MELDAS Series

M700_70 Maintenance manual

USA-E99091-023 *

MITSUBISHI ELECTRIC AUTOMATION

USA

List of Revisions

Rev	Date of Revision	Detail	Author
*	12/28/11	First Edition Created	Taiwan

Introduction

(1) Read this manual thoroughly and understand the product's functions and performance before starting use.
(2) An effort has been made to describe special handling of this machine, but items that are not described must be interpreted as "not possible".
(3) The contents of this manual are subject to change without notice. Mitsubishi will not be held liable for any mistakes in the contents of this manual.
(4) If the contents of this manual are revised,the instruction manual sub-No.(*,A,B,…..) on the front of this cover will be changed.

List of related manuals

The following manuals are available for reference.

Manual names

M700 Series	Connection	Manual	(IB-1500034)
M700 Series	Specifications	Manual	(IB-1500032)
M700 Series	Setup	Manual	(IB-1500124)
M700 Series	Instruction	Manual	(IB-1500042)
M700 Series	Programming	Manual	(IB-1500072)
M700 Series	NAVI-MILL	Manual	(IB-1500144)
MELDAS MDS-D Series	Specifications	Manual	(IB-1500011)
MELDAS MDS-D Series	Instruction	Manual	(IB-1500025)
M70 Series	Connection	Manual	(IB-1500254)
M70 Series	Setup	Manual	(IB-1500154)
MDS-D-SVJ3/SPJ3 Series	Specification	Manual	(IB-1500158)
MDS-D-SVJ3/SPJ3 Series	Instruction	Manual	(IB-1500193)

Precautions for Safety

Always read the specifications issued by the machine manufacturer, this manual, related manuals and enclosed documents before installation, operation, programming, maintenance or inspection to ensure correct use. Thoroughly understand the basics, safety information and precautions of this numerical controller before using the unit.
This manual ranks the safety precautions into "**DANGER**", "**WARNING**" and "**CAUTION**".

DANGER	When there is a great risk that the user could be subject to fatalities or serious injuries if handling is mistaken.
WARNING	When the user could be subject to fatalities or serious injuries if handling is mistaken.
CAUTION	When the user could be subject to injuries or when physical damage could occur if handling is mistaken.

Note that even if the items is ranked as " **CAUTION**", incorrect handling could lead to serious results. Important information is described in all cases, so please observe the items.

DANGER
Not applicable in this manual.

WARNING
1. Items related to prevention of electric shocks ө Do not operate the switches with wet hands, as this may lead to electric shocks. ө Do not damage, apply excessive stress,place heavy things on or sandwich the cabbies, as this may lead to electric shocks.

CAUTION

1. Items related to noise

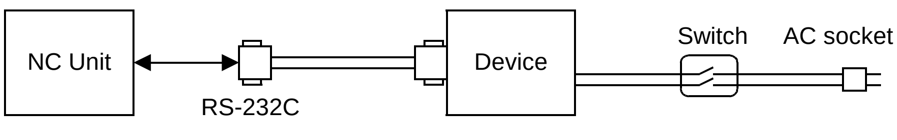
- Always treat the shield cables indicated in this manual with grounding treatment such as cable clamps.
  Separate the signal wire from the drive line/power line when wiring.

2. Items related to installation

- Install the NC Card on noncombustible material. Installation directly on or near combustible material may lead to fires.
  Always observe the installation direction.
  Do not install or operate an NC Card that is damaged or that have missing parts.
  Do not allow conductive foreign matter such as screws or metal chips or combustible foreign matter such as oil enter the NC Card.
  The NC Card are precision devices so do no drop or apply strong impacts on them.
  Do not install the NC Card where it may be subject to cutting oil.

3. Items related to connection

- Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- Incorrect connections may damage the devices, so connect the cables to the specified connectors.
- When using an inductive load such as relays, always connect a diode in parallel to the load as a noise measure.
- When using a capacitive load such as a lamp, always connect a protective resistor serially to the load to suppress rush currents.
- Do not connect or disconnect the connection cables between each unit while the power is ON.
- Do not connect or disconnect each PCB while the power in ON.
- When using an RS-232C device as a peripheral device, caution will be required when connecting and disconnecting the connector.
  Always use a double-OFF type AC power supply switch on the device side, and connect/disconnect the connector with the AC power supply on the device side OFF.



4. Items related to battery

- If the battery voltage drop warning alarm occurs, the programs, tool data and parameters could be damaged. Thus, reload each data with the input/output device after replacing the battery.
  Do not short-circuit, charge, overheat, incinerate or disassemble the battery.
  Dispose the spent battery according to local laws.

Introduction

Thank you for purchasing the Mitsubishi numeric control unit.
This manual describes the handling and caution points for using this AC servo.
Incorrect handling may lead to unforeseen accidents, so always read this instruction manual thoroughly to ensure correct usage.
Make sure that this instruction manual is delivered to the end user. Keep this manual in a safe place for future reference.

Precautions for safety

Please read this manual and auxiliary documents before starting installation, operation, maintenance or inspection to ensure correct usage. Thoroughly understand the device, safety information and precautions before starting operation.

The safety precautions in this instruction manual are ranked as “WARNING” and “CAUTION”.

WARNING	When a dangerous situation may occur if handling is mistaken leading to fatal or major injuries.
CAUTION	When a dangerous situation may occur if handling is mistaken leading to medium or minor injuries, physical damage.

Not that some items described as may lead to major results depending on the situation. In any case, important information that must be observed is described.

The numeric control unit is configured of the control unit, operation board, servo amplifier, spindle amplifier, power supply + servo drive or spindle drive, servomotor, and spindle motor, etc.

In this manual, the following items are generically called the “servomotor”.
- Servomotor
- Spindle motor

In this manual, the following items are generically called the “servo amplifier”.
- Servo amplifier
- Spindle amplifier
- Power supply + servo drive or spindle drive

Changes in terminal names

The terminal names have been changed in two stages as shown below.

	Prior to March 95	April 95 to March 96	Following April 96 (MDS-B Series)
Terminal name	R	R/L1	L1
	S	S / L2	L2
	T	T / L3	L3
	P	L+ / P	L+
	N	L- / N	L-
	Ro	L11 / Ro	L11
	So	L21 / So	L21
	G	G / ⏚	

For Safe Use

1. Electric shock prevention

WARNING
Do not open the front cover whole the power is ON or during operation. Failure to observe this could lead to electric shocks. Do not operate the unit with the front cover removed. The high voltage terminals and charged sections will be exposed, and can cause electric shocks. Do not remove the front cover even when the power is OFF unless carrying out wiring work or periodic inspections. The inside of the servo amplifier is charged, and can cause electric shocks. Wait at least 10 minutes after turning the power OFF before starting wiring or inspections. Failure to observe this could lead to electric shocks. Ground the servo amplifier and servomotor with Class 3 grounding or higher. Wiring and inspection work must be done by a qualified technician. Wire the servo amplifier and servomotor after installation. Failure to observe this could lead to electric shocks. Do not touch the switches with wet hands. Failure to observe this could lead to electric shocks. Do not damage, apply forcible stress, place heavy items or engage the cable. Failure to observe this could lead to electric shocks.

2. Fire prevention

CAUTION
Install the servo amplifier, servomotor and regenerative resistor on noncombustible material. Direct installation on combustible material or near combustible materials could lead to fires. Shut off the power on the servo amplifier side if a fault occurs in the servo amplifier. Fires could be caused if a large current continues to flow. Shut off the power with an error signal when using the regenerative resistor. The regenerative resistor could abnormally overheat and cause a fire due to a fault in the regenerative transistor, etc.

3. Injury prevention

CAUTION
Do not apply a voltage other than that specified in Instruction Manual on each terminal. Failure to observe this item could lead to ruptures or damage, etc.
Do not mistake the terminal connections. Failure to observe this item could lead to ruptures or damage, etc.
Do not mistake the polarity (+,-). Failure to observe this item could lead to ruptures or damage, etc.
Do not touch the servo amplifier fins, regenerative resistor or servomotor, etc., while the power is turned ON or immediately after turning the power OFF. Some parts are heated to high temperatures, and touching these could lead to bums.

4. Various precautions

Observe the following precautions. Incorrect handling of the unit could lead to faults, injuries and electric shocks, etc.

(1) Transportation and installation

CAUTION
Correctly transport the product according to its weight.
Use the servomotor's suspension bolts only when transporting the servomotor. Do not transport the servomotor when it is installed on the machine.
Do not stack the products above the tolerable number.
Do not hold the cables, axis or detector when transporting the servomotor.
Do not hold the connected power supply or cables when transporting the servomotor.
Do not hold the front cover when transporting the servo amplifier. The unit could drop.
Follow this Instruction Manual and install the unit in a place where the weight can be borne.
Do not get on top of or place heavy objects on the unit.
Always observe the installation directions.
Secure the specified distance between the servo amplifier and control panel, or between the servo amplifier and other devices.
Do not install or run a servo amplifier or servomotor that is damaged or missing parts.
Do not block the intake or exhaust ports of the servomotor provided with a cooling fan.
Do not let conductive objects such as screws or metal chips, etc., or combustible materials such as oil enter the servo amplifier or servomotor.
The servo amplifier and servomotor are precision devices, so do not drop them or apply strong impacts to them.

CAUTION

Store and use the units under the following environment conditions.

Environment	Conditions	
	Servo amplifier	Servomotor
Ambient temperature	0℃ to +55℃ (with no freezing)	0℃ to +40℃ (with no freezing)
Ambient humidity	To follow separate specifications	80%RH or less (with no dew condensation)
Storage temperature	To follow separate specifications	-15℃ to +70℃
Storage humidity	To follow separate specifications	90% RH or less (with no dew condensation)
Atmosphere	Indoors (Where unit is not subject to direct sunlight) With no corrosive gas, combustible gas, oil mist or dust	
Altitude	1000m or less above sea level	
Vibration	To follow separate specifications	

Securely fix the servomotor to the machine. Insufficient fixing could lead to the servomotor slipping off during operation.

Always install the servomotor with reduction gears in the designated direction. Failure to do so could lead to oil leaks.

Never touch the rotary sections of the servomotor during operations. Install a cover, etc., on the shaft.

When coupling to a servomotor shaft end, do not apply an impact by hammering, etc. The detector could be damaged.

Do not apply a load exceeding the tolerable load onto the servomotor shaft. The shaft could break.

When storing for a long time, please contact the Service Center or Service Station.

(2) Wiring

CAUTION
Correctly and securely perform the wiring. Failure to do so could lead to runaway of the servomotor. Do not install a condensing capacitor, surge absorber or radio noise filter on the output side of the servo amplifier. Correctly connect the output side (terminals U, V, W). Failure to do so could lead to abnormal operation of the servomotor. Do not directly connect a commercial power supply to the servomotor. Doing so could lead to faults. When using an inductive load such as a relay, always connect a diode as a noise measure parallel to that load. When using a capacitance load such as a lamp, always connect a protective resistor as a noise measure serial to that load. When connecting a DC relay for the control output signals such as the brake signal or contactor, do not mistake the polarity of the diode. Failure to observe this could cause the signals not to be output due to a fault or the protective circuit to fail. Do not connect/disconnect the cables connected between the units while the power is ON. Securely tighten the cable connector fixing screw or fixing mechanism. An insecure fixing could cause the cable to fall off while the power is ON. When use of a shielded cable is instructed in the connection diagrams, always ground the cable with a cable clamp, etc. Always separate the signals wires from the drive wire and power line. Use wires and cables that have a wire diameter, heat resistance and flexibility that conforms to the system. Check the cables sufficiently before wiring so that the battery unit is not mistakenly wired. The battery in the battery unit could short circuit and be charged due to incorrect wiring, and could lead to battery ignition, heating, rupture or generation of toxic gas.

(3) Trial operation and adjustment

CAUTION
Check and adjust each program and parameter before starting operation. Failure to do so could lead to unforeseen operation of the machine. Do not make remarkable adjustments and changes as the operation could become unstable.

(4) Usage methods

CAUTION
Install an external emergency stop circuit so that the operation can be stopped and power shut off immediately. Turn the power OFF immediately if smoke, abnormal noise or odors are generated from the spindle motor or spindle amplifier. Unqualified persons must not disassemble or repair the unit. Never make modifications. Reduce magnetic damage by installing a noise filter. The electronic devices used near the servo amplifier could be affected by magnetic noise. Use the spindle motor, spindle amplifier and regenerative resistor with the designated combination. Failure to do so could lead to fires or trouble. The brakes (magnetic brakes) assembled into the servomotor are for holding, and must not be used for normal braking. There may be cases when holding is not possible due to the magnetic brake's life or the machine construction (when ball screw and servomotor are coupled via a timing belt, etc.). Install a stop device to ensure safety on the machine side. After changing the parameters or after maintenance and inspection, always test the operation before starting actual operation. Do not enter the movable range of the machine during automatic operation. Never place body parts near or touch the spindle during rotation. Follow the power supply specification conditions given in the separate specifications manual for the power (input voltage, input frequency, tolerable power failure time, etc.).

(5) Troubleshooting

CAUTION
If a hazardous situation is predicted during power failure or product trouble, use a servomotor with magnetic brakes or install an external brake mechanism. Use a double circuit configuration that allows the operation circuit for the magnetic brakes to be operated even by the external emergency stop signal. Shut off with NC brake control PLC output. With a servo amplifier not provided with the EM1/EM2 output, provide double protection with the emergency stop signal (EMG). Always turn the input power OFF when an alarm occurs Never go near the machine after restoring the power after a failure, as the machine could start suddenly. (Design the machine so that personal safety can be ensured even if the machine starts suddenly.)

