mode notification signal	F513.0	○	○
MD2O	Software operator’s panel signal (MD2)	F073.1	○	○
MD2R	Mode notification signal	F513.1	○	○
MD4O	Software operator’s panel signal (MD4)	F073.2	○	○
MD4R	Mode notification signal	F513.2	○	○
MDIRST	MDI reset confirmation signal	F006.1	○	○
MDRN	Dry run check signal	F002.7	○	○
MDTCH1 - MDTCH8	Controlled axis detach status signals	F110	○	○
MEDT	Memory edit selection check signal	F003.6	○	○
MF	Auxiliary function strobe signals	F007.0	○	○
MF2	2nd M function strobe signal	F008.4	○	○
MF3	3rd M function strobe signal	F008.5	○	○
MF4	4th M function strobe signal	F008.6	○	○
MF5	5th M function strobe signal	F008.7	○	○
MFIN	Auxiliary function completion signal	G005.0	○	○
MFIN2	2nd M function completion signal	G004.4	○	○
MFIN3	3rd M function completion signal	G004.5	○	○
MFIN4	4th M function completion signal	G004.6	○	○
MFIN5	5th M function completion signal	G004.7	○	○
MFNHGA	Spindle switch MAIN MCC contact status signals (serial spindle)	G072.6	○	○
MFNHGB		G076.6	○	○
MFNHGC		G206.6	○	○
MFNHGD		G268.6	○	○
MFSYNA, MFSYNB MFSYNC, MFSYND	Flexible synchronization control mode status signals	F197.0 - F197.3	○	○
MH	Manual handle feed selection check signal	F003.1	○	○
MHLC1 - MHLC5	Manual linear/circular interpolation signals	G544.0 - G544.4	○	○
MHUS1 - MHUS5	Usage selection of manual linear/circular interpolation signals	G545.0 - G545.4	○	○
MI1 - MI8	Mirror image signals	G106	○	○
MINC	Incremental feed selection check signal	F003.0	○	○
MIX1 - MIX8	Composite control axis change selection signals	G128	○	○
MIXO1 - MIXO8	Composite axis confirmation signals	F343	○	○
MJ	Jog feed selection check signal	F003.2	○	○
MLK	All-axis machine lock signal	G044.1	○	○
MLK1 - MLK8	Each-axis machine lock signals	G108	○	○
MLKO	Software operator’s panel signal (MLK)	F075.4	○	○
MMDI	Manual data input selection check signal	F003.3	○	○
MMEM	Automatic operation selection check signal	F003.5	○	○
MMI1 - MMI8	Mirror image check signals	F108	○	○
MMLK	All-axis machine lock check signal	F004.1	○	○
MMMOD	Check mode confirmation signal	F091.3	○	○
MMOD	Checking mode signal	G067.2	○	○
MNCHG	Direction change prohibition signal	F091.1	○	○
MORA1A	Magnetic sensor orientation completion signals (serial spindle)	F046.6	○	○
MORA1B		F050.6	○	○
MORA1C		F169.6	○	○
MORA1D		F267.6	○	○
MORA2A	Magnetic sensor orientation proximity signals (serial spindle)	F046.7	○	○
MORA2B		F050.7	○	○
MORA2C		F169.7	○	○
MORA2D		F267.7	○	○

Symbol	Signal name	Address	T	M
MORCMA	Magnetic sensor orientation command signals (serial spindle)	G073.0	○	○
MORCMB		G077.0	○	○
MORCMC		G207.0	○	○
MORCMD		G269.0	○	○
MP1, MP2, MP4	Manual handle feed amount selection signals (incremental feed signals)	G019.4, G019.5 G019.6	○	○
MP21, MP22 MP31, MP32 MP41, MP42 MP51, MP52	Manual handle feed amount selection signals	G087.0, G087.1 G087.3, G087.4 G087.6, G087.7 G380.0, G380.1	○	○
MP1O	Software operator's panel signal (MP1)	F076.0	○	○
MP2O	Software operator's panel signal (MP2)	F076.1	○	○
MPOFA	Motor power cutoff command signals (serial spindle)	G073.2	○	○
MPOFB		G077.2	○	○
MPOFC		G207.2	○	○
MPOFD		G269.2	○	○
MRDYA	Machine ready signals (serial spindle)	G070.7	○	○
MRDYB		G074.7	○	○
MRDYC		G204.7	○	○
MRDYD		G266.7	○	○
MREF	Manual reference position return selection check signal	F004.5	○	○
MRMT	DNC operation selection confirm signal	F003.4	○	○
MRVM	Reverse movement prohibition signal	G531.1	○	○
MRVMD	Reverse movement signal	F091.0	○	○
MRVSP	Reverse movement prohibition signal	F091.2	○	○
MSBK	Single block check signal	F004.3	○	○
MSP00 - MSP15	Multi-spindle address P signals	F160, F161	○	○
MSPOSA	Spindle positioning mode signals	F039.0	○	○
MSPOSB		F402.1	○	○
MSPOSC		F402.2	○	○
MSPOSD		F402.3	○	○
MSUSAS	Machine state history saving response signal	F545.5	○	○
MSUSRQ	Machine state history save request signal	G534.6	○	○
MT8N00 - MT8N31	Manual tool compensation tool number signals (8 digits)	G525 – G528	○	-
MTA, MTB, MTC, MTD	Flexible synchronization control mode selection signals	G197.0 - G197.3	○	○
MTCHIN	Teach in selection check signal	F003.7	○	○
MTLA	Manual tool compensation completion signal	F061.5	○	-
MTLANG	Manual tool compensation uncompleted signal	F061.4	○	-
MTLC	Manual tool compensation command number	G067.0	○	-
MTLN00 - MTLN15	Manual tool compensation tool number signal (4 digits)	G068, G069	○	-
MV1 - MV8	Axis moving signals	F102	○	○
MVD1 - MVD8	Axis moving direction signals	F106	○	○
NDCAL1 - NDCAL8	A/B phase detector disconnection alarm ignore signal (PMC axis control)	G202	○	○
NHSW	Waiting M codes of high-speed type invalid signal	G579.6	●	●
	Speed-up of non-buffering command by G code invalid signal		○	○
NMWT	No-wait signal	G063.7	●	●
NOINPS	In-position check disable signal	G023.5	○	○
NOT3DM	3-dimensional coordinate system conversion manual interrupt enable/disable switch signal	G347.7	○	○
NOWT	No-wait signal	G063.1	●	●
NOZAGC	Signal for disabling angular axis control for the perpendicular axis	G063.5	○	○
NPOS1 - NPOS8	Axis non-display signals	G198	○	○
NRROA	Shortcut command signals for orientation stop position change (serial spindle)	G072.2	○	○
NRROB		G076.2	○	○
NRROC		G206.2	○	○
NRROD		G268.2	○	○

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Symbol	Signal name	Address	T	M
NSYNCA	Signal for disabling torque difference alarm detection for axis synchronous control	G059.7	○	○
OFN0 - OFN5, OFN6 - OFN9	Tool offset number selection signals	G039.0 - G039.5, G040.0 - G040.3	○	–
ONSC	Tool compensation number specification signal	G547.6	○	–
OP	Automatic operation signal	F000.7	○	○
ORARA	Orientation completion signals (serial spindle)	F045.7	○	○
ORARB		F049.7	○	○
ORARC		F168.7	○	○
ORARD		F266.7	○	○
ORCMA	Orientation command signals(serial spindle)	G070.6	○	○
ORCMB		G074.6	○	○
ORCMC		G204.6	○	○
ORCMD		G266.6	○	○
OTA1 - OTA8	Stored stroke limit range switching axis selection signals	G596	○	○
OTD0 - OTD15	Stored stroke limit range switching data selection signals	G594, G595	○	○
OTSW	Stored stroke limit range switching start signal	G599.0	○	○
OTSWFN	Stored stroke limit range switching finish signal	F599.0	○	○
OUT0 - OUT15	Software operator’s panel general-purpose switch signals	F072, F074	○	○
OVC	Override cancel signal	G006.4	○	○
OVLN	Inter-path flexible synchronization mode select signal Advanced superimposition signal	G531.4	●	●
OVLNS	Inter-path flexible synchronization mode signal Advanced superimposition mode signal	F545.1	●	●
OVLS1 - OVLS8	Superimposed control axis selection signals	G190	○	○
OVMO1 - OVMO8	Superimposed control master axis confirmation signals	F344	○	○
OVRA	Analog override signals (serial spindle)	G072.4	○	○
OVRB		G076.4	○	○
OVRC		G206.4	○	○
OVRD		G268.4	○	○
OVSO1 - OVSO8	Superimposed control slave axis confirmation signals	F345	○	○
PBATL	Absolute position detector battery voltage low alarm signal	F172.7	○	○
PBATZ	Absolute position detector battery voltage zero alarm signal	F172.6	○	○
PC1DTA	Position coder one-rotation signal detection status signals (serial spindle)	F047.0	○	○
PC1DTB		F051.0	○	○
PC1DTC		F170.0	○	○
PC1DTD		F268.0	○	○
PC2SLC	2nd position coder selection signal	G028.7	○	○
PC3SLC	3rd position coder selection signal	G026.0	○	○
PC4SLC	4th position coder selection signal	G026.1	○	○
PCKSV	High speed program check saving data signal	F290.4	○	○
PE1EX	Peripheral axis control group 1 start signal	F534.5	○	○
PE2EX	Peripheral axis control group 2 start signal	F534.6	○	○
PE3EX	Peripheral axis control group 3 start signal	F534.7	○	○
PECK2	Small-hole peck drilling cycle in progress signal	F066.5	-	○
PGCK	High-speed program check signal	G290.5	○	○
PHERA, PHERB, PHERC, PHERD	Automatic phase synchronization positional error detection signals	F553.0 - F553.3	○	○
PHFINA - PHFIND	Flexible synchronization control phase synchronization end signals	F381.0 - F381.3	○	○
PK1 - PK8	Parking signals	G122	○	○
PKESS1	1st spindle parking signal	G122.6 (G031.6)	○	○

Symbol	Signal name	Address	T	M
PKESS2	2nd spindle parking signal	G122.7 (G031.7)	○	○
PKESE1	Spindle command synchronous parking signal(for each spindle)	G265.0	○	○
PKESE2		G265.1	○	○
PKESE3		G265.2	○	○
PKESE4		G265.3	○	○
PN1, PN2, PN4, PN16	External workpiece number search signals	G009.0 - G009.4	○	○
PRC	Position record signal	G040.6	○	-
PRGDPL	Program screen display mode signal	F053.1	○	○
PRGMD	High speed program check mode signal	F290.5	○	○
PRTSF	Target part count reached signal	F062.7	○	○
PSAR	Polygon spindle speed arrival signal	F063.2	○	○
PSE1	Polygon master axis not arrival signal	F063.0	○	○
PSE2	Polygon synchronization axis not arrival signal	F063.1	○	○
PSW01 - PSW16	Position switch signals	F070, F071	○	○
PSYN	Polygon synchronization under way signal	F063.7	○	○
PWFL	Power failure deceleration signal	G203.7	○	○
QRSTD	Program restart memory storing disabled signal	G517.6	○	○
R01I - R12I	Spindle motor speed command signals	G032.0 - G033.3	○	○
R01I2 - R12I2		G034.0 - G035.3	○	○
R01I3 - R12I3		G036.0 - G037.3	○	○
R01I4 - R12I4		G272.0 - G273.3	○	○
R01O - R12O	S 12-bit code signals	F036.0 - F037.3	○	○
R01O2 - R12O2		F200.0 - F201.3	○	○
R01O3 - R12O3		F204.0 - F205.3	○	○
R01O4 - R12O4		F270.0 - F271.3	○	○
RCFNA	Output switch completion signals (serial spindle)	F046.3	○	○
RCFNB		F050.3	○	○
RCFNC		F169.3	○	○
RCFND		F267.3	○	○
RCHA	Power line status check signals (serial spindle)	G071.7	○	○
RCHB		G075.7	○	○
RCHC		G205.7	○	○
RCHD		G267.7	○	○
RCHHGA	Spindle switch HIGH MCC contact status signals (serial spindle)	G072.7	○	○
RCHHGB		G076.7	○	○
RCHHGC		G206.7	○	○
RCHHGD		G268.7	○	○
RCHPA	Output switch signals (serial spindle)	F046.2	○	○
RCHPB		F050.2	○	○
RCHPC		F169.2	○	○
RCHPD		F267.2	○	○
RE01I - RE32I	Extended spindle motor speed command signals	G708 - G711	○	○
RE01I2 - RE32I2		G712 - G715	○	○
RE01I3 - RE32I3		G716 - G719	○	○
RE01I4 - RE32I4		G720 - G723	○	○
RE01O - RE32O	S 32-bit code signals	F708 - F711	○	○
RE01O2 - RE32O2		F712 - F715	○	○
RE01O3 - RE32O3		F716 - F719	○	○
RE01O4 - RE32O4		F720 - F723	○	○
RGHTH	Tool axis right-angle direction feed mode signal	G023.6	○	○
RGSPM	Spindle rotation direction signals	F065.1	○	○
RGSPP		F065.0	○	○
RGTAP	Rigid tapping signal	G061.0	○	○
RGTSP1 - RGTSP4	Rigid tapping spindle selection signals	G061.4 - G061.7	○	-
RLSOT	Stroke limit 1 release signal	G007.7	○	○
RLSOT3	Stroke limit 3 release signal	G007.4	○	○

Symbol	Signal name	Address	T	M
RMTC	Re-machining thread signal	G549.5	○	○
RMVED	Removal completion signal	F536.2	○	○
RMVST	Removal start signal	G536.2	○	○
RNDH	Tool tip center rotation feed mode signal	G298.2	○	○
ROTAA	Rotational direction command signals for orientation stop position change (serial spindle)	G072.1	○	○
ROTAB		G076.1	○	○
ROTAC		G206.1	○	○
ROTAD		G268.1	○	○
ROV1,ROV2	Rapid traverse override signals	G014.0, G014.1	○	○
ROV1O	Software operator’s panel signal (ROV1)	F076.4	○	○
ROV2O	Software operator’s panel signal (ROV2)	F076.5	○	○
ROVLP	Rapid traverse block overlap disable signal	G053.5	○	○
RP11 - RP18	Reference position match signals	F517.0 - F517.7	○	○
RP21 - RP28	2nd reference position match signals	F518.0 - F518.7	○	○
RPDO	Rapid traversing signal	F002.1	○	○
RRW	Reset & rewind signal	G008.6	○	○
RSLA	Output switch request signals (serial spindle)	G071.6	○	○
RSLB		G075.6	○	○
RSLC		G205.6	○	○
RSLD		G267.6	○	○
RSMAX	Spindle synchronous speed ratio control clamp signal	F065.2	○	○
RST	Resetting signal	F001.1	○	○
RSTRT	Reverse motion for restart start signal	G201.7	-	○
RSTRTE	Search for interruption block complete signal	F199.7	-	○
RSTRTL	Return to interruption point in progress signal	F199.6	-	○
RT	Manual rapid traverse selection signal	G019.7	○	○
RTAP	Rigid tapping-in-progress signal	F076.3	○	○
RTC2	Time constant of acceleration / deceleration after interpolation for rapid traverse switching signals	G599.6	○	○
RTC3		G599.7	○	○
RTC2O	Time constant of acceleration / deceleration after interpolation for rapid traverse switching confirmation signals	F599.6	○	○
RTC3O		F599.7	○	○
RTNT	Rigid tapping retraction start signal	G062.6	○	○
RTO	Software operator’s panel signal (RT)	F077.6	○	○
RTPT	Rigid tapping retraction completion signal	F066.1	○	○
RTRCT	Retract signal	G066.4	○	○
RTRCTF	Retract completion signal	F065.4	○	○
RVS	Reverse execution signal	G007.0	-	○
RVSL	Reverse movement signal	F082.2	-	○
RWD	Rewinding signal	F000.0	○	○
S00 - S31	Spindle function code signals	F022 - F025	○	○
S1MES	Spindle 1 under measurement signal	F062.3	○	-
S2MES	Spindle 2 under measurement signal	F062.4	○	-
S2TLS	Spindle measurement select signal	G040.5	○	-
SA	Servo ready signal	F000.6	○	○
SAR	Spindle speed arrival signal	G029.4	○	○
SARA	Spindle speed arrival signals (serial spindle)	F045.3	○	○
SARB		F049.3	○	○
SARC		F168.3	○	○
SARD		F266.3	○	○
SBK	Single block signal	G046.1	○	○
SBKO	Software operator’s panel signal (SBK)	F075.3	○	○
SBRT	Spindle synchronous speed ratio control signal	G038.1	○	○
SCLPA	Spindle clamp signals	F038.0	○	○
SCLPB		F401.1	○	○
SCLPC		F401.2	○	○
SCLPD		F401.3	○	○
SDPC	Speed display change signal	G038.5	○	○

Symbol	Signal name	Address	T	M
SDTA	Speed detection signals (serial spindle)	F045.2	○	○
SDTB		F049.2	○	○
SDTC		F168.2	○	○
SDTD		F266.2	○	○
SEO1 - SEO8	Excess synchronization error signals	F559	○	○
SEMI1 - SEMI8	Position feedback dynamic switching signals	G516	○	○
SF	Spindle function strobe signal	F007.2	○	○
SFAN	Alarm level detection signal	F093.1	○	○
SFIN	Spindle function completion signal	G005.2	○	○
SFRA	CW command signals (serial spindle)	G070.5	○	○
SFRB		G074.5	○	○
SFRC		G204.5	○	○
SFRD		G266.5	○	○
SGN	Spindle motor command polarity command signals	G033.5	○	○
SGN2		G035.5	○	○
SGN3		G037.5	○	○
SGN4		G273.5	○	○
SGNO1 - SGNO4	Spindle rotation direction signals in path table operation	F525.0 - F525.3	○	○
SH00A - SH14A	Spindle orientation external stop position command signals	G078.0 - G079.6	○	○
SH00B - SH14B		G080.0 - G081.6	○	○
SH00C - SH14C		G208.0 - G209.6	○	○
SH00D - SH14D		G270.0 - G271.6	○	○
SIND	Spindle motor speed command selection signals	G033.7	○	○
SIND2		G035.7	○	○
SIND3		G037.7	○	○
SIND4		G273.7	○	○
SKIP	Skip signal	X004.7	○	○
SKIP2 - SKIP6, SKIP7, SKIP8	Skip signals	X004.2 - X004.6, X004.0, X004.1	○	○
SKIPP	Skip signal	G006.6	○	○
SLANG	Display language switch start signal	G581.7	○	○
SLPCA	Path spindle feedback selection signals	G064.2	○	○
SLPCB		G064.3	○	○
SLPCC		G403.4	○	○
SLPCD		G403.5	○	○
SLREF	Manual 2nd/3rd/4th reference position return select 1 signal	G340.5	○	○
SLRER	Manual 2nd/3rd/4th reference position return select 2 signal	G340.6	○	○
SLSPA	Path spindle command selection signals	G063.2	○	○
SLSPB		G063.3	○	○
SLSPC		G403.0	○	○
SLSPD		G403.1	○	○
SLVA	Subordinate operation mode command signals (serial spindle)	G073.1	○	○
SLVB		G077.1	○	○
SLVC		G207.1	○	○
SLVD		G269.1	○	○
SLVSA	Subordinate operation status signals (serial spindle)	F046.4	○	○
SLVSB		F050.4	○	○
SLVSC		F169.4	○	○
SLVSD		F267.4	○	○
SMPK1 - SMPK8	Parking axis confirmation signals	F346	○	○

Symbol	Signal name	Address	T	M
SMSL11	Spindle position save selection signals	G588.0	○	○
SMSL12		G588.1	○	○
SMSL13		G588.2	○	○
SMSL14		G588.3	○	○
SMSL21		G588.4	○	○
SMSL22		G588.5	○	○
SMSL23		G588.6	○	○
SMSL24		G588.7	○	○
SMZ	In-position check signal	G053.6	○	○
SOCNA	Soft start/stop signals (serial spindle)	G071.4	○	○
SOCNB		G075.4	○	○
SOCNC		G205.4	○	○
SOCND		G267.4	○	○
SOR	Spindle orientation signal	G029.5	○	○
SORENA	Synchronous orientation enable signal	F047.3	○	○
SORENB		F051.3	○	○
SORENC		F170.3	○	○
SOREND		F268.3	○	○
SORSLA	Synchronous orientation request command	G073.3	○	○
SORSLB		G077.3	○	○
SORSLC		G207.3	○	○
SORSLD		G269.3	○	○
SOV0 - SOV7	Spindle speed override signals	G030	○	○
SOV20 - SOV27	2nd spindle speed override signals	G376	○	○
SOV30 - SOV37	3rd spindle speed override signals	G377	○	○
SOV40 - SOV47	4th spindle speed override signals	G378	○	○
SPAL	Spindle speed fluctuation detection alarm signal	F035.0	○	○
SPAPH1	Arbitrary spindle position phase synchronization signals	G587.4	○	○
SPAPH2		G587.5	○	○
SPAPH3		G587.6	○	○
SPAPH4		G587.7	○	○
SPL	Feed hold lamp signal	F000.4	○	○
SPMER1	Spindle position save error signals	F577.4	○	○
SPMER2		F577.5	○	○
SPMER3		F577.6	○	○
SPMER4		F577.7	○	○
SPMFN1	Spindle position save completion signals	F577.0	○	○
SPMFN2		F577.1	○	○
SPMFN3		F577.2	○	○
SPMFN4		F577.3	○	○
SPMST1	Spindle position save start signals	G587.0	○	○
SPMST2		G587.1	○	○
SPMST3		G587.2	○	○
SPMST4		G587.3	○	○
SPO	Software operator's panel signal (*SP)	F075.7	○	○
SPP1 - SPP8	Spindle indexing signals for each axis	F522	○	○
SPPHS	Spindle phase synchronous control signal	G038.3	○	○
SPPHS1	Spindle phase synchronous control signal (for each spindle)	G289.0	○	○
SPPHS2		G289.1	○	○
SPPHS3		G289.2	○	○
SPPHS4		G289.3	○	○
SPSLA	Spindle selection signals (serial spindle)	G071.2	○	○
SPSLB		G075.2	○	○
SPSLC		G205.2	○	○
SPSLD		G267.2	○	○
SPSP	Spindle command path specification signal	G536.7	○	○
SPSTPA	Spindle stop completion signal	G028.6	○	○
SPSTPB		G402.1	○	○
SPSTPC		G402.2	○	○
SPSTPD		G402.3	○	○
SPSYC	Spindle synchronous control signal	G038.2	○	○

Symbol	Signal name	Address	T	M
SPSYC1	Spindle synchronous control signal (for each spindle)	G288.0	○	○
SPSYC2		G288.1	○	○
SPSYC3		G288.2	○	○
SPSYC4		G288.3	○	○
SPWRN1 - SPWRN9	Spindle warning detail signals 1 to 9	F264.0 - F265.0	○	○
SQMPE	Program restart MDI program execution completion signal	F316.7	○	○
SQMPR	Program restart MDI program output completion signal	F316.6	○	○
SRN	Program restart signal	G006.0	○	○
SRNEX	Quick program restart under way signal	F534.1	○	○
SRNMV	Program restart under way signal	F002.4	○	○
SRSP1R	1st serial spindle ready signal	F034.6	○	○
SRSP2R	2nd serial spindle ready signal	F034.5	○	○
SRSP3R	3rd serial spindle ready signal	F034.4	○	○
SRSP4R	4th serial spindle ready signal	F034.3	○	○
SRSRDY	All-spindle operation ready signal	F034.7	○	○
SRVA	CCW command signals (serial spindle)	G070.4	○	○
SRVB		G074.4	○	○
SRVC		G204.4	○	○
SRVD		G266.4	○	○
SRVON1 - SRVON8	SV speed control mode signals	G521	○	○
SSEGB1 - SSEGB4	Simple spindle EGB signals	G351.0 - G351.3	○	○
SSEGBM1 - SSEGBM4	Simple spindle EGB mode signals	F351.0 - F351.3	○	○
SSIN	Spindle motor command polarity selection signals	G033.6	○	○
SSIN2		G035.6	○	○
SSIN3		G037.6	○	○
SSIN4		G273.6	○	○
SSR1 - SSR4	Total spindle revolution number reset signals	G533.0 - G533.4	○	○
SSRS	Total spindle revolution number reset selection signal	G533.4	○	○
SSTA	Speed zero signals (serial spindle)	F045.1	○	○
SSTB		F049.1	○	○
SSTC		F168.1	○	○
SSTD		F266.1	○	○
SSYO1 - SSYO4	Spindle synchronization signals in path table operation	F525.4 - F525.7	○	○
ST	Cycle start signal	G007.2	○	○
STCHK	Start check signal	G408.0	○	○
STL	Cycle start lamp signal	F000.5	○	○
STLK	Start lock signal	G007.1	○	○
SUCLPA	Spindle unclamp signals	F038.1	○	○
SUCLPB		F400.1	○	○
SUCLPC		F400.2	○	○
SUCLPD		F400.3	○	○
SVAR	Servo motor spindle control mode acceleration/deceleration completion signal	F090.6	○	○
SVDI0x	Learning control start signal	G320	○	○
SVDO0x	Learning control status signal	F320	○	○
SVDO2x	Learning memory clear signal	F322	○	○
SVF1 - SVF8	Servo off signals	G126	○	○
SVGN	Servo motor rotation polarity specification signal	G022.5	○	○
SVREV1 - SVREV8	SV speed control mode in-progress signals	F521	○	○
SVRI	Servo motor rotation speed specification signals	F021.0 - F022.3	○	○
SVRVS1 - SVRVS8	SV reverse signals	G523	○	○
SVSAR1 - SVSAR8	Speed arrival signals	F377	○	○
SVSP	Servo motor spindle control switching signal	G022.7	○	○
SVSPM	Servo motor spindle control mode signal	F090.7	○	○
SVSST1 - SVSST8	Speed zero signals	F376	○	○

Symbol	Signal name	Address	T	M
SVWRN1	Servo warning detail signals	F093.4	○	○
SVWRN2		F093.5	○	○
SVWRN3		F093.6	○	○
SVWRN4		F093.7	○	○
SWS1	Spindle selection signals	G027.0	○	○
SWS2		G027.1	○	○
SWS3		G027.2	○	○
SWS4		G026.3	○	○
SYAR	Servo motor spindle synchronization mode acceleration/deceleration completion signal	F090.4	○	○
SYCAL	Phase error monitor signal	F044.4	○	○
SYCAL1	Phase error monitor signal (for each spindle)	F043.0	○	○
SYCAL2		F043.1	○	○
SYCAL3		F043.2	○	○
SYCAL4		F043.3	○	○
SYCM1 - SYCM8	Synchronous master axis confirmation signals	F341	○	○
SYCS1 - SYCS8	Synchronous slave axis confirmation signals	F342	○	○
SYN1O - SYN8O	Synchronous/composite/superimposed control under way signals	F118	○	○
SYNC1 - SYNC8	Synchronous control axis selection signals	G138	○	○
SYNCJ1 - SYNCJ8	Signals for selecting the manual feed axis for axis synchronous control	G140	○	○
SYNER	Signal for indicating a positional deviation error alarm for axis synchronous control	F403.0	○	○
SYNMOD	EGB mode signal	F065.6	○	○
SYNMT1 - SYNMT8	Machine coordinate match state output signals	F210	○	○
SYNO1 - SYNO8	Axis synchronous control status signals	F532	○	○
SYNOF1 - SYNOF8	Synchronization compensation enable state output signals	F211	○	○
SYPER	Phase synchronization for Servo/Spindle synchronous error signal	F527.7	○	○
SYPFN	Phase synchronization for Servo/Spindle synchronous finished signal	F527.6	○	○
SYPST	Phase synchronization for Servo/Spindle synchronous start signal	G517.7	○	○
SYSS	Servo motor spindle synchronization start signal	G061.2	○	○
SYSSM	Servo motor spindle synchronization mode signal	F090.5	○	○
T00 - T31	Tool function code signals	F026 - F029	○	○
TAP	Tapping signal	F001.5	○	○
TB_BASE	Table base signal	G298.0	○	○
TCHG	Linear inclination compensation parameter change demand signal	G531.2	○	○
TDA1 - TDA8	Target distance attainment status signal	F730	○	○
TDC1 - TDC8	Total travel distance clear signal	G726	○	○
TDCF00 - TDCF07	DO signal for Data transfer between PMC and DCSPMC	F747	○	○
TDFCANA	Preload and multi-axis integrator copy disable signal (serial spindle)	G306.2	○	○
TDFCANB		G310.2	○	○
TDFCANC		G314.2	○	○
TDFCAND		G318.2	○	○
TDFTR1 - TDFTR8	Trouble forecast signals for disturbance level	F299	○	○
TDIACK	Built-in 3D interference check setting change completion signal	F531.5	○	○
TDICHG	Built-in 3D interference check setting change signal	G519.4	○	○
TDICHK	Built-in 3D interference check in-progress signal	F531.4	○	○
TDID	Built-in 3D interference check disable signal	G519.3	○	○
TDIH1AE - TDIH4AE	The tool holder move axis data invalid signal.	F542.4 - F542.7	○	○
TDIH1FE - TDIH4FE	The tool holder figure data invalid signal.	F540.4 - F540.7	○	○
TDIHO1 - TDIHO6	Tool holder interference signal.	F561.0 - F561.5	○	○

Symbol	Signal name	Address	T	M
TDIO1AE - TDIO6AE	The interference object move axis data invalid signal.	F543.0 - F543.5	○	○
TDIO1FE - TDIO6FE	The interference object figure data invalid signal.	F541.0 - F541.5	○	○
TDISAW	Built-in 3D interference check margin width change notification signal	G534.7	○	○
TDISD	3D interference check between specified targets disable signal	G518.3	○	○
TDIT1AE - TDIT4AE	The tool move axis data invalid signal.	F542.0 - F542.3	○	○
TDIT1FE - TDIT4FE	The tool figure data invalid signal.	F540.0 - F540.3	○	○
TDITO1 - TDITO6	Tool interference signal	F560.0 - F560.5	○	○
TDRCOF	Switching signal for three-dimensional rotary error compensation available/unavailable	G579.0	○	○
TDSML1 - TDSML8	Trouble forecast signals for thermal simulation	F298	○	○
TF	Tool function strobe signal	F007.3	○	○
TFIN	Tool function completion signal	G005.3	○	○
THD00 - THD15	Thermal growth compensation data	G354 - G355	○	○
THML	Thermal growth compensation start signal	G356.0	○	○
THREND	Thermal growth compensation reading completion signal	F356.1	○	○
THRD	Threading signal	F002.3	○	○
THSTB	Thermal growth compensation strobe signal	G356.1	○	○
TIALM	Path interference alarm signal	F064.7	●	-
TICHK	Path interference check in progress signal	F064.6	●	-
TKEY0 - TKEY5	Tool management data protection signals	G330.0 - G330.5	○	○
TL01 - TL512	Tool group number selection signals	G047.0 - G048.1	○	○
TLAL	Number of remaining tools notification signal	F154.0	-	○
TLCH	Tool change signal	F064.0	○	○
TLCH1	Tool change signal 1	F328.0	○	○
TLCH2	Tool change signal 2	F328.1	○	○
TLCH3	Tool change signal 3	F328.2	○	○
TLCH4	Tool change signal 4	F328.3	○	○
TLCHB	Tool life expiration notice signal	F064.3	○	○
TLCHB1	Tool life expiration notice signal 1	F329.4	○	○
TLCHB2	Tool life expiration notice signal 2	F329.5	○	○
TLCHB3	Tool life expiration notice signal 3	F329.6	○	○
TLCHB4	Tool life expiration notice signal 4	F329.7	○	○
TLCHI	Individual tool change signal	F064.2	○	○
TLCHI1	Individual tool change signal 1	F328.4	○	○
TLCHI2	Individual tool change signal 2	F328.5	○	○
TLCHI3	Individual tool change signal 3	F328.6	○	○
TLCHI4	Individual tool change signal 4	F328.7	○	○
TLMA	Torque limit signals (serial spindle)	F045.6	○	○
TLMB		F049.6	○	○
TLMC		F168.6	○	○
TLMD		F266.6	○	○
TLMEM	Tool management data edit in-progress signal	F315.7	○	○
TLMG10	Tool management data modification in-progress signal	F315.2	○	○
TLMHA	Torque limit command HIGH signals (serial spindle)	G070.1	○	○
TLMHB		G074.1	○	○
TLMHC		G204.1	○	○
TLMHD		G266.1	○	○
TLMLA	Torque limit command LOW signals (serial spindle)	G070.0	○	○
TLMLB		G074.0	○	○
TLMLC		G204.0	○	○
TLMLD		G266.0	○	○

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Symbol	Signal name	Address	T	M
TLMOT	Tool management data output in-progress signal	F315.4	○	○
TLMSRH	Tool search in-progress signal	F315.1	○	○
TLNCT1	Tool life counting disable signal 1	G329.4	○	○
TLNCT2	Tool life counting disable signal 2	G329.5	○	○
TLNCT3	Tool life counting disable signal 3	G329.6	○	○
TLNCT4	Tool life counting disable signal 4	G329.7	○	○
TLNW	New tool select signal	F064.1	○	○
TLRST	Tool change signal	G048.7	○	○
TLRST1	Tool change signal 1	G328.0	○	○
TLRST2	Tool change signal 2	G328.1	○	○
TLRST3	Tool change signal 3	G328.2	○	○
TLRST4	Tool change signal 4	G328.3	○	○
TLRSTI	Individual tool change reset signal	G048.6	○	○
TLRSTI1	Individual tool change reset signal 1	G328.4	○	○
TLRSTI2	Individual tool change reset signal 2	G328.5	○	○
TLRSTI3	Individual tool change reset signal 3	G328.6	○	○
TLRSTI4	Individual tool change reset signal 4	G328.7	○	○
TLMG10	Tool management data modification in-progress signal	F315.2	○	○
TLSKF	Tool skip completion signal	F315.0	○	○
TLSKF1	Tool skip completion signal 1	F329.0	○	○
TLSKF2	Tool skip completion signal 2	F329.1	○	○
TLSKF3	Tool skip completion signal 3	F329.2	○	○
TLSKF4	Tool skip completion signal 4	F329.3	○	○
TLSKP	Tool skip signal	G048.5	○	○
TLSKP1	Tool skip signal 1	G329.0	○	○
TLSKP2	Tool skip signal 2	G329.1	○	○
TLSKP3	Tool skip signal 3	G329.2	○	○
TLSKP4	Tool skip signal 4	G329.3	○	○
TMFNFD	Life expiration signal	F315.6	○	○
TMRON	General-purpose integrating meter start signal	G053.0	○	○
TPMG00 - TPMG07	DI signal for Data transfer between PMC and DCSPMC	G765	○	○
TPPRS	Touch panel check signal	F006.0	○	○
TRACT	Tool retraction mode signal	F092.3	○	○
TRESC	Tool retraction signal	G059.0	○	○
TRMTN	Tool retraction axis movement signal	F092.4	○	○
TRQL1 - TRQL8	Torque limit reached signals	F114	○	○
TRQM1 - TRQM8	Torque control mode signal (PMC axis control)	F190	○	○
TRRTN	Tool return signal	G059.1	○	○
TRSPS	Tool return completion signal	F092.5	○	○
TSE	Torch swing select signal	G519.5	-	○
UI000 - UI031	Input signals for custom macro	G054 - G057	○	○
UI100 - UI131		G276 - G279	○	○
UI200 - UI231		G280 - G283	○	○
UI300 - UI331		G284 - G287	○	○
UINT	Interrupt signal for custom macro	G053.3	○	○
UO000 - UO031	Output signals for custom macro	F054, F055, F276, F277	○	○
UO100 - UO131		F056 - F059	○	○
UO200 - UO231		F280 - F283	○	○
UO300 - UO331		F284 - F287	○	○
VDCABA	DC-link failure detection state signal (serial spindle)	F306.4	○	○
VDCABB		F308.4	○	○
VDCABC		F310.4	○	○
VDCABD		F312.4	○	○
WATO	Waiting signal	F063.6	●	●
WBCNT	Web browser connection status signal	F578.2	○	○
WBEND	Web browser connection prohibition signal	G579.5	○	○
WECCS	SRAM ECC error warning signal	F535.3	○	○
WETE	Embedded Ethernet communication error warning signal	F535.4	○	○

Symbol	Signal name	Address	T	M
WETF	Fast Ethernet communication error warning signal	F535.5	○	○
WFAN	Warning level detection signal	F093.3	○	○
WFLN1	FL-net1 communication abnormality warning signal	F535.6	○	○
WFLN2	FL-net2 communication abnormality warning signal	F535.7	○	○
WIOCH1	I/O link 1 retry warning signal	F535.0	○	○
WIOCH2	I/O link 2 retry warning signal	F535.1	○	○
WIOCH3	I/O link 3 retry warning signal	F535.2	○	○
WOQSM	Workpiece origin offset measurement mode selection signal	G039.6	−	○
WOQSM	Workpiece coordinate system shift value write mode select signal	G039.6	○	−
WOSET	Workpiece coordinate system shift value write signal	G040.7	○	-
WPRST1 - WPRST8	Each axis workpiece coordinate system preset signals	G358	○	○
WPSF1 - WPSF8	Each axis workpiece coordinate system preset completion signals	F358	○	○
XPFLA	Power failure detection signals (for spindle)	F307.1	○	○
XPFLB		F309.1	○	○
XPFLC		F311.1	○	○
XPFLD		F313.1	○	○
ZP1 – ZP8	Reference position return end signals	F094	○	○
ZP21 – ZP28	2nd reference position return completion signals	F096	○	○
ZP31 – ZP38	3rd reference position return completion signals	F098	○	○
ZP41 – ZP48	4th reference position return completion signals	F100	○	○
ZRF1 – ZRF8	Reference position establishment signals	F120	○	○
ZRN	Manual reference position return selection signal	G043.7	○	○
ZRNO	Software operator’s panel signal (ZRN)	F073.4	○	○
ZRNR	Mode notification signal	F513.7	○	○

9.2 LIST OF ADDRESSES

Expression of signals

Address — Symbol (#0 to #7 indicates bit position)

	#7	#6	#5	#4	#3	#2	#1	#0
Fn000	OP	SA	STL	SPL				RWD
		SA	STL	SPL				RWD

For an item common to both lathe and machining center systems, if there is any signal effective to either one only, the table is divided into two parts and the signal is not indicated in the part for the system to which the signal is not effective, as shown in the example below. The upper part is for the lathe system while the lower part is for the machining center system.

	#7	#6	#5	#4	#3	#2	#1	#0	
Gn053	*CDZ		ROVLP		UINT			TMRON	T series
			ROVLP		UINT			TMRON	M series

[Example 1]
The figure above indicates *CDZ is provided only for the lathe system while the other signals for both the lathe system and machining system.

	#7	#6	#5	#4	#3	#2	#1	#0	
Gn040									T series
					OFN9	OFN8	OFN7	OFN6	M series

[Example 2]
Signals OFN6 to OFN9 are for machining center system only.

NOTE

1. In X addresses in the table, the emergency stop signal for each signal is *ESP<X0008.4>, *ESP<X0008.0>, and *ESP<X0008.1>, respectively.
2. For multi-path control, one of the following superscripts is attached to the top right of a symbol depending on the signal type.
   - Path type (for path 1 on PMC side) : #1
   - Path type (for path 2 on PMC side) : #2
   - Path type (for path 3 on PMC side) : #3

   In addition, #1, #2 or #3 attached to a signal indicates the signal is provided only for path 1, 2, or 3 on PMC side, respectively.
   - Path type : #P
   - Controlled axis type : #SV
   - Spindle type : #SP

   In G and F addresses in the table, #P, #SV, or #SP attached to a signal indicates the signal is provided for each path on CNC side, each control axis on CNC side, or each spindle on CNC side, respectively.
   - PMC axis control group type: #PX

   #PX attached to a signal indicates the signal is provided for each PMC axis control group.
3. For the signals, a single data number is assigned to 8 bits. Each bit has a different meaning.
4. The letter "n" in each address representation indicates the address position used in each path on the CNC side, as shown below.
   1st path : n=0 (No. 0 to 999)
   2nd path : n=1 (No. 1000 to 1999)
5. For a signal of controlled axis type, when the number of axes exceeds eight for each path, set parameter No. 3021 to address this situation.

MT → CNC

Address	Bit 7	6	5	4	3	2	1	0
X0000								
X0001								
X0002								
X0003								
X0004 T series	SKIP[#1]	ESKIP SKIP6[#1]	-MIT2[#1] SKIP5[#1]	+MIT2[#1] SKIP4[#1]	-MIT1[#1] SKIP3[#1]	+MIT1[#1] SKIP2[#1]	 SKIP8[#1]	 SKIP7[#1]
X0004 M series	SKIP[#1]	ESKIP SKIP6[#1]	SKIP5[#1]	SKIP4[#1]	SKIP3[#1]	 SKIP2[#1]	 SKIP8[#1]	 SKIP7[#1]
X0005								
X0006								
X0007	*DEC8[#2]	*DEC7[#2]	*DEC6[#2]	*DEC5[#2]	*DEC4[#2]	*DEC3[#2]	*DEC2[#2]	*DEC1[#2]
X0008				*ESP			(*ESP)	(*ESP)
X0009	*DEC8[#1]	*DEC7[#1]	*DEC6[#1]	*DEC5[#1]	*DEC4[#1]	*DEC3[#1]	*DEC2[#1]	*DEC1[#1]
X0010	*DEC8[#3]	*DEC7[#3]	*DEC6[#3]	*DEC5[#3]	*DEC4[#3]	*DEC3[#3]	*DEC2[#3]	*DEC1[#3]
X0011 T series	SKIP[#3]	ESKIP[#3] SKIP6[#3]	-MIT2[#3] SKIP5[#3]	+MIT2[#3] SKIP4[#3]	-MIT1[#3] SKIP3[#3]	+MIT1[#3] SKIP2[#3]	 SKIP8[#3]	 SKIP7[#3]
X0011 M series	SKIP[#3]	ESKIP[#3] SKIP6[#3]	SKIP5[#3]	SKIP4[#3]	SKIP3[#3]	 SKIP2[#3]	 SKIP8[#3]	 SKIP7[#3]
X0012								
X0013 T series	SKIP[#2]	ESKIP[#2] SKIP6[#2]	-MIT2[#2] SKIP5[#2]	+MIT2[#2] SKIP4[#2]	-MIT1[#2] SKIP3[#2]	+MIT1[#2] SKIP2[#2]	 SKIP8[#2]	 SKIP7[#2]
X0013 M series	SKIP[#2]	ESKIP[#2] SKIP6[#2]	SKIP5[#2]	SKIP4[#2]	SKIP3[#2]	 SKIP2[#2]	 SKIP8[#2]	 SKIP7[#2]

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PMC → CNC

Address	Bit number 7	6	5	4	3	2	1	0
Gn000	ED7#P	ED6#P	ED5#P	ED4#P	ED3#P	ED2#P	ED1#P	ED0#P
Gn001	ED15#P	ED14#P	ED13#P	ED12#P	ED11#P	ED10#P	ED9#P	ED8#P
Gn002	ESTB#P	EA6#P	EA5#P	EA4#P	EA3#P	EA2#P	EA1#P	EA0#P
Gn003								
Gn004			MFIN3#P	MFIN2#P	FIN#P			
Gn005	BFIN#P	AFL#P			TFIN#P	SFIN#P		MFIN#P
Gn006		SKIPP#P		OVC#P		*ABSM#P		SRN#P
Gn007	RLSOT#P	EXLM#P	*FLWU#P	RLSOT3#P		ST#P	STLK#P	
	RLSOT#P	EXLM#P	*FLWU#P	RLSOT3#P		ST#P	STLK#P	RVS#P
Gn008	ERS#P	RRW#P	*SP#P	*ESP#P	*BSL#P		*CSL#P	*IT#P
Gn009				PN16#P	PN8#P	PN4#P	PN2#P	PN1#P
Gn010	*JV7#P	*JV6#P	*JV5#P	*JV4#P	*JV3#P	*JV2#P	*JV1#P	*JV0#P
Gn011	*JV15#P	*JV14#P	*JV13#P	*JV12#P	*JV11#P	*JV10#P	*JV9#P	*JV8#P
Gn012	*FV7#P	*FV6#P	*FV5#P	*FV4#P	*FV3#P	*FV2#P	*FV1#P	*FV0#P
Gn013	*AFV7#P	*AFV6#P	*AFV5#P	*AFV4#P	*AFV3#P	*AFV2#P	*AFV1#P	*AFV0#P
Gn014							ROV2#P	ROV1#P
Gn015								
Gn016								
	F1D#P							
Gn017								
Gn018	HS2D#P	HS2C#P	HS2B#P	HS2A#P	HS1D#P	HS1C#P	HS1B#P	HS1A#P
Gn019	RT#P	MP4#P	MP2#P	MP1#P	HS3D#P	HS3C#P	HS3B#P	HS3A#P
Gn020					HS4D#P	HS4C#P	HS4B#P	HS4A#P
Gn021	SVR08I#P	SVR07I#P	SVR06I#P	SVR05I#P	SVR04I#P	SVR03I#P	SVR02I#P	SVR01I#P
Gn022	SVSP#P		SVGN#P	DFSYC#P	SVR12I#P	SVR11I#P	SVR10I#P	SVR09I#P
Gn023	ALNGH#P	RGHTH#P	NOINPS#P	HREV#P	HNDLF#P			
Gn024	EPN7#P	EPN6#P	EPN5#P	EPN4#P	EPN3#P	EPN2#P	EPN1#P	EPN0#P
Gn025	EPNS#P		EPN13#P	EPN12#P	EPN11#P	EPN10#P	EPN9#P	EPN8#P
Gn026		*SSTP4#SP			SWS4#P		PC4SLC#P	PC3SLC#P
Gn027	CON#P		*SSTP3#SP	*SSTP2#SP	*SSTP1#SP	SWS3#P	SWS2#P	SWS1#P
Gn028	PC2SLC#P	SPSTPA#SP	*SCPFA#SP	*SUCPFA#SP		GR2#SP	GR1#SP	

Address	7	6	5	4	3	2	1	0
	Bit number							
Gn029		*SSTP#P	SOR#P	SAR#P	GR32#SP	GR31#SP	GR22#SP	GR21#SP
Gn030	SOV7#P	SOV6#P	SOV5#P	SOV4#P	SOV3#P	SOV2#P	SOV1#P	SOV0#P
Gn031	PKESS2#P	PKESS1#P	GR42#SP	GR41#SP	M3R#P			
Gn032	R08I#SP	R07I#SP	R06I#SP	R05I#SP	R04I#SP	R03I#SP	R02I#SP	R01I#SP
Gn033	SIND#SP	SSIN#SP	SGN#SP		R12I#SP	R11I#SP	R10I#SP	R09I#SP
Gn034	R08I2#SP	R07I2#SP	R06I2#SP	R05I2#SP	R04I2#SP	R03I2#SP	R02I2#SP	R01I2#SP
Gn035	SIND2#SP	SSIN2#SP	SGN2#SP		R12I2#SP	R11I2#SP	R10I2#SP	R09I2#SP
Gn036	R08I3#SP	R07I3#SP	R06I3#SP	R05I3#SP	R04I3#SP	R03I3#SP	R02I3#SP	R01I3#SP
Gn037	SIND3#SP	SSIN3#SP	SGN3#SP		R12I3#SP	R11I3#SP	R10I3#SP	R09I3#SP
Gn038			SDPC#P		SPPHS#P	SPSYC#P	SBRT#P	*PLSST#P
	*BECLP#P	*BEUCP#P	SDPC#P		SPPHS#P	SPSYC#P	SBRT#P	*PLSST#P
Gn039	GOQSM #P	WOQSM #P	OFN5#P	OFN4#P	OFN3#P	OFN2#P	OFN1#P	OFN0#P
Gn040	WOSET#P	PRC#P	S2TLS#P		OFN9#P	OFN8#P	OFN7#P	OFN6#P
Gn041	HS2ID#P	HS2IC#P	HS2IB#P	HS2IA#P	HS1ID#P	HS1IC#P	HS1IB#P	HS1IA#P
Gn042	DMMC#P				HS3ID#P	HS3IC#P	HS3IB#P	HS3IA#P
Gn043	ZRN#P		DNCI#P			MD4#P	MD2#P	MD1#P
Gn044							MLK#P	BDT1#P
Gn045	BDT9#P	BDT8#P	BDT7#P	BDT6#P	BDT5#P	BDT4#P	BDT3#P	BDT2#P
Gn046	DRN#P	KEY4	KEY3	KEY2	KEY1		SBK#P	KEYP
Gn047	TL128#P	TL64#P	TL32#P	TL16#P	TL08#P	TL04#P	TL02#P	TL01#P
Gn048	TLRST#P	TLRSTI#P	TLSKP#P			LFCIV#P	TL512#P	TL256#P
Gn049	*TLV7#P	*TLV6#P	*TLV5#P	*TLV4#P	*TLV3#P	*TLV2#P	*TLV1#P	*TLV0#P
Gn050							*TLV9#P	*TLV8#P
Gn051	*CHLD#P	CHPST#P			*CHP8#P	*CHP4#P	*CHP2#P	*CHP1#P
Gn052								
Gn053	*CDZ#P		ROVLP#P		UINT#P			TMRON#P
			ROVLP#P		UINT#P			TMRON#P
Gn054	UI007#P	UI006#P	UI005#P	UI004#P	UI003#P	UI002#P	UI001#P	UI000#P
Gn055	UI015#P	UI014#P	UI013#P	UI012#P	UI011#P	UI010#P	UI009#P	UI008#P
Gn056	UI023#P	UI022#P	UI021#P	UI020#P	UI019#P	UI018#P	UI017#P	UI016#P

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Address	Bit number 7	6	5	4	3	2	1	0
Gn057	UI031#P	UI030#P	UI029#P	UI028#P	UI027#P	UI026#P	UI025#P	UI024#P
Gn058					EXOUT#P	EXSTP#P	EXINP#P	
Gn059	NSYNCA#P						TRRTN#P	TRESC#P
Gn060	*TSB#P							
Gn061	RGTSP4#SP	RGTSP3#SP	RGTSP2#SP	RGTSP1#SP		SYSS#P		RGTAP#P
						SYSS#P		RGTAP#P
Gn062		RTNT#P					*CRTOF	
Gn063	NMWT#P	INFD#P	NOZAGC#P		SLSPB#P	SLSPA#P	NOWT	HEAD
Gn064		ESRSYC#P			SLPCB#P	SLPCA#P		
Gn065								
Gn066	EKSET			RTRCT#P			ENBKY	IGNVRY#P
Gn067	HCREQ	HCABT		EGBS#P	MCHK#P	MMOD#P		MTLC#P
							CGREN#P	
Gn068	MTL07#P	MTL06#P	MTL05#P	MTL04#P	MTL03#P	MTL02#P	MTL01#P	MTL00#P
Gn069	MTL15#P	MTL14#P	MTL13#P	MTL12#P	MTL11#P	MTL10#P	MTL09#P	MTL08#P
Gn070	MRDYA#SP	ORCMA#SP	SFRA#SP	SRVA#SP	CTH1A#SP	CTH2A#SP	TLMHA#SP	TLMLA#SP
Gn071	RCHA#SP	RSLA#SP	INTGA#SP	SOCNA#SP	MCFNA#SP	SPSLA#SP	*ESPA#SP	ARSTA#SP
Gn072	RCHHGA#SP	MFNHGA#SP	INCMDA#SP	OVRIDA#SP	DEFMDA#SP	NRROA#SP	ROTAA#SP	INDXA#SP
Gn073						MPOFA#SP	SLVA#SP	MORCMA#SP
Gn074	MRDYB#SP	ORCMB#SP	SFRB#SP	SRVB#SP	CTH1B#SP	CTH2B#SP	TLMHB#SP	TLMLB#SP
Gn075	RCHB#SP	RSLB#SP	INTGB#SP	SOCNB#SP	MCFNB#SP	SPSLB#SP	*ESPB#SP	ARSTB#SP
Gn076	RCHHGB#SP	MFNHGB#SP	INCMDB#SP	OVRIDB#SP	DEFMDB#SP	NRROB#SP	ROTAB#SP	INDXB#SP
Gn077						MPOFB#SP	SLVB#SP	MORCMB#SP
Gn078	SH07A#SP	SH06A#SP	SH05A#SP	SH04A#SP	SH03A#SP	SH02A#SP	SH01A#SP	SH00A#SP
Gn079		SH14A#SP	SH13A#SP	SH12A#SP	SH11A#SP	SH10A#SP	SH09A#SP	SH08A#SP
Gn080	SH07B#SP	SH06B#SP	SH05B#SP	SH04B#SP	SH03B#SP	SH02B#SP	SH01B#SP	SH00B#SP
Gn081		SH14B#SP	SH13B#SP	SH12B#SP	SH11B#SP	SH10B#SP	SH09B#SP	SH08B#SP
Gn082	EUI07#P	EUI06#P	EUI05#P	EUI04#P	EUI03#P	EUI02#P	EUI01#P	EUI00#P
Gn083	EUI15#P	EUI14#P	EUI13#P	EUI12#P	EUI11#P	EUI10#P	EUI09#P	EUI08#P
Gn084								

Address	Bit number 7	6	5	4	3	2	1	0
Gn085								
Gn086					-Ja#P	+Ja#P	-Jg#P	+Jg#P
Gn087	MP42#P	MP41#P		MP32#P	MP31#P		MP22#P	MP21#P
Gn088	HS4ID#P	HS4IC#P	HS4IB#P	HS4IA#P	HNDMP#P			
Gn089								
Gn090	G2SLC#P	G2Y#P	G2Z#P	G2X#P		G2RVY#P	G2RVZ#P	G2RVX#P
Gn091								
Gn092								
Gn093								
Gn094								
Gn095								
Gn096	HROV#P	*HROV6#P	*HROV5#P	*HROV4#P	*HROV3#P	*HROV2#P	*HROV1#P	*HROV0#P
Gn097								
Gn098	EKC7	EKC6	EKC5	EKC4	EKC3	EKC2	EKC1	EKC0
Gn099								
Gn100	+J8#SV	+J7#SV	+J6#SV	+J5#SV	+J4#SV	+J3#SV	+J2#SV	+J1#SV
Gn101	*+ED28#SV	*+ED27#SV	*+ED26#SV	*+ED25#SV	*+ED24#SV	*+ED23#SV	*+ED22#SV	*+ED21#SV
Gn102	-J8#SV	-J7#SV	-J6#SV	-J5#SV	-J4#SV	-J3#SV	-J2#SV	-J1#SV
Gn103	*-ED28#SV	*-ED27#SV	*-ED26#SV	*-ED25#SV	*-ED24#SV	*-ED23#SV	*-ED22#SV	*-ED21#SV
Gn104	+EXL8#SV	+EXL7#SV	+EXL6#SV	+EXL5#SV	+EXL4#SV	+EXL3#SV	+EXL2#SV	+EXL1#SV
Gn105	-EXL8#SV	-EXL7#SV	-EXL6#SV	-EXL5#SV	-EXL4#SV	-EXL3#SV	-EXL2#SV	-EXL1#SV
Gn106	MI8#SV	MI7#SV	MI6#SV	MI5#SV	MI4#SV	MI3#SV	MI2#SV	MI1#SV
Gn107	*+ED38#SV	*+ED37#SV	*+ED36#SV	*+ED35#SV	*+ED34#SV	*+ED33#SV	*+ED32#SV	*+ED31#SV
Gn108	MLK8#SV	MLK7#SV	MLK6#SV	MLK5#SV	MLK4#SV	MLK3#SV	MLK2#SV	MLK1#SV
Gn109	*-ED38#SV	*-ED37#SV	*-ED36#SV	*-ED35#SV	*-ED34#SV	*-ED33#SV	*-ED32#SV	*-ED31#SV
Gn110	+LM8#SV	+LM7#SV	+LM6#SV	+LM5#SV	+LM4#SV	+LM3#SV	+LM2#SV	+LM1#SV
Gn111								
Gn112	-LM8#SV	-LM7#SV	-LM6#SV	-LM5#SV	-LM4#SV	-LM3#SV	-LM2#SV	-LM1#SV
Gn113								
Gn114	*+L8#SV	*+L7#SV	*+L6#SV	*+L5#SV	*+L4#SV	*+L3#SV	*+L2#SV	*+L1#SV

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Address	Bit number 7	6	5	4	3	2	1	0
Gn115								
Gn116	*-L8#SV	*-L7#SV	*-L6#SV	*-L5#SV	*-L4#SV	*-L3#SV	*-L2#SV	*-L1#SV
Gn117								
Gn118	*+ED8#SV	*+ED7#SV	*+ED6#SV	*+ED5#SV	*+ED4#SV	*+ED3#SV	*+ED2#SV	*+ED1#SV
Gn119								
Gn120	*-ED8#SV	*-ED7#SV	*-ED6#SV	*-ED5#SV	*-ED4#SV	*-ED3#SV	*-ED2#SV	*-ED1#SV
Gn121								
Gn122	PK8#SV PKESS2#P	PK7#SV PKESS1#P	PK6#SV	PK5#SV	PK4#SV	PK3#SV	PK2#SV	PK1#SV
Gn123								
Gn124	DTCH8#SV	DTCH7#SV	DTCH6#SV	DTCH5#SV	DTCH4#SV	DTCH3#SV	DTCH2#SV	DTCH1#SV
Gn125	IUDD8#SV	IUDD7#SV	IUDD6#SV	IUDD5#SV	IUDD4#SV	IUDD3#SV	IUDD2#SV	IUDD1#SV
Gn126	SVF8#SV	SVF7#SV	SVF6#SV	SVF5#SV	SVF4#SV	SVF3#SV	SVF2#SV	SVF1#SV
Gn127								
Gn128	MIX8#SV	MIX7#SV	MIX6#SV	MIX5#SV	MIX4#SV	MIX3#SV	MIX2#SV	MIX1#SV
Gn129								
Gn130	*IT8#SV	*IT7#SV	*IT6#SV	*IT5#SV	*IT4#SV	*IT3#SV	*IT2#SV	*IT1#SV
Gn131								
Gn132	+MIT8#P	+MIT7#P	+MIT6#P	+MIT5#P	+MIT4#P	+MIT3#P	+MIT2#P	+MIT1#P
Gn133								
Gn134	-MIT8#P	-MIT7#P	-MIT6#P	-MIT5#P	-MIT4#P	-MIT3#P	-MIT2#P	-MIT1#P
Gn135								
Gn136	EAX8#SV	EAX7#SV	EAX6#SV	EAX5#SV	EAX4#SV	EAX3#SV	EAX2#SV	EAX1#SV
Gn137								
Gn138	SYNC8#SV	SYNC7#SV	SYNC6#SV	SYNC5#SV	SYNC4#SV	SYNC3#SV	SYNC2#SV	SYNC1#SV
Gn139								
Gn140	SYNCJ8#SV	SYNCJ7#SV	SYNCJ6#SV	SYNCJ5#SV	SYNCJ4#SV	SYNCJ3#SV	SYNCJ2#SV	SYNCJ1#SV
Gn141								
Gn142	EBUFA#PX	ECLRA#PX	ESTPA#PX	ESOFA#PX	ESBKA#PX	EMBUFA#PX	ELCKZA#PX	EFINA#PX
Gn143	EMSBKA#PX	EC6A#PX	EC5A#PX	EC4A#PX	EC3A#PX	EC2A#PX	EC1A#PX	EC0A#PX

Address	Bit number 7	6	5	4	3	2	1	0
Gn144	EIF7A#PX	EIF6A#PX	EIF5A#PX	EIF4A#PX	EIF3A#PX	EIF2A#PX	EIF1A#PX	EIF0A#PX
Gn145	EIF15A#PX	EIF14A#PX	EIF13A#PX	EIF12A#PX	EIF11A#PX	EIF10A#PX	EIF9A#PX	EIF8A#PX
Gn146	EID7A#PX	EID6A#PX	EID5A#PX	EID4A#PX	EID3A#PX	EID2A#PX	EID1A#PX	EID0A#PX
Gn147	EID15A#PX	EID14A#PX	EID13A#PX	EID12A#PX	EID11A#PX	EID10A#PX	EID9A#PX	EID8A#PX
Gn148	EID23A#PX	EID22A#PX	EID21A#PX	EID20A#PX	EID19A#PX	EID18A#PX	EID17A#PX	EID16A#PX
Gn149	EID31A#PX	EID30A#PX	EID29A#PX	EID28A#PX	EID27A#PX	EID26A#PX	EID25A#PX	EID24A#PX
Gn150	EDRN#P	ERT#P	EOVC#P				EROV2#P	EROV1#P
Gn151	*EFOV7#P *EROV7#P	*EFOV6#P *EROV6#P	*EFOV5#P *EROV5#P	*EFOV4#P *EROV4#P	*EFOV3#P *EROV3#P	*EFOV2#P *EROV2#P	*EFOV1#P *EROV1#P	*EFOV0#P *EROV0#P
Gn152								
Gn153								
Gn154	EBUFB#PX	ECLRB#PX	ESTPB#PX	ESOFB#PX	ESBKB#PX	EMBUFB#PX	ELCKZB#PX	EFINB#PX
Gn155	EMSBKB#PX	EC6B#PX	EC5B#PX	EC4B#PX	EC3B#PX	EC2B#PX	EC1B#PX	EC0B#PX
Gn156	EIF7B#PX	EIF6B#PX	EIF5B#PX	EIF4B#PX	EIF3B#PX	EIF2B#PX	EIF1B#PX	EIF0B#PX
Gn157	EIF15B#PX	EIF14B#PX	EIF13B#PX	EIF12B#PX	EIF11B#PX	EIF10B#PX	EIF9B#PX	EIF8B#PX
Gn158	EID7B#PX	EID6B#PX	EID5B#PX	EID4B#PX	EID3B#PX	EID2B#PX	EID1B#PX	EID0B#PX
Gn159	EID15B#PX	EID14B#PX	EID13B#PX	EID12B#PX	EID11B#PX	EID10B#PX	EID9B#PX	EID8B#PX
Gn160	EID23B#PX	EID22B#PX	EID21B#PX	EID20B#PX	EID19B#PX	EID18B#PX	EID17B#PX	EID16B#PX
Gn161	EID31B#PX	EID30B#PX	EID29B#PX	EID28B#PX	EID27B#PX	EID26B#PX	EID25B#PX	EID24B#PX
Gn162			EOVCB#PX					
Gn163	*EFOV7B#PX *EROV7B#PX	*EFOV6B#PX *EROV6B#PX	*EFOV5B#PX *EROV5B#PX	*EFOV4B#PX *EROV4B#PX	*EFOV3B#PX *EROV3B#PX	*EFOV2B#PX *EROV2B#PX	*EFOV1B#PX *EROV1B#PX	*EFOV0B#PX *EROV0B#PX
Gn164								
Gn165								
Gn166	EBUFC#PX	ECLRC#PX	ESTPC#PX	ESOFC#PX	ESBKC#PX	EMBUFC#PX	ELCKZC#PX	EFINC#PX
Gn167	EMSBKC#PX	EC6C#PX	EC5C#PX	EC4C#PX	EC3C#PX	EC2C#PX	EC1C#PX	EC0C#PX
Gn168	EIF7C#PX	EIF6C#PX	EIF5C#PX	EIF4C#PX	EIF3C#PX	EIF2C#PX	EIF1C#PX	EIF0C#PX
Gn169	EIF15C#PX	EIF14C#PX	EIF13C#PX	EIF12C#PX	EIF11C#PX	EIF10C#PX	EIF9C#PX	EIF8C#PX
Gn170	EID7C#PX	EID6C#PX	EID5C#PX	EID4C#PX	EID3C#PX	EID2C#PX	EID1C#PX	EID0C#PX
Gn171	EID15C#PX	EID14C#PX	EID13C#PX	EID12C#PX	EID11C#PX	EID10C#PX	EID9C#PX	EID8C#PX
Gn172	EID23C#PX	EID22C#PX	EID21C#PX	EID20C#PX	EID19C#PX	EID18C#PX	EID17C#PX	EID16C#PX
Gn173	EID31C#PX	EID30C#PX	EID29C#PX	EID28C#PX	EID27C#PX	EID26C#PX	EID25C#PX	EID24C#PX

Address	Bit number 7	6	5	4	3	2	1	0
Gn174			EOVCC#PX					
Gn175	*EFOV7C#PX *EROV7C#PX	*EFOV6C#PX *EROV6C#PX	*EFOV5C#PX *EROV5C#PX	*EFOV4C#PX *EROV4C#PX	*EFOV3C#PX *EROV3C#PX	*EFOV2C#PX *EROV2C#PX	*EFOV1C#PX *EROV1C#PX	*EFOV0C#PX *EROV0C#PX
Gn176								
Gn177								
Gn178	EBUFD#PX	ECLRD#PX	ESTPD#PX	ESOFD#PX	ESBKD#PX	EMBUFD#PX	ELCKZD#PX	EFIND#PX
Gn179	EMSBKD#PX	EC6D#PX	EC5D#PX	EC4D#PX	EC3D#PX	EC2D#PX	EC1D#PX	EC0D#PX
Gn180	EIF7D#PX	EIF6D#PX	EIF5D#PX	EIF4D#PX	EIF3D#PX	EIF2D#PX	EIF1D#PX	EIF0D#PX
Gn181	EIF15D#PX	EIF14D#PX	EIF13D#PX	EIF12D#PX	EIF11D#PX	EIF10D#PX	EIF9D#PX	EIF8D#PX
Gn182	EID7D#PX	EID6D#PX	EID5D#PX	EID4D#PX	EID3D#PX	EID2D#PX	EID1D#PX	EID0D#PX
Gn183	EID15D#PX	EID14D#PX	EID13D#PX	EID12D#PX	EID11D#PX	EID10D#PX	EID9D#PX	EID8D#PX
Gn184	EID23D#PX	EID22D#PX	EID21D#PX	EID20D#PX	EID19D#PX	EID18D#PX	EID17D#PX	EID16D#PX
Gn185	EID31D#PX	EID30D#PX	EID29D#PX	EID28D#PX	EID27D#PX	EID26D#PX	EID25D#PX	EID24D#PX
Gn186			EOVCD#PX					
Gn187	*EFOV7D#PX *EROV7D#PX	*EFOV6D#PX *EROV6D#PX	*EFOV5D#PX *EROV5D#PX	*EFOV4D#PX *EROV4D#PX	*EFOV3D#PX *EROV3D#PX	*EFOV2D#PX *EROV2D#PX	*EFOV1D#PX *EROV1D#PX	*EFOV0D#PX *EROV0D#PX
Gn188								
Gn189								
Gn190	OVLS8#SV	OVLS7#SV	OVLS6#SV	OVLS5#SV	OVLS4#SV	OVLS3#SV	OVLS2#SV	OVLS1#SV
Gn191								
Gn192	IGVRY8#SV	IGVRY7#SV	IGVRY6#SV	IGVRY5#SV	IGVRY4#SV	IGVRY3#SV	IGVRY2#SV	IGVRY1#SV
Gn193					HDSR#P			
Gn194								
Gn195								
Gn196	*DEC8#SV	*DEC7#SV	*DEC6#SV	*DEC5#SV	*DEC4#SV	*DEC3#SV	*DEC2#SV	*DEC1#SV
Gn197					MTD#P	MTC#P	MTB#P	MTA#P
Gn198	NPOS8#SV	NPOS7#SV	NPOS6#SV	NPOS5#SV	NPOS4#SV	NPOS3#SV	NPOS2#SV	NPOS1#SV
Gn199							IOLBH2	IOLBH1
Gn200								
Gn201								
Gn202	NDCAL8#SV	NDCAL7#SV	NDCAL6#SV	NDCAL5#SV	NDCAL4#SV	NDCAL3#SV	NDCAL2#SV	NDCAL1#SV
Gn203	PWFL				ESTPR#P			

Address	Bit number 7	6	5	4	3	2	1	0
Gn204	MRDYC#SP	ORCMC#SP	SFRC#SP	SRVC#SP	CTH1C#SP	CTH2C#SP	TLMHC#SP	TLMLC#SP
Gn205	RCHC#SP	RSLC#SP	INTGC#SP	SOCNC#SP	MCFNC#SP	SPSLC#SP	*ESPC#SP	ARSTC#SP
Gn206	RCHHGC#SP	MFNHGC#SP	INCMDC#SP	OVRIDC#SP	DEFMDC#SP	NRROC#SP	ROTAC#SP	INDXC#SP
Gn207						MPOFC#SP	SLVC#SP	MORCMC#SP
Gn208	SH07C#SP	SH06C#SP	SH05C#SP	SH04C#SP	SH03C#SP	SH02C#SP	SH01C#SP	SH00C#SP
Gn209		SH14C#SP	SH13C#SP	SH12C#SP	SH11C#SP	SH10C#SP	SH09C#SP	SH08C#SP
Gn210	ED23#P	ED22#P	ED21#P	ED20#P	ED19#P	ED18#P	ED17#P	ED16#P
Gn211	ED31#P	ED30#P	ED29#P	ED28#P	ED27#P	ED26#P	ED25#P	ED24#P
Gn212								
Gn213								
Gn214								
Gn215								
Gn216								
Gn217								
Gn218								
Gn220								
Gn251						LCB2	LCBS	
Gn263								
Gn264					ESSYC4#SP	ESSYC3#SP	ESSYC2#SP	ESSYC1#SP
Gn265					PKESE4#SP	PKESE3#SP	PKESE2#SP	PKESE1#SP
Gn266	MRDYD#SP	ORCMD#SP	SFRD#SP	SRVD#SP	CTH1D#SP	CTH2D#SP	TLMHD#SP	TLMLD#SP
Gn267	RCHD#SP	RSLD#SP	INTGD#SP	SOCND#SP	MCFND#SP	SPSLD#SP	*ESPD#SP	ARSTD#SP
Gn268	RCHHGD#SP	MFNHGD#SP	INCMDD#SP	OVRIDD#SP	DEFMDD#SP	NRROD#SP	ROTAD#SP	INDXD#SP
Gn269						MPOFD#SP	SLVD#SP	MORCMD#SP
Gn270	SH07D#SP	SH06D#SP	SH05D#SP	SH04D#SP	SH03D#SP	SH02D#SP	SH01D#SP	SH00D#SP
Gn271		SH14D#SP	SH13D#SP	SH12D#SP	SH11D#SP	SH10D#SP	SH09D#SP	SH08D#SP
Gn272	R08I4#SP	R07I4#SP	R06I4#SP	R05I4#SP	R04I4#SP	R03I4#SP	R02I4#SP	R01I4#SP
Gn273	SIND4#SP	SSIN4#SP	SGN4#SP		R12I4#SP	R11I4#SP	R10I4#SP	R09I4#SP
Gn274	CSFI4#SP	CSFI3#SP	CSFI2#SP	CSFI1#SP	CONS4#SP	CONS3#SP	CONS2#SP	CONS1#SP
Gn275								

Address	7	6	5	4	3	2	1	0
Gn276	UI107#P	UI106#P	UI105#P	UI104#P	UI103#P	UI102#P	UI101#P	UI100#P
Gn277	UI115#P	UI114#P	UI113#P	UI112#P	UI111#P	UI110#P	UI109#P	UI108#P
Gn278	UI123#P	UI122#P	UI121#P	UI120#P	UI119#P	UI118#P	UI117#P	UI116#P
Gn279	UI131#P	UI130#P	UI129#P	UI128#P	UI127#P	UI126#P	UI125#P	UI124#P
Gn280	UI207#P	UI206#P	UI205#P	UI204#P	UI203#P	UI202#P	UI201#P	UI200#P
Gn281	UI215#P	UI214#P	UI213#P	UI212#P	UI211#P	UI210#P	UI209#P	UI208#P
Gn282	UI223#P	UI222#P	UI221#P	UI220#P	UI219#P	UI218#P	UI217#P	UI216#P
Gn283	UI231#P	UI230#P	UI229#P	UI228#P	UI227#P	UI226#P	UI225#P	UI224#P
Gn284	UI307#P	UI306#P	UI305#P	UI304#P	UI303#P	UI302#P	UI301#P	UI300#P
Gn285	UI315#P	UI314#P	UI313#P	UI312#P	UI311#P	UI310#P	UI309#P	UI308#P
Gn286	UI323#P	UI322#P	UI321#P	UI320#P	UI319#P	UI318#P	UI317#P	UI316#P
Gn287	UI331#P	UI330#P	UI329#P	UI328#P	UI327#P	UI326#P	UI325#P	UI324#P
Gn288					SPSYC4#SP	SPSYC3#SP	SPSYC2#SP	SPSYC1#SP
Gn289					SPPHS4#SP	SPPHS3#SP	SPPHS2#SP	SPPHS1#SP
Gn290			PGCK#P					
Gn291								
Gn292								
Gn293								
Gn294								
Gn295	CNCKY	C2SEND						
Gn296								
Gn297								
Gn298						RNDH#P		TB_BASE#P
Gn299								
Gn300								
Gn301								
Gn302								
Gn303								
Gn304								

Address	Bit number 7	6	5	4	3	2	1	0
Gn305								
Gn306								
Gn307				EXPFA				
Gn308								
Gn309								
Gn310								
Gn311				EXPFB				
Gn312								
Gn313								
Gn314								
Gn315				EXPFC				
Gn316								
Gn317								
Gn318								
Gn319				EXPFD				
Gn320								
Gn321								
Gn322								
Gn323								
Gn324								
Gn325								
Gn326								
Gn327								
Gn328	TLRSTI4$^{\#P}$	TLRSTI3$^{\#P}$	TLRSTI2$^{\#P}$	TLRSTI1$^{\#P}$	TLRST4$^{\#P}$	TLRST3$^{\#P}$	TLRST2$^{\#P}$	TLRST1$^{\#P}$
Gn329	TLNCT4$^{\#P}$	TLNCT3$^{\#P}$	TLNCT2$^{\#P}$	TLNCT1$^{\#P}$	TLSKP4$^{\#P}$	TLSKP3$^{\#P}$	TLSKP2$^{\#P}$	TLSKP1$^{\#P}$
Gn330			TKEY5$^{\#P}$	TKEY4$^{\#P}$	TKEY3$^{\#P}$	TKEY2$^{\#P}$	TKEY1$^{\#P}$	TKEY0$^{\#P}$
Gn331								
Gn332								
Gn333								
Gn334								

Address	Bit number 7	6	5	4	3	2	1	0
Gn335								
Gn336								
Gn337								
Gn338								
Gn339								
Gn340		SLRER$^{\#P}$	SLREF$^{\#P}$					
Gn341	*+ED48$^{\#SV}$	*+ED47$^{\#SV}$	*+ED46$^{\#SV}$	*+ED45$^{\#SV}$	*+ED44$^{\#SV}$	*+ED43$^{\#SV}$	*+ED42$^{\#SV}$	*+ED41$^{\#SV}$
Gn342	*-ED48$^{\#SV}$	*-ED47$^{\#SV}$	*-ED46$^{\#SV}$	*-ED45$^{\#SV}$	*-ED44$^{\#SV}$	*-ED43$^{\#SV}$	*-ED42$^{\#SV}$	*-ED41$^{\#SV}$
Gn343	*+ED58$^{\#SV}$	*+ED57$^{\#SV}$	*+ED56$^{\#SV}$	*+ED55$^{\#SV}$	*+ED54$^{\#SV}$	*+ED53$^{\#SV}$	*+ED52$^{\#SV}$	*+ED51$^{\#SV}$
Gn344	*-ED58$^{\#SV}$	*-ED57$^{\#SV}$	*-ED56$^{\#SV}$	*-ED55$^{\#SV}$	*-ED54$^{\#SV}$	*-ED53$^{\#SV}$	*-ED52$^{\#SV}$	*-ED51$^{\#SV}$
Gn345								
Gn346								
Gn347	NOT3DM$^{\#P}$						HDN$^{\#P}$	
Gn348								
Gn349								
Gn350								
Gn351					SSEGB4$^{\#SP}$	SSEGB3$^{\#SP}$	SSEGB2$^{\#SP}$	SSEGB1$^{\#SP}$
Gn352	*FHRO7$^{\#P}$	*FHRO6$^{\#P}$	*FHRO5$^{\#P}$	*FHRO4$^{\#P}$	*FHRO3$^{\#P}$	*FHRO2$^{\#P}$	*FHRO1$^{\#P}$	*FHRO0$^{\#P}$
Gn353	FHROV$^{\#P}$						*FHRO9$^{\#P}$	*FHRO8$^{\#P}$
Gn354								
Gn355								
Gn356								
Gn357								
Gn358	WPRST8$^{\#SV}$	WPRST7$^{\#SV}$	WPRST6$^{\#SV}$	WPRST5$^{\#SV}$	WPRST4$^{\#SV}$	WPRST3$^{\#SV}$	WPRST2$^{\#SV}$	WPRST1$^{\#SV}$
to								
Gn375								
Gn376	SOV27	SOV26	SOV25	SOV24	SOV23	SOV22	SOV21	SOV20
Gn377	SOV37	SOV36	SOV35	SOV34	SOV33	SOV32	SOV31	SOV30
Gn378	SOV47	SOV46	SOV45	SOV44	SOV43	SOV42	SOV41	SOV40
Gn379	HS5ID$^{\#P}$	HS5IC$^{\#P}$	HS5IB$^{\#P}$	HS5IA$^{\#P}$	HS5D$^{\#P}$	HS5C$^{\#P}$	HS5B$^{\#P}$	HS5A$^{\#P}$
Gn380							MP52$^{\#P}$	MP51$^{\#P}$

Address	Bit number 7	6	5	4	3	2	1	0
Gn381 to Gn395					AUTPHD#P	AUTPHC#P	AUTPHB#P	AUTPHA#P
Gn396								
Gn397								
Gn398								
Gn399								
Gn400					*SUCPFD#SP	*SUCPFC#SP	*SUCPFB#SP	
Gn401					*SCPFD#SP	*SCPFC#SP	*SCPFB#SP	
Gn402					SPSTPD#SP	SPSTPC#SP	SPSTPB#SP	
Gn403			SLPCD#P	SLPCC#P			SLSPD#P	SLSPC#P
Gn404								
Gn405								
Gn406					ITF04#P	ITF03#P	ITF02#P	ITF01#P
Gn407								
Gn408								STCHK#P
Gn409								
Gn410								
Gn411	HS4IE#P	HS3IE#P	HS2IE#P	HS1IE#P	HS4E#P	HS3E#S	HS2E#P	HS1E#P
Gn412				HS5IE				HS5E
Gn413								
Gn414								
Gn415								
Gn416								
Gn417								
Gn418								
Gn419								
Gn420								
Gn421								
Gn422								

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Address	Bit number 7	6	5	4	3	2	1	0
Gn423								
Gn424								
Gn425								
Gn426								
Gn427								
Gn428								
Gn429								
Gn430								
Gn431								
Gn432								
Gn433								
Gn434								
Gn435								
Gn436								
Gn437								
Gn438								
Gn439								
Gn440								
Gn441								
Gn442								
Gn443								
Gn444								
Gn445								
Gn446								
Gn447								
Gn448								
Gn449								
Gn450 to Gn512	MCST8#P	MCST7#P	MCST6#P	MCST5#P	MCST4#P	MCST3#P	MCST2#P	MCST1#P
Gn513	MCST16#P	MCST15#P	MCST14#P	MCST13#P	MCST12#P	MCST11#P	MCST10#P	MCST9#P

Address	7	6	5	4	3	2	1	0
Gn514								MCFIN$^{\#P}$
Gn515								
Gn516								
Gn517	SYPST$^{\#P}$						GAE2$^{\#P}$	GAE1$^{\#P}$
	SYPST$^{\#P}$					GAE3$^{\#P}$	GAE2$^{\#P}$	GAE1$^{\#P}$
Gn518				DNTCLR				
Gn519								
Gn520								
Gn521	SRVON8	SRVON7	SRVON6	SRVON5	SRVON4	SRVON3	SRVON2	SRVON1
Gn522								
Gn523	SVRVS8	SVRVS7	SVRVS6	SVRVS5	SVRVS4	SVRVS3	SVRVS2	SVRVS1
Gn524								
Gn525								
Gn526								
Gn527								
Gn528 to								
Gn530	EGBS8$^{\#SV}$	EGBS7$^{\#SV}$	EGBS6$^{\#SV}$	EGBS5$^{\#SV}$	EGBS4$^{\#SV}$	EGBS3$^{\#SV}$	EGBS2$^{\#SV}$	EGBS1$^{\#SV}$
Gn531	EXLM3$^{\#P}$	EXLM2$^{\#P}$		OVLN$^{\#P}$	HBTRN$^{\#P}$		MRVM$^{\#P}$	FWSTP$^{\#P}$
Gn532								
Gn533				SSRS	SSR4	SSR3	SSR2	SSR1
Gn534								
Gn535								
Gn536	SPSP$^{\#P}$		DASN	EXCST		RMVST		
Gn537 to								
Gn544				MHLC5$^{\#P}$	MHLC4$^{\#P}$	MHLC3$^{\#P}$	MHLC2$^{\#P}$	MHLC1$^{\#P}$
Gn545				MHUS5$^{\#P}$	MHUS4$^{\#P}$	MHUS3$^{\#P}$	MHUS2$^{\#P}$	MHUS1$^{\#P}$
Gn546								
Gn547		ONSC$^{\#P}$						
					OFNC9$^{\#P}$	OFNC8$^{\#P}$	OFNC7$^{\#P}$	OFNC6$^{\#P}$
Gn548	*CL8$^{\#SV}$	*CL7$^{\#SV}$	*CL6$^{\#SV}$	*CL5$^{\#SV}$	*CL4$^{\#SV}$	*CL3$^{\#SV}$	*CL2$^{\#SV}$	*CL1$^{\#SV}$

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Address	7	6	5	4	3	2	1	0
Gn549 to Gn570			RMTC#P	GTMSR#P				
Gn571								
Gn572								
Gn573								
Gn574								
Gn575								
Gn576								
Gn577								
Gn578								
Gn579		NHSW	WBEND					
Gn580	*ACTF8#SV	*ACTF7#SV	*ACTF6#SV	*ACTF5#SV	*ACTF4#SV	*ACTF3#SV	*ACTF2#SV	*ACTF1#SV
Gn581 to	SLANG	LANG7	LANG6	LANG5	LANG4	LANG3	LANG2	LANG1
Gn587	SPAPH4	SPAPH3	SPAPH2	SPAPH1	SPMST4	SPMST3	SPMST2	SPMST1
Gn588	SMSL24	SMSL23	SMSL22	SMSL21	SMSL14	SMSL13	SMSL12	SMSL11
Gn589 to Gn594								
Gn595								
Gn596								
Gn597								
Gn598								
Gn599 to								
Gn680 to	EXPF8	EXPF7	EXPF6	EXPF5	EXPF4	EXPF3	EXPF2	EXPF1
Gn708	RE08I#SP	RE07I#SP	RE06I#SP	RE05I#SP	RE04I#SP	RE03I#SP	RE02I#SP	RE01I#SP
Gn709	RE16I#SP	RE15I#SP	RE14I#SP	RE13I#SP	RE12I#SP	RE11I#SP	RE10I#SP	RE09I#SP
Gn710	RE24I#SP	RE23I#SP	RE22I#SP	RE21I#SP	RE20I#SP	RE19I#SP	RE18I#SP	RE17I#SP
Gn711	RE32I#SP	RE31I#SP	RE30I#SP	RE29I#SP	RE28I#SP	RE27I#SP	RE26I#SP	RE25I#SP
Gn712	RE08I2#SP	RE07I2#SP	RE06I2#SP	RE05I2#SP	RE04I2#SP	RE03I2#SP	RE02I2#SP	RE01I2#SP
Gn713	RE16I2#SP	RE15I2#SP	RE14I2#SP	RE13I2#SP	RE12I2#SP	RE11I2#SP	RE10I2#SP	RE09I2#SP
Gn714	RE24I2#SP	RE23I2#SP	RE22I2#SP	RE21I2#SP	RE20I2#SP	RE19I2#SP	RE18I2#SP	RE17I2#SP

Address	7	6	5	4	3	2	1	0
Gn715	RE32I2#SP	RE31I2#SP	RE30I2#SP	RE29I2#SP	RE28I2#SP	RE27I2#SP	RE26I2#SP	RE25I2#SP
Gn716	RE08I3#SP	RE07I3#SP	RE06I3#SP	RE05I3#SP	RE04I3#SP	RE03I3#SP	RE02I3#SP	RE01I3#SP
Gn717	RE16I3#SP	RE15I3#SP	RE14I3#SP	RE13I3#SP	RE12I3#SP	RE11I3#SP	RE10I3#SP	RE09I3#SP
Gn718	RE24I3#SP	RE23I3#SP	RE22I3#SP	RE21I3#SP	RE20I3#SP	RE19I3#SP	RE18I3#SP	RE17I3#SP
Gn719	RE32I3#SP	RE31I3#SP	RE30I3#SP	RE29I3#SP	RE28I3#SP	RE27I3#SP	RE26I3#SP	RE25I3#SP
Gn720	RE08I4#SP	RE07I4#SP	RE06I4#SP	RE05I4#SP	RE04I4#SP	RE03I4#SP	RE02I4#SP	RE01I4#SP
Gn721	RE16I4#SP	RE15I4#SP	RE14I4#SP	RE13I4#SP	RE12I4#SP	RE11I4#SP	RE10I4#SP	RE09I4#SP
Gn722	RE24I4#SP	RE23I4#SP	RE22I4#SP	RE21I4#SP	RE20I4#SP	RE19I4#SP	RE18I4#SP	RE17I4#SP
Gn723	RE32I4#SP	RE31I4#SP	RE30I4#SP	RE29I4#SP	RE28I4#SP	RE27I4#SP	RE26I4#SP	RE25I4#SP
to Gn765	TPMG07	TPMG06	TPMG05	TPMG04	TPMG03	TPMG02	TPMG01	TPMG00
Gn766								
Gn767								

CNC → PMC

Address	7	6	5	4	3	2	1	0
Fn000	OP#P	SA#P	STL#P	SPL#P				RWD#P
Fn001	MA#P		TAP#P	ENB#SP	DEN#P	BAL#P	RST#P	AL#P
Fn002	MDRN#P	CUT#P		SRNMV#P	THRD#P	CSS#P	RPDO#P	INCH#P
Fn003		MEDT#P	MMEM#P	MRMT#P	MMDI#P	MJ#P	MH#P	MINC#P
Fn004			MREF#P	MAFL#P	MSBK#P	MABS#P	MMLK#P	MBDT1#P
Fn005	MBDT9#P	MBDT8#P	MBDT7#P	MBDT6#P	MBDT5#P	MBDT4#P	MBDT3#P	MBDT2#P
Fn006						ERTVA#P	MDIRST#P	TPPRS
Fn007	BF#P				TF#P	SF#P		MF#P
Fn008	MF5#P	MF4#P	MF3#P	MF2#P				
Fn009	DM00#P	DM01#P	DM02#P	DM30#P				
Fn010	M07#P	M06#P	M05#P	M04#P	M03#P	M02#P	M01#P	M00#P
Fn011	M15#P	M14#P	M13#P	M12#P	M11#P	M10#P	M09#P	M08#P
Fn012	M23#P	M22#P	M21#P	M20#P	M19#P	M18#P	M17#P	M16#P
Fn013	M31#P	M30#P	M29#P	M28#P	M27#P	M26#P	M25#P	M24#P
Fn014	M207#P	M206#P	M205#P	M204#P	M203#P	M202#P	M201#P	M200#P
Fn015	M215#P	M214#P	M213#P	M212#P	M211#P	M210#P	M209#P	M208#P
Fn016	M307#P	M306#P	M305#P	M304#P	M303#P	M302#P	M301#P	M300#P
	M223#P	M222#P	M221#P	M220#P	M219#P	M218#P	M217#P	M216#P
Fn017	M315#P	M314#P	M313#P	M312#P	M311#P	M310#P	M309#P	M308#P
	M231#P	M230#P	M229#P	M228#P	M227#P	M226#P	M225#P	M224#P
Fn018								
Fn019								
Fn020								
Fn021								
Fn022	S07#P	S06#P	S05#P	S04#P	S03#P	S02#P	S01#P	S00#P
Fn023	S15#P	S14#P	S13#P	S12#P	S11#P	S10#P	S09#P	S08#P
Fn024	S23#P	S22#P	S21#P	S20#P	S19#P	S18#P	S17#P	S16#P
Fn025	S31#P	S30#P	S29#P	S28#P	S27#P	S26#P	S25#P	S24#P
Fn026	T07#P	T06#P	T05#P	T04#P	T03#P	T02#P	T01#P	T00#P
Fn027	T15#P	T14#P	T13#P	T12#P	T11#P	T10#P	T09#P	T08#P

Address	Bit 7	6	5	4	3	2	1	0
Fn028	T23#P	T22#P	T21#P	T20#P	T19#P	T18#P	T17#P	T16#P
Fn029	T31#P	T30#P	T29#P	T28#P	T27#P	T26#P	T25#P	T24#P
Fn030	B07#P	B06#P	B05#P	B04#P	B03#P	B02#P	B01#P	B00#P
Fn031	B15#P	B14#P	B13#P	B12#P	B11#P	B10#P	B09#P	B08#P
Fn032	B23#P	B22#P	B21#P	B20#P	B19#P	B18#P	B17#P	B16#P
Fn033	B31#P	B30#P	B29#P	B28#P	B27#P	B26#P	B25#P	B24#P
Fn034	SRSRDY#P	SRSP1R#SP	SRSP2R#SP	SRSP3R#SP	SRSP4R#SP	GR3O#P	GR2O#P	GR1O#P
Fn035								SPAL#P
Fn036	R08O#SP	R07O#SP	R06O#SP	R05O#SP	R04O#SP	R03O#SP	R02O#SP	R01O#SP
Fn037					R12O#SP	R11O#SP	R10O#SP	R09O#SP
Fn038					ENB3#SP	ENB2#SP	SUCLPA#SP	SCLPA#SP
Fn039							ENB4#SP	MSPOSA#SP
Fn040	AR07#SP	AR06#SP	AR05#SP	AR04#SP	AR03#SP	AR02#SP	AR01#SP	AR00#SP
Fn041	AR15#SP	AR14#SP	AR13#SP	AR12#SP	AR11#SP	AR10#SP	AR09#SP	AR08#SP
Fn042								
Fn043					SYCAL4#SP	SYCAL3#SP	SYCAL2#SP	SYCAL1#SP
Fn044				SYCAL#P	FSPPH#P	FSPSYC#P	FSCSL#P	
Fn045	ORARA#SP	TLMA#SP	LDT2A#SP	LDT1A#SP	SARA#SP	SDTA#SP	SSTA#SP	ALMA#SP
Fn046	MORA2A#SP	MORA1A#SP	PORA2A#SP	SLVSA#SP	RCFNA#SP	RCHPA#SP	CFINA#SP	CHIPA#SP
Fn047							INCSTA#SP	PC1DEA#SP
Fn048				CSPENA#SP				
Fn049	ORARB#SP	TLMB#SP	LDT2B#SP	LDT1B#SP	SARB#SP	SDTB#SP	SSTB#SP	ALMB#SP
Fn050	MORA2B#SP	MORA1B#SP	PORA2B#SP	SLVSB#SP	RCFNB#SP	RCHPB#SP	CFINB#SP	CHIPB#SP
Fn051							INCSTB#SP	PC1DEB#SP
Fn052				CSPENB#SP				
Fn053	EKENB			BGEACT#P	IOALM#P	IOBSY#P	PRGDPL	INHKY
Fn054	UO007#P	UO006#P	UO005#P	UO004#P	UO003#P	UO002#P	UO001#P	UO000#P
Fn055	UO015#P	UO014#P	UO013#P	UO012#P	UO011#P	UO010#P	UO009#P	UO008#P
Fn056	UO107#P	UO106#P	UO105#P	UO104#P	UO103#P	UO102#P	UO101#P	UO100#P

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Address	7	6	5	4	3	2	1	0
Fn057	UO115#P	UO114#P	UO113#P	UO112#P	UO111#P	UO110#P	UO109#P	UO108#P
Fn058	UO123#P	UO122#P	UO121#P	UO120#P	UO119#P	UO118#P	UO117#P	UO116#P
Fn059	UO131#P	UO130#P	UO129#P	UO128#P	UO127#P	UO126#P	UO125#P	UO124#P
Fn060						ESCAN#P	ESEND#P	EREND#P
Fn061					HCEXE	HCAB2	*BCLP#P	*BUCLP#P
Fn062	PRTSF#P	D3ROT#P		S2MES#P	S1MES#P	HSRA#P		AICC#P
Fn063	PSYN#P	WATO#P		COSP2#P	COSP1#P	PSAR#P	PSE2#P	PSE1#P
Fn064	TIALM#P	TICHK#P	COSP#P		TLCHB#P	TLCHI#P	TLNW#P	TLCH#P
Fn065		SYNMOD#P		RTRCTF#P		RSMAX#P	RGSPM#P	RGSPP#P
Fn066			PECK2#P			FEED0#P	RTPT#P	
Fn067								
Fn068								
Fn069								
Fn070	PSW08#P	PSW07#P	PSW06#P	PSW05#P	PSW04#P	PSW03#P	PSW02#P	PSW01#P
Fn071	PSW16#P	PSW15#P	PSW14#P	PSW13#P	PSW12#P	PSW11#P	PSW10#P	PSW09#P
Fn072	OUT7#P	OUT6#P	OUT5#P	OUT4#P	OUT3#P	OUT2#P	OUT1#P	OUT0#P
Fn073				ZRNO#P		MD4O#P	MD2O#P	MD1O#P
Fn074	OUT15#P	OUT14#P	OUT13#P	OUT12#P	OUT11#P	OUT10#P	OUT9#P	OUT8#P
Fn075	SPO#P	KEYO	DRNO#P	MLKO#P	SBKO#P	BDTO#P		
Fn076			ROV2O#P	ROV1O#P	RTAP#P		MP2O#P	MP1O#P
Fn077		RTO#P			HS1DO#P	HS1CO#P	HS1BO#P	HS1AO#P
Fn078	*FV7O#P	*FV6O#P	*FV5O#P	*FV4O#P	*FV3O#P	*FV2O#P	*FV1O#P	*FV0O#P
Fn079	*JV7O#P	*JV6O#P	*JV5O#P	*JV4O#P	*JV3O#P	*JV2O#P	*JV1O#P	*JV0O#P
Fn080	*JV15O#P	*JV14O#P	*JV13O#P	*JV12O#P	*JV11O#P	*JV10O#P	*JV9O#P	*JV8O#P
Fn081	-J4O#P	+J4O#P	-J3O#P	+J3O#P	-J2O#P	+J2O#P	-J1O#P	+J1O#P
Fn082		EGBSM#P				RVSL#P		
Fn083								

Address	Bit number 7	6	5	4	3	2	1	0
Fn084	EUO07#P	EUO06#P	EUO05#P	EUO04#P	EUO03#P	EUO02#P	EUO01#P	EUO00#P
Fn085	EUO15#P	EUO14#P	EUO13#P	EUO12#P	EUO11#P	EUO10#P	EUO09#P	EUO08#P
Fn086								
Fn087								
Fn088								
Fn089								
Fn090	SVSPM#P	SVAR#P	SYSSM#P	SYAR#P	ABTSP3#SP	ABTSP2#SP	ABTSP1#SP	ABTQSV#P
Fn091			ADCO#P	ABTSP4#SP	MMMOD#P	MRVSP#P	MNCHG#P	MRVMD#P
Fn092			TRSPS#P	TRMTN#P	TRACT#P			
Fn093	SVWRN4#P	SVWRN3#P	SVWRN2#P	SVWRN1#P	WFAN#P	LFCIF#P	SFAN#P	LIFOVR#P
Fn094	ZP8#SV	ZP7#SV	ZP6#SV	ZP5#SV	ZP4#SV	ZP3#SV	ZP2#SV	ZP1#SV
Fn095								
Fn096	ZP28#SV	ZP27#SV	ZP26#SV	ZP25#SV	ZP24#SV	ZP23#SV	ZP22#SV	ZP21#SV
Fn097								
Fn098	ZP38#SV	ZP37#SV	ZP36#SV	ZP35#SV	ZP34#SV	ZP33#SV	ZP32#SV	ZP31#SV
Fn099								
Fn100	ZP48#SV	ZP47#SV	ZP46#SV	ZP45#SV	ZP44#SV	ZP43#SV	ZP42#SV	ZP41#SV
Fn101								
Fn102	MV8#SV	MV7#SV	MV6#SV	MV5#SV	MV4#SV	MV3#SV	MV2#SV	MV1#SV
Fn103								
Fn104	INP8#SV	INP7#SV	INP6#SV	INP5#SV	INP4#SV	INP3#SV	INP2#SV	INP1#SV
Fn105								
Fn106	MVD8#SV	MVD7#SV	MVD6#SV	MVD5#SV	MVD4#SV	MVD3#SV	MVD2#SV	MVD1#SV
Fn107								
Fn108	MMI8#SV	MMI7#SV	MMI6#SV	MMI5#SV	MMI4#SV	MMI3#SV	MMI2#SV	MMI1#SV
Fn109								
Fn110	MDTCH8#SV	MDTCH7#SV	MDTCH6#SV	MDTCH5#SV	MDTCH4#SV	MDTCH3#SV	MDTCH2#SV	MDTCH1#SV
Fn111								
Fn112	EADEN8#SV	EADEN7#SV	EADEN6#SV	EADEN5#SV	EADEN4#SV	EADEN3#SV	EADEN2#SV	EADEN1#SV

Address	Bit number 7	6	5	4	3	2	1	0
Fn113								
Fn114	TRQL8#SV	TRQL7#SV	TRQL6#SV	TRQL5#SV	TRQL4#SV	TRQL3#SV	TRQL2#SV	TRQL1#SV
Fn115								
Fn116								
Fn117								
Fn118	SYN8O#SV	SYN7O#SV	SYN6O#SV	SYN5O#SV	SYN4O#SV	SYN3O#SV	SYN2O#SV	SYN1O#SV
Fn119								
Fn120	ZRF8#SV	ZRF7#SV	ZRF6#SV	ZRF5#SV	ZRF4#SV	ZRF3#SV	ZRF2#SV	ZRF1#SV
Fn121								
Fn122					HDO3#P	HDO2#P	HDO1#P	HDO0#P
Fn123								
Fn124	+OT8#SV	+OT7#SV	+OT6#SV	+OT5#SV	+OT4#SV	+OT3#SV	+OT2#SV	+OT1#SV
Fn125								
Fn126	-OT8#SV	-OT7#SV	-OT6#SV	-OT5#SV	-OT4#SV	-OT3#SV	-OT2#SV	-OT1#SV
Fn127								
Fn128								
Fn129	*EAXSL#P		EOV0#P					
Fn130	EBSYA#PX	EOTNA#PX	EOTPA#PX	EGENA#PX	EDENA#PX	EIALA#PX	ECKZA#PX	EINPA#PX
Fn131					EMF3A#PX	EMF2A#PX	EABUFA#PX	EMFA#PX
Fn132	EM28A#PX	EM24A#PX	EM22A#PX	EM21A#PX	EM18A#PX	EM14A#PX	EM12A#PX	EM11A#PX
Fn133	EBSYB#PX	EOTNB#PX	EOTPB#PX	EGENB#PX	EDENB#PX	EIALB#PX	ECKZB#PX	EINPB#PX
Fn134					EMF3B#PX	EMF2B#PX	EABUFB#PX	EMFB#PX
Fn135	EM28B#PX	EM24B#PX	EM22B#PX	EM21B#PX	EM18B#PX	EM14B#PX	EM12B#PX	EM11B#PX
Fn136	EBSYC#PX	EOTNC#PX	EOTPC#PX	EGENC#PX	EDENC#PX	EIALC#PX	ECKZC#PX	EINPC#PX
Fn137					EMF3C#PX	EMF2C#PX	EABUFC#PX	EMFC#PX
Fn138	EM28C#PX	EM24C#PX	EM22C#PX	EM21C#PX	EM18C#PX	EM14C#PX	EM12C#PX	EM11C#PX
Fn139	EBSYD#PX	EOTND#PX	EOTPD#PX	EGEND#PX	EDEND#PX	EIALD#PX	ECKZD#PX	EINPD#PX
Fn140					EMF3D#PX	EMF2D#PX	EABUFD#PX	EMFD#PX
Fn141	EM28D#PX	EM24D#PX	EM22D#PX	EM21D#PX	EM18D#PX	EM14D#PX	EM12D#PX	EM11D#PX
Fn142	EM48A#PX	EM44A#PX	EM42A#PX	EM41A#PX	EM38A#PX	EM34A#PX	EM32A#PX	EM31A#PX

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fn143								
Fn144								
Fn145	EM48B#PX	EM44B#PX	EM42B#PX	EM41B#PX	EM38B#PX	EM34B#PX	EM32B#PX	EM31B#PX
Fn146								
Fn147								
Fn148	EM48C#PX	EM44C#PX	EM42C#PX	EM41C#PX	EM38C#PX	EM34C#PX	EM32C#PX	EM31C#PX
Fn149								
Fn150								
Fn151	EM48D#PX	EM44D#PX	EM42D#PX	EM41D#PX	EM38D#PX	EM34D#PX	EM32D#PX	EM31D#PX
Fn152								
Fn153								
Fn154								TLAL#P
Fn155								
Fn156								
Fn157								
Fn158								
Fn159								
Fn160	MSP07#P	MSP06#P	MSP05#P	MSP04#P	MSP03#P	MSP02#P	MSP01#P	MSP00#P
Fn161	MSP15#P	MSP14#P	MSP13#P	MSP12#P	MSP11#P	MSP10#P	MSP09#P	MSP08#P
Fn162								
Fn163								
Fn164								
Fn165								
Fn166								
Fn167								
Fn168	ORARC#SP	TLMC#SP	LDT2C#SP	LDT1C#SP	SARC#SP	SDTC#SP	SSTC#SP	ALMC#SP
Fn169	MORA2C#SP	MORA1C#SP	PORA2C#SP	SLVSC#SP	RCFNC#SP	RCHPC#SP	CFINC#SP	CHIPC#SP
Fn170	CSYFNC#SP	CS1DTC#SP					INCSTC#SP	PC1DEC#SP
Fn171				CSPENC#SP				

Address	Bit number 7	6	5	4	3	2	1	0
Fn172	PBATL#P	PBATZ#P						
Fn173								
Fn174								
Fn175								
Fn176								
Fn177								
Fn178								
Fn179								
Fn180	CLRCH8#SV	CLRCH7#SV	CLRCH6#SV	CLRCH5#SV	CLRCH4#SV	CLRCH3#SV	CLRCH2#SV	CLRCH1#SV
Fn181								
Fn182	EACNT8#SV	EACNT7#SV	EACNT6#SV	EACNT5#SV	EACNT4#SV	EACNT3#SV	EACNT2#SV	EACNT1#SV
Fn183								
Fn184	ABDT8#SV	ABDT7#SV	ABDT6#SV	ABDT5#SV	ABDT4#SV	ABDT3#SV	ABDT2#SV	ABDT1#SV
Fn185								
Fn186								
Fn187								
Fn188								
Fn189								
Fn190	TRQM8#SV	TRQM7#SV	TRQM6#SV	TRQM5#SV	TRQM4#SV	TRQM3#SV	TRQM2#SV	TRQM1#SV
Fn191								
Fn192								
Fn193								
Fn194								
Fn195								
Fn196								
Fn197					MFSYND#P	MFSYNC#P	MFSYNB#P	MFSYNA#P
Fn198								
Fn199								
Fn200	R08O2#SP	R07O2#SP	R06O2#SP	R05O2#SP	R04O2#SP	R03O2#SP	R02O2#SP	R01O2#SP
Fn201					R12O2#SP	R11O2#SP	R10O2#SP	R09O2#SP

Address	Bit number 7	6	5	4	3	2	1	0
Fn202	AR072$^{\#SP}$	AR062$^{\#SP}$	AR052$^{\#SP}$	AR042$^{\#SP}$	AR032$^{\#SP}$	AR022$^{\#SP}$	AR012$^{\#SP}$	AR002$^{\#SP}$
Fn203	AR152$^{\#SP}$	AR142$^{\#SP}$	AR132$^{\#SP}$	AR122$^{\#SP}$	AR112$^{\#SP}$	AR102$^{\#SP}$	AR092$^{\#SP}$	AR082$^{\#SP}$
Fn204	R08O3$^{\#SP}$	R07O3$^{\#SP}$	R06O3$^{\#SP}$	R05O3$^{\#SP}$	R04O3$^{\#SP}$	R03O3$^{\#SP}$	R02O3$^{\#SP}$	R01O3$^{\#SP}$
Fn205					R12O3$^{\#SP}$	R11O3$^{\#SP}$	R10O3$^{\#SP}$	R09O3$^{\#SP}$
Fn206	AR073$^{\#SP}$	AR063$^{\#SP}$	AR053$^{\#SP}$	AR043$^{\#SP}$	AR033$^{\#SP}$	AR023$^{\#SP}$	AR013$^{\#SP}$	AR003$^{\#SP}$
Fn207	AR153$^{\#SP}$	AR143$^{\#SP}$	AR133$^{\#SP}$	AR123$^{\#SP}$	AR113$^{\#SP}$	AR103$^{\#SP}$	AR093$^{\#SP}$	AR083$^{\#SP}$
Fn208	EGBM8$^{\#SV}$	EGBM7$^{\#SV}$	EGBM6$^{\#SV}$	EGBM5$^{\#SV}$	EGBM4$^{\#SV}$	EGBM3$^{\#SV}$	EGBM2$^{\#SV}$	EGBM1$^{\#SV}$
Fn209								
Fn210	SYNMT8$^{\#P}$	SYNMT7$^{\#P}$	SYNMT6$^{\#P}$	SYNMT5$^{\#P}$	SYNMT4$^{\#P}$	SYNMT3$^{\#P}$	SYNMT2$^{\#P}$	SYNMT1$^{\#P}$
Fn211	SYNOF8$^{\#P}$	SYNOF7$^{\#P}$	SYNOF6$^{\#P}$	SYNOF5$^{\#P}$	SYNOF4$^{\#P}$	SYNOF3$^{\#P}$	SYNOF2$^{\#P}$	SYNOF1$^{\#P}$
Fn212								
Fn213								
Fn214								
Fn215								
Fn216								
Fn217								
Fn218								
Fn263								
Fn264	SPWRN8$^{\#P}$	SPWRN7$^{\#P}$	SPWRN6$^{\#P}$	SPWRN5$^{\#P}$	SPWRN4$^{\#P}$	SPWRN3$^{\#P}$	SPWRN2$^{\#P}$	SPWRN1$^{\#P}$
Fn265								SPWRN9$^{\#P}$
Fn266	ORARD$^{\#SP}$	TLMD$^{\#SP}$	LDT2D$^{\#SP}$	LDT1D$^{\#SP}$	SARD$^{\#SP}$	SDTD$^{\#SP}$	SSTD$^{\#SP}$	ALMD$^{\#SP}$
Fn267	MORA2D$^{\#SP}$	MORA1D$^{\#SP}$	PORA2D$^{\#SP}$	SLVSD$^{\#SP}$	RCFND$^{\#SP}$	RCHPD$^{\#SP}$	CFIND$^{\#SP}$	CHIPD$^{\#SP}$
Fn268							INCSTD$^{\#SP}$	PC1DED$^{\#SP}$
Fn269				CSPEND$^{\#SP}$				
Fn270	R08O4$^{\#SP}$	R07O4$^{\#SP}$	R06O4$^{\#SP}$	R05O4$^{\#SP}$	R04O4$^{\#SP}$	R03O4$^{\#SP}$	R02O4$^{\#SP}$	R01O4$^{\#SP}$
Fn271					R12O4$^{\#SP}$	R11O4$^{\#SP}$	R10O4$^{\#SP}$	R09O4$^{\#SP}$
Fn272	AR074$^{\#SP}$	AR064$^{\#SP}$	AR054$^{\#SP}$	AR044$^{\#SP}$	AR034$^{\#SP}$	AR024$^{\#SP}$	AR014$^{\#SP}$	AR004$^{\#SP}$
Fn273	AR154$^{\#SP}$	AR144$^{\#SP}$	AR134$^{\#SP}$	AR124$^{\#SP}$	AR114$^{\#SP}$	AR104$^{\#SP}$	AR094$^{\#SP}$	AR084$^{\#SP}$
Fn274	CSFO4$^{\#SP}$	CSFO3$^{\#SP}$	CSFO2$^{\#SP}$	CSFO1$^{\#SP}$	FCSS4$^{\#SP}$	FCSS3$^{\#SP}$	FCSS2$^{\#SP}$	FCSS1$^{\#SP}$
Fn275								

Address	Bit number 7	6	5	4	3	2	1	0
Fn276	UO023#P	UO022#P	UO021#P	UO020#P	UO019#P	UO018#P	UO017#P	UO016#P
Fn277	UO031#P	UO030#P	UO029#P	UO028#P	UO027#P	UO026#P	UO025#P	UO024#P
Fn278								
Fn279								
Fn280	UO207#P	UO206#P	UO205#P	UO204#P	UO203#P	UO202#P	UO201#P	UO200#P
Fn281	UO215#P	UO214#P	UO213#P	UO212#P	UO211#P	UO210#P	UO209#P	UO208#P
Fn282	UO223#P	UO222#P	UO221#P	UO220#P	UO219#P	UO218#P	UO217#P	UO216#P
Fn283	UO231#P	UO230#P	UO229#P	UO228#P	UO227#P	UO226#P	UO225#P	UO224#P
Fn284	UO307#P	UO306#P	UO305#P	UO304#P	UO303#P	UO302#P	UO301#P	UO300#P
Fn285	UO315#P	UO314#P	UO313#P	UO312#P	UO311#P	UO310#P	UO309#P	UO308#P
Fn286	UO323#P	UO322#P	UO321#P	UO320#P	UO319#P	UO318#P	UO317#P	UO316#P
Fn287	UO331#P	UO330#P	UO329#P	UO328#P	UO327#P	UO326#P	UO325#P	UO324#P
Fn288					FSPSY4#SP	FSPSY3#SP	FSPSY2#SP	FSPSY1#SP
Fn289					FSPPH4#SP	FSPPH3#SP	FSPPH2#SP	FSPPH1#SP
Fn290			PRGMD#P	PCKSV#P		DNTCM		
Fn291								
Fn292								
Fn293	HPS08#P	HPS07#P	HPS06#P	HPS05#P	HPS04#P	HPS03#P	HPS02#P	HPS01#P
Fn294	HPS16#P	HPS15#P	HPS14#P	HPS13#P	HPS12#P	HPS11#P	HPS10#P	HPS09#P
Fn295	CNCKYO	C2SENO						
Fn296								
Fn297								MBCAN#P
Fn298	TDSML8	TDSML7	TDSML6	TDSML5	TDSML4	TDSML3	TDSML2	TDSML1
Fn299	TDFTR8	TDFTR7	TDFTR6	TDFTR5	TDFTR4	TDFTR3	TDFTR2	TDFTR1
Fn300								
Fn301								
Fn302								
Fn303								
Fn304								

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fn305								
Fn306								
Fn307								
Fn308								
Fn309								
Fn310								
Fn311								
Fn312								
Fn313								
Fn314								
Fn315	TLMEM#P	TMFNFD#P		TLMOT#P		TLMG10#P	TLMSRH#P	TLSKF#P
Fn316	SQMPE#P	SQMPR#P						
Fn317								
Fn318								
Fn319								
Fn320								
Fn321								
Fn322								
Fn323								
Fn324								
Fn325								
Fn326								
Fn327								
Fn328	TLCHI4#P	TLCHI3#P	TLCHI2#P	TLCHI1#P	TLCH4#P	TLCH3#P	TLCH2#P	TLCH1#P
Fn329	TLCHB4#P	TLCHB3#P	TLCHB2#P	TLCHB1#P	TLSKF4#P	TLSKF3#P	TLSKF2#P	TLSKF1#P
Fn330								
Fn331								
Fn332								
Fn333								

9

Address	7	6	5	4	3	2	1	0
Fn334								
Fn335								
Fn336								
Fn337								
Fn338								
Fn339								
Fn340								
Fn341	SYCM8#SV	SYCM7#SV	SYCM6#SV	SYCM5#SV	SYCM4#SV	SYCM3#SV	SYCM2#SV	SYCM1#SV
Fn342	SYCS8#SV	SYCS7#SV	SYCS6#SV	SYCS5#SV	SYCS4#SV	SYCS3#SV	SYCS2#SV	SYCS1#SV
Fn343	MIXO8#SV	MIXO7#SV	MIXO6#SV	MIXO5#SV	MIXO4#SV	MIXO3#SV	MIXO2#SV	MIXO1#SV
Fn344	OVMO8#SV	OVMO7#SV	OVMO6#SV	OVMO5#SV	OVMO4#SV	OVMO3#SV	OVMO2#SV	OVMO1#SV
Fn345	OVSO8#SV	OVSO7#SV	OVSO6#SV	OVSO5#SV	OVSO4#SV	OVSO3#SV	OVSO2#SV	OVSO1#SV
Fn346	SMPK8#SV	SMPK7#SV	SMPK6#SV	SMPK5#SV	SMPK4#SV	SMPK3#SV	SMPK2#SV	SMPK1#SV
Fn347	D3MI#P							
Fn348								
Fn349								
Fn350								
Fn351					SSEGBM4#SP	SSEGBM3#SP	SSEGBM2#SP	SSEGBM1#SP
Fn356								
Fn358	WPSF8#SV	WPSF7#SV	WPSF6#SV	WPSF5#SV	WPSF4#SV	WPSF3#SV	WPSF2#SV	WPSF1#SV
Fn374								
Fn376	SVSST8#SV	SVSST7#SV	SVSST6#SV	SVSST5#SV	SVSST4#SV	SVSST3#SV	SVSST2#SV	SVSST1#SV
Fn377	SVSAR8#SV	SVSAR7#SV	SVSAR6#SV	SVSAR5#SV	SVSAR4#SV	SVSAR3#SV	SVSAR2#SV	SVSAR1#SV
Fn381					PHFIND#P	PHFINC#P	PHFINB#P	PHFINA#P
Fn395								
Fn396								
Fn397								
Fn398								
Fn399								
Fn400					SUCLPD#SP	SUCLPC#SP	SUCLPB#SP	

Address	7	6	5	4	3	2	1	0
Fn401					SCLPD#SP	SCLPC#SP	SCLPB#SP	
Fn402					MSPOSD#SP	MSPOSC#SP	MSPOSB#SP	
Fn403								SYNER#P
Fn404							COSP4#P	COSP3#P
Fn405								
Fn406								
Fn407								
Fn408								
Fn409								
Fn410								
Fn411								
Fn412								
Fn413								
Fn414								
Fn415								
Fn416								
Fn417								
Fn418								
Fn419								
Fn420 to Fn511								
Fn512						MCSP#P	MCRQ#P	MCEXE#P
Fn513	ZRNR#P		DNCIR#P			MD4R#P	MD2R#P	MD1R#P
Fn514	MCEX8#P	MCEX7#P	MCEX6#P	MCEX5#P	MCEX4#P	MCEX3#P	MCEX2#P	MCEX1#P
Fn515	MCEX16#P	MCEX15#P	MCEX14#P	MCEX13#P	MCEX12#P	MCEX11#P	MCEX10#P	MCEX9#P
Fn516								
Fn517	RP18	RP17	RP16	RP15	RP14	RP13	RP12	RP11
Fn518	RP28	RP27	RP26	RP25	RP24	RP23	RP22	RP21
Fn519								

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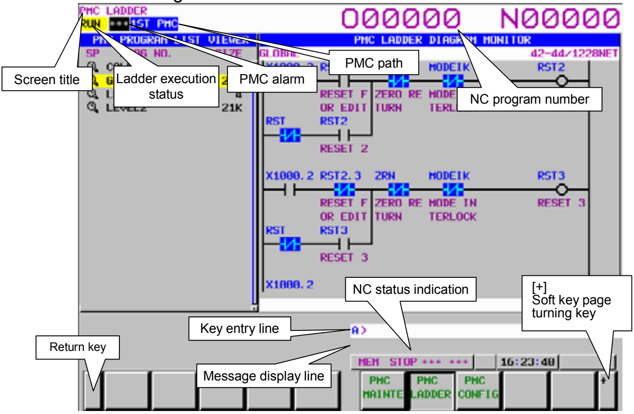
Address	7	6	5	4	3	2	1	0
Fn520								ATBK
Fn521	SVREV8	SVREV7	SVREV6	SVREV5	SVREV4	SVREV3	SVREV2	SVREV1
Fn522	SPP8	SPP7	SPP6	SPP5	SPP4	SPP3	SPP2	SPP1
Fn523								
Fn524								
Fn525								
Fn526			DWL					
Fn527	SYPER#P	SYPFN#P						
Fn528 to Fn531								
	IOLBR	DVCPR#P						
Fn532	SYNO8#SV	SYNO7#SV	SYNO6#SV	SYNO5#SV	SYNO4#SV	SYNO3#SV	SYNO2#SV	SYNO1#SV
Fn533								
Fn534	PE3EX	PE2EX	PE1EX	MBSO#P			SRNEX	
Fn535	WFLN2	WFLN1	WETF	WETE	WECCS	WIOCH3	WIOCH2	WIOCH1
Fn536	INIST			EXCED	ASNED	RMVED		
Fn540	TDIH4FE	TDIH3FE	TDIH2FE	TDIH1FE	TDIT4FE	TDIT3FE	TDIT2FE	TDIT1FE
Fn541			TDIO6FE	TDIO5FE	TDIO4FE	TDIO3FE	TDIO2FE	TDIO1FE
Fn542	TDIH4AE	TDIH3AE	TDIH2AE	TDIH1AE	TDIT4AE	TDIT3AE	TDIT2AE	TDIT1AE
Fn543			TDIO6AE	TDIO5AE	TDIO4AE	TDIO3AE	TDIO2AE	TDIO1AE
Fn544								
Fn545				DNTER			OVLNS#P	FLANG
Fn546			GTME	GTMC				
Fn547	HPMERR	HPMSVM	HPMNTS					
to Fn553					PHERD#P	PHERC#P	PHERB#P	PHERA#P
Fn554								
to Fn558	CDLAD5	CDLAD4	CDPRM	CDDCL	CDLAD3	CDLAD2	CDLAD1	CDCEX
Fn559	SEO8#SV	SEO7#SV	SEO6#SV	SEO5#SV	SEO4#SV	SEO3#SV	SEO2#SV	SEO1#SV
Fn560			TDITO6#P	TDITO5#P	TDITO4#P	TDITO3#P	TDITO2#P	TDITO1#P
Fn561			TDIHO6#P	TDIHO5#P	TDIHO4#P	TDIHO3#P	TDIHO2#P	TDIHO1#P
Fn562								
to Fn577	SPMER4	SPMER3	SPMER2	SPMER1	SPMFN4	SPMFN3	SPMFN2	SPMFN1

Address	Bit number 7	6	5	4	3	2	1	0
Fn578			ALLO			WBCNT		
to								
Fn580	ARE07#SP	ARE06#SP	ARE05#SP	ARE04#SP	ARE03#SP	ARE02#SP	ARE01#SP	ARE00#SP
Fn581	ARE15#SP	ARE14#SP	ARE13#SP	ARE12#SP	ARE11#SP	ARE10#SP	ARE09#SP	ARE08#SP
Fn582	ARE23#SP	ARE22#SP	ARE21#SP	ARE20#SP	ARE19#SP	ARE18#SP	ARE17#SP	ARE16#SP
Fn583	ARE31#SP	ARE30#SP	ARE29#SP	ARE28#SP	ARE27#SP	ARE26#SP	ARE25#SP	ARE24#SP
Fn584	ARE072#SP	ARE062#SP	ARE052#SP	ARE042#SP	ARE032#SP	ARE022#SP	ARE012#SP	ARE002#SP
Fn585	ARE152#SP	ARE142#SP	ARE132#SP	ARE122#SP	ARE112#SP	ARE102#SP	ARE092#SP	ARE082#SP
Fn586	ARE232#SP	ARE222#SP	ARE212#SP	ARE202#SP	ARE192#SP	ARE182#SP	ARE172#SP	ARE162#SP
Fn587	ARE312#SP	ARE302#SP	ARE292#SP	ARE282#SP	ARE272#SP	ARE262#SP	ARE252#SP	ARE242#SP
Fn588	ARE073#SP	ARE063#SP	ARE053#SP	ARE043#SP	ARE033#SP	ARE023#SP	ARE013#SP	ARE003#SP
Fn589	ARE153#SP	ARE143#SP	ARE133#SP	ARE123#SP	ARE113#SP	ARE103#SP	ARE093#SP	ARE083#SP
Fn590	ARE233	ARE223	ARE213	ARE323	ARE193	ARE183	ARE173	ARE163
Fn591	ARE313#SP	ARE303#SP	ARE293#SP	ARE283#SP	ARE273#SP	ARE263#SP	ARE253#SP	ARE243#SP
Fn592	ARE074#SP	ARE064#SP	ARE054#SP	ARE044#SP	ARE034#SP	ARE024#SP	ARE014#SP	ARE004#SP
Fn593	ARE154#SP	ARE144#SP	ARE134#SP	ARE124#SP	ARE114#SP	ARE104#SP	ARE094#SP	ARE084#SP
Fn594	ARE234#SP	ARE224#SP	ARE214#SP	ARE324#SP	ARE194#SP	ARE184#SP	ARE174#SP	ARE164#SP
Fn595	ARE314#SP	ARE304#SP	ARE294#SP	ARE284#SP	ARE274#SP	ARE264#SP	ARE254#SP	ARE244#SP
to								
Fn598	-OT3O#P	+OT3O#P	-OT2O#P	+OT2O#P	-OT12O#P	+OT12O#P	-OT11O#P	+OT11O#P
Fn599								OTSWFN#P
to								
Fn708	RE08O#SP	RE07O#SP	RE06O#SP	RE05O#SP	RE04O#SP	RE03O#SP	RE02O#SP	RE01O#SP
Fn709	RE16O#SP	RE15O#SP	RE14O#SP	RE13O#SP	RE12O#SP	RE11O#SP	RE10O#SP	RE09O#SP
Fn710	RE24O#SP	RE23O#SP	RE22O#SP	RE21O#SP	RE20O#SP	RE19O#SP	RE18O#SP	RE17O#SP
Fn711	RE32O#SP	RE31O#SP	RE30O#SP	RE29O#SP	RE28O#SP	RE27O#SP	RE26O#SP	RE25O#SP
Fn712	RE08O2#SP	RE07O2#SP	RE06O2#SP	RE05O2#SP	RE04O2#SP	RE03O2#SP	RE02O2#SP	RE01O2#SP
Fn713	RE16O2#SP	RE15O2#SP	RE14O2#SP	RE13O2#SP	RE12O2#SP	RE11O2#SP	RE10O2#SP	RE09O2#SP
Fn714	RE24O2#SP	RE23O2#SP	RE22O2#SP	RE21O2#SP	RE20O2#SP	RE19O2#SP	RE18O2#SP	RE17O2#SP
Fn715	RE32O2#SP	RE31O2#SP	RE30O2#SP	RE29O2#SP	RE28O2#SP	RE27O2#SP	RE26O2#SP	RE25O2#SP
Fn716	RE08O3#SP	RE07O3#SP	RE06O3#SP	RE05O3#SP	RE04O3#SP	RE03O3#SP	RE02O3#SP	RE01O3#SP
Fn717	RE16O3#SP	RE15O3#SP	RE14O3#SP	RE13O3#SP	RE12O3#SP	RE11O3#SP	RE10O3#SP	RE09O3#SP

Address	7	6	5	4	3	2	1	0
Fn718	RE24O3#SP	RE23O3#SP	RE22O3#SP	RE21O3#SP	RE20O3#SP	RE19O3#SP	RE18O3#SP	RE17O3#SP
Fn719	RE32O3#SP	RE31O3#SP	RE30O3#SP	RE29O3#SP	RE28O3#SP	RE27O3#SP	RE26O3#SP	RE25O3#SP
Fn720	RE08O4#SP	RE07O4#SP	RE06O4#SP	RE05O4#SP	RE04O4#SP	RE03O4#SP	RE02O4#SP	RE01O4#SP
Fn721	RE16O4#SP	RE15O4#SP	RE14O4#SP	RE13O4#SP	RE12O4#SP	RE11O4#SP	RE10O4#SP	RE09O4#SP
Fn722	RE24O4#SP	RE23O4#SP	RE22O4#SP	RE21O4#SP	RE20O4#SP	RE19O4#SP	RE18O4#SP	RE17O4#SP
Fn723 to	RE32O4#SP	RE31O4#SP	RE30O4#SP	RE29O4#SP	RE28O4#SP	RE27O4#SP	RE26O4#SP	RE25O4#SP
Fn747 to	TDCF07	TDCF06	TDCF05	TDCF04	TDCF03	TDCF02	TDCF01	TDCF00
Fn767								

10.1 OPERATING THE PMC SCREEN

The basic configuration of the PMC screen is described below.



-	Screen title:	Displays the name of a specific submenu of the PMC.
-	Ladder execution status:	Displays the execution status of the ladder program.
-	PMC alarm:	Indicates whether any PMC alarm is occurring.
-	PMC path:	Displays the currently selected PMC.
-	NC program number:	Displays the number of the currently selected NC program.
-	Key entry line:	Line for entering a numerical value or character key string.
-	Message display line:	Displays an error or warning message.
-	NC status indication:	Displays the NC mode, the execution status of the NC program and the current NC path number.
-	Return key:	Used to switch from the PMC operation menu to a specific PMC submenu or from a specific PMC submenu to the main menu of the PMC.
-	Soft key page change key:	Used to turn soft key pages.

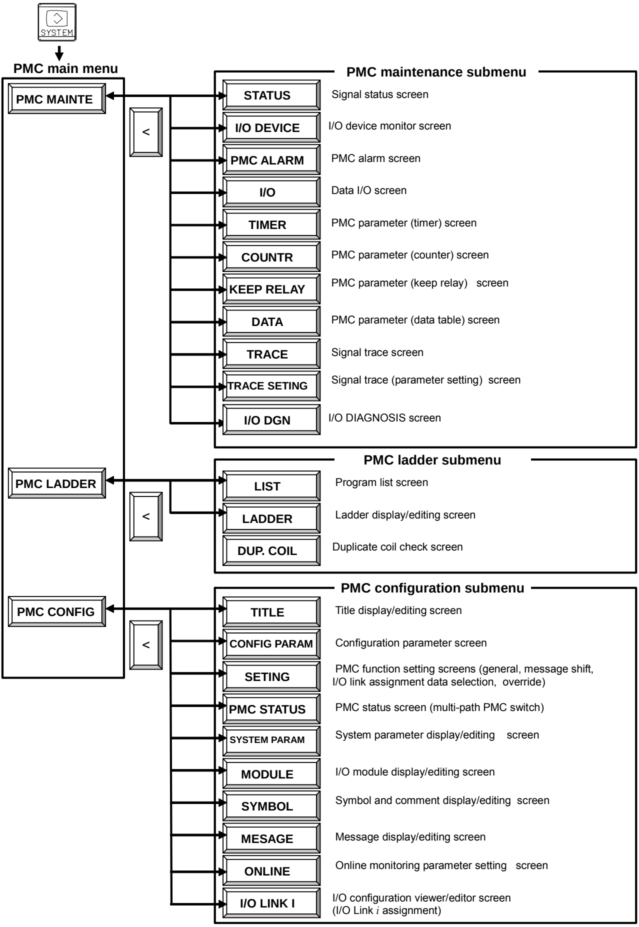
The PMC main menu offers the following three types of submenus, which are respectively used for specific purposes.

(1) PMC maintenance menu
This menu displays the screens related to the maintenance of the PMC, such as those for PMC signal status monitoring and traces and for PMC data display and editing.

(2) PMC ladder menu
This menu displays the screens related to the display and editing of the ladder program.

(3) PMC configuration menu
This menu displays the screens related to the display and editing of the data other than the ladder constituting the sequence program, as well as the screen for setting the PMC functions.

10.1.1 Transition of the PMC Screens



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10.2 FUNCTIONAL INSTRUCTIONS

10.2.1 List of Functional Instructions

Table 10.2.1 Functional instructions for PMCs for the Series 0*i*-F
(arranged in sequence of instruction group)

○ : Usable
● : Extended PMC Ladder Instruction Function
Δ : Executed as NOP instruction (Note2)
× : Unusable.

Inst-ruction group		Inst-ruction name	SUB No.	Processing	1st to 3rd PMCs	DCS PMC (Note1)
Timer	1	TMR	3	ON delay timer	○	○
	2	TMRB	24	Fixed ON delay timer	○	○
	3	TMRBF	77	Fixed OFF delay timer	○	○
	4	TMRC	54	ON delay timer	○	○
	5	TMRST	221	Stop watch timer (1 ms accuracy)	●	●
	6	TMRSS	222	Stop watch timer (1 sec accuracy)	●	●
Counter	1	CTR	5	Counter processing	○	○
	2	CTRB	56	Counter processing	○	○
	3	CTRC	55	Counter processing	○	○
	4	CTRD	223	Counter processing (4 bytes length)	●	●
Data transfer	1	MOVB	43	1-byte transfer	○	○
	2	MOVW	44	2-byte transfer	○	○
	3	MOVD	47	4-byte transfer	○	○
	4	MOVN	45	Transfer of arbitrary number of bytes	○	○
	5	MOVE	8	Data transfer after logical product	○	○
	6	MOVOR	28	Data transfer after logical sum	○	○
	7	XMOVB	35	Index modification binary data transfer	○	○
	8	XMOV	18	BCD index modification data transfer	○	○
	9	MOVBT	224	Bit transfer	●	●
	10	SETNB	225	Data setting (1 byte length)	●	●
	11	SETNW	226	Data setting (2 bytes length)	●	●
	12	SETND	227	Data setting (4 bytes length)	●	●
	13	XCHGB	228	Data exchange (1 byte length)	●	●
	14	XCHGW	229	Data exchange (2 bytes length)	●	●
	15	XCHGD	230	Data exchange (4 bytes length)	●	●
	16	SWAPW	231	Data swap (2 bytes length)	●	●
	17	SWAPD	232	Data swap (4 bytes length)	●	●
	18	DSCHB	34	Binary data search	○	○
	19	DSCH	17	BCD data search	○	○
Table data	1	TBLRB	233	Reading data from table (1 byte length)	●	●
	2	TBLRW	234	Reading data from table (2 bytes length)	●	●
	3	TBLRD	235	Reading data from table (4 bytes length)	●	●
	4	TBLRN	236	Reading data from table (arbitrary bytes length)	●	●
	5	TBLWB	237	Writing data to table (1 byte length)	●	●
	6	TBLWW	238	Writing data to table (2 bytes length)	●	●
	7	TBLWD	239	Writing data to table (4 bytes length)	●	●
	8	TBLWN	240	Writing data to table (arbitrary bytes length)	●	●
	9	DSEQB	241	Searching data from table (=) (1 byte length)	●	●
	10	DSEQW	242	Searching data from table (=) (2 bytes length)	●	●
	11	DSEQD	243	Searching data from table (=) (4 bytes length)	●	●
	12	DSNEB	244	Searching data from table (≠) (1 byte length)	●	●
	13	DSNEW	245	Searching data from table (≠) (2 bytes length)	●	●
	14	DSNED	246	Searching data from table (≠) (4 bytes length)	●	●
	15	DSGTB	247	Searching data from table (>) (1 byte length)	●	●
	16	DSGTW	248	Searching data from table (>) (2 bytes length)	●	●
	17	DSGTD	249	Searching data from table (>) (4 bytes length)	●	●
	18	DSLTB	250	Searching data from table (<) (1 byte length)	●	●
	19	DSLTW	251	Searching data from table (<) (2 bytes length)	●	●
	20	DSLTD	252	Searching data from table (<) (4 bytes length)	●	●
	21	DSGEB	253	Searching data from table (≧) (1 byte length)	●	●
	22	DSGEW	254	Searching data from table (≧) (2 bytes length)	●	●
	23	DSGED	255	Searching data from table (≧) (4 bytes length)	●	●

Table data	24	DSLEB	256	Searching data from table (≦) (1 byte length)	●	●
	25	DSLEW	257	Searching data from table (≦) (2 bytes length)	●	●
	26	DSLED	258	Searching data from table (≦) (4 bytes length)	●	●
	27	DMAXB	259	Maximum data (1 byte length)	●	●
	28	DMAXW	260	Maximum data (2 bytes length)	●	●
	29	DMAXD	261	Maximum data (4 bytes length)	●	●
	30	DMINB	262	Minimum data (1 byte length)	●	●
	31	DMINW	263	Minimum data (2 bytes length)	●	●
	32	DMIND	264	Minimum data (4 bytes length)	●	●
Comparison	1	EQB	200	1 byte length, signed, Binary comparison (=)	○	○
	2	EQW	201	2 bytes length, signed, Binary comparison (=)	○	○
	3	EQD	202	4 bytes length, signed, Binary comparison (=)	○	○
	4	NEB	203	1 byte length, signed, Binary comparison (≠)	○	○
	5	NEW	204	2 bytes length, signed, Binary comparison (≠)	○	○
	6	NED	205	4 bytes length, signed, Binary comparison (≠)	○	○
	7	GTB	206	1 byte length, signed, Binary comparison (>)	○	○
	8	GTW	207	2 bytes length, signed, Binary comparison (>)	○	○
	9	GTD	208	4 bytes length, signed, Binary comparison (>)	○	○
	10	LTB	209	1 byte length, signed, Binary comparison (<)	○	○
	11	LTW	210	2 bytes length, signed, Binary comparison (<)	○	○
	12	LTD	211	4 bytes length, signed, Binary comparison (<)	○	○
	13	GEB	212	1 byte length, signed, Binary comparison (≧)	○	○
	14	GEW	213	2 bytes length, signed, Binary comparison (≧)	○	○
	15	GED	214	4 bytes length, signed, Binary comparison (≧)	○	○
	16	LEB	215	1 byte length, signed, Binary comparison (≦)	○	○
	17	LEW	216	2 bytes length, signed, Binary comparison (≦)	○	○
	18	LED	217	4 bytes length, signed, Binary comparison (≦)	○	○
	19	RNGB	218	1 byte length, signed, Binary comparison(range)	○	○
	20	RNGW	219	2 bytes length, signed, Binary comparison(range)	○	○
	21	RNGD	220	4 bytes length, signed, Binary comparison(range)	○	○
	22	COMPB	32	Binary comparison	○	○
	23	COMP	15	BCD comparison	○	○
	24	COIN	16	Coincidence check	○	○
Bit operation	1	DIFU	57	Rising-edge detection	○	○
	2	DIFD	58	Falling-edge detection	○	○
	3	EOR	59	Exclusive OR	○	○
	4	AND	60	Logical AND	○	○
	5	OR	61	Logical OR	○	○
	6	NOT	62	Logical NOT	○	○
	7	PARI	11	Parity check	○	○
	8	SFT	33	Shift register	○	○
	9	EORB	265	Exclusive OR (1 byte length)	●	●
	10	EORW	266	Exclusive OR (2 bytes length)	●	●
	11	EORD	267	Exclusive OR (4 bytes length)	●	●
	12	ANDB	268	Logical AND (1 byte length)	●	●
	13	ANDW	269	Logical AND (2 bytes length)	●	●
	14	ANDD	270	Logical AND (4 bytes length)	●	●
	15	ORB	271	Logical OR (1 byte length)	●	●
	16	ORW	272	Logical OR (2 bytes length)	●	●
	17	ORD	273	Logical OR (4 bytes length)	●	●
	18	NOTB	274	Logical NOT (1 byte length)	●	●
	19	NOTS	275	Logical NOT (2 bytes length)	●	●
	20	NOTD	276	Logical NOT (4 bytes length)	●	●
	21	SHLB	277	Bit shift left (1 byte length)	●	●
	22	SHLW	278	Bit shift left (2 bytes length)	●	●
	23	SHLD	279	Bit shift left (4 bytes length)	●	●
	24	SHLN	280	Bit shift left (arbitrary bytes length)	●	●
	25	SHRB	281	Bit shift right (1 byte length)	●	●
	26	SHRW	282	Bit shift right (2 bytes length)	●	●
	27	SHRD	283	Bit shift right (4 bytes length)	●	●
	28	SHRN	284	Bit shift right (arbitrary bytes length)	●	●
	29	ROLB	285	Bit rotation left (1 byte length)	●	●

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Bit operation	30	ROLW	286	Bit rotation left (2 bytes length)	●	●
	31	ROLD	287	Bit rotation left (4 bytes length)	●	●
	32	ROLN	288	Bit rotation left (arbitrary bytes length)	●	●
	33	RORB	289	Bit rotation right (1 byte length)	●	●
	34	RORW	290	Bit rotation right (2 bytes length)	●	●
	35	RORD	291	Bit rotation right (4 bytes length)	●	●
	36	RORN	292	Bit rotation right (arbitrary bytes length)	●	●
	37	BSETB	293	Bit set (1 byte length)	●	●
	38	BSETW	294	Bit set (2 bytes length)	●	●
	39	BSETD	295	Bit set (4 bytes length)	●	●
	40	BSETN	296	Bit set (arbitrary bytes length)	●	●
	41	BRSTB	297	Bit reset (1 byte length)	●	●
	42	BRSTW	298	Bit reset (2 bytes length)	●	●
	43	BRSTD	299	Bit reset (4 bytes length)	●	●
	44	BRSTN	300	Bit reset (arbitrary bytes length)	●	●
	45	BTSTB	301	Bit test (1 byte length)	●	●
	46	BTSTW	302	Bit test (2 bytes length)	●	●
	47	BTSTD	303	Bit test (4 bytes length)	●	●
	48	BTSTN	304	Bit test (arbitrary bytes length)	●	●
	49	BPOSB	305	Bit search (1 byte length)	●	●
	50	BPOSW	306	Bit search (2 bytes length)	●	●
	51	BPOSD	307	Bit search (4 bytes length)	●	●
	52	BPOSN	308	Bit search (arbitrary bytes length)	●	●
	53	BCNTB	309	Bit count (1 byte length)	●	●
	54	BCNTW	310	Bit count (2 bytes length)	●	●
	55	BCNTD	311	Bit count (4 bytes length)	●	●
	56	BCNTN	312	Bit count (arbitrary bytes length)	●	●
Code conversion	1	CODB	27	Binary code conversion	○	○
	2	COD	7	BCD code conversion	○	○
	3	DCNV	14	Data conversion	○	○
	4	DCNVB	31	Extended data conversion	○	○
	5	DECB	25	Binary decoding	○	○
	6	DEC	4	BCD decoding	○	○
	7	TBCDB	313	Binary to BCD conversion (1 byte length)	●	●
	8	TBCDW	314	Binary to BCD conversion (2 bytes length)	●	●
	9	TBCDD	315	Binary to BCD conversion (4 bytes length)	●	●
	10	FBCDB	316	BCD to Binary conversion (1 byte length)	●	●
	11	FBCDW	317	BCD to Binary conversion (2 bytes length)	●	●
	12	FBCDD	318	BCD to Binary conversion (4 bytes length)	●	●
Operation	1	ADDB	36	Binary addition	○	○
	2	SUBB	37	Binary subtraction	○	○
	3	MULB	38	Binary multiplication	○	○
	4	DIVB	39	Binary division	○	○
	5	ADD	19	BCD addition	○	○
	6	SUB	20	BCD subtraction	○	○
	7	MUL	21	BCD multiplication	○	○
	8	DIV	22	BCD division	○	○
	9	NUMEB	40	Binary constant definition	○	○
	10	NUME	23	BCD-constant definition	○	○
	11	ADDSB	319	Addition (1 byte length)	●	●
	12	ADDSW	320	Addition (2 bytes length)	●	●
	13	ADDSD	321	Addition (4 bytes length)	●	●
	14	SUBSB	322	Subtraction (1 byte length)	●	●
	15	SUBSW	323	Subtraction (2 bytes length)	●	●
	16	SUBSD	324	Subtraction (4 bytes length)	●	●
	17	MULSB	325	Multiplication (1 byte length)	●	●
	18	MULSW	326	Multiplication (2 bytes length)	●	●
	19	MULSD	327	Multiplication (4 bytes length)	●	●
	20	DIVSB	328	Division (1 byte length)	●	●
	21	DIVSW	329	Division (2 bytes length)	●	●
	22	DIVSD	330	Division (4 bytes length)	●	●
	23	MODSB	331	Remainder (1 byte length)	●	●

Operation	24	MODSW	332	Remainder (2 bytes length)	●	●
	25	MODSD	333	Remainder (4 bytes length)	●	●
	26	INCSB	334	Increment (1 byte length)	●	●
	27	INCSW	335	Increment (2 bytes length)	●	●
	28	INCSD	336	Increment (4 bytes length)	●	●
	29	DECSB	337	Decrement (1 byte length)	●	●
	30	DECSW	338	Decrement (2 bytes length)	●	●
	31	DECSD	339	Decrement (4 bytes length)	●	●
	32	ABSSB	340	Absolute value (1 byte length)	●	●
	33	ABSSW	341	Absolute value (2 bytes length)	●	●
	34	ABSSD	342	Absolute value (4 bytes length)	●	●
	35	NEGSB	343	Sign inversion (1 byte length)	●	●
	36	NEGSW	344	Sign inversion (2 bytes length)	●	●
	37	NEGSD	345	Sign inversion (4 bytes length)	●	●
CNC function	1	DISPB	41	Message display	○	Δ
	2	EXIN	42	External data input	○	Δ
	3	WINDR	51	CNC window data read	○	Δ
	4	WINDW	52	CNC window data write	○	Δ
	5	AXCTL	53	PMC axis control	○	Δ
	6	PSGN2	63	Position signal output 2	○	Δ
	7	PSGNL	50	Position signal output	○	Δ
Program control	1	COM	9	Common line control	○	○
	2	COME	29	End of common line control	○	○
	3	JMP	10	Jump	○	○
	4	JMPE	30	End of jump	○	○
	5	JMPB	68	Label jump 1	○	○
	6	JMPC	73	Label jump 2	○	○
	7	LBL	69	Label	○	○
	8	CALL	65	Conditional subprogram call	○	○
	9	CALLU	66	Unconditional subprogram call	○	○
	10	SP	71	Subprogram	○	○
	11	SPE	72	End of subprogram	○	○
	12	END1	1	End of 1st-level program	○	○
	13	END2	2	End of 2nd-level program	○	○
	14	END3	48	End of 3rd-level program	○ (Note3)	Δ (Note4)
	15	END	64	End of ladder program	○	○
	16	NOP	70	No operation	○	○
	17	CS	74	Case call	○	○
	18	CM	75	Sub program call in case call	○	○
	19	CE	76	End of case call	○	○
Rotation control	1	ROTB	26	Binary rotation control	○	○
	2	ROT	6	BCD rotation control	○	○
Invalid instruction	1	SPCNT	46	Spindle control	Δ	Δ
	2	DISP	49	Message display	Δ	Δ
	3	MMCWR	98	MMC window data read	Δ	Δ
	4	MMCWW	99	MMC window data write	Δ	Δ
	5	FNC90	90	Arbitrary-function instruction 1	Δ	Δ
	6	FNC91	91	Arbitrary-function instruction 2	Δ	Δ
	7	FNC92	92	Arbitrary-function instruction 3	Δ	Δ
	8	FNC93	93	Arbitrary-function instruction 4	Δ	Δ
	9	FNC94	94	Arbitrary-function instruction 5	Δ	Δ
	10	FNC95	95	Arbitrary-function instruction 6	Δ	Δ
	11	FNC96	96	Arbitrary-function instruction 7	Δ	Δ
	12	FNC97	97	Arbitrary-function instruction 8	Δ	Δ

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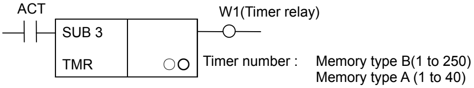
NOTE

1. This PMC is used for the dual check safety function (option).
2. These instructions are intended to maintain source-level compatibility with programs for conventional models. They are treated as a NOP instruction (instruction that performs no operation).
3. The 3rd level sequence part is available for the compatibility with programs for conventional models. However the execution cycle period of time for processing the 3rd level sequence part is not guaranteed.
4. These instructions are intended to maintain source-level compatibility with programs for other models. A program can be created on level 3, but it is not executed.

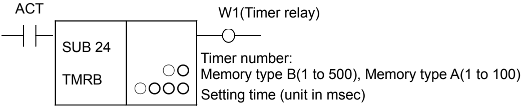
10.2.2 Details of Functional Instructions

10.2.2.1 Timer

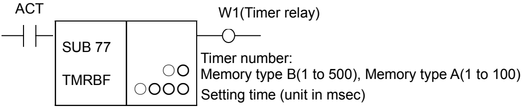
(1) Variable timer



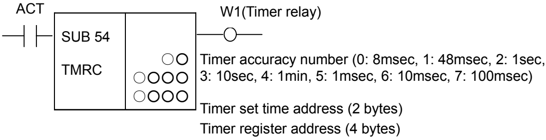
(2) Fixed ON delay timer



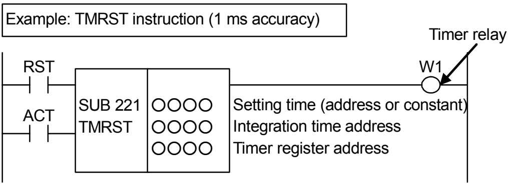
(3) Fixed OFF delay timer



(4) Variable timer

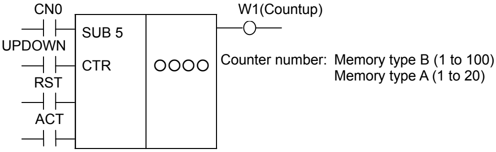


(5) Stop watch timer (1 ms accuracy, 1 sec accuracy)

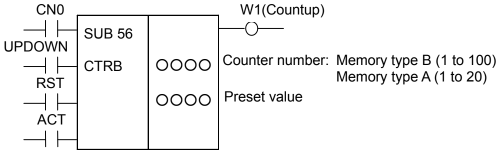


10.2.2.2 Counter

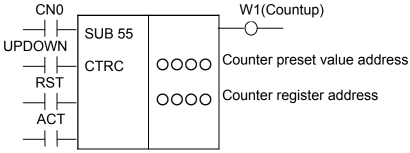
(1) Counter



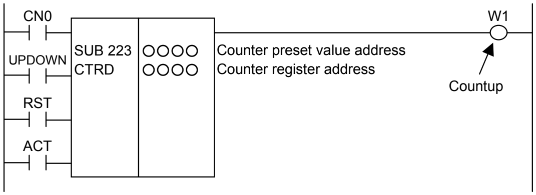
(2) Fixed counter



(3) Counter

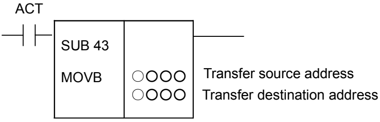


(4) Counter (4 bytes length)

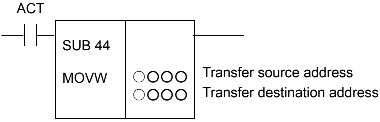


10.2.2.3 Data transfer

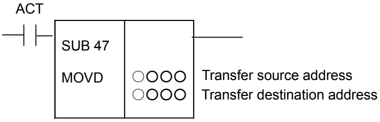
(1) Transfer of 1 byte



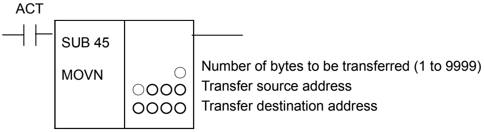
(2) Transfer of 2 bytes



(3) Transfer of 4 bytes



(4) Transfer of an arbitrary number of bytes



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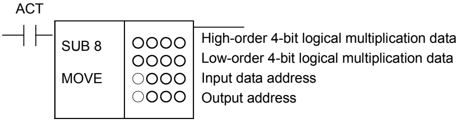
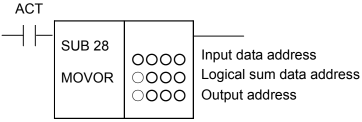
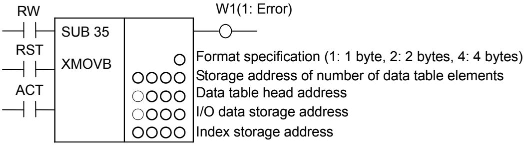
(5) Logical product transfer



(6) Data transfer after logical sum

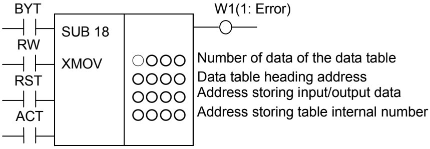


(7) Binary index modifier data transfer



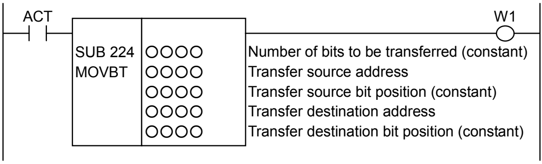
RW = 0: Read, 1: Write

(8) BCD index modifier data transfer



BYT = 0: Data stored in the data table, BCD in two digits long.
BYT = 1: Data stored in the data table, BCD in four digits long.
RW = 0: Read, 1: Write

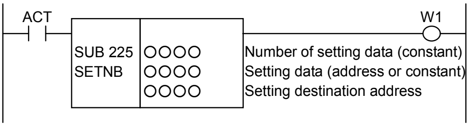
(9) Bit transfer



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(10) Data setting (1 bytes length, 2 bytes length, 4 bytes length)

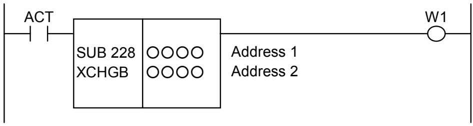
Example: SETNB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(11) Data exchang (1 bytes length, 2 bytes length, 4 bytes length)

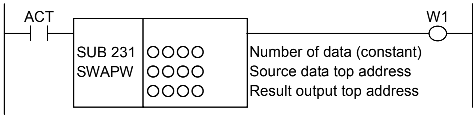
Example: XCHGB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

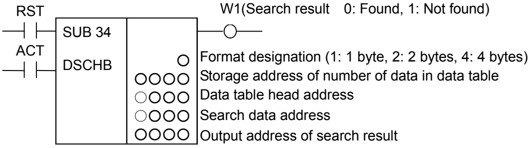
(12) Data swap (2 bytes length, 4 bytes length)

Example: SWAPW instruction (2 bytes length)

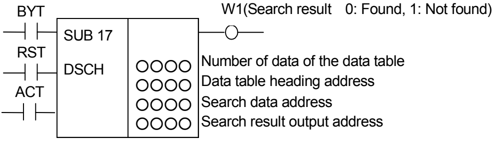


W1 may be omitted. Another functional instruction can be connected instead of a coil.

(13) Binary data search



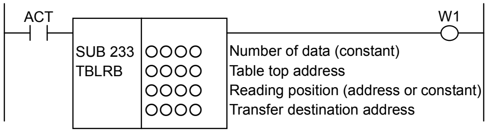
(14) BCD data search



10.2.2.4 Table data

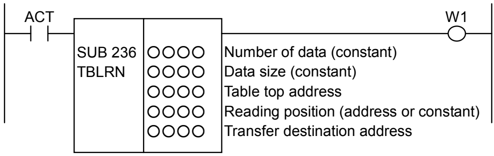
(1) Reading data from table (1 bytes length, 2 bytes length, 4 bytes length)

Example: TBLRB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

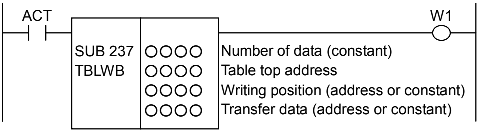
(2) Reading data from table (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

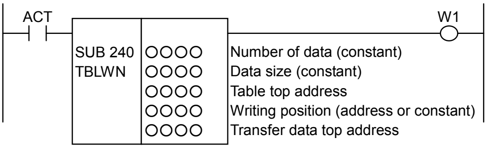
(3) Writing data to table (1 bytes length, 2 bytes length, 4 bytes length)

Example: TBLWB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

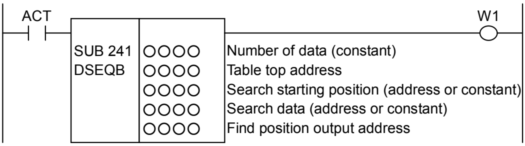
(4) Writing data to table (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(5) Searching data from table (=, ≠, >, <, ≧, ≦) (1 bytes length, 2 bytes length, 4 bytes length)

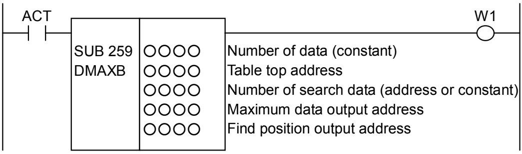
Example: DSEQB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(6) Maximum data (1 bytes length, 2 bytes length, 4 bytes length)

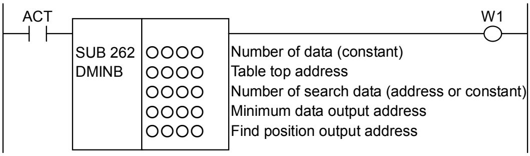
Example: DMAXB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(7) Minimum data (1 bytes length, 2 bytes length, 4 bytes length)

Example: DMINB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

10.2.2.5 Comparison

(1) 1 byte length signed binary comparison (=)

ACT — SUB 200 EQB — W1 (0: Mismatch, 1: Match)

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(2) 2 bytes length signed binary comparison (=)

ACT — SUB 201 EQW — W1 (0: Mismatch, 1: Match)

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(3) 4 bytes length signed binary comparison (=)

ACT — SUB 202 EQD — W1 (0: Mismatch, 1: Match)

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(4) 1 byte length signed binary comparison (≠)

ACT — SUB 203 NEB — W1 (0: Mismatch, 1: Match)

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(5) 2 bytes length signed binary comparison (≠)

ACT — SUB 204 NEW — W1 (0: Mismatch, 1: Match)

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(6) 4 bytes length signed binary comparison (≠)

ACT — SUB 205 NED — W1 (0: Mismatch, 1: Match)

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(7) 1 byte length signed binary comparison (>)

ACT — SUB 206 GTB — W1 (0: [Comparison data 1] ≤ [Comparison data 2]) (1: [Comparison data 1] > [Comparison data 2])

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(8) 2 bytes length signed binary comparison (>)

ACT — SUB 207 GTW — W1 (0: [Comparison data 1] ≤ [Comparison data 2]) (1: [Comparison data 1] > [Comparison data 2])

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(9) 4 bytes length signed binary comparison (>)

ACT — SUB 208 GTD — W1 (0: [Comparison data 1] ≤ [Comparison data 2]) (1: [Comparison data 1] > [Comparison data 2])

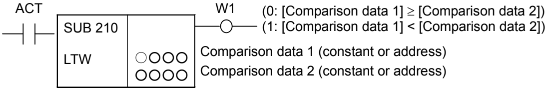
○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

(10) 1 byte length signed binary comparison (<)

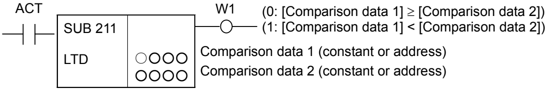
ACT — SUB 209 LTB — W1 (0: [Comparison data 1] ≥ [Comparison data 2]) (1: [Comparison data 1] < [Comparison data 2])

○○○○ Comparison data 1 (constant or address)
○○○○ Comparison data 2 (constant or address)

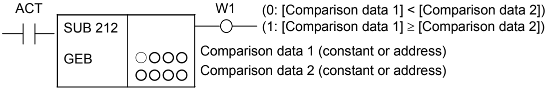
(11) 2 bytes length signed binary comparison (<)



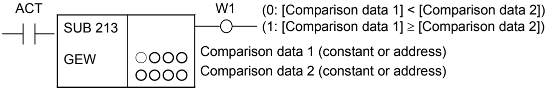
(12) 4 bytes length signed binary comparison (<)



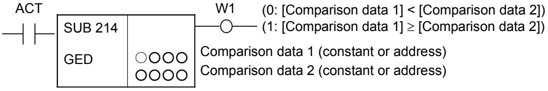
(13) 1 byte length signed binary comparison (≥)



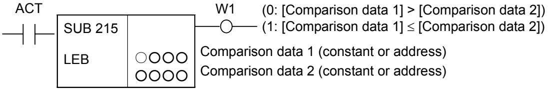
(14) 2 bytes length signed binary comparison (≥)



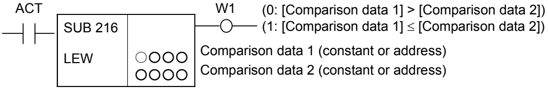
(15) 4 bytes length signed binary comparison (≥)



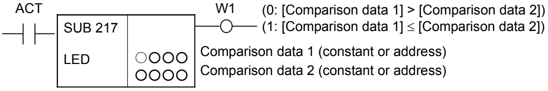
(16) 1 byte length signed binary comparison (≤)



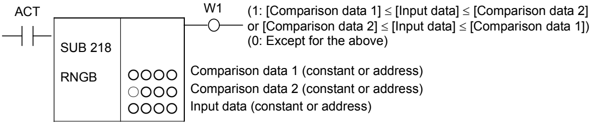
(17) 2 bytes length signed binary comparison (≤)



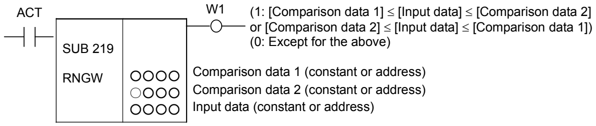
(18) 4 bytes length signed binary comparison (≤)



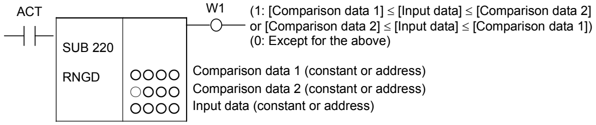
(19) 1 byte length signed binary comparison (range)



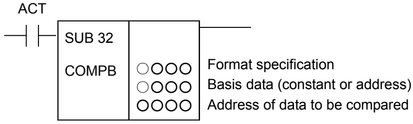
(20) 2 bytes length signed binary comparison (range)



(21) 4 bytes length signed binary comparison (range)



(22) Comparison between binary data

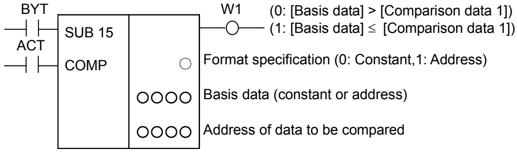


[Format specification]
X 0 0 Y
  X → 0: Input data is a constant, 1: Address
  Y → 1: 1 byte, 2: 2 bytes, 4: 4 bytes
[Operation output register]

	#7	#6	#5	#4	#3	#2	#1	#0
R9000			V				N	Z

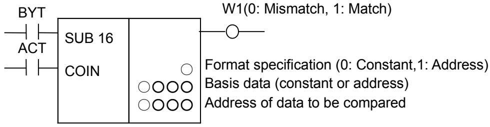
Basis data = Comparison data: V=0, N=0, Z=1
Basis data > Comparison data: V=0, N=0, Z=0
Basis data < Comparison data: V=0, N=1, Z=0
Overflow: V=1, N=0, Z=0

(23) Comparison between BCD data



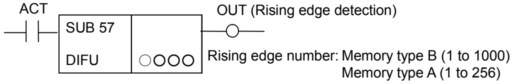
BYT = 0: Process data is BCD two digits long.
BYT = 1: Process data is BCD four digits long.