CONTENTS

Chapter1 : NC unit introduction

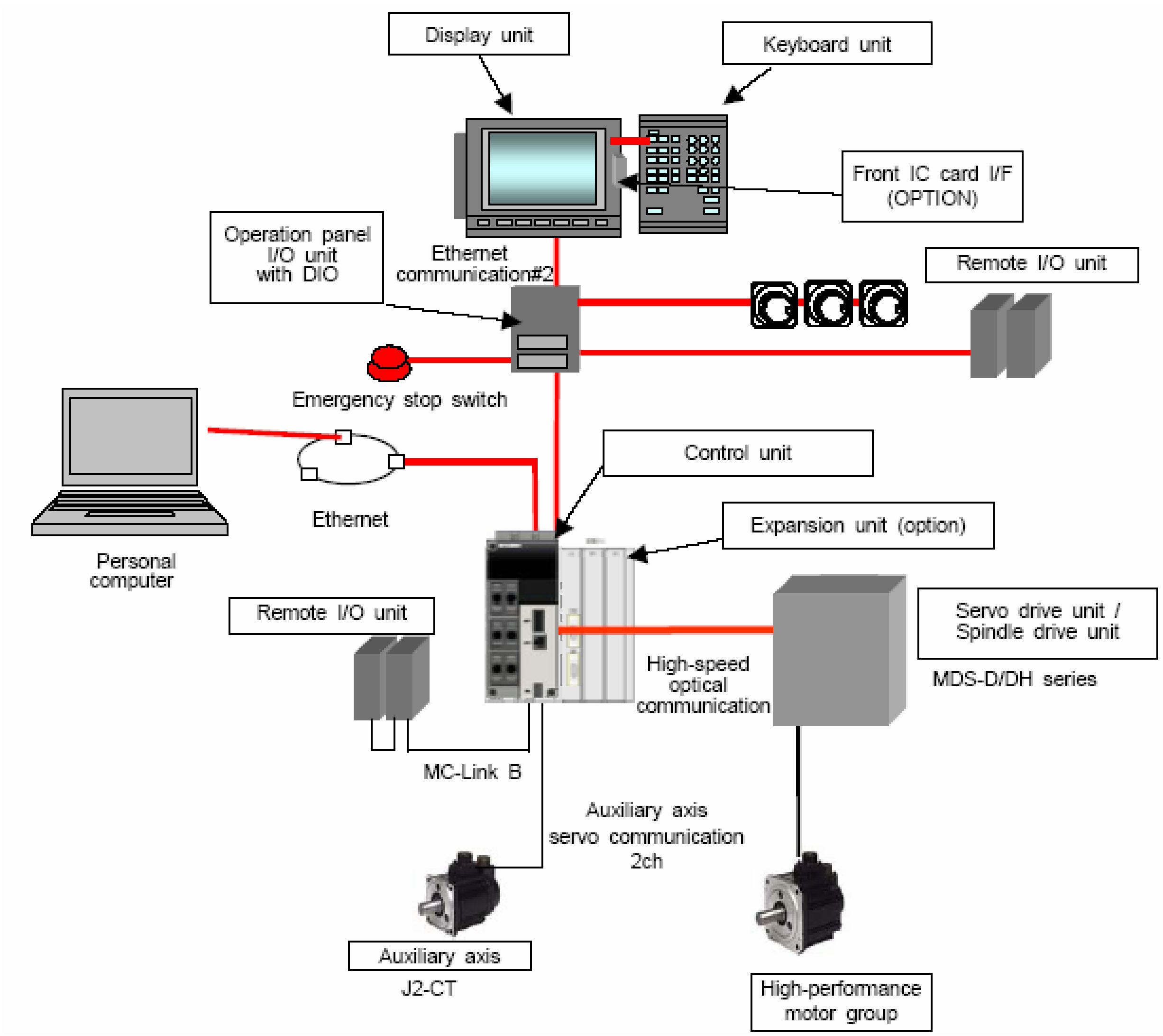
Chapter2 : SERVO UNIT INTRODUCTION

Chapter3 : Spindle unit introduction

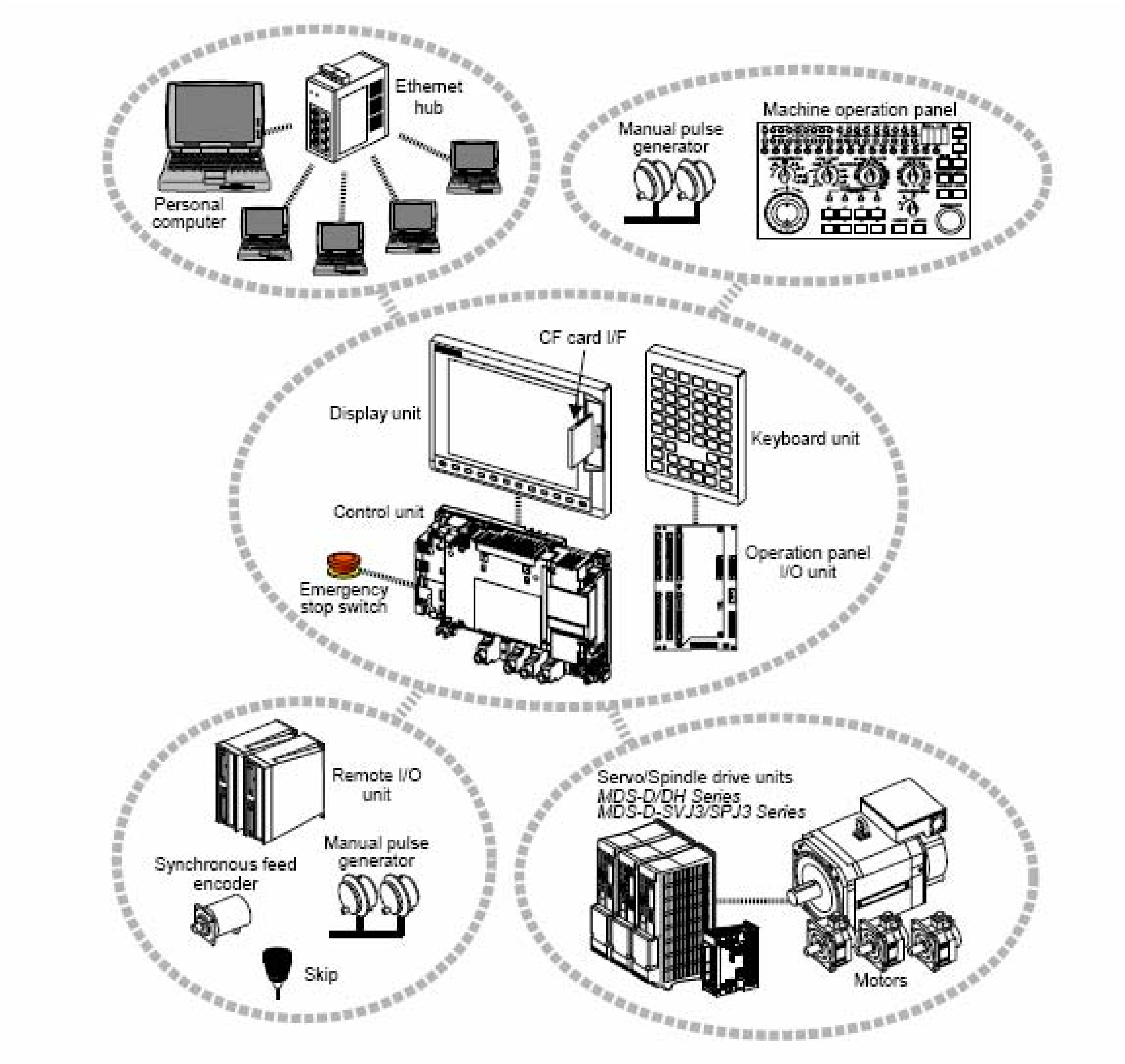
1. NC UNIT INTRODUCTION

1 Basic configuration

1.1.1 M700 Series system configuration drawing



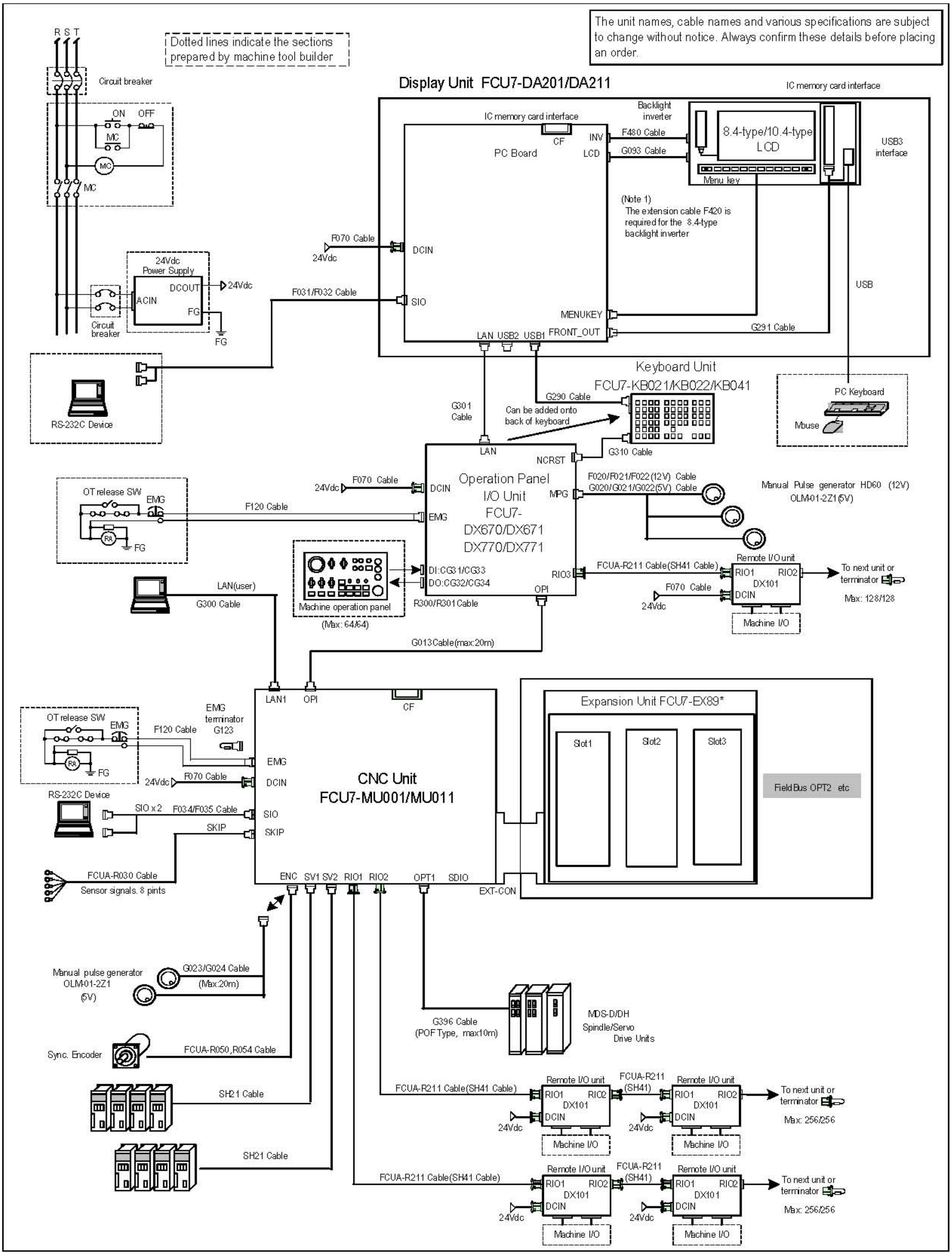
1.1.2 M70 series system configuration drawing



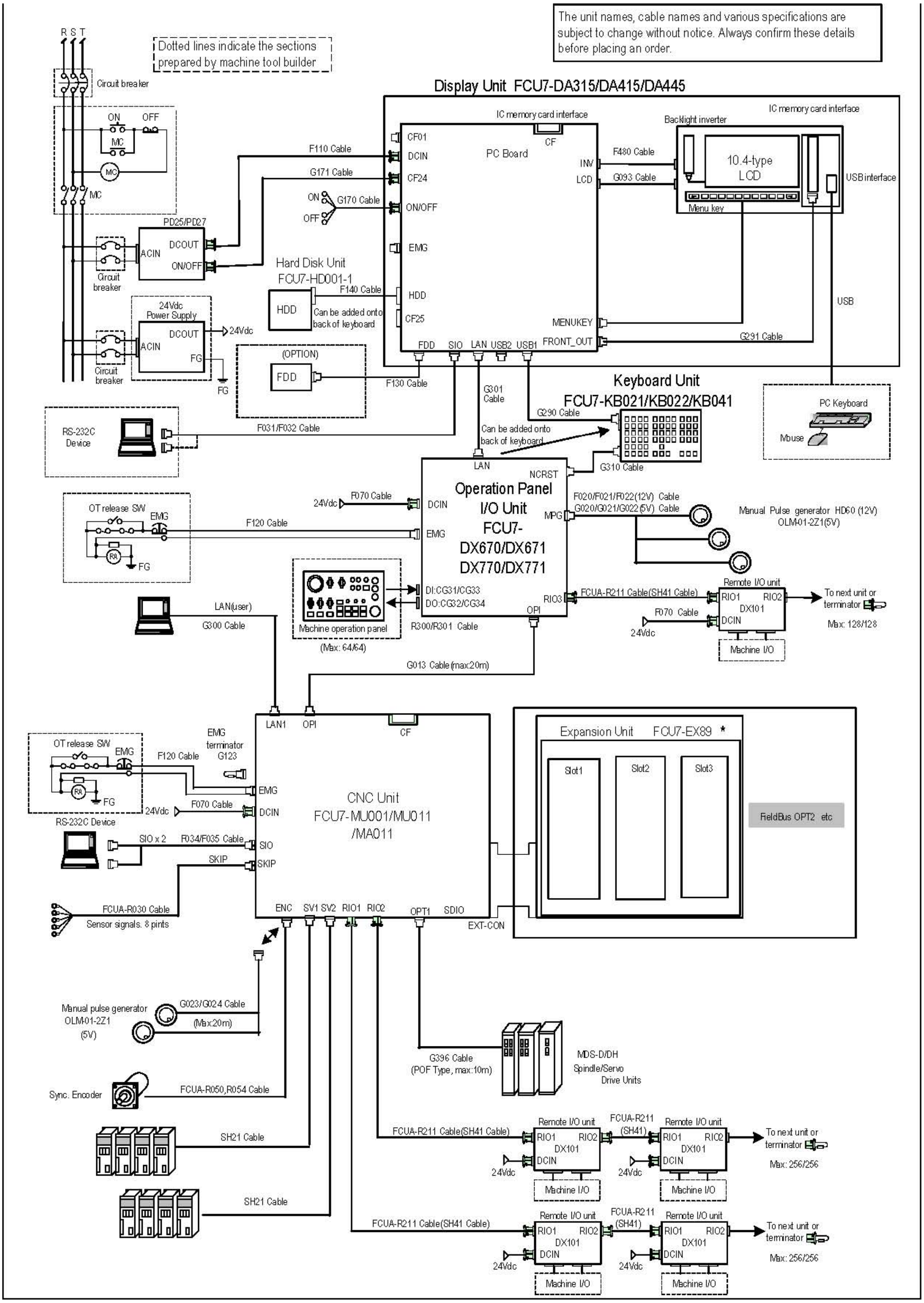
（Note 1） Control unit is mounted on the back side of the display unit with base plate.
（Note 2） Operation panel I/O unit is mounted on the back side of the keyboard unit.

1.2 General Connection Diagram

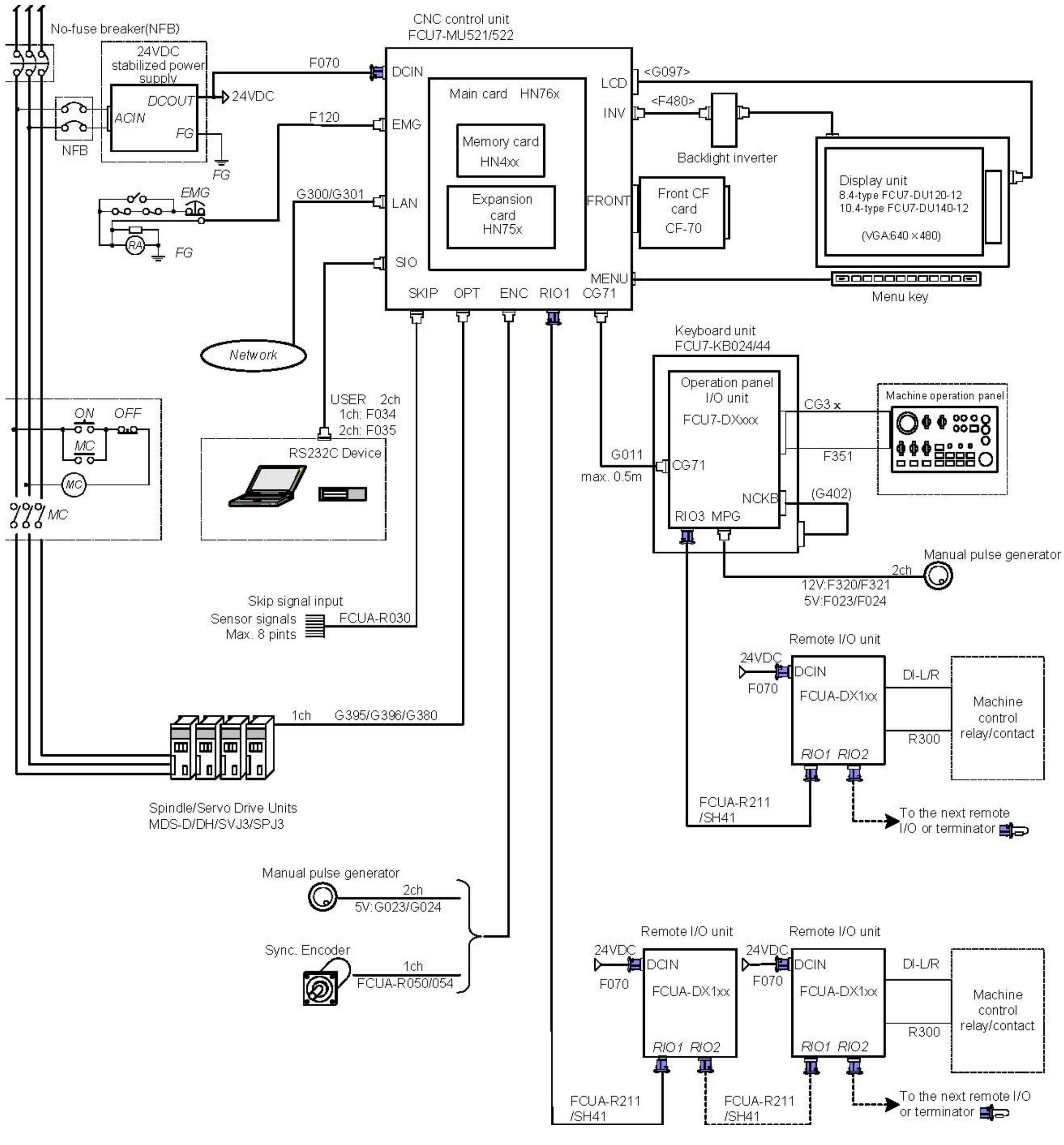
1.2.1 M700 CE display unit：FCU7-DA201-11／FCU7-DA211-11



1.2.2 M700 XP display unit：FCU7-DA315-11／FCU7-DA415-11／FCU7-DA445-11



1.2.3 **M70** General Connection Diagram



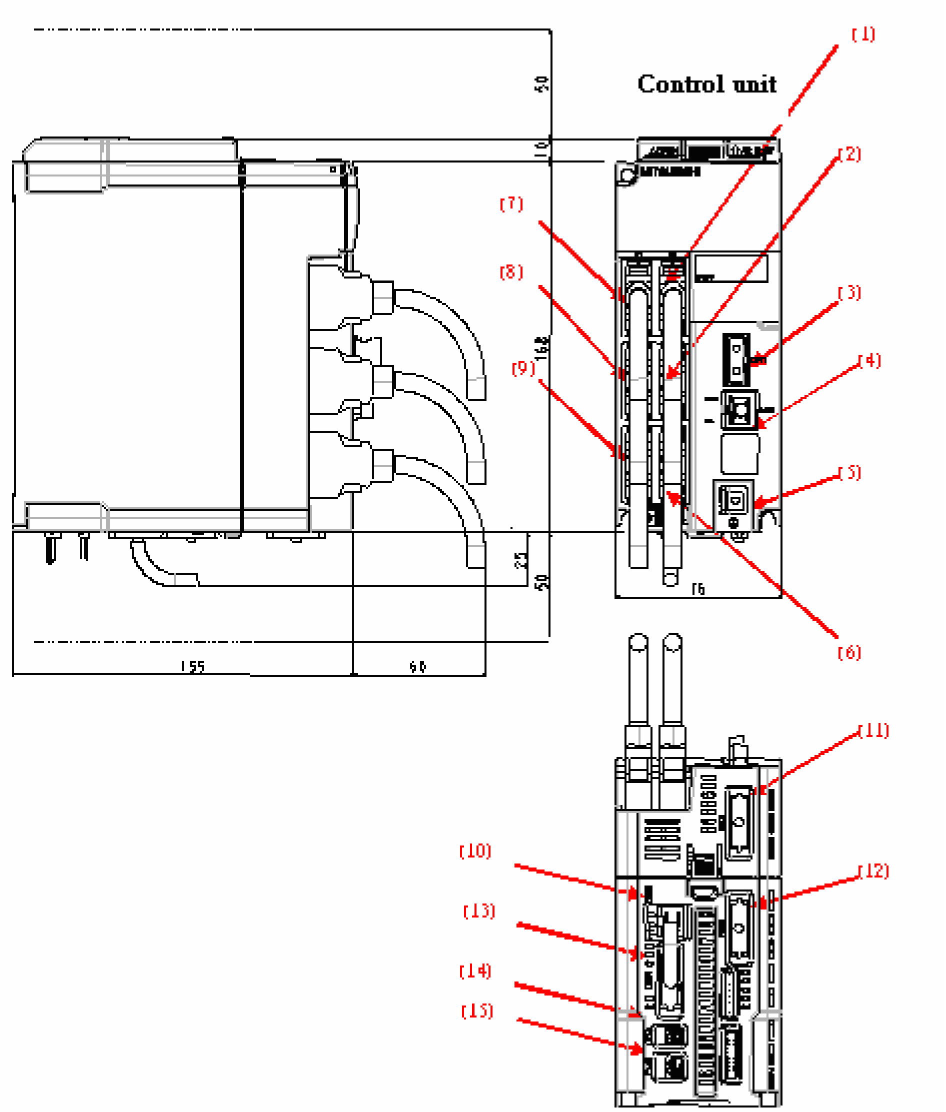
1.3 System configuration list

1.3.1 Control unit：

Type	Function	Configuration element
FCU7-MU001	M700 control unit set M720 series (M720 system compatible unit)	Main control card ― HN115 CPU card ― HN122 24V input power supply card ― HN081 Memory card ― HN482 G123 cable Case set
FCU7-MU011	M700 control unit set M730 series (M730 system compatible unit)	Main control card ― HN115 CPU card― HN123 24V input power supply card ― HN081 Memory card ― HN484 G123 cable Case set
FCU7-MA011	M700 control unit set M750 series (M750 system compatible unit)	Main control card ― HN145 CPU card ― HN123 24V input power supply card ― HN081 Memory card ― HN484 G123 cable Case set
FCU7-MU521	M70 series (NC functions and display controller)	Main control card ― (HN761) Memory card ― (HN451)
FCU7-MU522	M70 series (NC functions and display controller)	Main control card ― (HN761) Memory card ― (HN451) Expansion card ― (HN751)

1. Basic Configuration

(1) M700 series：FCU7-MU001／FCU7-MU011／FCU7-MA011



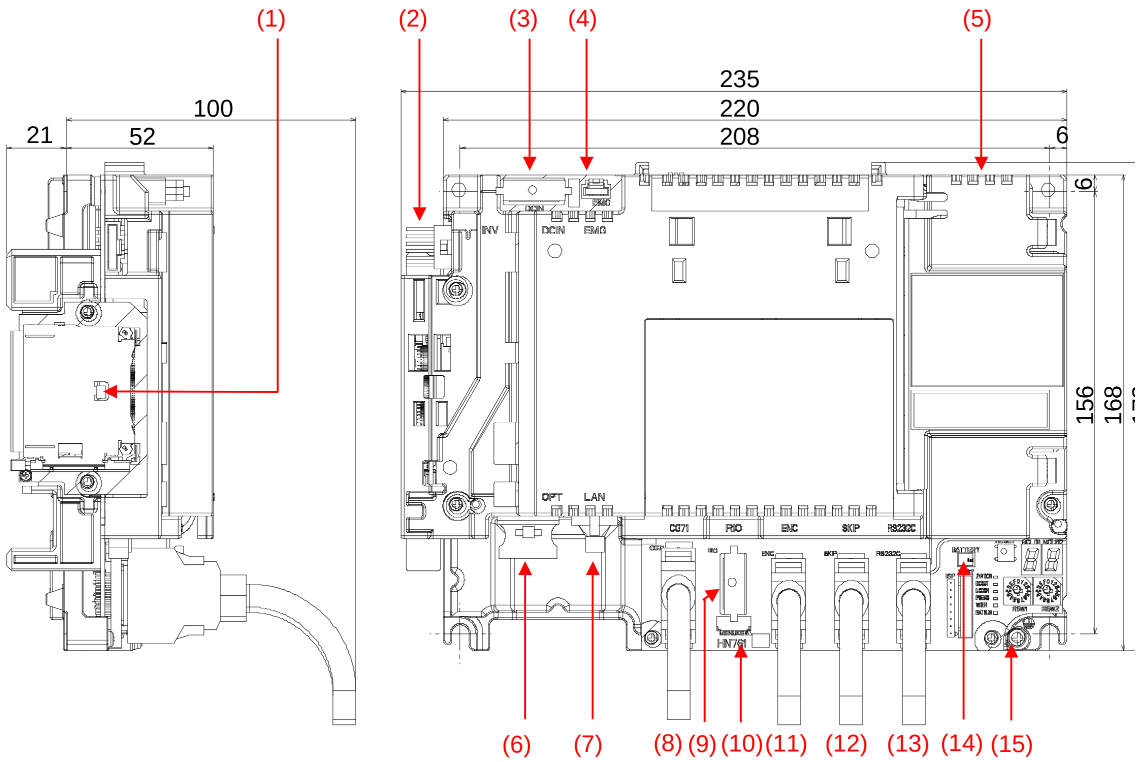
Explanation of control unit and connector functions

No.	Connec-tor name	Function
(1)	SV1	Auxiliary axis servo communication I/F
(2)	SV2	Auxiliary axis servo communication I/F
(3)	OPT1	Optical servo communication I/F
(4)	LAN1	NC LAN communication I/F
(5)	FG	Frame ground
(6)	SKIP	Skip input 8ch
(7)	OPI	Operation panel I/O unit I/F (Note 1)
(8)	SIO	RS-232C communication I/F 2ch

No.	Connec-tor name	Function
(9)	ENC	Encoder input 1ch (5V manual pulse generator input 2ch)
(10)	SDIO	Input/output I/F for safety monitoring
(11)	RIO1	Remote IO unit I/F
(12)	RIO2	Remote IO unit I/F
(13)	DCIN	24VDC input
(14)	CF01	Power OFF input
(15)	EMG	External emergency stop input (Note 2)

1. Basic Configuration

(2) M70 Sereis：FCU7-MU521／FCU7-MU522



Explanation of connector functions

No.	Connec- tor name	Function
(1)	CF	Front CF card I/F
(2)	INV	Display unit backlight Inverter connector
(3)	DCIN	24VDC input
(4)	EMG	External emergency stop input
(5)	LCD	Display unit signal connector
(6)	OPT	Optical servo communication I/F
(7)	LAN	LAN communication I/F
(8)	CG71	Operation panel I/O unit I/F

No.	Connec- tor name	Function
(9)	RIO1	Remote IO unit I/F
(10)	MENUKEY	Menu key I/F
(11)	ENC	Encoder input 1ch (5V manual pulse generator input 2ch) Skip input 8ch
(12)	SKIP	RS-232C communication I/F 2ch
(13)	SIO	Battery (Q6BAT) connector
(14)	BATTERY	FG terminal block
(15)	FG	