(24) Coincidence check



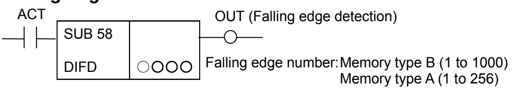
10.2.2.6 Bit operation

(1) Rising edge detection

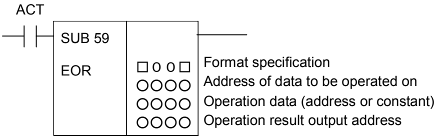


10

(2) Falling edge detection

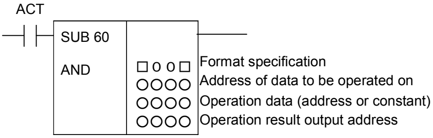


(3) Exclusive OR



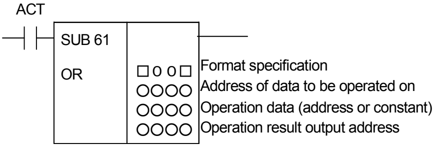
[Format specification]
X 0 0 Y
X → 0: Constant, 1: Address
Y → 1: 1 byte, 2: 2 bytes, 4: 4 bytes

(4) Logical AND



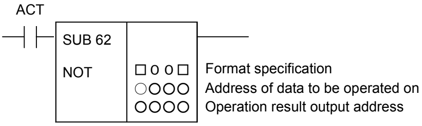
[Format specification]
X 0 0 Y
X → 0: Constant, 1: Address
Y → 1: 1 byte, 2: 2 bytes, 4: 4 bytes

(5) Logical OR



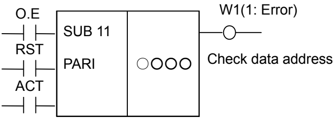
[Format specification]
X 0 0 Y
X → 0: Constant, 1: Address
Y → 1: 1 byte, 2: 2 bytes, 4: 4 bytes

(6) Logical NOT



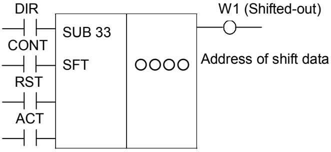
[Format specification]
X 0 0 Y
X → 0: Constant, 1: Address
Y → 1: 1 byte, 2: 2 bytes, 4: 4 bytes

(7) Parity check



O.E = 0: Odd-parity error check, 1: Even-parity error check

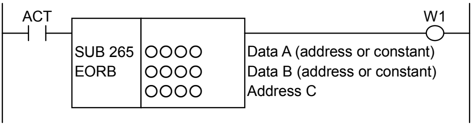
(8) Shift register



DIR = 0: Left-direction shift, 1: Right-direction shift
CONT = 0: Shift-in is "0", 1: Original bit value

(9) Exclusive OR (1 byte length, 2 bytes length, 4 bytes length)

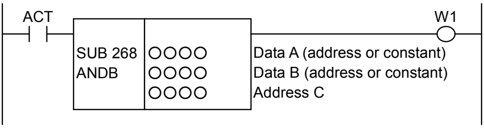
Example: EORB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(10) Logical AND (1 byte length, 2 bytes length, 4 bytes length)

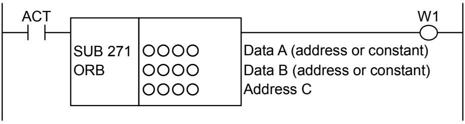
Example: ANDB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(11) Logical OR (1 byte length, 2 bytes length, 4 bytes length)

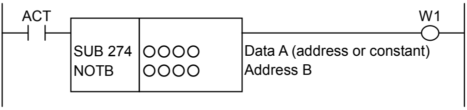
Example: ORB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(12) Logical NOT (1 byte length, 2 bytes length, 4 bytes length)

Example: NOTB instruction (1 byte length)

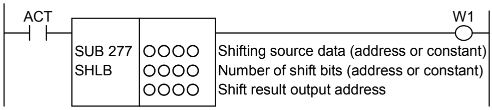


W1 may be omitted. Another functional instruction can be connected instead of a coil.

10

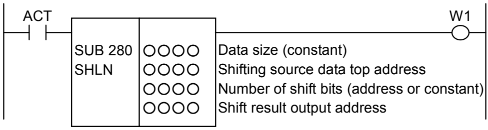
(13) Bit shift left (1 byte length, 2 bytes length, 4 bytes length)

Example: SHLB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

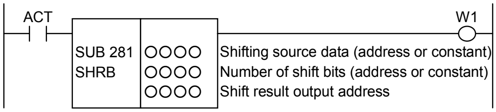
(14) Bit shift left (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

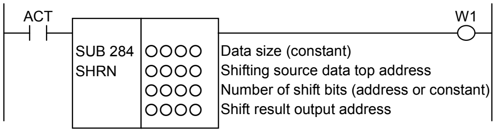
(15) Bit shift right (1 byte length, 2 bytes length, 4 bytes length)

Example: SHRB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

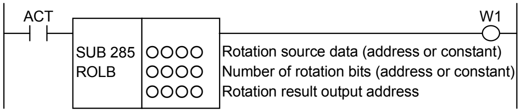
(16) Bit shift right (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

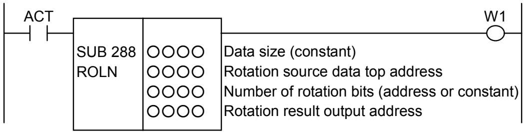
(17) Bit rotation left (1 byte length, 2 bytes length, 4 bytes length)

Example: ROLB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

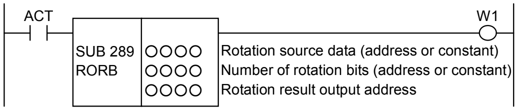
(18) Bit rotation left (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

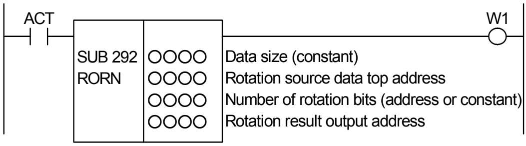
(19) Bit rotation right (1 byte length, 2 bytes length, 4 bytes length)

Example: RORB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

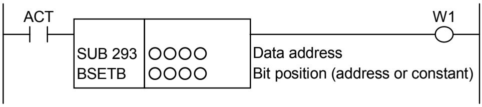
(20) Bit rotation right (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

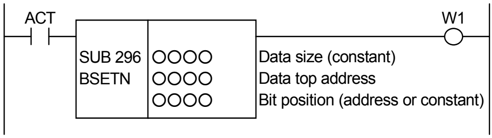
(21) Bit set (1 byte length, 2 bytes length, 4 bytes length)

Example: BSETB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

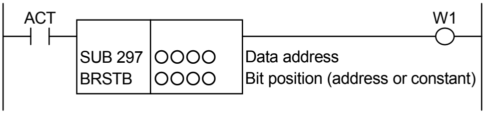
(22) Bit set (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

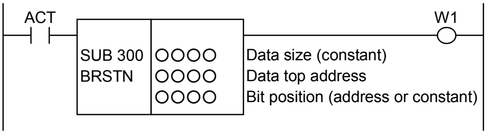
(23) Bit reset (1 byte length, 2 bytes length, 4 bytes length)

Example: BRSTB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

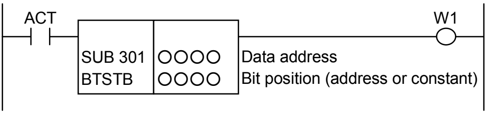
(24) Bit reset (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

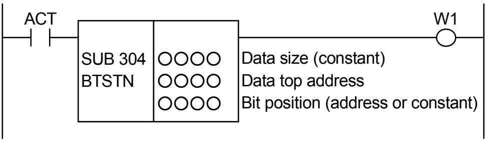
(25) Bit test (1 byte length, 2 bytes length, 4 bytes length)

Example: BTSTB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

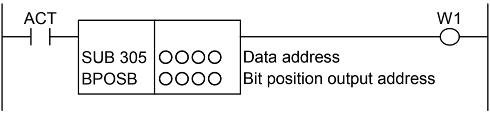
(26) Bit test (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

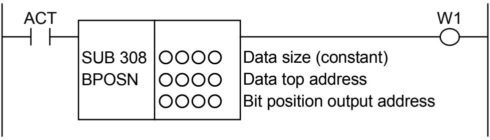
(27) Bit search (1 byte length, 2 bytes length, 4 bytes length)

Example: BPOSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

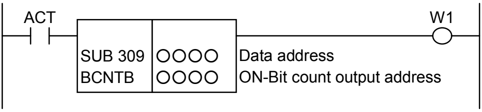
(28) Bit search (arbitrary bytes length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

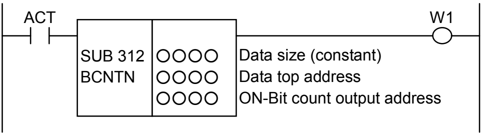
(29) Bit count (1 byte length, 2 bytes length, 4 bytes length)

Example: BCNTB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

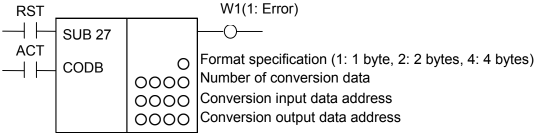
(30) Bit count (arbitrary bytes length)



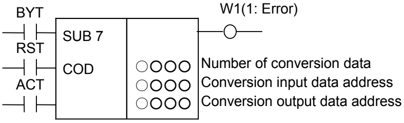
W1 may be omitted. Another functional instruction can be connected instead of a coil.

10.2.2.7 Code conversion

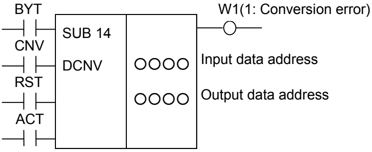
(1) Binary code conversion



(2) BCD code conversion

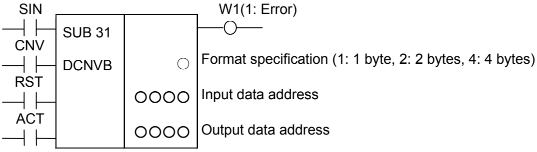


(3) Data conversion



CNV = 0: Converts binary-code into BCD-code.
1: Converts BCD-code into binary-code.

(4) Extended data conversion



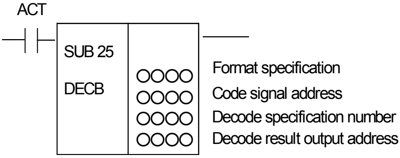
SIN = 0: Data (BCD code) to be input is positive.
1: Data (BCD code) to be input is negative.
CNV = 0: Convert binary data into BCD data
1: Convert BCD data into binary data.

[Operation output register]

	#7	#6	#5	#4	#3	#2	#1	#0
R9000			V				N	

V: Overflow, N : The result is negative.

(5) Binary decoding



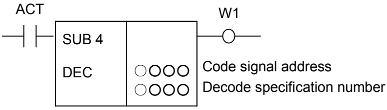
[Format specification]

- Basic specification
  1: 1 byte, 2: 2 bytes, 4: 4 bytes
- Extended specification
  0 n n x
    nn→ The multiple decoding number setting
      00-01:
      It decodes 8 continuous numbers.
      The decode result output address needs a memory of 1 byte length.

02-99:
It decodes multiple (8 × nn) continuous numbers.
The decode result output address needs a memory of nn bytes length.

x→ The byte length setting of code data
1: 1 byte length
2: 2 bytes length
4: 4 bytes length

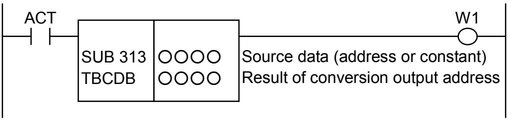
(6) BCD decoding



[Decode specification number]
XX YY
XX → Number specification: Specify the number to decode.
YY → Digit specification
01: Decodes the low one digit only.
10: Decodes the high one digit only.
11: Decodes two digits.

(7) Binary to BCD conversion (1 byte length, 2 bytes length, 4 bytes length)

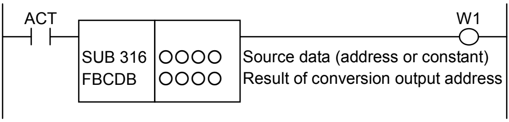
Example: TBCDB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(8) BCD to Binary conversion (1 byte length, 2 bytes length, 4 bytes length)

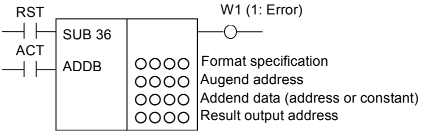
Example: FBCDB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

10.2.2.8 Operation instruction

(1) Binary addition



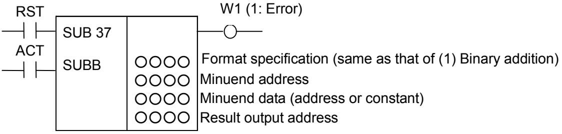
[Format specification]
X 0 0 Y
X → 0: Addition data is a constant, 1: Addition data is an address.
Y → 1: 1 byte, 2: 2 bytes, 4: 4 bytes

[Operation output register]

	#7	#6	#5	#4	#3	#2	#1	#0
R9000			V				N	Z

V: Overflow, Z: Zero, N: The sign is minus.

(2) Binary subtraction

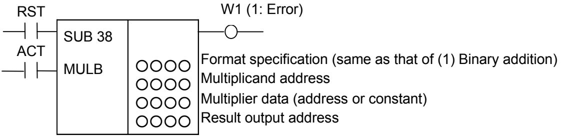


[Operation output register]

	#7	#6	#5	#4	#3	#2	#1	#0
R9000			V				N	Z

V: Overflow, Z: Zero, N: The sign is minus.

(3) Binary multiplication

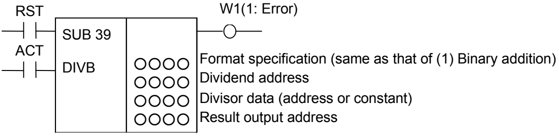


[Operation output register]

	#7	#6	#5	#4	#3	#2	#1	#0
R9000			V				N	Z

V: Overflow, Z: Zero, N: The sign is minus.

(4) Binary division



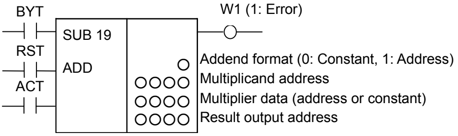
(Any remainder is output to R9002 to R9005.)

[Operation output register]

	#7	#6	#5	#4	#3	#2	#1	#0
R9000			V				N	Z

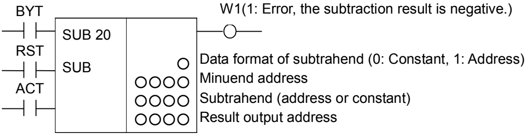
V: Overflow, Z: Zero, N: The sign is minus.

(5) BCD addition



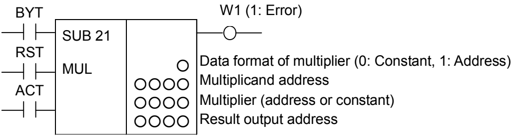
BYT = 0: BCD two digits long. 1: BCD four digits long

(6) BCD subtraction



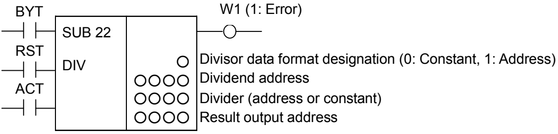
BYT = 0: BCD two digits long, 1: BCD four digits long

(7) BCD multiplication



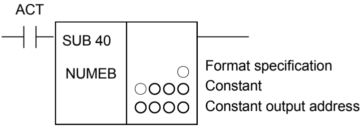
BYT = 0: BCD two digits long, 1: BCD four digits long

(8) BCD division



BYT = 0: BCD two digits long, 1: BCD four digits long

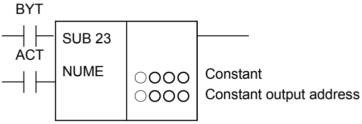
(9) Definition of binary constants



[Format specification]

- Basic specification
  1: 1 byte, 2: 2 bytes, 4: 4 bytes
- Extended specification
  0 n n x
  - nn→ Number of data in the array
    00-01:
    It defines constant at 1 memory.
    02-99:
    It defines constants at multiple (nn) memory.
  - x→ The byte length setting of constant
    1: 1 byte length
    2: 2 bytes length
    4: 4 bytes length

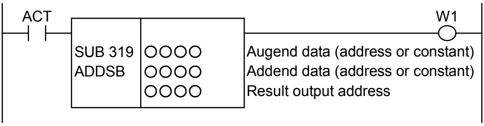
(10) Definition of BCD constants



BYT = 0: BCD two digits long, 1: BCD four digits long

(11) Addition (1 byte length, 2 bytes length, 4 bytes length)

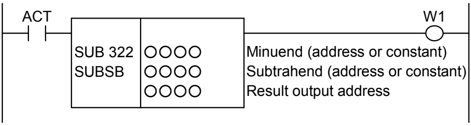
Example: ADDSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(12) Subtraction (1 byte length, 2 bytes length, 4 bytes length)

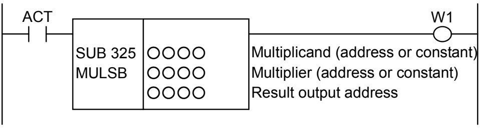
Example: SUBSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(13) Multiplication (1 byte length, 2 bytes length, 4 bytes length)

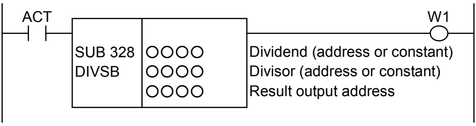
Example: MULSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(14) Division (1 byte length, 2 bytes length, 4 bytes length)

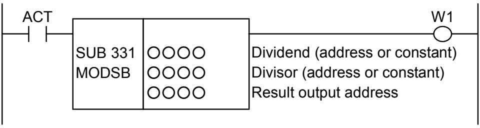
Example: DIVSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(15) Remainder (1 byte length, 2 bytes length, 4 bytes length)

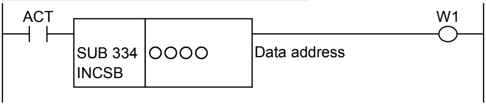
Example: MODSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(16) Increment (1 byte length, 2 bytes length, 4 bytes length)

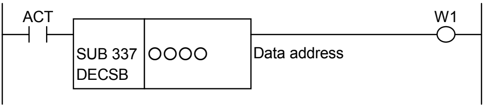
Example: INCSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(17) Decrement (1 byte length, 2 bytes length, 4 bytes length)

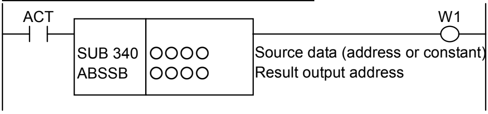
Example: DECSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(18) Absolute value (1 byte length, 2 bytes length, 4 bytes length)

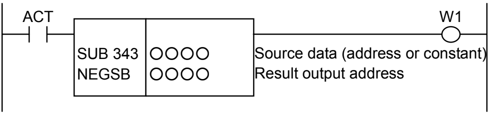
Example: ABSSB instruction (1 byte length)



W1 may be omitted. Another functional instruction can be connected instead of a coil.

(19) Sign inversion (1 byte length, 2 bytes length, 4 bytes length)

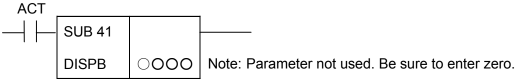
Example: NEGSB instruction (1 byte length)



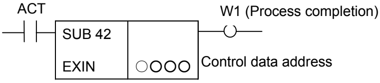
W1 may be omitted. Another functional instruction can be connected instead of a coil.

10.2.2.9 CNC functions

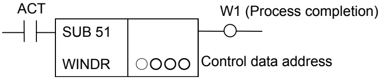
(1) Message display



(2) External data input



(3) Reading of CNC window data

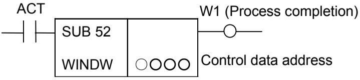


[Operation output register]

	#7	#6	#5	#4	#3	#2	#1	#0
R9000								E

E: WINDR error

(4) Writing of CNC window data

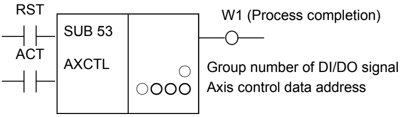


[Operation output register]

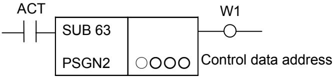
	#7	#6	#5	#4	#3	#2	#1	#0
R9000								E

E: WINDR error

(5) PMC axis control



(6) Position signal output 2

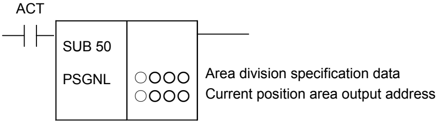


[Operation output register]

	#7	#6	#5	#4	#3	#2	#1	#0
R9000								E

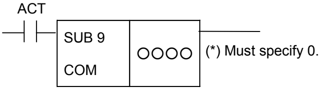
E: Invalid path or axis number

(7) Position signal output

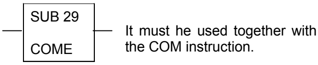


10.2.2.10 Program control

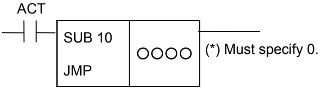
(1) Common line control



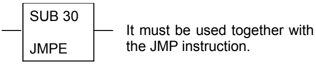
(2) Common line control end



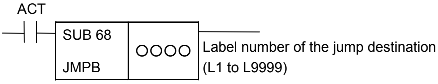
(3) Jump



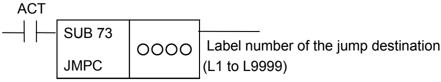
(4) Jump end



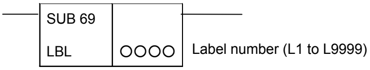
(5) Label jump 1



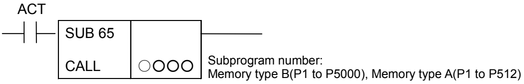
(6) Label jump 2



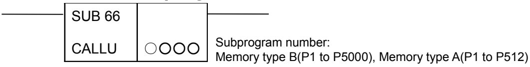
(7) Label



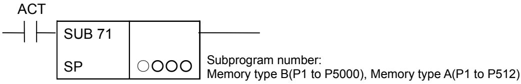
(8) Conditional subprogram call



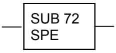
(9) Unconditional subprogram call



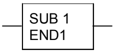
(10) Subprogram



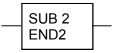
(11) End of a subprogram



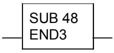
(12) End of a 1st level program



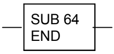
(13) End of a 2nd level program



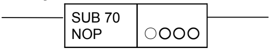
(14) End of a 3rd level program



(15) End of a ladder program

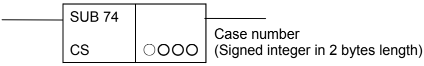


(16) No operation



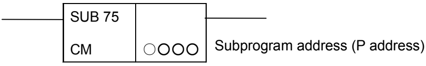
(17) Case call

The combination of one CS, one or more CM and one CE is used to construct a case call block.



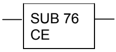
(18) Sub program call in case call

The combination of one CS, one or more CM and one CE is used to construct a case call block.



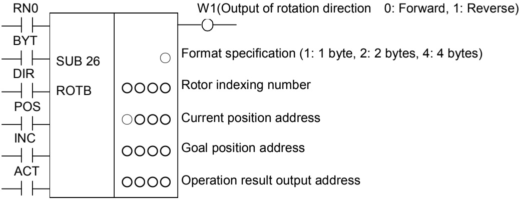
(19) End of case call

The combination of one CS, one or more CM and one CE is used to construct a case call block.

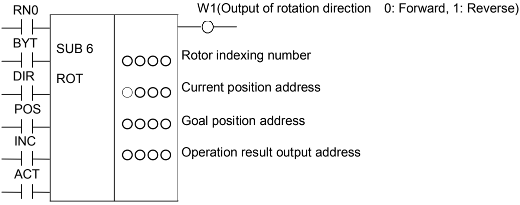


10.2.2.11 Rotation control

(1) Binary rotation control



(2) BCD rotation control



10.2.3 Functional Instructions (Arranged in Sequence of SUB No.)

Table 10.2.3 Functional instructions for PMCs

○ : Usable
● : Extended PMC Ladder Instruction Function
Δ : Executed as NOP instruction (Note2)
× : Unusable

Instruction name	SUB No.	Processing	1st to 3rd PMCs	DCS PMC (Note1)
END1	1	End of 1st-level program	○	○
END2	2	End of 2-level program	○	○
TMR	3	Timer processing	○	○
DEC	4	BCD decoding	○	○
CTR	5	Counter processing	○	○
ROT	6	BCD rotation control	○	○
COD	7	BCD code conversion	○	○
MOVE	8	Data transfer after logical product	○	○
COM	9	Common line control	○	○
JMP	10	Jump	○	○
PARI	11	Parity check	○	○
DCNV	14	Data conversion	○	○
COMP	15	BCD comparison	○	○
COIN	16	Coincidence check	○	○
DSCH	17	BCD data search	○	○
XMOV	18	BCD index modification data transfer	○	○
ADD	19	BCD addition	○	○
SUB	20	BCD subtraction	○	○
MUL	21	BCD multiplication	○	○
DIV	22	BCD division	○	○
NUME	23	BCD constant definition	○	○
TMRB	24	Fixed-timer processing	○	○
DECB	25	Binary decoding	○	○

Instruction name	SUB No.	Processing	1st to 3rd PMCs	DCS PMC (Note1)
ROTB	26	Binary rotation control	○	○
CODB	27	Binary code conversion	○	○
MOVOR	28	Data transfer after logical sum	○	○
COME	29	End of common line control	○	○
JMPE	30	End of jump	○	○
DCNVB	31	Extended data conversion	○	○
COMPB	32	Binary comparison	○	○
SFT	33	Shift register	○	○
DSCHB	34	Binary data search	○	○
XMOVB	35	Index modification binary data transfer	○	○
ADDB	36	Binary addition	○	○
SUBB	37	Binary subtraction	○	○
MULB	38	Binary multiplication	○	○
DIVB	39	Binary division	○	○
NUMEB	40	Binary constant definition	○	○
DISPB	41	Message display	○	Δ
EXIN	42	External data input	○	Δ
MOVB	43	1-byte transfer	○	○
MOVW	44	2-byte transfer	○	○
MOVN	45	Transfer of arbitrary number of bytes	○	○
SPCNT	46	Spindle control	Δ	Δ
MOVD	47	4-byte transfer	○	○
END3	48	End of 3rd-level program	○ (Note3)	Δ (Note4)
DISP	49	Message display	Δ	Δ
PSGNL	50	Position signal output	○	Δ
WINDR	51	CNC window data read	○	Δ
WINDW	52	CNC window data write	○	Δ
AXCTL	53	PMC axis control	○	Δ
TMRC	54	Timer processing	○	○
CTRC	55	Counter processing	○	○
CTRB	56	Counter processing	○	○
DIFU	57	Rising-edge detection	○	○
DIFD	58	Falling-edge detection	○	○
EOR	59	Exclusive OR	○	○
AND	60	Logical AND	○	○
OR	61	Logical OR	○	○
NOT	62	Logical NOT	○	○
PSGN2	63	Position signal output 2	○	Δ
END	64	End of ladder program	○	○
CALL	65	Conditional subprogram call	○	○
CALLU	66	Unconditional subprogram call	○	○
JMPB	68	Label jump 1	○	○
LBL	69	Label	○	○
NOP	70	No operation	○	○
SP	71	Subprogram	○	○
SPE	72	End of subprogram	○	○
JMPC	73	Label jump 2	○	○
CS	74	Case call	○	○
CM	75	Sub program call in case call	○	○
CE	76	End of case call	○	○
TMRBF	77	Fixed OFF delay timer	○	○
FNC90	90	Arbitrary-function instruction 1	Δ	Δ
FNC91	91	Arbitrary-function instruction 2	Δ	Δ
FNC92	92	Arbitrary-function instruction 3	Δ	Δ
FNC93	93	Arbitrary-function instruction 4	Δ	Δ
FNC94	94	Arbitrary-function instruction 5	Δ	Δ
FNC95	95	Arbitrary-function instruction 6	Δ	Δ
FNC96	96	Arbitrary-function instruction 7	Δ	Δ

Instruction name	SUB No.	Processing	1st to 3rd PMCs	DCS PMC (Note1)
FNC97	97	Arbitrary-function instruction 8	Δ	Δ
MMCWR	98	MMC window data read	Δ	Δ
MMCWW	99	MMC window data write	Δ	Δ
EQB	200	1 byte length, signed binary comparison (=)	○	○
EQW	201	2 bytes length, signed binary comparison (=)	○	○
EQD	202	4 bytes length, signed binary comparison (=)	○	○
NEB	203	1 byte length, signed binary comparison (≠)	○	○
NEW	204	2 bytes length, signed binary comparison (≠)	○	○
NED	205	4 bytes length, signed binary comparison (≠)	○	○
GTB	206	1 byte length, signed binary comparison (>)	○	○
GTW	207	2 bytes length, signed binary comparison (>)	○	○
GTD	208	4 bytes length, signed binary comparison (>)	○	○
LTB	209	1 byte length, signed binary comparison (<)	○	○
LTW	210	2 bytes length, signed binary comparison (<)	○	○
LTD	211	4 bytes length, signed binary comparison (<)	○	○
GEB	212	1 byte length, signed binary comparison (≧)	○	○
GEW	213	2 bytes length, signed binary comparison (≧)	○	○
GED	214	4 bytes length, signed binary comparison (≧)	○	○
LEB	215	1 byte length, signed binary comparison (≦)	○	○
LEW	216	2 bytes length, signed binary comparison (≦)	○	○
LED	217	4 bytes length, signed binary comparison (≦)	○	○
RNGB	218	1 byte length, signed binary comparison (range)	○	○
RNGW	219	2 bytes length, signed binary comparison (range)	○	○
RNGD	220	4 bytes length, signed binary comparison (range)	○	○
TMRST	221	Stop watch timer (1 ms accuracy)	●	●
TMRSS	222	Stop watch timer (1 sec accuracy)	●	●
CTRD	223	Counter processing (4 byte length)	●	●
MOVBT	224	Bit transfer	●	●
SETNB	225	Data setting (1 byte length)	●	●
SETNW	226	Data setting (2 bytes length)	●	●
SETND	227	Data setting (4 bytes length)	●	●
XCHGB	228	Data exchange (1 byte length)	●	●
XCHGW	229	Data exchange (2 bytes length)	●	●
XCHGD	230	Data exchange (4 bytes length)	●	●
SWAPW	231	Data swap (2 bytes length)	●	●
SWAPD	232	Data swap (4 bytes length)	●	●
TBLRB	233	Reading data from table (1 byte length)	●	●
TBLRW	234	Reading data from table (2 bytes length)	●	●
TBLRD	235	Reading data from table (4 bytes length)	●	●
TBLRN	236	Reading data from table (arbitrary bytes length)	●	●
TBLWB	237	Writing data to table (1 byte length)	●	●
TBLWW	238	Writing data to table (2 bytes length)	●	●
TBLWD	239	Writing data to table (4 bytes length)	●	●
TBLWN	240	Writing data to table (arbitrary bytes length)	●	●
DSEQB	241	Searching data from table (=) (1 byte length)	●	●
DSEQW	242	Searching data from table (=) (2 bytes length)	●	●
DSEQD	243	Searching data from table (=) (4 bytes length)	●	●
DSNEB	244	Searching data from table (≠) (1 byte length)	●	●
DSNEW	245	Searching data from table (≠) (2 bytes length)	●	●
DSNED	246	Searching data from table (≠) (4 bytes length)	●	●
DSGTB	247	Searching data from table (>) (1 byte length)	●	●
DSGTW	248	Searching data from table (>) (2 bytes length)	●	●
DSGTD	249	Searching data from table (>) (4 bytes length)	●	●
DSLTB	250	Searching data from table (<) (1 byte length)	●	●
DSLTW	251	Searching data from table (<) (2 bytes length)	●	●
DSLTD	252	Searching data from table (<) (4 bytes length)	●	●
DSGEB	253	Searching data from table (≧) (1 byte length)	●	●
DSGEW	254	Searching data from table (≧) (2 bytes length)	●	●
DSGED	255	Searching data from table (≧) (4 bytes length)	●	●

Instruction name	SUB No.	Processing	1st to 3rd PMCs	DCS PMC (Note1)
DSLEB	256	Searching data from table (≦) (1 byte length)	●	●
DSLEW	257	Searching data from table (≦) (2 bytes length)	●	●
DSLED	258	Searching data from table (≦) (4 bytes length)	●	●
DMAXB	259	Maximum data (1 byte length)	●	●
DMAXW	260	Maximum data (2 bytes length)	●	●
DMAXD	261	Maximum data (4 bytes length)	●	●
DMINB	262	Minimum data (1 byte length)	●	●
DMINW	263	Minimum data (2 bytes length)	●	●
DMIND	264	Minimum data (4 bytes length)	●	●
EORB	265	Exclusive OR (1 byte length)	●	●
EORW	266	Exclusive OR (2 bytes length)	●	●
EORD	267	Exclusive OR (4 bytes length)	●	●
ANDB	268	Logical AND (1 byte length)	●	●
ANDW	269	Logical AND (2 bytes length)	●	●
ANDD	270	Logical AND (4 bytes length)	●	●
ORB	271	Logical OR (1 byte length)	●	●
ORW	272	Logical OR (2 bytes length)	●	●
ORD	273	Logical OR (4 bytes length)	●	●
NOTB	274	Logical NOT (1 byte length)	●	●
NOTS	275	Logical NOT (2 bytes length)	●	●
NOTD	276	Logical NOT (4 bytes length)	●	●
SHLB	277	Bit shift left (1 byte length)	●	●
SHLW	278	Bit shift left (2 bytes length)	●	●
SHLD	279	Bit shift left (4 bytes length)	●	●
SHLN	280	Bit shift left (arbitrary bytes length)	●	●
SHRB	281	Bit shift right (1 byte length)	●	●
SHRW	282	Bit shift right (2 bytes length)	●	●
SHRD	283	Bit shift right (4 bytes length)	●	●
SHRN	284	Bit shift right (arbitrary bytes length)	●	●
ROLB	285	Bit rotation left (1 byte length)	●	●
ROLW	286	Bit rotation left (2 bytes length)	●	●
ROLD	287	Bit rotation left (4 bytes length)	●	●
ROLN	288	Bit rotation left (arbitrary bytes length)	●	●
RORB	289	Bit rotation right (1 byte length)	●	●
RORW	290	Bit rotation right (2 bytes length)	●	●
RORD	291	Bit rotation right (4 bytes length)	●	●
RORN	292	Bit rotation right (arbitrary bytes length)	●	●
BSETB	293	Bit set (1 byte length)	●	●
BSETW	294	Bit set (2 bytes length)	●	●
BSETD	295	Bit set (4 bytes length)	●	●
BSETN	296	Bit set (arbitrary bytes length)	●	●
BRSTB	297	Bit reset (1 byte length)	●	●
BRSTW	298	Bit reset (2 bytes length)	●	●
BRSTD	299	Bit reset (4 bytes length)	●	●
BRSTN	300	Bit reset (arbitrary bytes length)	●	●
BTSTB	301	Bit test (1 byte length)	●	●
BTSTW	302	Bit test (2 bytes length)	●	●
BTSTD	303	Bit test (4 bytes length)	●	●
BTSTN	304	Bit test (arbitrary bytes length)	●	●
BPOSB	305	Bit search (1 byte length)	●	●
BPOSW	306	Bit search (2 bytes length)	●	●
BPOSD	307	Bit search (4 bytes length)	●	●
BPOSN	308	Bit search (arbitrary bytes length)	●	●
BCNTB	309	Bit count (1 byte length)	●	●
BCNTW	310	Bit count (2 bytes length)	●	●
BCNTD	311	Bit count (4 bytes length)	●	●
BCNTN	312	Bit count (arbitrary bytes length)	●	●
TBCDB	313	Binary to BCD conversion (1 byte length)	●	●
TBCDW	314	Binary to BCD conversion (2 bytes length)	●	●
TBCDD	315	Binary to BCD conversion (4 bytes length)	●	●

Instruction name	SUB No.	Processing	1st to 3rd PMCs	DCS PMC (Note1)
FBCDB	316	BCD to Binary conversion (1 byte length)	●	●
FBCDW	317	BCD to Binary conversion (2 bytes length)	●	●
FBCDD	318	BCD to Binary conversion (4 bytes length)	●	●
ADDSB	319	Addition (1 byte length)	●	●
ADDSW	320	Addition (2 bytes length)	●	●
ADDSD	321	Addition (4 bytes length)	●	●
SUBSB	322	Subtraction (1 byte length)	●	●
SUBSW	323	Subtraction (2 bytes length)	●	●
SUBSD	324	Subtraction (4 bytes length)	●	●
MULSB	325	Multiplication (1 byte length)	●	●
MULSW	326	Multiplication (2 bytes length)	●	●
MULSD	327	Multiplication (4 bytes length)	●	●
DIVSB	328	Division (1 byte length)	●	●
DIVSW	329	Division (2 bytes length)	●	●
DIVSD	330	Division (4 bytes length)	●	●
MODSB	331	Remainder (1 byte length)	●	●
MODSW	332	Remainder (2 bytes length)	●	●
MODSD	333	Remainder (4 bytes length)	●	●
INCSB	334	Increment (1 byte length)	●	●
INCSW	335	Increment (2 bytes length)	●	●
INCSD	336	Increment (4 bytes length)	●	●
DECSB	337	Decrement (1 byte length)	●	●
DECSW	338	Decrement (2 bytes length)	●	●
DECSD	339	Decrement (4 bytes length)	●	●
ABSSB	340	Absolute value (1 byte length)	●	●
ABSSW	341	Absolute value (2 bytes length)	●	●
ABSSD	342	Absolute value (4 bytes length)	●	●
NEGSB	343	Sign inversion (1 byte length)	●	●
NEGSW	344	Sign inversion (2 bytes length)	●	●
NEGSD	345	Sign inversion (4 bytes length)	●	●

NOTE

1. This PMC is used for the dual check safety function (option).
2. These instructions are intended to maintain source-level compatibility with programs for conventional models. They are treated as a NOP instruction (instruction that performs no operation).
3. The 3rd level sequence part is available for the compatibility with programs for conventional models. However the execution cycle period of time for processing the 3rd level sequence part is not guaranteed.
4. These instructions are intended to maintain source-level compatibility with programs for other models. A program can be created on level 3, but it is not executed.

10.3 I/O MODULE ASSIGNMENT NAMES (I/O Link)

Table 10.3 Assignment name

I/O device name	Assignment name (actual module name)		Occupied address
Input modules for I/O Unit-MODEL A	ID32A	(AID32A1)	4 bytes for input
	ID32B	(AID32B1)	4 bytes for input
	ID16C	(AID16C)	2 bytes for input
	ID16D	(AID16D)	2 bytes for input
	ID32E	(AID32E1)	4 bytes for input
	ID32E	(AID32E2)	4 bytes for input
	ID32F	(AID32F1)	4 bytes for input
	ID32F	(AID32F2)	4 bytes for input
	IA16G	(AIA16G)	2 bytes for input
	AD04A	(AAD04A)	8 bytes for input
	ES01A	(AES01A)	1 byte for input
	ID08F	(AID08F)	1 byte for input
Output modules for I/O Unit-MODEL A	OD32A	(AOD32A1)	4 bytes for output
	OD08C	(AOD08C)	1 byte for output
	OD08D	(AOD08D)	1 byte for output
	OD16C	(AOD16C)	2 bytes for output
	OD16D	(AOD16D)	2 bytes for output
	OD32C	(AOD32C1)	4 bytes for output
	OD32C	(AOD32C2)	4 bytes for output
	OD32D	(AOD32D1)	4 bytes for output
	OD32D	(AOD32D2)	4 bytes for output
	OA05E	(AOA05E)	1 byte for output
	OA08E	(AOA08E)	1 byte for output
	OA12F	(AOA12F)	2 bytes for output
	OR08G	(AOR08G)	1 byte for output
	OR16G	(AOR16G)	2 bytes for output
	DA02A	(ADA02A)	4 bytes for output
	DA02A	(ADA02B)	4 bytes for output
	BK01A	(ABK01A)	1 byte for output
	OA08K	(AOA08K)	1 byte for output
	OD08L	(AOD08L)	1 byte for output
	OD16D	(AOD16D2)	2 bytes for output
	OR08I	(AOR08I3)	1 byte for output
	OR08J	(AOR08J3)	1 byte for output
Output modules with an output protection function for I/O Unit-MODEL A	/2	(AOD16DP)	2 bytes for output
	/1	(AOD08DP)	1 byte for input
	/1	(AOD08DP)	1 byte for output
Input/output module for I/O Unit-MODEL A	IO24I	(AIO40A)	3 bytes for input
	IO16O	(AIO40A)	2 bytes for output
FANUC CNC SYSTEM FANUC Power Mate	FS04A		4 bytes for input 4 bytes for output
	FS08A		8 bytes for input 8 bytes for output
	OC02I		16 bytes for input
	OC02O		16 bytes for output
	OC03I		32 bytes for input
	OC03O		32 bytes for output

Table 10.3 Assignment name

I/O device name	Assignment name (actual module name)	Occupied address
FANUC CNC SYSTEM FANUC Power Mate	/n	12 bytes for input 12 bytes for output
		16 bytes for input 16 bytes for output
		20 bytes for input 20 bytes for output
		24 bytes for input 24 bytes for output
		28 bytes for input 28 bytes for output
		32 bytes for input 32 bytes for output
I/O Link βi amplifier	OC02I	16 bytes for input
	OC02O	16 bytes for output
Connection unit 1	CN01I	12 bytes for input
	CN01O	8 bytes for output
Connection unit 2	CN02I	24 bytes for input
	CN02O	16 bytes for output
Operator's panel connection unit A	/8	8 bytes for input
	/4	4 bytes for output
Operator's panel connection unit B	CN01I	12 bytes for input
	CN01O	8 bytes for output
Machine operator's panel interface unit	OC02I	16 bytes for input
	OC02O	16 bytes for output
	OC03I	32 bytes for input
	OC03O	32 bytes for output
Modules for I/O Unit-MODEL B	#n	n bytes for input
		n bytes for output
	##	4 bytes for input
I/O Link connection unit	/n	1 to 8 bytes for input 1 to 8 bytes for output
		12 bytes for input 12 bytes for output
		16 bytes for input 16 bytes for output
		20 bytes for input 20 bytes for output
		24 bytes for input 24 bytes for output
		28 bytes for input 28 bytes for output
		32 bytes for input 32 bytes for output
	OC02I	16 bytes for input
	OC02O	16 bytes for output
	OC03I	32 bytes for input
	OC03O	32 bytes for output

Table 10.3 Assignment name

I/O device name	Assignment name (actual module name)	Occupied address
Distribution I/O connection panel I/O modules	CM03I	3 bytes for input
	CM06I	6 bytes for input
	CM09I	9 bytes for input
	CM12I	12 bytes for input
	CM13I	13 bytes for input
	CM14I	14 bytes for input
	CM15I	15 bytes for input
	CM16I	16 bytes for input
	CM02O	2 bytes for output
	CM04O	4 bytes for output
	CM06O	6 bytes for output
	CM08O	8 bytes for output
External I/O cards A and D for the Power Mate	/6	6 bytes for input
	/4	4 bytes for output
External I/O cards B and E for the Power Mate	OC01I	12 bytes for input
	OC01O	8 bytes for output
External I/O cards C and F for the Power Mate	/3	3 bytes for input
	/2	2 bytes for output
Handy machine operator's panel	#2	2 bytes for input
		2 bytes for output
	##	4 bytes for input
AS-i converter unit	OC03I	32 bytes for input
	OC03O	32 bytes for output

11.1 OVERVIEW

The configuration of this chapter is as follows:

- Section 11.2, “ETHERNET MOUNTING LOCATIONS”
  The mounting locations of the Embedded Ethernet and Ethernet optional board are described.
- Section 11.3, “LIST OF ETHERNET-RELATED SCREENS”
  A list of screen operation procedures for the Embedded Ethernet and Ethernet optional board is provided.
- Section 11.4, “EMBEDDED ETHERNET”
  The parameter setting, operation, and maintenance screens of the Embedded Ethernet are described. (The description is based on the common embedded port and PCMCIA card.)
- Section 11.5, “ETHERNET OPTION BOARD”
  The parameter setting, operation, and maintenance screens of the Fast Ethernet board/Fast Data Server are described.
- Section 11.6, “TROUBLESHOOTING”
  The check Items required when Ethernet trouble occurs are described.

11.2 ETHERNET MOUNTING LOCATIONS

See Chapter 6, “HARDWARE”.

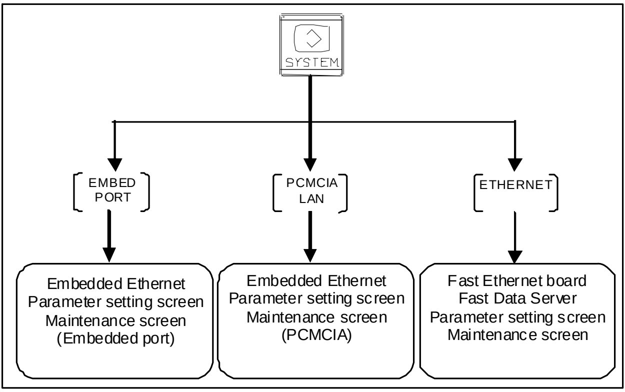
NOTE

1 Up to three Ethernet optional boards can be mounted.
Up to one Ethernet optional board operates the Ethernet function and others operate the FL-net function or other Industrial Ethernet function, however. Use parameters to set each function to be operated by each hardware component.

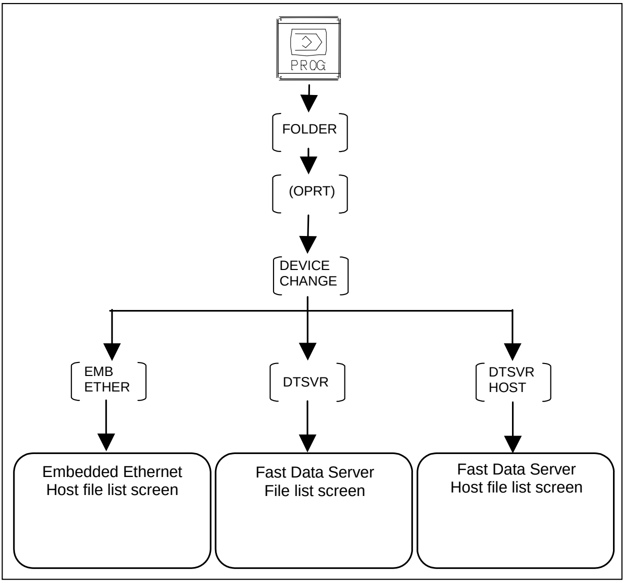
2 The Embedded Ethernet and Ethernet optional board can be used simultaneously.

11.3 LIST OF ETHERNET-RELATED SCREENS

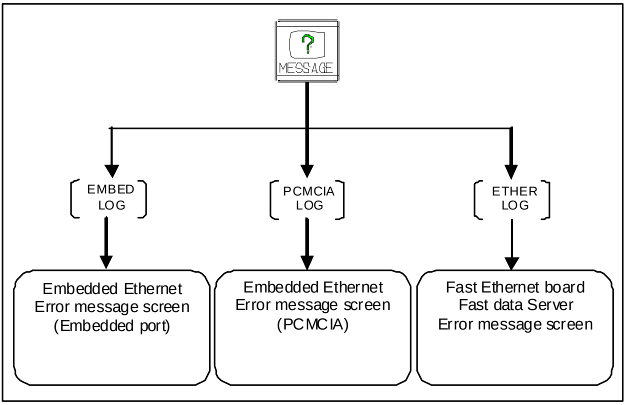
11.3.1 Setting and Maintenance (SYSTEM key)



11.3.2 File Operation (PROG Key)



11.3.3 Error Message (MESSAGE Key)

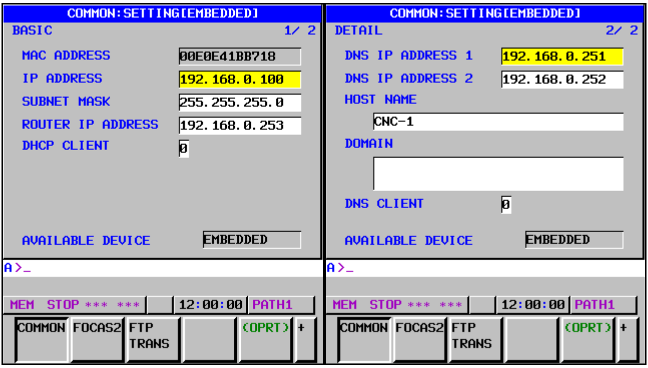


11.4 EMBEDDED ETHERNET

11.4.1 Parameter Setting Screen

The Embedded Ethernet parameters can be set separately for the embedded port and for the PCMCIA card.
The parameters are divided according to function, and you can switch between the parameter screens by using the soft key.

(1) Common parameter



(a) Common display items

Item	Description
MAC ADDRESS	Embedded Ethernet MAC address
AVAILABLE DEVICE	Enabled device of the Embedded Ethernet. Either the embedded port or the PCMCIA card is displayed.

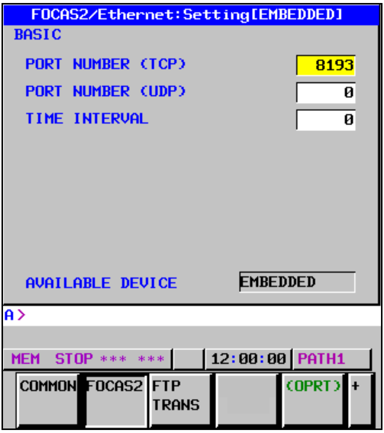
(b) Common setting items

Item	Description
IP ADDRESS	Specify the IP address of the Embedded Ethernet. (Example of specification format: "192.168.0.100")
SUBNET MASK	Specify a mask address for the IP addresses of the network. (Example of specification format: "255.255.255.0")
ROUTER IP ADDRESS	Specify the IP address of the router. Specify this item when the network contains a router. (Example of specification format: "192.168.0.253”)
DHCP CLIENT	The value of parameter No.14880#6(DHC) related to the DHCP client function is displayed, and the setting is also possible. Refer to “Ethernet –related NC parameters”.
DNS IP ADDRESS 1,2	Up to two DNS IP addresses can be specified. The CNC searches for the DNS server using DNS IP addresses 1 and 2 in that order
HOST NAME	Enter a desired CNC host name. If the DHCP server interacts with the DNS server, this host name is posted to the DNS server. If no host name is set, "NC-<MAC address>" is automatically set. Example of host name automatically set: NC-00E0E4004CF9
DOMAIN	Specify the DOMAIN of the cnc when DNS function is used and the CNC is joined to a domain.

Item	Description
DNS CLIENT	The value of parameter No.14880#5(DNS) related to the DNS client function is displayed, and the setting is also possible. Refer to “Ethernet –related NC parameters”.

NOTE
The parameter for an IP address specified by entering characters can be cleared by entering spaces.

(2) FOCAS2/Ethernet parameter



(a) FOCAS2/Ethernet setting items

Item	Description
PORT NUMBER (TCP)	Specify a port number to be used with the FOCAS2/Ethernet function or CNC Screen function. The valid input range is 5001 to 65535.
PORT NUMBER (UDP)	Set this item to 0.
TIME INTERVAL	Set this item to 0.

Initial setting of the PCMCIA card

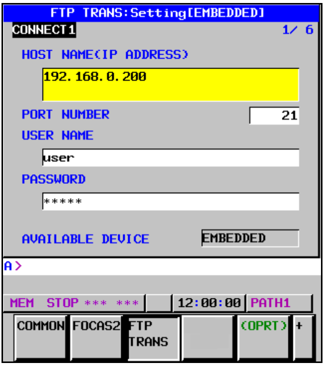
The PCMCIA card is factory-set to the following standard setting values, for ease of connection with a SERVO GUIDE or FANUC LADDER-III.

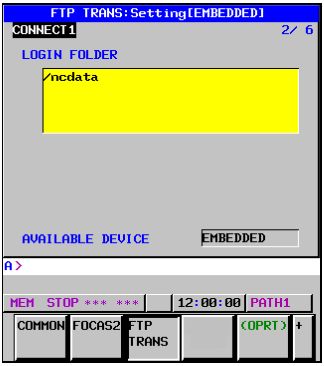
IP ADDRESS	: 192.168.1.1
SUBNET MASK	: 255.255.255.0
ROUTER IP ADDRESS	: None
PORT NUMBER (TCP)	: 8193
PORT NUMBER (UDP)	: 0
TIME INTERVAL	: 0

If a specified IP address is changed to a blank (space), the specified setting is reset to the standard setting value.
The embedded port does not have a standard setting value.

11

(3) FTP file transfer parameter





Settings for three host computers can be made.

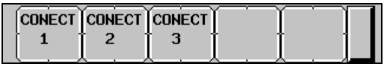
Item	Description
HOST NAME	Specify the IP address of the host computer. (Example of specification format: "192.168.0.200”)
PORT NUMBER	Specify a port number to be used with the FTP file transfer function. An FTP session is used, so that "21" is to be specified usually.
USERNAME	Specify a user name to be used for logging in to the host computer with FTP. (Up to 31 characters can be specified.)
PASSWORD	Specify a password for the user name specified above. (Up to 31 characters can be specified.) Be sure to set a password.
LOGIN FOLDER	Specify a work folder to be used when logging in to the host computer. (Up to 127 characters can be specified.) If nothing is specified, the home folder specified in the host computer becomes the log-in folder.

Changing the host computer to be connected for the FTP file transfer function

Procedure

Select a destination.

1 Pressing the soft key [(OPRT)] causes soft key [HOST SELECT] to be displayed. Pressing this soft key causes soft keys [CONECT 1], [CONECT 2], and [CONECT 3] to be displayed.



2 Depending on the host computer to be connected, press soft key [CONECT 1], [CONECT 2], or [CONECT 3]. Destination 1, 2, or 3 is highlighted in the screen title field. The computer corresponding to the highlighted destination is selected as the target computer to be connected.

[Example] When destination 1 is selected

(4) Device change

Each time you press the soft key [EMB/PCMCIA], you switch between effective devices.

(5) Ethernet-related NC parameters

Among the Ethernet parameters, the parameters for detailed setting are set using NC parameters.
Among the Ethernet parameters, the parameters for normal setting are set using the dedicated setting screens of (1) to (3).

0020	I/O CHANNEL : Input/output device selection

[Data type] Byte
[Valid data range] 0 to 35
9 : Embedded Ethernet FTP file transfer is selected as an I/O device.

0024	Setting of communication with the PMC ladder development tool

[Data type] Byte
[Valid data range]
10: The high-speed interface (Ethernet) is used for PMC online editing.

	#7	#6	#5	#4	#3	#2	#1	#0
14880		DHC	DNS	UNM			PCH	ETH

[Data type] Bit

ETH The embedded port and PCMCIA card are:
0 : Used.
1 : Not used.

For embedded port

PCH At the start of communication of the FTP file transfer function, checking for the presence of the FTP server using PING is:
0 : Performed.
1 : Not performed.

UNM With the embedded Ethernet port, the unsolicited messaging function is:
0 : Not used.
1 : Used.

DNS The DNS client function is:
0 : Not used.
1 : Used.

DHC The DHCP client function is:
0 : Not used.
1 : Used.

	#7	#6	#5	#4	#3	#2	#1	#0
14882		WAL		UNS			MOD	ERD

[Data type] Bit

ERD On Embedded Ethernet, Machine Remote Diagnosis is:
0 : Not used.
1 : Used.

MOD On Embedded Ethernet, Modbus/TCP Server function is:
0 : Not used.
1 : Used.

UNS In the CNC Unsolicited Messaging function, When the stop request of the Unsolicited Messaging function is received excluding the connecting Unsolicited Messaging server :
0 : The stop request is rejected.
1 : The stop request is accepted.

WAL In CNC screen Web server function, when failing in login continuously five times, this function becomes:
0 : Disabled.
1 : Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
14883	PSV							

[Data type] Bit

PSV On Embedded Ethernet, FTP file transfer function operate in:
0 : Active mode.
1 : Passive mode.

14890	Selects the host computer 1 OS for FTP file transfer.

14891	Selects the host computer 2 OS for FTP file transfer.

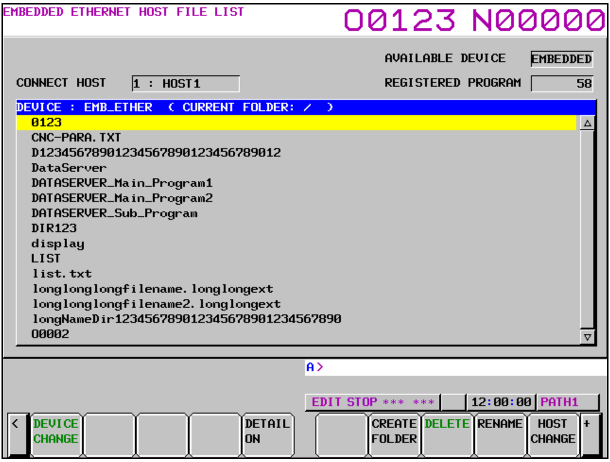
14892	Selects the host computer 3 OS for FTP file transfer.

[Data type] Byte

[Valid data range] 0 to 2
0 : Windows
1 : UNIX/VMS
2 : Linux

11.4.2 FTP File Transfer Operation Screen

(1) Embedded Ethernet host file list screen



Embedded Ethernet host file list screen

(a) Display item

AVAILABLE DEVICE
The currently selected device is displayed.
Check that the embedded port is selected currently.

CONNECT HOST
Number of the currently connected host of the host computer

REGISTERED PROGRAM
Displays the number of files registered in the folder on the host computer currently connected.

DEVICE
Current device. When the Embedded Ethernet host file list is selected, “EMB_ETHER” is displayed.

CURRENT FOLDER
Current work folder in the host computer

FILE LIST
Information of the files and folders in the host computer

(b) Operation list

DETAIL ON, DETAIL OFF
Switches between the outline and detailed file lists.

CREATE FOLDER
Creates a new subfolder in the current work folder.

DELETE
Deletes a file or folder.

RENAME
Renames a file or folder.

HOST CHANGE
Changes the connected host computer.

SEARCH
Searches the current folder for a file.

REFRESH
Updates the information displayed on the Embedded Ethernet host file list screen.

11.4.3 Maintenance Screen for Embedded Ethernet Function

With the Embedded Ethernet function, a dedicated maintenance screen is available.

The maintenance screen enables operations to be checked when the Embedded Ethernet function operates abnormally.

Displaying and operating the PING screen

Procedure

1 Press the function key 

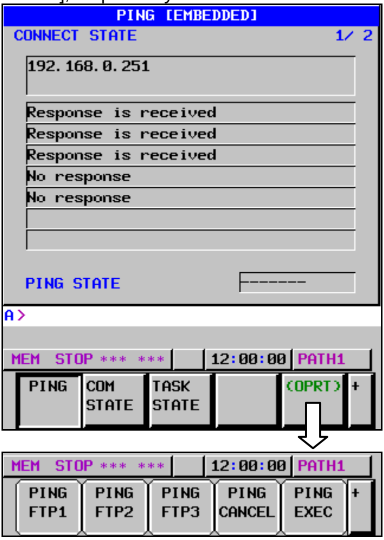
.

2 Soft keys [EMBEDDED] and [PCMCIA LAN] appear. (When there is no soft keys, press the continuous menu key.)

3 By pressing the soft key [EMBEDDED], the Ethernet Setting screen for the embedded port is displayed. By pressing the soft key [PCMCIA LAN], the Ethernet Setting screen for the PCMCIA card can be set.

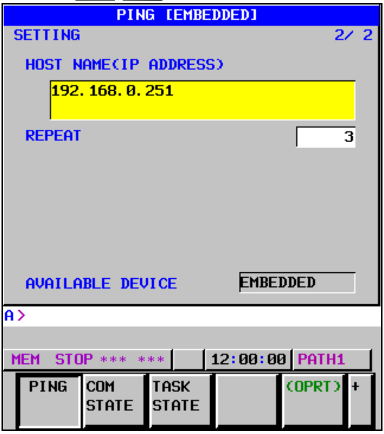
4 Press soft key [PING] and then press [(OPRT)].

5 To send the PING command to connection destination 1 for FTP file transfer, press soft key [PING FTP1]. Similarly, to send the PING command to connection destination 2 or 3, press [PING FTP2] or [PING FTP3], respectively.



PING connection status screen

6 To send the PING command to the desired destination, enter the address of the destination on the PING setting screen. (Page change keys   are used for switching.)



PING setting screen

7 After entering the address and the REPEAT count, press the soft key [PING]. The specified number of PING commands are sent to the specified destination.

8 To cancel the PING command currently being sent, press soft key [PING CANCEL].

Displaying Communication status screen

Procedure

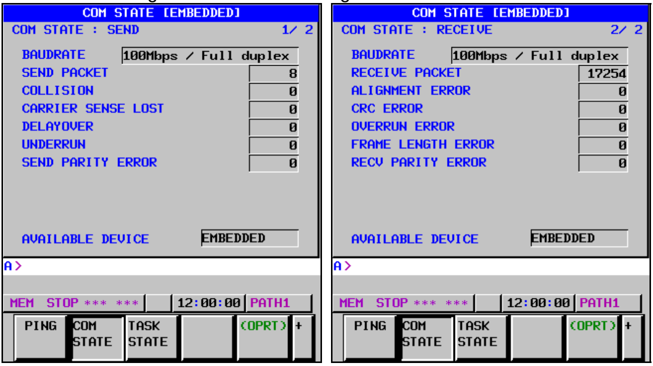
1 Press the function key .

2 Soft keys [EMBEDDED] and [PCMCIA LAN] appear. (When there is no soft keys, press the continuous menu key.)

3 By pressing the soft key [EMBEDDED], the Ethernet Setting screen for the embedded port is displayed. By pressing the soft key [PCMCIA LAN], the Ethernet Setting screen for the PCMCIA card can be set.

4 To display the communication status of the Embedded Ethernet, press soft key [COM STATE].

Page change keys   can be used to switch between the sending state and the receiving state.



Communication status screen

Display item	Description
BAUDRATE	Displays the communication rate and mode. Communication rate: 100 Mbps or 10 Mbps Communication mode: Full duplex or Half duplex --------: Not connected to the hub unit
SEND PACKET	Displays the number of sent packets.
COLLISION CARRIER SENSE LOST DELAYOVER UNDERRUN SEND PARITY ERROR	Displays the number of errors detected during packet sending.
RECEIVE PACKET	Displays the number of received packets.
ALIGNMENT ERROR CRC ERROR OVERRUN ERROR FRAME LENGTH ERROR RECV PARITY ERROR	Displays the number of errors detected during packet reception.
AVAILABLE DEVICE	Enabled device of the Embedded Ethernet. Either the Embedded Ethernet port or the PCMCIA Ethernet card is displayed.

Displaying a software status screen

Procedure

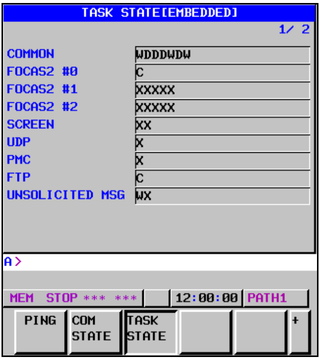
1 Press the function key 

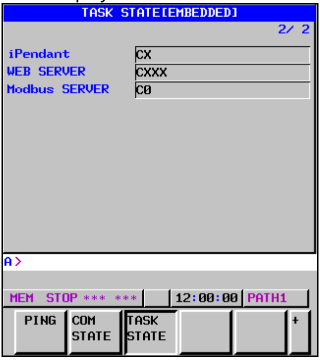
.

2 Soft keys [EMBEDDED] and [PCMCIA LAN] appear. (When there is no soft keys, press the continuous menu key.)

3 To display the Ethernet Setting screen for the embedded port or the PCMCIA card, press soft key [EMBEDDED] or [PCMCIA LAN], respectively.

4 Pressing soft key [TASK STATE] causes the task status of the Embedded Ethernet function to be displayed.





Software status screen

The following symbols are used.

	Symbol and meaning
FOCAS2 #0	C: Waiting for a connection from the host W: Data processing in progress (1) D: Data processing in progress (2) N: FOCAS2 out of service
FOCAS2 #1, #2	W: Data processing in progress (1) D: Data processing in progress (2) X: Not yet executed

	Symbol and meaning
UDP	W: Data processing in progress (1) D: Data processing in progress (2) X: Not yet executed
PMC	W: Data processing in progress (1) D: Data processing in progress (2) X: Not yet executed
FTP	C: Execution wait W: Data processing in progress (1) D: Data processing in progress (2) X: Not yet executed
UNSOLICITED MSG	W: Data processing in progress (1) D: Data processing in progress (2) N: Abnormal state X: Not yet executed Number: Alive signal (UDP) transmission in progress when count-up operation is performed
iPendant	C: Waiting for a connection from iPendant W: Data processing in progress (1) D: Data processing in progress (2) X: Not yet executed
WEB SERVER	C: Waiting for a connection W: Data processing in progress (1) D: Data processing in progress (2) X: Not yet executed
Modbus SERVER	C: Waiting for a connection W: Data processing in progress (1) D: Data processing in progress (2) X: Not yet executed Number: Number of sockets currently connected
MAIL	W: Data processing in progress (1) D: Data processing in progress (2) N: Abnormal state X: Not yet executed

If the FOCAS2/Ethernet function is running,
you can determine the operating status with FOCAS2#0, FOCAS2#1, and FOCAS2#2.

If the FANUC LADDER-III function is running,
you can determine the operating status with PMC.

If the FTP file transfer function is running,
you can determine the operating status with FTP.

If the CNC Unsolicited Messaging function is running,
you can determine the operating status with CNC unsolicited messages.

If the CNC screen Web server function is running,
you can determine the operating status with WEB SERVER.

If the Modbus/TCP server function is running,
you can determine the operating status with Modbus.

If the CNC Status Notification function is running,
you can determine the operation status with MAIL.

11.4.4 Log Screen of the Embedded Ethernet Function

This screen displays the log of the Embedded Ethernet function.

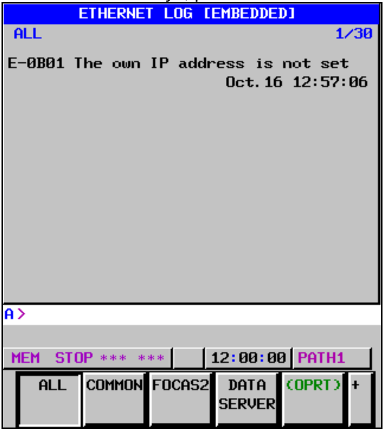
Displaying the log screen

Procedure

1 Press the function key 

.

2 To display the log screen for the embedded port or PCMCIA card, press soft key [EMBED LOG] or [PCMCIA LOG], respectively. (When there is no soft keys, press the continuous menu key.)



LOG screen

The newest error log appears at the top of the screen. The date and time when an error occurred are displayed at the right end of the line. The format of date and time data is “MMM.DD hh:mm:ss” where MMM represents a month, DD represents a day, hh represents hours, mm represents minutes, and ss represents seconds.
The date and time of the upper item shown above is October 16,12:57:06.
To clear the log, press soft keys [(OPRT)] and [CLEAR] in that order.

The log for each function can be displayed by using soft keys on the Embedded Ethernet log screen.

(1) Soft key [ALL]
Displays all log related to the Embedded Ethernet.

(2) Soft key [COMMON]
Displays the log related to the parameter settings of the Embedded Ethernet function and the basic communication function.

(3) Soft key [FOCAS2]
Displays the log related to the FOCAS2/Ethernet function.

(4) Soft key [FTP TRANS]
Displays the log related to FTP file transfer.

(5) Soft key [UNSOLT MSG]
Displays the log related to the unsolicited messaging function.

(6) Soft key [WEB]
Displays the log related to the CNC screen Web server function.

(7) Soft key [Modbus]
Displays the log related to the Modbus/TCP Server function.

(8) Soft key [MAIL]
Displays the log related to the CNC Status Notification function.

Error No.	Log message	Description and necessary action
E-0118 E-0119	Error occurred while wait for FOCAS2 pdu	A communication error has occurred because of any of the following: The network quality has been lowered to such a level that data cannot be received from a PC at the other end. The communication channel has been logically shut down. Software running on a PC at the other end has logically shut down the communication channel. The Ethernet cable has been disconnected.
E-011A	All communication paths are busy	All the FOCAS2/Ethernet communication channels are busy.
E-0148	Cannot save parameter for Unsolicited Message	When the FOCAS2 function cnc_wrunsolicprm2 was received, the parameter for the unsolicited messaging function could not be saved for one of the following causes: → The mode of the unsolicited messaging function is not set to "PC mode". → The state of the unsolicited messaging function is not "Not Ready". → The argument "parameter-for-unsolicited-message" of the FOCAS2 function cnc_wrunsolicprm2 includes an invalid value.
E-0149	The received parameter for Unsolicited Message is wrong	When the FOCAS2 function cnc_wrunsolicprm2, cnc_rdunsolicprm2, cnc_unsolicstart, or cnc_unsolicstop was received, the argument "parameter-number-for-unsolicited-message" was found to be invalid.
E-0200	(Received message from FTP server)	A message sent by the FTP server is displayed as it is. A message containing characters other than ASCII characters may not be displayed correctly.
E-0202	Connection failed with FTP server	Software of the FTP server may not be running. Run the FTP server software. Alternatively, the FTP server may not respond to the PING command to increase the security level (such as a firewall setting). Set bit 1(PCH) of NC parameter No. 14880 to “1” and connect the server again.
E-0207	The router is not found	The specified IP address of the router may be wrong. Alternatively, the router may be turned off. Check whether the IP address of the router has been correctly specified and whether the router is turned on.

Error No.	Log message	Description and necessary action
E-0208	The FTP server is not found	The specified IP address of the FTP server may be wrong. Alternatively, the FTP server may be turned off. Check whether the IP address of the FTP server has been correctly specified and whether the FTP server is turned on. Alternatively, the FTP server may not respond to the PING command to increase the security level (such as a firewall setting). Set bit 1(PCH) of NC parameter No. 14880 to "1" and connect the server again.
E-020B	Cannot login into FTP server	Check whether a correct user name and password are specified when logging into the FTP server.
E-020C	The parameters of FTP server are wrong	Check whether a correct user name and password are specified when logging into the FTP server.
E-020D	Changing a work folder of host failed	Check the work folder logging into the FTP server.
E-041A	Frame transmission failed (TCP)	A communication error has occurred because of any of the following: → The network quality has been lowered to such a level that data cannot be received from a PC at the other end. The communication channel has been logically shut down. → Software running on a PC at the other end has logically shut down the communication channel. → The Ethernet cable has been disconnected. → Data cannot be posted to the communication destination due to a firewall setting.
E-0901	Cannot read MAC address	The MAC address is not written in the hardware. Alternatively, the hardware has been damaged.
E-0A06	Network is too busy	An excessive amount of data is flowing over the network. One possible solution is to divide the network.
E-0B00	The own IP address is wrong	Specify a correct IP address in the designated format.
E-0B01	The own IP address is not set	Specify an IP address.
E-0B02	Subnet mask is wrong	Specify a correct subnet mask in the designated format.
E-0B03	Subnet mask is not set	Specify a subnet mask.
E-0B04	Router IP address is wrong	There may be class disagreement between the IP address of the local node and the IP address of the router.
E-0B05	IP address of DNS server is wrong	There may be class disagreement between the IP address of the local node and the IP address of the DNS server.

Error No.	Log message	Description and necessary action
E-0B06	The own host name is wrong	Check whether a correct host name is specified.
E-0B07	The own domain name is wrong	Check whether a correct domain name is specified.
E-0B08	TCP port number is wrong	A value beyond the permissible setting range may be specified.
E-0B09	UDP port number is wrong	A value beyond the permissible setting range may be specified.
E-0B0B	IP address of remote FTP server is wrong	Specify a correct IP address in the designated format.
E-0B0C	Port NO of a remote FTP server is wrong	A value beyond the permissible setting range may be specified.
E-0B0D	User name of remote FTP server is wrong	The specified user name may contain a prohibited character.
E-0B0E	Password of remote FTP server is wrong	The specified password may contain a prohibited character.
E-0B0F	Login folder of remote FTP srv is wrong	The specified log-in folder name may contain a prohibited character.
E-0B18	Cannot set because DHCP is available	To allow a set-up, disable the DHCP client function.
E-0B19 E-0B1A	Embedded Ethernet hardware isn't found	The software or hardware of Embedded Ethernet function cannot be recognized. Check whether the software has been incorporated. Check whether the hardware is sound.
E-0B27	Unsolicited Message function isn't available	The software condition for using the unsolicited messaging function is not satisfied. The cause may be one of the following: →The version of communication software is not supported yet. → NC parameters for using the unsolicited messaging function are not set.
E-0B29	Mode of Unsolicited Message is wrong	In the CNC mode, the FOCAS2 function cnc_wrunsolicprm2 cannot be executed.
E-0B2A	Status of Unsolicited Message is wrong	The state of the unsolicited messaging function was other than "Not Ready", so that the parameters for the unsolicited messaging function could not be updated. The cause may be one of the following: → In a state other than "Not Ready", the FOCAS2 function cnc_wrunsolicprm2 or cnc_unsolicstart was executed. → In a state other than "Not Ready", soft key [APPLY] was pressed.

Error No.	Log message	Description and necessary action
E-0B2B	Cannot refresh parameter of Unsolicited Message	The parameters for the unsolicited messaging function could not be updated. The cause may be one of the following: → The problem of E-0B29 or E-0B2A occurred. → A parameter for the unsolicited messaging function includes an invalid value.
E-0B44	Invalid value exists in Transmission parameter of Unsolicited Message	The parameter for the unsolicited messaging function, TRANSMISSION NUMBER or TRANSMISSION PARAMETER (NO. 1 to NO. 3), includes an invalid value.
E-0B45	The total of Transmission size of Unsolicited Message exceeds the limitation	The sum of sizes specified by the parameters for the unsolicited messaging function, TRANSMISSION PARAMETER NO. 1 to NO. 3, exceeds the maximum specifiable number of bytes.
E-0B47	TCP port number of Modbus/TCP Server is wrong	Zero is specified. To use this function, specify TCP port number.
E-0B48	Status PMC address of Modbus/TCP Server is out of range	A value beyond the permissible setting range is specified. Check the status PMC address settings.
E-0B49	Data PMC address of Modbus/TCP Server is wrong	An odd-numbered address is specified. Check the data PMC address setting.
E-0B4A	Data PMC address of Modbus/TCP Server is out of range	A value beyond the permissible setting range is specified. Check the data PMC address setting or data size setting.
E-0B4B	Modbus area of Modbus/TCP Server is out of range	A value beyond the permissible setting range is specified. Check the data Modbus address setting or data size setting.
E-1001	All Modbus communication paths are busy	The number of connected communication parties (Modbus/TCP clients) exceeded the maximum number of connectable clients. Connections to communication parties (Modbus/TCP clients) will be terminated in order of the oldest to the newest.
E-1003	Version number of Modbus packet is wrong	Specify a correct version number according to the protocol of Modbus/TCP.
E-1004	Length of Modbus packet is wrong	Specify a correct size according to the protocol of Modbus/TCP.
E-100B	Function code of Modbus packet is wrong	The specified function code may not be supported.
E-1015 E-1016	Data address of Modbus packet is wrong	Specify a correct data address according to the protocol of Modbus/TCP.
E-1017 E-1018 E-1019	Data value of Modbus packet is wrong	Specify a correct data address according to the protocol of Modbus/TCP.

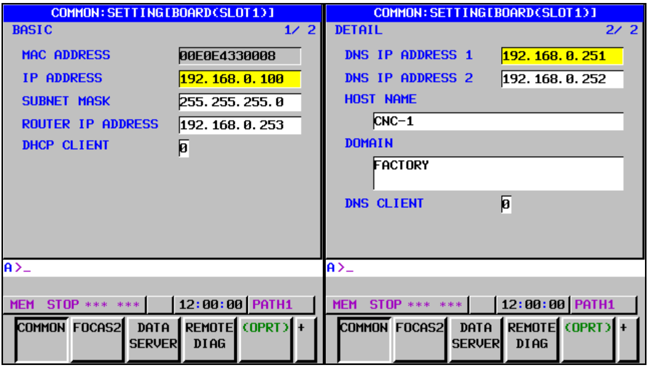
Error No.	Log message	Description and necessary action
E-101A	Data address that client requested is out of range (1-3)	No PMC area is assigned to the Modbus area requested from the connected communication party (Modbus/TCP client). Assign a PMC area.
E-1300	(Sent message to Web browser)	It is a message transmitted to notify the Web browser of the error detected with the Web server.
E-1301	User name is not set	Specify a user name of the CNC screen Web server function.
E-1302	Password is not set	Specify a password of the CNC screen Web server function.
E-1303	User name is wrong	Check whether a correct user name of the CNC screen Web server function.
E-1304	Password is wrong	Check whether a correct password of the CNC screen Web server function.
E-1305	All communication paths are busy	All the Web communication channels are busy.
E-1306	Session ended	The connection with the Web browser ended.
E-1307	Session canceled	The connection with the Web browser aborted compulsorily by either of the following factor. → The DI signal WBEND (refer to chapter 5) became “1”. → CNC screen display function started on other personal computer.
E-1308	Session started	The connection with the Web browser started.
E-1309	Login failed	The CNC screen Web server function became disabled. Turn off / on the power of the CNC.
E-1402	User name is not set	Enter user name of CNC Status Notification function.
E-1403	Password is not set	Enter password of CNC Status Notification function.
E-1404	User name is wrong	Confirm user name of CNC Status Notification function.
E-1405	Password is wrong	Confirm password of CNC Status Notification function.
E-1406	Login failed	CNC Status Notification function has not been usable. Please restart the CNC.
E-XXXX	(No message)	An internal error has occurred. Make a notification of the error number.

11.5 ETHERNET OPTIONAL BOARD

Parameters are divided according to function, and you can switch between the parameter screens by using the soft key.

11.5.1 Parameter Setting Screen

(1) Common parameters



(a) Setting item

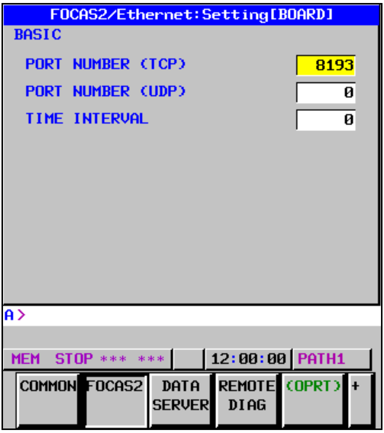
Item	Description
IP ADDRESS	Specify the IP address of the Fast Ethernet. (Example of specification format: "192.168.0.100”)
SUBNET MASK	Specify a mask address for the IP addresses of the network. (Example of specification format: "255.255.255.0”)
ROUTER IP ADDRESS	Specify the IP address of the router. Specify this item when the network contains a router. (Example of specification format: "192.168.0.253”)
DHCP CLIENT	The value of parameter No.904#6(DHC) related to the DHCP client function is displayed, and the setting is also possible. Refer to “Ethernet –related NC parameters”.
DNS IP ADDRESS 1, 2	Up to two DNS server IP addresses can be set. The CNC searches for a DNS server in the order from DNS IP address 1 to 2.
HOST NAME	Enter a desired CNC host name. If the DHCP server interacts with the DNS server, this host name is posted to the DNS server. If no host name is set, "NC-<MAC address>" is automatically set. Example of host name automatically set: NC-00E0E4004CF9
DOMAIN	Specify the DOMAIN of the cnc when DNS function is used and the CNC is joined to a domain.
DNS CLIENT	The value of parameter No.904#5(DNS) related to the DNS client function is displayed, and the setting is also possible. Refer to “Ethernet –related NC parameters”.

(b) Display item

Item	Description
MAC ADDRESS	Fast Ethernet MAC address

NOTE
The parameter for an IP address specified by entering characters can be cleared by entering spaces.

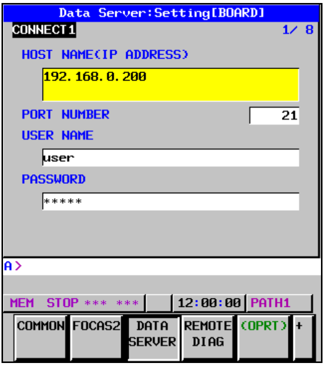
(2) FOCAS2/Ethernet parameter

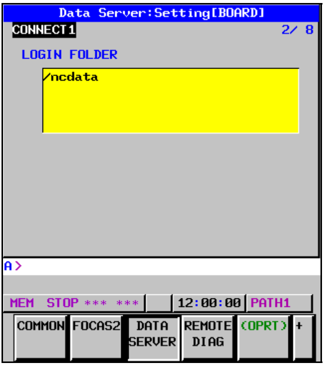


(a) Setting item

Item	Description
PORT NUMBER (TCP)	Specifies the port No. to be used by the FOCAS2/Ethernet functions and CNC screen display functions, within a range of 5001 to 65535.
PORT NUMBER (UDP)	Set this item to 0.
TIME INTERVAL	Set this item to 0.

(3) Data Server function parameter



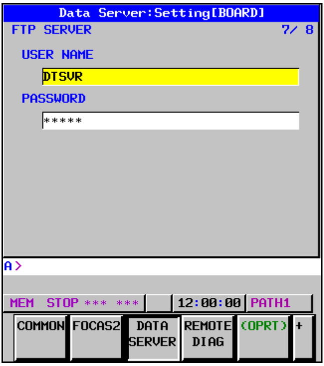


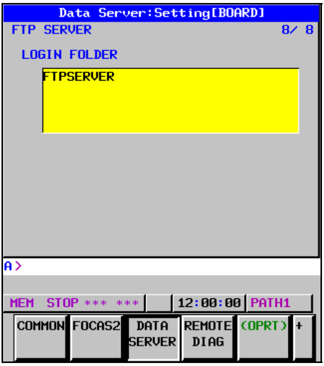
Settings for three host computers can be made.

(a) Setting item for Data server

Item	Description
HOST NAME	Specify the IP address of the host computer. (Example of specification format: "192.168.0.200”)
PORT NUMBER	Specify the port number. Usually, set 21 because the FTP communication is used.
USER NAME	Specify the name of the user to log on to the host computer using FTP. (A user name of up to 31 characters can be specified.)
PASSWORD	Specify the password for the above user name. The password must always be specified.

Item	Description
LOGIN FOLDER	Specify a work folder to be used when the user logs in to the host computer. (Up to 127 characters can be specified.) If no data is set, the home folder set on the host computer is used as a login folder.

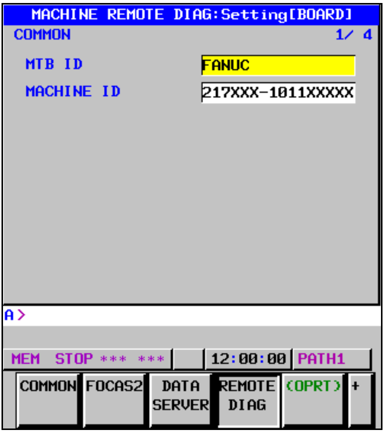




(b) Setting item of FTP server

Item	Description
USER NAME	Specify a user name to be used when the host computer logs in to the Data Server. (A user name of up to 31 characters can be specified.)
PASSWORD	Specify the password for the above user name. The password must always be specified.
LOGIN FOLDER	Specify a work folder to be used when the host computer logs in to the Data Server. (Up to 127 characters can be specified.) If no data is set, the home folder (home directory) is used as a login folder.

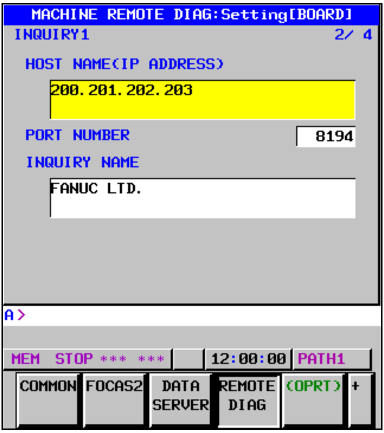
(4) Machine remote diagnosis function parameter



11

- **Setting item**

Item	Description
MTB ID	This information is required by the machine remote diagnosis package to confirm that the diagnosis request is issued from a machine manufactured by the machine tool builder. The MTB identification information on the diagnosis accepting server of the machine remote diagnosis package can be set to accept diagnosis requests only from the machines manufactured by the machine tool builder. (Example of specification format: "FANUC")
MACHINE ID	Information required by the machine remote diagnosis package to identify the machine under diagnosis (Example of specification format: "217XXX-1011XXXXX")



- **Setting item**

Item	Description
HOST NAME	Specify the IP address of the host computer (machine remote diagnosis accepting server) when the DNS client function is disabled. (Example of specification format: "200.201.202.203") Specify the host name of the host computer (machine remote diagnosis accepting server) when the DNS client function is enabled. (You can specify up to 63 characters.) (Example of specification format: "RMTDIAG.FANUC.CO.JP")
PORT NUMBER	Specify a port number. Usually, specify "8194" because the machine remote diagnosis functions are used.
INQUIRY NAME	Specify information for identifying the host computer (machine remote diagnosis accepting server). (You can specify up to 63 characters.) (Example of specification format: "FANUC LTD.")

(5) Ethernet-related NC parameters

Among the Ethernet parameters, <u>the parameters for detailed setting</u> are set using NC parameters.
Among the Ethernet parameters, <u>the parameters for normal setting</u> are set using the dedicated setting screens of (1) to (4).

	#7	#6	#5	#4	#3	#2	#1	#0
0000								TVC

[Data type] Bit

TVC When a file is transferred from the personal computer to the Data Server, a TV check is:
0 : Not performed.
1 : Performed.

0020	I/O CHANNEL : Input/output device selection

[Data type] Byte
[Valid data range] 0 to 35
5 : Selects the Data Server as the input/output device.
6 : Selects the FOCAS2/Ethernet as the input/output device.
Required only if you perform DNC operation.

0024	Setting of communication with the PMC ladder development tool

[Data type] Byte
[Valid data range]
10 : The high-speed interface (Ethernet) is used for PMC online editing.

	#7	#6	#5	#4	#3	#2	#1	#0
0100					NCR	CRF	CTV	

[Data type] Bit
CTV When a file is transferred from the personal computer to the Data Server, character counting for the TV check in program comment parts is:
0 : Performed.
1 : Not performed.
CRF When a file is output from the Data Server to the personal computer, EOB (end of block) is:
0 : Set as specified by parameter NCR (No. 100#3).
1 : “Set to "CR" "LF".
NCR When a file is output from the Data Server to the personal computer, EOB (end of block) is:
0 : Set to "LF" "CR" "CR".
1 : Set to "LF".

	#7	#6	#5	#4	#3	#2	#1	#0
0901							EFT	

[Data type] Bit path
EFT The FTP file transfer function by the Ethernet function is:
0 : Not used.
1 : Used.

	#7	#6	#5	#4	#3	#2	#1	#0
0904	LCH	DHC	DNS	UNW				BWT

[Data type] Bit
BWT If FTP communication is behind data supply during DNC operation in the buffer mode of the Data Server function:
0 : An error is caused.
1 : No error is caused and DNC operation continues after waiting the completion of FTP communication.
UNW The CNC Unsolicited Messaging function is:
0 : Not used.
1 : Used.
DNS DNS client function is:
0 : Not used.
1 : Used.
DHC DHCP client function is:
0 : Not used.
1 : Used.

LCH In the LIST-GET service of the Data Server, when a list file specifies 1025 or more files:
0 : A check for duplicated file names is performed.
1 : A check for duplicated file names is not performed.

	#7	#6	#5	#4	#3	#2	#1	#0
0905				UNS	DSF		PCH	DNE

[Data type] Bit

DNE During DNC operation using the FOCAS2/Ethernet functions, the termination of DNC operation is:
0 : Waited.
1 : Not waited. (HSSB compatible specification)

PCH At the start of communication of the Data Server or machine remote diagnosis function, checking for the presence of the server using PING is:
0 : Performed.
1 : Not performed.

DSF When a program is stored on the memory card of the Data Server:
0 : The file name takes priority.
1 : The program name in the NC program takes priority.

UNS In the CNC Unsolicited Messaging function, when the end of the function is requested by other than the CNC Unsolicited Messaging server currently connected:
0 : The request for the end of the function is rejected.
1 : The request for the end of the function is accepted.

	#7	#6	#5	#4	#3	#2	#1	#0
0906			SCM			OVW		

[Data type] Bit

OVW When the Data Server is working as an FTP server, if it receives a file having the same name as for an existing file in it from an FTP client:
0 : An error occurs.
1 : No error occurs, and the received file is written over the existing file.

SCM Data Server function accesses its memory card with the forwarding mode:
0 : A memory card-supported mode recognized by Data Server.
1 : A traditional PIO mode2.

0921	Selects the host computer 1 OS for Data Server
0922	Selects the host computer 2 OS for Data Server
0923	Selects the host computer 3 OS for Data Server

[Data type] Word

[Valid data range] 0 to 2

Set the OS type of the host computer that is connected by Data Server function or FTP File Transfer function.
0 : Windows
1 : UNIX/VMS
2 : Linux

0924	FOCAS2/Ethernet waiting time setting

[Data type] Word
[Unit of data] msec
[Valid data range] 0 to 32767

When the FOCAS2/Ethernet and Data Server functions are used simultaneously, this parameter sets the FOCAS2/Ethernet function waiting time in milliseconds.
When a value of 0 is set, the functions operate with assuming that 1 millisecond is specified.

0929	FTP server transfer mode

[Data type] Word
[Valid data range] 0 to 2

If the computer is to operate as an FTP server, the file transfer mode is:
0 : Determined from the specification with the TYPE command from the FTP client.
1 : Fixed at text mode.
2 : Fixed at binary mode.

0930	Maximum number of files that can be registered to the memory card of the Data Server and maximum size per file that can be registered

[Data type] Word
[Valid data range] 0, 10 to 15

No.0930	Maximum number of files	Maximum size per file
0	2047	512MB
10	511	2048MB
11	1023	1024MB
12	2047	512MB
13	4095	256MB
14	8191	128MB
15	16383	64MB

0970	Select hardware that operates Ethernet or Data Server function

0971	Select hardware that operates first FL-net function

0972	Select hardware that operates second FL-net function

[Data type] Byte
[Valid data range] -1 to 6
-1 : Not used
0 : Unsetting
1 : Multi-function Ethernet
3 : Option board mounted in slot 1
4 : Option board mounted in slot 2
5 : Option board mounted in slot 3
6 : Option board mounted in slot 4

	#7	#6	#5	#4	#3	#2	#1	#0
3107				SOR				

[Data type] Bit
SOR In the Data Server FILE LIST screen, files are displayed:
0 : In the order of zero-suppressed program number.
1 : In the order of program name.

11

	#7	#6	#5	#4	#3	#2	#1	#0
3233							PDM	

[Data type] Bit

PDM When the Data Server FILE LIST screen is displayed:

0 : The setting of an M198 operation folder/DNC operation file is enabled.

1 : The setting of a foreground/background folder is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
8706		MRD						

[Data type] Bit

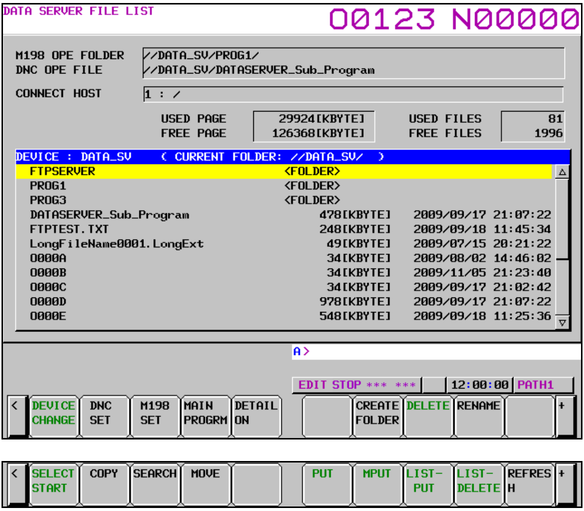
MRD The remote machine diagnosis is:

0 : Not used.

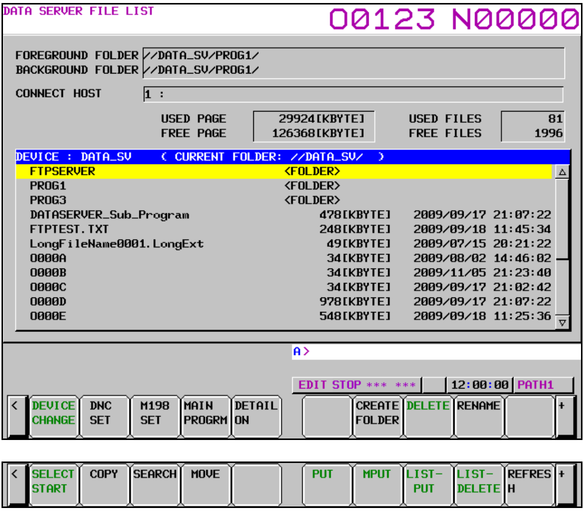
1 : Used by Fast Ethernet board.

11.5.2 Fast Data Server Operation Screen

(1) DATA SERVER FILE LIST screen



DATA SERVER FILE LIST screen / When PDM=0 (No.3233#1=0)



DATA SERVER FILE LIST screen / When PDM=1 (No.3233#1=1)

(a) Display item

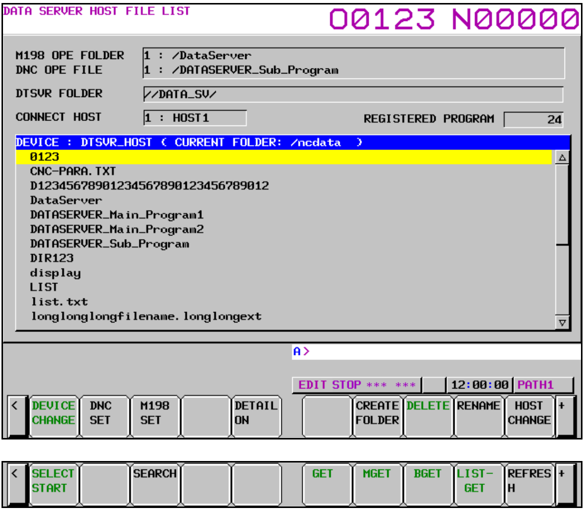
- M198 OPE FOLDER
  Displays a folder (directory) for M198-based subprogram calling. This item is displayed when CNC parameter PDM (No. 3233#1) is set to 0.
- DNC OPE FILE
  Displays a file name used when DNC operation is performed. This item is displayed when parameter PDM (No. 3233#1) is set to 0.
- FOREGROUND FOLDER / BACKGROUND FOLDER
  Displays foreground/background folders (directories). This item is displayed when parameter PDM (No. 3233#1) is set to 1.
- CONNECT HOST
  Displays the work folder and the number of the host currently connected.
- USED PAGE / FREE PAGE
  Displays the size used of the memory card built into the Fast Data Server and the size that is free.
- USED FILES / FREE FILES
  Displays the total number of folders (files) in use of the Data Server and the number of remaining free folders (files).
- DEVICE
  Displays the current device. If the memory card built into the Fast Data Server is selected, "DATA_SV" is indicated.
- CURRENT FOLDER
  Displays the current work folder.
- File list
  Displays information about the files and folders in the current work folder.

(b) Operation list

- DEVICE CHANGE
  Enables a device for display on the PROGRAM LIST screen. When selecting the memory card built into the Fast Data Server, press soft key [DTSVR].
- DNC SET
  Specifies a file for DNC operation. This soft key can be used when CNC parameter PDM (No. 3233#1) is set to 0.
- M198 SET
  Specifies a folder for M198-based subprogram calling. This soft key can be used when parameter PDM (No. 3233#1) is set to 0.

- FORE CHANGE / BACK CHNAGE
  Specifies a foreground/background folder. These soft keys can be used when parameter PDM (No. 3233#1) is set to 1.
- MAIN PROGRM
  Selects a file as a main program.
- DETAIL OFF / DETAIL ON
  Switches the file list information to overall display or detail display.
- CREATE FOLDER
  Creates a sub-folder under the current work folder.
- DELETE
  Deletes a file or folder.
- RENAME
  Renames a file or folder.
- SELECT START
  Selects multiple files.
- COPY
  Copies a file within the Data Server.
- SEARCH
  Searches for a file in the current work folder.
- PUT
  Transfers a file from the Data Server to the host computer.
- MPUT
  Transfers multiple files from the Data Server to the host computer.
- LIST-PUT
  Transfers multiple files from the Data Server to the host computer according to a list file.
- LIST-DELETE
  Deletes multiple files from the Data Server according to a list file.
- REFRESH
  Updates the display information of the PROGRAM LIST screen.

(2) DATA SERVER HOST FILE LIST screen



DATA SERVER HOST FILE LIST screen

(a) Display item

- M198 OPE FOLDER
  Displays a folder (directory) for M198-based subprogram calling.
- DNC OPE FILE
  Displays a file name used when DNC operation is performed.
- DT SERVER FOLDER
  Displays the work folder (directory) of the Data Server (memory card).

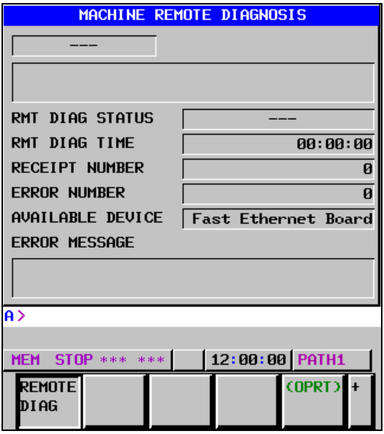
- CONNECT HOST
  Displays the number of the host computer currently connected.
- DEVICE
  Displays the current device. If the host file list of the Data Server is selected, "DTSVR_HOST" is indicated.
- CURRENT FOLDER
  Displays the work folder in the current host computer.
- FILE LIST
  Displays information about the files and folders in the host computer.

(b) Operation list

- DEVICE CHANGE
  Enables a device for display on the PROGRAM LIST screen. When selecting the host file list of the Data Server, press soft key [DTSVR HOST].
- DNC SET
  Specifies a file for DNC operation.
- M198 SET
  Specifies a folder for M198-based subprogram calling.
- DETAIL OFF / DETAIL ON
  Switches the file list information to overall display or detail display.
- CREATE FOLDER
  Creates a sub-folder under the current work folder.
- DELETE
  Deletes a file or folder.
- RENAME
  Renames a file or folder.
- HOST CHANGE
  Changes the connected host computer.
- SEARCH
  Searches for a file in the current folder.
- GET
  Transfers a file from the host computer to the Data Server.
- MGET
  Transfers files from the host computer to the Data Server by specifying a file name with wildcards (*, ?).
- BGET
  Transfers a file from the host computer to the Data Server in binary format. Use this soft key to transfer a binary-format NC program or data other than an NC program such as NC parameter or tool data.
- LIST-GET
  Transfers multiple files from the host computer to the Data Server according to a list file.
- REFRESH
  Updates the information displayed on the DATA SERVER HOST FILE LIST screen.

11.5.3 Machine Remote Diagnosis Operation Screens

(1) MACHINE REMOTE DIAGNOSIS screen



(a) Display item

- INQUIRY NUMBER
  Displays the inquiry number indicating the machine remote diagnosis accepting server: "INQUIRY 1 ," "INQUIRY2," or "INQUIRY3."
- INQUIRY
  Displays information for identifying the machine remote diagnosis accepting server.
- RMT DIAG STATUS
  Displays the status of machine remote diagnosis.
- RMT DIAG TIME
  Displays the time until the machine remote diagnosis status changes from "OPEN" to "CLOSE," "FORCE CLOSING," or "ERROR."
  At each start of diagnosis, the time is accumulated from "00:00:00."
- RECEIPT NUMBER
  Displays the receipt number issued by the machine remote diagnosis accepting server.
- ERROR NUMBER
  Displays the number of an error which occurs in operation of the machine remote diagnosis functions.
- AVAILABLE DEVICE
  Displays the type of communication device for which the machine remote diagnosis functions can operate.
- ERROR MESSAGE
  Displays the message indicating an error which occurs in operation of the machine remote diagnosis functions.

(b) Operation list

- DIAG OPEN
  Starts machine remote diagnosis.
- DIAG CLOSE
  Forcibly terminates machine remote diagnosis.
- INQUIRY1
  Selects inquiry destination 1.
- INQUIRY2
  Selects inquiry destination 2.
- INQUIRY3
  Selects inquiry destination 3.

(c) Diagnosis status

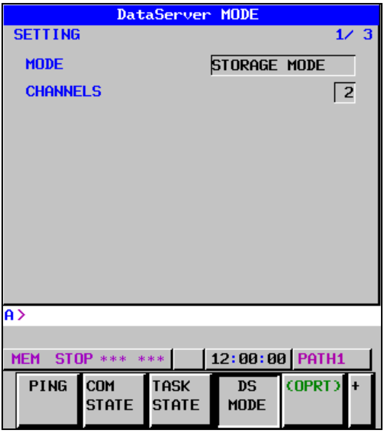
Status	Description
---	No operation
OPEN	[DIAG OPEN] was pressed.
OPENING	An attempt is being made to connect the machine remote diagnosis accepting server.
ACCEPTED	The machine remote diagnosis accepting server accepted diagnosis.
REFUSED	The machine remote diagnosis accepting server rejected diagnosis.
DIAGNOSING	This message flashes in synchronization with data flowing on the communication line.
CLOSE	The machine remote diagnosis accepting server terminated diagnosis.
FORCE CLOSING	[DIAG CLOSE] was pressed. After the completion of forced termination processing, "---" is indicated in the RMT DIAG STATUS field.
ERROR	An error occurred on the communication line.

(d) Error numbers and error messages

No.	Error message	Meaning and action to be taken
1	Diagnosis is busy	[DIAG OPEN] was pressed during diagnosis.
2	Router isn’t alive	The IP address of the router may be invalid or the power to the router may be off. Check whether the IP address of the router is valid and whether the power to the router is on.
3	Receipt Server isn’t alive	The IP address of the machine remote diagnosis accepting server may be invalid or the power to the machine remote diagnosis accepting server may be off. Check whether the IP address of the machine remote diagnosis accepting server is valid and whether the power to the machine remote diagnosis accepting server is on.
4	System error	A system error occurred. Check the log messages on the ETHERNET LOG screen and contact FANUC.
5	Invalid Inquiry number.	A value outside the valid setting range may be set for the inquiry destination. Check whether the correct inquiry destination is set.
6	Invalid IP Address	Set the IP address according to the IP address specification format.
7	Invalid PORT number	A value outside the valid setting range may be set for the port number. Check whether the correct port number is set.
8	Invalid Router IP Address	Set the IP address of the router according to the IP address specification format.
9	Socket error	A communication error occurred due to a cause as listed below. Check the network wiring and anti-noise measures. → The network quality degraded, data could not be received from the personal computer with which to communicate, and the logical communication path was disconnected. → The software component on the personal computer with which to communicate forcibly disconnected the logical communication path. → The Ethernet cable was disconnected.

No.	Error message	Meaning and action to be taken
11	Invalid Request	An internal error related to machine remote diagnosis occurred in the CNC. Check the log messages on the ETHERNET LOG screen and contact FANUC.
12	Invalid Packet	An unrecognizable packet was received. Check the log messages on the ETHERNET LOG screen and contact FANUC.
13	Diagnosis was already stopped	[DIAG CLOSE] was pressed not during diagnosis.
17	Receive error	An attempt to receive data failed. See Number 9 and check the network wiring and anti-noise measures.
19	HeartBeat timeout	Communication with the machine remote diagnosis accepting server stopped. See Number 9 and check the network wiring and anti-noise measures.
20	HeartBeat error	An attempt was failed to send a heartbeat packet for machine remote diagnosis. See Number 9 and check the network wiring and anti-noise measures.
22	DNS error	An attempt was failed to connect the machine remote diagnosis accepting server using the DNS client function. The IP address of the DNS server may be invalid or the power to the DNS server may be off. Check whether the IP address of the DNS server is valid and whether the power to the DNS server is on.

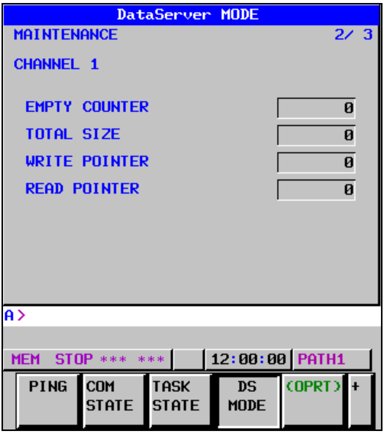
11.5.4 Maintenance Screen (for Data Server Function)



Data Server MODE screen (SETTING)

(a) Display item for SETTING

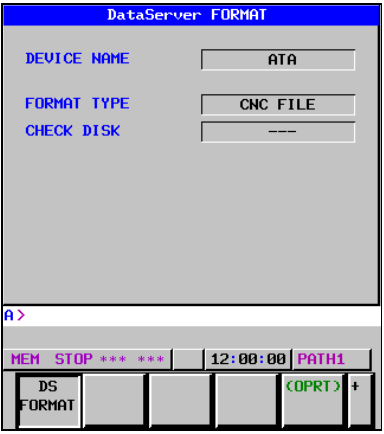
Item	Description
CHANNELS	Displays the number of channels currently being used.
MODE	Displays the currently set Data Server mode. STORAGE MODE FTP MODE BUFFER MODE



Data Server MODE screen (MAINTENANCE)

(b) Display item for MAINTENANCE

Item	Description
CHANNEL	Interface number of the buffer used for transferring NC programs between the CNC and Data Server. For example, a channel is assigned to each path.
EMPTY COUNTER	Used for maintenance. This item indicates the number of cases where the buffer becomes empty while NC programs are being transferred from the Data Server to the CNC.
TOTAL SIZE	Used for maintenance. This item indicates the total number of bytes transferred when an NC program is transferred from the Data Server.
WRITE POINTER READ POINTER	Used for maintenance. This item indicates the buffer use status when NC programs are transferred from the Data Server to the CNC.



Data Server FORMAT screen

(c) Display item for FORMAT

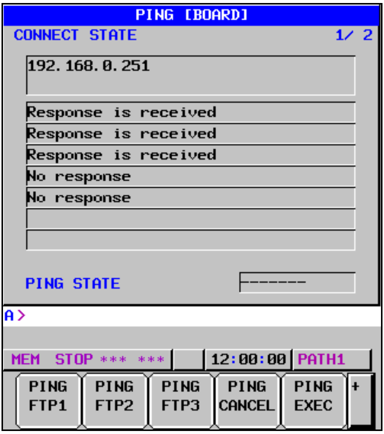
Item	Description
DEVICE NAME	Indicates the storage media currently being used by the Data Server. "ATA" or "NONE" is indicated.
FORMAT TYPE	Indicates the format type of the memory card. "CNC FILE" or "---" is displayed. When "---" is displayed, check whether the memory card is mounted properly and is formatted correctly.
CHECK DISK	Indicates the check result. When no check is made : "---" When the check result is normal : "OK" When the check result is abnormal : "NG"

11.5.5 Maintenance Screen

An operation check on the Fast Ethernet board can be made.
The page keys are used for screen switching.

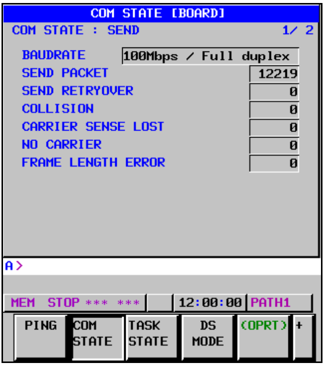
(1) Ping command transmission

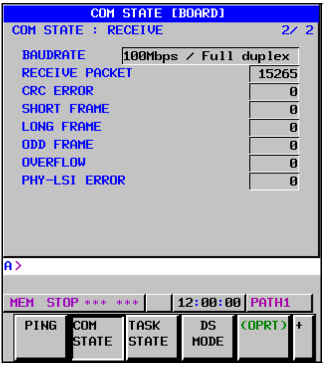
By sending the ping command, the state of the communication cable and whether the communication destination exists can be checked.
Enter the IP address of the communication destination with the MDI keys, then press the soft key [PING]. The ping command is transmitted to the specified destination and the result is displayed.



(2) Error detection count of the Ethernet controller

The error count detected by the error detection controller is displayed.

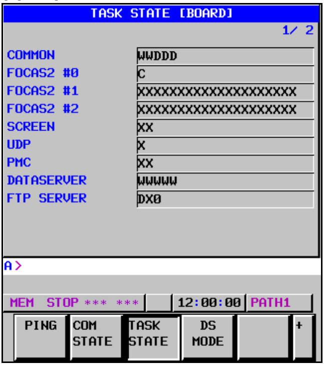


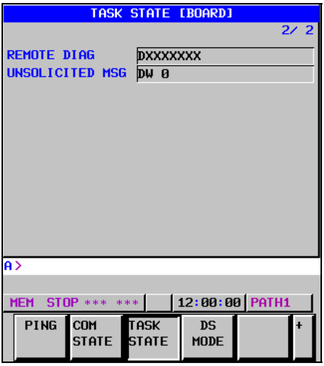


(a) Display item

Display item	Description
BAUDRATE	Displays the communication rate and mode. Communication rate: 100 Mbps or 10 Mbps Communication mode: Full duplex or Half duplex --------: Not connected to the hub unit
SEND PACKET	Displays the number of sent packets.
SEND RETRYOVER COLLISION CARRIER SENSE LOST NO CARRIER FRAME LENGTH ERROR	Displays the number of errors detected during packet sending.
RECEIVE PACKET	Displays the number of received packets.
CRC ERROR SHORT FRAME LONG FRAME ODD FRAME OVERFLOW PHY-LSI ERROR	Displays the number of errors detected during packet reception.

(3) Operation states of the tasks internal to the Fast Ethernet





(a) Display item

The meaning of each symbol is indicated below.

	Symbol and meaning
COMMON	W: Data being processed (1) D: Data being processed (2) E: Start of software
FOCAS2 #0	C: Waiting for connection from the host W: Data being processed (1) D: Data being processed (2) N: FOCAS2 incapable of being executed
FOCAS2 #1	W: Data being processed (1) D: Data being processed (2) X: Not executed yet
FOCAS2 #2	W: Data being processed (1) D: Data being processed (2) X: Not executed yet
SCREEN	W: Data being processed (1) D: Data being processed (2) X: Not executed yet
UDP	W: Data being processed (1) D: Data being processed (2) X: Not executed yet
PMC	W: Data being processed (1) D: Data being processed (2) X: Not executed yet
DATASERVER	W: Data being processed (1) D: Data being processed (2) X: Not executed yet
FTP SERVER	W: Data being processed (1) D: Data being processed (2) Number: Number of sockets currently connected
REMOTE DIAG	W: Data being processed (1) D: Data being processed (2) X: Not executed yet
UNSOLICITED MSG	W: Data being processed (1) D: Data being processed (2) N: Abnormal state X: Not executed yet Number: Alive signal (UDP) transmission in progress when count-up operation is performed

When the FOCAS2/Ethernet functions are running, you can check the operating status from:
FOCAS2#0, FOCAS2#1, and FOCAS2#2.

When the CNC screen display functions are running, you can check the operating status from:
SCREEN

When the FANUC LADDER-III functions are running, you can check the operating status from:
PMC

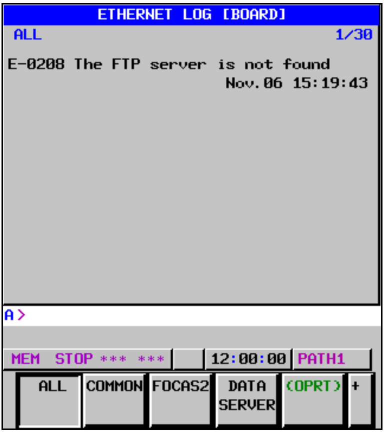
When the Data Server functions are running, you can check the operating status from:
DATASERVER and FTP SERVER

When the Machine Remote Diagnosis functions are running, you can check the operating status from:
REMOTE DIAG

When the CNC Unsolicited Messaging functions are running, you can check the operating status from:
UNSOLICITED MSG

11.5.6 Error Message Screen

You can switch between the error message screens with the page change keys.



Error No.	Log message	Meaning and action to be taken
E-0118 E-0119	Error occurred while wait for FOCAS2 pdu	A communication error occurred due to one of the following causes: → The network quality degraded, data could not be received from the personal computer with which to communicate, and the logical communication path was disconnected. → The software component on the personal computer with which to communicate forcibly disconnected the logical communication path. → The Ethernet cable was disconnected.
E-011A	All communication paths are busy	All FOCAS2/Ethernet communication paths are being used.
E-0126	No response from RMT DIAG server	The IP address of the machine remote diagnosis accepting server may be invalid or the power to the machine remote diagnosis accepting server may be off. Check whether the IP address of the machine remote diagnosis accepting server is valid and whether the power to the machine remote diagnosis accepting server is on. Alternatively, the machine remote diagnosis accepting server may not respond to the PING command to increase the security level (such as a firewall setting). Set CNC parameter No. 905#1 to "1" and connect the server again.

Error No.	Log message	Meaning and action to be taken
E-012D	No response from router	The IP address of the router may be invalid or the power to the router may be off. Check whether the IP address of the router is valid and whether the power to the router is on.
E-0148	Cannot save parameter for Unsolicited Message	When the FOCAS2 function cnc_wrunsolicprm2 was received, the parameter for the unsolicited messaging function could not be saved for one of the following causes: → The mode of the unsolicited messaging function is not set to "PC mode". → The state of the unsolicited messaging function is not "Not Ready". → The argument "parameter-for-unsolicited-message" of the FOCAS2 function cnc_wrunsolicprm2 includes an invalid value.
E-0149	The received parameter for Unsolicited Message is wrong	When the FOCAS2 function cnc_wrunsolicprm2, cnc_rdunsolicprm2, cnc_unsolicstart, or cnc_unsolicstop was received, the argument "parameter-number-for-unsolicited-message" was found to be invalid.
E-0200	(Received message from FTP server)	A message sent from the FTP server is displayed as is. A message containing kanji, hiragana, and/or katakana characters may not be displayed correctly.
E-0202	Connection failed with FTP server	The FTP server software may not be running. Run the FTP server software. Alternatively, the setting may be made so that the FTP server cannot be connected to increase the security level (such as a firewall setting). Change the firewall setting so that the FTP server can be connected.
E-0207	The router is not found	The IP address of the router may be invalid or the power to the router may be off. Check whether the IP address of the router is valid and whether the power to the router is on.
E-0208	The FTP server is not found	The IP address of the FTP server may be invalid or the power to the FTP server may be off. Check whether the IP address of the FTP server is valid and whether the power to the FTP server is on. Alternatively, the FTP server may not respond to the PING command to increase the security level (such as a firewall setting). Set CNC parameter No. 905#1 to "1" and connect the server again.
E-020B	Cannot login into FTP server	Check the user name and password for logging in to the FTP server.
E-020C	The parameters of FTP server are wrong	Check the user name and password for logging in to the FTP server.
E-020D	Changing a work folder of host failed	Check the work folder for logging in to the FTP server.
E-0219	The DNC file is not found	Check whether the file for DNC operation is specified correctly.

Error No.	Log message	Meaning and action to be taken
E-021A	The specified file is not found	Check whether the specified file is present.
E-021B	Opening a file failed	The file could not be opened. Check the error code in parentheses.
E-021F	FTP transfer is busy on BUFFER mode	FTP communication could not catch up with data supply. Correct the file division size. Alternatively, set CNC parameter No. 0904#0 to 1.
E-0220	There is no file in list file	No file is defined in the list in the buffer mode. Correct the file list.
E-0221	The specified file already exists	The specified file is already present on the memory card of the Data Server. Delete the existing file. Alternatively, change the file name.
E-0223	Writing data to the file failed	Data could not be written to the memory card of the Data Server. Check the error code in parentheses.
E-023A	The specified file is busy	The file on the memory card of the Data Server is currently used. When a file on the memory card is selected as a main program, the file is regarded as being used.
E-0252	Contents of ATA card are broken	Format the memory card of the Data Server.
E-02F0	ATA card is not found	Check whether a memory card is installed in the Data Server.
E-02F3	ATA card is not mounted	Check whether the memory card of the Data Server is destroyed and whether the memory card has been formatted.
E-041A	Frame transmission failed (TCP)	A communication error occurred due to one of the following causes: → The network quality degraded, data could not be received from the personal computer with which to communicate, and the logical communication path was disconnected. → The software component on the personal computer with which to communicate forcibly disconnected the logical communication path. → The Ethernet cable was disconnected. → Data cannot be posted to the communication destination due to a firewall setting.
E-0A02	Cannot read MAC address	The MAC address may not be written on the Fast Ethernet board or Fast Data Server board or the board may be damaged.
E-0A06	Network is too busy	An excessive amount of data flows over the network. Take action such as dividing the network.
E-0B00	The own IP address is wrong	Set the IP address according to the IP address specification format.
E-0B01	The own IP address is not set	Set the IP address.
E-0B02	Subnet mask is wrong	Set the subnet mask according to the subnet mask specification format.

Error No.	Log message	Meaning and action to be taken
E-0B03	Subnet mask is not set	Set the subnet mask.
E-0B04	Router IP address is wrong	There may be a conflict between the classes of the local node and router IP addresses.
E-0B05	IP address of DNS server is wrong	There may be a conflict between the classes of the local node and DNS server IP addresses.
E-0B06	The own host name is wrong	Check the host name setting.
E-0B07	The own domain name is wrong	Check the domain name setting.
E-0B08	TCP port number is wrong	A value outside the valid setting range may be set.
E-0B09	UDP port number is wrong	A value outside the valid setting range may be set.
E-0B0B	IP address of remote FTP server is wrong	Set the IP address according to the IP address specification format.
E-0B0C	Port number of a remote FTP server is wrong	A value outside the valid setting range may be set.
E-0B0D	User name of remote FTP server is wrong	A character unavailable for a user name may be used.
E-0B0E	Password of remote FTP server is wrong	A character unavailable for a password may be used.
E-0B0F	Login folder of remote FTP srv is wrong	A character unavailable for a login folder name may be used.
E-0B10	Port number of own FTP server is wrong	A value outside the valid setting range may be set.
E-0B11	User name of own FTP server is wrong	A character unavailable for a user name may be used.
E-0B12	Password of own FTP server is wrong	A character unavailable for a password may be used.
E-0B13	Login folder of own FTP server is wrong	A character unavailable for a login folder name may be used.
E-0B14	IP address of Remote Diag is wrong	Set the IP address of the machine remote diagnosis accepting server according to the IP address specification format.
E-0B15	Port number of Remote Diag is wrong	A value outside the valid setting range may be set.
E-0B18	Cannot set because DHCP is available	To set the item, disable the DHCP client function.
E-0B27	Unsolicited Message function isn't available	The software condition for using the unsolicited messaging function is not satisfied. The cause may be one of the following: →The version of communication software is not supported yet. → NC parameters for using the unsolicited messaging function are not set.
E-0B29	Mode of Unsolicited Message is wrong	In the CNC mode, the FOCAS2 function cnc_wrunsolicprm2 cannot be executed.

Error No.	Log message	Meaning and action to be taken
E-0B2A	Status of Unsolicited Message is wrong	The state of the unsolicited messaging function was other than "Not Ready", so that the parameters for the unsolicited messaging function could not be updated. The cause may be one of the following: → In a state other than "Not Ready", the FOCAS2 function cnc_wrunsolicprm2 or cnc_unsolicstart was executed. → In a state other than "Not Ready", soft key [APPLY] was pressed.
E-0B2B	Cannot refresh parameter of Unsolicited Message	The parameters for the unsolicited messaging function could not be updated. The cause may be one of the following: → The problem of E-0B29 or E-0B2A occurred. → A parameter for the unsolicited messaging function includes an invalid value.
E-0B44	Invalid value exists in Transmission parameter of Unsolicited Message	The parameter for the unsolicited messaging function, TRANSMISSION NUMBER or TRANSMISSION PARAMETER (NO. 1 to NO. 3), includes an invalid value.
E-0B45	The total of Transmission size of Unsolicited Message exceeds the limitation	The sum of sizes specified by the parameters for the unsolicited messaging function, TRANSMISSION PARAMETER NO. 1 to NO. 3, exceeds the maximum specifiable number of bytes.
E-XXXX	(No message)	Internal error. Report the error number.

The meanings of the error codes indicated in error messages are as follows:

Error code	Meaning
2	The available space of the memory card of the Data Server is insufficient.
10	The specified folder cannot be found.
11	The allowable number of entries is exceeded.
12	Access to a folder was rejected.
14	The specified file cannot be found.
15	Access to a file was rejected.
19	An attempt was made to access a file being used.
22	The specified file name is illegal.
28	A TV check error was detected.
36	The specified file is already present.
37	The folder is not empty.
39	The specified folder is already present.
48	The available file size is exceeded.

11.6 TROUBLESHOOTING

11.6.1 Confirmation of Connection with the Hub Unit

1. Is the hub unit and the CNC connected together with a category 5 twisted pair cable (STP cable) with a common shield?
   Is the STP cable connected correctly?
   In general, a straight cable is used to make a connection between a hub unit and communication unit.
2. Are the hub unit and cable grounded?
3. Is the power to the hub unit turned on?
4. Is the LED (LED for LINK) of the connected hub unit turned on? (Some hub units do not have an LED for LINK.)
   The LED is not turned on when the hub unit is not connected to the CNC or when the power to the CNC is not turned on.
5. Is the LIL LED of the Fast Ethernet board turned on at all times? The LED is not turned on when the board is not connected to the hub unit or when the power to the hub unit is not turned on.
   The PCMCIA card is dedicated to 10BASE-T. Is a hub unit dedicated to 10BASE-T used when the PCMCIA card is used?
6. Is the LINK LED turned on when the embedded port is used?
   The LED is not turned on when the port is not connected to the hub unit or when the power to the hub unit is not turned on.

11.6.2 Confirmation of Each Parameter Setting

(1) Confirmation of settings on the CNC side

1. Is an MAC address displayed?
   An MAC address can be checked on the parameter setting screen.
2. Is the correct IP address set?
   Ensure that the IP address for each unit is unique.
3. Is the correct subnet mask set?
   The setting must match that of the communication destination unit.
4. When communications via a router are performed, is the IP address of the router set correctly?

(2) Confirmation of settings on the personal computer side

1. Is the correct IP address set?
   Ensure that the IP address for each unit is unique.
2. Is the correct subnet mask set?
   The setting must match that of the communication destination unit.
3. When communications via a router are performed, is the IP address of the router set correctly?

11.6.3 Confirmation of Communications Based on the Ping Command

(1) Confirmation from the CNC side

Use the ping command from the CNC side. For the Embedded Ethernet, see Subsection, "Maintenance Screen for Embedded Ethernet Function." For the Fast Ethernet board/Fast Data Server, see Subsection, "Maintenance screen" (1), "Ping command transmission".

When there is no response from the destination unit, a hardware connection and/or software setting may be faulty. Check the connection and settings for errors.

(2) Confirmation from the personal computer

Example below is used for explanation.

Check method:

At the command prompt, enter ping NC-IP-address. If a response is returned, a connection has been established.

The example below assumes that the IP address on the CNC side is 192.168.1.1.

1 If a response is returned (normal)

```
C:#>Ping 192.168.1.1

Pinging 192.168.1.1  with 32 bytes of data:

Reply from 192.168.1.1:bytes=32 time<10ms TIL=128
Reply from 192.168.1.1:bytes=32 time<10ms TIL=128
Reply from 192.168.1.1:bytes=32 time<10ms TIL=128

C:#>
```

2 If no response is returned (abnormal)

```
C:#>Ping  192.168.1.1

Pinging 192.168.1.1  with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.

C:#>
```

11

12 POWER MATE CNC MANAGER FUNCTION

When the I/O Link Option for the FANUC servo unit βi series (called I/O Link βi below) is used for CNC additional axes (slaves), the Power Mate CNC manager function can be used to display and set up various types of data of these slaves on the CNC.

The Power Mate CNC manager function enables the following display and setting operations:
(1) Current position display (absolute/machine coordinates)
(2) Parameter display and setting
(3) Alarm display
(4) Diagnosis data display
(5) System configuration screen display

Up to eight slaves can be connected to each I/O Link channel.

12.1 SCREEN DISPLAY

1 Press the function key 
.

2 Press the continuous menu key  several times until the soft key [P.MATE MGR.] is displayed.

3 Pressing the soft key [P.MATE MGR.] displays the absolute coordinate screen, which is the initial screen of the Power Mate CNC manager. On this screen, you can select each of the following items by pressing the corresponding soft key:
ABS: Absolute coordinate display
MACHIN: Machine coordinate display
PARAM: Parameter screen
MSG: Alarm list
DGNOS: Diagnosis screen
SYSTEM: System information
To select another function after one of the functions listed above is selected, press the return menu key  until the soft keys appear as shown above. Then, select the desired function.

4 Terminating the Power Mate CNC manager function
Press the return menu key once or twice. The soft keys of the CNC system appear, and the Power Mate CNC manager terminates.
Alternatively, you can select another function by pressing an MDI function key (
, 
, 
, etc.) to terminate the Power Mate CNC manager function.

- Selecting a slave

When slaves are connected to multiple I/O Link channels, pressing [NEXT CH] or [PREV. CH] displayed by pressing the soft key [(OPRT)] changes the displayed channel.
In the upper section of the screen, the following information items are displayed for the connected slaves (up to eight slaves):

- I/O Link group number (0 to 15)
- Alarm status

The cursor is positioned at the number of the slave for which to display information (active slave). When multiple slaves are connected, pressing the [NEXT SLAVE] or [PREV. SLAVE] changes the active slave.
You can display the slave status and select a slave on any screen of the Power Mate CNC manager function.

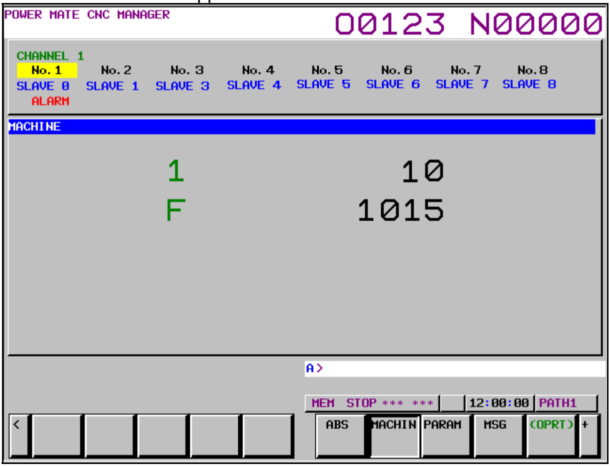
Current position display screen

The current position display screen displays the current position and actual feedrate of the slave.
The following current position data is displayed:

- Absolute coordinate (current position in the absolute coordinate system)
- Machine coordinate (current position in the machine coordinate system)

- **Display method**

  Press the soft key [ABS] or [MACHIN]. The absolute or machine coordinate screen appears as follows:



Power Mate CNC manager: Machine coordinate screen

- **Axis name display**

  You can change the axis name by setting it in the I/O Link βi parameters (Nos. 0024 and 0025). Up to two characters can be set. (Use the ASCII codes of 0 to 9 and/or A to Z). When no axis name is set or the setting data is invalid, the axis name is set to 1.

  This axis name is used only for position display of the Power Mate CNC manager function and irrelevant to the controlled axis on the CNC.

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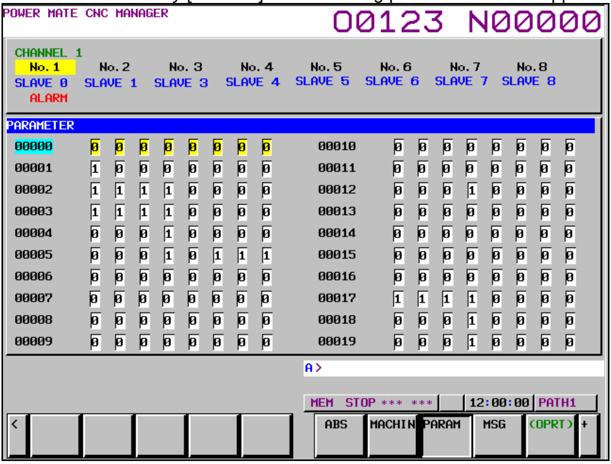
Parameter screen

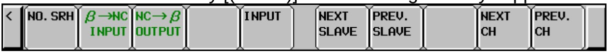
The parameters required for the functions of the slave must be specified in advance.

Press the soft key [PARAM]. The following parameter screen appears:



This screen displays only the bit and decimal data. For details of the parameters, refer to FANUC SERVO AMPLIFER βi series I/O Link Option Maintenance Manual.

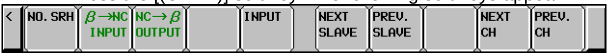
- **Selecting and searching for a parameter**
  1 First, select the active slave.
  2 Press the soft key [(OPRT)]. The following soft keys appear:



  3 Enter a parameter number and press the soft key [NO.SRH]. The search starts.
  You can also select a desired parameter number by pressing the cursor keys and page keys and moving the cursor.

- **Setting a parameter**

  You can directly set an I/O Link βi parameter of the slave from the CNC.
  1 Select a desired parameter using either of the above methods.
  2 Press the [(OPRT)] soft key. The following soft keys appear:



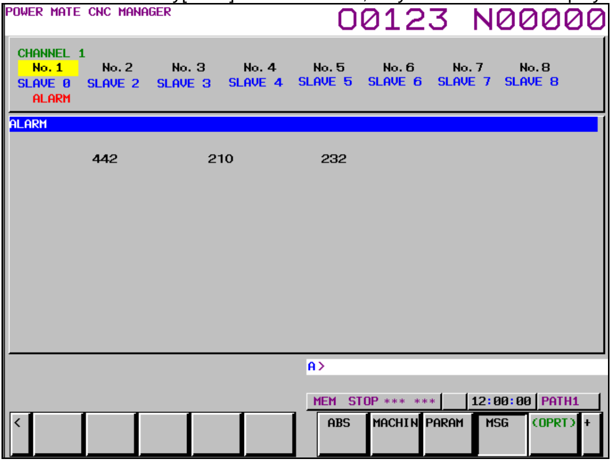
  3 Enter setting data.
  4 Press the soft key [INPUT] or MDI key INPUT.

Alarm screen

If an alarm is issued for the slave, “ALARM” is displayed in the slave status field in the upper section of the screen.
At this time, you can display the alarm screen to check the details of the alarm.
Up to 40 alarm codes are displayed on the screen.
For details of the alarms, refer to FANUC SERVO AMPLIFER βi series I/O Link Option Maintenance Manual.

- **Display method**

  Press the soft key[MSG]. On the screen, only error codes are displayed.



Example of displaying alarms for I/O Link βi of slave 0

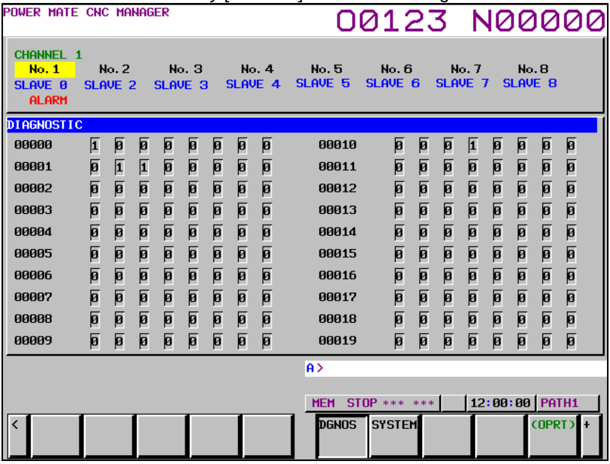
Diagnosis screen

The diagnosis screen displays diagnosis information of the slave.
Diagnosis data is displayed in bit or integer (decimal) representation. For details of diagnosis data, refer to FANUC SERVO AMPLIFER βi series I/O Link Option Maintenance Manual.

- **Display method**

1 Press the continuous menu key [▷].

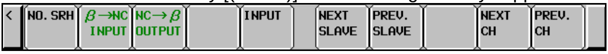
2 Press the soft key [DGNOS] to select the diagnosis screen.



- **Searching for diagnosis data**

1 First, select the active slave.

2 Press the soft key [(OPRT)]. The following soft keys appear:



3 Enter a diagnosis number and press the soft key [NO.SRH]. The search starts.
You can also select a desired parameter number by pressing the cursor keys [↑] [↓] and page keys [PAGE ↑] [PAGE ↓] and moving the cursor.

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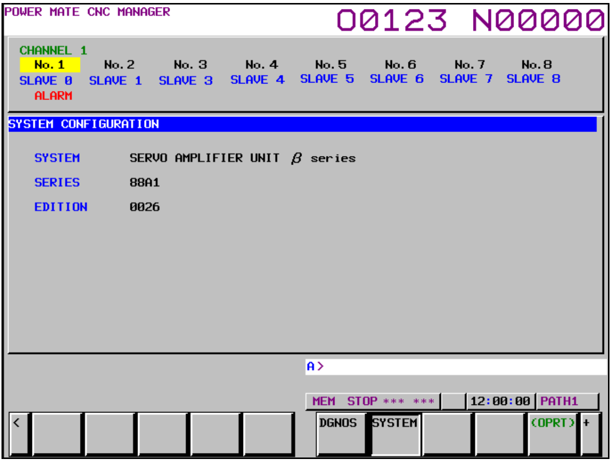
System configuration screen

The system configuration screen displays the system software information of the slave.

- Display method

1 Press the continuous menu key [▷].

2 Press the soft key [SYSTEM] to select the system configuration screen.



Series and edition of the I/O Link βi system software

12.2 PARAMETERS

	#7	#6	#5	#4	#3	#2	#1	#0
0960				PPE	PMN	MD2	MD1	

[Input type] Setting input

[Data type] Bit path

MD1
MD2 The slave parameters are input from and output to either of the following devices:

MD2	MD1	
0	0	Program memory
0	1	Memory card

PMN The Power Mate CNC manager function is:

0 : Enabled.

1 : Disabled. (Communication with the slave is not performed.)

PPE Setting slave parameters using the Power Mate CNC manager:

0 : Can always be performed regardless of the setting of PWE.

1 : Follows the setting of PWE.

	#7	#6	#5	#4	#3	#2	#1	#0
0961					PMO			

[Input type] Parameter input

[Data type] Bit

PMO The O number of a program for saving and restoring the I/O LINK βi parameter is set based on:

0 : Group number and channel number

1 : Group number only

8760	Program number of data input/output (Power Mate CNC manager)

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the program numbers of programs to be used for inputting and outputting slave data (parameters) when the Power Mate CNC manager function is used.
For a slave specified with I/O LINK channel m and group n, the following program number is used:
Setting + (m - 1) $\times$ 100 + n $\times$ 10

If the setting is 0, the parameters of the slave specified with channel 1 and group 0 cannot be input from or output to the CNC memory because the program number is set to 0. The parameters can be input from and output to a memory card.
(Set a value with which any used program number does not exceed 99999999.)

12.3 WARNING

If an alarm is issued for the Power Mate CNC manager, a warning message is displayed.

Message	Description
DATA ERROR	An attempt was made to execute [OUTPUT] (NC → β*i*) for a program not found in the program area.
WRITE PROTECTED	An attempt was made to execute [INPUT] (β*i* → NC) for a program area when the memory protection signal (KEY) is off.
EDIT REJECTED	An attempt was made to execute [INPUT] (β*i* → NC) when the program area already contained a program with the same name as that to be created by executing [INPUT] (β*i* → NC). An attempt was made to execute [INPUT] (β*i* → NC) when the number of the program to be created by executing [INPUT] (β*i* → NC) was selected. An attempt was made to execute [INPUT] (β*i* → NC) when bit 0 (TVC) of CNC parameter No. 0000 was set to 1. (Parameters Nos. 0000 to 0019 are output, but parameter No. 0020 and subsequent parameters are not output.) An attempt was made to execute [OUTPUT] (NC → β*i*) when a memory card did not contain any program for which [OUTPUT] (NC → β*i*) could be executed. An attempt was made to execute [INPUT] (β*i* → NC) for a protected memory card.
NO MORE SPACE	An attempt was made to execute [INPUT] (β*i* → NC) when the program area did not have enough unused space.
FORMAT ERROR	Data other than digits, signs, CAN, and INPUT was entered as the setting of a parameter.
TOO MANY FIGURES	Data consisting of 9 or more digits was entered for a bit-type parameter.
DATA IS OUT OF RANGE	The setting exceeds the valid data range.

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13.1 DIAGNOSIS FUNCTION

13.1.1 Displaying Diagnosis Screen

(1) Press function key SYSTEM .

(2) Press soft key [DGNOS], then a diagnosis screen is displayed.

13.2 LIST OF DIAGNOSIS INFORMATION (DGN)

A number is assigned to each of the information items that are displayed on the diagnosis screen to indicate the internal statuses of the CNC.
A list of numbers is provided below.

Supplement 1:

In this manual, the term diagnosis information, diagnosis number, or DGN may be used to indicate a number.
Example: Diagnosis information 300, DGN201#1

Supplement 2:

For display of CNC operating state, for example, see Section 18.3, "CNC STATE DISPLAY".

13.2.1 Display of Causes of Instructions not Functioning

DGN **0** — CNC's internal status 1

IN.POSITION CHECK	An in-position check is being performed.
FEEDRATE OVERRIDE 0%	A cutting override of 0% is set.
JOG FEEDRATE OVERRIDE 0%	Jog feedrate 0%
INTERLOCK/START.LOCK	Interlock or startlock is on.
SPINDLE SPEED ARRIVAL CHECK	Waiting for spindle speed arrival signal to turn on.
Wait Revolution	Waiting for a spindle one-rotation signal in threading.
Stop Position Coder	Waiting for position coder rotation in spindle feed per revolution.

DGN **2** — Dwell execution status

"1" is displayed when dwell is executed.

DGN **8** — CNC's internal status 2

Foreground Reading	Inputting data in the foreground.
Background Reading	Inputting data in the background.

13.2.2 RS232-C interface output state

DGN **10** — RS232-C interface output state

When data is being output through the RS232-C interface, "1" is indicated.

13.2.3 State of TH Alarm

DGN **30** — Number of characters in a TH alarm (foreground editing)

The position of the character at which a TH alarm occurred in foreground input is displayed as the number of characters from the beginning of the block.

DGN **31** — TH alarm character code (foreground editing)

The bit pattern of the character at which a TH alarm occurred in foreground input is displayed.

DGN **32** — Number of characters in a TH alarm (background editing)

The position of the character at which a TH alarm occurred in background input is displayed as the number of characters from the beginning of the block.

DGN	33	TH alarm character code (background editing)

The bit pattern of the character at which a TH alarm occurred in background input is displayed.

DGN	43	Number of the current display language of the CNC screen

The number of the current display language of the CNC screen is indicated.
The correspondence between languages and numbers is show below.

0 : English
1 : Japanese
2 : German
3 : French
4 : Chinese (traditional characters)
5 : Italian
6 : Korean
7 : Spanish
8 : Dutch
9 : Danish
10 : Portuguese
11 : Polish
12 : Hungarian
13 : Swedish
14 : Czech
15 : Chinese (simplified characters)
16 : Russian
17 : Turkish
18 : Bulgarian
19 : Rumanian
20 : Slovak
21 : Finnish
22 : Hindi
23 : Vietnamese
24 : Indonesian

13.2.4 Details of Serial Pulsecoder

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	200	OVL	LV	OVC	HCA	HVA	DCA	FBA	OFA

OVL Overload alarm
LV Insufficient voltage alarm
OVC Over current alarm
HCA Abnormal current alarm
HVA Overvoltage alarm
DCA Discharge alarm
FBA Disconnection alarm
OFA Overflow alarm

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	201	ALD	PCR		EXP				

	ALD	EXP	
Overload alarm	0	-	Amplifier overheat
	1	-	Motor overheat
Disconnection alarm	1	0	Built-in Pulsecoder (hard)
	1	1	Disconnection of separated type Pulsecoder (hard)
	0	0	Disconnection of Pulsecoder (software)

PCR The one-rotation signal of the position detector was caught before a manual reference position return is performed. Since the manual reference position return grid was established, a manual reference position return is enabled.

> **NOTE**
> Value displayed in this diagnosis data is opposite in sign to cumulative value of compensation pulses.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	202		CSA	BLA	PHA	RCA	BZA	CKA	SPH

CSA Hardware of serial Pulsecoder is abnormal
BLA Battery voltage is low (warning)
PHA Serial Pulsecoder or feedback cable is erroneous. Counting of feedback cable is erroneous.
RCA Serial Pulsecoder is faulty. Counting of feedback cable is erroneous.
BZA Battery voltage became 0. Replace the battery and set the reference position.
CKA Serial Pulsecoder is faulty. Internal clock stopped.
SPH Serial Pulsecoder or feedback cable is faulty. Counting of feedback cable is erroneous.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	203	DTE	CRC	STB	PRM				

DTE Communication failure of serial Pulsecoder. There is no response for communication.
CRC Communication failure of serial Pulsecoder. Transferred data is erroneous.
STB Communication failure of serial Pulsecoder. Transferred data is erroneous.
PRM The alarm is detected by the servo, the values specified in the parameter is not correct.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	204		OFS	MCC	LDA	PMS			

OFS Abnormal current value result of A/D conversion of digital servo
MCC Contacts of MCC of servo amplifier is melted.
LDA Serial Pulsecoder LED is abnormal
PMS Feedback is not correct due to faulty serial Pulsecoder C or feedback cable.

13.2.5 Details of Separate Serial Pulsecoder Alarms

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	205	OHA	LDA	BLA	PHA	CMA	BZA	PMA	SPH

OHA Overheat occurred in the separate Pulsecoder.
LDA An LED error occurred in the separate Pulsecoder.
BLA A low battery voltage occurred in the separate Pulsecoder.
PHA A phase data error occurred in the separate linear scale.
CMA A count error occurred in the separate Pulsecoder.
BZA The battery voltage for the separate Pulsecoder is zero.
PMA A pulse error occurred in the separate Pulsecoder.
SPH A soft phase data error occurred in the separate Pulsecoder.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	206	DTE	CRC	STB					

DTE A data error occurred in the separate Pulsecoder.
CRC A CRC error occurred in the separate Pulsecoder.
STB A stop bit error occurred in the separate Pulsecoder.

13.2.6 Connection System of Scale

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	202	SEM							

SEM Separate position detector is not used (semi-closed loop)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	206							ROT	LIN

LIN Separate position detector is serial interface linear scale
ROT Separate position detector is serial interface rotary scale

	SEM	ROT	LIN
Separate position detector (serial) (linear scale)	0	0	1
Separate position detector (serial) (rotary scale)	0	1	0
Separate position detector (AB phase)	0	0	0
Semi-closed mode	1	0	0

13.2.7 Details of Invalid Servo Parameter Alarms (on the CNC Side)

When servo alarm No. 417 is issued, and diagnosis No. 203#4 = 0, its cause is indicated.
When diagnosis No. 203#4 = 1, see diagnosis No. 352.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	280				DIR	PLS	PLC		MOT

MOT The motor type specified in parameter No. 2020 falls outside the predetermined range.
PLC The number of velocity feedback pulses per motor revolution, specified in parameter No. 2023, is zero or less. The value is invalid.
PLS The number of position feedback pulses per motor revolution, specified in parameter No. 2024, is zero or less. The value is invalid.
DIR The wrong direction of rotation for the motor is specified in parameter No. 2022 (the value is other than 111 or -111).

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13.2.8 Position Error Amount

DGN	300	Position error of an axis in detection unit

$$\text{Position error amount} = \frac{\text{Feed rate [mm/min]} \times 100}{60 \times \text{servo loop gain [1/s]}} \times \frac{1}{\text{Detection unit}}$$

13.2.9 Machine Position

DGN	301	Distance from reference position of an axis in detection unit

13.2.10 Distance from the End of the Deceleration Dog to the First Grid Point

DGN	302	Distance from the end of the deceleration dog to the first grid point

[Data type] Real axis
[Unit of data] Machine unit
[Valid data range] –99999999 to 99999999

13.2.11 Reference Counter

DGN	304	Reference counter amount in each axis

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] –99999999 to 99999999

13.2.12 Machine Coordinates on the Angular/Cartesian Axes

DGN	306	Machine coordinates on the angular axis in the Cartesian coordinate system (output unit)

DGN	307	Machine coordinates on the Cartesian axis in the Cartesian coordinate system (output unit)

13.2.13 Servo Motor Temperature Information

DGN	308	Servo motor temperature (°C)

[Data type] Byte axis
[Valid data range] 0 to 255

The temperature of the servo motor winding is displayed.

When it reaches 140°C, a motor overheat alarm is generated.

DGN	309	Pulse coder temperature (°C)

[Data type] Byte axis
[Valid data range] 0 to 255

The temperature of the printed circuit board in the Pulsecoder is displayed.

When it reaches 100°C (about 85°C in terms of the temperature of the atmosphere in the Pulsecoder), a motor overheat alarm is generated.

NOTE

1 Temperature information has the following error:
- 50°C to 160°C ±5°C
- 160°C to 180°C ±10°C

2 The temperature at which an overheat alarm is generated has an error of up to 5°C.

13.2.14 Cause that Sets Parameter APZ (No. 1815#4) to 0

You can find the cause that sets parameter APZ (No. 1815#4) to 0 by checking diagnosis Nos. 310 and 311.
Once diagnosis No. 310 or 311 is set to 1, this setting is kept unchanged until the zero point of the absolute position detector of the corresponding axis is set again. Possible causes that set APZ to 0 are as follows:

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	310		DTH	ALP	NOF	BZ2	BZ1	PR2	PR1

PR1 One of the following parameters was changed:
No.1815#0, No.1815#1, No.1815#6, No.1817#3, No.1820, No.1821, No.1822, No.1823, No.1850, No.1868, No.1869, No.1874, No.1875, No.1876, No.1878, No.1883, No.1884, No.2022, No.2084, No.2085, No.2179, increment system for a rotary axis A type, No.11802#6, No.11810

PR2 Parameter ATS (No. 8303#1) was changed. Alternatively, when parameter SMA (No. 8302#7) was set to 1, APZ of the axis to be synchronized together was set to 0.

BZ1 A battery voltage of 0 V was detected. (Inductosyn)

BZ2 A battery voltage of 0 V was detected. (Separate position detector)

NOF The inductosyn did not output offset data.

ALP The zero point was set by MDI when the α Pulsecoder had not rotate one or more turns.

DTH An axis detach operation was performed by the controlled-axis detach signal DTCH (G124) or by setting parameter RMV (No. 0012#7).

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	311		DUA	XBZ	GSG	AL4	AL3	AL2	AL1

AL1 An SV alarm (SV301 to SV305) was issued.

AL2 Broken-wire alarm SV445 or SV447 was detected.

AL3 A battery voltage of 0 V was detected. (Serial Pulsecoder)

AL4 Rotation count abnormality alarm RCAL was detected.

GSG The status of broken-wire alarm ignore signal NDCAL (G202) changed from 1 to 0.

XBZ A battery voltage of 0 V or a count error was detected. (Separate serial position detector)

DUA The difference in error between the semi-closed loop and closed loop became too large when the dual position feedback function was being used.

13.2.15 Servo status flag (Separate Detector Unit)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	350		ALT	ALA	APE	CK1	TP1	AC1	PS1

PS1 A position detector is connected to 1st/3rd SDU unit.

AC1 An acceleration sensor is connected to 1st/3rd SDU unit.

TP1 A temperature detection circuit is connected to 1st/3rd SDU unit.

CK1 A servo check interface unit is used as 1st/3rd SDU unit.

APE An error has occurred in EEPROM of αi pulsecoder. (This is not an alarm.)

ALA An alarm is issued from an acceleration sensor.

ALT An alarm is issued from a temperature detection circuit.

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		#7	#6	#5	#4	#3	#2	#1	#0
DGN	351					CK2	TP2	AC2	PS2

PS2 A position detector is connected to 2nd/4th SDU unit.

AC2 An acceleration sensor is connected to 2nd/4th SDU unit.

TP2 A temperature detection circuit is connected to 2nd/4th SDU unit.

CK2 A servo check interface unit is used as 2nd/4th SDU unit.

13.2.16 Details of Invalid Servo Parameter Setting Alarms (on the Servo Side)

DGN	352	Detail number for invalid servo parameter setting alarm

Indicates information that can be used to identify the location (parameter) and cause of an invalid servo parameter setting alarm (servo alarm No. 417).

This diagnosis information is valid when the following conditions are satisfied.

- Servo alarm No. 417 has occurred.
- Diagnosis PRM (No. 203#4) = 1

See the following table for the displayed detail numbers and the corresponding causes. For further detail information that could be used to take measures, refer to FANUC AC SERVO MOTOR αi/βi series Parameter Manual (B-65270EN).

13.2.17 Detailed Descriptions about Invalid Servo Parameter Setting Alarms

Detail number	Parameter number	Cause	Measure
0092	2009#2	This function cannot use on 0i-F series CNC	Set No.2009#2=0
0233	2023	A value specified as the number of velocity pulses is greater than 13100 when initialization bit 0 = 1.	Decrease the value specified as the number of velocity pulses to within 13100.
0234	2023	When a DD motor is used, a value smaller than 512 is set as the number of velocity pulses.	Set 512 or a greater number as the number of velocity pulses, or disable the DD motor. (No. 2300#2=0)
0243	2024	A value specified as the number of position pulses is greater than 13100 when initialization bit 0 = 1.	Decrease the value specified as the number of position pulses to within 13100. Use the position feedback pulse conversion coefficient (No. 2185).
0434 0435	2043	The internal value of the velocity loop integration gain has overflowed.	Decrease the value specified in the velocity loop integration gain parameter.
0443 0444 0445	2044	The internal value of the velocity loop proportional gain has overflowed.	Use a function (No.2200#6) for changing the internal format of the velocity loop proportional gain. Alternatively, decrease the setting of this parameter.
0474 0475	2047	The internal value of the observer parameter (POA1) has overflowed.	Change the setting to: (-1) × (desired setting)/10
0534 0535	2053	The internal value of the dead zone compensation parameter has overflowed.	Decrease the setting until the invalid parameter setting alarm will not occur any longer.
0544 0545	2054		
0694 0695 0696 0699	2069	The interval value of the velocity feed-forward coefficient has overflowed.	Decrease the velocity feed-forward coefficient.
0754 0755	2075	The setting of the parameter listed at the left has overflowed.	This parameter is presently not in use. Specify 0 in it.
0764 0765	2076		
0843	2084	No positive value has been set for the flexible feed gear numerator. Alternatively, the following condition exists: Feed gear numerator > denominator × 16	Specify a positive value as the flexible feed gear numerator. Alternatively, satisfy the following condition: Feed gear numerator ≤ denominator × 16 (except for phase A-/B-specific stand-alone type detector).

Detail number	Parameter number	Cause	Measure
0853	2085	No positive value has been set as the flexible feed gear denominator.	Specify a positive value as the flexible feed gear denominator.
0884 0885 0886	2088	The internal value of the machine velocity feedback coefficient has overflowed.	Decrease the machine velocity feedback coefficient. Alternatively, use the damping control function, which has an equivalent effect.
0883	2088	A value of 100 or greater was specified in the machine velocity feedback coefficient for an axis with a serial stand-alone type detector.	The maximum allowable value for the machine velocity feedback coefficient for axes with a serial stand-alone type detector is 100. Decrease the setting to within 100.
0994 0995 0996	2099	The internal value for suppressing N pulses has overflowed.	Decrease the setting of the parameter listed at the left.
1033	2103	The retract distance related to an unexpected disturbance torque differs between the master and slave axes of position tandem control (if the same-axis retract function is in use).	Set the same value for both the L and M axes.
1123	2112	No value has been entered for the AMR conversion coefficient parameter when a linear motor is in use.	Set an AMR conversion coefficient.
1182	2118 2078 2079	No dual position feedback conversion coefficient is set.	Set an AMR conversion coefficient.
1284 1285	2128	If the value specified as the number of velocity pulses is small, the internal value of the current control parameter overflows.	Decrease the value for the parameter listed at the left to within a range where no alarm will occur any longer.
1294 1295	2129	If the value specified as the number of velocity pulses is large, the internal value of the current control parameter overflows.	Reset "a" to a smaller value when the setting of the parameter listed at the left is broken up into: a $\times$ 256 + b
1393	2139	The setting of the linear motor AMR offset has exceeded $\pm$45.	Enlarge the AMR offset setting range (N2270#1=1) to input a value within a range of $\pm$60.
1454 1455 1456 1459	2145	Velocity feed-forward coefficient for cutting overflowed.	Decrease the velocity feed-forward coefficient.
1493	2149	A value greater than 6 is set in this parameter.	A value not greater than 6 is permitted to be set in this parameter. Correct the setting with a value not greater than 6.

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Detail number	Parameter number	Cause	Measure
1503	2150	A value greater than or equal to 10 is set.	The setting must be less than 10.
1786	2178	No.2212#6 or No.2213#6 is set to 1, and No. 2178=0 is set.	Set No.2212#6 or No.2213#6 to 0.
1793	2179	A negative value or a value greater than the setting of parameter No. 1821 is set.	Set a positive value smaller than the setting of parameter No. 1821.
1853	2185	A negative value or a value greater than the setting of parameter No. 2023 is set.	Set a positive value smaller than the setting of parameter No. 2023.
2203	2220#0	If pole detection is enabled (bit 7 of No. 2213=1) and a non-binary detector is enabled (bit 0 of No. 2220=1), an illegal servo parameter setting alarm is issued when any of the following is set: - AMR conversion coefficient 1 $\leq$ 0 - AMR conversion coefficient 2 $\leq$ 0 - AMR conversion coefficient 2 $>$ 512 (The settable range is 1 (2 poles) to 512 (1024 poles).)	Set the AMR conversion coefficients correctly.
2243	2224#5	This alarm is issued when a setting is made to neglect the invalid setting of the parameter for the feed-forward timing adjustment function (No.2224#5=1) and a command for nano interpolation is issued.	Use either one.
2632	2263	When the lifting function against gravity is enabled (No.2298#7=1) or the post-servo-off travel distance monitor function is enabled (No.2278#5=1), the function for enabling the CNC software to post the detection unit to the servo software is not supported and the setting of the detection unit (No. 2263) is disabled.	Take one of the following actions: 1) Set a value in parameter No. 2263. 2) Disable the lifting function against gravity and the post-servo-off travel distance monitor function. 3) Use CNC software that supports the function for enabling the detection unit to be posted to the servo software.
2780	2277#5,6,7 2278#0,2,4 24096	When the first SDU unit is not used (No. 24096=0), a setting is made to connect a detector (acceleration sensor, temperature detection circuit, or analog check interface unit) to the first SDU unit.	Check the FSSB setting (No. 24096) or the detector setting (bits 0, 2, and 4 of No. 2278).

Detail number	Parameter number	Cause	Measure
2781	2277#5,6,7 2278#1,3,4 24097	When the second SDU unit is not used (No. 24097=0), a setting is made to connect a detector (acceleration sensor, temperature detection circuit, or analog check interface unit) to the second SDU unit.	Check the FSSB setting (No.24097) or the detector setting (bits 1, 3, and 4 of No. 2278).
2782	2277#5,6,7 2278#0,4 24096	Any of the following settings is made: • For use with the first SDU unit (No. 24096>0), both of an acceleration sensor and temperature detection circuit are enabled. • Settings are made to use the first SDU unit, disable an acceleration sensor (No.2277#5,6,7=0,0,0), and read acceleration data from the second unit (No.2278#1=1).	Check the settings of the acceleration sensor and temperature detection circuit.
2783	2277#5,6,7 2278#1,4 24097	Any of the following settings is made: • For use with the second SDU unit (No. 24097>0), both of an acceleration sensor and temperature detection circuit are enabled. • Settings are made to use the second SDU unit, disable an acceleration sensor (No.2277#5,6,7=0,0,0), and read acceleration data from the second unit (No.2278#1=1).	Check the settings of the acceleration sensor and temperature detection circuit.
2784	1815#1 2277#5,6,7 2278#0,1,4	At the time of full-closed system setting, a detector other than a separate position detector is connected (with the first/second SDU unit).	Modify the setting of the detector.
2785	1815#1 2277#5,6,7 2278#0,4	At the time of full-closed system setting, a detector other than a separate position detector is connected (with the first SDU unit).	Modify the setting of the detector.
2786	1815#1 2277#5,6,7 2278#1,4	At the time of full-closed system setting, a detector other than a separate position detector is connected (with the second SDU unit).	Modify the setting of the detector.

Detail number	Parameter number	Cause	Measure
2787	2278#0,#1	A setting is made to connect two temperature detection circuits.	Only one temperature detection circuit can be connected. Modify the setting so that data is read from one of the first and second SDU units.
2788	1815#1 2277#5,6,7 2278#4 2278#0,1 24096 24097	A setting is made to connect two temperature detection circuits.	Only one temperature detection circuit can be connected. Modify the setting so that data is read from one of the first and second SDU units.
3002	2300#3,#7	The αiCZ detection circuit and linear motor position detection circuit do not support overheat signal connection.	Replace the αiCZ detection circuit and linear motor position detection circuit with those circuits that support overheat signal connection. Alternatively, modify the setting so that the overheat signal is read from a DI signal (No.2300#3=0).
3012	2301#2,#7	• When bit 2 of No. 2301=1 Hardware (PS, SV) that does not support DC link voltage information output is connected, but bit 2 of No. 2301 is set to 1. • When bit 7 of No. 2301=1 The CNC software does not support the torque control setting range extension function.	• When bit 2 of No. 2301=1 Set bit 2 of No. 2301 to 0. • When bit 7 of No. 2301=1 Use CNC software that supports the function.
3553 3603	2355	The value 4 or a smaller number is set.	Set the value 5 or a greater number.
3603	2113 2360 2363 2366	The value 95 or smaller number is set.	Set the value 96 or a greater number. Alternatively, if no resonance elimination filter is used, set all of the center frequency, band width, and dumping value to 0.
3603 3663	2366	The value 4 or a smaller number is set.	Set the value 5 or a greater number.
3722	2372	The not 0 value is set	Set the value 0
4553	2455	A negative value is set.	Set the value 0 or a greater number.
4563	2456	A value not within 0 to 12 is set.	Set a value within 0 to 12.
8213	1821	A positive value is not set in the reference counter capacity parameter.	Set a positive value in this parameter.

Detail number	Parameter number	Cause	Measure
8254 8255 8256	1825	A position gain of 0 is set, or the internal position gain value has overflowed.	• Set a value other than 0 (when setting = 0). • Use the function for automatic format change for position gain setting range. (No.2209#6=1)
9053	1815#1 24096 24097	At the time of full-closed system setting, no separate detector interface unit is set.	Set a separate detector interface unit.
10010 10016 10019	2200#0	The internal value of a parameter used to detect "unmatched feedback alarm" has overflowed.	Check the parameter (FFG, the number of position pulse and the number of velocity pulse) and the direction of position feedback. If both of them are correct, set unmatched feedback alarm to disable.(No.2200#0=1)
10033	2004	Illegal control cycle setting This error occurs if automatic modification is carried out for the control cycle.	Correct this parameter related to interrupt cycle setting.
10053	2018#0	The scale reverse connection bit has been set up for a linear motor.	The scale reverse connection bit cannot be used for linear motors.
10062	2209#4	The amplifier in use does not support the HC alarm avoidance function.	If you want to use this amplifier, reset the function bit listed at the left to 0. If you want to use the HC alarm avoidance function, use an amplifier that supports it.
10092 10093	2004 2013#0 2014#0	Different control cycles are set within one servo CPU.	Set the same control cycle for axes controlled by one servo CPU.
10103	2004 2013#0	HRV1 is set.	The Series 0i-F does not allow HRV1 setting. Set HRV2 or HRV3.
10113	2013#0	Current cycle mismatch alarm. This alarm is issued if the specified current cycle does not match the actual setting.	An axis for which HRV3 is specified exists on the same optical cable. Review the placement of the amplifier, or disable HRV3.
10123	2013#0	Alarm for indicating the disability of HRV3 setting. This alarm is issued when the axis supports HRV3 but the other axis of the pair does not support HRV3.	Eliminate the cause of the disability in setting the other axis. Alternatively, cancel the HRV3 setting.

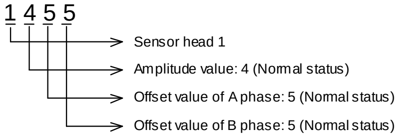
Detail number	Parameter number	Cause	Measure
10133	2013#0 2014#0	This alarm is issued when HRV3 is set, but the amplifier does not support these control types.	HRV3 is unusable for the axis on which the alarm was issued.
10202	2277#5,6,7 2278#0,2,4	The ID of the detector connected to the first SDU unit differs from the parameter setting.	Check the detector-related parameter or the state of detector connection.
10212	2277#5,6,7 2278#1,3,4	The ID of the detector connected to the second SDU unit differs from the parameter setting.	Check the detector-related parameter or the state of detector connection.

DGN 353 Servo diagnosis data 1

DGN 354 Servo diagnosis data 2

Servo data for tuning or diagnose are displayed. This diagnosis information has various meanings.