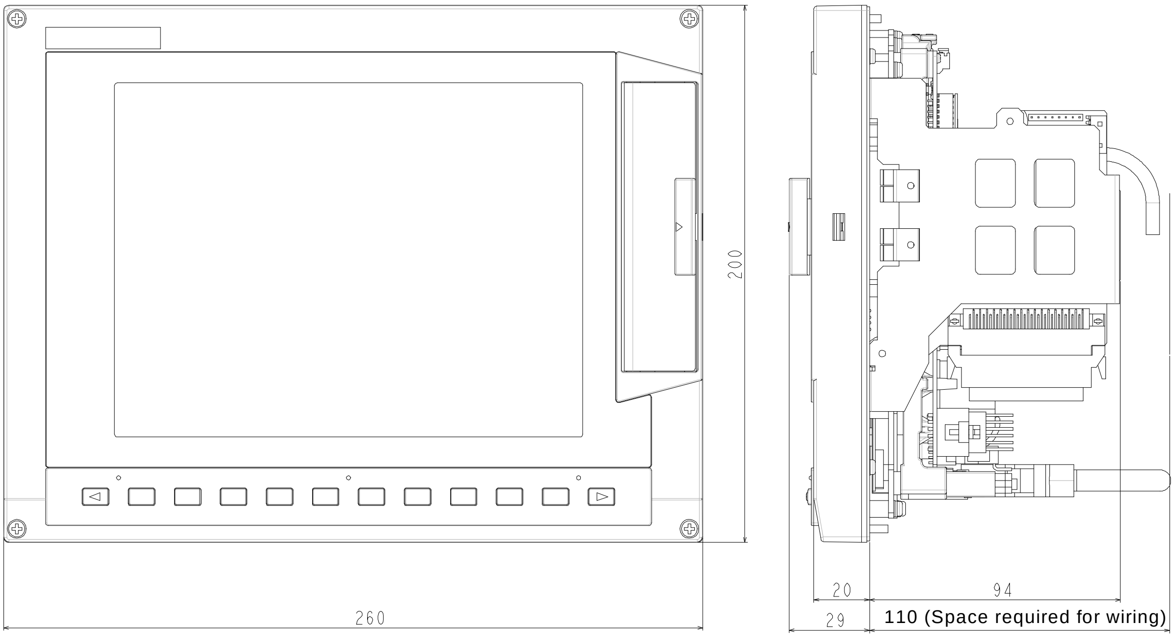
1.3.2 Display unit：

Type	Function	Configuration element	Details
FCU7-DA201-xx (M700)	8.4-type color LCD display unit Windows CE compatible (separated type)	8.4-type (VGA) LCD, Escutcheon Control card (ROD-6204-MIT1CE) G093 cable G291 cable F480 cable with front IC card (FCU7-EP102)	Control card 24VDC input Mounting method: Mount on front panel
FCU7-DA211-xx (M700)	10.4-type color LCD display unit Windows CE compatible (separated type)	10.4-type (VGA) LCD, Escutcheon Control card (ROD-6204-MIT1CE) G093 cable G291 cable F480 cable with front IC card (FCU7-EP102)	Control card 24VDC input Mounting method: Mount on front panel
FCU7-DA315-xx (M700)	10.4-type colour LCD display unit Windows XPe compatible (separated type)	10.4-type (VGA) LCD, Escutcheon Control card (MIC73M2) G093 cable G291 cable F480 cable with front IC card (FCU7-EP102)	Celeron 733MHz Control card: 24VDC input Mounting method: Mount on front panel Use PD25/PD27 for power supply
FCU7-DA415-xx (M700)	10.4-type colour LCD display unit High-performance version Windows XPe compatible (separated type)	10.4-type (VGA) LCD, Escutcheon Control card (MIP12M2) G093 cable G291 cable F480 cable with front IC card (FCU7-EP102)	Pentium III 1.26GHz Control card: 24VDC input Mounting method: Mount on front panel Use PD25/PD27 for power supply
FCU7-DA445-xx (M700)	10.4-type color LCD display unit (Wide view angle) High-performance version Windows XPe compatible (separated type)	10.4-type (VGA) LCD, Escutcheon Control card (MIP12M2) G093 cable G291 cable F480 cable with front IC card (FCU7-EP102)	Pentium III 1.26GHz Control card: 24VDC input Mounting method: Mount on front panel Use PD25/PD27 for power supply
FCU7-DU120-12 (M70)	8.4-type color TFT	LCD panel	CF card I/F is normally equipped with the control unit.
		Backlight inverter	
FCU7-DU140-12 (M70)	10.4-type color TFT	LCD panel	CF card I/F is normally equipped with the control unit.
		Backlight inverter	

(Note 1) FCU7-DAxxx-01: without MITSUBISHI logo; without touch panel
FCU7-DAxxx-11: with MITSUBISHI logo; without touch panel
FCU7-DAxxx-21: without MITSUBISHI logo; with touch panel
FCU7-DAxxx-31: with MITSUBISHI logo; with touch panel
(FCU7-DA201-xx: without touch panel type only)
FCU7-DU1xx-xx： with MITSUBISHI logo；Without touch panel

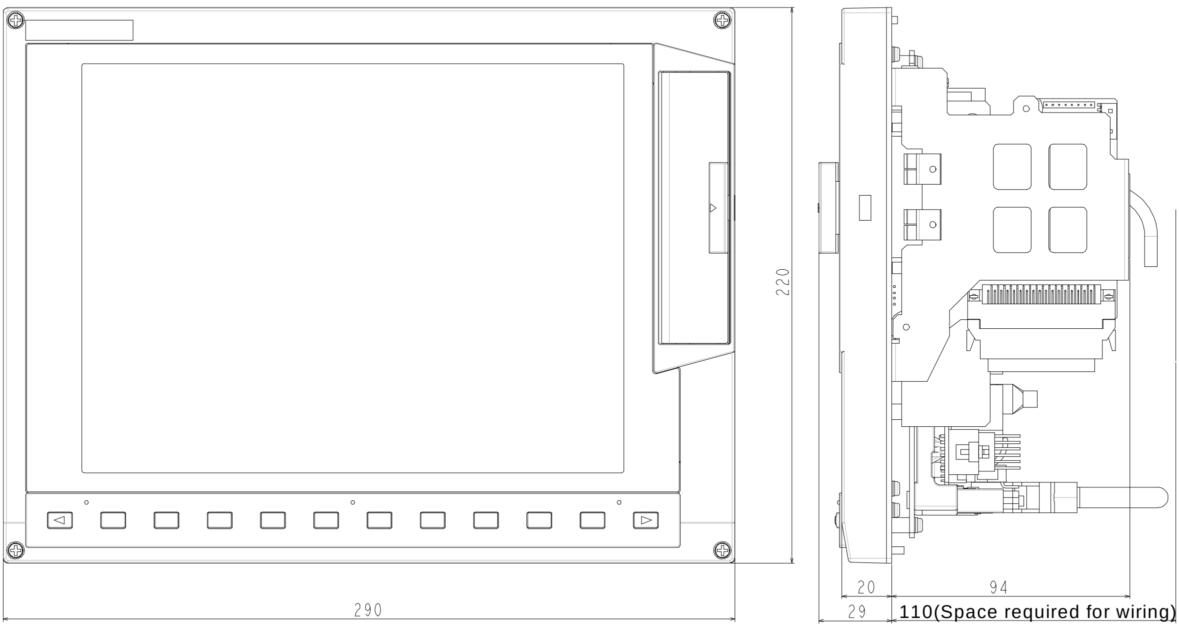
1. Basic Configuration

(1) FCU7-DA201 Front View（8.4-type）

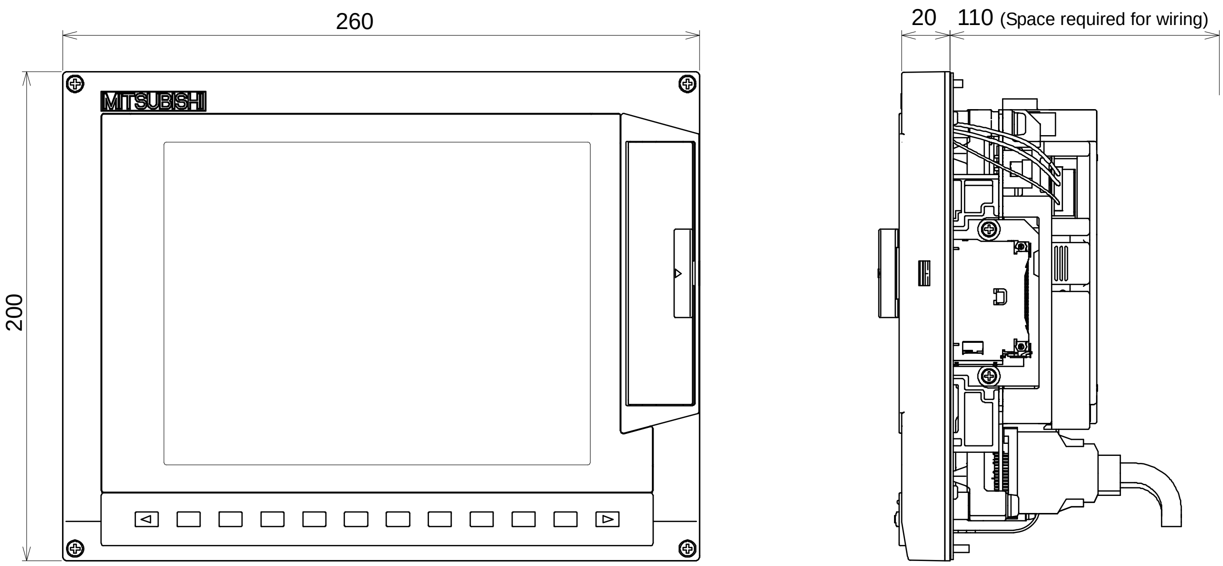


(2) FCU7-DA211／FCU7-DA315／FCU7-DA415／FCU7-DA445

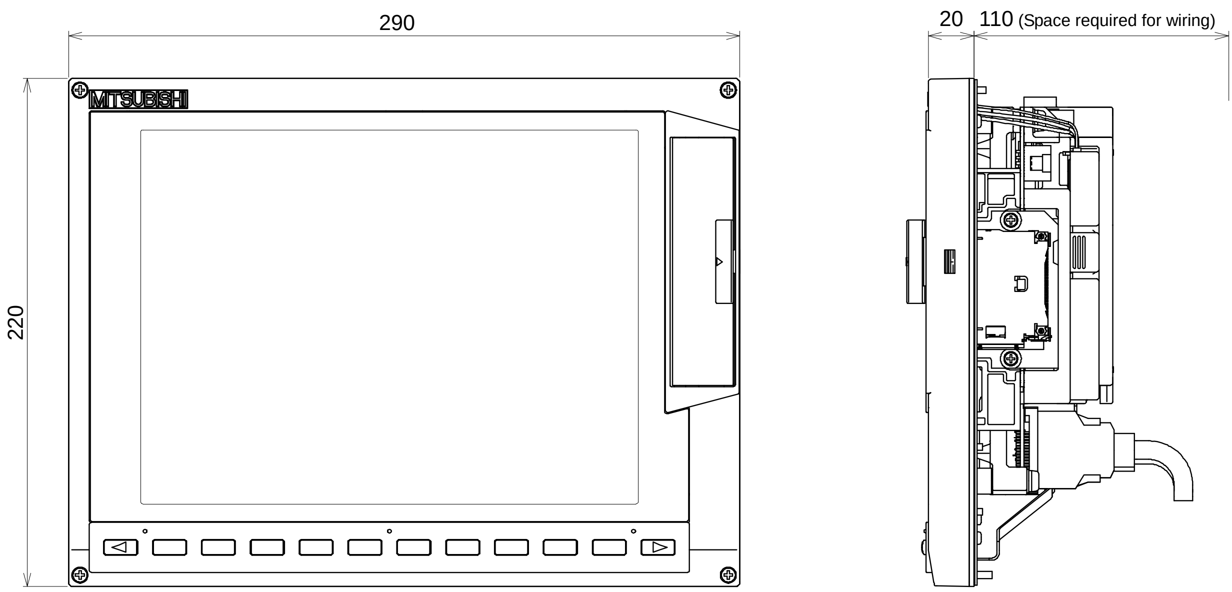
Front View（10.4-type）



(3) FCU7-DU120-12 (8.4-type)

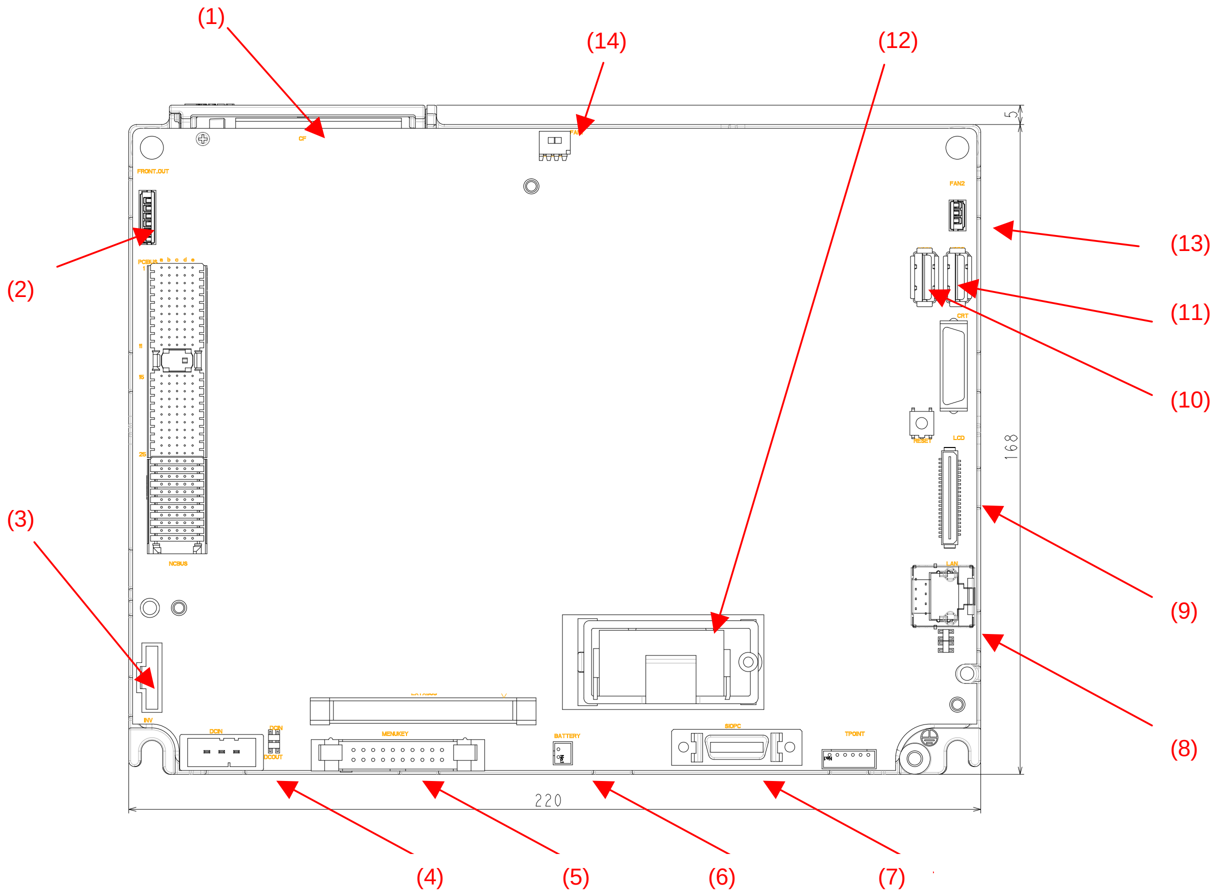


(4)FCU7-DU140-12 (10.4-type)



（Note）The display unit（FCU7-DU120-12／FCU7-DU140-12）back side is control unit.