1) Parameter ITDOUT (No. 2294#0) was set to 1
The amplitude and offset status data of αiCZ sensor is displayed.
DGN No.353: Amplitude and offset of Sensor head 1
DGN No.354: Amplitude and offset of Sensor head 2
The fourth digit: Sensor head number.
1: Sensor head 1, 2: Sensor head 2
The third digit: Amplitude status from 1 to 9.
The value from 3 to 7 expresses the normal status.
The second digit: Offset status of A phase from 1 to 9.
The value from 3 to 7 expresses the normal status.
The first digit: Offset status of B phase from 1 to 9.
The value from 3 to 7 expresses the normal status.



NOTE
1 When No.2294#0 is not set to “0”, other information is displayed.
2 Above values on the diagnosis screen should be checked during rotating.
3 After Checking, the parameter No.2294#0 should be set to “0”.

2) Parameter ACCOUT (No. 2290#0) was set to 1
Acceleration feedback data from the acceleration sensor is displayed to DGN No.354.
* For details, refer to Acceleration monitor function in FANUC SERVO MOTOR $\alpha i/\beta i$ series Parameter Manual (B-65270EN).

3) Otherwise
Internal value of servo control software is displayed. These diagnosis information varies according to the servo control software series/edition and the parameter No.2115, 2151, 2152, and 2153.

DGN | 355 | Communication alarm ignore counter (separate type)

DGN | 356 | Link processing counter (built-in type)

DGN | 357 | Link processing counter (separate type)

The number of times a communication error occurred during serial communication with the detector is indicated. Data transmitted during communication is guaranteed unless another alarm occurs. However, if the counter value indicated in this diagnosis information increases in a short period, there is a high probability that serial communication is disturbed by noise. So, take sufficient measures to prevent noise.

* For details, refer to FANUC SERVO MOTOR $\alpha i/\beta i$ series Parameter Manual (B-65270EN).

DGN | 358 | V ready-off information

This information is provided to analyze the cause of the V ready-off alarm (servo alarm SV0401).
Convert the indicated value to a binary representation, and check bits 5 to 14 of the binary representation.
When amplifier excitation is turned on, these bits are set to 1 sequentially from the lowest bit, which is bit 5. If the amplifier is activated normally, bits 5 to 14 are all set to 1.
Therefore, check the bits sequentially from the lowest bit to find the first bit that is set to 0. This bit indicates that the corresponding processing could not be completed and so the V ready-off alarm was caused.

#15	#14	#13	#12	#11	#10	#09	#08
	SRDY	DRDY	INTL		CRDY		

#07	#06	#05	#04	#03	#02	#01	#00
	*ESP						

*ESP Converter emergency stop state released
CRDY Converter ready
INTL DB relay released
DRDY Amplifier ready (amplifier)
SRDY Amplifier ready (software)

* For details, refer to FANUC SERVO MOTOR $\alpha i/\beta i$ series Parameter Manual (B-65270EN).

DGN | 359 | Communication alarm ignore counter (built-in)

Same diagnosis information as that of diagnosis No. 355.
See the descriptions of diagnosis Nos. 355 to 357.

DGN | 360 | Cumulative value of specified pulses (NC)

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] –99999999 to 99999999
Cumulative value of move commands distributed from the CNC since power-on is indicated.

DGN | 361 | Compensation pulses (NC)

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] –99999999 to 99999999
Cumulative value of compensation pulses (backlash compensation, pitch error compensation, and so on) distributed from the CNC since power-on is indicated.

NOTE
Value displayed in this diagnosis data is opposite in sign to cumulative value of compensation pulses.

DGN	362	Cumulative value of specified pulses (SV)

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] –99999999 to 99999999
Cumulative value of move pulses and compensation pulses received by the servo system since power-on is indicated.

DGN	363	Cumulative feedback (SV)

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] –99999999 to 99999999
Cumulative value of positional feedback pulses the servo system received from the Pulsecoder since power-on is indicated.

DGN	365	Total travel distance (clearable)

DGN	366	Total travel distance

[Data type] 2-word axis
[Unit of data] m, 100 inch, 360 degree
[Valid data range] 0 to 42949672 (When unit of data is m)
0 to 16909320 (When unit of data is 100 inch)
0 to 4294967295 (When unit of data is 360 degree)
Total travel distance of axis is displayed.
When total travel distance clear signal TDCx<Gn726> is set to "1" from "0", diagnosis data No. 365 becomes 0. Diagnosis data No. 366 becomes 0 when it exceeds the upper limit.

13.2.18 Diagnosis Data Related to the Inductosyn Absolute Position Detector

DGN	380	Difference between the absolute position of the motor and offset data

[Data type] 2-word axis
[Unit of data] Detection unit

$$\frac{\text{M (absolute position of the motor) - S (offset data)}}{\lambda \text{ (pitch interval)}}$$

The remainder resulting from the division is displayed.

DGN	381	Offset data from the Inductosyn

[Data type] 2-word axis
[Unit of data] Detection unit
Offset data is displayed when CNC calculates the machine position.

13.2.19 Diagnosis Data Related to the Serial Spindles

DGN	403	Motor temperature of spindle

[Data type] Byte spindle
[Unit of data] °C
[Valid data range] 0 to 255
The temperature of the winding of the spindle motor is indicated.
This information can be used to determine the overheat alarm of the spindle.
(The temperature that causes an overheat alarm varies from motor to motor.)

NOTE
1 Temperature information has the following error:
- 50°C to 160°C ±5K
- 160°C to 180°C ±10K

2 The indicated temperature and the temperature causing an overheat alarm have the following error:
- For lower than 160°C 5K maximum
- For 160 to 180°C 10K maximum

DGN 410 — Spindle load meter indication

[Data type] Word spindle
[Unit of data] %

DGN 411 — Spindle motor speed indication

[Data type] Word spindle
[Unit of data] min^{-1}

DGN 417 — Spindle position coder feedback information

[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 418 — Positional deviation of spindle in position loop mode

[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 425 — Spindle synchronization error

[Data type] 2-word spindle
[Unit of data] Detection unit
When the spindles are in synchronization mode, the absolute value of the synchronization error when each spindle is set as the slave axis is indicated.

DGN 445 — Spindle position data

[Data type] 2-word spindle
[Unit of data] Pulse
[Valid data range] Depend on the bit 0 (ORPUNT) of No.4542 setting (Refer to the table below)

Bit 0 (ORPUNT) of No.4542	Valid data range
0	0 to 4095
1	0 to 32767

This data is valid when parameter No. 3117#1 is set to 1. To display spindle position data, spindle orientation must be performed once.

13.2.20 Diagnosis Data Related to Rigid Tapping

DGN 450 — Spindle position error during rigid tapping

[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 451 — Spindle distribution during rigid tapping

[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 452 — Difference in error amount between spindle and tapping axis during rigid tapping (momentary value)

[Data type] 2-word spindle
[Unit of data] %

DGN 453 — Difference in error amount between spindle and tapping axis during rigid tapping (maximum value)
[Data type] 2-word spindle
[Unit of data] %

DGN 454 — Accumulated spindle distribution during rigid tapping (cumulative value)
[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 455 — Difference in spindle-converted move command during rigid tapping (momentary value)
[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 456 — Difference in spindle-converted positional deviation during rigid tapping (momentary value)
[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 457 — Width of synchronization error during rigid tapping (maximum value)
[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 458 — Tapping axis distribution amount during rigid tapping (cumulative value)
[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 459 — Selected spindle number during rigid tapping
[Data type] 2-word path

DGN 460 — Difference in spindle-converted move command during rigid tapping (maximum value)
[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 461 — Difference in spindle-converted machine position during rigid tapping (momentary value)
[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 462 — Difference in spindle-converted machine position during rigid tapping (maximum value)
[Data type] 2-word spindle
[Unit of data] Detection unit

DGN 1580 — REMAINING DURATION TIME in Spindle smart load meter
[Data type] Word spindle
[Unit of data] sec

DGN 1581 — MAXIMUM value in Spindle smart load meter
[Data type] Word spindle
[Unit of data] %

13.2.21 Diagnosis data related to polygon machining with two spindles

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	470	SC0	LGE		SCF	PSC	PEN	PSU	SPL

[Data type] Bit path

SPL Polygon synchronization with two spindles under way

PSU Polygon synchronization mode with two spindles being activated

PEN Polygon synchronization mode with two spindles released

PSC Spindle speed being changed during polygon synchronization mode with two spindles

SCF Spindle speed changed during polygon synchronization mode with two spindles

LGE The loop gain is different between the spindles during polygon synchronization mode with two spindles.

SC0 Actual speed command is 0 during polygon synchronization mode with two spindles.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	471	NPQ	PQE	QMS	NSP	SUO	QCL		SCU

[Data type] Bit path

Polygon turning with two spindles

Indication of causes for alarms PS5018, PS0314, and PS0218

SCU The specified speed is too low during polygon synchronization mode with two spindles.

QCL The polygon synchronization axis is clamped.

SUO The specified speed is too high during the polygon synchronization mode with two spindles.

NSP A spindle necessary for control is not connected.

QMS When bit 1 (QDR) of parameter No. 7603 = 1, a negative value is specified at Q.

PQE In a G51.2, either P or Q has a value out of the specifiable range. Or, P and Q are not specified as a pair.

NPQ In a G51.2, R is specified when P and Q have not been specified at all, or none of P, Q, and R has been specified.

DGN	474	Rotation ratio for the master axis during the polygon synchronization mode with two spindles (P command value)

[Data type] 2-word path

This indication is the current rotation ratio (P command value) of the master axis during the polygon synchronization mode with two spindles.

DGN	475	Rotation ratio for the polygon synchronization axis during the polygon synchronization mode with two spindles (Q command value)

[Data type] 2-word path

This indication is the current rotation ratio (Q command value) of the polygon synchronization axis during the polygon synchronization mode with two spindles.

13.2.22 Diagnosis Data Related to the Small-hole Peck Drilling Cycle

DGN	520	Total number of times a retraction operation has been performed during drilling since G83 was specified

DGN	521	Total number of times a retraction operation has been performed in response to the reception of the overload torque detection signal during drilling since G83 was specified

The total numbers of times output in Nos.520 and 521 are cleared to zero by a G83 command issued after the small-hole peck drilling cycle mode is entered.

DGN	522	Coordinate value of the drilling axis at which retraction operation starts (least input increment)

DGN	523	Difference between the coordinate value of the drilling axis at which the previous retraction operation started and the coordinate value of the drilling axis at which the current retraction operation starts (least input increment: previous value minus current value)

13.2.23 Diagnosis Data Related to the Dual Position Feedback Function

DGN	550	Closed loop error

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -99999999 to 99999999

DGN	551	Semi-closed loop error

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -99999999 to 99999999

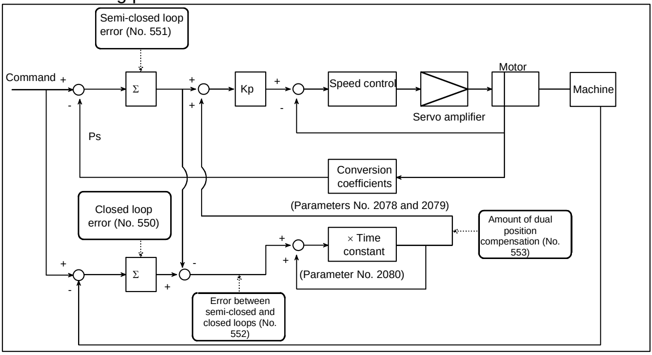
DGN	552	Error between semi-closed and closed loops

[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -32768 to 32767

DGN	553	Amount of dual position compensation

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -99999999 to 99999999

The data items displayed on the diagnosis screen are obtained at the following positions:



13.2.24 Automatic Alteration of Tool Position Compensation

DGN	560	Manual tool compensation state number

[Data type] Byte
[Unit of data] None
[Valid data range] 0 to 255

When incomplete operation was performed in manual tool compensation, one of the following numbers is used for notification.

0 : Manual tool compensation was completed normally.
1 : The data of T code command falls outside the allowable range.
2 : The offset value falls outside the range.
3 : The offset number falls outside the range.
4 : Automatic operation or axis movement is being performed in the CNC.
5 : The CNC is in the tool-nose radius compensation mode.
6 : The CNC is in a mode other than the JOG mode, HNDL (INC) mode, and REF mode.
7 : A CNC parameter is illegal.

13.2.25 State of High-speed HRV Current Control

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	700							HOK	HON

[Data type] Bit axis

The state of high-speed HRV current control is displayed.

HON The motor is controlled in the high-speed HRV current control mode.

HOK This bit is set to 1 when high-speed HRV current control is enabled.
High-speed HRV current control is enabled when the following conditions are satisfied:

- Parameter HR3 (No. 2013#0) is set to 1.
- Parameter HR4 (No. 2014#0) is set to 1.
- Servo software, servo modules, and servo amplifiers suitable for high-speed HRV current control are used.
- When a separate detector interface unit is used, the separate detector interface unit is suitable for high-speed HRV current control.

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13.2.26 Servo status flag 2

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	700	L2K	O2K	1VP	FFB	PFB	DCL		

DCL DC link voltage information can be used.
PFB On the semi-closed side, a high-resolution rotary scale (such as RCN727) is connected.
FFB On the full-closed side, a high-resolution rotary scale (such as RCN727) is connected.
1VP A detector is connected via an analog SDU unit.
O2K The detector on the full-closed side enables 2048-magnification interpolation setting.
L2K The detector on the semi-closed side enables 2048-magnification interpolation setting. (Linear motor)

13.2.27 Spindle Error and Warning States

DGN	710	Spindle error state

[Data type] Word spindle

DGN	712	Spindle warning state

[Data type] Word spindle

When an error (yellow LED ON + error number indication) or a warning occurs in a Spindle Amplifier (SP), the number is indicated on the diagnosis screen.
If neither error nor warning occurs, 0 is indicated.

For spindle errors, refer to "ERROR DISPLAY ON THE SPINDLE AMPLIFIER" in this manual.
For warnings, see Subsection, "Spindle Warning Interface" in this manual.

DGN	720	Spindle diagnosis data 1

DGN	722	Spindle diagnosis data 2

Spindle data for tuning or diagnose are displayed. This diagnosis information has various meanings depending on a parameter setting.

(1) In case that parameter No. 4532 is set to 9
The amplitude and offset status data of αiCZ sensor is displayed.
Diagnosis data No.720: Amplitude and offset of sensor head 1
Diagnosis data No.722: Amplitude and offset of sensor head 2
The fourth digit: Sensor head number.
1: Sensor head 1
2: Sensor head 2
The third digit: Amplitude status from 1 to 9.
The value from 3 to 7 expresses the normal status.
The second digit: Offset status of A phase from 1 to 9.
The value from 3 to 7 expresses the normal status.
The first digit: Offset status of B phase from 1 to 9.
The value from 3 to 7 expresses the normal status.

Example : 1 4 5 5
→ Sensor head 1
→ Amplitude value: 4 (Normal status)
→ Offset value of A phase: 5 (Normal status)
→ Offset value of B phase: 5 (Normal status)

(2) In case that parameter No. 4532 is set to 11
The estimated inertia in Inertia estimation function is displayed. Negative value means estimation error.
-1: The acceleration is beyond the tolerable level.
-2: The acceleration is too small.
-3: The estimation result overflows.

(3) In case that parameter No. 4532 is set to 15
The amplitude and offset status data of spindle analog sensor is displayed.
Diagnosis data No.720: Amplitude and offset of motor sensor (Connected JYA2)
The fourth digit: Always “1”
The information is related to motor sensor.
The third digit: Amplitude status from 1 to 9.
The value from 3 to 7 expresses the normal status.

The second digit: Offset status of A phase from 1 to 9.
The value from 3 to 7 expresses the normal status.
The first digit: Offset status of B phase from 1 to 9.
The value from 3 to 7 expresses the normal status.

Diagnosis data No.722: Amplitude and offset of spindle sensor (Connected JYA4)

The fourth digit: Always “2”
The information is related to spindle sensor.
The third digit: Amplitude status from 1 to 9.
The value from 3 to 7 expresses the normal status.
The second digit: Offset status of A phase from 1 to 9.
The value from 3 to 7 expresses the normal status.
The first digit: Offset status of B phase from 1 to 9.
The value from 3 to 7 expresses the normal status.

Example: 2 4 5 5
- 2 → Spindle sensor (Connected JYA4)
- 4 → Amplitude value: 4 (Normal status)
- 5 → Offset value of A phase: 5 (Normal status)
- 5 → Offset value of B phase: 5 (Normal status)

13.2.28 Digital Servo (2)

DGN	750	OVC level

[Data type] 2-word axis
[Unit of data] %
The ratio to the soft thermal (OVC) alarm generation level is displayed.

DGN	752	DC link voltage information

[Data type] Word axis
[Unit of data] V
[Valid data range] 0 to 1023
DC link voltage information is indicated.

DGN	760	R phase current value

[Data type] Word axis
[Unit of data] Value 6554 is equivalent to the maximum amplifier current.
[Valid data range] -6554 to +6554
The actual R phase current value of the servo motor is indicated.

DGN	761	Effective current value

[Data type] Word axis
[Unit of data] Value 8027 is equivalent to the maximum amplifier current.
[Valid data range] -8027 to +8027
The effective current value of the servo motor is indicated.

DGN	762	Activation phase

[Data type] Word axis
[Unit of data] 256 corresponds to 360 degrees
[Valid data range] 0 to 255
The activation phase (electric angle) of the servo motor is displayed.

DGN	763	Center frequency of Adaptive Resonance Elimination Filter

[Data type] Word axis
[Unit of data] Hz
[Valid data range] 100 to 2000

In Adaptive Resonance Elimination Filter, the center frequency following up the changeable mechanical resonance is displayed.

* For details, refer to Adaptive Resonance Elimination Filter in FANUC SERVO MOTOR $\alpha i/\beta i$ series Parameter Manual (B-65270EN/08 or later).

DGN	764	Estimated inertia

[Data type] Word axis
[Unit of data] Refer to the following manual
[Valid data range] -3 to 32767

The estimated inertia in Inertia Estimation Function is displayed. Negative value means estimation error.

* For details, refer to Inertia Estimation Function in FANUC SERVO MOTOR $\alpha i/\beta i$ series Parameter Manual (B-65270EN/08 or later).

13.2.29 Fan Rotation Speed

DGN	1002	FAN1 rotation speed

DGN	1003	FAN2 rotation speed

[Data type] 2-word
[Unit of data] 1/min

FAN1,FAN2
The rotation speed of the fans in the CNC controller are indicated.
When any error or warning does not occur, “0” is displayed.

13.2.30 8-Level Data Protection Function

DGN	1004	Current operation level of 8-Level Data Protection

[Data type] Word
[Unit of data] None
[Valid data range] 0 to 7

This number shows current operation level of 8-Level Data Protection Function.

13.2.31 Reason why a start cannot be performed

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1005						OHT		JMD

[Data type] Bit path

The reason why a start cannot be performed is displayed.

JMD M,S,T,B of manual numeric command is specified while M,S,T,B is being executed.

OHT Automatic operation can not start. (During a retract operation etc)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1006	RVS	PTR		NOP		SRN	ALM	*SP

[Data type] Bit path

The reason why a start cannot be performed is displayed.

*SP The feed hold signal (*SP) is 0.

ALM An alarm occurs.

SRN The SRN signal is "1".

NOP The device is not ready in the DNC operation mode (RMT).

PTR The tool retraction signal (TRESC) is "1". Alternatively, the tool is not returned to the position where the tool retraction signal was input.
RVS Reverse operation of the program cannot be performed.

13.2.32 Alarm type

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1007			PW	IO		OT	SV	SW

[Data type] Bit path
The alarm type is displayed.
SW Parameter writing switch on.
SV Servo alarms.
OT Overtravel alarms.
IO Memory file alarms.
PW Alarms requiring power to be turned off.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1008				EX	MC	SR	BG	PS

[Data type] Bit path
The alarm type is displayed.
PS Alarms on program and operation
BG Background edit alarms.
SR Communication alarms.
MC Macro alarms.
EX External alarms.

13.2.33 Reset / feed hold state

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1010					RST	ERS	RRW	ESP

[Data type] Bit path
The reset / feed hold state is displayed.
ESP During emergency stop.
RRW The reset and rewind signal is "1".
ERS The extermal reset signal is "1".
RST The reset key is being pressed.

13.2.34 Cause of turning off of the cycle start lamp

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1011	HLD	STP	MOD	ALM	RST	ERS	RRW	ESP

[Data type] Bit path
The cause of turning off of the cycle start lamp is displayed.
ESP During emergency stop.
RRW The reset and rewind signal is "1".
ERS The extermal reset signal is "1".
RST The reset key is being pressed.
ALM An alarm is being generated.
MOD The mode has been changed to another mode.
STP Single–block stop.
HLD During feed hold.

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13.2.35 Cause of Lock

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1013	SMZ							

[Data type] Bit path

The cause of the operation is locked.

SMZ Waiting the acc/dec completion.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1014	FED	POL	EDC		CS2	PST		

[Data type] Bit path

The cause of the operation is locked.

PST Motion lock by parameter rewriting.

CS2 Motion lock by threading, rigid tapping, spindle positioning, and EGB.

EDC The feedrate calculated by cutting feed instruction is almost 0.(when external deceleration is effective)

POL The feedrate of one or less was calculated by polar coordinate interpolation.

FED The feedrate calculated by cutting feed instruction is almost 0.(override etc)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1015								BCT

[Data type] Bit path

The cause of the operation is locked.

BCT Waiting for balance cutting.

13.2.36 Automatic Data Backup

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1016	ANG	ACM			DT3	DT2	DT1	AEX

[Data type] Bit axis

The automatic data backup status is displayed.

AEX Automatic data backup is being executed.

DT1 Data item 1 was updated in the previous backup.

DT2 Data item 2 was updated in the previous backup.

DT3 Data item 3 was updated in the previous backup.

ACM Automatic data backup has been executed.

ANG An error occurred in automatic data backup.

13.2.37 Custom Macro / Execution Macro / Auxiliary Macro

DGN	1493	Number of macro statement blocks executed by custom and execution macros

[Data type] 2-word path

[Unit of data] Block

The number of macro statement blocks executed by custom and execution macros per 1024 ms is displayed.

This data provides an indication of the actual macro statement processing speed.

DGN	1494	Number of blocks executed by auxiliary macros

[Data type] 2-word path

[Unit of data] Block

The number of blocks executed by auxiliary macros per 1024 ms is displayed.

This data provides an indication of the actual auxiliary macro processing speed.

13.2.38 CNC Fan Status

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1495	NI2	NI1	FAN		NI2	NI1	FAN	

[Data type] Bit
FAN For CNC fan 2 without a fan2
NI2-NI1 For CNC fan 2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)
1	0	Exchange necessary 2(The fan binds and starting-time is long.)
1	1	Exchange necessary 1 and 2.

FAN For CNC fan 1 without a fan1
NI2-NI1 For CNC fan 1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)
1	0	Exchange necessary 2(The fan binds and starting-time is long.)
1	1	Exchange necessary 1 and 2.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1496	NI2	NI1	FAN		NI2	NI1	FAN	

[Data type] Bit
FAN For CNC fan 4 without a fan4
NI2-NI1 For CNC fan 4 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

FAN For CNC fan 3 without a fan3
NI2-NI1 For CNC fan 3 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

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13.2.39 Main Program

DGN	1497	Main program change counter

[Data type] Byte path
[Unit of data] 1 time

This number counts change of main program from power on.
If this counter exceeds 255, it returns to 0 and is incremented again.
The counter turns to 0 when power is off.

13.2.40 Diagnosis Data Related to the Spindles

DGN	1520	Spindle total revolution number 1

DGN	1521	Spindle total revolution number 2

[Data type] 2-word spindle
[Unit of data] 1000 min^{-1}
[Valid data range] 0 to 999999999

The number of revolutions of the spindle is counted and the total number of revolutions is indicated.

DGN	1547	Spindle motor speed data (2 word)

[Data type] 2-word spindle
[Unit of data] min^{-1}
When bit 0 (SSE) of No.3791 is set to 1, the spindle motor speed is displayed to diagnosis data No.1547. And then, diagnosis data No.411 is displayed 0.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1570	LNK							S2W

[Data type] Bit spindle

S2W A spindle speed command is the resolution of spindle speed/1048575 [min^{-1}].

LNK Communication with the serial spindle control side has been established.

13.2.41 Communication between spindle amplifier and servo amplifier

DGN	1612	The index number of the spindle axis that synchronizes with each servo axis

[Data type] Byte axis
The index number of the spindle axis that can use direct communication between a spindle amplifier and a servo amplifier on FSSB connection is displayed.

13.2.42 Servo Leakage Detection Function

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1700	VPG	RLY	ZOF	ZTR	INS	ZMS	ZND	ZUD

[Data type] Bit axis

ZUD When Leakage Detection Function is effective the insulation resistance is
0: Measurement completion
1: Unmeasurement

ZND Leakage Detection Function
0: Correspondence
1: Non-correspondence

ZMS Insulation resistance
0: Measurement incompleteness end
1: Measurement completion (completion:0→1、Emergency stop:0)

INS Insulation resistance decrease
0: (More than standard value.)Default 10MΩ
1: The insulation resistance is abnormal. (Below standard value)

ZTR Insulation resistance measurement circuit communication abnormality
0: Normality
1: Communication abnormality

ZOF Insulation resistance measurement circuit offset is excessive
0: Normality
1: Offset is excessive

RLY Between ground relay is abnormal.
0: Normality
1: Abnormal.

VPG The VPG offset is excessive.
0: Normality
1: Offset is excessive

DGN	1701	Leakage resistance data

[Data type] Real axis
[Unit of data] MΩ
[Valid data range] 0.0 to 102.1

13.2.43 Spindle Leakage Detection Function

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1702	VPG	RLY	ZOF	ZTR	INS	ZMS	ZND	ZUD

[Data type] Bit spindle

ZUD When Leakage Detection Function is effective the insulation resistance is
0: Measurement completion
1: Unmeasurement

ZND Leakage Detection Function
0: Correspondence
1: Non-correspondence

ZMS Insulation resistance
0: Measurement incompleteness end
1: Measurement completion (completion:0→1、Emergency stop:0)

INS Insulation resistance decrease
0: (More than standard value.)Default 10MΩ
1: The insulation resistance is abnormal. (Below standard value)

ZTR Insulation resistance measurement circuit communication abnormality
0: Normality
1: Communication abnormality

ZOF Insulation resistance measurement circuit offset is excessive
0: Normality
1: Offset is excessive

RLY Between ground relay is abnormal.
0: Normality
1: Abnormal.

VPG The VPG offset is excessive.
0: Normality
1: Offset is excessive

DGN	1703	Leakage resistance data

[Data type] Real spindle
[Unit of data] MΩ
[Valid data range] 0.0 to 102.1

NOTE
Leakage Detection Function 1700-1703 is detected by the emergency stop on. And the data detected by the emergency stop off is maintained.

13.2.44 Internal Cooling Fan for the Servo Amplifier

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1710	AI2	AI1	FAN		AI2	AI1	FAN	

[Data type] Bit axis

#1 FAN For servo amplifier internal cooling fan 2 without a fan2

#3 AI2 - #2 AI1 For servo amplifier internal cooling fan 2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

#5 FAN For servo amplifier internal cooling fan 1 without a fan1

#7 AI2 - #6 AI1 For servo amplifier internal cooling fan 1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

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13.2.45 Radiator Cooling Fan for Servo Amplifier

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1713	AR2	AR1	FAN		AR2	AR1	FAN	

[Data type] Bit axis

#1 FAN Servo radiator cooling fan2 without a fan2

#3 AR2 - #2 AR1 Servo radiator cooling fan2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

#5 FAN Servo radiator cooling fan1 without a fan1

#7 AR2 - #6 AR1 Servo radiator cooling fan1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

13.2.46 Internal Cooling Fan for Common Power Supply

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1716	PI2	PI1	FAN		PI2	PI1	FAN	

[Data type] Bit axis

#1 FAN Common power supply internal cooling fan2 without a fan2

#3 PI2 - #2 PI1 Common power supply internal cooling fan2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

#5 FAN Common power supply internal cooling fan1 without a fan1

#7 PI2 - #6 PI1 Common power supply internal cooling fan1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

13.2.47 Radiator Cooling Fan for Common Power Supply

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1719	PR2	PR1	FAN		PR2	PR1	FAN	

[Data type] Bit axis

#1 FAN Common power supply radiator cooling fan2 without a fan2

#3 PR2 - #2 PR1 Common power supply radiator cooling fan2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

#5 FAN Common power supply radiator cooling fan1 without a fan1

#7 PR2 - #6 PR1 Common power supply radiator cooling fan1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

13.2.48 Internal Cooling Fan for Spindle Amplifier

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1722	AI2	AI1	FAN		AI2	AI1	FAN	

[Data type] Bit spindle

#1 FAN Spindle internal cooling fan2 without a fan2

#3 AI2 - #2 AI1 Spindle internal cooling fan2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

#5 FAN Spindle internal cooling fan1 without a fan1

#7 AI2 - #6 AI1 Spindle internal cooling fan1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

13.2.49 Radiator Cooling Fan for Spindle Amplifier

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1725	AR2	AR1	FAN		AR2	AR1	FAN	

[Data type] Bit spindle

#1 FAN Spindle radiator cooling fan2 without a fan2

#3 AR2 - #2 AR1 Spindle radiator cooling fan2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

#5 FAN Spindle radiator cooling fan1 without a fan1

#7 AR2 - #6 AR1 Spindle radiator cooling fan1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

13.2.50 Internal Cooling Fan for Common Power Supply

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1728	PI2	PI1	FAN		PI2	PI1	FAN	

[Data type] Bit spindle

#1 FAN Common power supply internal cooling fan2 without a fan2

#3 PI2 - #2 PI1 Common power supply internal cooling fan2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

#5 FAN Common power supply internal cooling fan1 without a fan1

#7 PI2 - #6 PI1 Common power supply internal cooling fan1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

13.2.51 Radiator Cooling Fan for Common Power Supply

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	1731	PR2	PR1	FAN		PR2	PR1	FAN	

[Data type] Bit spindle

#1 FAN Common power supply radiator cooling fan2 without a fan2

#3 PR2 - #2 PR1 Common power supply radiator cooling fan2 Exchange necessary information

#3	#2	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

#5 FAN Common power supply radiator cooling fan1 without a fan1

#7 PR2 - #6 PR1 Common power supply radiator cooling fan1 Exchange necessary information

#7	#6	State
0	0	Normal
0	1	Exchange necessary 1(The speed of the fan decreased)

13.2.52 Detector Battery Exhaustion

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	3019			EXP	INP	ABP			

[Data type] Bit axis

If a detector battery low alarm is issued, the cause can be checked.

ABP The battery of the A/B phase is low.

INP The battery of the serial pulse coder (built-in position detector) is low.

EXP The battery of the separate detector of serial type is low.

13.2.53 Diagnosis Data Related to Axis Synchronous Control

DGN	3500	Synchronization error amount

[Data type] 2-word axis

[Unit of data] Detection unit

[Valid data range] -99999999 to 99999999

The difference in position (synchronization error amount) between the master axis and slave axis is indicated. This data is indicated for the slave axis.

DGN	3501	Synchronization error compensation value

[Data type] 2-word axis

[Unit of data] Detection unit

[Valid data range] -99999999 to 99999999

Cumulative value of compensation pulses (synchronization error compensation value) output to the slave axis is indicated. This data is indicated for the slave axis.

13.2.54 Diagnosis Data Related to Synchronous/Composite Control

DGN	3502	Indication of synchronization error amount for each axis

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -99999999 to 99999999

When synchronization deviation is detected (bit 1 (SERx) of parameter No. 8162 is set to 1), the positional deviation difference of the slave axis from the master axis is indicated.
The positional deviation difference is:
(Positional deviation of master axis) ± (positional deviation of slave axis)

＋: When mirror image is applied to synchronization command
- : When mirror image is not applied to synchronization command

13.2.55 Diagnosis Data Related to Axis Synchronous Control 2

DGN	3506	SYNC TORQUE DIFFERENCE

[Data type] word axis
[Valid data range] 0 to 32767

The absolute torque difference value between the master axis and the slave axis in the axis synchronous control is displayed.

13.2.56 Detailed Descriptions about SV0657 “CARD/SV FUNCTION MISMATCH”

DGN	3508	CARD/SV MISMATCH number

[Data type] word axis
[Valid data range] 0 to 32767

Information is output for identifying the location (parameter) of an SV0657 alarm which has been issued. Correct parameters according to displayed number.

The 2nd to 4th digits:
  Lower three digit of parameter number caused SV0657.
The 1st digit:
  0 to 7: bit number for bit parameter
  8: word parameter

Example） DGN3508=2125 means that the reason of alarm SV0657 is parameter No.2212#5.

13.2.57 Detailed Descriptions about Invalid FSSB Setting Alarms

DGN	3510	FSSB alarm number

[Data type] Word

Information is output for identifying the location (parameter) and cause of an FSSB-related alarm which has been issued. For the displayed detail numbers and corresponding causes and actions, see the table below. When more than one FSSB alarm number is displayed, take actions for the FSSB alarm having the smaller alarm number.

Detail alarm No.	Parameter number	Cause	Action
120 451 452	-	The FSSB internal status did not change to open.	Check the connection between the CNC and each amplifier. Alternatively, the servo card may be faulty.
140 450	24000 to 24095	The ATR value is inconsistent with the connected slave (servo, spindle, or separate detector).	Set the ATR value corresponding to the connected slave.
271	3717 24000 to 24095	The spindle amplifier number corresponding to the ATR value setting is not set.	Make the spindle amplifier number consistent with the ATR value setting.
272	24000 to 24031 24064 to 24095	The fifth to eighth separate detector is set for the first FSSB line (third FSSB line).	Do not set the fifth to eighth separate detectors for the first FSSB line (third FSSB line).
273	24032 to 24063	The first to fourth (ninth to twelfth) separate detector is set for the second FSSB line.	Do not set the first to fourth (ninth to twelfth) separate detectors for the second FSSB line.
276	24000 to 24095	The setting for a separate detector is made more than once.	Make the setting for each separate detector only once in the servo card.
290	24000 to 24095	The maximum number of slaves per FSSB line is exceeded for an FSSB line of servo HRV2 control.	Reduce the number of slaves to 32 (maximum number of slaves per FSSB line of servo HRV2 control) or less.
291	24000 to 24095	The maximum number of slaves per FSSB line is exceeded for an FSSB line of servo HRV3 control.	Reduce the number of slaves to 15 (maximum number of slaves per FSSB line of servo HRV3 control) or less.
310	1023 24104 to 24199	The servo axis number corresponding to the ATR value setting of a separate detector is not set for parameter No. 1023.	Set the value corresponding to the ATR value setting for parameter No. 1023.
313	1023 14476#5 24104 to 24199	The servo axis number corresponding to the ATR value setting of a separate detector is not set for parameter No. 1023.	Set the value corresponding to the ATR value setting for parameter No. 1023.
314	1023 14476#5 24104 to 24199	The ATR value setting of a separate detector is invalid.	Correct the settings of parameters Nos. 24104 to 24199.
383	-	Manual setting 1 cannot be performed when a separate detector is used.	Disconnect the separate detector. Alternatively, perform manual setting or automatic setting.
453	-	Servo initialization has not completed successfully.	An optical cable may be faulty or the connection between the amplifier and another module may be incorrect.

Detail alarm No.	Parameter number	Cause	Action
454	-	Alarm Nos. 550 to 556 of diagnostic data No. 3511 occurred.	Check diagnosis data No. 3511.
460	24000 to 24095	The ATR value of a spindle or separate detector is set for a slave which is not connected.	Set the ATR value corresponding to the connected slave.
471	24000 to 24095	Although a separate detector is connected, the separate detector setting is not made.	Set the value for the separate detector in the corresponding parameter.
480	24000 to 24095	In ATR value setting, a servo axis number exceeds 80.	Make settings so that any servo axis number does not exceed 80.

DGN 3511 FSSB alarm number

[Data type] Word axis

Information is output for identifying the location (parameter) and cause of an FSSB-related alarm which has been issued. For the displayed detail numbers and corresponding causes and actions, see the table below. When more than one FSSB alarm number is displayed, take actions for the FSSB alarm having the smaller alarm number.

Detail alarm No.	Parameter number	Cause	Action
210	24096 to 24103	Although a separate detector is not set, a value is set in parameters Nos. 24096 to 24103.	Set parameters Nos. 24096 to 24103 to all 0.
220	1023	An unavailable servo axis number is set.	Change the servo axis number.
221	1023	A servo axis number is set more than once.	Change the servo axis number.
250	24096 to 24103	For a specific servo axis, two or more separate detectors are used and the paired separate detectors are two of the first, third, fifth, and seventh units or the second, fourth, sixth, and eighth units.	To use two separate detectors for a specific servo axis, one separate detector must have an odd number and the other must have an even number. Three or more separate detectors cannot be used.
270	1023 24000 to 24095	- The servo axis number corresponding to the ATR value setting is not set for parameter No. 1023. - An unavailable servo axis number is set. - A servo axis number is set more than once.	Check the conditions on the left.
292	1023 2013#0	For an FSSB line of servo HRV3 control, only the following servo axis numbers can be used: (1+8n,2+8n,3+8n,4+8n (n=0,1,⋯,9))	For the FSSB line of servo HRV3 control, set the servo axis numbers on the left.

Detail alarm No.	Parameter number	Cause	Action
311	24096 to 24103	A connector number is invalid.	Specify a value between 0 and 8.
314	24096 to 24103	A connector number is set more than once.	Make setting so that each connector number is used only once for one separate detector.
350	2013#0 2014#0	Different current loops (HRV) are used for FSSB lines.	Set the same current loop (HRV) for the FSSB lines.
360	1023 2013#0 2014#0	Different current loops (HRV) are set for the first and second FSSB lines and parameter No. 1023 setting is invalid.	Set servo axis numbers so that each set of (1 to 6), (9 to 14), (17 to 22), (25 to 30), (33 to 38), and (41 to 46) is set for the same FSSB line.
370	1902#0 1902#1 2013#0 2014#0	When servo HRV3 control is set, manual setting 1 cannot be performed.	To set servo HRV3 control, perform manual setting or automatic setting.
380	1023	When a servo axis number is skipped, manual setting 1 cannot be performed.	Set servo axis numbers without skipping any number.
382	1023	An attempt was made to perform manual setting 1 though the maximum number of controlled axes per FSSB line is exceeded.	Reduce the number of connected servo axes to the maximum number of controlled axes or less.
470	24000 to 24095	An ATR value is set more than once.	Set each ATR value only once.
481	1023 24000 to 24095	A servo axis number is inconsistent with the ATR value setting or the servo motor having a servo axis number is not connected.	Check whether the value set in parameter No. 1023 is consistent with ATR value setting and whether the servo motor corresponding to each servo axis number is connected.
520	2165	At power-on, amplifier ID information could not be read.	Check the connection between the CNC and each amplifier. Alternatively, an amplifier may be faulty.
550	1023 24000 to 24095	The ATR value setting is inconsistent with the servo axis number setting.	Make the value set in parameter No. 1023 consistent with the ATR value setting.
551	24000 to 24095	The number of ATR value settings exceeds the number of slaves connected to the CNC.	Make as many settings as the number of slaves connected to the CNC.
552	1023	An unavailable servo axis number is set.	Change the servo axis number.
553	1023	A servo axis number is set more than once.	Change the servo axis number.

Detail alarm No.	Parameter number	Cause	Action
554	24096 to 24103	A value is set in parameters Nos. 24096 to 24103 though no separate detector is connected.	Set parameters Nos. 24096 to 24103 to all 0.
555 557 558	2165	The maximum current of an amplifier (parameter No. 2165) differs from that of a motor.	Set the maximum current of the amplifier (parameter No. 2165) to that of the motor.
1023	1023	An invalid servo axis number is set.	Set a correct servo axis number.

DGN 3513 FSSB alarm number

[Data type] Word spindle

Information is output for identifying the location (parameter) and cause of an FSSB-related alarm which has been issued. For the displayed detail numbers and corresponding causes and actions, see the table below. When more than one FSSB alarm number is displayed, take actions for the FSSB alarm having the smaller alarm number.

Detail alarm No.	Parameter number	Cause	Action
271	3717 24000 to 24095	An ATR value is set more than once.	Make each spindle amplifier consistent with the ATR value setting.
381	3717	When a spindle amplifier number is skipped, manual setting 1 cannot be performed.	Set spindle amplifier numbers without skipping any number.

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13.2.58 Absolute Position Detection

DGN 3520 Information of setting the zero point for absolute position detection

[Data type] Byte axis
[Unit of data] None
[Valid data range] 0 to 3

To set the zero point of absolute position detection:
0 : is not performed yet.
1 : was performed by the manual reference position return.
2 : was performed by MDI operation.
3 : was performed by the reading of parameter file.

13.2.59 Diagnosis Data Related to Linear Scale with Absolute Address Reference Marks

DGN 3545 Linear scale with absolute address reference marks: measurement point 1

DGN 3546 Linear scale with absolute address reference marks: measurement point 2

DGN 3547 Linear scale with absolute address reference marks: measurement point 3

DGN	3548	Linear scale with absolute address reference marks: measurement point 4

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999999999 to 999999999

DGN	3549	Linear scale with absolute address reference marks: Status display

DGN	3550	Linear scale with absolute address reference marks: Scale value

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999999999 to 999999999

DGN	3551	Linear scale with absolute address reference marks: Scale value (High)

[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999 to 999

Linear scale with absolute address reference marks
Scale value = Diagnosis data No.3551 × 1,000,000,000 + Diagnosis data No.3550

13.2.60 Wrong Operation Prevention Function

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	3570								MSC

[Data type] Bit path

MSC Memory operation is stopped due to the reconfirming of midway block start.
In a multipath system, the bit is set to 1 on only the path on which the cursor is position in the middle of the program.

13.2.61 Stored stroke limit range switching function by signal

DGN	3710	Coordinate value I of stored stroke check 1 in the positive direction
DGN	3711	Coordinate value I of stored stroke check 1 in the negative direction
DGN	3712	Coordinate value II of stored stroke check 1 in the positive direction
DGN	3713	Coordinate value II of stored stroke check 1 in the negative direction
DGN	3714	Coordinate value of stored stroke check 2 in the positive direction
DGN	3715	Coordinate value of stored stroke check 2 in the negative direction
DGN	3716	Coordinate value of stored stroke check 3 in the positive direction
DGN	3717	Coordinate value of stored stroke check 3 in the negative direction

[Data type] Real axis
[Unit of data] Machine unit
Machine coordinates value of effective, various kind of stored stroke limits are displayed now.

13.2.62 Flexible Path Axis Assignment Information

DGN 4000 | Reason number of alarm in flexible path axis assignment

The cause of the alarm that may be issued in flexible path axis assignment is displayed.
- 1: The number of axes in the path is 0.
- 2: Servo alarm No. 417 is issued.
- 3: No ID is specified in the free command.
- 4: An ID is specified more than once in the free command.
- 5: The target axis of free command P is not found in the path or the specified axis has been freed.
- 6: The target axis of free command Q is not found in the path or the specified axis has been freed.
- 7: The target axis of free command R is not found in the path or the specified axis has been freed.
- 8: The target axis is not found in the path specified in the free command or the specified axis has been freed.
- 9: No axis is specified in the free command or an ID is specified.
- 10: The arbitrary axis switching ID setting is invalid.
- 11: No ID is specified in the acquisition command.
- 12: An ID is specified more than once in the acquisition command.
- 13: An axis array is specified more than once in the acquisition command.
- 14: The target axis specified in the acquisition command is not found in the path or no ID is set.
- 15: The axis array in the path specified in the acquisition command is invalid.
- 16: The axis to be freed belongs to the local path.
- 18: The axis to be freed belongs to the path to be replaced with the specified path.
- 19: The axis to be acquired is not freed. (No.11561#1=1)
- 20: The axis specified in the acquisition command is waited to be freed in another path.
- 21: The axis specified in the acquisition command is not freed.
- 22: No axis is specified in the acquisition command or an ID is specified.
- 24: The axis specified in the replace command is found in the same path.
- 25: No ID is specified in the replace command.
- 26: An ID is specified more than once in the replace command.
- 27: For a system having three or more paths, replace command L is not specified.
- 28: The target axis specified in the replace command is not found in the path (source).
- 29: For the axis specified in the replace command, another command is being executed or the axis has been freed.
- 30: The target axis specified in the replace command is not found in the path (destination).
- 32: The target axis specified in the replace command is not found.
- 33: The replace command is inconsistent.

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- 34: No axis is specified in the replace command or an ID is specified.
- 35: Another cycle is being executed.
- 36: Specified in the SV rotation control mode.
- 37: Specified in the polygon turning mode.
- 38: Specified in PMC axis control.
- 39: Specified in the high precision oscillation mode.
- 40: Specified in the mirror image mode.
- 41: Specified in the 3-dimensional coordinate system conversion mode.
- 42: Specified in the coordinate rotation mode.
- 43: Specified in the scaling mode.
- 44: Specified in axis synchronous control.
- 45: An axis being freed is specified.
- 46: An axis in composite control is specified.
- 47: An axis in synchronous control is specified.
- 48: An axis in superimposed control is specified.
- 55: The move command is specified simultaneously.
- 56: Specified in tool compensation.

DGN	4001	Path to which the arbitrary axis switching axis belongs

A path (specified by parameter No. 981) to which an axis specified for flexible path axis assignment belongs is displayed.
0 : Belongs to the local path.
1 to 10 : Belongs to another path after acquired or replaced.
-1 to -10: Has been freed.

13.2.63 Amount of shift for automatic operation

DGN	4100	Amount of travel distance by manual operation with manual absolute off state

DGN	4101	Amount of travel distance by manual handle interruption

DGN	4102	Amount of G92 offset (G50 for G code system A in T series)

DGN	4103	Amount of G52 offset

DGN	4104	Amount of travel distance during machine lock

DGN	4107	Amount of travel distance during mirror image

[Date type] Real axis

13.2.64 Arbitrary speed threading

DGN	4300	Position error of servo calculated by CNC

[Date type] 2-word path
[Unit of data] Detection unit

Position error of servo which is calculated by CNC for calculating compensation of thread start position. If calculated position error is different from actual position error, it is possible to adjust using parameter No.11492 so that the diagnosis display No.4300 and No.300 (position error of feed axis) would be the same value.

DGN	4301	Position error of spindle calculated by CNC

[Date type] 2-word path
[Unit of data] Detection unit

Position error of spindle which is calculated by CNC for calculating compensation of thread start position. If calculated position error is different from actual position error, it is possible to adjust using parameter No.11493 so that the diagnosis display No.4301 and No.418 (position error of spindle) would be the same value.

13.2.65 Communication

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	4400					BD2	BD1		

[Data type] Byte

When the communication alarm "SR2038" occurs, the detail information of wrong hardware option is indicated.

BD1 Fast Ethernet board mounted in slot 1
BD2 Fast Ethernet board mounted in slot 2

> **NOTE**
> When the communication alarm "SR2038" does not occur, all bits are 0.

DGN	4401	**Details of communication alarm**

[Data type] Byte
[Valid data range] 0 to 7

When the communication alarm "SR2038" occurs, the information is indicated.

0 : The communication’s combination is correct.
1 : The number of mounted the Fast Ethernet board exceeds limitaion. The number of the Fast Ethernet board that can be mounted is up to three.
2 : The Fast Ethernet board that diagnosis data No.4400 indicates doesn't exist. Confirm the Fast Ethernet board specified for parameters Nos.970 to 976.
3 : In the Fast Ethernet board that diagnosis data No.4400 indicates, the working function is not specified. Parameters Nos.970 to 976 are wrong though the Fast Ethernet board exists. Specify -1 for parameters Nos.970 to 976 when not using it.
4 : In the Fast Ethernet board that diagnosis data No.4400 indicates, two or more of Data Server functions, FL-net functions, EtherNet/IP functions, and PROFINET functions are specified simultaneously. The Data Server functions, FL-net functions, EtherNet/IP functions, and PROFINET functions are mutually exclusive. Specify parameters Nos. 970 to 976 so that these communication functions operate in different Fast Ethernet board.
5 : In the Fast Ethernet board that diagnosis data No.4400 indicates, a software option of necessary communication function is not effective. For parameter No. 970, the Fast Ethernet board specified for parameter No. 971 or 973 is specified. Alternatively, a Fast Ethernet board is specified for parameter No. 970 and parameter No. 975 is set to 10, 20, or 30.
6 : In the Fast Ethernet board that diagnosis data No.4400 indicates, a software option of necessary communication function is not effective.
7 : Necessary software is not installed.

13.2.66 Machine State monitoring function

DGN	4500	Potential Saving Number

[Data type] Byte
[Valid data range] 0 to 30
Potential Saving Number is displayed.

13.2.67 CNC screen display function

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	4700						SD3	SD2	SD1

[Data type] Byte
Executing CNC screen display function is indicated.
SD1 1st connected CNC screen display function.
SD2 2nd connected CNC screen display function.
SD3 3nd connected CNC screen display function.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	4701						ST3	ST2	ST1

[Data type] Byte
CNC screen display function that stopped screen updating by breaking connection for 30 seconds or more is indicated.
ST1 1st connected CNC screen display function.
ST2 2nd connected CNC screen display function.
ST3 3nd connected CNC screen display function.

NOTE
1 This bit is maintained until CNC screen display function restarts.
2 This diagnosis is set only when CNC control software makes stop CNC screen display function. When network software stops screen, the log message is displayed on Ethernet log screen.

13.2.68 Total Current Actual Power Consumption of All Servo/Spindle

DGN	4900	Total current actual power consumption of all axes

[Data type] 2-word
[Unit of data] W

NOTE
Actual power consumption = power consumption - regenerated power. When regenerated power exceeds power consumption, a negative value is displayed.

13.2.69 Current Actual Power Consumption of Each Servo

DGN	4901	Current actual power consumption of each servo

[Data type] 2-word axis
[Unit of data] W

NOTE
A negative value is displayed when power is regenerated, for example, during deceleration along the axis.

13.2.70 Current Actual Power Consumption of Each Spindle

DGN	4902	Current actual power consumption of each spindle

[Data type] 2-word spindle
[Unit of data] W

NOTE
A negative value is displayed when power is regenerated, for example, during deceleration along the axis.

13.2.71 Cumulative Values of Total Power Consumption of All Servo/Spindle

DGN	4910	Cumulative value of total actual power consumption of all axes
DGN	4911	Cumulative value of total power consumption of all axes
DGN	4912	Cumulative value of total regenerated power of all axes

[Data type] 2-word
[Unit of data] 0.001kWh

NOTE
1 When bit 7 (PKI) of parameter No.11370 is set to 1, these values are not cleared by power-off. When the clear operation is done, cumulative value starts from 0. When bit 7 (PKI) of parameter No.11370 is set to 0, these values not cleared by power-off.
2 When bit 7 (PKI) of parameter No.11370 is set to 1,
Unit of data is 0.001kWh when bit 0 (PIE) of parameter No.24325 is set to 0.
Unit of data is 0.01kWh when bit 0 (PIE) of parameter No.24325 is set to 1.

13.2.72 Cumulative Power Consumption of Each Servo

DGN	4920	Cumulative value of total actual power consumption of each axis
DGN	4921	Cumulative value of total power consumption of each axis
DGN	4922	Cumulative value of total regenerated power of each axis

[Data type] 2-word axis
[Unit of data] 0.001kWh

NOTE
1 When bit 7 (PKI) of parameter No.11370 is set to 1, these values are not cleared by power-off. When the clear operation is done, cumulative value starts from 0. When bit 7 (PKI) of parameter No.11370 is set to 0, these values not cleared by power-off.
2 When bit 7 (PKI) of parameter No.11370 is set to 1,
Unit of data unit is 0.001kWh when bit 0 (PIE) of parameter No.24325 is set to 0.
Unit of data is 0.01kWh when bit 0 (PIE) of parameter No.24325 is set to 1.

DGN	4923	Accumulated power consumption in all servo axes

[Data type] 2-word
[Unit of data] 0.001kWh

NOTE
These data have been accumulated since last clear operation.
These data are not cleared by power off.

13.2.73 Cumulative Power Consumption of Each Spindle

DGN	4930	Cumulative actual power consumption of each spindle
DGN	4931	Cumulative power consumption of each spindle
DGN	4932	Cumulative regenerated power of each spindle

[Data type] 2-word spindle
[Unit of data] 0.001kWh

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NOTE
1 When bit 7 (PKI) of parameter No.11370 is set to 1, these values are not cleared by power-off. When the clear operation is done, cumulative value starts from 0. When bit 7 (PKI) of parameter No.11370 is set to 0, these values not cleared by power-off.
2 When bit 7 (PKI) of parameter No.11370 is set to 1,
Unit of data unit is 0.001kWh when bit 0 (PIE) of parameter No.24325 is set to 0.
Unit of data is 0.01kWh when bit 0 (PIE) of parameter No.24325 is set to 1.

DGN 4933 Accumulated power consumption in all spindle axes

[Data type] 2-word
[Unit of data] 0.001kWh

NOTE
These data have been accumulated since last clear operation.
These data are not cleared by power off.

13.2.74 Cumulative Power Consumption of Peripheral Devices

DGN 4943 Accumulated power consumption in all peripheral devices

[Data type] 2-word
[Unit of data] 0.001kWh

NOTE
These data have been accumulated since last clear operation.
These data are not cleared by power off.

13.2.75 Cumulative Reduction of Power Consumption

DGN 4953 Accumulated reduction of power consumption

[Data type] 2-word
[Unit of data] 0.001kWh

NOTE
These data have been accumulated since last clear operation.
These data are not cleared by power off.

13.2.76 Cumulative time of Power consumption

DGN 4960 Cumulative time of power consumption monitor

[Data type] 2-word
[Unit of data] min

NOTE
1 This value is not cleared by power-off. When the clear operation is done, cumulative time starts from 0.
2 This value is available when the bit7 (PKI) of parameter No.11370 is set to 1.

13.2.77 Interpolation State

DGN 5000 Smoothing mode

[Data type] Bit

NAME Interpolation state when 1 is indicated

TOLERANCE ON
When tolerance control G5.1 Q3 is specified and all conditions are satisfied, 1 is indicated.

SMOOTHING ON
When nano smoothing G5.1 Q3 is specified and all conditions are satisfied, 1 is indicated. The G5.1 Q3 command turns on AI contour control at the same time. Therefore, the AI contour control mode signal AICC<Fn062.0> turns on and AICC1/AICC2 blinks in the state display at the lower right of the screen.

13.2.78 Smooth Tolerance Control

DGN 5004 — Tolerance for linear axes at corners in tolerance control mode

[Data type] Real Path
[Unit of data] mm/inch

Tolerance for linear axes at corners in tolerance control mode is displayed.

DGN 5005 — Tolerance for rotary axes at corners in tolerance control mode

[Data type] Real Path
[Unit of data] degree

Tolerance for rotary axes at corners in tolerance control mode is displayed.

DGN 5006 — Tolerance for rotary axes at corners in tolerance control mode

[Data type] Real Path
[Unit of data] mm/inch

Tolerance for linear axes for curves generated in tolerance control mode is displayed.

DGN 5007 — Tolerance for rotary axes for curves generated in tolerance control mode

[Data type] Real Path
[Unit of data] degree

Tolerance for rotary axes for curves generated in tolerance control mode is displayed.

13.2.79 Automatic Phase Synchronization for Flexible Synchronization Control

DGN 5600 — Automatic phase synchronization error amount (group A)

DGN 5601 — Automatic phase synchronization error amount (group B)

DGN 5602 — Automatic phase synchronization error amount (group C)

DGN 5603 — Automatic phase synchronization error amount (group D)

[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)

The error amount between the master axis and slave axis after the execution of automatic phase synchronization for flexible synchronization control is displayed. For inter-path flexible synchronization control, this data is displayed on the path of the slave axis.

DGN 5604 — Maximum value of automatic phase synchronization error amount (group A)

DGN 5605 — Maximum value of automatic phase synchronization error amount (group B)

DGN 5606 — Maximum value of automatic phase synchronization error amount (group C)

DGN 5607 — Maximum value of automatic phase synchronization error amount (group D)

[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)

The maximum error amount between the master axis and slave axis after the execution of automatic phase synchronization for flexible synchronization control is displayed. For inter-path flexible synchronization control, this data is displayed on the path of the slave axis. During automatic operation, this data is initialized at the start of automatic operation. During manual operation, it is initialized at the start of flexible synchronization control.

13.2.80 Code consumption rate in real time custom macro

DGN 7080 Code consumption rate for Modal RTM command with ID-1

DGN 7081 Code consumption rate for Modal RTM command with ID-2
to
DGN 7089 Code consumption rate for Modal RTM command with ID-10

[Data type] Word
[Unit of data] %
[Valid data range] 0 to 100

DGN 7090 Code consumption rate for One-shot RTM command

[Data type] Word
[Unit of data] %
[Valid data range] 0 to 100

14.1 OVERVIEW OF HISTORY FUNCTION

This function allows you to record history of operations performed by operators, alarms generated, external operator messages, and so on, check the history, and output history data.
The main capabilities of this function are described below.

14.2 ALARM HISTORY

From all recorded history data, only alarm history is extracted and displayed on the screen. If the amount of history data exceeds the storage capacity, history data will be automatically erased starting with the oldest.

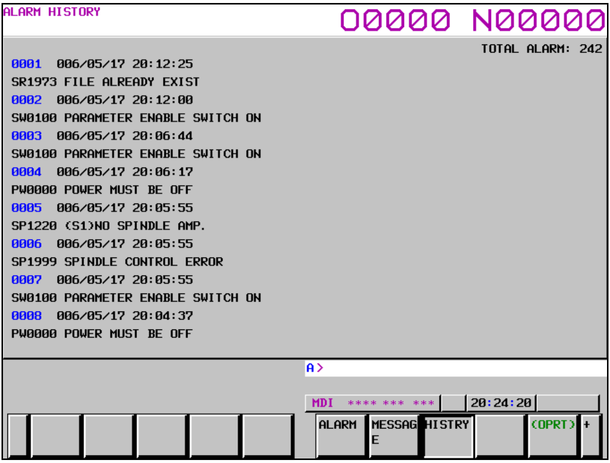


Fig. 14.2 ALARM HISTORY screen

14.2.1 Screen Display

Generated alarms are displayed in the order of newest to oldest.
For each alarm, the following items of information are displayed:

a Path name (in multipath operation only)
b Date and time the alarm was generated
c Alarm type and number
d Alarm message
(For external and macro alarms, no message text is displayed.)

If, after the alarm was generated, the path name, axis, name, spindle name, and so on are changed, the ALARM HISTORY screen displays the new names.
For modal 'O' data, if the name is a program name, only the first five characters of the name is output.

Procedure

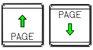
1 Press function key 

.

2 Press return menu key  .

3 Press continuous menu key  until soft key [HISTRY] is displayed.

4 Press soft key [HISTRY], and the ALARM HISTORY screen is displayed.

5 To switch between the previous and next pages, use the page keys 

.

14.2.2 Erasing History Data from the ALARM HISTORY Screen

Procedure

1. Display the ALARM HISTORY screen.
2. Press soft key [(OPRT)].
3. Press soft key [ERASE] and all history data will be erased.

NOTE
When you erase history data with this procedure, not only alarm history but also external operator message, operation history, and other history data will be erased. You cannot erase them separately.

14.2.3 External/Macro Alarm Display

Using the parameter below, you can record not only alarm numbers but also messages to alarm history when external alarms (1000 and above) or macro alarms (3000 and above) are generated. Note, however, that only the first 64 characters of an external or macro alarm message are recorded.
If the settings are such that messages are not recorded or if messages are not input, “EXTERNAL ALARM” or “MACRO ALARM” are displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3112					EAH			

[Data type] Bit

EAH With the alarm history function, external/macro alarm messages are:
0 : Not recorded.
1 : Recorded.

NOTE
This parameter is effective if parameter HAL (No. 3196#7) is 0.

	#7	#6	#5	#4	#3	#2	#1	#0
3196	HAL							

[Data type] Bit

HAL When an alarm is generated, additional alarm (modal data at the time the alarm is generated, as well as absolute and machine coordinates) is:
0 : Recorded in operation history and alarm history.
1 : Not recorded.

NOTE
Alarm, operation, and external operator messages, data change history, and so on are retained in the same storage area, and if the storage capacity is exceeded due to other history data, the alarm history may be erased.
The maximum number of history items that can be stored is as described below, provided that only alarms are to be recorded.
About 4000 if parameter HAL (No. 3196#7) is 1.
If parameter HAL (No. 3196#7) is 1, not only alarms but also modal information at the time of alarm generation and coordinates are recorded and, therefore, the maximum number differs depending on the system.
(Example: About 280 for a 5-axis system, about 200 for a 10-axis system)
If parameter EAH (No. 3112#3) is 1, the number further decreases because macro and external alarm messages are also recorded.

14.3 EXTERNAL OPERATOR MESSAGE HISTORY

From all recorded history data recorded, only external operator message history is extracted and displayed on the screen. If the amount of history data exceeds the storage capacity, history data will be automatically erased starting with the oldest.

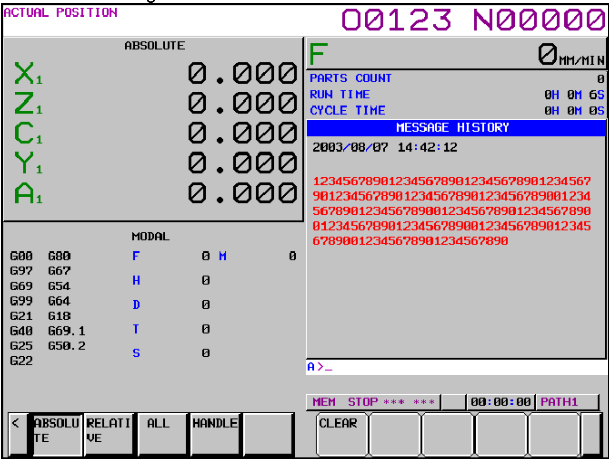
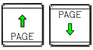


Fig. 14.3 ALARM HISTORY screen

14.3.1 Screen Display

Procedure

1. Press function key .
2. Press continuous menu key  until soft key [MSGHIS] is displayed.
3. Press soft key [MSGHIS], and the external operator message history screen is displayed.
4. To switch between the previous and next pages, use the page keys .

NOTE

External operator, operation, and alarm operator messages, data change history, and so on are retained in the same storage area, and if the storage capacity is exceeded due to other history data, the external operator message history may be erased.
The maximum number of history items that can be stored is about 150, provided that only external operator messages are to be recorded.

14.3.2 Erasing History Data from the External Operator Message History Screen

Procedure

1. Display the external operator message history screen.
2. Press soft key [(OPRT)].
3. Press soft key [ERASE] and all history data will be erased.

NOTE

When you erase history data with this procedure, not only external operator message history but also operation history, alarm history, and other history data will be erased. You cannot erase them separately.

14.3.3 Parameter Setting

	#7	#6	#5	#4	#3	#2	#1	#0
3112						OMH		

[Data type] Bit

OMH The external operator message history screen is:
0 : Not displayed.
1 : Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3196		HOM						

[Data type] Bit

HOM External operator message history is:
0 : Recorded.
1 : Not recorded.

14.4 OPERATION HISTORY

You can display history of what key-in and signal operations operators performed when faults or alarms were generated, as well as what alarms were generated. The following items are recorded:

(1) Operation history
  (a) MDI key operation that an operator performed
  (b) I/O signal (X, Y, G, and F) ON/OFF switching
  (c) External key operation
    (Not displayed on the screen)
(2) Alarm history
  (a) Alarm generated
  (b) Modal information and coordinates at the generation of an alarm (Not displayed on the screen)
(3) Data change history
  (a) Tool offset data change
    (When the parameter HTO (No.3196#0) is set to 1.)
  (b) Workpiece offset data change
    (When the parameter HWO (No.3196#1) is set to 1.)
  (c) Parameter change
    (When the parameter HPM (No.3196#2) is set to 1.)
  (d) Custom macro common variable data change
    (When the parameter HMV (No.3196#3) is set to 1.)
(4) External operator message history
  (When the parameter HOM (No.3196#6) is set to 0.)
(5) Time stamp (date and time)

Except for some, operation and alarm history data can be viewed on the operation history screen. (Data change history, external operator message history, or alarm messages are not displayed.)
Also, all recorded history data can be output to an external I/O device.

NOTE
The maximum number of history items that can be stored is about 8000 provided that only MDI key operations are to be recorded. This number is not fixed, however, because the sizes of individual history data items are not uniform.

14.4.1 Parameter Setting

	#7	#6	#5	#4	#3	#2	#1	#0
3106				OPH				

[Data type] Bit

OPH The operation history screen is:
0 : Not displayed.
1 : Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3195		HDE	HKE					

[Data type] Bit

HKE A key operation history is:
0 : Recorded.
1 : Not recorded.

HDE A DI/DO history is:
0 : Recorded.
1 : Not recorded.

3122	Time interval used to record time data in operation history

[Data type] Word
[Unit of data] min
[Valid data range] 0 to 1440

Time is recorded in operation history at the specified time interval.If the setting is 0, 10 minutes is assumed.If no data is recorded in the time interval, time is not recorded.

NOTE
This parameter must be set to the same parameter for all paths.

	#7	#6	#5	#4	#3	#2	#1	#0
3196	HAL	HOM			HMV	HPM	HWO	HTO

[Data type] Bit

HTO Tool offset data change history is:
0 : Not recorded.
1 : Recorded.

HWO Workpiece offset data change history is:
(For the T series, including workpiece shift change history)
0 : Not recorded.
1 : Recorded.

HPM Parameter change history is:
0 : Not recorded.
1 : Recorded.

HMV Custom macro common variable change history is:
0 : Not recorded.
1 : Recorded.

HOM External operator message history is:
0 : Recorded.
1 : Not recorded.

HAL When an alarm is generated, additional alarm (modal data at the time the alarm is generated, as well as absolute and machine coordinates) is:
0 : Recorded in operation history and alarm history.
1 : Not recorded.
If you want to record more alarm history items, set it to 1. Set the ten G code modal group numbers you want to record in parameters Nos. 12990 to 12999).

12990	G code modal group (first one) to be recorded as history data when an alarm is issued
to	
12999	G code modal group (tenth one) to be recorded as history data when an alarm is issued

[Data type] Byte path
[Valid data range] 1 to maximum G code group number

Set a G code modal group number to be recorded as alarm history and operation history data when an alarm is issued.

* If a value outside the valid data range is specified, the status of groups 01 to 10 is recorded.

14.4.2 Screen Display

Procedure

1 Press function key [MESSAGE].

2 Press menu key [▷] until soft key [OPERAT HISTORY] is displayed.

3 Press soft key [OPERAT HISTORY] and then the newly displayed soft key [OPERAT HISTORY], and the operation history screen is displayed.

4 If you want to display subsequent operation history, you can use the page keys [PAGE ⇑] [PAGE ⇓] to switch to the previous and next pages.

If you want to display the latter half of one page and the former half of the next, press either of the cursor keys [←] [→]. This causes the screen to shift by half a page.

(For 8.4" LCDs, the screen shifts by one row.)

By pressing soft key [(OPRT)] with the operation history screen being displayed, you can perform the following soft key operations:

a [TOP] displays the top page (oldest data).

b [BOTTOM] displays the last page (latest data).

c [NO. SRH] displays specified operation history data.

Example: Specifying 50 and pressing [NO. SRH] displays data No. 50.

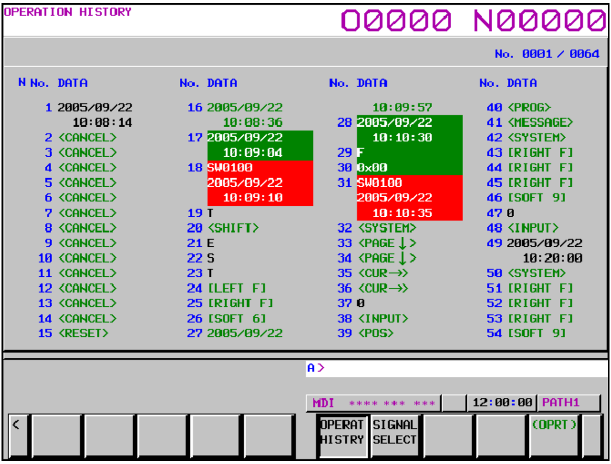


Fig. 14.4.2 Operation history screen

Display items

1 Serial number and display start history number/total number of history items

A serial number is displayed to the left of each recorded history data item. The smaller the serial number, the older the data item. The display start history number/total number of history items are displayed at the upper right corner of the screen. Those history data items not displayed on the screen are not included in the total number of history items.

2 Data

- MDI key

  When parameter HKE (No. 3195#5) is 0, key operations are recorded. A key operation is displayed following a path number, as in 1_[LEFT F], 2_[LEFT F]. (The path number is not displayed if only one path is used.)

  P_ in P_[LEFT F] indicates a key operation from the outside.

(a) Address keys and numeric keys
Characters such as A to Z, 0 to 9, ;, +, and - are displayed directly. They are displayed in black.
(b) Function menu keys, operation menu keys, and soft keys
They are displayed in brackets, as in [LEFT F], [SOFT 1] to [SOFT 10], and [RIGHT F]. They are displayed in green.
(c) Function keys, page keys, cursor keys, and other keys
They are displayed in < and >, as in <POS>, <SYSTEM>, <PAGE ↑>, <CUR →>, <RESET>, and <INPUT>. They are displayed in green.
(d) Keys at power up
They are displayed in white against green background.

- I/O signals
When parameter HDE (No. 3195#6) is 0, the I/O signals specified on the operation history signal selection screen are recorded. After the signals are recorded, the address of each signal is displayed, and any bit changes are displayed for each bit. They are displayed in purple.

G000.2 ↓

A change from 0 to 1 is indicated by a ↑.
A change from 1 to 0 is indicated by a ↓.
Indicates a bit.
Indicates a signal address.

NOTE
1 If there are changes in multiple bits of the same address at the same time, they are handled as a single history data item.
2 A change in signal that is less than 8 msec is not recorded as history data.

- Alarm
On the operation history screen, alarm numbers and times of generation are displayed.
They are displayed in white against red background.

A path number is displayed.
An alarm number is displayed.
For a servo axis type, a servo axis name is displayed.
For a spindle axis type, a spindle name or number is displayed.

1_OT0506 (XA1)
2016/01/11
11:22:33

The date and time of generation are displayed on two lines.

If, after the alarm was generated, the path name, axis, name, spindle name, and so on are changed, the names are displayed.

- Date and time
Dates and times are displayed on two lines, as described below.
(a) Date and time of power up. It is displayed in white against green background.
(b) Date and time of power down. It is displayed in green.
(c) New date when the date has changed. It is displayed in black.
(d) Date and time at the constant time interval set in parameter No. 3122. It is displayed in black.
(e) Date and time when history data is erased. It is displayed in black.

NOTE
1 As for recording of time data at a constant time interval, there is no data stored in a time interval, the time is not stored. (if time data is stored due to a date change, this is regarded as stored data.)
2 If the date and time of the CNC system is changed, the date and time may be recorded as date and time (c) or (d).

14.4.3 Inputting and Outputting Operation History Data

Only output operation is permitted on operation history data.
The output data is in text format. So, to reference the output data you must use an application that can handle text files on the personal computer.

14.4.3.1 Outputting operation history data

All operation history data is output in the output format form the memory of the CNC to a memory card.

Outputting operation history data

Procedure

1 Make sure the output device is ready for output.
2 Press the EDIT switch on the machine operator's panel.
3 Press function key [SYSTEM] to display the operation history screen.
4 Press soft key [(OPRT)].
5 Press the continuous menu key [▷].
6 Press soft key [F OUTPUT].
7 Type the file name that you want to output.
If the file name is omitted, default file name "OPRT_HIS.TXT" is assumed.
8 Press soft key [EXEC].
This starts outputting the operation history data, and "OUTPUT" blinks in the lower right part of the screen. When the read operation ends, the "OUTPUT" indication disappears.
To cancel the output, press soft key [CANCEL].

14.4.4 History Data Not Displayed on the Screen

In addition to displayed history data items, i.e., MDI key, I/O signal status, generated alarm, external operator message (not displayed on the operation history screen), and time stamp, you can record the data items below, together with times. You cannot display these history data items on a screen but can output them to an external I/O device. (See Section "Outputting All History Data".)

(1) Detailed data at the generation of an alarm
When bit 7 (HAL) of parameter No. 3196 is 0, the alarm number and the time of generation are recorded, so are ten G code modal data items, second auxiliary function codes, D, E, F, H, M, N, O, S, T, and absolute and machine coordinates.
As for the ten G code modal data items to be recorded, set group numbers in parameters Nos. 12990 to 12999. If you do not specify any, G code modal data items in groups 0 to 10 are recorded.

NOTE
1 For modal 'O' data, if the name is a program name, only the first five characters of the name is output.
2 If you want to record more items rather than detailed data at the time of alarm generation, set bit 7 (HAL) of parameter No. 3196 to 1.

(2) External alarm message, macro alarm message
When bit 3 (EAH) of parameter No. 3112 is 1, external and macro alarm messages can be recorded as history data. Note, however, that only the first 64 characters of a message are recorded.

NOTE
To record external and macro alarm messages as history data, you must set bit 3 (EAH) of parameter No. 3112 to 1 and bit 7 (HAL) of parameter No. 3196 to 0.

(3) Key input from the outside
Data about key input from the outside is recorded.

(4) Tool offset data change
When bit 0 (HTO) of parameter No. 3196 is 1, if tool offset data is changed, the tool offset number and type, old tool offset data, new tool offset data, and the time of change are recorded.

(5) Workpiece offset data change
When bit 1 (HWO) of parameter No. 3196 is 1, if workpiece offset data is changed, the workpiece offset number, old workpiece offset data, new workpiece offset data, and the time of change are recorded. Extended workpiece offset and work shift (for the T series) are also recorded.

(6) Parameter change
When bit 2 (HPM) of parameter No. 3196 is 1, if a parameter is changed, the character number, type (axis, spindle, path, or machine group), old parameter data, new parameter data, and the time of change are recorded.

NOTE
History of changes at power up or password or key changes are not recorded.

(7) Change in custom macro common variables #100 to #999
When bit 3 (HMV) of parameter No. 3196 is 1, if a custom macro common variable is changed, the common variable number, old common variable value, new common variable value, and the time of change are recorded.

14.4.5 Erasing History Data from the Operation History Screen

Procedure

1 Display the operation history screen.
2 Press soft key [(OPRT)].
3 Press soft key [CLEAR ALL].
4 Press soft key [EXEC], and all history data will be erased.

NOTE
When you erase history data with this procedure, not only operation history but also external operator message, alarm, and other history data will be erased. You cannot erase them separately.

14.5 SELECTING OPERATION HISTORY SIGNALS

You can select I/O signals for which history is to be recorded. You can set up to 60 signals.

Data setting

1 Press function key MESSAGE.
2 Press continuous menu key until soft key [OPERAT HISTORY] is displayed.
3 Press soft key [OPERAT HISTORY].
4 Press soft key [SIGNAL SELECT], and the operation history signal selection screen will be displayed.
5 Press soft key [(OPRT)].
6 Press the cursor keys to move the cursor to the desired position.

7 Key in a signal type (X, G, F, or Y) and an address and then press 

.

Example:

If you enter G0004 and pressing 

,

the signal address "G0004" is set at the ADDRES position and the initial value "00000000" is set at the SIGNAL position.

8 Select the bit for which history is to be recorded.
To change all the bits of the specified signal address, press soft key [ON:1] or [OFF:0] when all the bits are displayed in reverse video like "00000000". The bits will be "11111111" or "00000000".
To change a specific bit only, use the cursor keys   to position the desired bit and press soft key [ON:1] or [OFF:0]. The selected bit will be 1 or 0.

9 For signal selection, you can select up to 60 addresses. You need not necessarily start with No. 1.

NOTE
1 History is not recorded while the operation history signal selection screen is being displayed.
2 Addresses that can be set for I/O signals are X, Y, G, and F only. For those that are not set, ******** is displayed.
3 Even if an address is set, history is not recorded if all bits are 0.
4 If the ON/OFF width of an input signal is 8 msec or less, history data will not be recorded. In addition, some signals may not be recorded.
5 If many signals are selected, processing speed may decrease.

Deleting individual data items

1 Display the operation history signal selection screen.
2 Move the cursor to the data item you want to delete.
3 Press soft key [DELETE].
4 Press soft key [EXEC].

Deleting all data

1 Display the operation history signal selection screen.
2 Press soft key [ALLDEL].
3 Press soft key [EXEC].

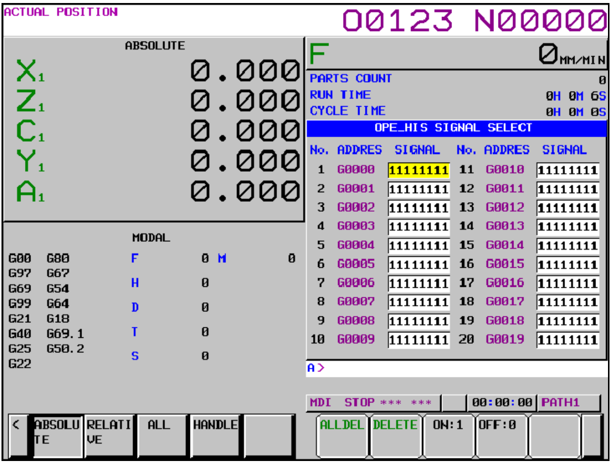


Fig. 14.5 Operation history signal selection screen

14.6 OUTPUTTING ALL HISTORY DATA

You can output all history data to an external I/O device.
You cannot output each history data item separately.

Procedure

1 Place the output device to an output-enabled state.
2 Enter EDIT mode.
3 Press function key 

.
4 Press menu key  until soft key [OPERAT HISTORY] is displayed.
5 Press soft key [OPERAT HISTORY] and then the newly displayed soft key [OPERAT HISTORY], and the operation history screen is displayed.
6 Press soft key [(OPRT)].
7 Press soft key [F OUTPUT].
8 Enter a file name and press soft key [EXEC].
If you press soft key [EXEC] without entering a file name, the output file name will be "OPRT_HIS.TXT".

The waveform diagnosis display function traces values of data such as servo positional deviation amount, torque, and machine signals and plots and displays a graph representing changes in the traced data. This function facilitates servo motor and spindle motor adjustment and fault location when trouble has occurred.
The waveform diagnosis function can trace the following data:

(1) Servo-related data
- Positional deviation amount
- Pulse amount after distribution
- Torque amount
- Pulse amount after acc./dec.
- Current command value
- Heat simulation data
- Composite speed of all axes

(2) Spindle-related data
- Speed of each spindle
- Load meter value
- Spindle-converted positional deviation difference

(3) Machine signal
- ON/OFF state of the external I/O signal specified by a signal address

Up to four servo and spindle data items or up to 32 signals can be traced at the same time.
Data can be traced under the following three conditions:

(1) Data is acquired at any point of time.
(2) Data immediately after a specified event is acquired.
(3) Data immediately before a specified event is acquired.

In condition (3), the time to end tracing can be delayed by a specified time. This allows data before and after the occurrence of an event can be acquired. Traced data can be output to an external input/output device.

15.1 WAVEFORM DIAGNOSIS PARAMETER SCREEN

Display

1 Press the function key 

.

2 Press the soft key [W.DGNS].

3 Pressing the soft key [WAVE PARAM] displays the WAVEFORM DIAGNOSIS (PARAMETER) screen.

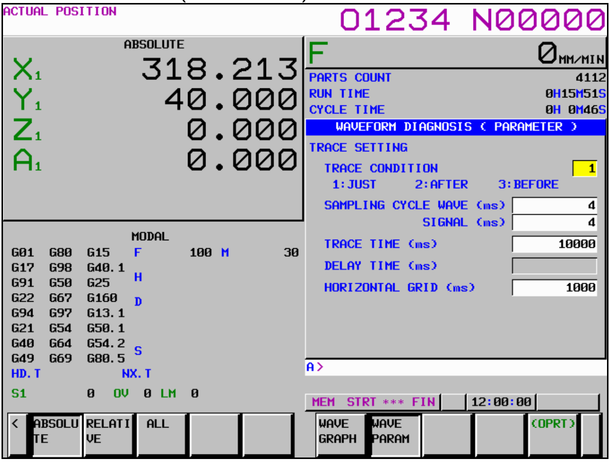


Fig.15.1 WAVEFORM DIAGNOSIS (PARAMETER) screen

15.1.1 Tracing Data

Starting tracing

1. Display the WAVE DIAGNOS. (GRAPHIC) screen.
2. Press the soft key [TRACE] to start tracing.

"Now Sampling…" appears in the upper part of the screen. When tracing ends, the indication "Now Sampling…" disappears.
Even when the screen display is changed to another screen, tracing continues.