(5) FCU7-DA201（8.4-type）／FCU7-DA211（10.4-type）Rear View

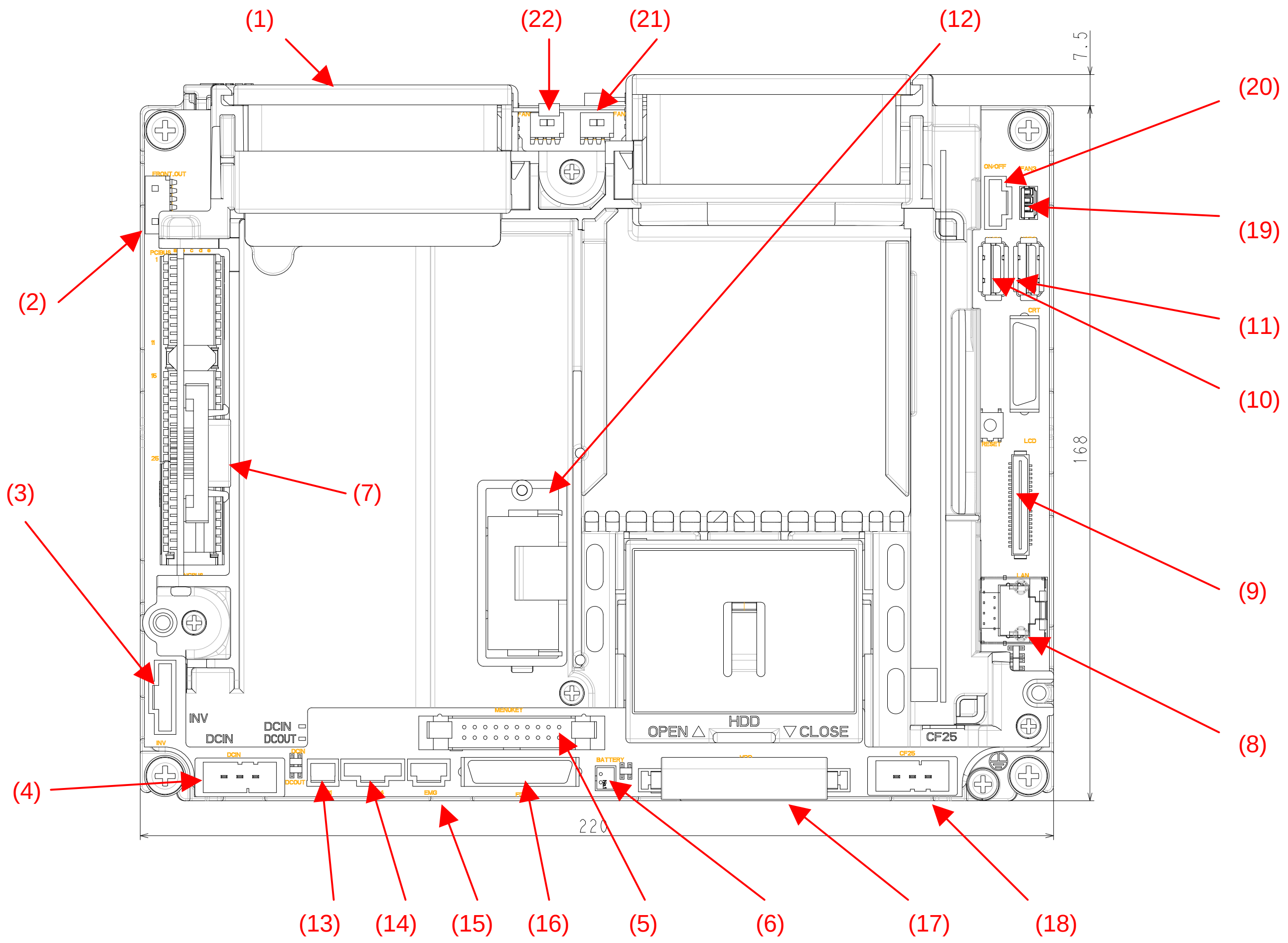


Explanation of control unit and connector functions

No.	Connector name	Function
(1)	CF	Compact flash card I/F (ATA connection specifications)
(2)	FRONT_OUT	Front IC card I/F
(3)	INV	LCD inverter power output
(4)	DCIN	24VDC input
(5)	MENUKEY	Menu key connector
(6)	BAT	Battery connector
(7)	SIO	RS-232C communication I/F 2ch

No.	Connector name	Function
(8)	PCLAN	Personal computer LAN I/F
(9)	LCD	LCD I/F
(10)	USB1	USB (Ver1.1) I/F (5V, max 500mA)
(11)	USB2	USB (Ver1.1) I/F (5V, max 500mA)
(12)	BATTERY	Battery holder Battery: Q6BAT
(13)	FAN2	External fan I/F (24V, max 270mA)
(14)	FAN1	Internal fan I/F (24V)

(6) FCU7-DA315／FCU7-DA415／FCU7-DA445 Rear View



Explanation of control unit and connector functions

No.	Connector name	Function
(1)	CF	Compact flash card I/F (IDE connection specifications)
(2)	FRONT_OUT	Front IC card I/F
(3)	INV	LCD inverter power output
(4)	DCIN	power supply I/F　24VDC input
(5)	MENUKEY	Menu key connector
(6)	BAT	Battery connector
(7)	SIO	RS-232C communication I/F 1ch (2ch)
(8)	PCLAN	Personal computer LAN I/F
(9)	LCD	LCD I/F
(10)	USB1	USB (Ver1.1) I/F (5V, max 500mA)
(11)	USB2	USB (Ver1.1) I/F (5V, max 500mA)

No.	Connector name	Function
(12)	BATTERY	Battery holder　Battery: Q6BAT
(13)	CF01	power supply I/F ACFAIL input
(14)	CF24	power supply I/F ON/OFF input/output
(15)	EMG	Not used.
(16)	FDD	Floppy disk I/F
(17)	HDD	Hard disk I/F
(18)	CF25	Not used.
(19)	FAN3	(24V, max 270mA)
(20)	ONOFF	ON/OFF switch I/F
(21)	FAN2	Fan 2 I/F (24V)
(22)	FAN1	Fan 1 I/F (24V)

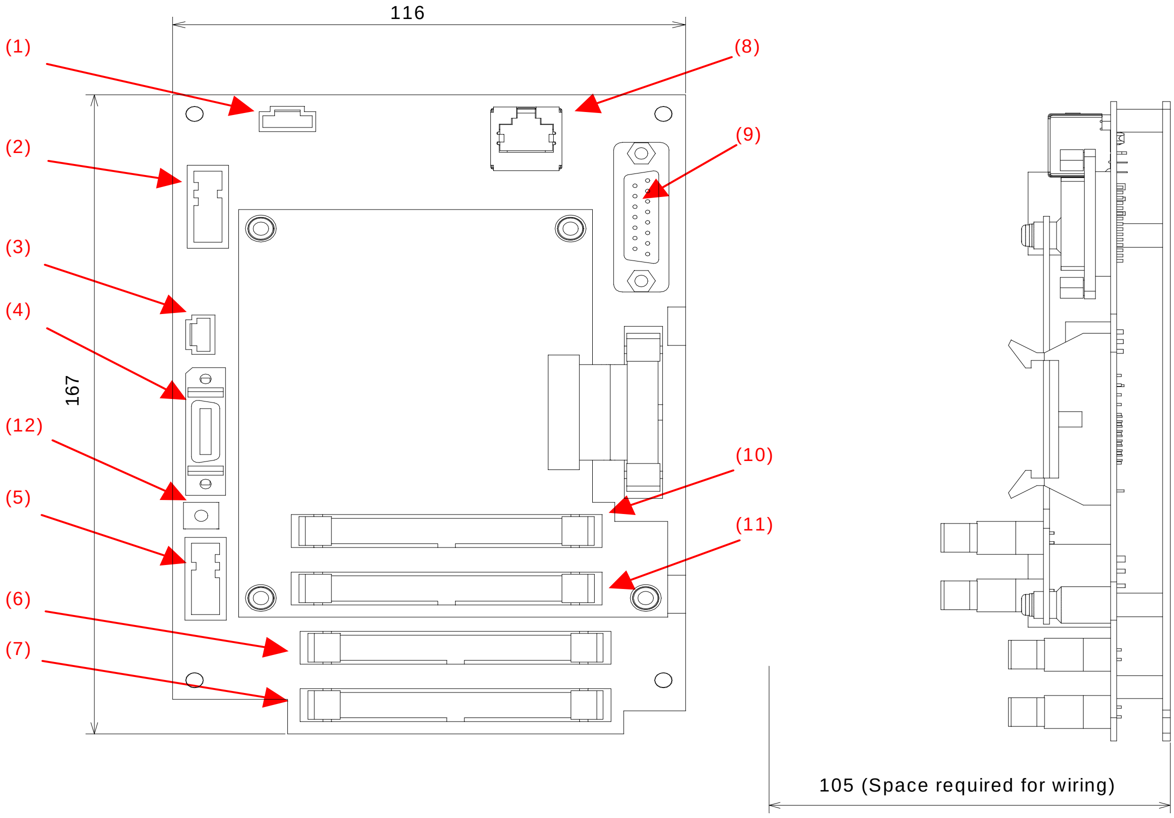
1.3.3 Operation Panel I/O Unit：

Type	Function	Configuration element		Details
FCU7-DX670 (M700)	Sink/source input + sink output	HN391 Mounting bracket G301 cable G310 cable Terminator R-TM		DI/DO = 32 points/32 points (output 60mA) Output insulation type (Note 1) Display-main body relay I/F Manual pulse generator 3ch Emergency stop input Remote I/O 1ch (160 points/160 points)
FCU7-DX671 (M700)	Sink/source input + source output	HN392 Mounting bracket G301 cable G310 cable Terminator R-TM		DI/DO = 32 points/32 points (output 60mA) Output insulation type (Note 1) Display-main body relay I/F Manual pulse generator 3ch Emergency stop input Remote I/O 1ch (160 points/160 points)
FCU7-DX770 (M700)	Sink/source inpu t + sink output	HN391+HN396 Mounting bracket G301 cable G310 cable Terminator R-TM		DI/DO = 64 points/64 points (output 60mA) Output insulation type (Note 1) Display-main body relay I/F Manual pulse generator 3ch Emergency stop input Remote I/O 1ch (128 points/128 points)
FCU7-DX771 (M700)	Sink/source input + source output	HN392+HN397 Mounting bracket G301 cable G310 cable Terminator R-TM		DI/DO = 64 points/64 points (output 60mA) Output insulation type (Note 1) Display-main body relay I/F Manual pulse generator 3ch Emergency stop input Remote I/O 1ch (128 points/128 points)
FCU7-DX710 (M70)	DI/DO Sink/source input (insulation) DO sink output (non-insulation)	Base card	(HN341)	DI/DO = 64 points/64 points + MPG 2ch
FCU7-DX711 (M70)	DI/DO Sink/source input (insulation) DO source output (non-insulation)	Base card	(HN351)	DI/DO = 64 points/64 points + MPG 2ch
FCU7-DX720 (M70)	DI/DO Sink/source input (insulation) DO sink output (non-insulation)	Base card	(HN341)	DI/DO = 64 points/64 points + MPG 2ch
		Add-on card	(HN361)	DI/DO = 32 points/16 points + AO 1ch
FCU7-DX721 (M70)	DI/DO Sink/source input (insulation) DO source output (non-insulation)	Base card	(HN351)	DI/DO = 64 points/64 points + MPG 2ch
		Add-on card	(HN371)	DI/DO = 32 points/16 points + AO 1ch
FCU7-DX730 (M70)	DI/DO Sink/source input (insulation) DO sink output (non-insulation)	Base card	(HN341)	DI/DO = 64 points/64 points + MPG 2ch
		Add-on card	(HN362)	DI/DO = 32 points/32 points
FCU7-DX731 (M70)	DI/DO Sink/source input (insulation) DO source output (non-insulation)	Base card	(HN342)	DI/DO = 64 points/64 points + MPG 2ch
		Add-on card	(HN372)	DI/DO = 32 points/32 points

(Note 1) Operation panel I/O unit is mounted on the back side of the keyboard unit FCU7-KB024/KB044.