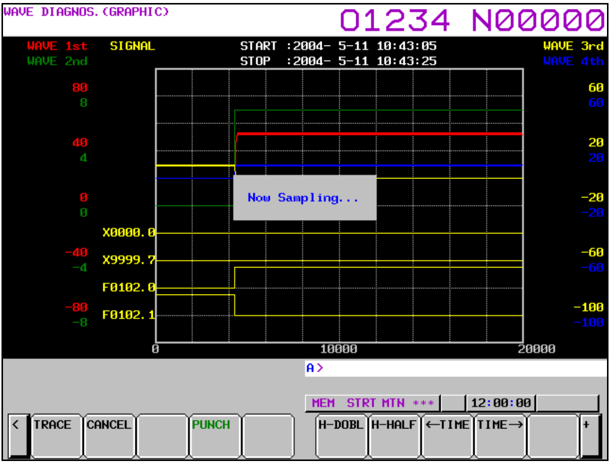
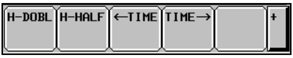


Fig.15.1.1 WAVE DIAGNOS. (GRAPHIC) screen

Canceling tracing

When the soft key [CANCEL] is pressed during tracing, tracing stops.

Moving, extending, and reducing a waveform



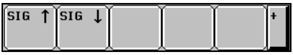
When [H-DOBL] or [H-HALF] is pressed, the length of the time axis on one screen is extended or reduced, respectively.
When a waveform cannot fit in one screen, the time axis can be moved by pressing [←TIME] or [TIME→].

Furthermore, pressing [CH-1], [CH-2], [CH-3], or [CH-4], a submenu appears.

When [WAV.EX] or [WAV.RE] is pressed, the length of the time axis on one screen is extended or reduced, respectively. The graduation unit on the horizontal axis, which is a parameter, also changes automatically.
The graduation unit changes from 1 to 2 to 5 to 10 to 20 to 50 to 100, and so on.
When [WAV. ↑] or [WAV. ↓] is pressed, each waveform of servo and spindle data can be moved upward or downward.

15

Displaying signal data



Up to 32 signals can be measured at the same time. Up to nine signals can be displayed at the same time if only signal data is displayed, or up to four signals can be displayed if signal data is displayed over waveforms.
When [SIG ↑] or [SIG ↓] is pressed, the currently displayed signals are changed.

NOTE
Signal data cannot be moved.

15.1.2 Outputting Data

Waveform diagnosis data can be output to an input/output device.

Specifying a format

When outputting data, you can select one of the two formats, which are the FS16*i*/0*i*-C compatible format (called the 0*i*-C compatible format hereinafter) and the FS30*i*/0*i*-D/F format (called the 0*i*-F format hereinafter). If bit 0 (IOF) of parameter No. 10600 is set to 0, the 0*i*-F format is selected; if bit 0 (IOF) of parameter No. 10600 is set to 1, the 0*i*-C compatible format is selected.

Output format

Traced data is input or output as a text file with the following format:

- **Identifiers**

Identifier word (T)	Meaning
T0/T1	Header
T60	Servo positional deviation
T61	Servo pulses after distribution
T62	Servo torque
T63	Actual servo speed
T64	Servo current command value
T65	Servo heat simulation data
T68	Measurement item
T69	Date and time (start of measurement)
T70	Servo pulses after acc./dec.
T75	Composite speed of all axes
T80	Spindle speed
T81	Spindle load meter
T82	Difference in spindle-converted positional deviation
T90	Measurement period (waveform)
T91	Measurement period (signal)
T92	Date and time (end of measurement)
T98	Signal data

(1) Header

− 0*i*-F format

T	1	C	W	A	V	E		D	I	A	G	N	O	S	;

− 0*i*-C compatible format

T	0	C	W	A	V	E		D	I	A	G	N	O	S	;

(2) Date and time of start/end of tracing

– Starting date and time

T	6	9	D	*	*	*	*	*	*	*	*	,	*	*	*	*	*	*	;
				year				month		day			hour		min		sec		

– Ending date and time

T	9	2	D	*	*	*	*	*	*	*	*	,	*	*	*	*	*	*	;
				year				month		day			hour		min		sec		

NOTE
The ending date and time is output only in the 0*i*-F format.

(3) Waveform sampling cycle

T	9	0	D	*	*	*	*	;

Waveform sampling cycle

(4) Signal sampling cycle

T	9	1	D	*	*	*	*	;

Signal sampling period

NOTE
The waveform sampling cycle and signal sampling cycle are output only in the 0*i*-F format.

(5) Selection item

T	6	8	P	*	*	D	*	*	,	*	*	,	to	*	*	;

	Measurement item	Axis No. / path No. / signal address
P0	Servo positional deviation	Controlled axis number (1 to 32)
P1	Servo pulses after distribution	
P2	Servo torque	
P3	Actual servo speed	
P4	Servo current command value	
P5	Servo heat simulation data	
P6	Servo pulses after acc./dec.	
P10	Composite speed of all axes	Path number (1 to 10)
P20	Spindle speed	Controlled spindle number (1 to 8)
P21	Spindle load meter	
P22	Difference in spindle-converted positional deviation	
P30	Signal	Signal address

NOTE
Items P6 to P30 are output only in the 0*i*-F format.

(6) Waveform diagnosis data

T	6	0	D	*	*	,	*	*	,	to	*	*	;

T	6	1	D	*	*	,	*	*	,	to	*	*	;

T	6	2	D	*	*	,	*	*	,	to	*	*	;

T	6	3	D	*	*	,	*	*	,	to	*	*	;
T	6	4	D	*	*	,	*	*	,	to	*	*	;
T	6	5	D	*	*	,	*	*	,	to	*	*	;
T	7	0	D	*	*	,	*	*	,	to	*	*	;
T	7	5	D	*	*	,	*	*	,	to	*	*	;
T	8	0	D	*	*	,	*	*	,	to	*	*	;
T	8	1	D	*	*	,	*	*	,	to	*	*	;
T	8	2	D	*	*	,	*	*	,	to	*	*	;
T	9	8	D	*	*	,	*	*	,	to	*	*	;

Waveform diagnosis data × No. of axes / No. of paths / No. of signals

Blocks are output in the following order:

Header	(0*i*-C compatible/0*i*-F format)
Date and time (start of measurement)	(0*i*-C compatible/0*i*-F format)
Date and time (end of measurement)	(0*i*-F format only)
Waveform measurement period	(0*i*-F format only)
Signal measurement period	(0*i*-F format only)
Selection item	(0*i*-C compatible/0*i*-F format)
Waveform diagnosis data	(0*i*-C compatible/0*i*-F format)

NOTE
Signal data of waveform diagnosis data is output after all waveform data is output.

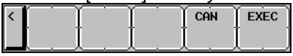
- **Sample file**

```
T01WAVE DIAGNOSE                 ←  - Header
T69D20160101,120125              ←  - Start time
T92D20160101,120130              ←  - End time
T90D2                            ←  - Waveform period
T91D4                            ←  - Signal period
T68P0D1,2                        ←  - Measurement item/axis
T68P4D1
T68P10D1
T68P30DG0010.4,G0010.5,G0010.6   ←  - Measurement item/signal
T60D643,6420                     ←  - Waveform data
T64D270
T75D1855
T60D673,6451
T64D265
T75D1855
T60D702,6480
T64D268
T75D1855
 :
T75D1855                         ←  - Signal data
T98D0,0,1
```

Outputting a file

1 Display the WAVE DIAGNOS. (GRAPHIC) screen.
2 When the operation soft key [(OPRT)] is pressed, soft keys are displayed in the following operation selection state:

3 Change the mode to the EDIT mode.
4 Enter a file name in the key-in buffer, and press the soft key [F OUTPUT]. If no file name is input, the file name is assumed to be WAVE-DGN.TXT by default.
5 Press the [EXEC] soft key shown below to start outputting data:



6 When data output ends, or when the soft key [CAN] is pressed, the initial operation selection state is restored.

NOTE
While data is being traced, data output is not allowed.

Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
10600								IOF

[Input type] Parameter input
[Type of data] Bit
IOF The output format used for waveform diagnosis is:
0 : 30*i*/0*i*-D/F format (0*i*-F format).
1 : 16*i*/0*i*-C format (0*i*-C compatible format).

16 DIGITAL SERVO

This chapter describes servo tuning screen required for maintenance of digital servo and adjustment of reference position.

16.1 INITIAL SETTING SERVO PARAMETERS

This section describes how to set initial servo parameters, which is used for field adjustment of machine tool.

1 Turn on power at the emergency stop condition.

2 Set the parameter to display the servo tuning screen.

	#7	#6	#5	#4	#3	#2	#1	#0
3111								SVS

SVS

0 : Servo tuning screen is not displayed.

1 : Servo tuning screen is displayed.

3 Turn off the power once then turn it on again.

4 Display the servo parameter setting screen by the following operation: Press function key SYSTEM, continuous menu key ▷, and soft key [SV.PARA].

5 Input data required for initial setting using the cursor keys ⬆ ⬇ ⬅ ➡ and page keys PAGE ⇧ PAGE ⇩.

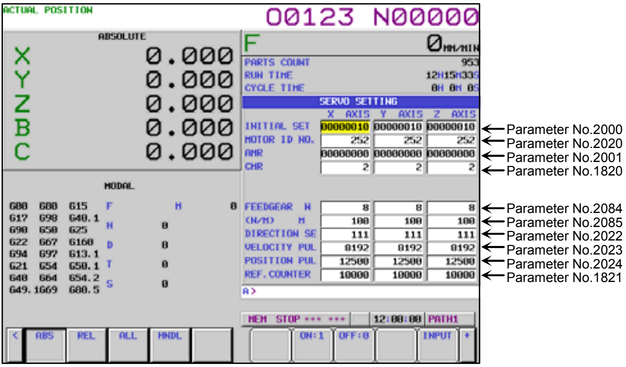


Fig.16.1 SERVO SETTING screen

(1) Initial set bit

	#7	#6	#5	#4	#3	#2	#1	#0
2000							DGPRM	PLC01

DGPRM

0 : Initial setting of digital servo parameter is done.

1 : Initial setting of digital servo parameter is not done.

PLC01

0 : Values of parameters No.2023 and No.2024 are used as they are:

1 : Values of parameters No.2023 and No.2024 are multiplied by 10.

(2) Motor ID No.

Specify the motor ID number.

Select the motor ID number of a motor to be used according to the motor model and motor specification (the middle four digits in A06B-****-B***) listed in the following tables.

When using servo HRV3 or HRV4 control, perform loading by using the motor ID number for servo HRV2 control. Loading is possible with the series and editions listed in the table and later editions.

The mark "x" indicates a value that varies depending on the options used. The mark "-" indicates that automatic loading of standard parameters is not supported as of December, 2005.

NOTE
Specify the motor ID number for servo HRV2 control.

Table 16.1 (a) αiS series servo motor

Motor model	Motor specification	Motor ID No.	90G0
αiS2/5000	0212	262	01.0
αiS2/6000	0218	284	01.0
αiS4/5000	0215	265	01.0
αiS4/6000	210	466	01.0
αiS8/4000	0235	285	01.0
αiS8/6000	0232	290	01.0
αiS12/4000	0238	288	01.0
αiS12/6000	0230	462	01.0
αiS22/4000	0265	315	01.0
αiS22/6000	0262	452	01.0
αiS30/4000	0268	318	01.0
αiS40/4000	0272	322	01.0
αiS50/3000	0275-Bx0x	324	01.0
αiS50/3000 FAN	0275-Bx1x	325	01.0
αiS100/2500	0285-Bx0x	335	01.0
αiS100/2500 FAN	0285-Bx1x	330	01.0
αiS200/2500	0288-Bx0x	338	01.0
αiS200/2500 FAN	0288-Bx1x	334	01.0
αiS300/2000	0292	342	01.0
αiS500/2000	0295	345	01.0

Table 16.1 (b) αiF series servo motor

Motor model	Motor specification	Motor ID No.	90G0
αiF1/5000	0202	252	01.0
αiF2/5000	0205	255	01.0
αiF4/4000	0223	273	01.0
αiF8/3000	0227	277	01.0
αiF12/3000	0243	293	01.0
αiF22/3000	0247	297	01.0
αiF30/3000	0253	303	01.0
αiF40/3000	0257-Bx0x	307	01.0
αiF40/3000FAN	0257-Bx1x	308	01.0

Table 16.1 (c) αiS series servo motor (for 400-V driving)

Motor model	Motor specification	Motor ID No.	90G0
αiS2/5000HV	0213	263	01.0
αiS2/6000HV	0219	287	01.0
αiS4/5000HV	0216	266	01.0
αiS4/6000HV	0214	467	01.0
αiS8/4000HV	0236	286	01.0
αiS8/6000HV	0233	292	01.0

Motor model	Motor specification	Motor ID No.	90G0
α*i*S12/4000HV	0239	289	01.0
α*i*S22/4000HV	0266	316	01.0
α*i*S22/6000HV	0263	453	01.0
α*i*S30/4000HV	0269	319	01.0
α*i*S40/4000HV	0273-Bx9x 0273-Bx2x	323	01.0
α*i*S50/3000HV FAN	0276-Bx1x 0276-Bx3x	326	01.0
α*i*S50/3000HV	0276-Bx0x 0276-Bx2x	327	01.0
α*i*S100/2500HV	0286-Bx0x	336	01.0
α*i*S100/2500HV FAN	0286-Bx1x	331	01.0
α*i*S200/2500HV	0289-Bx0x	339	01.0
α*i*S200/2500HV FAN	0289-Bx1x	337	01.0
α*i*S300/2000HV	0293	343	01.0
α*i*S500/2000HV	0296	346	01.0
α*i*S1000/2000HV	0298	348	01.0
α*i*S1000/2000HV	0098	458	01.0
α*i*S2000/2000HV	0091	459	01.0
α*i*S3000/2000HV	0092	460	01.0

Table 16.1 (d) α*i*F series servo motor (for 400-V driving)

Motor model	Motor specification	Motor ID No.	90G0
α*i*F4/4000HV	0225	275	01.0
α*i*F8/3000HV	0229	279	01.0
α*i*F12/3000HV	0245	295	01.0
α*i*F22/3000HV	0249	299	01.0

Table 16.1 (e) αC*i* series servo motor

Motor model	Motor specification	Motor ID No.	90G0
αC4/3000*i*	0221	271	01.0
αC8/2000*i*	0226	276	01.0
αC12/2000*i*	0241	291	01.0
αC22/2000*i*	0246	296	01.0
αC30/1500*i*	0251	301	01.0

Table 16.1 (f) β*i*S series servo motor

Motor model	Motor specification	Motor ID No.	90G0
β*i*S0.2/5000	0111	260	01.0
β*i*S0.3/5000	0112	261	01.0
β*i*S0.4/5000	0114	280	01.0
β*i*S0.5/6000	0115	281	01.0
β*i*S1/6000	0116	282	01.0
β*i*S2/4000	0061	253	01.0
β*i*S4/4000	0063	256	01.0
β*i*S8/3000	0075	258	01.0

Motor model	Motor specification	Motor ID No.	90G0
β*i*S12/3000	0078	272	01.0
β*i*S22/2000	0085	274	01.0

Table 16.1 (g) β*i*S series servo motor (for 400-V driving)

Motor model	Motor specification	Motor ID No.	90G0
β*i*S2/4000HV	0062	251	01.0
β*i*S4/4000HV	0064	264	01.0
β*i*S8/3000HV	0076	267	01.0
β*i*S12/3000HV	0079	270	01.0
β*i*S22/2000HV	0086	278	01.0

Table 16.1 (h) Linear motor (for 200-V driving)

Motor model	Motor specification	Motor ID No.	90G0
L*i*S300A1/4	0441-B200	351	01.0
L*i*S600A1/4	0442-B200	353	01.0
L*i*S900A1/4	0443-B200	355	01.0
L*i*S1500B1/4	0444-B210	357	01.0
L*i*S3000B2/2	0445-B110	360	01.0
L*i*S3000B2/4	0445-B210	362	01.0
L*i*S4500B2/2	0446-B110	364	01.0
L*i*S6000B2/2	0447-B110	368	01.0
L*i*S6000B2/4	0447-B210	370	01.0
L*i*S7500B2/2	0448-B110	372	01.0
L*i*S7500B2/4	0448-B210	374	01.0
L*i*S9000B2/2	0449-B110	376	01.0
L*i*S9000B2/4	0449-B210	378	01.0
L*i*S3300C1/2	0451-B110	380	01.0
L*i*S9000C2/2	0454-B110	384	01.0
L*i*S11000C2/2	0455-B110	388	01.0
L*i*S15000C2/2	0456-B110	392	01.0
L*i*S15000C2/3	0456-B210	394	01.0
L*i*S10000C3/2	0457-B110	396	01.0
L*i*S17000C3/2	0459-B110	400	01.0

Table 16.1 (i) Linear motor (for 400-V driving)

Motor model	Motor specification	Motor ID No.	90G0
L*i*S1500B1/4	0444-B210	358	01.0
L*i*S3000B2/2	0445-B110	361	01.0
L*i*S4500B2/2HV	0446-B010	363	01.0
L*i*S4500B2/2	0446-B110	365	01.0
L*i*S6000B2/2HV	0447-B010	367	01.0
L*i*S6000B2/2	0447-B110	369	01.0
L*i*S7500B2/2HV	0448-B010	371	01.0
L*i*S7500B2/2	0448-B110	373	01.0
L*i*S9000B2/2	0449-B110	377	01.0
L*i*S3300C1/2	0451-B110	381	01.0

Motor model	Motor specification	Motor ID No.	90G0
L*i*S9000C2/2	0454-B110	385	01.0
L*i*S11000C2/2HV	0455-B010	387	01.0
L*i*S11000C2/2	0455-B110	389	01.0
L*i*S15000C2/3HV	0456-B010	391	01.0
L*i*S10000C3/2	0457-B110	397	01.0
L*i*S17000C3/2	0459-B110	401	01.0

Table 16.1 (j) Synchronous built-in servo motor (for 200-V driving)

Motor model	Motor specification	Motor ID No.	90G0
D*i*S85/400	0483-B20x	423	01.0
D*i*S110/300	0484-B10x	425	01.0
D*i*S260/600	0484-B31x	429	01.0
D*i*S370/300	0484-B40x	431	01.0

Table 16.1 (k) Synchronous built-in servo motor (for 400-V driving)

Motor model	Motor specification	Motor ID No.	90G0
D*i*S85/400	0483-B20x	424	01.0
D*i*S110/300	0484-B10x	426	01.0
D*i*S260/600	0484-B31x	430	01.0
D*i*S370/300	0484-B40x	432	01.0

(3) Arbitrary AMR function

(Axis)	#7	#6	#5	#4	#3	#2	#1	#0
2001	AMR7	AMR6	AMR5	AMR4	AMR3	AMR2	AMR1	AMR0

(*) Set "00000000".

(4) CMR

1820	Command multiply ratio

<1> When CMR is 1/2 to 1/27

$$\text{Setting value} = \frac{1}{\text{CMR}} + 100$$

<2> When CMR is 0.5 to 48

$$\text{Setting value} = 2 \times \text{CMR}$$

1822	Value of the numerator of arbitrary command multiplier n/m

1823	Value of the denominator of arbitrary command multiplier n/m

To set an arbitrary command multiplier, the corresponding option is required.

(5) Turn off the power then back on.

(6) N/M of feed gear (F·FG)

2084	n for flexible feed gear

2085	m for flexible feed gear

Setting for the α Pulsecoder in the semi-closed mode

$$\frac{\text{F·FG numerator } (\leq 32767)}{\text{F·FG denominator } (\leq 32767)^{\text{(Note 1)}}} = \frac{\text{Necessary position feedback pulses per motor revolution}}{1{,}000{,}000^{\text{(Note 2)}}}$$

(as irreducible fraction)

NOTE

1. For both F·FG number and denominator, the maximum setting value (after reduced) is 32767.
2. αi Pulsecoders assume one million pulses per motor revolution, irrespective of resolution, for the flexible feed gear setting.
3. If the calculation of the number of pulses required per motor revolution involves π, such as when a rack and pinion are used, assume π to be approximately 355/113.

(Example)

For detection in 1 μm units, specify as follows:

Table 16.1 (l) Examples of calculation

Ball screw lead (mm/rev)	Number of necessary position pulses (pulses/rev)	F·FG
10	10000	1/100
20	20000	2/100 or 1/50
30	30000	3/100

(Example)

If the machine is set to detection in 1,000 degree units with a gear reduction ratio of 10:1 for the rotation axis, the table rotates by 360/10 degrees each time the motor makes one turn.

1000 position pulses are necessary for the table to rotate through one degree. The number of position pulses necessary for the motor to make one turn is:

360/10 × 1000 = 36000 with reference counter =36000

$$\frac{\text{F·FG numerator}}{\text{F·FG denominator}} = \frac{36{,}000}{1{,}000{,}000} = \frac{36}{1{,}000}$$

Setting for use of a separate detector (full-closed)

$$\frac{\text{F·FG numerator } (\le 32767)}{\text{F·FG denominator } (\le 32767)} = \frac{\text{Number of position pulses corresponding to a predetermined amount of travel}}{\text{Number of position pulses corresponding to a predetermined amount of travel from a separate detector}} \text{ (as irreducible fraction)}$$

(Example)

To detect a distance of 1 μm using a 0.5 μm scale, set the following:

$$\frac{\text{Numerator of F·FG}}{\text{Denominator of F·FG}} = \frac{L/1}{L/0.5} = \frac{1}{2}$$

Table 16.1 (m) Examples of calculation

		1/1000 mm	1/10000 mm
One revolution of motor	8 mm	n = 1/m = 125	n = 2/m = 25
	10 mm	n = 1/m = 100	n = 1/m = 10
	12 mm	n = 3/m = 250	n = 3/m = 25

(7) Direction of travel

2022	Rotational direction of motor

111: Normal (Clockwise as viewed from the Pulsecoder)

-111: Reverse (Counterclockwise as viewed from the Pulsecoder)

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(8) Number of speed pulses, Number of position pulses

Table 16.1 (n) Number of speed pulses, Number of position pulses

	Semi-closed loop	Closed loop		
		Parallel type	Serial linear scale	Serial rotary scale
Command unit (μm)	1/0.1	1/0.1	1/0.1	1/0.1
Initial bit setting	#0=0	#0=0	#0=0	#0=0
Number of speed pulses	8192	8192	8192	8192
Number of position pulses	12500 (*1)	(*2 - Example 1)	(*2 - Example 1)	(*2 - Example 2)

Set 8192 as the number of speed pulses. For the linear motor or synchronous built-in servo motor, make settings according to "Linear Motor Parameter Setting" or “Synchronous Built-In Servo Motor Parameter Setting” in the FANUC SERVO MOTOR α*i*S/α*i*F/β*i*S Parameter Manual (B-65270EN).

NOTE

1 Setting of the number of position pulses for the semi-closed loop (indicated by (*1) in the above table)
Set 12500.

2 Setting of the number of position pulses for the closed loop (indicated by (*2) in the above table)
As the number of position pulses, set the number of pulses fed back from a separate detector when the motor makes one revolution. (The flexible feed gear has no relevance to the calculation of the number of position pulses.)

Example 1)
When a ball screw (direct connection) with a 10-mm lead and a separate detector with a resolution of 0.5 μm per pulse are used
When the motor makes one revolution, the following pulses are fed back from the separate detector:
10/0.0005 = 20,000
Accordingly, Number of position pulses = 20,000

Example 2)
When a serial rotary scale with a resolution of 1,000,000 pulses per revolution is used, the number of position feedback pulses is exceptionally calculated by the following:
12500 × (deceleration ratio between the motor and table)
When the deceleration ratio between the motor and table is 10:1, for example, the number of position pulses is:
12,500 × (1/10) = 1,250

3 When the set number of position pulses is greater than 32767
With the conventional NC, bit 0 (high resolution bit) to be initially set was changed according to the command unit as required. With the Series 30*i*, there is no dependency between the command unit and bit 0 to be initially set. The conventional way of setting poses no problem, but the method described below makes the setting much easier.

With a position feedback pulse conversion coefficient, the number of position pulses is set using the product of two parameters.

2185	Conversion coefficient for the number of position feedback pulses

(Example of setting)
When a linear scale with a minimum resolution of 0.1 (m is used and the travel distance per motor revolution is 16 mm:

Ns = (travel distance per motor revolution (mm)) / (minimum resolution of detector (mm))
= 16mm/0.0001mm = 160000 (> 32767) = 10000×16

So, set the following:
A: 10000
B: 16

NOTE
If the detector of the motor is an αi pulse coder (the number of speed pulses = 8192), select a power of 2 (such as 2, 4, 8, and so on) as a conversion coefficient whenever possible. (The position gain value used inside the software becomes more accurate.)

(9) Reference counter

1821	Reference counter capacity for each axis (0 to 99999999)

- For the semi-closed loop

(Rotary axis)
Count on the reference counter
= Number of position pulses corresponding to a single motor revolution/M, or the same number divided by an integer value
(*) When the motor-table gear reduction ratio is M/N (M and N are integers, and M/N is a fraction that is reduced to lowest terms.)
(Linear axis)
Count on the reference counter
= Number of position pulses corresponding to a single motor revolution or the same number divided by an integer value

NOTE
1 If the calculation above results in a fraction, a setting can be made with a fraction.
2 If the rotation ratio between the motor and table on the rotary axis is not an integer, the reference counter capacity needs to be set so that the point (grid point) where the reference counter equals 0 appears at the same position relative to the table. So, with the rotary axis, the number of position pulses per motor revolution needs to be multiplied by 1/M.

[Example of setting]
αi Pulsecoder and semi-closed loop (1-μm detection)

Table 16.1 (o) Example of setting

Ball screw lead (mm/revolution)	Necessary number of position pulses (pulse/revolution)	Reference counter	Grid width (mm)
10	10000	10000	10
20	20000	20000	20
30	30000	30000	30

When the number of position pulses corresponding to a single motor revolution does not agree with the reference counter setting, the position of the zero point depends on the start point.

In such a case, set the reference counter capacity with a fraction to change the detection unit and eliminate the error in the reference counter.

[Example of setting]
System using a detection unit of 1 μm, a ball screw lead of 20 mm/revolution, and a gear reduction ratio of 1/17

(a) Method of specifying the reference counter capacity with a fraction
The number of position pulses necessary for the motor to make one turn is: 20000/17
Set the following parameter as stated below.

1821	Reference counter capacity (numerator) (0 to 99999999)

2179	Reference counter capacity (denominator) (0 to 32767)

A value up to around 100 is assumed to be set as the denominator of the reference counter capacity. If a larger value is set, the grid width becomes too small, which makes it difficult to perform reference position return by grid method.
At present, the denominator parameter is not displayed on the servo screen, requiring you to set it on the parameter screen.
In this example, set the numerator and denominator, respectively, to 20000 and 17.

NOTE
Even if a setting is made with a fraction, set the number of position pulses per motor revolution/M for a semi-closed loop rotary axis when the reduction ratio is M/N.
Reference counter
= Number of position pulses per motor revolution/M, or
The same number divided by an integer

(b) Method of changing the detection unit
The number of position pulses necessary for the motor to make one turn is: 20000/17
In this case, increase all the following parameter values by a factor of 17, and set the detection unit to 1/17 μm.

Table 16.1 (p) Method of changing the detection unit

Parameter modification		Series 30*i*
FFG	× 17	Servo screen
CMR	× 17	Servo screen
Reference counter	× 17	Servo screen
Effective area	× 17	No.1826, No.1827
Position error limit in traveling	× 17	No.1828
Position error limit in the stop state	× 17	No.1829
Backlash	× 17	No.1851, No.1852

Changing the detection unit from 1 μm to 1/17 μm requires multiplying each of the parameter settings made for the detection unit by 17.

⚠ **CAUTION**
In addition to the above parameters, there are some parameters that are to be set in detection units.

Making these modifications eliminates the difference between the number of position pulses corresponding to a single motor revolution and the reference counter setting.
Number of position pulses corresponding to a single motor revolution = 20000
Reference counter setting = 20000

- Full-closed loop

Reference counter setting
= Z-phase (reference-position) interval divided by the detection unit, or this value sub-divided by an integer value

NOTE
If the separate detector-table rotation ratio for the rotary axis is not an integer, it is necessary to set the reference counter capacity in such a way that points where reference counter = 0 (grid points) appear always at the same position for the table.

[Example of setting]

Example 1)

When the Z-phase interval is 50 mm and the detection unit is 1 μm:

Reference counter setting = 50,000/1 = 50,000

Example 2)

When a rotary axis is used and the detection unit is 0.001°:

Reference counter setting = 360/0.001 = 360,000

When a linear scale is used and a single Z phase exists:

Set the reference counter to 10000, 50000, or another round number.

If the calculated value of the reference counter capacity is not an integer, the reference counter capacity can be set as a fraction as in the case of a semi-closed loop. For details of parameters, see the semi-closed loop example.

NOTE
The following value can be set as a reference counter capacity:
(For linear axis)
Reference counter capacity
= Number of position pulses corresponding to the Z-phase interval of a separate detector or the same number divided by an integer
(For rotary axis)
Reference counter capacity
= Number of position pulses per revolution of a separate detector/M or the same number divided by an integer
(*) When the rotation ratio between the table and separate detector is M/N (M and N are integers, and M/N is a fraction that is reduced to lowest terms.)

6 Turn off the power then back on.

16.2 FSSB SETTING SCREEN

16.2.1 FSSB Display and Setting Screen

Connecting the CNC control unit to servo amplifiers via a high-speed serial bus (FANUC Serial Servo Bus, or FSSB), which uses only one fiber optics cable, can significantly reduce the amount of cabling in machine tool electrical sections. Axis settings are calculated automatically according to the interrelationships between axes and amplifiers entered on the FSSB setting screen. Parameter Nos. 1023, 2013#0, 2014#0, 3717, 11802#4, 24000 to 24095, and 24096 to 24103 are specified automatically according to the results of the calculation.

Display

The FSSB setting screen displays FSSB-based amplifier and axis information. This information can also be specified by the operator.

1 Press function key 

.

2 To display [FSSB], press continuous menu key  several times.

3 Pressing the soft key [FSSB] causes the [CONNECTION STATUS] screen (or the previously selected FSSB setting screen) to appear, with the following soft keys displayed.

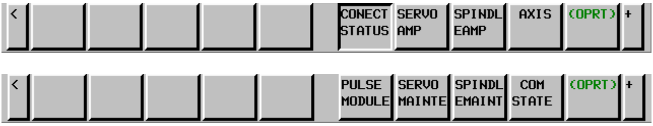

Fig.16.2 (a) Connection status screen soft keys

There are seven FSSB setting screens: [CONNECTION STATUS], [SERVO AMPLIFIER SETTING], [SPINDLE AMPLIFIER SETTING], [SEPARATE DETECTOR INTERFACE UNIT], [AXIS SETTING], [SERVO AMPLIFIER MAINTENANCE], and [SPINDLE AMPLIFIER MAINTENANCE].

Pressing the soft key [CONECT STATUS] causes the [CONNECTION STATUS] screen to appear.

Pressing the soft key [SERVO AMP] causes the [SERVO AMPLIFIER SETTING] screen to appear.

Pressing the soft key [SPNDLE AMP] causes the [SPINDLE AMPLIFIER SETTING] screen to appear.

Pressing the soft key [PULSE MODULE] causes the [SEPARATE DETECTOR INTERFACE UNIT] screen to appear.

Pressing the soft key [AXIS] causes the [AXIS SETTING] screen to appear.

Pressing the soft key [SERVO MAINTE] causes the [SERVO AMPLIFIER MAINTENANCE] screen to appear.

Pressing the soft key [SPNDLE MAINTE] causes the [SPINDLE AMPLIFIER MAINTENANCE] screen to appear.

(1) Connection status screen

The connection status screen displays the connection status of slaves connected to the FSSB at power-on.

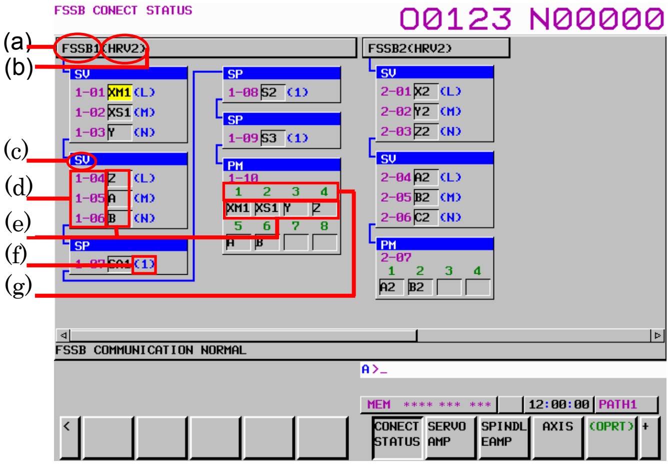

Fig.16.2 (b) Connection status screen

The connection status screen displays the following items:

(a) FSSB1,FSSB2,FSSB3 .... FSSB line number
The FSSB line number is displayed. (FSSB1: First FSSB line, FSSB2: Second FSSB line, FSSB3: Third FSSB line)

(b) HRV2,HRV3,HRV4,HRV− .... Current loop
The current loop for each FSSB line is displayed. “HRV-” may be displayed when no servo amplifier is connected to the FSSB or an FSSB-related alarm is issued.

(c) SV,SP,PM................................ Slave type
The type of slave connected to the FSSB is displayed. (SV: Servo amplifier, SP: Spindle amplifier, PM: Separate detector interface unit)

(d) 1-01 to 1-32, 2-01 to 2-32, 3-01 to 3-32 .. Slave number
An FSSB line number (1: First FSSB line, 2: Second FSSB line, 3: Third FSSB line), a hyphen (-), and a slave number (connection number for the line) are displayed. (The maximum number of slaves per line is 32.)

(e) XM1,XS1,Y,Z,A,B .... Program axis name, Spindle name
The program axis name or spindle name set for each amplifier or separate detector interface unit is displayed.

(f) L,M,N,1 .... Amplifier axis order
The axis order for each amplifier is displayed. (L: First axis for a servo amplifier, M: Second axis for a servo amplifier, N: Third axis for a servo amplifier, 1: First spindle for a spindle amplifier)

(g) 1 to 8.. Connector number
The connector number of a separate detector interface unit is displayed.

16

(2) Servo amplifier setting screen

The servo amplifier setting screen displays servo amplifier information.

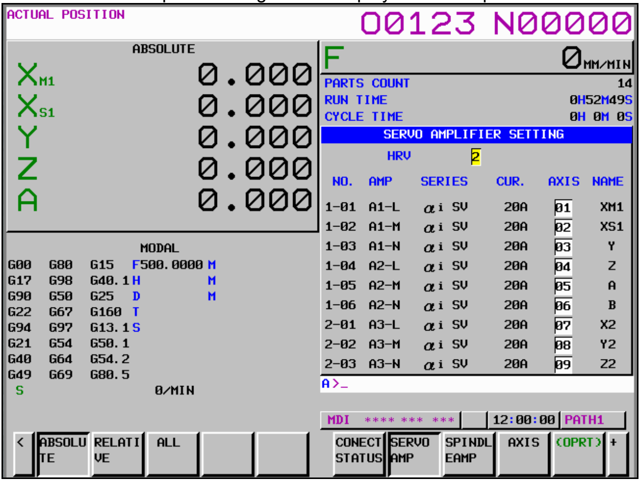

Fig.16.2 (c) Servo amplifier setting screen

The servo amplifier setting screen consists of the following items:

- HRV ....Current loop
  The current loop to be set at FSSB automatic setting is displayed. This value does not indicate the current effective current loop. (2: Servo HRV2 control, 3: Servo HRV3 control, 4: Servo HRV4 control)
- NO. ....Slave number
  An FSSB line number (1: First FSSB line, 2: Second FSSB line, 3: Third FSSB line), a hyphen (-), and a slave number (connection number for the line) are displayed. (The maximum number of slaves per line is 32.)
- AMP ....Amplifier type
  This consists of the letter A, which stands for "servo amplifier", a number indicating the placing of the servo amplifier, as counted from that nearest to the CNC, and an alphabetic character indicating the axis order in the servo amplifier (L: First axis, M: Second axis, N: Third axis).
- The following items are displayed as servo amplifier information:
  - SERIES .... Servo amplifier type and series
    (The display of the series name "β*i*SV" is not supported)
  - CUR.......... Maximum rating current
- AXIS ....Controlled axis number
  The controlled axis number assigned to the servo amplifier is displayed. "0" is displayed if an FSSB-related alarm is issued or no controlled axis number is assigned.
- NAME ....Program axis name
  The program axis name corresponding to a particular controlled axis number set in parameter No. 1020 is displayed. When the axis number is 0, nothing is displayed.

(3) Spindle amplifier setting screen

The spindle amplifier setting screen displays spindle amplifier information.

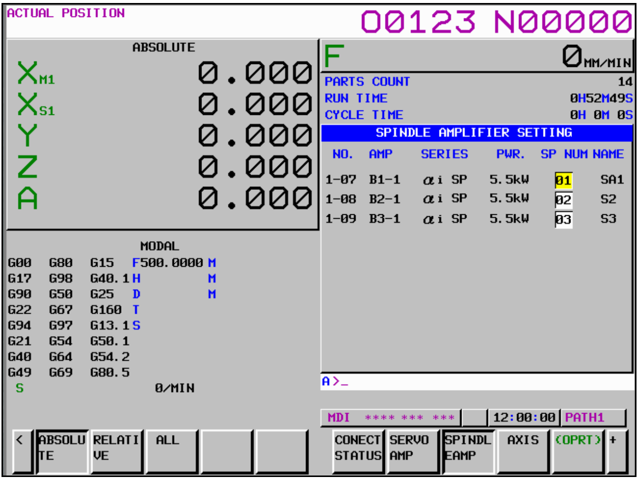

Fig.16.2 (d) Spindle amplifier setting screen

The spindle amplifier setting screen consists of the following items:

- NO. ....Slave number
  An FSSB line number (1: First FSSB line, 2: Second FSSB line, 3: Third FSSB line), a hyphen (-), and a slave number (connection number for the line) are displayed. (The maximum number of slaves per line is 32.)
- AMP........................Amplifier type
  This consists of the letter B, which stands for “spindle amplifier”, a number indicating the placing of the spindle amplifier, as counted from that nearest to the CNC, and an alphabetic character indicating the axis order in the spindle amplifier (1: First spindle for a spindle amplifier).
- The following items are displayed as spindle amplifier information:
  - SERIES .... Spindle amplifier type and series
  - PWR. .... Maximum output
- SP NUM..................Spindle number
  The spindle number assigned to the spindle amplifier is displayed. “0” is displayed if an FSSB-related alarm is issued or no spindle number is assigned.
- NAME ....Spindle name
  The spindle name corresponding to the spindle number is displayed. When the spindle number is 0, nothing is displayed.

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(4) Separate detector interface unit screen

The separate detector interface unit screen displays information on separate detector interface units.

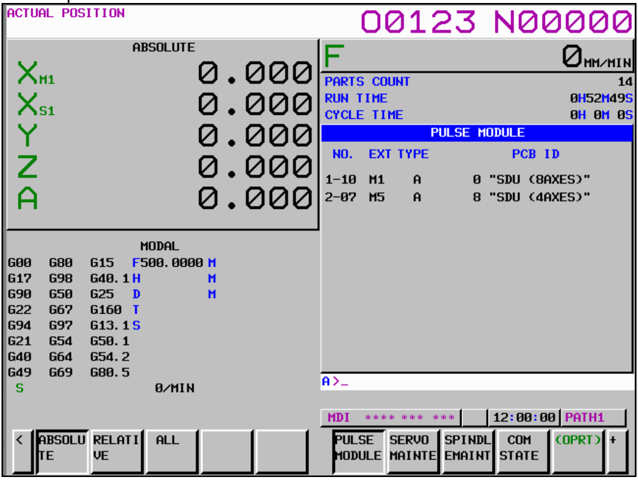

Fig.16.2 (e) Separate detector interface unit screen

The separate detector interface unit screen displays the following items:

- NO. ....Slave number
  An FSSB line number (1: First FSSB line, 2: Second FSSB line, 3: Third FSSB line), a hyphen (-), and a slave number (connection number for the line) are displayed. (While the maximum number of slaves per line is 32, the maximum number of separate detector interface units per line is 4.)
- The following items are displayed as separate detector interface unit information:
  - EXT
    This consists of the letter M, which stands for "separate detector interface unit", and a number indicating the placing of the separate detector interface unit, as counted from that nearest to the CNC. For the second FSSB line, M5 is displayed for the first separate detector interface unit since the number starts from 5. For the third FSSB line, M9 is displayed for the first separate detector interface unit since the number starts from 9.
  - TYPE
    This is a letter indicating the type of the separate detector interface unit.
  - PCB ID
    The ID of the separate detector interface unit is displayed.
    The separate detector interface unit ID is followed by SDU (8AXES) when 8-axes separate detector interface unit or SDU (4AXES) when 4-axes separate detector interface unit.

(5) Axis setting screen

The axis setting screen displays the information of axis.

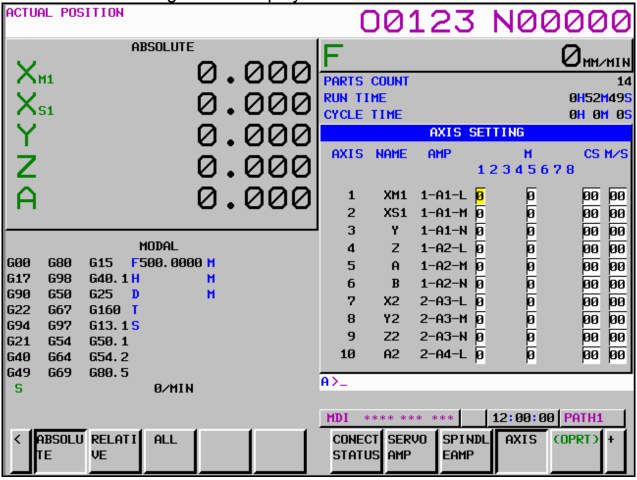

Fig.16.2 (f) Axis setting screen

The axis setting screen displays the following items. Any item that cannot be set is not displayed. (When the first and fifth separate detector interface units are connected and Cs contour control and tandem control can be used, the screen shown in above figure is displayed.)

- AXIS ..... Controlled axis number
  This item is the placing of the NC controlled axis.
- NAME ... Program axis name for each axis
- AMP...... FSSB line number and amplifier type of the servo amplifier connected to each axis
- M1......... Connector number of the first or ninth (first unit for the third FSSB line) separate detector interface unit
- M2......... Connector number of the second or tenth separate detector interface unit
- M3......... Connector number of the third or eleventh separate detector interface unit
- M4......... Connector number of the fourth or twelfth separate detector interface unit
- M5......... Connector number of the fifth (first unit for the second FSSB line) separate detector interface unit
- M6......... Connector number of the sixth separate detector interface unit
- M7......... Connector number of the seventh separate detector interface unit
- M8......... Connector number of the eighth separate detector interface unit
  Connector numbers set by FSSB automatic setting are displayed.
- Cs .... Cs contour controlled axis
  The spindle number for the Cs contour controlled axis set by FSSB automatic setting is displayed.
- M/S .... Master axis / Slave axis (Slave axis / Dummy axis)
  Either of the following settings is displayed: Master axis/slave axis setting for tandem control or slave axis/dummy axis setting for the electronic gear box (EGB) set by FSSB automatic setting.

The M1 to M8, Cs, and M/S values are to be set by FSSB automatic setting and do not indicate current effective settings. The previous values set normally are displayed first after power-on. “0” is displayed when an FSSB-related alarm is issued.

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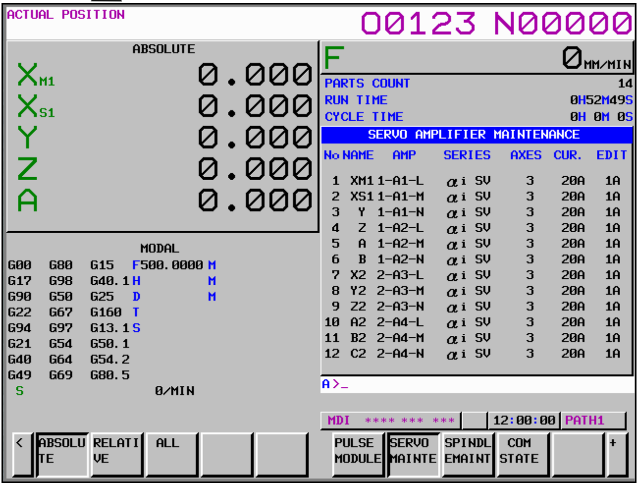
(6) Servo amplifier maintenance screen

The servo amplifier maintenance screen displays maintenance information for servo amplifiers. This screen consists of the following two pages, either of which can be selected by pressing the cursor keys [←] and [→].



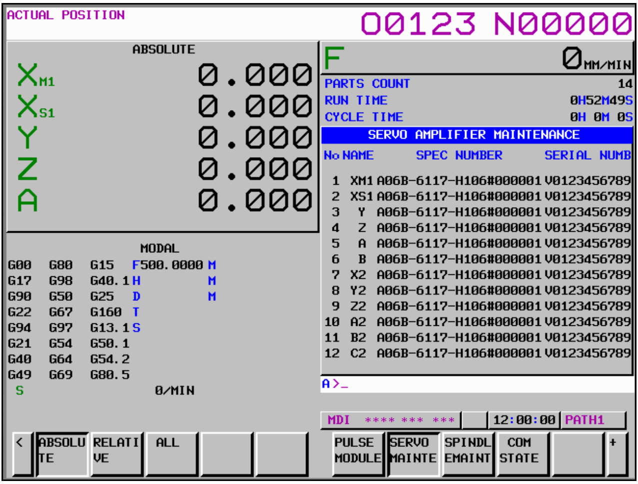


Fig.16.2 (g) Servo amplifier maintenance screen

The servo amplifier maintenance screen displays the following items:

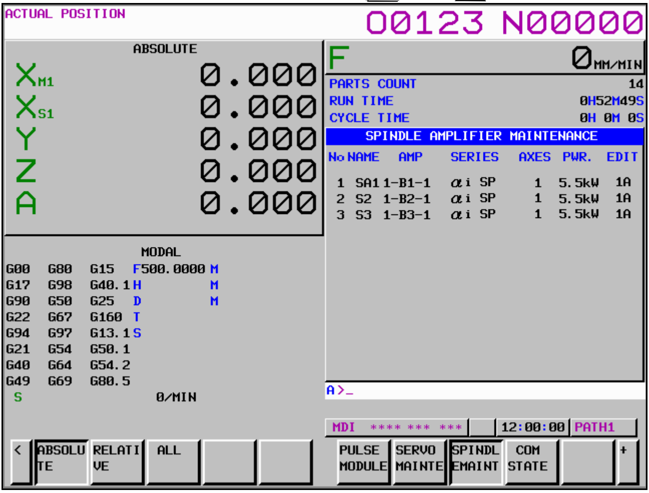
- No .... Controlled axis number
- NAME .... Program axis name for each axis
- AMP .... FSSB line number and amplifier type of the servo amplifier connected to each axis
- SERIES................ Type and series of the servo amplifier connected to each axis
  (The display of the series name "β*i*SV" is not supported)
- AXES .... Maximum number of axes controlled by a servo amplifier connected to each axis
- CUR. .... Maximum rating current for servo amplifiers connected to each axis

- EDIT .... Version number of a servo amplifier connected to each axis
- SPEC NUMBER... Amplifier drawing number of the servo amplifier connected to each axis
- SERIAL NUMB..... Serial number of the servo amplifier connected to each axis

(7) Spindle amplifier maintenance screen

The spindle amplifier maintenance screen displays maintenance information for spindle amplifiers.

This screen consists of the following two pages, either of which can be selected by pressing the cursor keys [←] and [→].



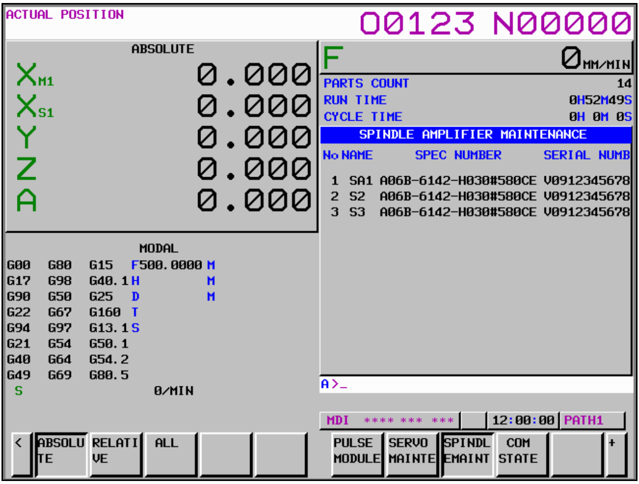


Fig.16.2 (h) Spindle amplifier maintenance screen

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The spindle amplifier maintenance screen displays the following items:

- No .... Spindle number
- NAME .... Spindle name
- AMP..................... FSSB line number and amplifier type of the spindle amplifier connected to each axis

- SERIES................ Type and series of the spindle amplifier connected to each axis
- AXES .... Maximum number of axes controlled by a spindle amplifier connected to each axis
- PWR. .... Rated output of the spindle amplifier connected to each axis
- EDIT .... Version number of a servo amplifier connected to each axis
- SPEC NUMBER... Amplifier drawing number of the spindle amplifier connected to each axis
- SERIAL NUMB..... Serial number of the spindle amplifier connected to each axis

16.3 SERVO TUNING SCREEN

16.3.1 Parameter Setting

Set a parameter to display the servo tuning screen.

	#7	#6	#5	#4	#3	#2	#1	#0
3111								SVS

SVS
0 : Servo tuning screen is not displayed.
1 : Servo tuning screen is displayed.

16.3.2 Displaying Servo Tuning Screen

1 Press function key SYSTEM key continuous menu key ▷ and soft key [SV. PARA] in this order.
2 Press soft key [SV.TUN] to select the servo tuning screen.

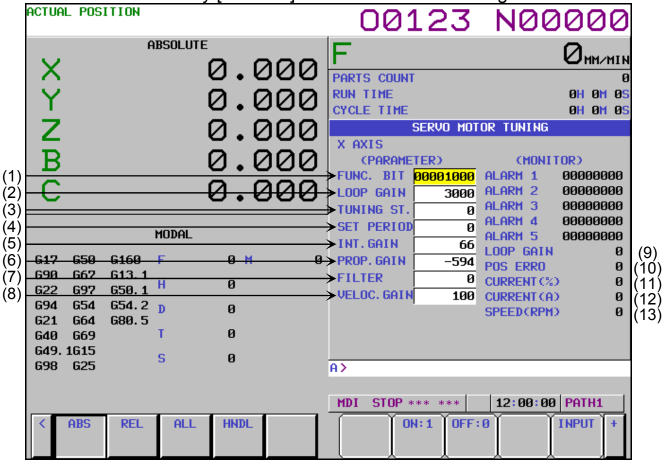


Fig.16.3.2 Servo Tuning Screen

(1) Function bit: Parameter (No.2003)
(2) Loop gain: Parameter (No.1825)
(3) Tuning start:
(4) Set period:
(5) Integral gain: Parameter (No.2043)
(6) Proportional gain: Parameter (No.2044)

$$\text{Setting value} = \frac{(\text{Parameter (No.2021)}) + 256}{256} \times 100$$

(7) Filter : Parameter (No.2067)
(8) Velocity gain:
(9) Loop gain: Actual loop gain
(10) Position error: Actual position error (Diagnosis data No.300)
(11) Current(%): Indicate current with % to the rated value.
(12) Current(A): Indicate current with A (peak value).
(13) Speed RPM: Number of motor actual rotation

16.4 αi SERVO INFORMATION SCREEN

Overview

In the αi servo system, ID information output from each of the connected units is obtained and output to the CNC screen.
The units that have ID information are shown below.
(Note: Some instances of these units do not have ID information.)

- Servo motor
- Pulsecoder
- Servo amplifier(SV)
- Power supply(PS)

ID information is automatically read from each of the connected units during first startup of the CNC and then recorded. During the second or later startup, the ID information recorded during first startup can be compared with the ID information read this time on the screen to check whether the configuration of the connected units is changed. (If there is a difference between them, the alarm mark (*) appears.)
The recorded ID information can be edited. Therefore, the ID information of an unit that does not have ID information can be displayed. (However, the alarm mark (*) indicating a difference between these IDs appears.)

Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
13112							SVI	IDW

[Data type] Bit

IDW The edit of the servo information screen or the spindle information screen is:
0 : Prohibited
1 : Allowed

SVI The servo information screen is:
0 : Displayed
1 : Not displayed

Displaying the servo information screen

1 Press the 

function key, then press the soft key [SYSTEM].

2 Press the soft key [SERVO INFO] to display the screen as shown below.

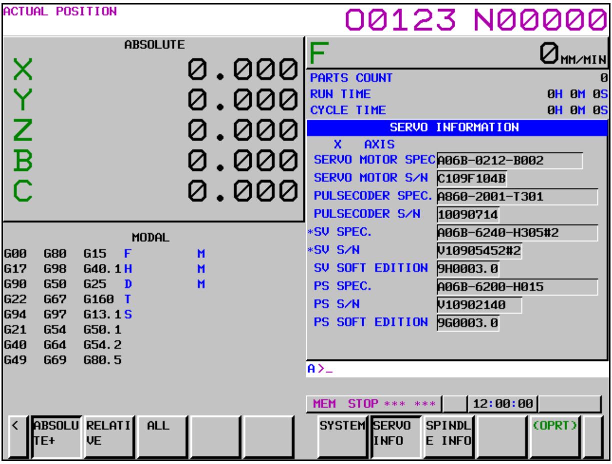


Fig.16.4 (a) Servo information screen (dsiplaying)

(*) Servo information is stored in Flash ROM. If there is a difference between the ID information in screen and the actual ID information, the corresponding items are preceded by *.

Additional Information

Even if replacement is performed reasonably such as for repairing, this function incorrectly indicates the * mark when it detects the replacement. To clear the * mark, follow the steps below to update the registered data, as described in the editing section later.

(1) Make the registered data editable. (Bit 0 (IDW) of parameter No.13112 is 1)
(2) On the edit screen, place the cursor on the item from which you want to delete the * mark.
(3) Operate the soft keys [READ ID], [INPUT], and [SAVE] in that order.
To update all items and clear * marks at a time, press soft key [UPDATEALL ID] (displayed when bit 1 (IDC) of parameter No. 11320 is set to 1).

Editing the servo information screen

1 Assume that bit 0 (IDW) of parameter No.13112 is 1.
2 Press the MDI switch on the machine operator's panel.
3 Follow the steps shown in "Displaying the servo information screen" to display the screen as shown below.

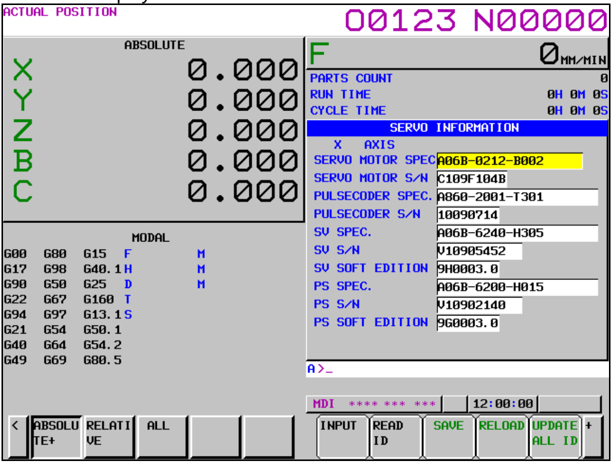


Fig.16.4 (b) Servo information screen (editing)

4 To move the cursor on the screen, use the cursor keys  and .

Screen operation

Table 16.4 Key operation and use

Mode	Key operation	Use
Viewing (*1)	Page keys	Scrolls up or down on a screen-by-screen basis.
Editing (*2)	Soft keys	
	[INPUT]	Replace the selected ID information at the cursor position with the character string in key-in buffer.
	[READ ID]	Transfers the ID information the connected device at the cursor has to the key-in buffer. Only the items preceded by * (*3) are valid.
	[SAVE]	Saves the ID information that has been changed on the servo information screen in Flash ROM.
	[RELOAD]	Cancels the ID information that has been changed on the servo information screen and loads ID information from Flash ROM.
	UPDATEALL ID] (*4)	Updates the ID information for all axes that is output from each of the connected units displayed on the servo or spindle information screen at a time.
	Page keys	Scrolls up or down on a screen-by-screen basis.
	Cursor keys	Scrolls up or down the selection of ID information.

(*1) Viewing mode: when bit 0 (IDW) of parameter No.13112 is 0
(*2) Editing mode: when bit 0 (IDW) of parameter No.13112 is 1
(*3) If there is a difference between the ID information in screen and the actual ID information, the corresponding items are preceded by *.
(*4) When bit 1 (IDC) of parameter No.11320 is 1

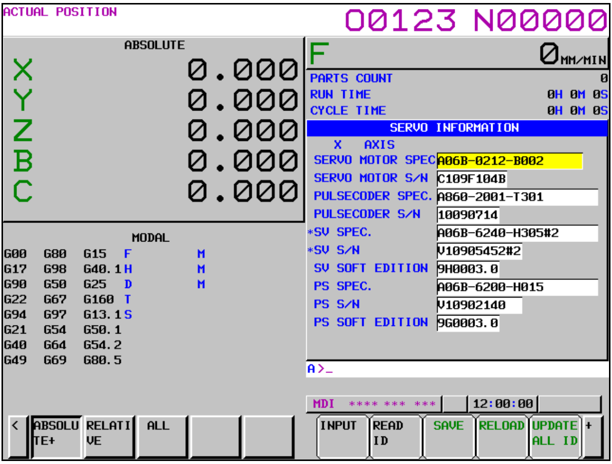


Fig.16.4 (c) Servo information screen

NOTE
For axes that are not used by the αi servo system, ID information of connected units cannot be obtained.

16.5 αi SERVO WARNING INTERFACE

Overview

The αi servo system can report the warning status before one of the following target alarms occurs.
When the warning status is entered, a report to the PMC is issued.
For example, this signal can be used by the machine for retracting tools from the time a warning occurs by the time a servo alarm occurs.

Signal

Servo warning detail signals SVWRN1 to 4 <F093.4 to 7>

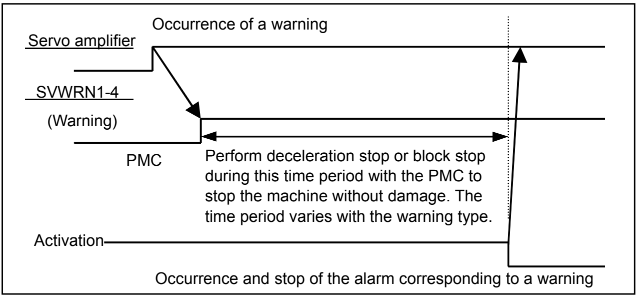
[Classification] Output signal

[Function] Reports the warning signal corresponding to the state of the servo amplifier.

[Output condition] The following table shows the warning statuses of the servo amplifier and their corresponding warning signals.

Corresponding alarm messages	Warning status signals				Time from when a warning state signal is issued to until an alarm occurs
	SVWRN4 (#7)	SVWRN3 (#6)	SVWRN2 (#5)	SVWRN1 (#4)	
SV0444 SV INTERNAL FAN FAILURE	1	0	0	0	One minute
SV0601 SV EXTERNAL FAN FAILURE	1	0	0	1	Until overheat occurs (inconstant)
SV0040 PS EXTERNAL INPUT COMPONENT ERROR	1	0	1	1	One minute
SV0443 PS INTERNAL FAN FAILURE	1	1	0	0	One minute
SV0606 PS EXTERNAL FAN FAILURE	1	1	0	1	Until overheat occurs (inconstant)
SV0431 PS OVERLOAD	1	1	1	0	One minute
SV0607 PS IMPROPER INPUT POWER	1	1	1	1	

A timing chart for handling a warning is shown below.

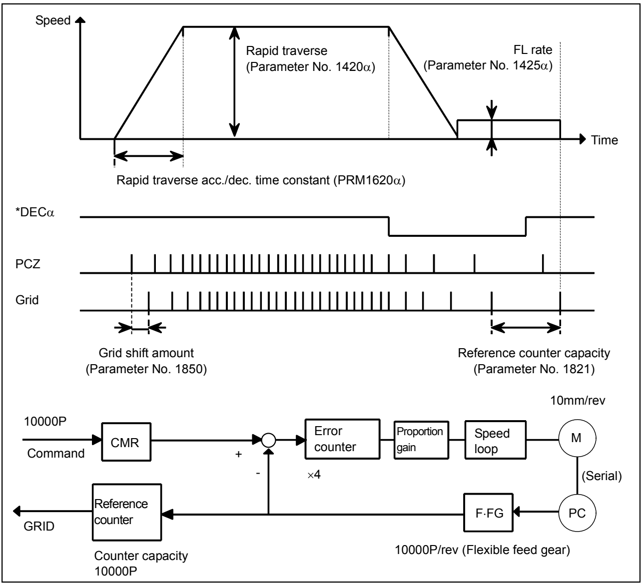


Signal address

	#7	#6	#5	#4	#3	#2	#1	#0
F093	SVWRN4	SVWRN3	SVWRN2	SVWRN1				

16.6 ADJUSTING REFERENCE POSITION (DOG METHOD)

Overview



Parameter

There are the following related parameters.

	#7	#6	#5	#4	#3	#2	#1	#0
1005							DLZx	

DLZx

0 : The normal method (dog) is used for reference position return.

1 : Reference position setting without dogs is used (for each axis).

NOTE

A reference position can be set axis by axis by setting parameter DLZx. Reference position setting without dogs cannot be used for a spindle positioning axis and Cs contour axis. When these axes are involved, use parameter DLZx.

1821	Reference counter capacity [P]

Number of feedback pulses or its division by an integer is set.

1850	Grid shift amount per axis [P]

(*) When the resolution is 0.0001mm, set the value in the unit ten times the detection unit.

	#7	#6	#5	#4	#3	#2	#1	#0
1815			APC	APZ			OPT	

APC

0 : Position detector is other than absolute Pulsecoder.

1 : Position detector is absolute Pulsecoder.

APZ Zero position of absolute Pulsecoder is :

0 : Not established

1 : Established

(Turns to 1 after establishment)

To manually change the value of the APZ bit from 0 to 1 without first returning to the reference position when using $\alpha i/\beta i$ Pulsecoder, follow this procedure: Back up the data with the battery and give the motor one or more turns. Turn the power off then on again, then change the APZ bit setting from 0 to 1.

OPT

0 : Position detection is performed by the Pulsecoder built in the motor.

1 : Separate Pulsecoder or linear scale is used.

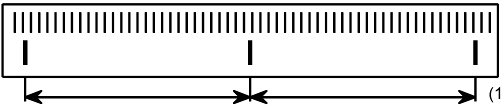
- Separate Pulsecoder or linear scale is used

1821	Reference counter capacity for each axis	[P]

Normally, the number of feedback pulses per motor revolution is set to the reference counter capacity.

(*) When plural reference marks are on a linear scale, a quotient of the distance between the reference marks divided by an integer may be used as a reference counter capacity:

(Example)



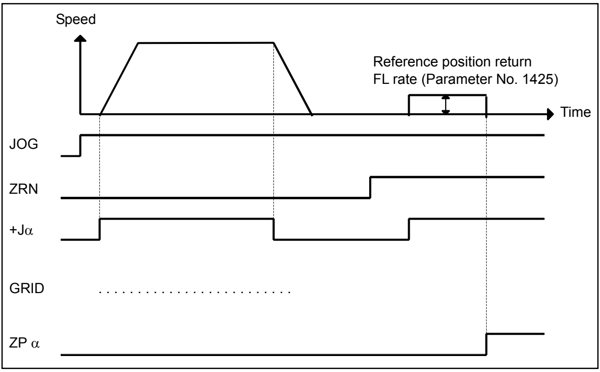
(1μm)

300mm ⇒ reference counter 30000
20000
15000
10000 etc.

16.7 REFERENCE POSITION SETTING WITHOUT DOGS

When there are no dog nor limit switch for reference position return, this function enables the tool to return the reference position that is set by MTB. When the absolute position detector is used, the reference position once set remains also during power off. When the absolute detector is replaced or absolute position is lost, perform this setting.

Overview



Operation

<1> Move the tool along an axis for setting the reference position in the reference position return direction in jog feed and position the tool near the reference position.

<2> Select the manual reference position return mode and set the feed axis and direction select signal (+ or – direction) for the axis for setting the reference position to 1.

<3> The tool is positioned at the nearest grid (electric grid based on the one-rotation signal of the position detector) in the reference position return direction specified in bit 5 (ZMIx) of parameter No.1006 from the current position. This position is set as the reference position.

<4> After the in-position status is confirmed, the reference position return completion signal (ZP1) and reference position establishment signal (ZRF1) are set to 1.

(*) After the reference position has been set, select the reference position return mode (ZRN signal is 1) and turn on an axis-and-direction- select signal, then the tool returns to the reference position.

Parameter

Related parameters include the following:

	#7	#6	#5	#4	#3	#2	#1	#0
1005							DLZx	

DLZx

0 : The normal method (dog) is used for reference position return.

1 : Reference position setting without dogs is used (axis by axis).

NOTE

A reference position can be set axis by axis by setting bit 1 (DLZx) of parameter No.1005. Reference position setting without dogs cannot be used for a spindle positioning axis and Cs contour axis. When these axes are involved, use parameter DLZx.

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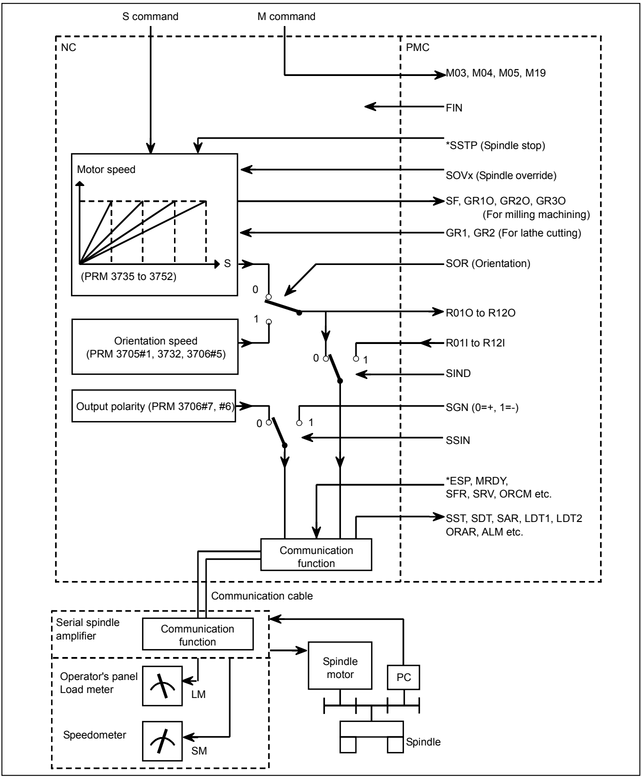
	#7	#6	#5	#4	#3	#2	#1	#0
1006			ZMIx					

ZMIx
0 : Reference position return and backlash initial direction is +.
1 : Reference position return and backlash initial direction is -.
(*) After ZRN signal becomes 1, manual feed direction is always the direction set by this parameter irrespective of an axis selection signal.

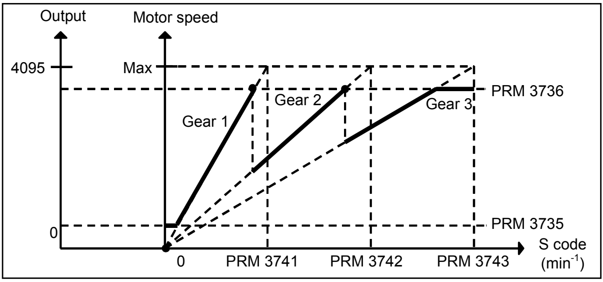
This chapter outlines the serial interface spindle amplifiers and explains related parameters.

17.1 SERIAL INTERFACE AC SPINDLE

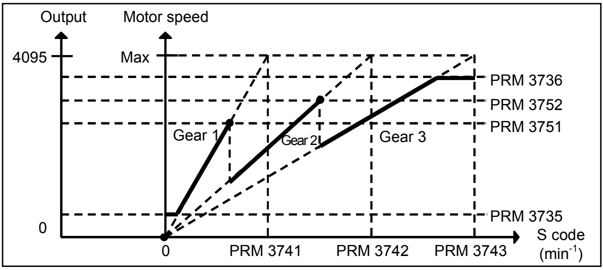
17.1.1 Overview of Spindle Control



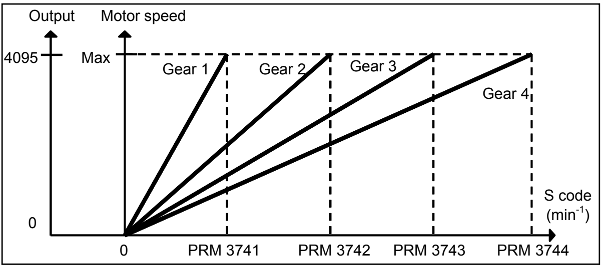
17.1.1.1 Method A of gear change for M series (bit 2 (SGB) of parameter No. 3705 is 0)



17.1.1.2 Method B of gear change for M series (bit 2 (SGB) of parameter No. 3705 is 1)



17.1.1.3 T series



17.1.2 Automatic Setting of Standard Parameters

The standard parameters related to each motor model can be set automatically.

* The specifications for controlling a motor depend on the specifications defined by the machine tool builder. The parameters defined by the machine tool builder are set as the standard values (initial values) by this automatic setting function. Therefore, when performing automatic operation, always set parameters properly according to the parameter list (parameters 4000 and later).

1 Turn on the power in the emergency stop state.
2 Set bit 7 (LDSP) of parameter No. 4019 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
4019	LDSP							

LDSP The parameters for the serial interface spindle are:
0 : Not set automatically.
1 : Set automatically.

3 Set a motor model code.

4133	Motor model code

Code	Motor model	Amplifier
301	αiI0.5/10000 (3000/10000min^{-1})	αiSP2.2-B
302	αiI1/10000 (3000/10000min^{-1})	αiSP2.2-B
303	αiI1/15000 (3000/150000min^{-1})	αiSP5.5-B
304	αiI1.5/10000 (1500/10000min^{-1})	αiSP5.5-B
305	αiI1.5/15000 (3000/150000min^{-1})	αiSP15-B
306	αiI2/10000 (1500/10000min^{-1})	αiSP5.5-B
307	αiI2/15000 (3000/15000min^{-1})	αiSP22-B

Code	Motor model	Amplifier
308	α*i*I3/10000 (1500/10000min^{-1})	α*i*SP5.5-B
309	α*i*I3/12000 (1500/12000min^{-1})	α*i*SP11-B
310	α*i*I6/10000 (1500/10000min^{-1})	α*i*SP11-B
311	α*i*I0.5/10000HV (3000/10000min^{-1})	α*i*SP5.5HV-B
312	α*i*I8/8000 (1500/8000min^{-1})	α*i*SP11-B
313	α*i*I1/10000HV (3000/10000min^{-1})	α*i*SP5.5HV-B
314	α*i*I12/7000 (1500/7000min^{-1})	α*i*SP15-B
315	α*i*I1.5/10000HV (1500/10000min^{-1})	α*i*SP5.5HV-B
316	α*i*I15/7000 (1500/7000min^{-1})	α*i*SP22-B
317	α*i*I2/10000HV (1500/10000min^{-1})	α*i*SP5.5HV-B
318	α*i*I18/7000 (1500/7000min^{-1})	α*i*SP22-B
319	α*i*I3/10000HV (1500/10000min^{-1})	α*i*SP5.5HV-B
320	α*i*I22/7000 (1500/7000min^{-1})	α*i*SP26-B
321	α*i*I6/10000HV (1500/10000min^{-1})	α*i*SP11HV-B
322	α*i*I30/6000 (1150/6000min^{-1})	α*i*SP45-B
323	α*i*I40/6000 (1500/6000min^{-1})	α*i*SP45-B
324	α*i*I50/4500 (1150/4500min^{-1})	α*i*SP55-B
325	α*i*I8/8000HV (1500/8000min^{-1})	α*i*SP11HV-B
326	α*i*I12/7000HV (1500/7000min^{-1})	α*i*SP15HV-B
327	α*i*I15/7000HV (1500/7000min^{-1})	α*i*SP30HV-B
328	α*i*I22/7000HV (1500/7000min^{-1})	α*i*SP30HV-B
329	α*i*I30/6000HV (1150/6000min^{-1})	α*i*SP45HV-B
330	α*i*I40/6000HV (1500/6000min^{-1})	α*i*SP45HV-B
331	α*i*I60/5000HV (1150/6000min^{-1})	α*i*SP75HV-B
333	β*i*6/10000 (1500/10000min^{-1})	β*i*SVSP-11-B
334	β*i*I8/8000 (1500/8000min^{-1})	β*i*SVSP-11-B
335	β*i*I12/7000 (1500/7000min^{-1})	β*i*SVSP-15-B
336	β*i*I3/10000 (1500/10000min^{-1})	β*i*SVSP-7.5-B
337	β*i*I3/10000 (1500/10000min^{-1})	β*i*SVSP-11-B
338	β*i*I3/10000 (1500/10000min^{-1})	β*i*SVSP-15-B
339	β*i*I6/10000 (1500/10000min^{-1})	β*i*SVSP-15-B
340	β*i*I8/8000 (1500/8000min^{-1})	β*i*SVSP-15-B
341	β*i*I8/10000 (1500/10000min^{-1})	β*i*SVSP-11-B
342	β*i*I8/10000 (1500/10000min^{-1})	β*i*SVSP-15-B
343	β*i*I12/8000 (1500/8000min^{-1})	β*i*SVSP-15-B
347	β*i*Ip12/6000 (750/6000min^{-1})	β*i*SVSP-7.5-B
348	β*i*Ip12/6000 (750/6000min^{-1})	β*i*SVSP-11-B
349	β*i*Ip12/6000 (750/6000min^{-1})	β*i*SVSP-15-B
350	β*i*Ip15/6000 (750/6000min^{-1})	β*i*SVSP-11-B
351	β*i*Ip15/6000 (750/6000min^{-1})	β*i*SVSP-15-B
352	β*i*Ip18/6000 (750/6000min^{-1})	β*i*SVSP-15-B
353	β*i*Ip18/6000 (750/6000min^{-1})	β*i*SVSP-11-B
354	β*i*Ip15/6000 (750/6000min^{-1})	β*i*SVSP-18-B

Code	Motor model	Amplifier
355	β*i*Ip18/6000 (750/6000min^{-1})	β*i*SVSP-18-B
356	β*i*Ip22/6000 (750/6000min^{-1})	β*i*SVSP-15-B
357	β*i*Ip22/6000 (750/6000min^{-1})	β*i*SVSP-18-B
358	β*i*Ip30/6000 (750/6000min^{-1})	β*i*SVSP-18-B
359	β*i*I6/10000 (1500/10000min^{-1})	β*i*SVSP-18-B
360	β*i*I8/10000 (1500/10000min^{-1})	β*i*SVSP-18-B
361	β*i*I12/8000 (1500/8000min^{-1})	β*i*SVSP-18-B
362	β*i*I15/7000 (1500/7000min^{-1})	β*i*SVSP-18-B
363	α*i*I6/10000(PowerUp) (1500/10000min^{-1})	α*i*SP11-B β*i*SVSP-11-B
364	α*i*I8/8000(PowerUp) (1500/8000min^{-1})	α*i*SP15-B β*i*SVSP-15-B
365	α*i*I12/7000(PowerUp) (1500/7000min^{-1})	α*i*SP15-B
366	α*i*I15/7000(PowerUp) (1500/7000min^{-1})	α*i*SP22-B
367	α*i*I18/7000(PowerUp) (1500/7000min^{-1})	α*i*SP22-B
368	α*i*I22/7000(PowerUp) (1500/7000min^{-1})	α*i*SP26-B
369	α*i*I12/7000(PowerUp) (1500/7000min^{-1})	α*i*SP22-B β*i*SVSP-18-B
370	β*i*Ip12/6000 (750/6000min^{-1})	β*i*SVSP-18-B
371	β*i*I3/10000 (1500/10000min^{-1})	β*i*SVSP-18-B
372	α*i*I0.5/15000(PowerUp) (3000/15000min^{-1})	α*i*SP2.2-B
373	α*i*I2/10000(PowerUp) (1500/10000min^{-1})	α*i*SP11-B
374	α*i*I30/7000 (PowerUp) (1150/7000min^{-1})	α*i*SP37-B
375	α*i*I40/7000 (PowerUp) (1150/7000min^{-1})	α*i*SP45-B
376	α*i*I50/5000HV (1150/5000min^{-1})	α*i*SP45HV-B
377	α*i*I75/5000HV (1050/5000min^{-1})	α*i*SP75HV-B
401	α*i*I6/12000 (1500/12000,4000/12000min^{-1})	α*i*SP11-B
402	α*i*I8/10000 (1500/10000,4000/10000min^{-1})	α*i*SP11-B
403	α*i*I12/10000 (1500/10000,4000/10000min^{-1})	α*i*SP15-B
404	α*i*I15/10000 (1500/10000,4000/10000min^{-1})	α*i*SP22-B
405	α*i*I18/10000 (1500/10000,4000/10000min^{-1})	α*i*SP22-B
406	α*i*I22/10000 (1500/10000,4000/10000min^{-1})	α*i*SP26-B
407	α*i*I$_P$12/6000 (500/1500,750/6000min^{-1})	α*i*SP11-B
408	α*i*I$_P$15/6000 (500/1500,750/6000min^{-1})	α*i*SP15-B
409	α*i*I$_P$18/6000 (500/1500,750/6000min^{-1})	α*i*SP15-B
410	α*i*I$_P$22/6000 (500/1500,750/6000min^{-1})	α*i*SP22-B
411	α*i*I$_P$30/6000 (400/1500,575/6000min^{-1})	α*i*SP22-B
412	α*i*I$_P$40/6000 (400/1500,575/6000min^{-1})	α*i*SP26-B
413	α*i*I$_P$50/6000 (575/1500,1200/6000min^{-1})	α*i*SP26-B
414	α*i*I$_P$60/4500 (400/1500,750/4500min^{-1})	α*i*SP30-B
415	α*i*I100/4000HV (1000/3000,2000/4000min^{-1})	α*i*SP75HV-B
418	α*i*I$_P$40/6000HV (400/1500,575/6000min^{-1})	α*i*SP30HV-B
419	α*i*Ip50/6000HV (575/1500,1200/6000min^{-1})	α*i*SP30HV-B
420	α*i*Ip60/5000HV (400/1500,750/6000min^{-1})	α*i*SP30HV-B

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Code	Motor model	Amplifier
421	α*i*I6/12000(PowerUp) (1500/12000,4000/12000min^{-1})	α*i*SP11-B
422	α*i*I8/10000(PowerUp) (1500/10000,4000/10000min^{-1})	α*i*SP15-B
423	α*i*I8/12000(PowerUp) (1500/12000,4000/12000min^{-1})	α*i*SP15-B
424	α*i*I12/12000(PowerUp) (1500/12000,4000/12000min^{-1})	α*i*SP15-B
425	α*i*I15/12000(PowerUp) (1500/12000,4000/12000min^{-1})	α*i*SP22-B
426	α*i*I18/12000(PowerUp) (1500/12000,4000/12000min^{-1})	α*i*SP22-B
427	α*i*I22/12000(PowerUp) (1500/1200,4000/12000min^{-1})	α*i*SP26-B
428	α*i*I100/5000HV (1000/5000,3000/5000min^{-1})	α*i*SP100HV-B
429	α*i*Ip18/6000(PowerUp) (500/1500,750/6000min^{-1})	α*i*SP15-B
430	α*i*Ip22/6000(PowerUp) (500/1500,750/6000min^{-1})	α*i*SP22-B
431	α*i*Ip50/6000(PowerUp) (575/1500,1200/6000min^{-1})	α*i*SP26-B

4. Turn off the power then back on. Then, the parameters are read.

17.1.3 Spindle Setting and Tuning Screen

17.1.3.1 Display method

1 Confirm the parameters

	#7	#6	#5	#4	#3	#2	#1	#0
3111							SPS	

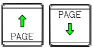
SPS
 0 : The spindle tuning screen is not displayed.
 1 : The spindle tuning screen is displayed.