(Note 2) Operation panel I/O unit for 700 Series is not available.

(1) M700 series FCU7-DX670／FCU7-DX671／FCU7-DX770／FCU7-DX771



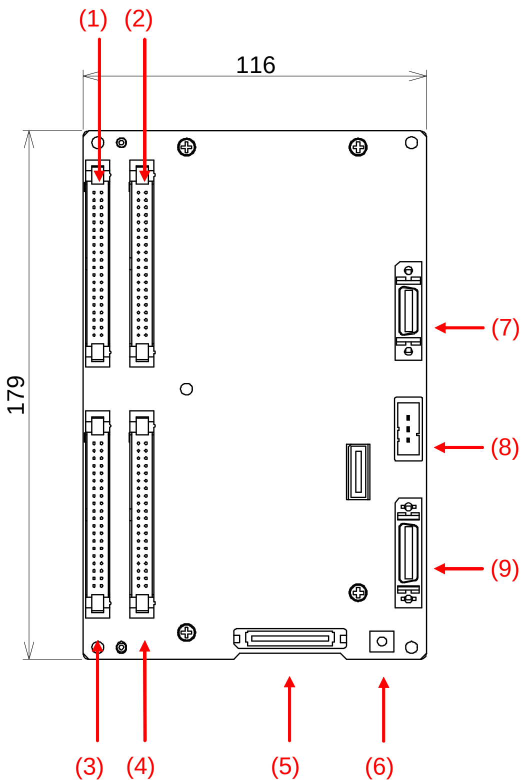
Explanation of operation panel I/O unit and connector functions

No.	Connector name	Function
(1)	NCRST	NC keyboard → Control unit Reset I/F (DI: 1 point used)
(2)	DCIN	24VDC input
(3)	EMGIN	External emergency stop input for operation panel
(4)	OPI	Control unit connection I/F
(5)	RIO3	Remote I/O Connection I/F for 3rd channel expansion

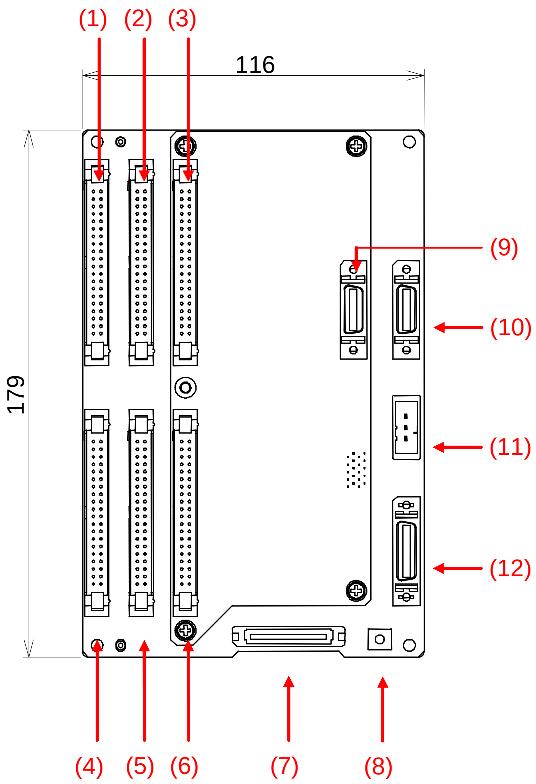
No.	Connector name	Function
(6)	CG32	DO: 32 points 60mA
(7)	CG31	DI: 32 points
(8)	PCLAN	Display side LAN connection I/F
(9)	MPG	Manual pulse generator 3ch
(10)	CG34	DO: 32 points 60mA
(11)	CG33	DI: 32 points
(12)	FG	RIO3 cable clamp FG

(2) M70 series FCU7-DX710／FCU7-DX711／ FCU7-DX720／FCU7-DX721 FCU7-DX730／FCU7-DX731

FCU7-DX710/FCU7-DX711



FCU7-DX720/FCU7-DX721
FCU7-DX730/FCU7-DX731



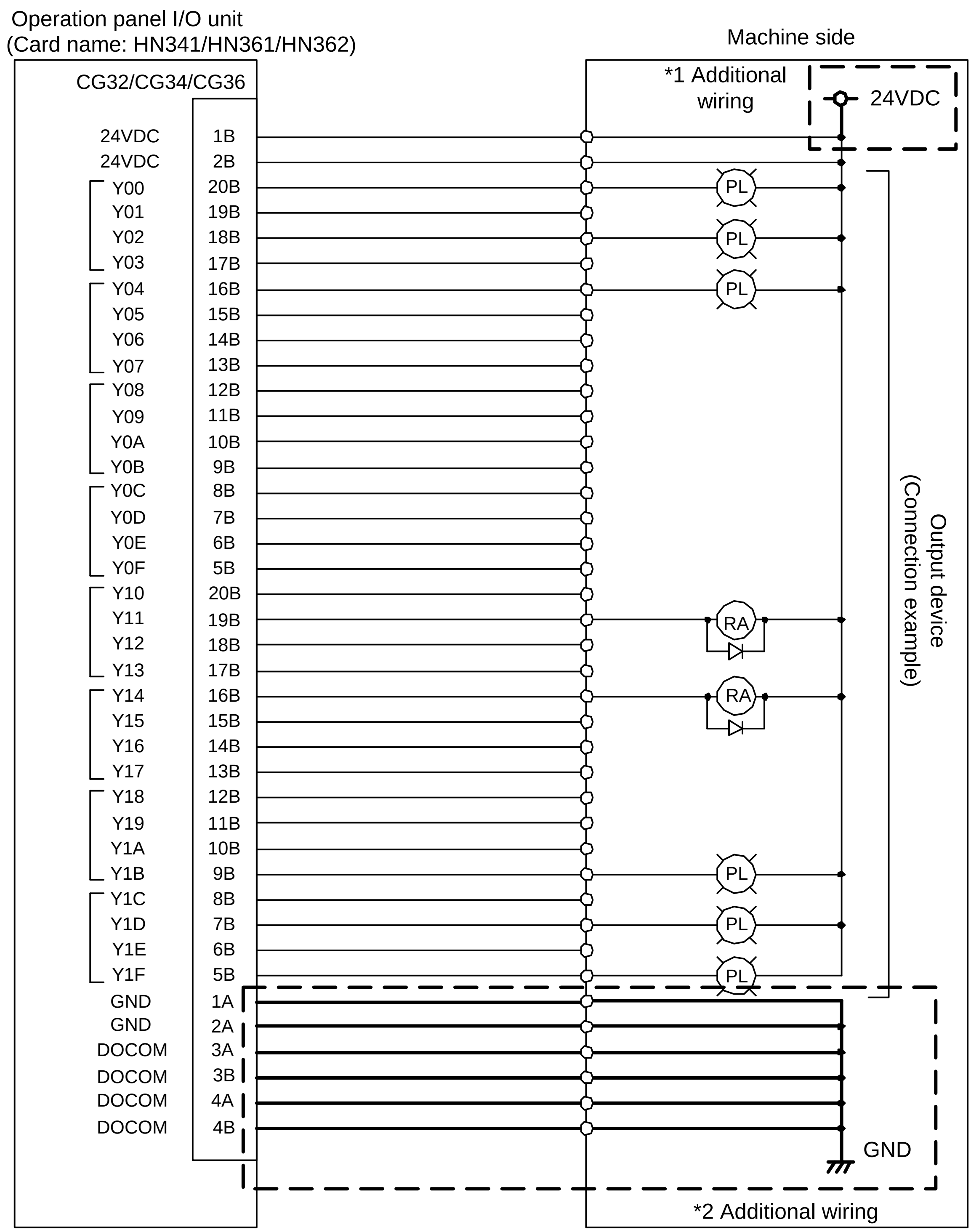
Explanation of connector functions

No.	Connector name	Function
(1)	CG31	DI: 32 points (1st station) **(Note)**
(2)	CG33	DI: 32 points (2nd station) **(Note)**
(3)	CG32	DO: 32 points (1st station) **(Note)**
(4)	CG34	DO: 32 points (2nd station) **(Note)**
(5)	NCKB	Keyboard I/F
(6)	FG	FG terminal block
(7)	MPG	Manual pulse generator input 2ch (5V, 12V)
(8)	RI03	Remote I/O unit I/F (4th to 6th station can be used)
(9)	CG71	Control unit I/F

No.	Connector name	Function
(1)	CG31	DI: 32 points (1st station) **(Note)**
(2)	CG33	DI: 32 points (2nd station) **(Note)**
(3)	CG35	DI: 32 points (3rd station) **(Note)**
(4)	CG32	DO: 32 points (1st station) **(Note)**
(5)	CG34	DO: 32 points (2nd station) **(Note)**
(6)	CG36	FCU7-DX730/DX731 DO: 32 points (3rd station) **(Note)** FCU7-DX720/DX721 DO: 16 points (3rd station) **(Note)** (with analog output)
(7)	MPG	Manual pulse generator input 2ch (5V, 12V)
(8)	RI03	Remote I/O unit I/F (4th to 6th station can be used)
(9)	CG71	Control unit I/F

(Note) Station No. cannot be changed.

(3) Wiring for Sink Type output（FCU7-DX710／DX720／DX730）



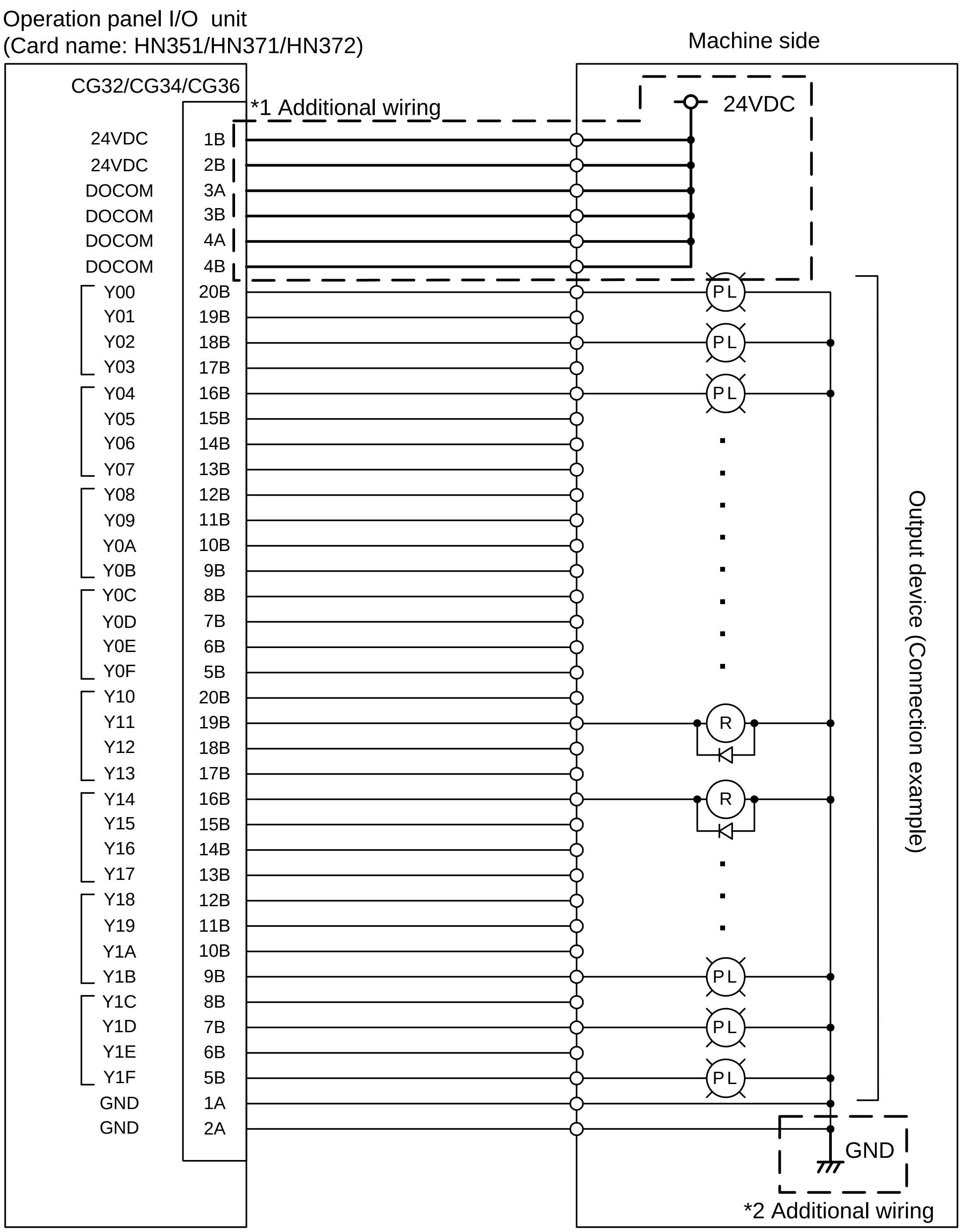
(Note 1) Connect +24V to the flat connector 1B, 2B (24VDC). (*1)

(Note 2) Connect 0V (GND) to the flat connector 3A, 3B, 4A, 4B (DOCOM). (*2)

(Note 3) Connect 0V (GND) to the flat connector 1A, 2A (GND). (*2)

(Note 4) When large current flows due to small amount of connected load, fuse may be blown out or 24V power supply voltage may drop. In order to secure the appropriate current value, watch the connected load.

(4) Wiring for Source Type output (FCU7-DX711/DX721/DX731)



(Note 1) Connect +24V to the flat connector 1B, 2B (24VDC). (*1)

(Note 2) Connect +24V to the flat connector 3A, 3B, 4A, 4B (DOCOM). (*1)

(Note 3) Connect 0V (GND) to the flat connector 1A, 2A (GND). (*2)

(Note 4) For the power supply connected to DOCOM, consider the power consumption of the output devices.