2 Press the  key to select the screen for setting parameters and other data.

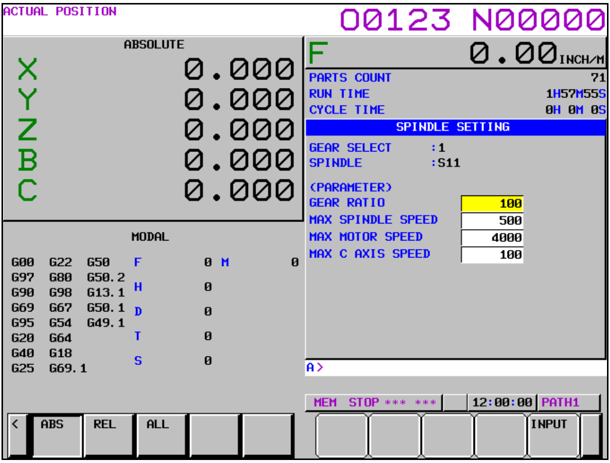
3 Press the continuous menu key .

4 Press the soft key [SP.PRM]. Then, the spindle setting and tuning screen appears.

5 The following screens are provided. These screens can be selected using soft keys.
<1> [SP.SET] : Spindle setting screen
<2> [SP.TUN] : Spindle tuning screen
<3> [SP.MON] : Spindle monitor screen

6 With the page keys , a spindle to be displayed can be selected (only when multiple serial spindles are connected).

17.1.3.2 Spindle setting screen



Gear selection

The gear select status on the machine side is displayed.

Indication	CTH1	CTH2
1	0	0
2	0	1
3	1	0
4	1	1

Spindle

Select a spindle for which data is to be set.

S11 : Main spindle amplifier for the 1st spindle
S12 : Subspindle amplifier for the 1st spindle
S21 : Main spindle amplifier for the 2nd spindle
S22 : Subspindle amplifier for the 2nd spindle

Parameter

<table>
<tr><th></th><th>S11:
1st Main</th><th>S12:
1st Sub</th><th>S21:
2nd Main</th><th>S22:
2nd Sub</th></tr>
<tr><td>Gear ratio (HIGH)</td><td>4056</td><td rowspan="2">4216</td><td>4056</td><td rowspan="2">4216</td></tr>
<tr><td>Gear ratio (MIDIUM HIGH)</td><td>4057</td><td>4057</td></tr>
<tr><td>Gear ratio (MIDIUM LOW)</td><td>4058</td><td rowspan="2">4217</td><td>4058</td><td rowspan="2">4217</td></tr>
<tr><td>Gear ratio (LOW)</td><td>4059</td><td>4059</td></tr>
<tr><td>Max. spindle speed (gear1)</td><td colspan="2">3741</td><td colspan="2">3741</td></tr>
<tr><td>Max. spindle speed (gear2)</td><td colspan="2">3742</td><td colspan="2">3742</td></tr>
<tr><td>Max. spindle speed (gear3)</td><td colspan="2">3743</td><td colspan="2">3743</td></tr>
<tr><td>Max. spindle speed (gear4)</td><td colspan="2">3744</td><td colspan="2">3744</td></tr>
<tr><td>Max. motor speed</td><td>4020</td><td>4196</td><td>4020</td><td>4196</td></tr>
<tr><td>Max. C axis speed</td><td>4021</td><td>None</td><td>4021</td><td>None</td></tr>
</table>

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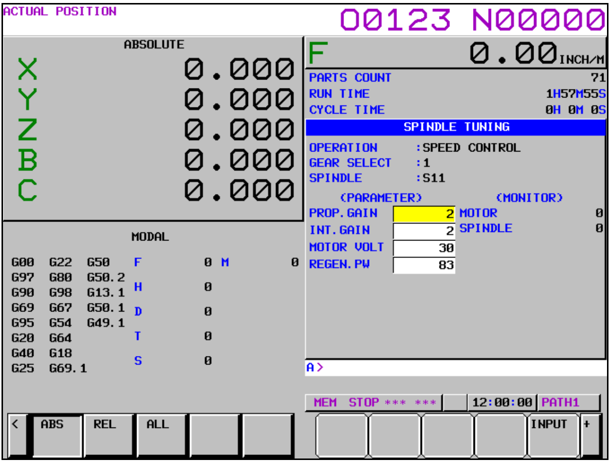
17.1.3.3 Spindle tuning screen



Operation mode

<1> Normal operation
<2> Orientation
<3> Synchronous control
<4> Rigid tapping
<5> Cs contour control
<6> Spindle positioning control

Displayed parameters

The displayed parameters vary depending on the operation mode.

Spindle positioning control	Proportional gain Integral gain Loop gain Motor voltage ZRN gain (%) Shift reference position
Normal operation	Proportional gain Integral gain Motor voltage Regenerative power
Orientation	Proportional gain Integral gain Loop gain Motor voltage ORAR gain (%) Shift spindle stop position Shift reference position
Synchronous control	Proportional gain Integral gain Loop gain Motor voltage Acc./dec.constant (%) Shift reference position
Rigid tapping	Proportional gain Integral gain Loop gain Motor voltage ZRN gain Shift reference position

Cs contour control	Proportional gain Integral gain Loop gain Motor voltage ZRN gain (%) Shift reference position

(*1) For the parameter numbers corresponding to the displayed parameter items, see Subsection 17.1.3.5.

Displayed monitoring items

The displayed monitoring items vary depending on the operation mode.

Spindle positioning control	Motor speed Feedrate Position deviation S
Normal operation	Motor speed Spindle speed
Orientation	Motor speed Spindle speed Position deviation S
Synchronous control	Motor speed Spindle speed Position deviation S1 Position deviation S2 Synchronous deviation
Rigid tapping	Motor speed Spindle speed Position deviation S Position deviation Z Synchronous deviation
Cs contour control	Motor speed Spindle speed Position deviation S

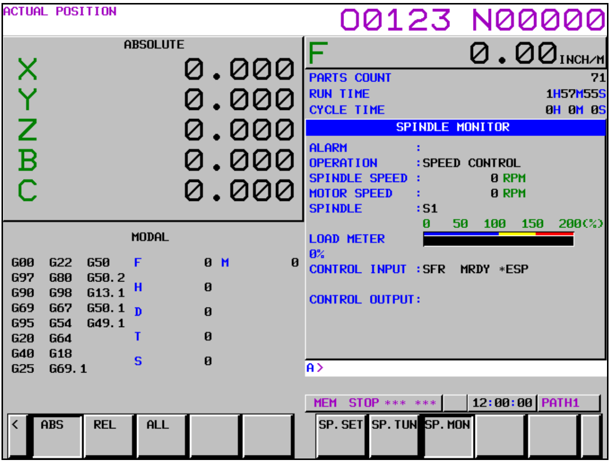
(*1)

$$\text{Motor speed } [\text{min}^{-1}] = \frac{|\text{Spindle data}|}{16383} \times \text{Max. motor speed } (*)$$

(*) Parameter No. 4020: Main spindle,
Parameter No. 4196: Sub spindle

(*2) The spindle speed in Cs contour control mode is in degrees/min.

17.1.3.4 Spindle monitor screen



Spindle alarm

9001 : Motor overheat
9002 : Excessive speed deviation
9003 : DC link fuse blown
9004 : PS input power failure
9006 : Temperature sensor disconnection
9007 : Excessive speed
9009 : Main circuit overload
9011 : PS DC link overvoltage
9012 : DC link overcurrent
9013 : CPU internal data memory error
9014 ; Invalid software series
9015 : Output switch/spindle switch alarm
9016 : RAM error
9017 : ID number parity error
9018 : Sum check error
9019 : Excessive U phase current detection offset
9020 : Excessive V phase current detection offset
9021 : Position sensor polarity setting error
9022 : SP overload current
9024 : Serial transfer data error
9027 : Position coder signal disconnection
9029 : Short-time overload
9030 : PS input overcurrent
9031 : Speed detection disconnection
9032 : Serial LSI RAM error
9033 : PS spare charge error
9034 : Parameter range error
9035 : Gear ratio parameter setting error
9036 : Error counter overflow
9037 : Speed detector parameter error
9041 : PC one-rotation signal detection error
9042 : PC one-rotation signal undetected
9043 : Signal of the differential speed position coder disconnected
9046 : PC one-rotation signal detection error in threading
9047 : Position coder signal error
9049 : Excessive cumulative differential velocity
9050 : Excessive spindle control speed
9051 : PS DC link section voltage low
9052 : ITP signal error I
9053 : ITP signal error II
9054 : Overload current
9055 : Power line error at switching
9056 : Internal cooling fan stopped
9057 : Excessive PS regenerated power 2
9058 : PS main circuit overload
9059 : PS internal cooling fan stopped
9061 : Excessive semi-closed loop/closed loop error in dual position FB
9065 : Travel distance error in pole determination
9066 : Inter-spindle amplifier communication error
9067 : FSC/EGB command error
9068 : Illegal spindle parameter
9069 : Safety speed exceeded
9070 : Axis data error
9071 : Safety parameter error
9072 : Motor speed found mismatching
9073 : Motor sensor disconnection
9074 : CPU test alarm
9075 : CRC test alarm
9076 : Safety function unexecuted
9077 : Axis number found mismatching
9078 : Safety parameter found mismatching
9079 : Initial test operation error
9080 : Communication destination spindle amplifier error
9081 : Motor sensor one-rotation signal detection error

9082 : Motor sensor one-rotation signal undetected
9083 : Motor sensor signal error
9084 : Spindle sensor disconnection
9085 : Spindle sensor one-rotation signal detection error
9086 : Spindle sensor one-rotation signal undetected
9087 : Spindle sensor signal error
9088 : Radiator cooling fan stopped
9089 : Sub module SM (SSM) error
9090 : Abnormal rotation alarm
9091 : Pole position count error
9092 : Overspeed (velocity command reference)
9110 : Error in communication between amplifiers
9111 : PS control power supply undervoltage
9112 : Excessive PS regenerative power 1
9113 : PS cooler radiation fan stopped
9114 : PS control axis error 1
9115 : PS control axis error 2
9120 : Communication data alarm
9121 : Communication data alarm
9122 : Communication data alarm
9123 : Spindle switching circuit error
9124 : Invalid speed command in learning control
9125 : Invalid dynamic characteristic compensation degree in learning control
9127 : Invalid leaning cycle
9128 : Excessive speed deviation in spindle synchronous control
9129 : Excessive positional deviation in spindle synchronous control
9130 : Master-slave polarity error in torque tandem mode
9131 : Spindle tuning function alarm
9132 : Serial sensor data error
9133 : Serial sensor data transfer error
9134 : Serial sensor soft phase
9135 : Safety speed zero alarm
9136 : Safety speed zero found mismatching
9137 : SP device communication error
9138 : Current limit setting error
9139 : Serial sensor pulse error
9140 : Serial sensor count error
9141 : Serial sensor one-rotation signal undetected
9142 : Serial sensor error
9143 : High-speed Cs axis switching function command error
9144 : Current detection circuit error
9145 : Driver power low
9146 : SP: Internal overheat
9148 : Axis number not set
9149 : Ext.current FB U-offset
9150 : Ext.current FB V-offset
9151 : Filter module error
9152 : Ext.Cur. FB disconnect
9153 : SP no failure
9154 : Phase open
9155 : Failure of SP (Open)
9156 : Failure of current ctrl.
9157 : Failure of SP (Short)
9159 : Mismatched function code
9160 : Thermistor disconnection
9161 : Pow.cable short circuit
9204 : PS soft thermal
9211 : PS illegal parameter
9212 : PS hardware error
9213 : PS external input component error
9214 : PS PFB-R error
9215 : PS PFB-C error
9216 : PS SUB MODULE error

Operation

Following 6 modes are available:

a. Normal operation
b. Orientation
c. Synchronous operation
d. Rigid tapping
e. Cs contour control
f. Spindle positioning control

Load meter

The load meter displays spindle load in a unit of 10%.

$$\text{Load meter [\%]} = \frac{\text{Load meter data}}{32767} \times \text{Max. output value of load meter (*)}$$

(*) Parameter No. 4127: High-speed main winding
Parameter No. 4274: High-speed sub-winding
Parameter No. 4093: Low-speed main winding
Parameter No. 4279: Low-speed sub-winding

Control input signal

Max.10 signals those are ON are displayed from the following signals:

TLML	: Torque limit command (low)	SPSL	: Spindle selection signal
TLMH	: Torque limit command (high)	MCFN	: Power line switching
CTH1	: Gear signal 1	SOCN	: Soft start/stop signal
CTH2	: Gear signal 2	RSL	: Output switching request
SRV	: Spindle reverse rotation	RCH	: Power line state confirm
SFR	: Spindle forward rotation	INDX	: Orientation stop pos. change
ORCM	: Spindle orientation	ROTA	: Rotation direction of ORCM
MRDY	: Machine ready	NRRO	: Short-cut of ORCM
ARST	: Alarm reset signal	INTG	: Speed integral control signal
ESP	: Emergency stop	DEFM	: Referential mode command

Control output signals

Max. 10 signals those are ON are displayed from the following signals:

ALM	: Alarm signal	TLM5	: Torque limitation
SST	: Speed zero signal	ORAR	: Orientation end signal
SDT	: Speed detecting signal	CHP	: Power line switched signal
SAR	: Speed arrival signal	CFIN	: Spindle switch complete
LDT1	: Load detecting signal 1	RCHP	: Output switch signal
LDT2	: Load detecting signal 2	RCFN	: Output switch complete signal

17.1.3.5 Correspondence between operation mode and parameters on spindle tuning screen

Normal operation mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4040	4206	4040	4206
Proportional gain (LOW)	4041	4207	4041	4207
Integral gain (HIGH)	4048	4212	4048	4212
Integral gain (LOW)	4049		4049	
Motor voltage	4083	4236	4083	4236
Regenerative power	4080	4231	4080	4231

Orientation mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4042	4208	4042	4208
Proportional gain (LOW)	4043	4209	4043	4209
Integral gain (HIGH)	4050	4213	4050	4213
Integral gain (LOW)	4051		4051	

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Loop gain (HIGH)	4060	4218	4060	4218
Loop gain (MID.HIGH)	4061		4061	
Loop gain (MID.LOW)	4062	4219	4062	4219
Loop gain (LOW)	4063		4063	
Motor voltage	4084	4237	4084	4237
Gain change upon completion of orientation	4064	4220	4064	4220
Stop position shift	4077	4228	4077	4228
PC-type orientation stop position	4031	4204	4031	4204

Synchronous control mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4044	4210	4044	4210
Proportional gain (LOW)	4045	4211	4045	4211
Integral gain (HIGH)	4052	4214	4052	4214
Integral gain (LOW)	4053		4053	
Loop gain (HIGH)	4065	4221	4065	4221
Loop gain (MID.HIGH)	4066		4066	
Loop gain (MID.LOW)	4067	4222	4067	4222
Loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
Acc./Dec. time constant	4032		4032	
Shift amount	4034		4034	

Rigid tapping mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4044	4210	4044	4210
Proportional gain (LOW)	4045	4211	4045	4211
Integral gain (HIGH)	4052	4214	4052	4214
Integral gain (LOW)	4053		4053	
Loop gain (HIGH)	4065	4221	4065	4221
Loop gain (MID.HIGH)	4066		4066	
Loop gain (MID.LOW)	4067	4222	4067	4222
Loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
ZRN gain %	4091	4239	4091	4239
Grid shift amount at servo mode	4073	4223	4073	4223

Cs contour control mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4046	-	4046	-
Proportional gain (LOW)	4047	-	4047	-
Integral gain (HIGH)	4054	-	4054	-
Integral gain (LOW)	4055		4055	
Loop gain (HIGH)	4069	-	4069	-
Loop gain (MID.HIGH)	4070		4070	
Loop gain (MID. LOW)	4071	-	4071	-
Loop gain (LOW)	4072		4072	
Motor voltage	4086	-	4086	-
ZRN gain %	4092	-	4092	-
Reference position shift	4135	-	4135	-

Spindle positioning control mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4044	4210	4044	4210
Proportional gain (LOW)	4045	4211	4045	4211
Integral gain (HIGH)	4052	4214	4052	4214
Integral gain (LOW)	4053		4053	
Loop gain (HIGH)	4065	4221	4065	4221
Loop gain (MID.HIGH)	4066		4066	
Loop gain (MID.LOW)	4067	4222	4067	4222
Loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
ZRN gain %	4091	4239	4091	4239
Reference position shift	4073	4223	4073	4223

17.1.4 Warning Interface

Overview

The warning state can be reported before an alarm is issued. When the warning state is entered, a report to the PMC is sent.
For example, this signal can be used for retracting tools or reducing cutting load from the time a warning occurs by the time an overheat alarm occurs. In addition, diagnosis data also contains warning numbers.

Signal

- **Spindle warning detailed signals**
  SPWRN1 to SPWRN9 <F264#0 to #7, F265#0>

[Classification] Output

[Function] Reports the warning number corresponding to the state of the spindle amplifier.

[Output condition] When the spindle is in the warning state, a warning number consisting of SPWRN1 to SPWRN9 is output as nine-bit binary data.
If warnings occurred on multiple αi spindle amplifiers, the warning number of the ai spindle having the smallest axis number is output.

The warning numbers and their descriptions are shown below.

Warning number	Contents	Details
01	Motor overheat	If the motor temperature exceeds the overheat warning detection level (set by the relevant parameter), the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. If the motor temperature reaches the overheat alarm detection level, an alarm is issued.
04	PS input power failure	If a main power failure is detected, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed.
56	Internal fan stopped	If the internal fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute after the warning signal is output, an alarm occurs.

Warning number	Contents	Details
58	PS main circuit overloaded	If the main circuit of the Common Power Supply (PS) is overloaded, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. An alarm is issued about 1 minute after the warning signal is output.
59	PS internal cooling fan stopped	If the Common Power Supply (PS) cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute after the warning signal is output, an alarm occurs.
88	Radiator cooling fan stopped	If the radiator cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. If the main circuit overheats, an alarm occurs.
113	PS radiator cooling fan stopped	If the Common Power Supply (PS) radiator cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. If the Common Power Supply (PS) main circuit overheats, an alarm occurs.
213	PS external input component error	If the external component such as input filter or transducer is troubled, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. An alarm is issued about 1 minute after the warning signal is output.

Signal address

	#7	#6	#5	#4	#3	#2	#1	#0
F264	SPWRN8	SPWRN7	SPWRN6	SPWRN5	SPWRN4	SPWRN3	SPWRN2	SPWRN1

	#7	#6	#5	#4	#3	#2	#1	#0
F265								SPWRN9

Diagnosis data

The status of a warning is displayed on the following diagnosis data.

712	Warning status of spindle

[Data type] Word spindle

The number of a warning caused on each spindle is indicated.

If there is no warning, 0 is indicated.

17.1.5 Spindle Information Screen

Overview

In the αi spindle system, ID information output from each of the connected units is obtained and output to the CNC screen.
The units that have ID information are shown below.
(Note: Some instances of these units do not have ID information.)

- Spindle amplifier (SP)
- Power supply (PS)

ID information is automatically read from each of the connected units during first startup of the CNC and then recorded. During second or later startup, the ID information recorded during first startup can be compared with the ID information read this time on the screen to check whether the configuration of the connected units is changed. (If there is a difference between them, the alarm mark (*) appears.)
The recorded ID information can be edited. Therefore, the ID information of an unit that does not have ID information can be displayed. (However, the alarm mark (*) indicating a difference between these IDs appears.)

Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
13112						SPI		IDW

[Data type] Bit

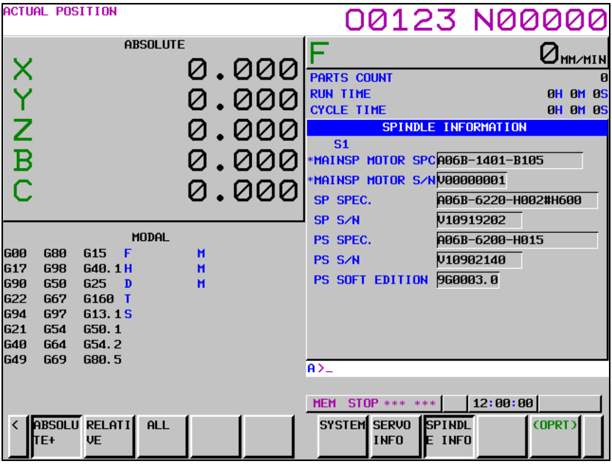
IDW The edit of the servo information screen or the spindle information screen is:
0 : Prohibited
1 : Allowed

SPI The spindle information screen is:
0 : Displayed
1 : Not displayed

Displaying the spindle information screen

1 Press the function key [SYSTEM], then press the [SYSTEM] soft key.

2 Press the soft key [SPINDLE INFO] to display the screen as shown below.

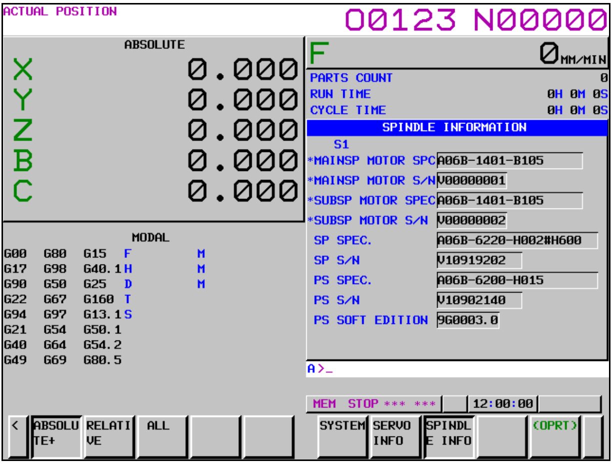


(*1) Spindle information is stored in Flash ROM. If there is a difference between the ID information in screen and the actual ID information, the corresponding items are preceded by *.

(*2) The specification and serial number of spindle motor are not automatically read.to be input (The method is described later). For easy maintenace, FANUC recommend to input the information of each motor (The method is described later).

Spindle switch control

When spindle switch control is used, the ID information of the subspindle is also displayed.



Additional Information

Even if replacement is performed reasonably such as for repairing, this function incorrectly indicates the * mark when it detects the replacement. To clear the * mark, follow the steps below to update the registered data, as described in the editing section later.

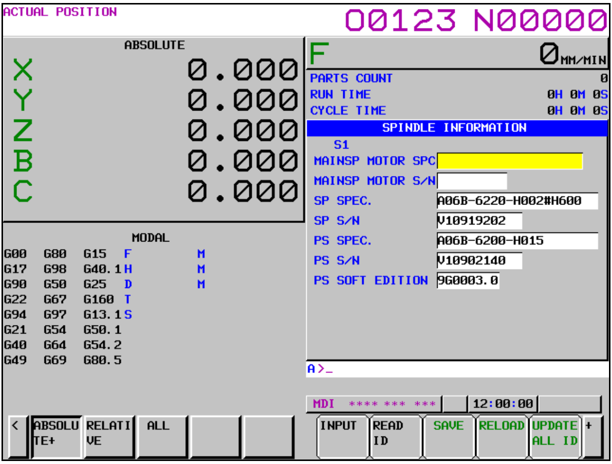
(1) Make the registered data editable. (Bit 0 (IDW) of parameter No. 13112 = 1)

(2) On the edit screen, place the cursor on the item from which you want to delete the * mark.

(3) Operate the soft keys [READ ID], [INPUT], and [SAVE] in that order. To updata all items and clear * marks at a time, press soft key [UPDATEALL ID] (displayed when bit 1 (IDC) of parameter No. 11320 is set to 1).

Editing the spindle information screen

1 Set bit 0 (IDW) of parameter No.13112 to 1.
2 Press the MDI switch on the machine operator's panel.
3 Follow the steps shown in "Displaying the spindle information screen" to display the screen as shown below.

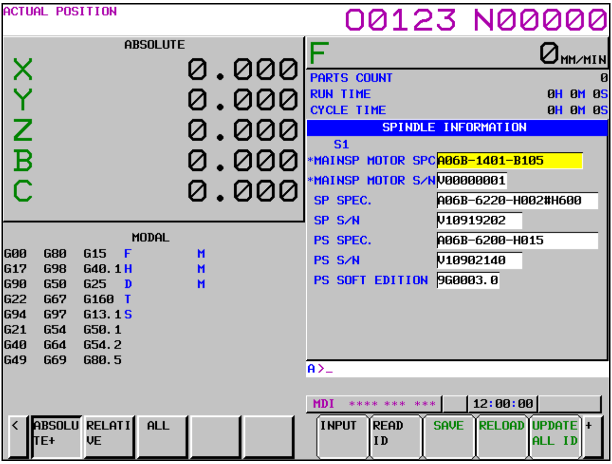


4 To move key-in buffer on the screen, use the  and  keys.

Screen operation on the editing screen

Mode	Key operation	Use
Viewing (*1)	Page keys	Scrolls up or down on a screen-by-screen basis.
Editing (*2)	Soft keys	
	[INPUT]	Replace the selected ID information at the cursor position with the character string in key-in buffer.
	[READ ID]	Transfers the ID information the connected device at the cursor has to the key-in buffer. Only the items proceeded by * (*3) are valid.
	[SAVE]	Saves the ID information that has been changed on the spindle information screen in Flash ROM.
	[RELOAD]	Cancels the ID information that has been changed on the spindle information screen and loads ID information from Flash ROM.
	UPDATEALL ID] (*4)	Updates the ID information for all axes that is output from each of the connected units displayed on the servo or spindle information screen at a time.
	Page keys	Scrolls up or down on a screen-by-screen basis.
	Cursor keys	Scrolls up or down the selection of ID information.

(*1) Viewing mode: when bit 0 (IDW) of parameter No.13112 is 0
(*2) Editing mode: when bit 0 (IDW) of parameter No.13112 is 1
(*3) Spindle information is stored in Flash ROM. If there is a difference between the ID information in screen and the actual ID information, the corresponding items are preceded by *.
(*4) When bit 1 (IDC) of parameter No. 11320 is 1


ACTUAL POSITION
O0123 N00000
ABSOLUTE
X 0.000
Y 0.000
Z 0.000
B 0.000
C 0.000
F 0 MM/MIN
PARTS COUNT 0
RUN TIME 0H 0M 0S
CYCLE TIME 0H 0M 0S
SPINDLE INFORMATION
S1
*MAINSP MOTOR SPC A06B-1401-B105
*MAINSP MOTOR S/N V00000001
SP SPEC. A06B-6220-H002#H600
SP S/N V10919202
PS SPEC. A06B-6200-H015
PS S/N V10902140
PS SOFT EDITION 9G0003.0
MODAL
G00 G80 G15 F M
G17 G98 G40.1 H M
G90 G50 G25 D M
G22 G67 G160 T
G94 G97 G13.1 S
G21 G54 G50.1
G40 G64 G54.2
G49 G69 G80.5
A>_
MDI **** *** *** 12:00:00
ABSOLUTE+
RELATIVE
ALL
INPUT
READ ID
SAVE
RELOAD
UPDATE ALL ID

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18.1 SCREEN DISPLAY AT POWER ON

18.1.1 Display until the CNC Starts

```
(1) RAM TEST :END
(2) ROM TEST :END [60W6A]
(3) DRAM ID  :xxxxxxxx
(4) SRAM ID  :xxxxxxxx
(5) FROM ID  :xxxxxxxx

    *** MESSAGE ***
(7) LOADING CNC DATA-1      xxxxxx/xxxxxx
    END
```

```
(2) RAM TEST :END
    ROM TEST :ERROR
```

Processing is stopped in the event of an error

```
(6) *** MESSAGE ***
    ROM PARITY ERROR:NC BASIC. HIT SELECT.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

SELECT key → SYSTEM MONITOR

Details of display items

(1) WORK RAM test results are displayed. In the event of an error, however, the sequence is not displayable, and LED indication is conducted without error display.
(2) BOOT ROM parity test results are displayed. During normal operation, the series and edition are displayed. In the event of an error, processing is stopped.
(3) The ID of the DRAM MODULE installed in the CNC is displayed.
(4) The ID of the SRAM MODULE installed in the CNC is displayed.
(5) The ID of the FROM MODULE installed in the CNC is displayed.
(6) The CNC BASIC software in flash memory is checked for validity and, in the event of an error, an error is displayed. In the event of an error, clicking the soft key [SELECT] allows you to select the SYSTEM MONITOR screen.
(7) This message indicates that the CNC BASIC software is being transferred to flash memory to DRAM.

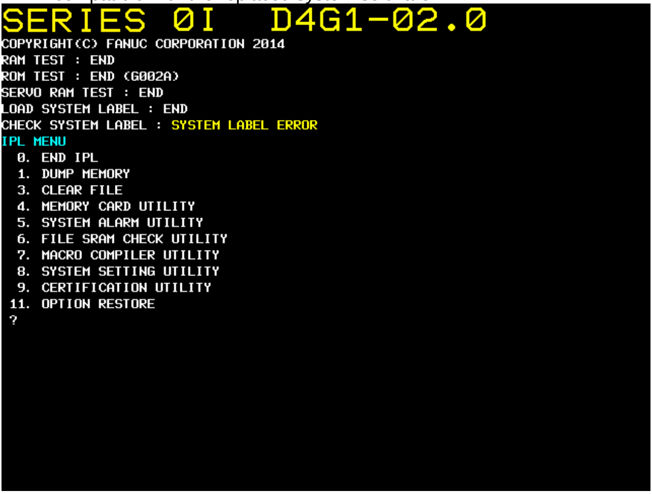
18.1.2 IPL Display

```
SERIES 0I   D4G1-02.0
COPYRIGHT(C) FANUC CORPORATION 2014
RAM TEST : END
ROM TEST : END (G002A)
SERVO RAM TEST : END
LOAD SYSTEM LABEL : END
CHECK SYSTEM LABEL : END
LOAD FILES : END
SERVO ROM TEST : END
PMC LADDER CHECK : END
LOAD MESSAGE DATA : END
```

The start status is displayed. If a hardware fault or a mounting error occurs, the system stops at this screen.

18.1.3 System Label Check Error

When an attempt is made to turn on the power to the CNC after replacing the system software, the screen shown below is displayed, and the system is not started if the replacing new system software is not compatible with the replaced system software.



If the screen shown above is displayed and the system is not started, perform memory all clear or reinstall the original system software.

18.2 SYSTEM CONFIGURATION SCREEN DISPLAY

After the system has started normally, you can find the types of installed printed circuit boards and software types by displaying a system configuration screen.

1 Press the function key 

.

2 Press the soft key [SYSTEM].

3 Two types of system configuration screen, the hardware screen and software screen, are provided, and you can switch between these screens by using the page keys 

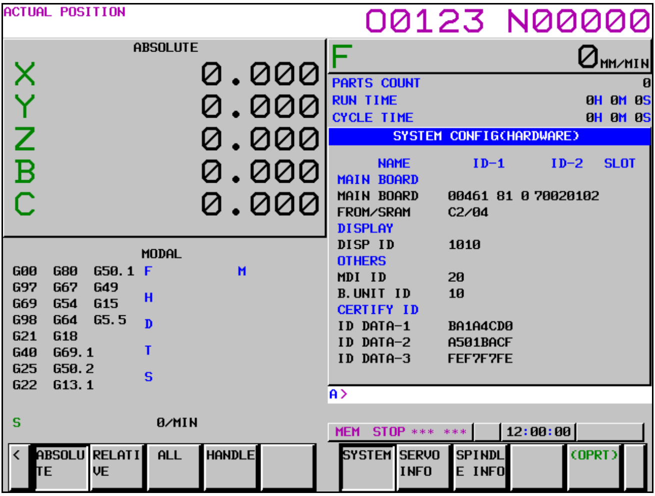
.

When all information cannot be displayed on one page of the screen, you can switch to the next page by using the page keys 

.

18.2.1 Hardware Configuration Screen

Screen display



Displayed information

The following explains the displayed information:

1. NAME
   MAIN BOARD
   - Displays information on the main board, and cards and modules on the main board.

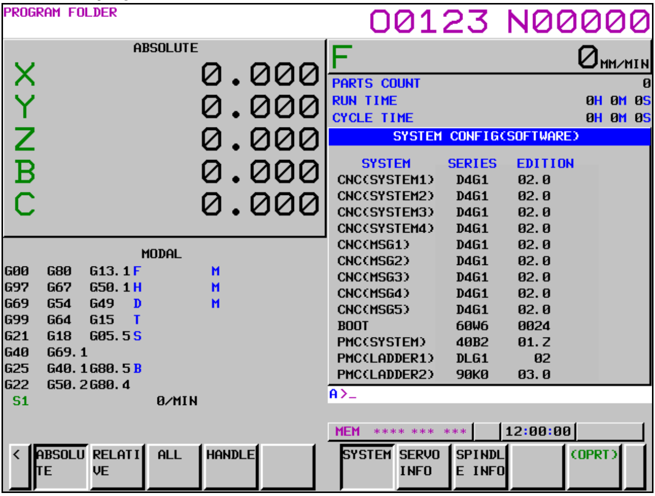
   OPTION BOARD
   - Displays information on the board installed in the option slot.

   DISPLAY
   - Displays information on the display unit.

   OTHERS
   - Displays information on other components (such as an MDI and a basic unit).
2. ID-1 / ID-2
   - Displays ID information.
3. SLOT
   - Displays the number of the slot in which the option board is inserted.

18.2.2 Software Configuration Screen

Screen display



Displayed information

The following explains the displayed information:
SYSTEM : Software type
SERIES : Software series
EDITION : Software edition

Displayed systems and corresponding software types

The following lists the correspondence between displayed systems and software:

System	Software type
CNC(SYSTEM1)	CNC system software 1
CNC(SYSTEM2)	CNC system software 2
CNC(SYSTEM3)	CNC system software 3
CNC(SYSTEM4)	CNC system software 4
CNC(MSG1)	CNC language indication 1
CNC(MSG2)	CNC language indication 2
CNC(MSG3)	CNC language indication 3
CNC(MSG4)	CNC language indication 4
CNC(MSG5)	CNC language indication 5
BOOT	Boot system
PMC(SYSTEM)	PMC function
PMC(LADDER1)	PMC ladder for path 1
PMC(LADDER2)	PMC ladder for path 2
PMC(LADDER3)	PMC ladder for path 3
PMC(LAD DCS)	Dual check safety PMC ladder
SERVO	Digital servo software (up to ten programs displayed)
SPINDLE-1	Spindle 1
SPINDLE-2	Spindle 2
SPINDLE-3	Spindle 3
SPINDLE-4	Spindle 4

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System	Software type
GRAPHIC	Graphic function
GRAPHIC1	Graphic function
GRAPHIC2	Graphic function
GRAPH(FONT)	Graphic function (additional Chinese font)
MGI(LIB)	Library for MANUAL GUIDE *i*
MGI(SYSTEM)	System software for MANUAL GUIDE *i*
MGI(MACRO M)	Macro software for MANUAL GUIDE *i* (M system)
MGI(MACRO T)	Macro software for MANUAL GUIDE *i* (T system)
MGI(USER0)	User data 0 for MANUAL GUIDE *i*
MGI(USER1)	User data 1 for MANUAL GUIDE *i*
MGI(USER2)	User data 2 for MANUAL GUIDE *i*
MGI(USER3)	User data 3 for MANUAL GUIDE *i*
MGI(USER4)	User data 4 for MANUAL GUIDE *i*
MGI(USER5)	User data 5 for MANUAL GUIDE *i*
MGI(USER6)	User data 6 for MANUAL GUIDE *i*
MGI(USER7)	User data 7 for MANUAL GUIDE *i*
MGI(USER8)	User data 8 for MANUAL GUIDE *i*
MGI(USER9)	User data 9 for MANUAL GUIDE *i*
MACRO EXE1	Macro executor 1
MACRO EXE2	Macro executor 2
MACRO EXE3	Macro executor 3
MACRO EXE4	Macro executor 4
MACRO EXE5	Macro executor 5
MACRO EXE6	Macro executor 6
MACRO EXE7	Macro executor 7
MACRO EXE8	Macro executor 8
MACRO EXE9	Macro executor 9
MACRO EXE10	Macro executor 10
MACRO EXE11	Macro executor 11
MACRO EXE12	Macro executor 12
MACRO EXE13	Macro executor 13
MACRO EXE14	Macro executor 14
MACRO EXE15	Macro executor 15
MACRO EXE16	Macro executor 16
MACRO EXE17	Macro executor 17
MACRO EXE18	Macro executor 18
MACRO EXE19	Macro executor 19
MACRO EXE20	Macro executor 20
CEXELIB	Library for C Language Executor
CEXEAPL	Application for C Language Executor
CEXEDATA0	C Language Executor data file 0
CEXEDATA1	C Language Executor data file 1
CEXEDATA2	C Language Executor data file 2
CEXEDATA3	C Language Executor data file 3
CEXEDATA4	C Language Executor data file 4

System	Software type
CEXEDATA5	C Language Executor data file 5
CEXEDATA6	C Language Executor data file 6
CEXEDATA7	C Language Executor data file 7
CEXEDATA8	C Language Executor data file 8
CEXEDATA9	C Language Executor data file 9
EMBED ETHER	Embedded Ethernet software
ETHER DISPLY	Ethernet Display software
USB SOFT	USB software
PROFI SOFT	PROFIBUS software
PROFI MASTER	PROFIBUS Master software
DEVNT SOFT	DeviceNet software
PROFI SLAVE	PROFIBUS Slave software
CC-LINK SOFT	CC-Link software
ETHERNET	Fast Ethernet software
PROFINET	PROFINET software
NETWORK SAFE	Network Safety software
TMI(LIB)	Library for TURN MATE i
TMI(SYSTEM)	System software for TURN MATE i
TMI(MACRO T)	Macro software for TURN MATE i (T system)
MG0I(LIB)	Library for MANUAL GUIDE 0i
MG0I(SYSTEM)	System software for MANUAL GUIDE 0i
MG0I(EMCR M)	Execution macro software for MANUAL GUIDE 0i (M system)
MG0I(CMCR M)	Conversation macro software for MANUAL GUIDE 0i (M system)
MG0I(EMCR T)	Execution macro software for MANUAL GUIDE 0i (T system)
MG0I(CMCR T)	Conversation macro software for MANUAL GUIDE 0i (T system)

- Display of digital servo software
  When multiple programs are loaded, up to ten types are displayed. For the type of servo software used for each axis, check parameter No. 1024.
- Display of spindle software
  The series and edition of software are displayed for each spindle. This information is displayed for up to 4 spindles.
- Display of macro executor
  The series and edition are displayed for each number specified at the time of P-CODE macro creation.
  Up to 20 types of macro executor are displayed.

18.3 CNC STATE DISPLAY

Description of each display

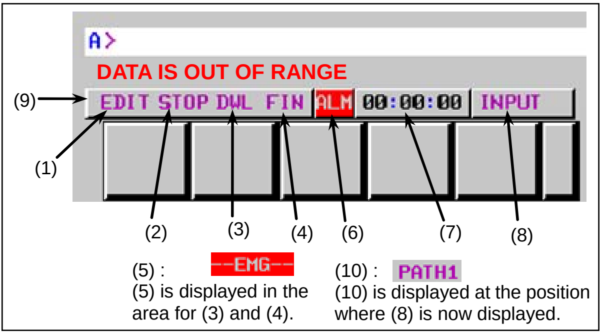


Fig. 18.3 State display positions

(1) Current mode

MDI	:	Manual data input, MDI operation
MEM	:	Automatic operation (memory operation)
RMT	:	Automatic operation (DNC operation)
EDIT	:	Memory editing
HND	:	Manual handle feed
JOG	:	Jog feed
INC	:	Manual incremental feed
REF	:	Manual reference position return

(2) Automatic operation status

****	:	Reset (When the power is turned on or the state in which program execution has terminated and automatic operation has terminated.)
STOP	:	Automatic operation stop (The state in which one block has been executed and automatic operation is stopped.)
HOLD	:	Feed hold (The state in which execution of one block has been interrupted and automatic operation is stopped.)
STRT	:	Automatic operation start-up (The state in which the system operates automatically)
MSTR	:	Manual numerical command start state (The state in which a manual numerical command is being executed) Alternatively, tool retract and recover operation state (The state in which a recover operation and repositioning operation are being performed)

(3) Axis moving status/dwell status

MTN	:	Indicates that the axis is moving.
DWL	:	Indicates the dwell state.
***	:	Indicates a state other than the above.

(4) State in which an auxiliary function is being executed

FIN	:	Indicates the state in which an auxiliary function is being executed. (Waiting for the complete signal from the PMC)
***	:	Indicates a state other than the above.

(5) Emergency stop or reset status

--EMG--	:	Indicates emergency stop. (Blinks in reversed display.)
-RESET-	:	Indicates that the reset signal is being received.

(6) Alarm status

ALM : Indicates that an alarm is issued. (Blinks in reversed display.)
BAT* : Indicates that the battery is low. (Blinks in reversed display.)
APC* : Indicates that the amplifier battery will soon run out. (Blinks in reversed display.)
FAN : Indicates that the fan speed becomes low. (Blinks in reversed display.)
LKG : Indicates that the insulation resistance value of the motor or the power line has decreased.. (Blinks in reversed display.)
PSW : Indicates that the power supply is abnormal state. (Blinks in reversed display.)
PMC : Indicates that a PMC alarm is issued. (Blinks in reversed display.)
Space : Indicates a state other than the above.

(7) Current time

hh:mm:ss - Hours, minutes, and seconds

M.H.RTR. : Indicates manual handle retrace mode.
(Manual handle retrace function, parameter No. 6401#6)
NO RVRS. : Indicates a state in which a block cannot be reverted.
(Manual handle retrace function, parameter No. 6401#6)
NO CHAG. : Indicates a state in which a block cannot be retraced.
(Manual handle retrace function, parameter No. 6401#6)

(8) Program editing status

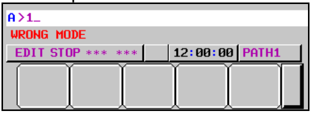
INPUT	:	Indicates that data is being input.
OUTPUT	:	Indicates that data is being output.
SEARCH	:	Indicates that a search is being performed.
EDIT	:	Indicates that another editing operation is being performed (insertion, modification, etc.)
LSK	:	Indicates that labels are skipped when data is input.
RSTR	:	Indicates that the program is being restarted
COMPARE	:	Indicates that a data comparison is being made.
OFST	:	Indicates that the tool length compensation amount measurement mode is set (for the machining center system) or that the tool length compensation amount write mode is set (for the lathe system).
WOFS	:	Indicates that the workpiece origin offset amount measurement mode is set.
AICC1	:	Indicates that operation is being performed in the AI contour control I mode.
AICC2	:	Indicates that operation is being performed in the AI contour control II mode.
AI APC	:	Indicates that operation is being performed in the AI advanced preview control mode.
MEM-CHK	:	Indicates that a program memory check is being made.
WSFT	:	Indicates that the workpiece shift amount write mode is set.
TWP	:	Indicates that operation is being performed in the tilted working plane indexing mode.
RVRS	:	Indicates a retract state. (Retrace function)
RTRY	:	Indicates a re-forward state. (Retrace function)
RVED	:	Indicates a retract end or retract disabled state. (Retrace function)
PTRR	:	Indicates tool retract & recover mode.
TOLCON	:	Indicates that operation is being performed in Tolerance control mode.
Space	:	Indicates that no editing operation is being performed.

(9) Warning for data setting or input/output operation

When invalid data is entered (wrong format, value out of range, etc.), when input is disabled (wrong mode, write disabled, etc.), or when input/output operation is incorrect (wrong mode, etc.), a warning message is displayed. In this case, the CNC does not accept the setting or input/output operation (retry the operation according to the message).

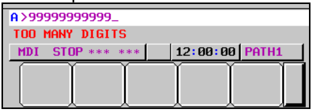
Example 1)

When a parameter is entered



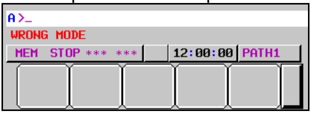
Example 2)

When a parameter is entered



Example 3)

When a parameter is output to an external input/output device



(10) Tool post name

The number of a path whose status is indicated is displayed.

PATH1 : Indicates that the status being indicated is for path 1. Other names can be used depending on the settings of parameters 3141 to 3147. The tool post name is displayed at the position where (8) is now displayed. While the program is edited, (8) is displayed.

18.4 PERIODICAL MAINTENANCE SCREEN

18.4.1 Overview

The periodic maintenance screen facilitates management of consumables that require periodic replacement (for example, an LCD unit backlight and a backup battery).

Setting the name and service life of consumables, and the countdown method to be used for them enables counting of the remaining service time according to the specified countdown method and displaying of the result.

18.4.1.1 Screen configuration

The periodic maintenance screen consists of the following screens:

(1) Status screen:
Displays item names, remaining service time, countdown status, and lets you specify item names.

(2) Setting screen:
Lets you specify service life, remaining service time, and count type (countdown method).

(3) NC system menu screen:
Displays the names of registered consumables used in the NC.

(4) Machine system menu screen:
Enables registering the names of consumables used in the machine.

18.4.1.2 Procedure

To use this function, follow the steps below:

(1) Select a number for registration.
(For selection, use the cursor key on the status screen.)

(2) Specify an item name.
The following two methods are available.
- Selecting a name from a menu screen (machine or NC system menu screen).
- Entering a name to the status screen directly from the MDI.

Using the machine system menu screen requires that item names be registered previously.

(3) Specify the service life, remaining service time, and count type for a target item.
After the setting, the remaining service time can be checked on the status screen.

18.4.2 Screen Display and Setting

For the 10.4" and 8.4" LCDs, display the periodic maintenance screen with the procedure below.

(1) Press function key SYSTEM.

(2) Press continuous menu key ▷ several times. Soft key [MAINTE] appears.

(3) Press soft key [MAINTE]. The periodic maintenance screen appears.

For the 15" LCD, display the periodic maintenance screen with the procedure below.

(1) Press function key SYSTEM.

(2) Press vertical soft key [NEXT] several times. Vertical soft key [MAINTE] appears.

(3) Press vertical soft key [MAINTE]. The periodic maintenance screen appears.

The periodic maintenance screen consists of the status screen, setting screen, machine system menu screen, and NC system menu screen. You can switch between the status and setting screens by using soft key [CHANGE].

18.4.2.1 Status screen display and setting

Up to 10 consumable items can be registered. Their remaining service time and count status are displayed on the status screen.

(1) Status screen and menu screen display

- **Status screen**

  10.4” display unit

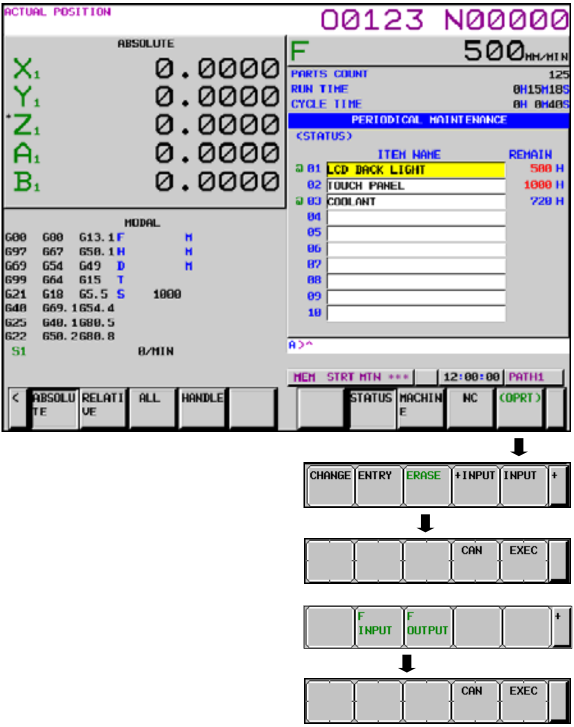


Fig. 18.4.2.1 (a) Status screen (10.4” display unit)

15” display unit

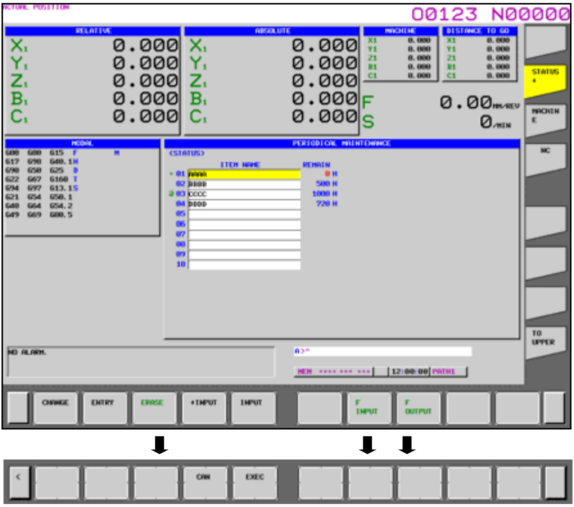


Fig. 18.4.2.1 (b) Status screen (15” display unit)

- **Machine system menu screen**

10.4” display unit

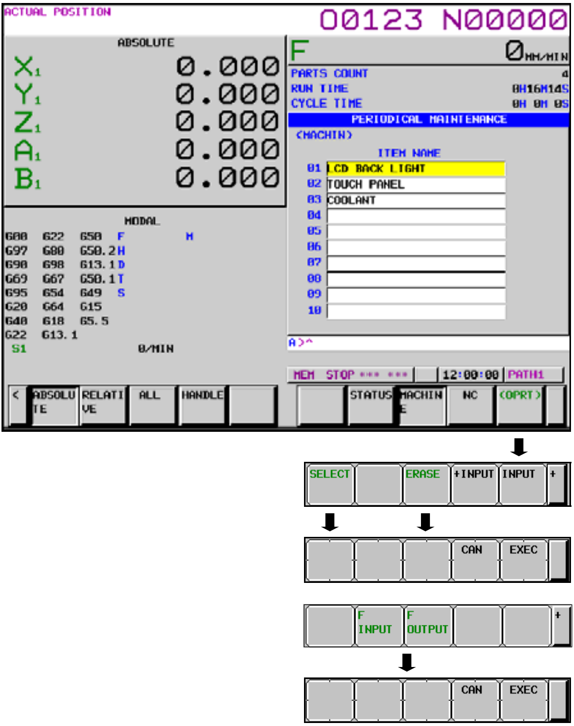


Fig. 18.4.2.1 (c) Machine system menu screen (10.4” display unit)

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15" display unit

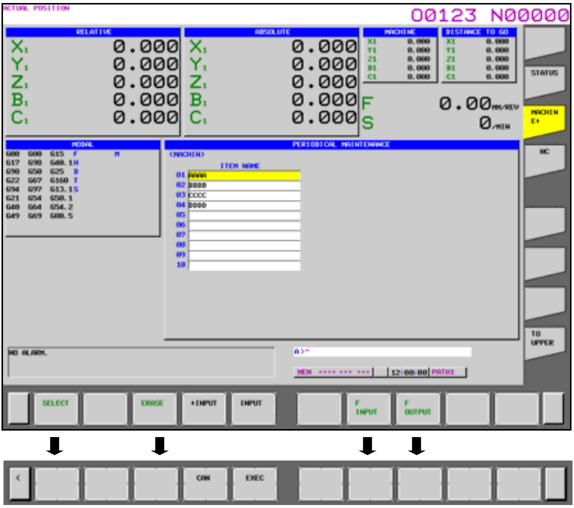

Fig. 18.4.2.1 (d) Machine system menu screen (15" display unit)

- **NC system menu screen**

10.4" display unit

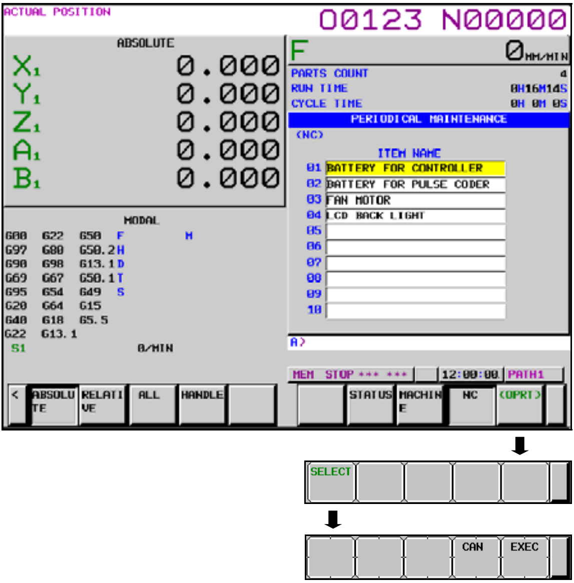

Fig. 18.4.2.1 (e) NC system menu screen (10.4" display unit)

15” display unit

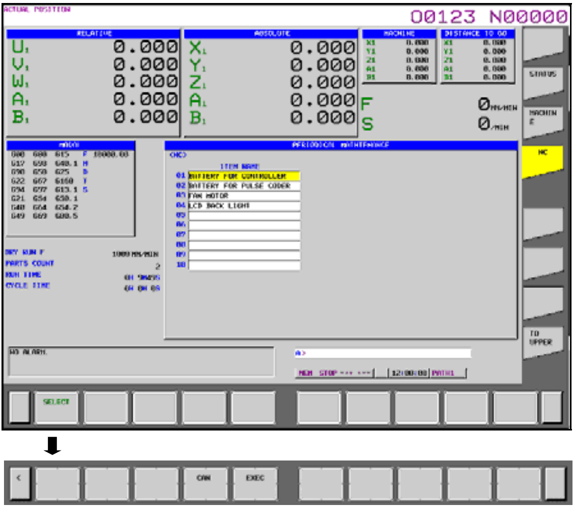

Fig. 18.4.2.1 (f) NC system menu screen (15” display unit)

NOTE
On the NC system screen, no item name can be registered, erased, input, or output.

(2) Setting

(a) Item name

The name of an item to be subjected to periodic maintenance is set under "Item name".
An item name can be set in either of two ways: using the menu screen and using the MDI keyboard.

<1> Setting from the menu screen

1. Place the cursor on the target item name, and press soft key [ENTRY], [MACHIN], or [NC]. A menu screen appears. The menu screen is either the machine or NC system menu screen.
2. Press soft key [MACHIN] or [NC]. The system switches to a screen that holds the names of consumables typical to the machine system or NC system.
3. Place the cursor on a registered item name, and press soft key [SELECT], then soft key [EXEC]. The item is set and the system returns to the status screen.
   To return the soft key display to the immediately preceding one, press soft key [CANCEL] before pressing soft key [EXEC].
4. When the menu screen appears, press soft key [STATUS] to return to the status screen.

Using the machine system menu screen requires that item names be registered on the screen previously.
This can be done using two methods, (i) and (ii).

(i) Program-based registration
Executing a program in the following format enables item names to be registered on the machine system menu screen.
Format

G10 L61 Px [n]
X : Registration number
N : Item name. Format:
[Alphanumeric characters*two-byte characters*alphanumeric characters]

(ii) MDI keypad-based registration

On the machine system menu screen, you can register an item name on the machine system menu screen by entering the format below using keys and pressing soft key [INPUT] (or INPUT key).

You can add additional information for a registered item name by pressing soft key [+INPUT].

Format

Alphanumeric characters*two-byte characters*alphanumeric characters

The two-byte characters shall comply with the FANUC code.

When entering a two-byte character using keys, sandwich it with an "*" pair. The item name can consist of up to 24 alphanumeric characters (if no two-byte character is included) or 12 two-byte characters (if no alphanumeric character is included).

[Example] To register "LCD backlight", enter:

>LCD∗110E10F410CC114010B610FE∗_

NOTE

1. "*" cannot be used in item names, because it is used as control code.
   "[", "]", "(", or ")" also cannot be used in item names.
2. If an attempt is made to register an item name of both alphanumeric characters and two-byte characters, the "DATA OUT OF RANGE" warning message may be generated even if the maximum registrable number of characters is not exceeded.
3. When you select a blank item name on the machine system menu screen, the warning "EDIT REJECTED" will be generated.
   If you select a blank item name on the NC system menu screen, a blank is set.

To erase the registered data for an item name, place the cursor on the target item name, press soft key [ERASE], then [EXEC].

<2> MDI keypad-based setting

You can register an item name on the status screen by entering the format below using keys and pressing soft key [INPUT] (or INPUT key).

You can add additional information for a registered item name by pressing soft key [+INPUT].

Format

Alphanumeric characters*two-byte characters*alphanumeric characters

The two-byte characters shall comply with the FANUC code.

When entering a two-byte character using keys, sandwich it with an "*" pair. The item name can consist of up to 24 alphanumeric characters (if no two-byte character is included) or 12 two-byte characters (if no alphanumeric character is included).

[Example] To register "LCD backlight", enter:

>LCD∗110E10F410CC114010B610FE∗_

NOTE

1. "*" cannot be used in item names, because it is used as control code.
   "[", "]", "(", or ")" also cannot be used in item names.
2. If an attempt is made to register an item name of both alphanumeric characters and two-byte characters, the "DATA OUT OF RANGE" warning message may be generated even if the maximum registrable number of characters is not exceeded.

To erase the registered data for an item name, place the cursor on the target item name, press soft key [ERASE], then [EXEC].

When an item name is deleted, the related service life, remaining service time, and count type are also deleted.

(b) Remaining service time

The remaining service time of an item (the time allowed before the item is replaced) is obtained by countdown and displayed under "Remaining service time." When the remaining service time decreases to a specified percentage (specified in parameter No. 8911) of the service life or lower, it is displayed in red.
Countdown continues even after the service life has expired.

NOTE
The status screen does not enable you to make settings.
Make settings on the setting screen.

(c) Count status

The count status is displayed at the left of the corresponding item number, as listed below:

Display	Count status
Blank	Count suspended
@	Count under way
*	The service life has expired.

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18.4.2.2 Setting screen display and setting

10.4" display unit

The setting screen lets you specify the service life, the remaining service time, and count type for a registered item name.
It also displays the same count status information as displayed on the status screen.

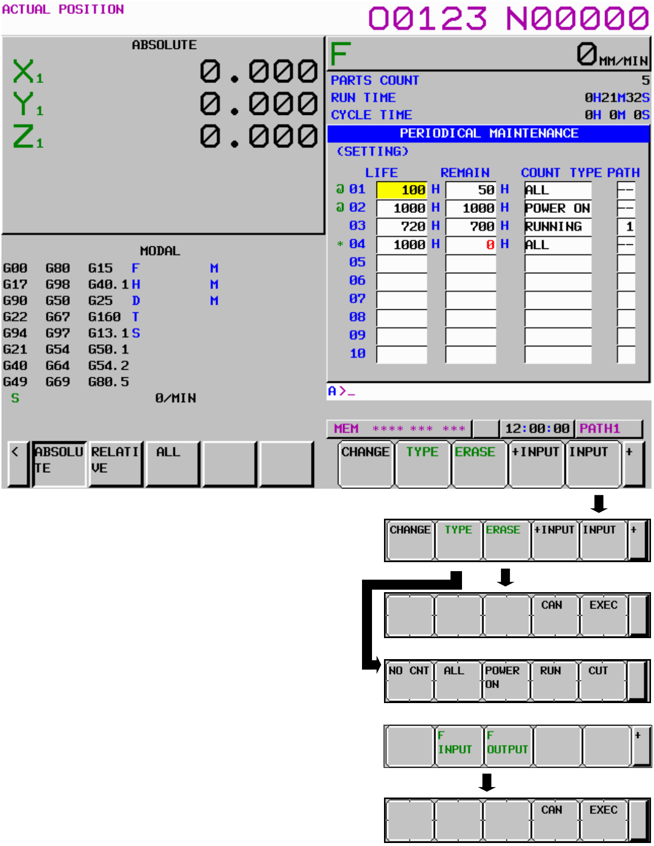

Fig. 18.4.2.2 (a) Setting screen (10.4" display unit)

15” display unit

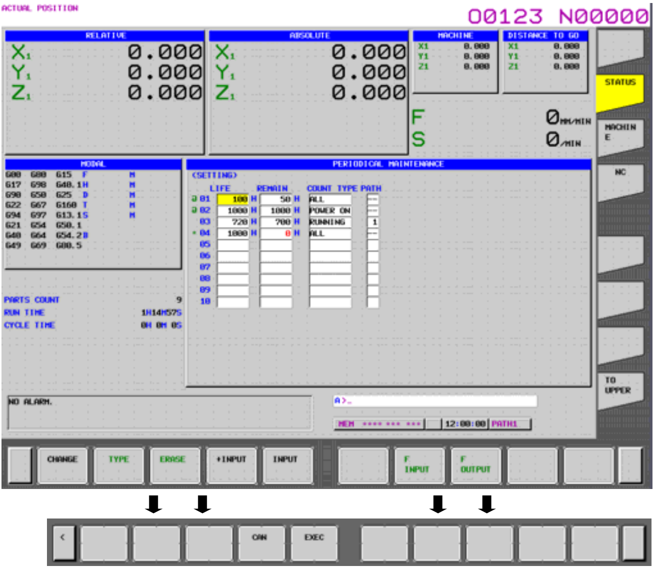

Fig. 18.4.2.2 (b) Setting screen (15” display unit)

(1) Service life

The service life of a consumable item is to be specified under “LIFE.”
First place the cursor on the service life of a target registration number, enter a desired service life value and press soft key [INPUT] (or  key), and the service life is set. At this time, the same value is also set for the remaining service time. The count type is displayed as “------”.
By pressing soft key [+INPUT], you can add additional time to an already set service life. At this time, the same value is also added to the remaining service time.
The valid data range for the service life is: 0 to 65535 (hours).

NOTE
1 If an attempt is made to make settings when no item name is registered, the warning "EDIT REJECTED" will be generated.
2 If an attempt is made to enter a value exceeding the valid range, the warning "DATA IS OUT OF RANGE" will be generated.
3 When you press soft keys [ERASE] and [TYPE], the warning "EDIT REJECTED" will be generated.

(2) Remaining service time

The time allowed before the item is replaced is obtained by countdown and displayed under "REMAIN".
When the remaining service time decreases to a specified percentage (specified in parameter No. 8911) of the service life or lower, it is displayed in red.
Countdown continues even after the service life has expired. First place the cursor on the remaining service time of a target registration number, enter a desired remaining service time value, and press soft key [INPUT] (or  key), and the remaining service life is set.
By pressing soft key [+INPUT], you can add additional time to an already set remaining service time. The valid range is from 0 to (service life).
To set the same value as the service life, press soft key [ERASE] and then [EXEC].

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NOTE
1 If an attempt is made to make settings when no item name or service life is registered, the warning "EDIT REJECTED" will be generated.
2 If an attempt is made to enter a value exceeding the valid range, the warning "DATA IS OUT OF RANGE" will be generated.
3 When you press soft key [TYPE], the warning "EDIT REJECTED" will be generated.

(3) Counter type

A count type can be selected and set under "COUNT TYPE".
After the cursor is placed on the count type of a target registration number, pressing soft key [TYPE] displays the following count types as soft keys. Select one and press soft key [EXEC].

Soft key	Meaning	Display
[NO CNT]	Not counting (suspended).	— — — — — —
[ALL]	Always count.	All times
[POWER ON]	Count while the power is supplied.	Power-on time
[RUN]	Count while operation is under way.	Operating
[CUT]	Count while cutting is under way.	Cutting

NOTE
1 If an attempt is made to make settings when no item name or service life is registered, the warning "EDIT REJECTED" will be generated.
2 Pressing soft keys [INPUT] and [+INPUT] has no effect.
3 With the "all times" count type, an error of 24 hours will occur in a leap year.
4 When you press soft key [ERASE], the warning "EDIT REJECTED" will be generated.

(4) Path number

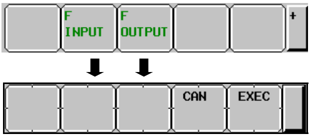
When [RUN] or [CUT] is set to the count type in multi path, path number can be set.
Make the cursor to the count type of a target registration number, then input path number and press soft key [INPUT].
The setting range is 0-(max path number).
When the specified path is operating or cutting, counting is performed.
If 0 is set, when either of path is operating or cutting, counting is performed.

NOTE
1 If [NO CNT], [ALL] or [POWER ON] is set to count type, “--” is displayed. In this case, if the setting is operated, the warning “EDIT REJECTED” is issued.
2 If the setting is beyond the valid data range, the warning “DATA IS OUT OF RANGE” is issued.
3 If soft key [TYPE] is pressed, the warning “EDIT REJECTED” is issued.
4 If soft key [ERASE] is pressed, the warning “EDIT REJECTED” is issued.
5 The soft key [+INPUT] is invalid.

18.4.3 Registered Data Input/Output

Registered data can be output to an external device by using soft key [F OUTPUT].
Registered data can also be input from an external device by using soft key [F READ].
Input/output operations can be done on the status, setting, and menu screen (only the machine system menu screen).
If you do not specify a data file name, "MAINTENA.TXT" will be assumed on the status and setting screens and "MAINTEMC.TXT" on the machine system menu screen.

Screen	Data file name
Status	MAINTENA.TXT
Setting	
Machine system menu	MAINTEMC.TXT
NC system menu	(Output not permitted)



18.4.3.1 Data output

Set the EDIT mode, then press the soft key [F OUTPUT], and data is output in the format below.

Format

- **Output format on the status and setting screens**

```
G10 L60 P01 [n] Aa Rr Qq ;
G10 L60 P02 [n] Aa Rr Qq ;
G10 L60 P03 [n] Aa Rr Qq ;
                :
```

Format

- **Output format on the menu screen (machine system menu)**

```
G10 L61 P01 [n] ;
G10 L61 P02 [n] ;
G10 L61 P03 [n] ;
                :
```

a: Service life
r: Remaining service time
n: Item name
[Alphanumeric characters*two-byte characters*alphanumeric characters]
q: Count type
0 = Not counting
1 = Always count.
2 = Count while the power is supplied.
3 = Count while operation is under way.
4 = Count while cutting is under way.

18.4.3.2 Data input

Set the EDIT mode, then press the soft key [F READ], and data is registered in item names and so on in the input format (G10).
You can also input the format (G10) to program memory first and then register data.

NOTE
If the input format (G10) is not the same as the output format, data may not be registered correctly.

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18.4.4 Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
8901	MEN							

[Input type] Parameter input
[Data type] Bit
MEN The periodic maintenance screen is:
0 : Displayed.
1 : Not displayed.

8911	Percentage to the service life of each item displayed on the periodic maintenance screen

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 99

If the remaining service time goes below the service life, the remaining service time is displayed in red and a warning is displayed on the periodic maintenance screen.

18.4.5 Warning

On the periodic maintenance screen, the warnings below may be generated depending on the operation performed.

Warning message	Description
FORMAT ERROR	Input data is not in a correct format.
DATA IS OUT OF RANGE	Input data contains a value exceeding the valid range.
TOO MANY DIGITS	Input data contains a number exceeding valid number of digits.
INCORRECT CHARACTER CODE IS CONTAINED	Input data contains an incorrect character code.
ILLEGAL DATA	Data is illegal.
EDIT REJECTED	An attempt was made to perform data that cannot be edited.

18.5 MAINTENANCE INFORMATION SCREEN

18.5.1 Overview

The maintenance information screen is provided to record the history of maintenance performed by a service person of FANUC or machine tool builder.

The screen has the following features:

- MDI alphabetical input is allowed.
  (Half-size kana input is for Japanese display only.)
- The recording screen can be scrolled in units of lines.
- Edited maintenance information can be input and output.
- Records are stored in Flash ROM.
- Double-byte (shift JIS) codes can be displayed.

18.5.2 Screen Display and Operation

18.5.2.1 Screen display

For the 10.4" and 8.4" LCDs, display the maintenance information screen with the procedure below.

(1) Prees function key 

.

(2) Press the continuous menu key  several times. Soft key [M-INFO] appears.

(3) Press the soft key [M-INFO]. The maintenance information screen appears.

For the 15" LCD, display the maintenance information screen with the procedure below.

(1) Prees function key 

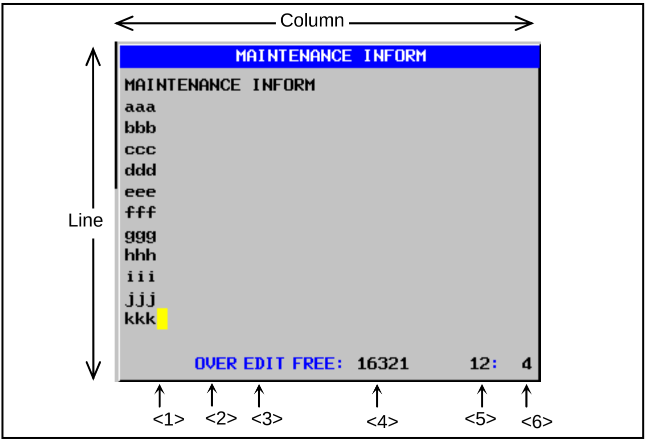
.

(2) Press vertical soft key [NEXT] several times. Vertical soft key [M-INFO] appears.

(3) Press vertical soft key [M-INFO]. The maintenance information screen appears.

When selected, the maintenance screen shows the latest information.

The status (mode, number of empty character spaces, cursor line, column number) is displayed at the bottom of the screen.



Status display

<1> Kana/alphabetic
KN: Half-size kana input mode.
ABC: English input mode

<2> OVER / INSERT
OVER: Overwrite mode
INSERT: Insert input mode.

<3> EDIT / READ
EDIT: Editing allowed
READ: Editing inhibited
<4> Number of empty character spaces
Number of empty character spaces as half-size characters
<5> Current cursor line
Position of the line on which the cursor is currently located.
<6> Current cursor column
Position of the column at which the cursor is currently located.

NOTE
The numbers of lines and columns that can be displayed by each LCD are:
- 10.4” display unit: 37 characters × 12 lines
- 8.4” display unit: 38 characters × 11 lines
- 15” display unit: 38 characters × 19 lines

18.5.2.2 Edit operation

The maintenance information screen has view mode and edit mode, which are selected by pressing the soft key [END] or [EDIT].
Initially, view mode is selected. To start editing, select edit mode by pressing the soft keys [(OPRT)] and [EDIT]. When the editing is completed, press the soft key [END] key. Then, select soft key [SAVE] or [QUIT]. Unless soft key [SAVE] is selected, the edited data will be lost at next power-up.
To scroll the screen showing the recorded information, press a cursor keys or page keys on the MDI unit.
The following keys are used for editing (character input) and viewing:

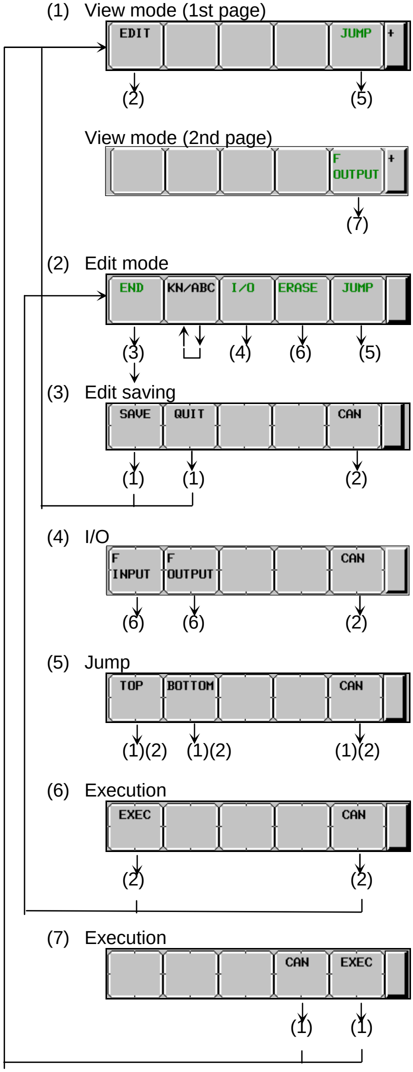
Table of (edit) operations on the maintenance information screen

Mode	Key	Description
View	Soft key	
	[EDIT]	Allows editing.
	[JUMP]	Displays the beginning or the end.
	Cursor keys	Scrolls the screen up or down.
	Page keys	Scrolls the screen up or down in units of whole screens.
Edit	Soft key	
	[END]	Ends editing. Select whether to save the edited data.
	[KN/ABC]	Switches between half-size kana input and alphabetic input modes. (Supports Japanese display only.)
	[CLEAR ALL]	Clears all maintenance information. (This key is enabled when the parameter MDC (No.3116#7) is set to 1.)
	[I/O]	Inputs or outputs the maintenance information.
	[JUMP]	Moves the cursor to the beginning or end.
	Cursor keys	Moves the cursor position up or down.
	Page keys	Scrolls the screen up or down in units of whole screens.
	Alphanumeric/ special character keys	Allows alphabetical, numeric, or special character input. (For details of half-size kana input, see Subsection 18.5.2.5, " Half-size kana input".)
	 key	Switches between insert and overwrite modes.
	 key	If the key input buffer does not contain any character, deletes the one character at the cursor position. If the key input buffer contains characters, deletes the characters from the buffer.

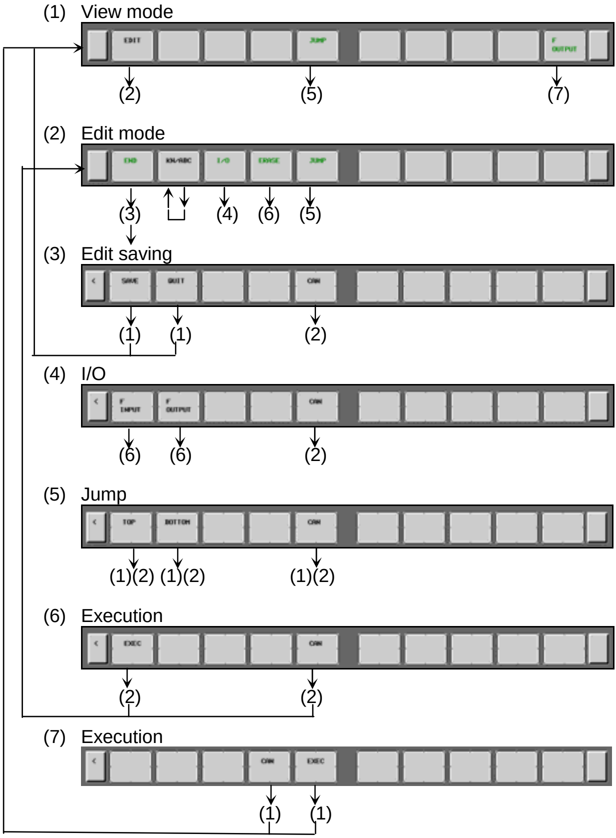
Mode	Key	Description
Edit	CAN key	If the key input buffer does not contain any character, deletes the one character before the cursor. If the key input buffer contains characters, deletes the one character from the buffer.
	INPUT key	If the key input buffer does not contain any character, starts a new line. If the key input buffer contains characters, outputs the characters from the buffer to the information screen.

18.5.2.3 Operation of soft keys

10.4" display unit



15” display unit



18.5.2.4 Input/output of maintenance information

The maintenance information can be input and output.
When the maintenance information is input from or output to a memory card, a file name MAINTINF.TXT is used.

(1) Format

. . . . %%

Main unit

(2) Input

When a MAINTINF.TXT file generated in the format shown above is input, the data is added at the end of the existing maintenance information. Double-byte characters can be input in shift JIS format.

NOTE

A TAB code is converted to one to four blanks, depending on the input position.
80h to 90h and E0h to EBh are assumed as prefix codes of double-byte characters. Reading these codes alone is inhibited.
Control codes (00H to 1FH) except TAB and LF are discarded in reading.
%% cannot be input

(3) Output

All maintenance information is output in the format shown above.

18.5.2.5 Half-size kana input

By pressing soft key [KN/ABC], you can switch between half-size kana input and alphabetic input modes.

In half-size kana input mode, alphabetic characters are converted in accordance with the "half-size kana/Roman character conversion table" and resultant half-size kana characters are displayed in the key input buffer.

Pressing the 

key causes the characters in the key input buffer to be output to maintenance information.

Pressing the 

key causes the characters to be deleted from the key input buffer and the one character of the maintenance information on which the cursor is positioned to be deleted.

Pressing the 

key causes cancels conversion, and deletes one character from the key input buffer. If the key input buffer does not contain any character, the one character of the maintenance information that immediately precedes the cursor is deleted.

Half-size kana input-to-Roman character conversion table (part 1)

A	ア	KA	カ	SA	サ	TA	タ	NA	ナ
I	イ	KI	キ	SI	シ	TI	チ	NI	ニ
U	ウ	KU	ク	SU	ス	TU	ツ	NU	ヌ
E	エ	KE	ケ	SE	セ	TE	テ	NE	ネ
O	オ	KO	コ	SO	ソ	TO	ト	NO	ノ
HA	ハ	MA	マ	YA	ヤ	RA	ラ	WA	ワ
HI	ヒ	MI	ミ	YI	イ	RI	リ	WI	イ
HU	フ	MU	ム	YU	ユ	RU	ル	WU	ウ
HE	ヘ	ME	メ	YE	エ	RE	レ	WE	エ
HO	ホ	MO	モ	YO	ヨ	RO	ロ	WO	ヲ
XA	ァ	GA	ガ	ZA	ザ	DA	ダ	BA	バ
XI	ィ	GI	ギ	ZI	ジ	DI	ヂ	BI	ビ
XU	ゥ	GU	グ	ZU	ズ	DU	ヅ	BU	ブ
XE	ェ	GE	ゲ	ZE	ゼ	DE	デ	BE	ベ
XO	ォ	GO	ゴ	ZO	ゾ	DO	ド	BO	ボ
PA	パ	FA	ファ	JA	ジャ	VA	ヴァ		
PI	ピ	FI	フィ	JI	ジ	VI	ヴィ		
PU	プ	FU	フ	JU	ジュ	VU	ヴ		
PE	ペ	FE	フェ	JE	ジェ	VE	ヴェ		
PO	ポ	FO	フォ	JO	ジョ	VO	ヴォ		

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Half-size kana input-to-Roman character conversion table (part 2)

XYA	ｬ	KYA	ｷｬ	SYA	ｼｬ	TYA	ﾁｬ	NYA	ﾆｬ
XYI	ｨ	KYI	ｷｨ	SYI	ｼｨ	TYI	ﾁｨ	NYI	ﾆｨ
XYU	ｭ	KYU	ｷｭ	SYU	ｼｭ	TYU	ﾁｭ	NYU	ﾆｭ
XYE	ｪ	KYE	ｷｪ	SYE	ｼｪ	TYE	ﾁｪ	NYE	ﾆｪ
XYO	ｮ	KYO	ｷｮ	SYO	ｼｮ	TYO	ﾁｮ	NYO	ﾆｮ
HYA	ﾋｬ	MYA	ﾐｬ	RYA	ﾘｬ	GYA	ｷﾞｬ	ZYA	ｼﾞｬ
HYI	ﾋｨ	MYI	ﾐｨ	RYI	ﾘｨ	GYI	ｷﾞｨ	ZYI	ｼﾞｨ
HYU	ﾋｭ	MYU	ﾐｭ	RYU	ﾘｭ	GYU	ｷﾞｭ	ZYU	ｼﾞｭ
HYE	ﾋｪ	MYE	ﾐｪ	RYE	ﾘｪ	GYE	ｷﾞｪ	ZYE	ｼﾞｪ
HYO	ﾋｮ	MYO	ﾐｮ	RYO	ﾘｮ	GYO	ｷﾞｮ	ZYO	ｼﾞｮ
DYA	ﾁﾞｬ	BYA	ﾋﾞｬ	PYA	ﾋﾟｬ	FYA	ﾌｬ	JYA	ｼﾞｬ
DYI	ﾁﾞｨ	BYI	ﾋﾞｨ	PYI	ﾋﾟｨ	FYI	ﾌｨ	JYI	ｼﾞｨ
DYU	ﾁﾞｭ	BYU	ﾋﾞｭ	PYU	ﾋﾟｭ	FYU	ﾌｭ	JYU	ｼﾞｭ
DYE	ﾁﾞｪ	BYE	ﾋﾞｪ	PYE	ﾋﾟｪ	FYE	ﾌｪ	JYE	ｼﾞｪ
DYO	ﾁﾞｮ	BYO	ﾋﾞｮ	PYO	ﾋﾟｮ	FYO	ﾌｮ	JYO	ｼﾞｮ
CYA	ｼｬ	SHA	ｼｬ	CHA	ﾁｬ	DHA	ﾃﾞｬ	TSA	ﾂｧ
CYI	ｼｨ	SHI	ｼ	CHI	ﾁ	DHI	ﾃﾞｨ	TSI	ﾂｨ
CYU	ｼｭ	SHU	ｼｭ	CHU	ﾁｭ	DHU	ﾃﾞｭ	TSU	ﾂ
CYE	ｼｪ	SHE	ｼｪ	CHE	ﾁｪ	DHE	ﾃﾞｪ	TSE	ﾂｪ
CYO	ｼｮ	SHO	ｼｮ	CHO	ﾁｮ	DHO	ﾃﾞｮ	TSO	ﾂｫ

NN	ﾝ
MM	ﾝ
XTU	ｯ
XTSU	ｯ

For a sokuon, input two constant characters (except N and M).
[Example] "IPPAI"→「ｲｯﾊﾟｲ」

18.5.3 Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
8901	MEN							

[Input type] Parameter input
[Data type] Bit
MEN The periodic maintenance screen is:
0 : Displayed.
1 : Not displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3116	MDC							

[Input type] Parameter input
[Data type] Bit
MDC Erasure of all maintenance information data is:
0 : Not possible.
1 : Possible.

	#7	#6	#5	#4	#3	#2	#1	#0
3206							MIF	

[Input type] Parameter input
[Data type] Bit
MIF Editing of the maintenance information screen is:
0 : Not prohibited.
1 : Prohibited.

NOTE
The maintenance information screen is displayed only when parameter MEN (No. 8901#7) is 0.

18.5.4 Warning

On the maintenance information screen, the warnings below may be generated depending on the operation performed.

Warning message	Meaning
NO MORE SPACE	An overflow occurred in CNC memory.
ALARM	The operation could not be performed because an alarm was generated in the CNC.
BUSY	Wait for CNC processing to end or make a retry.
ILLEGAL DATA	Investigate data and correct it as required.
WRONG MODE	The CNC is in wrong mode.
COMMAND ILLEGAL USE	A corresponding CNC option cannot be found.
PARAMETER ERROR	CNC parameter settings contain an error.
EDIT REJECTED	An attempt was made to perform an edit operation on data that could not be edited.
WRITE PROTECT	Writing is prohibited.
COMMAND REJECT	The CNC rejected the execution of the processing. Check the execution conditions.

19.1 INPUT AND OUTPUT OF DATA

After you change a SRAM module, you must set various data again. This section explains how to input parameters, part programs, tool offset, and other data from an external I/O device such as a floppy disk and output them to the device.

19.1.1 Setting Parameters for Input/Output

Setting procedure of parameters

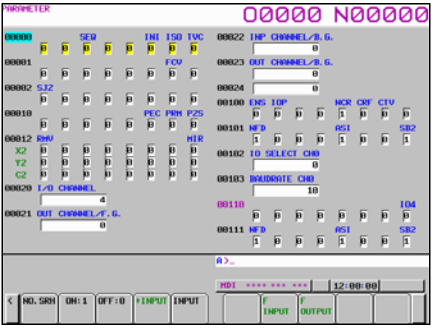
Parameter writing is enabled with following steps 1 to 3.

1 Set to MDI mode or emergency stop state.

2 Press function key  several times or press soft key [SETING] to display SETTING (HANDY) screen.

3 Set the cursor to PARAMETER WRITE and, press  and  keys in this order. Here alarm 100 will be displayed.

4 Press function key  several times to display the following screen.



(To make the cursor display in bit unit, press the cursor keys  or .)

5 Press soft key [(OPRT)] and the following operation menu is displayed.

<1> Soft key [NO.SRH] :
Searched by number.
Example) Parameter number $\rightarrow$ [NO.SRH]

<2> Soft key [ON : 1] :
Item with cursor position is set to 1. (bit parameter only)

<3> Soft key [OFF : 0] :
Item with cursor position is set to 0. (bit parameter only)

<4> Soft key [+INPUT] :
Input value is added to the value at cursor. (word type only)

<5> Soft key [INPUT] :
Input value is replaced with the value at cursor.

<6> Soft key [F INPUT] :
Parameters are input from RS232-C interface.

<7> Soft key [F OUTPUT] :
Parameters are output to RS232-C interface.

6 After the parameters have been input, set PARAMETER WRITE on the SETTING screen to 0. Press  key to release alarm SW0100, “PARAMETER ENABLE SWITCH ON”.

7 Convenient method

<1> To change parameters in bit unit, press cursor key [←] or [→], then the cursor becomes bit length and you can set parameters bit by bit (Bit parameter only).

<2> To set data consecutively, use [EOB] key.

(Example 1)

[1] [2] [3] [4] [EOB] [4] [5] [6] [7] [EOB] [9] [9] [9] [9] [INPUT]

This key sequence sets data as follows:

```
      0 → 1 2 3 4
      0   4 5 6 7
      0   9 9 9 9
      0         0
```

(Example 2)

[1] [2] [3] [4] [EOB] [EOB] [9] [9] [9] [9] [INPUT]

This key sequence sets data as follows:

```
      0 → 1 2 3 4
      0         0
      0   9 9 9 9
      0         0
```

<3> To set the same data sequentially, press "=".

(Example)

[1] [2] [3] [4] [EOB] "=" [EOB] "=" [INPUT]

This key sequence sets data as follows:

```
      0 → 1 2 3 4
      0   1 2 3 4
      0   1 2 3 4
      0         0
```

<4> Bit parameters can be set as follows:

(Example)

[1] [1] [EOB] "=" [EOB] "=" [INPUT]

This key sequence sets data as follows:

```
0 0 0 0 0 0 0 0 → 0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 → 0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 → 0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 → 0 0 0 0 0 0 0 0
```

8 After the required parameters are set, set PARAMETER WRITE to 0.

19.1.2 Inputting/Outputting Data

The main CPU memorized the following data.
Outputting the data 1/O device while the CNC is running normally.

(1) CNC parameter
(2) PMC parameter
(3) Pitch error compensation amount
(4) Custom macro variables
(5) Tool compensation amount
(6) Part program (machining program, custom macro program)

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19.1.2.1 Confirming the parameters required for data output

Note) Be sure that data output cannot be done in an alarm status.

Parameters required for output are as follows:
In addition, (*) indicates the standard setting for input/output devices made by FANUC. Change these settings according to the unit you actually use.
(Parameter can be changed in MDI mode or emergency stop status.)

	#7	#6	#5	#4	#3	#2	#1	#0
0000							ISO	

[Input type] Setting input
[Data type] Bit

ISO
- 0 : Output with EIA code
- 1 : Output with ISO code (FANUC cassette)

NOTE
1. The I/O setting of a memory card is made by bit 0 (ISO) of parameter No. 0139.
2. The I/O setting of an USB memory is made by bit 0 (ISU) of parameter No. 11505.
3. The I/O setting of a data server is made by bit 0 (ISO) of parameter No. 0908.
4. When EIA code is used for data output (ISO = 0), set bit 3 (ASI) of parameter No.101 and 111 and 121 to 0.

0020	Selection of I/O channel

[Input type] Setting input
[Data type] Byte
- 0 : Channel 1 (JD56A of main board) (*)
- 1 : Channel 1 (JD56A of main board)
- 2 : Channel 2 (JD36A of main board)
- 4 : Memory card interface
- 17 : USB memory interface
- • An operation example shown here assumes that data input/ output is performed with an input/output unit connected to the JD56A. (I/O channel = 0)

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2

[Input type] Parameter input
[Data type] Bit

NFD
- 0 : Feed is output when data is output.
- 1 : Feed is not output when data is output.

ASI
- 0 : EIA or ISO code is used for input/output data. (*)
- 1 : ASCII code is used.

NOTE
When ASCII code is used for data input/output (ASI = 1), set bit 1 (ISO) of parameter No.0000 to 1.

SB2
- 0 : Number of stop bits is 1.
- 1 : Number of stop bits is 2. (*)

0102	Specification number of input/output device

[Input type] Parameter input
[Data type] Byte

Setting value	Input/output device
0	RS232-C (Used control codes DC1 to DC4)
1	FANUC CASSETTE ADAPTOR 1 (FANUC CASSETTE B1/B2)
2	FANUC CASSETTE ADAPTOR 3 (FANUC CASSETTE F1)
3	FANUC PROGRAM FILE Mate, FANUC FA Card Adaptor, FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File, FANUC SYSTEM P-MODEL H
4	RS232-C (Not used control codes DC1 to DC4)
5	Portable tape reader
6	FANUC PPR FANUC SYSTEM P-MODEL G, FANUC SYSTEM P-MODEL H

0103	Baud Rate (set transfer rate)

[Input type] Parameter input
[Data type] Byte

1:	50	5:	200	9:	2400
2:	100	6:	300	10:	4800 (*)
3:	110	7:	600	11:	9600
4:	150	8:	1200	12:	19200 [BPS]

	#7	#6	#5	#4	#3	#2	#1	#0
0139								ISO

[Input type] Setting input
[Data type] Bit

ISO

0 : Output with ASCII code.
1 : Output with ISO code. (memory card)

⚠ WARNING

1 Unless data is input using ASCII codes, set this parameter to 1 to input or output data using ISO codes.
2 Data input/output with ASCII codes is dangerous because parity information is not included and a data error during the data input/output is not detected.
3 DNC operation from a memory card also must set the parameter to 1, and execute DNC operation by ISO code. ASCII code is dangerous because parity information is not included and a data error during the data input is not detected.

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	#7	#6	#5	#4	#3	#2	#1	#0
0908								ISO

[Input type] Setting input
[Data type] Bit

ISO

0 : Output with ASCII code.
1 : Output with ISO code. (data server)

⚠ WARNING

1 Unless data is input using ASCII codes, set this parameter to 1 to input or output data using ISO codes.
2 Data input/output with ASCII codes is dangerous because parity information is not included and a data error during the data input/output is not detected.
3 DNC operation from a data server also must set the parameter to 1, and execute DNC operation by ISO code. ASCII code is dangerous because parity information is not included and a data error during the data input is not detected.

	#7	#6	#5	#4	#3	#2	#1	#0
11505								ISU

[Input type] Setting input
[Data type] Bit
ISU
0 : Output with ASCII code.
1 : Output with ISO code. (USB memory)

> ⚠ **WARNING**
> 1 Unless data is input using ASCII codes, set this parameter to 1 to input or output data using ISO codes.
> 2 Data input/output with ASCII codes is dangerous because parity information is not included and a data error during the data input/output is not detected.

19.1.2.2 Outputting CNC parameters

1 Enter EDIT mode or the emergency stop condition.
2 Press function key SYSTEM and soft key [PARAM] to select a program text.
3 Press soft key [(OPRT)] and continuous menu key ▷.
4 Press soft key [F OUTPUT] and [EXEC], and the parameters are started to be output.

19.1.2.3 Outputting pitch error compensation amount

1 Select EDIT mode.
2 Press function key SYSTEM and ▷ several times, then press [PITCH] to select the pitch error compensation setting screen.
3 Press soft key [(OPRT)] and function menu key ▷.
4 Press soft key [F OUTPUT] and [EXEC], then pitch error compensation amount is started to be output.

19.1.2.4 Outputting custom macro variable values

If the system is equipped with the custom macro function, values of variable No. 500 and later are output.
1 Select EDIT mode.
2 Press function key OFS SET.
3 Press function menu key ▷ and soft key [MACRO] to select custom macro variable screen.
4 Press soft key [(OPRT)] and then continuous menu key ▷.
5 Press soft key [F OUTPUT] and [EXEC], then custom macro variable values are output.

19.1.2.5 Outputting tool compensation amount

1 Select EDIT mode.
2 Press function key OFS SET and soft key [OFFSET] to display the tool compensation amount screen.
3 Press soft key [(OPRT)] and then continuous menu key ▷.
4 Press soft keys [F OUTPUT] and [EXEC], and the tool compensation amount is started to be output.

19.1.2.6 Outputting part program

1 Confirm the following parameters. If this parameter is set to 1, rather than the value indicated by (*), change to MDI mode and then reset to 0.

However, if you changed the parameter setting, restore the original value after finishing this work.

	#7	#6	#5	#4	#3	#2	#1	#0
3202				NE9				NE8

[Input type] Parameter input
[Data type] Bit
NE9
0 : Programs of 9000s are edited. (*)
1 : Programs of 9000s can be protected. (Protected programs are not output.)
NE8
0 : Programs of 8000s are edited. (*)
1 : Programs of 8000s can be protected. (Protected programs are not output.)

2 Select EDIT mode.
3 Press function key PROG and press soft key [PRGRM] to display program text.
4 Press soft key [(OPRT)] and then continuous menu key ▷.
5 Input a program number to be output. To output all programs input as:
O - 9 9 9 9
6 Press soft keys [F OUTPUT] and [EXEC], then program output is started.

19.1.2.7 Inputting CNC parameters

1 Set to the emergency stop state.
2 Confirm that the parameters required to input data is correct.
In addition, (*) indicates the standard setting for input/output devices made by FANUC. Change these settings according to the unit you actually use.
<1> Press function key OFS/SET several times, and press [SETING] to display SETTING screen.
<2> Confirm that PARAMETER WRITE=1.
<3> Press function key SYSTEM and press soft key [PARAM] to display parameter screen.
<4> Set the following parameters:

0020	Selection of I/O channel

[Input type] Setting input
[Data type] Byte
0 : Channel 1 (JD56A of main board) (*)
1 : Channel 1 (JD56A of main board)
2 : Channel 2 (JD36A of main board)
4 : Memory card interface
17 : USB memory interface

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2

[Input type] Parameter input
[Data type] Bit
NFD
0 : Feed is output when punching out.
1 : Feed is not output when punching out.
ASI
0 : EIA or ISO code is used.
1 : ASCII code is used at data input.

> **NOTE**
> When ASCII code is used for data input/output (ASI = 1), set bit 1 (ISO) of parameter No.0000 to 1.

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SB2
- 0 : Number of stop bits is 1.
- 1 : Number of stop bits is 2. (*)

0102	Specification number of input/output device

[Input type] Parameter input
[Data type] Byte

Setting value	Input/output device
0	RS232-C (Used control codes DC1 to DC4)
1	FANUC CASSETTE ADAPTOR 1 (FANUC CASSETTE B1/B2)
2	FANUC CASSETTE ADAPTOR 3 (FANUC CASSETTE F1)
3	FANUC PROGRAM FILE Mate, FANUC FA Card Adaptor, FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File, FANUC SYSTEM P-MODEL H
4	RS232-C (Not used control codes DC1 to DC4)
5	Portable tape reader
6	FANUC PPR FANUC SYSTEM P-MODEL G, FANUC SYSTEM P-MODEL H

0103	Baud rate (set transfer rate)

[Input type] Parameter input
[Data type] Byte

1:	50	5:	200	9:	2400	
2:	100	6:	300	10:	4800	(*)
3:	110	7:	600	11:	9600	
4:	150	8:	1200	12:	19200	[BPS]

3 Press continuous menu key [▷].
4 Press soft keys [F INPUT] and [EXEC]. Then input of parameters are started.
5 Upon completion of parameter input, turn off the power then turn on the power again.
6 Alarm DS0300, “APC ALARM: NEED REF RETURN” is issued if the system employs an absolute pulse coder. In such a case, perform reference position return again.

19.1.2.8 Inputting pitch error compensation amount

1 Release the emergency stop and select EDIT mode.
2 Confirm that PARAMETER WRITE=1 on the setting screen.
3 Press function key [PROG] and soft key [PRGRM] to display program contents.
4 Press function key [SYSTEM] several times, soft key [PARAM], [▷], and [PITCH] to select the setting screen for pitch error compensation amount.
5 Press function key [SYSTEM] and [▷] several times, then press [PITCH] to select the setting screen for pitch error compensation amount.
6 Press soft key [(OPRT)] and [▷] key.
7 Press soft keys [F INPUT] and [EXEC], then the pitch error compensation amount is started to be input.
8 After data has been input, press function key [OFS/SET] twice to display the SETTING screen and return the PARAMETER WRITE to 0.

19.1.2.9 Inputting custom macro variable values

(*) If the system is equipped with the custom macro function, input the variable values.

1. Select EDIT mode.
2. Press function key then soft key [PRGRM] to display program contents.
3. Press function key and press several times and then press [MACRO] to select the custom macro variable setting screen.
4. Press soft key [(OPRT)] and then the key.
5. Press soft key [F INPUT] and then the [EXEC] key, and the input of custom macro variable values will start.

19.1.2.10 Inputting tool compensation amount

1. Select EDIT mode.
2. Turn off the program protect (KEY=1).
3. Press function key , and soft key [OFFSET] to display the tool compensation amount screen.
4. Press soft key [(OPRT)] and key.
5. Press soft keys [F INPUT] and [EXEC], then data input is started.

19.1.2.11 Inputting part programs

Confirm the following parameters. If the setting is different from the value indicated by (*), reset to the specified value only during this work. (Change it in MDI mode).

	#7	#6	#5	#4	#3	#2	#1	#0
3201		NPE					RAL	

[Input type] Parameter input
[Data type] Bit

NPE When programs are registered in part program storage area, M02, M30 and M99 are:
- 0 : Regarded as the end of program.
- 1 : Not regarded as the end of program. (*)

RAL When programs are registered:
- 0 : All programs are registered. (*)
- 1 : Only one program is registered.

	#7	#6	#5	#4	#3	#2	#1	#0
3202				NE9				NE8

[Input type] Parameter input
[Data type] Bit

NE9
- 0 : Programs of 9000s can be edited. (*)
- 1 : Programs of 9000s are protected.

NE8
- 0 : Programs of 8000s can be edited. (*)
- 1 : Programs of 8000s are protected.

(*) For PPR, item 4 is not required.

1. Confirm that mode is EDIT mode.
2. Turn off the program protect (KEY3=1).
3. Press function key and press soft key [PRGRM] to select a part program file.
4. Press soft keys [F INPUT] and [EXEC], then data input is started.

19.1.3 Input/Output on the ALL IO Screen

Just by using the ALL IO screen, you can input programs, parameters, offset data, pitch error compensation data, macro variables, workpiece coordinate system data, operation history data, and tool management data from an external I/O device and output them to the device.

> ⚠ **CAUTION**
> While an external I/O device is being accessed, do not turn the power to the CNC off or remove the device, or the device may be damaged.

> **NOTE**
> The ALL IO screen can be operated only if a memory card or USB memory is selected as an external I/O device. Use NC parameter No. 20 to select an external I/O device.

The following explains how to display the ALL IO screen:

Displaying the ALL IO screen

Procedure

1 Press function key 

.

2 Press the continuous menu key  several times.

3 Press soft key [ALL IO] to display the ALL IO screen.

The subsequent steps to select data from the ALL IO screen will be explained for each type of data.

19.1.3.1 Inputting/outputting a program

A program can be input and output using the ALL IO screen.

Inputting a program

Procedure

1 Press soft key [PRGRM] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)].
4 Press soft key [N INPUT].
5 Set the name of the file that you want to input.
Type a file name, and press soft key [F NAME].
If the input file name is omitted, default file name "ALL-PROG.TXT" is assumed.
6 Set the program number to be used after the input.
Type a program number, and press soft key [P SET].
If the program number is omitted, the program number in the file is used directly.
7 Press soft key [EXEC].
This starts reading the program, and "INPUT" blinks in the lower right part of the screen. When the read operation ends, the "INPUT" indication disappears.
To cancel the input of the program, press soft key [CANCEL].

Outputting a program

Procedure

1 Press soft key [PRGRM] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)].
4 Press soft key [F OUTPUT].
5 Set the program that you want to output.
Type a program number, and press soft key [P SET].
If O-9999 is typed, all programs in the memory are output.
6 Set the file name to be output.
Type a file name, and press soft key [F NAME].
When no file name is set, the output file name is assumed to be "O-number" if a single program number is specified; if O-9999 is specified, the output file name is assumed to be "ALL-PROG.TXT".

7 Press soft key [EXEC].
This starts outputting the program, and "OUTPUT" blinks in the lower right part of the screen. When the read operation ends, the "OUTPUT" indication disappears.
To cancel the output of the program, press soft key [CANCEL].

19.1.3.2 Inputting/outputting parameters

Parameters can be input and output using the ALL IO screen.

Inputting parameters

Procedure

1 Press function key .
2 Press soft key [SETING].
3 Enter 1 in response to the prompt for “PARAMETER WRITE” in setting data. Alarm SW0100 appears.
4 Press soft key [PARAM] on the ALL IO screen.
5 Select EDIT mode.
6 Press soft key [(OPRT)].
7 Press soft key [N INPUT].
8 Set the name of the file that you want to input.
Type a file name, and press soft key [F NAME].
If the input file name is omitted, default input file name "CNC-PARA.TXT" is assumed.
9 Press soft key [EXEC].
This starts reading the parameter, and "INPUT" blinks in the lower right part of the screen. When the read operation ends, the "INPUT" indication disappears.
To cancel the input of the parameter, press soft key [CANCEL].
10 Press function key .
11 Press the chapter selection soft key [SETING].
12 Enter 0 in response to the prompt for “PARAMETER WRITE” in setting data.
13 Turn the power to the CNC back on.

Outputting parameters

Procedure

1 Press soft key [PARAM] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)].
4 Press soft key [F OUTPUT].
5 Set the file name to be output.
Type a file name, and press soft key [F NAME].
If the file name is omitted, default file name "CNC-PARA.TXT" is assumed.
6 Press soft key [EXEC].
This starts outputting the program, and “OUTPUT” blinks in the lower right part of the screen. When the read operation ends, the “OUTPUT” indication disappears.
To cancel the output of the parameter, press soft key [CANCEL].

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19.1.3.3 Inputting/outputting offset data

Offset data can be input and output using the ALL IO screen.

Inputting offset data

Procedure

1 Press soft key [OFFSET] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)].
4 Press soft key [N INPUT].

5 Set the name of the file that you want to input.
Type a file name, and press soft key [F NAME].
If the input file name is omitted, default input file name "TOOLOFST.TXT" is assumed.
6 Press soft key [EXEC].
This starts reading the offset data, and "INPUT" blinks in the lower right part of the screen. When the read operation ends, the "INPUT" indication disappears.
To cancel the input of the offset data, press soft key [CANCEL].

Outputting offset data

Procedure

1 Press soft key [OFFSET] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)].
4 Press soft key [F OUTPUT].
5 Set the file name to be output.
Type a file name, and press soft key [F NAME].
If the file name is omitted, default file name "TOOLOFST.TXT" is assumed.
6 Press soft key [EXEC].
This starts outputting the offset data, and "OUTPUT" blinks in the lower right part of the screen. When the read operation ends, the "OUTPUT" indication disappears.
To cancel the output of the offset data, press soft key [CANCEL].

19.1.3.4 Inputting/outputting custom macro common variables

Custom macro common variables can be input and output using the ALL IO screen.

Inputting custom macro common variables

Procedure

1 Press soft key [MACRO] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)].
4 Press soft key [N INPUT].
5 Set the name of the file that you want to input.
Type a file name, and press soft key [F NAME].
If the input file name is omitted, default input file name "MACRO.TXT" is assumed.
6 Press soft key [EXEC].
This starts reading the custom macro common variables, and "INPUT" blinks in the lower right part of the screen. When the read operation ends, the "INPUT" indication disappears.
To cancel the input of the custom macro common variables, press soft key [CANCEL].

Outputting custom macro common variables

Procedure

1 Press soft key [MACRO] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)].
4 Press soft key [F OUTPUT].
5 Set the file name to be output.
Type a file name, and press soft key [F NAME].
If the file name is omitted, default file name "MACRO.TXT" is assumed.
6 Press soft key [EXEC].
This starts outputting the custom macro common variables, and "OUTPUT" blinks in the lower right part of the screen. When the read operation ends, the "OUTPUT" indication disappears.
To cancel the output of the custom macro common variables, press soft key [CANCEL].

19.2 MEMRY CARD SLOT

19.2.1 Overview

In the case of the LCD-mounted type, memory card slot is in front of the LCD unit.
See the following table:

Hardware configuration	Card slot on LCD unit	Card slot on control unit
Type 1	Provided	No card slot

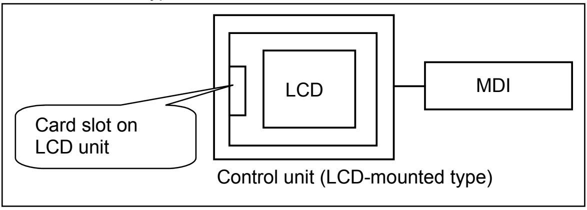
(Supplementary)

- See Subsection 19.2.2. about hardware configuration.

19.2.2 Hardware Configuration

- **Type 1**

LCD-mounted type



19.3 BOOT SYSTEM

19.3.1 Overview

The boot system load the CNC system software (Flash ROM → DRAM), then starts it so that software can be executed.
The boot system provides the following maintenance functions for the CNC:

(1) Registering a file in Flash ROM
A file is read from the FAT16-formatted memory card and written to the Flash ROM.
(A FAT32-formatted memory card cannot be recognized.)
(2) Checking a file (series and edition) in Flash ROM
(3) Deleting a file from Flash ROM
(4) Deleting a file from Memory card
(5) Saving a file in Flash ROM to a Memory card
(6) Batch saving and restoration of files of parameters and programs backed up by battery (SRAM area), to and from a Memory card
(7) Formatting of a Memory card

This section describes the activation of the boot system, as well as the screen displays and operation for the functions listed above.

> ⚠ **CAUTION**
> 1 This control unit supports the use of a Memory card as an input/output device. The Flash ATA card is available:
> See the order list for details of the supported Memory card types.
> 2 On a Memory card, only those files that are in the root directory can be accessed for display, reading, and writing. Those in subdirectories cannot be used.
> 3 The time required to read or write each data item varies depending on the Memory card type, the status of use, and other factors.
> 4 For Flash ATA cards, only those recommended by FANUC are available.
> 5 When formatting a Flash ATA card, use the quick formatting method, which clears the file allocation table and the directory information on the root directory. An unformatted Flash ATA card needs to be formatted in FAT16 with a PC or the like. (A FAT32-formatted ATA card cannot be recognized.)

19.3.1.1 Displaying the power ON sequence

```
(1) RAM TEST :END
(2) ROM TEST :END [60W6A]
(3) DRAM ID  :xxxxxxxx
(4) SRAM ID  :xxxxxxxx
(5) FROM ID  :xxxxxxxx



    *** MESSAGE ***
(7) LOADING CNC DATA-1      xxxxxx/xxxxxx
    END
```

```
    RAM TEST :END
(2) ROM TEST :ERROR
```

Processing is stopped in the event of an error

```
    *** MESSAGE ***
(6) ROM PARITY ERROR:NC BASIC. HIT SELECT.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

SELECT key → SYSTEM MONITOR

Details of display items

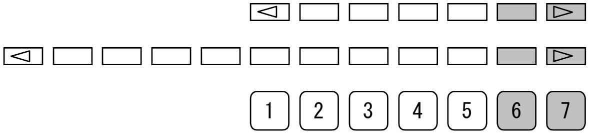
(1) WORK RAM test results are displayed. In the event of an error, however, the sequence is not displayable, and LED indication is conducted without error display.
(2) BOOT ROM parity test results are displayed. During normal operation, the series and edition are displayed. In the event of an error, processing is stopped.
(3) The ID of the DRAM MODULE installed in the CNC is displayed.
(4) The ID of the SRAM MODULE installed in the CNC is displayed.
(5) The ID of the FROM MODULE installed in the CNC is displayed.
(6) The CNC BASIC software in Flash ROM is checked for validity and, in the event of an error, an error is displayed. In the event of an error, clicking the [SELECT] soft key allows you to select the SYSTEM MONITOR screen.
(7) This message indicates that the CNC BASIC software is being transferred to Flash ROM to DRAM.

19.3.1.2 Starting the boot system

In ordinary system activation, the boot system automatically transfers files from Flash ROM to DRAM in the background.
The user is not aware of this operation. However, the boot system must be operated manually, from menu screen, when maintenance is to be carried out or when the Flash ROM does not contain a required file.

(1) In system maintenance, for example, to replace a file in Flash ROM
Operation :

Turn the power on by simultaneously pressing the two soft keys at the right end. If no soft keys are provided as with a touch panel, use MDI numeric keys 6 and 7.



After an FROM ID and other items are displayed on the CNC screen, releasing the key brings you to the SYSTEM MONITOR screen.

(2) When the Flash ROM does not contain a file required to start the CNC
Immediately after the CNC is turned on, the boot system starts transferring files from Flash ROM to DRAM. If, for some reason, a system file required to start the CNC is not in Flash ROM or has been destroyed, the boot system is automatically started.

19.3.1.3 System files and user files

The boot system organizes files in Flash ROM into two main groups : system files and user files. These two file types have the following characteristics :

System files

CNC and servo control software provided by FANUC

User files

PMC sequence program (ladder), P-CODE macro program, and other user-created files

19.3.2 Screen Configuration and Operating Procedure

When the boot system is first started, the MAIN MENU screen is displayed. This screen is described below :

MAIN MENU screen

```
(1)   SYSTEM MONITOR MAIN MENU     60W6 - 01

(2)    1.END
(3)    2.USER DATA LOADING
(4)    3.SYSTEM DATA LOADING
(5)    4.SYSTEM DATA CHECK
(6)    5.SYSTEM DATA DELETE
(7)    6.SYSTEM DATA SAVE
(8)    7.SRAM DATA UTILITY
(9)    8.MEMORY CARD FORMAT


      *** MESSAGE ***
(10)  SELECT MENU AND HIT SELECT KEY.

      [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title. The series and edition of the BOOT SYSTEM are displayed at the right end.
(2) Function for terminating the boot system and starting the CNC.
(3) Function for writing data to Flash ROM.
(4) Function for writing data to Flash ROM.
(5) Function for checking the edition of a file in ROM.
(6) Function for deleting a file from Flash ROM or Memory card.
(7) Function for making a backup copy of the data stored on the Memory card.
(8) Function for backing up and restoring the SRAM area
(9) Function for formatting a Memory card.
(10) Simple operating instructions and error messages are displayed.

Operating procedure

Press the soft key [UP] or [DOWN] to select the desired function. After positioning the cursor to the desired function, press the soft key [SELECT]. Before executing a function, the system my request confirmation from the operator by having him/her press the soft key [YES] or [NO].

Basic operation

Position the cursor. [UP] / [DOWN] → Select a function [SELECT] → Check the selection [YES] / [NO]

→ Execute the function → Select END → Return to original state

19.3.2.1 USER DATA LOADING/SYSTEM DATA LOADING screen

Description

The USER DATA LOADING screen is used to load ROM data from a Memory card to Flash ROM.
FANUC uses the SYSTEM DATA LOADING screen.

Screen configuration

```
(1) SYSTEM DATA LOADING
(2) MEMORY CARD DIRECTORY  (FREE[KB]:  5123)
(3)   1 PMC1.MEM      131200 2011-01-01 12:00
      2 PMC2.MEM      131200 2011-01-01 12:00
(4)   3 END

    *** MESSAGE ***
(5) SELECT MENU AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) The size of the free space of the Memory card is displayed.
(3) A list of files in the Memory card is displayed.
(4) Returning to the MAIN MENU.
(5) Message

Operating procedure

(1) Position the cursor to the file to be read from the Memory card and written to Flash ROM. Then, press the soft key [SELECT].
- A single page can list up to ten file names.
- If the Memory card contains ten or more files, the remaining files are displayed on another page.
  To display the next page, press the soft key [▷].
  To display the previous page, press the soft key [◁]. The END option is displayed on the last page.
  The END option is displayed on the last page.

(2) When you select a file from the USER DATA LOADING screen, you are prompted for confirmation.

```
SYSTEM DATA LOADING
MEMORY CARD DIRECTORY  (FREE[KB]:  5123)
  1 PMC1.MEM      131200 2011-01-01 12:00
  2 PMC2.MEM      131200 2011-01-01 12:00
  3 END


*** MESSAGE ***
LOADING OK ? HIT YES OR NO.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(3) To start loading, press the soft key [YES]. To cancel, press the soft key [NO].

```
*** MESSAGE ***
LOADING FROM MEMORY CARD xxxxxx/xxxxxx

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(4) When loading terminates normally, the system displays the following message. Press the soft key [SELECT]. If an error occurs, see Subsection 19.3.3, "Error Messages and Required Actions."

```
*** MESSAGE ***
LOADING COMPLETE.
HIT SELECT KEY.
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

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> **NOTE**
> Please do not delete, and do not write the option information file (named "OPRM INF"). When this file is written, the maintenance by FANUC is needed.

19.3.2.2 SYSTEM DATA CHECK screen

Description

This screen is used to list files in Flash ROM or Memory card, together with the corresponding numbers of management units in each file and the series and edition of the software.

Screen configuration

```
(1) SYSTEM DATA CHECK

(2)   1.FROM SYSTEM
(3)   2.MEMORY CARD SYSTEM
(4)   3.CNC BACKUP MENU
(5)   4.END

    *** MESSAGE ***
(6) SELECT MENU AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) Select the FROM SYSTEM screen.
(3) Select the MEMORY CARD SYSTEM screen.
(4) CNC BACKUP MENU is not used usually.
When the operation is necessary, FANUC explain separately.
(5) Returning to the MAIN MENU.
(6) Message

Screen configuration (FROM SYSTEM screen)

```
(1) SYSTEM DATA CHECK
    FROM DIRECTORY
(2)  21 PS0B     (0009) *
     22 PS1B     (0002) *
     23 PS2O     (0006) *
     24 DGG0SRVO(0005) *
     25 PMC1     (0001)
     26 PMCS     (0001)
(3)  27 END

    *** MESSAGE ***
(4) SELECT FILE AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) Names of files in Flash ROM The number of management units constituting each file appears in parentheses to the right of the file name. The system file displays “*”.
(3) Returning to the MAIN MENU.
(4) Message

Screen configuration (MEMORY CARD SYSTEM screen)

```
(1) SYSTEM DATA CHECK
    MEMORY CARD DIRECTORY  (FREE[KB]:  5123)
(2)   1 PMC1.MEM      131200 2011-01-01 12:00
(3)   2 PMC2.MEM      131200 2011-01-01 12:00
(4)   3 END


    *** MESSAGE ***
(5) SELECT FILE AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) The size of the free space of the Memory card is displayed.
(3) A list of files in the Memory card is displayed.
(4) Returning to the MAIN MENU.
(5) Message

Operating procedure

(1) Select either the FROM SYSTEM or MEMORY CARD SYSTEM screen.
(2) Select the file that you want to confirm (for example, “SYS1-CNC(0032)”).
(3) For the selected file, the management unit numbers are listed, together with the series and editions of the management units. After checking the listed data, select the soft key [SELECT] to return to the file selection screen.

```
(1) SYSTEM DATA CHECK
    SYS1-CNC(0032) *A
(2)   1 D6G1 001A 0000 9 D6G1 101A 0008
      2 D6G1 021A 0001 10 D6G1 121A 0009
      3 D6G1 041A 0002 11 D6G1 141A 000A
      4 D6G1 061A 0003 12 D6G1 161A 000B
      5 D6G1 081A 0004 13 D6G1 181A 000C
      6 D6G1 0A1A 0005 14 D6G1 1A1A 000D
      7 D6G1 0C1A 0006 15 D6G1 1C1A 000E
      8 D6G1 0E1A 0007 16 D6G1 1E1A 000F

    *** MESSAGE ***

    HIT SELECT KEY.
    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) The following items are displayed for each management unit:
- Series
- ROM number and edition
- Internal management-unit number

If a check result cannot be displayed, a "@" is displayed.

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19.3.2.3 SYSTEM DATA DELETE screen

Description

This screen is used to delete a user file from Flash ROM or Memory card.

Screen configuration

```
(1) SYSTEM DATA DELETE

(2)  1.FROM SYSTEM
(3)  2.MEMORY CARD SYSTEM
(4)  3.END


    *** MESSAGE ***
(5) SELECT MENU AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) Select the FROM SYSTEM screen.
(3) Select the MEMORY CARD SYSTEM screen.
(4) Returning to the MAIN MENU.
(5) Message

Screen configuration (FROM SYSTEM screen)

```
(1) SYSTEM DATA DELETE
    FROM DIRECTORY
(2)  21 PS0B     (0009) *
     22 PS1B     (0002) *
     23 PS2O     (0006) *
     24 DGG0SRVO(0005) *
     25 PMC1     (0001)
     26 PMCS     (0001)
     27 END
(3)

    *** MESSAGE ***
(4) SELECT FILE AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) Names of files in Flash ROM
The number of management units constituting each file appears in parentheses to the right of the file name.
(3) Returning to the MAIN MENU.
(4) Message

Screen configuration (MEMORY CARD SYSTEM screen)

```
(1) SYSTEM DATA DELETE
(2) MEMORY CARD DIRECTORY  (FREE[KB]:  5123)
(3)   1 PMC1.MEM     131200 2011-01-01 12:00
      2 PMC2.MEM     131200 2011-01-01 12:00
(4)   3 END


    *** MESSAGE ***
(5) SELECT FILE AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) The size of the free space of the Memory card is displayed.
(3) A list of files in the Memory card is displayed.
(4) Returning to the MAIN MENU.
(5) Message

Operating procedure

(1) Select either the FROM SYSTEM or MEMORY CARD SYSTEM screen.
(2) Select the file you want to delete.
(3) The following message is displayed for confirmation.

```
*** MESSAGE ***
DELETE OK ? HIT YES OR NO.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(4) Click the soft key [YES] to start reading. Click soft key [NO] to cancel reading.

```
*** MESSAGE ***
EXECUTING
ADDRESS xxxx:
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(5) Upon normal termination, a message such as that shown below is displayed. Click the soft key [SELECT]. If an error occurs, see Subsection 19.3.3, “Error Messages and Required Actions.”

```
*** MESSAGE ***
DELETE COMPLETE. HIT SELECT KEY.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

19.3.2.4 SYSTEM DATA SAVE screen

Description

This screen is used to write a user file in Flash ROM to a Memory card. Only user files can be saved from Flash ROM to a Memory card. System files cannot be saved.

Screen configuration

```
(1) SYSTEM DATA SAVE
    FROM DIRECTORY
(2)  21 PS0B     (0009) *
     22 PS1B     (0002) *
     23 PS2O     (0006) *
     24 DGG0SRVO(0005) *
     25 PMC1     (0001)
     26 PMCS     (0001)
     27 END
(3)

    *** MESSAGE ***
(4) SELECT FILE AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) Names of files in Flash ROM
The number of management units constituting each file appears in parentheses to the right of the filename.
(3) Returning to the MAIN MENU.
(4) Message

Operating procedure

(1) Select the file you want to save.
(2) The system displays the following confirmation message :

```
*** MESSAGE ***
SYSTEM DATA SAVE OK ? HIT YES OR NO.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(3) To start saving, press the soft key [YES]. To cancel, press soft key [NO].

```
*** MESSAGE ***
STORE TO MEMORY CARD

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(4) When saving terminates normally, the system displays the following message. Press the soft key [SELECT]. The names of files written to the Memory card are listed. Check the file names by, for example, making a note of the list.

```
*** MESSAGE ***
FILE SAVE COMPLETE. HIT SELECT KEY.
SAVE FILE NAME : PMC1.000
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

Saving ATA PROG

A file whose file name is ATA PROG contains an NC program. Even if you want to save this file,you cannot save it on this SYSTEM DATA SAVE screen, because it is saved together with SRAM data on the SRAM DATA UTILITY screen.

Others (System files and user files on SYSTEM DATA SAVE screen)

The SYSTEM DATA SAVE function provides a safeguard against free copying of the system files.
User files, however, are not protected.
Files saved from Flash ROM to a Memory card have the following names :

Header ID in Flash ROM		File name in Memory card
PMC1	→	PMC1.xxx
PD010.5M	→	PD0105M.xxx
PD011.0M	→	PD0110M.xxx

"xxx" is replaced by one of 32 numbers "000", "001", ,,, and "031".
For example, if you attempt to save the file "PMC1" from Flash ROM to a Memory card, it will be saved with a name of "PMC1.000" if no file with a name of "PMC1.000" is found on the Memory card. If, however, that file is saved to a Memory card that already contains a file named PMC1.000, the saved file is named PMC1.001. As files are added, the extension is incremented up to a maximum of PMC1.031. Any no-longer used numbers in the sequence of the extension numbers are used in as sending order. <u>If two or more files having identical names but different extension numbers are normally saved to the Memory card, check the file names displayed subsequently.</u>

19.3.2.5 SRAM DATA UTILITY screen

Description

This screen is used to collectively save and restore parameters, tool offset memory, and other data, retained after the CNC power in SRAM is turned off, to and from a Memory card.

Screen configuration

```
(1) SRAM DATA UTILITY

(2)   1.SRAM BACKUP  ( CNC -> MEMORY CARD )
      2.SRAM RESTORE ( MEMORY CARD -> CNC )
      3.AUTO BKUP RESTORE ( FROM -> CNC )
(3)   4.END
(4)   SRAM + ATA PROG FILE : (4MB)


(5)   SRAM_BAK.001

    *** MESSAGE ***
    SET MEMORY CARD NO.001
    ARE YOU SURE ? HIT YES OR NO.
    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) Menu
(3) Returning to the MAIN MENU.
(4) The SRAM file size is displayed. (Displayed after a processing option is selected.)
(5) The name of the file currently being saved or loaded is displayed. (Displayed after a processing option is selected.)

Operating procedure (Backing up data)

(1) Select "1.SRAM BACKUP" The following confirmation message is displayed. Click soft key [YES] to start backup.
(2) If the data cannot be saved entirely onto a single Memory card, a message such as that shown below is displayed. With the power still on, insert the second Memory card and click the soft key [YES]. Press the soft key [NO] to cancel saving.

```
*** MESSAGE ***
SET MEMORY CARD NO.002
ARE YOU SURE ? HIT YES OR NO.
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

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(3) In this way, you can divide SRAM data onto a maximum of 999 Memory card for backup.
(4) Upon the termination of backup, a message such as that shown below is displayed. Click the soft key [SELECT] to terminate the operation.

```
*** MESSAGE ***
SRAM BACKUP COMPLETE. HIT SELECT KEY.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

Operating procedure (Restoring the data)

(1) Select "2.RESTORE SRAM" The following confirmation message is displayed. Click soft key [YES] to start restoration.
(2) A message such as that shown below is displayed. Insert the first Memory card containing SRAM_BACK.001 and click the soft key [YES]. Click the soft key [NO] to cancel restoration.

```
*** MESSAGE ***
SET MEMORY CARD INCLUDING SRAM_BAK.001
ARE YOU SURE ? HIT YES OR NO.
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(3) If another Memory card is required, a message such as that shown below is displayed. With the power still on, insert the second Memory card and click the soft key [YES]. Press the soft key [NO] to cancel restoration.

```
*** MESSAGE ***
SET MEMORY CARD INCLUDING SRAM_BAK.002
ARE YOU SURE ? HIT YES OR NO.
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(4) Replace the second card with another, if required. Repeat this step until backing up all data.
(5) Upon the termination of restoration, a message such as that shown below is displayed. Click the soft key [SELECT] to terminate the operation.

```
*** MESSAGE ***
SRAM RESTORE COMPLETE. HIT SELECT KEY.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

19.3.2.6 MEMORY CARD FORMAT screen

Description

This function is used to format a Memory card. Memory cards must be formatted before they can be used for the first time or before they can be re-used after their data has been destroyed.

Operating procedure

(1) From the SYSTEM MONITOR MAIN MENU screen, select 8.MEMORY CARD FORMAT."
(2) The system displays the following confirmation message. Press the soft key [YES].

```
*** MESSAGE ***
MEMORY CARD FORMAT OK ? HIT YES OR NO.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(3) The system displays the following message asking whether to delete all data on the Memory card. To format the Memory card, press the soft key [YES].

```
*** MESSAGE ***
MEMORY CARD FORMAT OK ? HIT YES OR NO.
ALL DATA IN THE MEMORY CARD IS LOST.
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(4) The system displays the following message during formatting :

```
*** MESSAGE ***
FORMATTING MEMORY CARD.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(5) When a card has been formatted normally, the system display the following message. Press the soft key [SELECT].

```
*** MESSAGE ***
FORMAT COMPLETE. HIT SELECT KEY.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

19.3.2.7 Quitting BOOT

- Quit system monitoring.
  (1) Quit system monitoring.
    1 Using the soft key [UP] or [DOWN], position the cursor to 1. END on the SYSTEM MONITOR MAIN MENU screen.
    2 Select soft key [SELECT].

```
SYSTEM MONITOR MAIN MENU     60W6 - 01

 1.END
 2.USER DATA LOADING
 3.SYSTEM DATA LOADING
 4.SYSTEM DATA CHECK
 5.SYSTEM DATA DELETE
 6.SYSTEM DATA SAVE
 7.SRAM DATA UTILITY
 8.MEMORY CARD FORMAT


*** MESSAGE ***
SELECT MENU AND HIT SELECT KEY.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

  (2) To quit system monitoring, press soft key [YES].
- To continue the BOOT system, press soft key [NO].

NOTE
If the correct NC basic software is not written into the FROM, the system monitor screen is displayed again.

19.3.3 Error Messages and Required Actions

The following table lists and explains error messages in alphabetical order.

	Message	Description and required action
D	DEVICE ERROR (xxxx)	An attempt to write data to Flash ROM was unsuccessful. Turn the power off and back on again. If the second attempt also fails, the Flash ROM module may have been damaged or destroyed. Replace the Flash ROM module.
F	FILE CHECK ERROR (SRAM_BAK.001) HIT SELECT KEY.	SRAM backup file (SRAM_BAK.001) on the memory card is illegal. It is possible to have damaged the file.
	FILE CLOSE ERROR. HIT SELECT KEY.	Access to a Memory card failed. The Memory card may have been damaged electrically, or the Memory card may not be inserted in the slot securely.
	FILE DELETE ERROR. HIT SELECT KEY.	
	FILE OPEN ERROR. HIT SELECT KEY.	
	FILE READ ERROR. HIT SELECT KEY.	
	FILE SAVE ERROR. HIT SELECT KEY.	
	FLASH MEMORY NO SPACE. HIT SELECT KEY.	There is insufficient free Flash ROM to store the selected file. Delete any unnecessary files from Flash ROM. Alternatively, replace the Flash ROM module with another with a larger size.
I	ILLEGAL FORMAT FILE. HIT SELECT KEY.	The selected file cannot be read into Flash ROM. The selected file or the header information for Flash ROM may have been damaged or destroyed.
	ILLEGAL SRAM MODULE. HIT SELECT KEY.	The SRAM module ID is illegal. Check the drawing No. of the SRAM module.
M	MAX EXTENSION OVER. HIT SELECT KEY.	The extension number added to a file name exceeds 31 characters. Either replace the Memory card or delete any unnecessary backup files.
	MEMORY CARD DISMOUNT ERROR. HIT SELECT KEY.	Access to a Memory card failed. The Memory card may have been damaged electrically, or the Memory card may not be inserted in the slot securely.
	MEMORY CARD FORMAT ERROR	
	MEMORY CARD FULL. HIT SELECT KEY.	The Memory card is full. Delete any unnecessary files from the Memory card. Alternatively, replace the Memory card with another card having sufficient free space.
	MEMORY CARD MOUNT ERROR. HIT SELECT KEY.	The Memory card could not be accessed. Check that the Memory card has been FAT-formatted.
	MEMORY CARD NOT EXIST. HIT SELECT KEY.	The Memory card is not inserted into its slot. Check that the Memory card is pushed fully home.
	MEMORY CARD PROTECTED. HIT SELECT KEY.	Although writing to the Memory card was selected, the write inhibit switch is set. Disable the write inhibit switch.

	Message	Description and required action
	MEMORY CARD RESET ERROR. HIT SELECT KEY.	Access to a Memory card failed. The Memory card may have been damaged electrically, or the Memory card may not be inserted in the slot securely.
R	ROM PARITY ERROR:NC BASIC. HIT SELECT.	NC BASIC data is not correct. Use SYSTEM DATA CHECK to check that CNC system software is installed.
S	SRAM TEST ERROR (ECC)	An error was detected in the SRAM module. You can start up the system because data has been automatically restored. Replace the SRAM module, however, just in case that the data may be disarranged in the future.

19.4 LED DISPLAY

19.4.1 Overview

On the CNC, a 7-segment LED is installed.
The 7-segment LED indication changes according to the operating status of the CNC.
The 7-segment LED indications provided after the power is turned on until the CNC is ready for operation and when system errors occur are described below.

19.4.2 7-segment LED Indications (Turned on)

Table 19.4.2 (a) Meanings of LED indications

LED Display	Meaning
	Power not turned on (power-off state)
0	Initialization completed and ready for operation
1	CPU started up (BOOT system)
2	Initialization of G/A (BOOT system)
3	Initialization of various functions
4	Task initialization
5	System configuration parameter check Optional board waiting 2
6	Installation of various drivers All files cleared
7	Title display System ROM test
8	State where the CPU is not started after the power is turned on (BOOT system)
9	BOOT system ended, NC system started (BOOT system)
A	FROM initialization
b	Loading of embedded software
C	Loading of software for optional boards
c	IPL monitoring in progress
d	DRAM test error (BOOT system, NC system)
E	BOOT system error (BOOT system)
F	File cleared Optional board waiting 1
H	Loading of basic system software (BOOT system)
	Fan motor check in progress (BOOT system)

LED Display	Meaning
J	Optional board waiting 3 Optional board waiting 4 I/O Link waiting (I/O Link βi , Power Mate, etc.) Infinite loop of ladder program
L	Final system operation check
o	Fan motor error (BOOT system)
P	Indicator initialization (BOOT system)
U	FROM initialization (BOOT system) BOOT (NCBOOT32) of CNC with personal computer being executed
u	BOOT monitoring in progress (BOOT system)

If processing stops during startup due to a CNC error, and the system alarm screen is not displayed, take corrective action referring to Table 19.4.2(b).

Table 19.4.2 (b) Faulty regions and check items If processing stops during startup

LED display	Faulty region and check item
(all segments off)	The power supply (24V) or the power module may be faulty.
2	The main board may be faulty.
8	The main board may be faulty.
9	The main board may be faulty.
E	The main board (CPU) may be faulty.
H	The SRAM/FROM module or the main board may be faulty.
o	The fan motor in the CNC control section may be faulty.
P	The main board may be faulty.
L	The main board (CPU) may be faulty.

19.4.3 7-segment LED Indications (Blinking)

LED Display	Meaning
	Action
0	ROM PARITY error
	The SRAM/FROM module may be faulty.
2	An FROM file for program memory cannot be created.
	The state of the file for program memory on the FROM is checked with the BOOT system. Rearrange the FROM. Check the FROM size.
3	Software-detected system alarm
	If it is generated during startup: Use BOOT to check the state of the built-in software in FROM, and check the size of DRAM. In other cases: Check the error on the alarm screen and take corrective action.
4	The DRAM/SRAM/FROM ID is invalid. (BOOT system, NC system)
	The main board (CPU) or the SRAM/FROM module may be faulty.
5	A servo CPU timeout occurred.
	Check the state of servo software on the FROM with the BOOT system. The main board (Servo CPU) may be faulty.
6	An error occurred when embedded software is incorporated.
	Check the state of embedded software on the FROM with the BOOT system.
7	The indicator cannot be recognized.
	The indicator may be faulty.
8	Hardware-detected system alarm
	Check the error on the alarm screen and take corrective action.
9	Software for optional boards could not be loaded.
	Check the state of software for optional boards on the FROM with the BOOT system.
A	An error occurred in waiting for an optional board.
	The optional board or the PMC module may be faulty.
b	The BOOT FROM was updated. (BOOT system)
	Turn on the power again.
d	DRAM test error
	The main board (CPU) may be faulty.
c	The ID of the indicator is invalid.
	Check the indicator.
u	The ID of the BASIC system software does not math that of the hardware.
	Check the combination of the BASIC system software and the hardware

19.5 MAINTENANCE OF PERSONAL COMPUTER FUNCTION (BOOT AND IPL)

19.5.1 Overview

When the CNC is connected to a personal computer via HSSB using the personal computer function, you can perform maintenance of the CNC using Ncboot32.exe.
Ncboot32.exe provides the following functions:

- BOOT screen (for CNC user data maintenance, SRAM backup, and so forth)
- IPL screen (for clearing SRAM, and so forth)
- Display of the CNC power-on screen
- Display of CNC alarm screen
- Re-connection in case of the occurrence of a communication error
- Start of a registered application program
- Automatic call of the BOOT/IPL screen at the next start-up of the CNC
- Saving and restoration of auto backup data

Ncboot32.exe is copied to the System 32 folder of Windows during driver installation.
At the start of Windows, Ncboot32.exe starts automatically, and resides in the system tray.

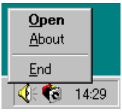
(Icon at the center)

Supplementary 1: Multi-connection Ncboot32.exe supports HSSB multi-connection. The CNCs connected by HSSB are managed as nodes. The boot, IPL, and system alarm screens are displayed in windows that are opened independently for each node.

Supplementary 2: Termination method
Normally, Ncboot32.exe need not be terminated. If you need to terminate it, however, see the "System tray" explanation, below: Display the popup menu and select "End".
When the Ncboot32.exe window is open, End cannot be selected.

System tray

Right-click the icon in the system tray, and the popup menu, shown below, appears.



Selecting [Open] causes the status screen to open.
Selecting [About] causes the version information dialog box to appear.
Selecting [End] causes Ncboot32.exe to terminate.

Double-clicking the icon in the system tray causes Open in the menu to be automatically selected.

19.5.2 Changing Start Sequences

By pressing the MDI keys 6 and 7 and turning the power ON you can perform maintenance work using the BOOT and IPL screens.

During normal operation

(1) The CNC starts without waiting for communication to be established.
(2) Initialize a work area for the FOCAS2 library.
(3) Start a registered application program.
(4) Perform monitoring for communication errors and CNC system alarms.

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During maintenance
(1) Wait until communication with the CNC is established.
(2) Display the BOOT screen.
(3) Display the IPL screen.
(4) Display the CNC power-on screen.
(5) Initialize a work area for the FOCAS2 library.
(6) Start a registered application program.
(7) Perform monitoring for communication errors and CNC system alarms.

19.5.3 Explanation of Screens

NOTE
To open each screen of Ncboot32.exe, you are recommended to use either the mouse or touch panel.

19.5.3.1 BOOT screen

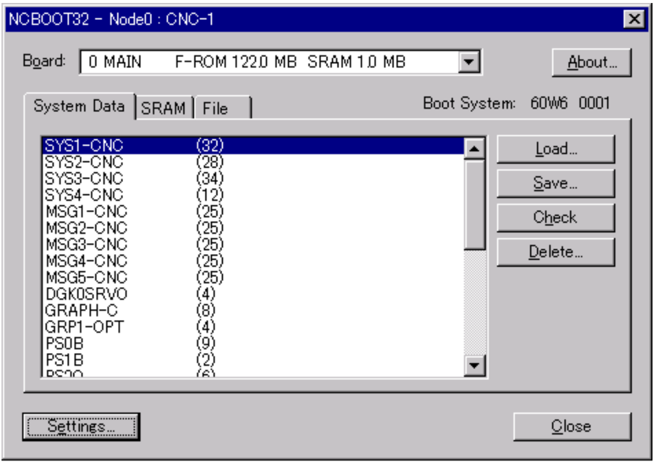

Fig.19.5.3.1 (a)

The area where the file is to be placed can be changed by using the [Setting...] button.

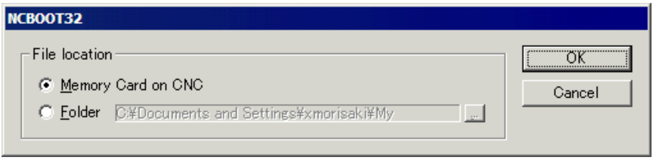

Fig.19.5.3.1 (b)

Select the memory card on the CNC or the folder on a personal computer. The file location may be changed at any time.

"Memory Card on CNC":	Specify the memory card slot of the CNC.
"Folder":	Specify a folder on the PC.

User data operation

The following screen is used for manipulating user data (including ladder programs and macro programs) on the NC.

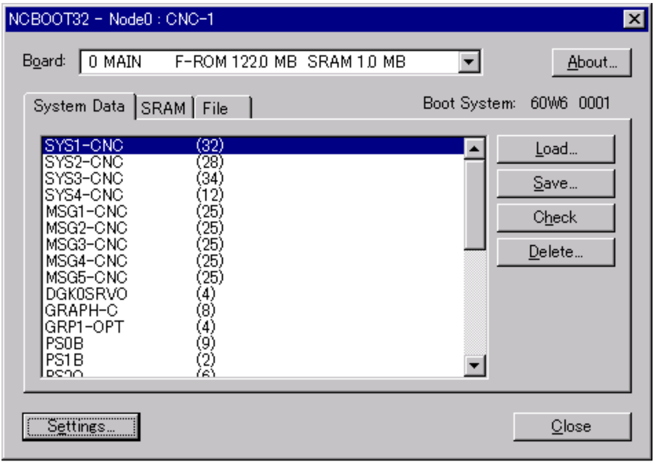

Fig.19.5.3.1 (c)

[Load...] opens the file selection screen. Specify a file to be loaded.
[Save] saves the selected NC user data in a file.
[Check] checks the contents of the selected NC system data or user data.
[Delete] deletes the selected NC user data.

SRAM operation

This screen is used to store and restore NC SRAM data.

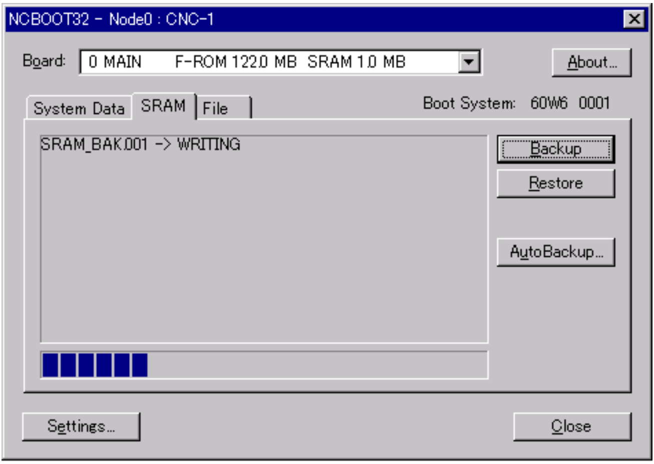

Fig.19.5.3.1 (d)

[Backup]: Saves SRAM data to a file.
[Restore]: Restore SRAM data from a file.
The progress of the operation is indicated in the lower part of the screen. The name of the backup file is automatically determined according to the SRAM size and cannot be changed.

The CNC has the function of automatically saving the data of SRAM in FROM. The personal computer can restore the data that was saved automatically to SRAM. Press the **[AutoBackup...]** button to display the following screen.

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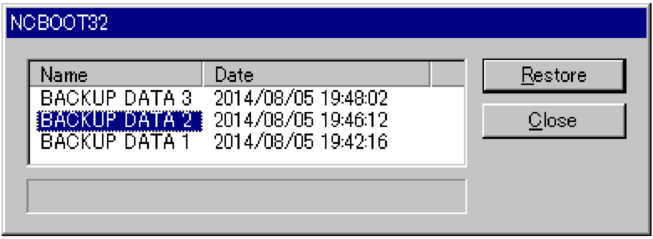


Fig.19.5.3.1 (e)

Select a saved image under **"Name"** and press the **[Restore]** button to restore the SRAM data of the CNC.

File operation

The following screen is used for operating files on a memory card in the CNC or in a folder of the personal computer.

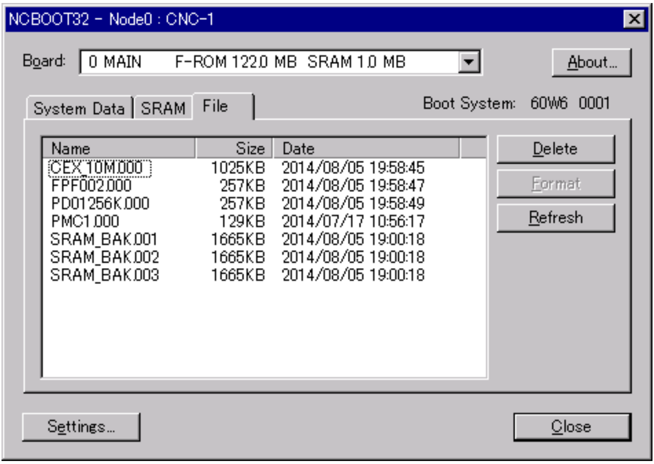


Fig.19.5.3.1 (f)

[Delete] deletes a selected file.
[Format] formats the memory card. This button is valid when the memory card is selected by [Setting...]
[Refresh] updates the file list to the latest state. After changing memory cards, click this button.

19.5.3.2 IPL screen

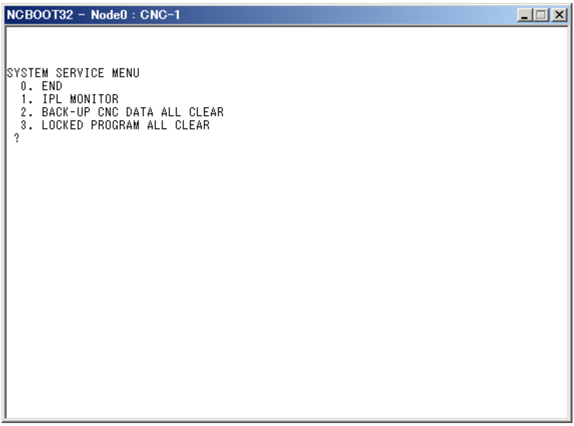


Fig.19.5.3.2

> **NOTE**
> The contents of the IPL screen vary depending on the CNC model. Follow the instructions displayed in the menu.

Functions on the IPL screen

The CNC allows functions to be performed according to the key status set at power-on.
No power-on time key operation can be performed with the personal computer function if the CNC is connected with a PC via HSSB using the PC functions.
Instead, the equivalent function on the IPL screen can be executed.
For details of the menu on the IPL screen and supported functions, see the following table.

Table 19.5.3.2

Title on IPL screen	Corresponding MDI key operation at power-on (Operation with a standard CNC)
0. EXIT	
1. IPL MONITOR	<-> + <.> (Start-up of the IPL monitor)
2. BACK-UP CNC DATA ALL CLEAR	<DELETE> + <RESET> (Memory all clear)
3. LOCKED PROGRAM ALL CLEAR	<M> + <O> (The C language executor is not temporarily started.)

19.5.4 Other Screens

19.5.4.1 CNC alarm screen

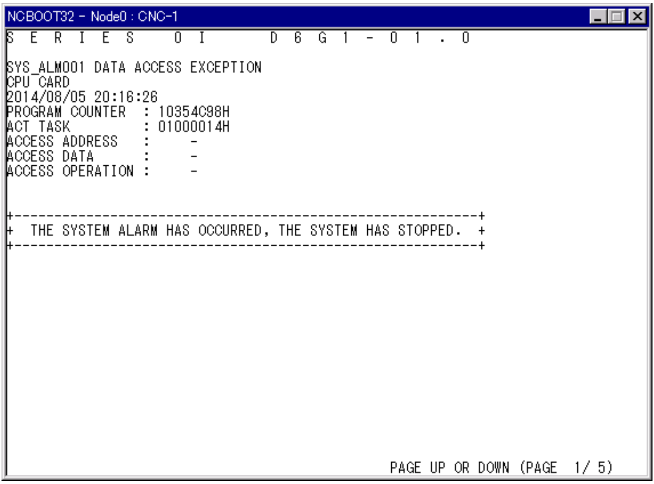


Fig.19.5.4.1

This screen appears when a system alarm is issued in the CNC. (The above screen is an example. The displayed information varies depending on the system alarm issued in the CNC.)

19.5.4.2 Status screen

To open the status screen, double-click the icon in the system tray. Alternatively, in the menu popped up by right-clicking, click “Open”.

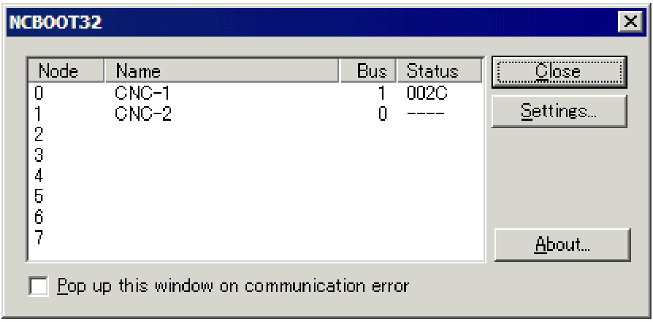


Fig.19.5.4.2

Node: Node number
Name: Node name. (Define the node name in advance by using the HSSB applet on the control panel.)
Bus: Hardware communication status
(0: Communication error, 1: Communication established)
Status: Status (in hexadecimal)
Bit2: End of boot processing
Bit3: End of IPL processing
Bit4: Rotary switch position 0
Bit5: Display of 30 lines on IPL/system alarm screen
Bit7: Internal flag
Bit8: CNC system alarm
Bit9: Internal flag
Bit10: Internal flag

Pop up this window on communication error:

By checking this item, this screen is opened automatically when a communication error occurs.

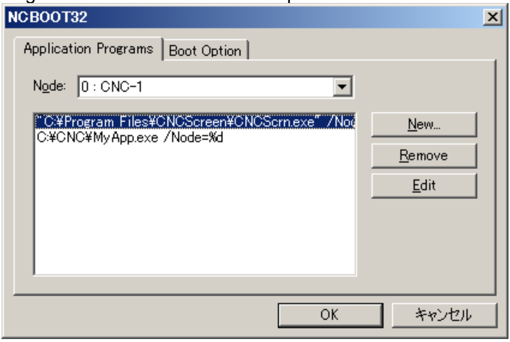
Clicking the [Close] button closes the screen.
Clicking the [Setting...] button opens the option setting screen.
Clicking the [About...] button opens the version information screen.

19.5.4.3 Option setting screen

On the option setting screen, application programs can be registered.
Any programs for use with FOCAS2 will not run unless they are started after FOCAS2 starts. By registering these programs in Ncboot32.exe, they can be executed in synchronization with the start of FOCAS2.
For the Personal computer function with Windows CE, it is possible to perform auto backup and configure MDI keys.

Option setting screen (Personal computer function with Windows XP)

Clicking the [Settings...] button on the status screen causes the option setting screen to open. On the option setting screen, an application must be registered with each node that requires it.



[Node] selects a node. In the list box in the center of the screen, the programs registered for the selected node are displayed.
[New...] registers a new program. When a blank character is included in the path, it is enclosed with double quotation marks.
[Remove] deletes a selected line.
[Edit] allows editing of a selected line. This button is used to edit arguments. The character string %d in the command line is replaced by a node number. To represent % itself, describe %%.
Example)

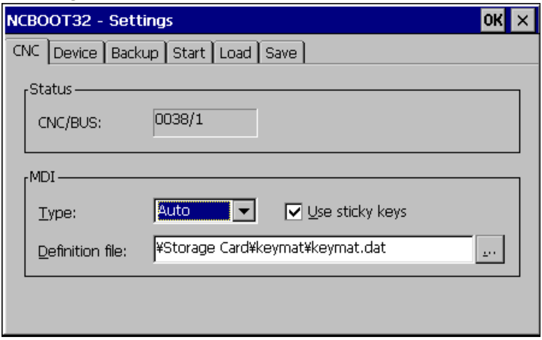
To start the CNC screen display function after FOCAS2 starts at that node, code the following:
"C:\Program Files\CNCScreen\CNCScrn.exe" /Node=%d

Option setting screen (Personal computer function with Windows CE)

To open the option setting screen, double-tap the icon in the system tray. Alternatively, select [Open] from the popup menu of the system tray.

NOTE
For any changes made on the option setting screen of the Personal computer function with Windows CE to take effect, you must turn the power off and back on.

- CNC setting screen



[Status]-[CNC]: Status (in hexadecimal)
- Bit2: End of boot processing
- Bit3: End of IPL processing
- Bit4: Maintenance mode (Position F)
- Bit5: Display of 30 lines on IPL/system alarm screen
- Bit7: Internal flag
- Bit8: CNC system alarm
- Bit9: Internal flag
- Bit10: Internal flag

[Status]-[Bus]:
Hardware communication status
(0: Communication error, 1: Communication established)

[MDI]-[Type] allows you to select an MDI key type.
- Auto: QWERTY MDI key type, M and T series standard MDI key type
- M series: MDI keyboard for M series
- T series: MDI keyboard for T series

Selecting [MDI]-[Use sticky keys] allows you to use the functions of the Shift, Ctrl, and Alt keys without pressing these keys in combination with other keys. For example, you can press Alt first and then 'F' instead of pressing Alt and 'F' at the same time. If you remove the check mark, you must press Alt and 'F' at the same time.
[MDI]-[Definition file] allows you to specify a customized MDI key definition file.

19.6 COLOR SETTING SCREEN

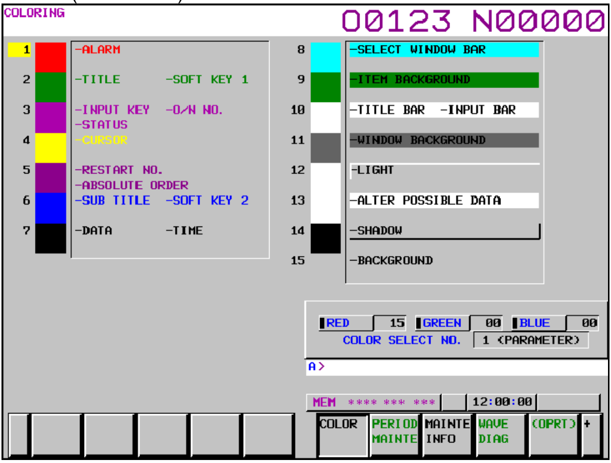
On the color setting (COLORING) screen, the colors of the VGA screen can be set.

19.6.1 Screen Display

1 Press function key .

2 Press the continuous menu key  several times until the soft key [COLOR] is displayed.

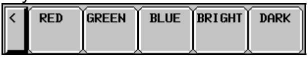
3 Pressing the soft key [COLOR] displays the color setting (COLORING) screen.



19.6.2 Operations for Color Setting

Modification to color settings (color palette values)

1 Pressing the soft key [(OPRT)] displays the following operation soft keys:



2 Move the cursor to a color number whose color palette values are to be modified.
The current color palette values of the individual color elements are displayed.

3 Select a color element to be modified, with the operation soft key [RED], [GREEN], or [BLUE].
Multiple color elements can be selected at a time.
Each of the operation soft keys [RED], [GREEN], and [BLUE] toggles between selection and deselection each time the soft key is pressed.
(The operation soft keys [RED], [GREEN], and [BLUE], when not displayed, can be displayed by pressing the rightmost soft key.)

4 By pressing the operation soft key [BRIGHT] or [DARK], modify the brightness of the selected color element.

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Storing color settings (color palette values)

Set color palette values can be stored.

1 Select a storage area by pressing the operation soft key [COLOR1], [COLOR2], or [COLOR3].

Color 1 —— Color 1 (standard color) data parameters (Nos. 6581 to 6595)

Color 2 —— Color 2 data parameters (Nos. 10421 to 10435)

Color 3 —— Color 3 data parameters (Nos. 10461 to 10475)

2 Press the operation soft key [MEMORY]. The following operation soft keys are displayed:

3 Press the operation soft key [EXEC]. The current color palette values are stored in the selected area.

Pressing the operation soft key [CAN] or the leftmost key does not store the current color palette values.

Calling color settings (color palette values)

1 Select an area for storing color palette values by pressing the operation soft key [COLOR1], [COLOR2], or [COLOR3].

(The operation soft keys [COLOR1], [COLOR2], and [COLOR3], when not displayed, can be displayed by pressing the rightmost soft key.)

2 Press the operation soft key [RECALL]. The following operation soft keys are displayed:

3 Press the operation soft key [EXEC]. Color palette values are called from the selected area for modification to the color settings. This operation is invalid if no color palette values are stored.

Pressing the operation soft key [CAN] or the leftmost key does not call color palette values.

19.7 MAINTENANCE ON THE USB FUNCTION

The USB function has maintenance screens.
On the maintenance screens, the USB memory status can be displayed and a USB memory can be formatted.

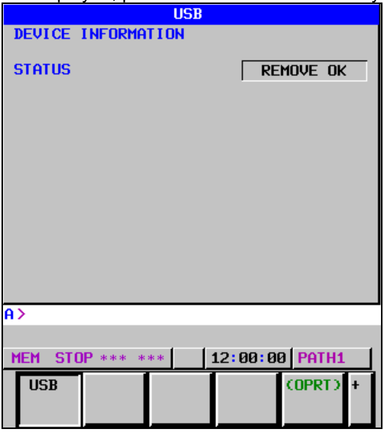
Displaying a maintenance screen

Procedure

1 Press function key 

.

2 Press soft key [USB]. The USB screen appears. (If soft key [USB] is not displayed, press the continuous menu key.)



For [STATUS], the USB memory status is displayed as listed below.

Status	Description
------	No USB memory is inserted.
REMOVE OK	A USB memory is inserted, but no data is input or output. The USB memory can be removed and data can be input and output.
ACCESSING	The USB memory is being accessed and cannot be removed.
FORMATTING	The USB memory is being formatted and cannot be removed.
FORMAT OK	Formatting the USB memory terminated normally. The USB memory can be removed and data can be input and output.
FORMAT NG	Formatting the USB memory terminated abnormally. Replace the USB memory.
ERROR	An unrecoverable error occurred. The USB function cannot be used.

⚠ **CAUTION**
While a USB memory is being formatted, do not turn the power to the CNC off or remove the USB memory, or the USB memory may be damaged.

NOTE
If [ERROR] is displayed for [STATUS], check the cause on the USB function log screen, remove the cause, and turn the power to the CNC off, then on again.

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Formatting a USB memory

Procedure

1. Press soft key [(OPRT)]. Soft key [FORMAT] is displayed.

2. Press soft keys [FORMAT], then [EXECUTE]. Formatting starts.

> ⚠ **CAUTION**
> While a USB memory is being formatted, do not turn the power to the CNC off or remove the USB memory, or the USB memory may be damaged.

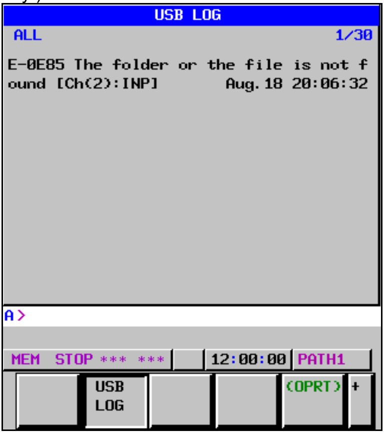
> **NOTE**
> 1 Formatting may take time depending on the capacity of the USB memory and manufacturer type. Formatting on the CNC once started cannot be canceled.
> 2 Formatting a USB memory deletes all files in the USB memory.
> 3 Any USB memory that is not physically formatted cannot be formatted on the CNC. Format a USB memory to be used for the first time with FAT or FAT32 without specifying the Quick Format option on the personal computer.

Displaying the log screen

Procedure

1. Press function key  .

2. Press soft key [USB LOG]. The USB LOG screen is displayed. (If soft key [USB LOG] is not displayed, press the continuous menu key.)



The latest error log message is displayed at the top of the screen. At the end of the error log message, the date and time when the error occurred are displayed. They are displayed in the following format: “MMM.DD hh:mm:ss” (month (MMM), day (DD), hours (hh), minutes (mm), and seconds (ss)).
In the above example, the date and time are 20:06:32 on August 18.

To clear the log, press soft keys [(OPRT)], then [CLEAR].

> **NOTE**
> For a log message, detail log message "[Ch(n):XXX]" may be output simultaneously.
> If you still have trouble, contact FANUC with the relevant log message and detail log message.

Error No.	Log message	Description and required action
E-0E02	The number of the opening files is over	Up to 60 files can be opened simultaneously.
E-0E03	The finding file is being executed	More than one file cannot be searched for simultaneously. Before a file search terminates, an attempt may be made to start another file search.
E-0E04	The searched file is not found	The file or folder specified for a search is not found in the folder with the specified full path name.
E-0E05	The drive name is wrong	Only drive A can be specified.
E-0E07	The number of the folder layers is over	Up to six folder layers can be recognized. Possible causes are: - To create or delete a folder, or obtain a list of files, a folder in the 7th layer is specified with its full path name. For example, The following full path name cannot be specified: "A:\DIR1\DIR2\DIR3\DIR4\DIR5\DIR6\DIR7" - To delete a file, rename a folder/ file, open a file, search for a file, or input/output a file, a file in the 7th layer is specified with its full path name. For example, The following full path specification is not allowed: "A:\DIR1\DIR2\DIR3\DIR4\DIR5\DIR6\DIR7\ABC"
E-0E08 E-0E09 E-0E0A	USB device is being accessed	Formatting cannot be executed. Possible causes are: - A file in the USB memory is open. [E-0E08] - A file search is in progress. [E-0E09] - The USB device is being accessed for a purpose other than above. [E-0E0A]

Error No.	Log message	Description and required action
E-0E0E E-0E0F E-0E13 E-0E14	USB device was removed when accessing	Possible causes are: - The USB device was removed while a file was open. Then, it was inserted again and file operation (such as write or close) was performed. In this case, the reliability of the file cannot be guaranteed. [E-0E0E, E-0E13] - The USB device was removed while a file search was in progress. Then, it was inserted again, the file search was continued or terminated. [E-0E0F, E-0E14]
E-0E12	(No message)	Sorting failed during file list acquisition. While a list of files was being acquired, a file or folder was possibly added or deleted using another application (such as the C Language Executor). Display the file list screen again.
E-0E40	USB device is not inserted	The USB device cannot be recognized. Possible causes are: - No USB device is inserted or an attempt was made to access the USB device before recognized. - The USB device was removed while it was being accessed.
E-0E41	USB device is being formatted	An attempt was made to operate the USB device being formatted. Operate the USB device after formatted.
E-0E80	The specified folder or file is wrong	Possible causes are: - The specified full path name begins with a “(blank)”. - The specified full path contains a nonexistent folder. - The specified full path name contains a non-ASCII code character. - The full path name specified for file open or input/output indicates an existing folder. - The full path name specified for deleting a file indicates an existing folder.
E-0E81	The file exists in the specified folder	The specified folder to be deleted contains a file.
E-0E82 E-0E83	The root folder cannot be deleted	The root folder cannot be deleted.
E-0E84	The folder or the file already exists	Possible causes are: - To rename a folder/file, the name of an existing folder/file was specified. - To open a file for writing data, the name of an existing file was specified and the file is read-only.
E-0E85	The folder or the file is not found	Possible causes are: - To delete a file or rename a folder/file, a folder/file with the specified full path name is not found. - To open a file for reading data or input a file, a file with the specified full path name is not found.

Error No.	Log message	Description and required action
E-0E86	USB device has no space	Processing cannot be continued because the capacity of the USB device is insufficient.
E-0E87	USB device is broken	The USB device cannot be recognized normally. Format the USB device with FAT or FAT32 without specifying the Quick Format option on the personal computer again before using it. If this error still occurs, replace the USB device.
E-0E88	Access is denied	Possible causes are: - The specified folder or file to be deleted is read-only. - The specified file to be deleted is open. - The specified file to be opened is already open. (An attempt was made to open an open file.) - A file opened for writing data was read. - A file opened for reading data was written.
E-0E8D	Access exceeded the file size	An attempt was made to access an invalid position for file pointer setting.
E-0F40	Overcurrent occurred	The USB device may be damaged. If this error occurs, turn the power to the CNC off, then on again. If this error frequently occurs, replace the USB device.
E-0F41	Parity Error occurred	The main board may be damaged. If this error occurs, then the power to the CNC off, then on again. If this error frequently occurs, replace the main board.
E-XXXX	(No message)	Internal error. Contact FANUC with the error number.

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Revision Record

Edition	Date	Contents
01	Oct., 2016	

B-64607EN/01

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