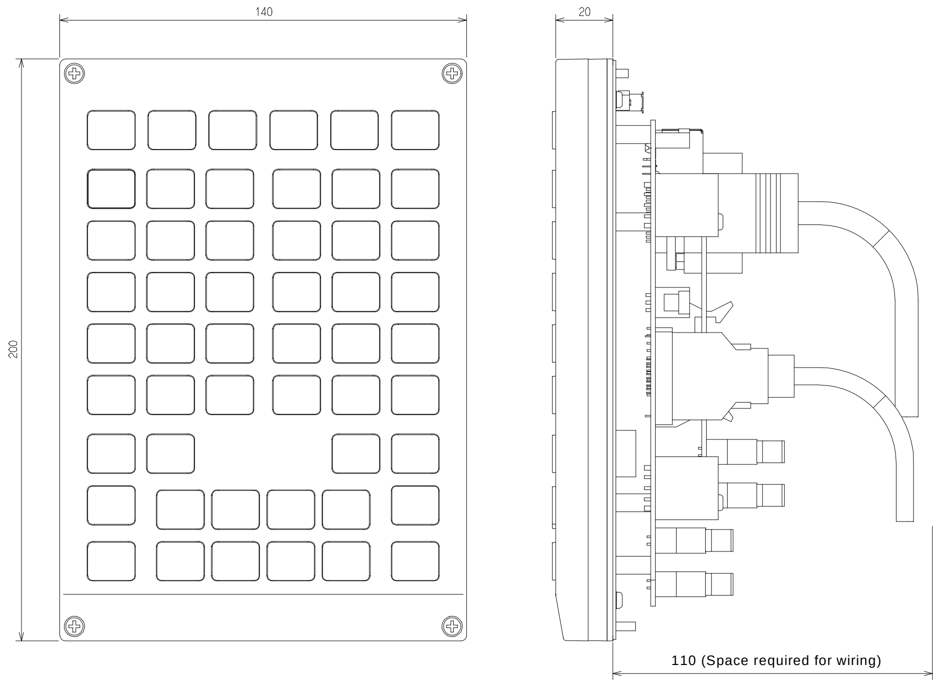
(Note 5) When large current flows due to small amount of connected load, fuse may be blown out or 24V power supply voltage may drop. In order to secure the appropriate current value, watch the connected load.

1.3.4 Keyboard Unit：

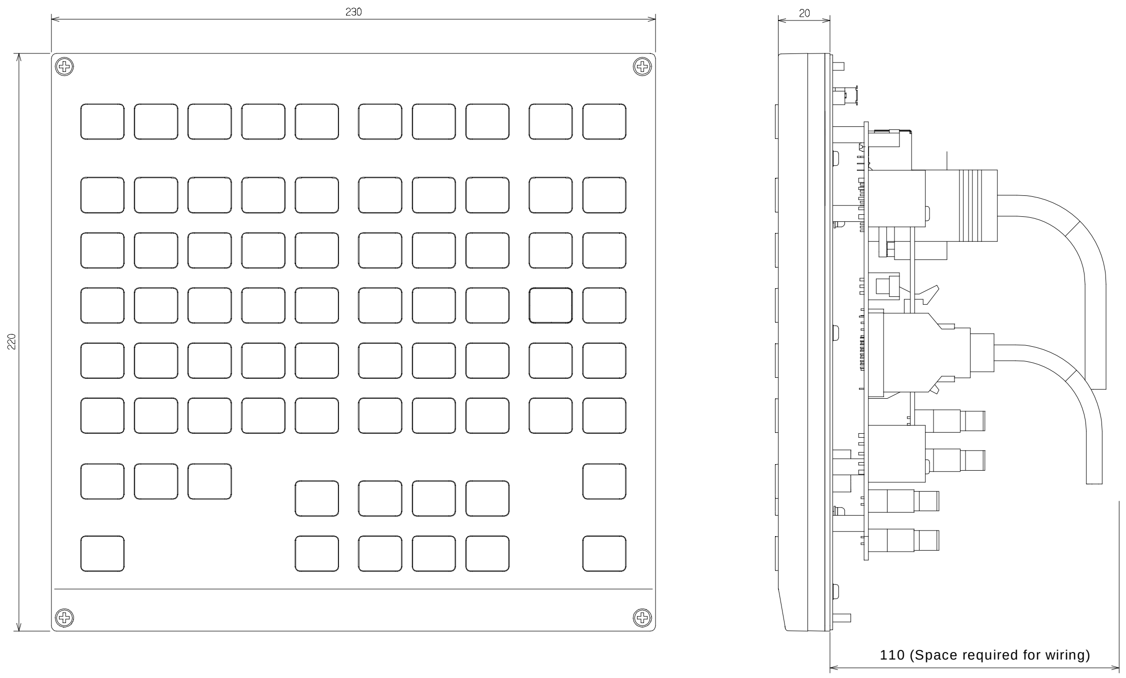
Type	Function	Configuration element	Details
FCU7-KB021 (M700)	8.4-type (display keyboard) ONG layout for (machining center)	Escutcheon key switch Control card G290 cable	Connect with G290 cable from display unit. Mounting method: Mount on front panel
FCU7-KB022 (M700)	8.4-type (display keyboard) ONG layout for (lathe)	Escutcheon key switch Control card G290 cable	Connect with G290 cable from display unit. Mounting method: Mount on front panel
FCU7-KB041 (M700)	10.4-type (display keyboard) ABC layout	Escutcheon key switch Control card, G290 cable	Connect with G290 cable from display unit. Mounting method: Mount on front panel
FCU7-KB024 (M70)	8.4-type (display keyboard)	Escutcheon, key switch	Connect with G011 cable from control unit Mounting method: Mount on front panel
FCU7-KB044 (M70)	10.4-type (display keyboard)	Escutcheon, key switch	Connect with G011 cable from control unit Mounting method: Mount on front panel

1. Basic Configuration

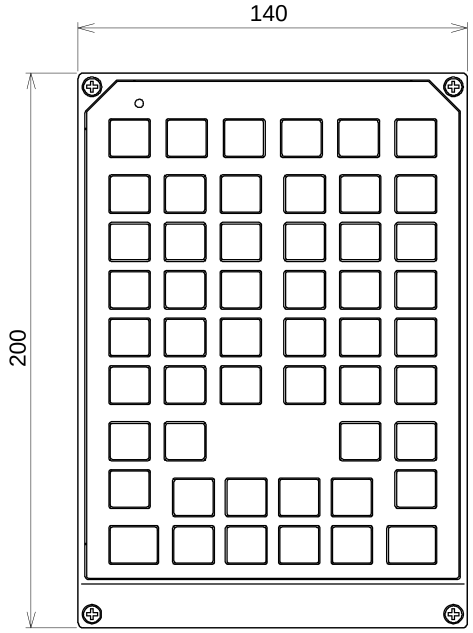
(1) FCU7-KB021／FCU7-KB022（ONG Layout）

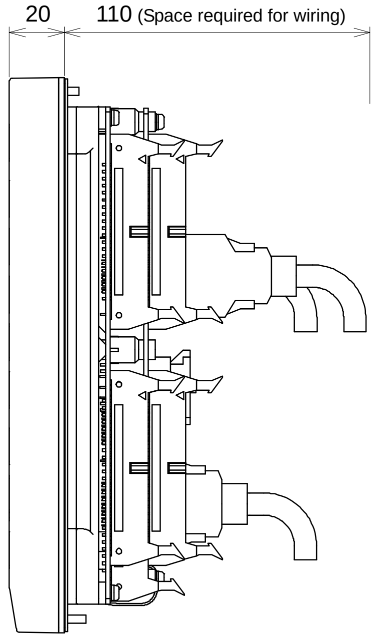


(2) FCU7-KB041（ABC Layout）

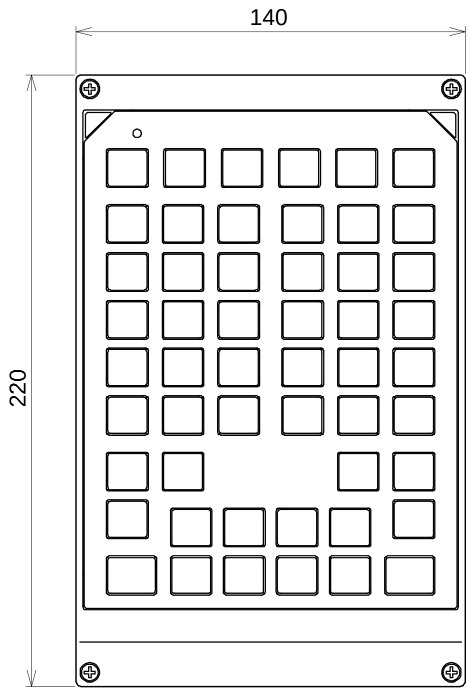


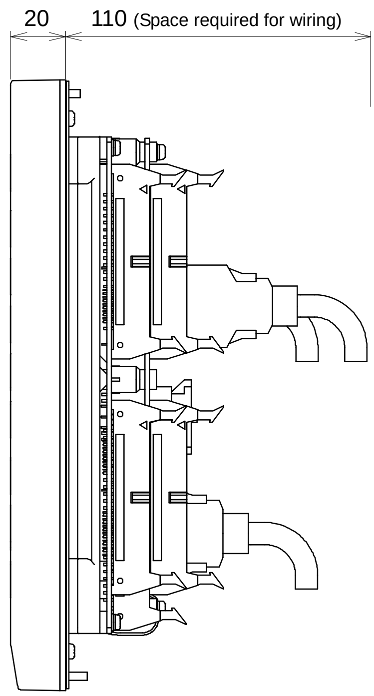
(3) FCU7-KB024（8.4-type）





(4) FCU7-KB044（10.4-type）





1.3.5 Remote I/O Unit：FCUA-DX100／FCUA-DX110／FCUA-DX120／FCUA-DX140／FCUA-DX101／FCUA-DX111／FCUA-DX121／FCUA-DX141

Type	Function	Configuration element	Details
FCUA-DX100	Sink/source input + sink output	RX311	DI/DO = 32 points/32 points
FCUA-DX110	Sink/source input + sink output	RX311+RX321-1	DI/DO = 64 points/48 points
FCUA-DX120	Sink/source input + sink output +analog output	RX311+RX321	DI/DO = 64 points/48 points + analog output 1 point
FCUA-DX140	Sink/source input + sink output +analog output/input	RX311+RX341	DI/DO = 32 points/32 points +analog input 4 points +analog output 1 point
FCUA-DX101	Sink/source input + source output	RX312	DI/DO = 32 points/32 points
FCUA-DX111	Sink/source input + source output	RX312+RX322-1	DI/DO = 64 points/48 points
FCUA-DX121	Sink/source input + source output +analog output	RX312+RX322	DI/DO = 64 points/48 points +analog output 1 point
FCUA-DX141	Sink/source input+ source output +analog output/input	RX312+RX341	DI/DO = 32 points/32 points + analog input 4 points + analog output 1 point

1.3.6 Scan I/O Card：HR357／HR347

Type	Function	Configuration element	Details
HR357	Scan I/O (source)	HR357	Scan DI/DO = 64 points /64 points DI/DO = 32 points /32 points
HR347	Scan I/O (sink)	HR347	Scan DI/DO = 64 points /64 points DI/DO = 32 points /32 points

1.3.7 Card-sized I/O Card：HR361／HR371／HR381／HR383

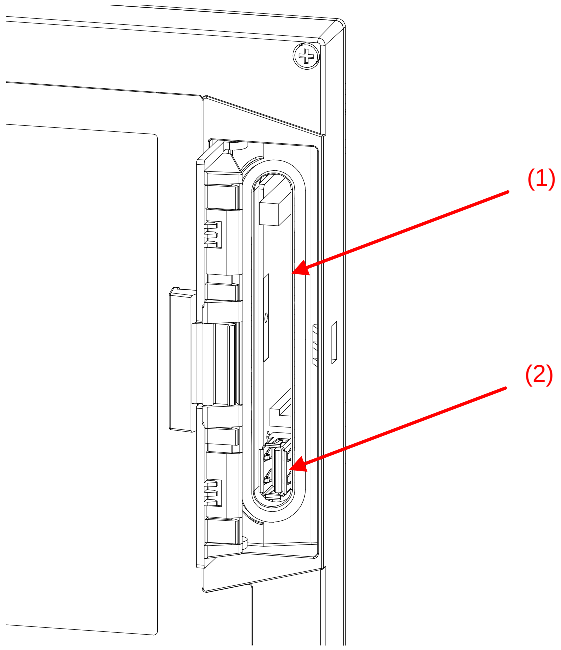
Type	Function	Configuration element	Details
HR361	DI16 (sink/source) +DO16 (sink)	HR361	DI16/DO16
HR371	DI32 (sink/source) +DO16 (source)	HR371	DI16/DO16
HR381	AO x 1	HR381	AO x 1
HR383	AI x 4+AO x 1	HR383	AI x 4+AO x 1

1.3.8 Extended I/O Card：QY231

Type	Function	Configuration element	Details
QY231	Sink/source input + source output	QY231	Sink/source input 64 points + source output 48 points

1.3.9 Front IC Card I/F Unit：FCU7-EP102

Type	Function	Configuration element	Details
FCU7-EP102-1	Memory card slot x 1ch USB x 1ch (Ver1.1)	Front IC card I/F (USB-PC-CARD-TYPE-A)	Connect with G291 cable from display unit PC Card Standard ATA compliant Memory card TYPEI, TYPEII only 5VDC: max 220mA

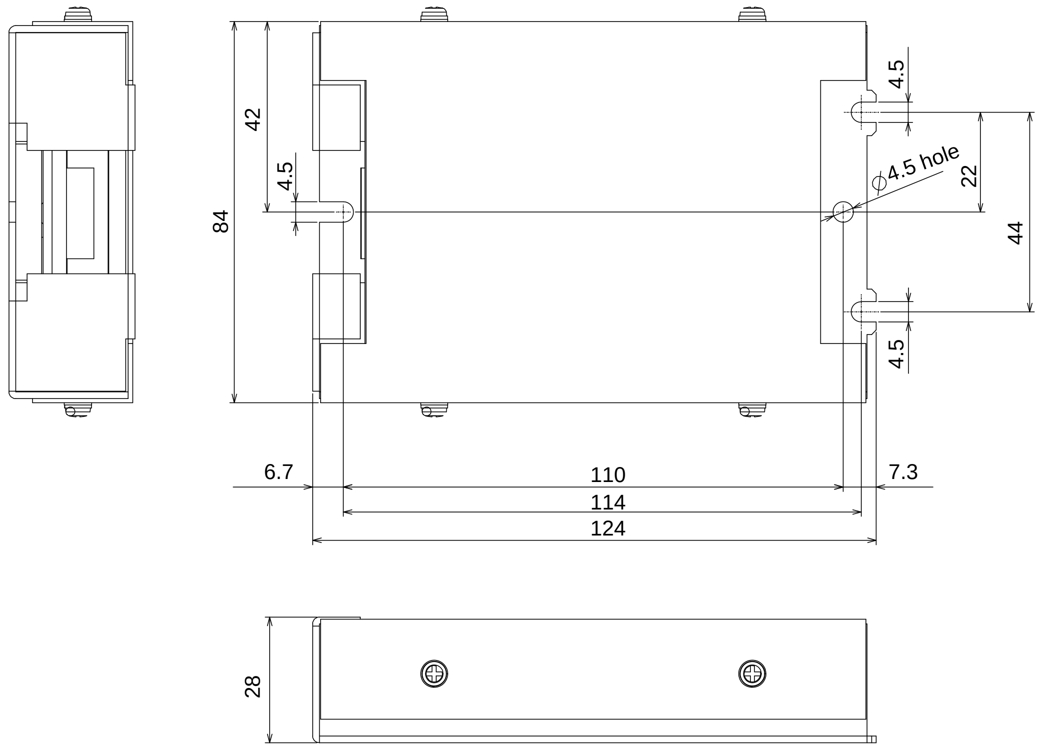


Explanation of front IC card I/F unit and connector functions

No.	Connector name	Function
(1)	Memory card I/F	(PC Card Standard ATA compliant memory card TYPEI, TYPEII only) (5VDC : max 220mA)
(2)	USB I/F	USB(Ver1.1)I/F (5V, max 100mA)

1.3.10 Hard Disk Unit：FCU7-HD001

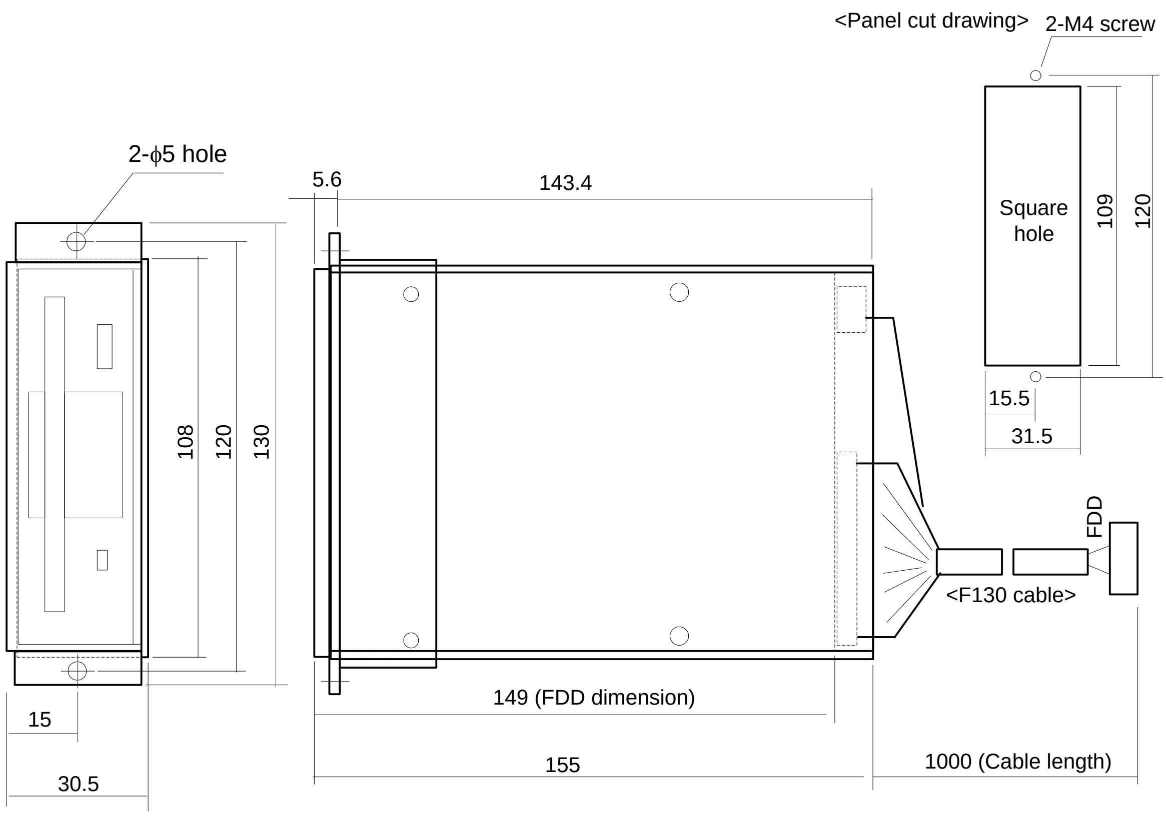
Type	Function	Configuration element	Details
FCU7-HD001-1	External memory device	(Hard disk) Mounting plate, (cushioning rubber) F140 cable (50cm)	Installation method: Mount on the back of FCU7-KB041



（The flat cable F140 is enclosed.）

1.3.11 Floppy Disk Unit：FCU7-FD221

Type	Function	Configuration element	Details
FCU7-FD221-1	External memory device	(Floppy disk drive) (Mounting plate for pendant box) F130 cable (1m)	FCU7-DA315/DA415/ DA445 connect with display unit



（F130 cable is enclosed.）

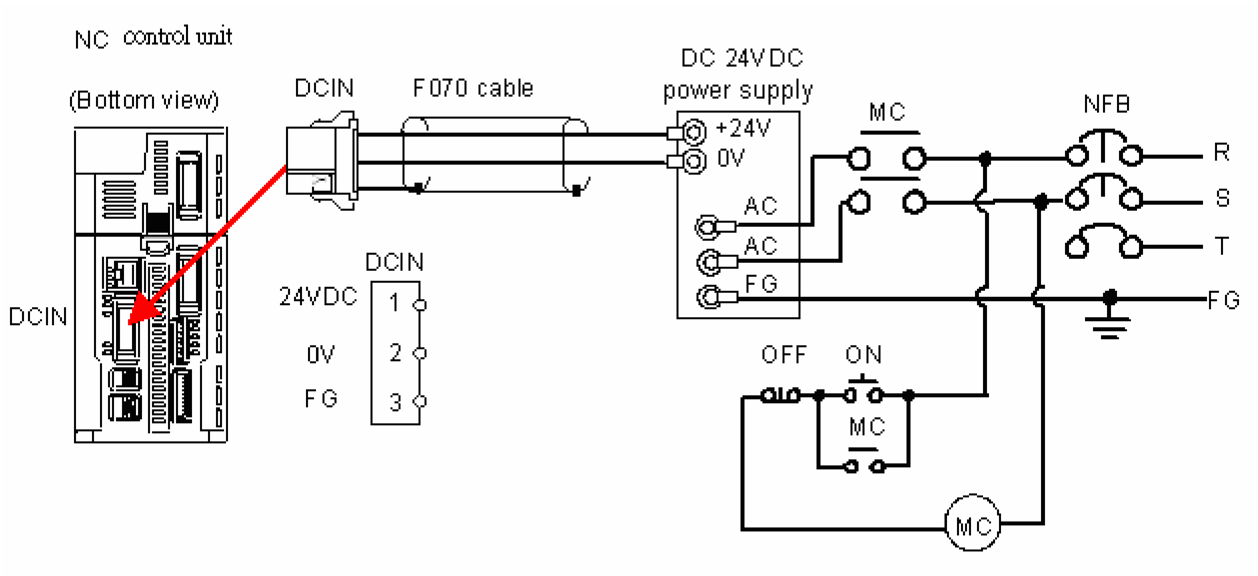
1.3.12 External Power Supply Unit：PD25／PD27

Control unit connects to DC 24V stabilized power supply or PD25/PD27.

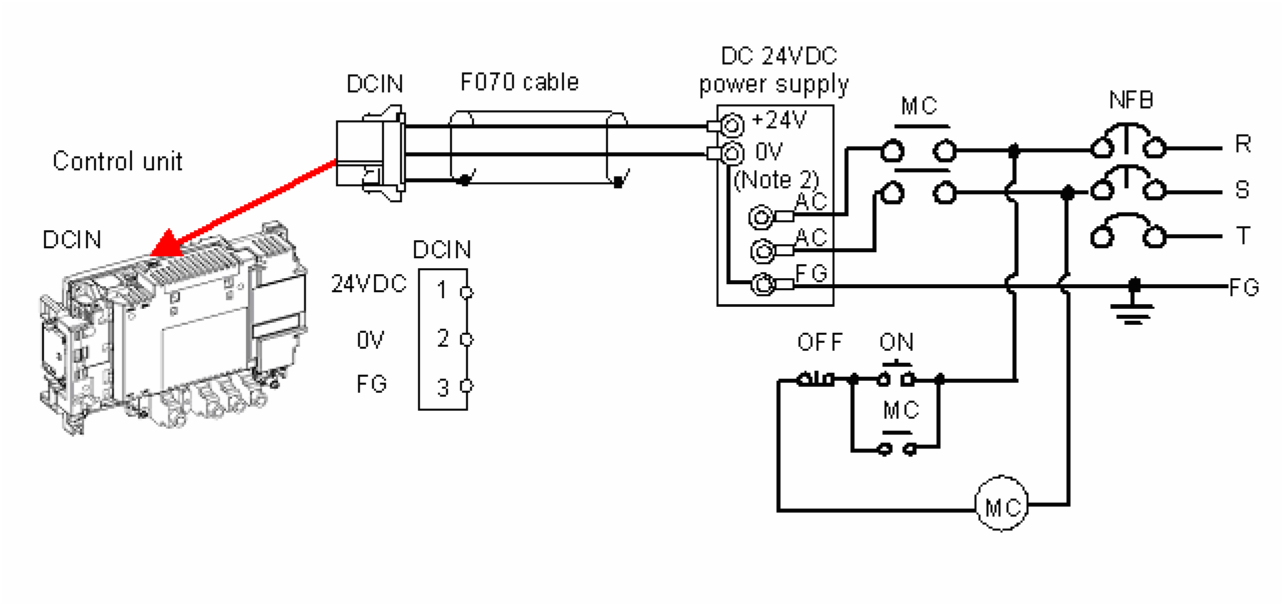
Type	Function	Configuration element	Details
PD25	External power supply with power supply ON/OFF function	(Power supply card) (Case set)	Input 200VAC Output 24VDC (3A)
PD27	External power supply with power supply ON/OFF function	(Power supply card) (Case set)	Input 200V to 400VAC Output 24VDC (8A)

(1) Connection of power supply

M700 series



M70 series



Stabilized power supply selection items

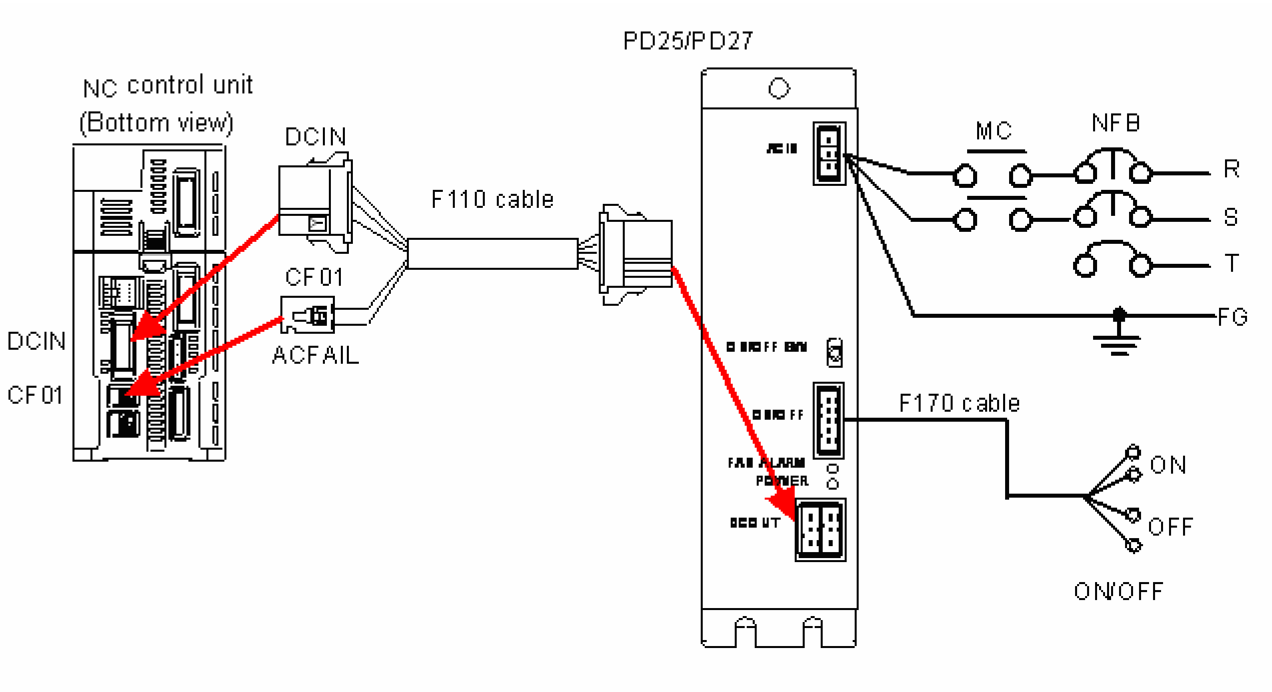
Item		Standard setting	Remarks
Output	Voltage fluctuation	±5%	±5% or less of 24VDC output
	Ripple noise	240mV (P-P)	
Output current		--	Refer to the maximum current consumption of the unit in use and calculate.
Output holding time		20ms (min)	Instantaneous power failure time（AC side）

(2) PD25/PD27 power supply items

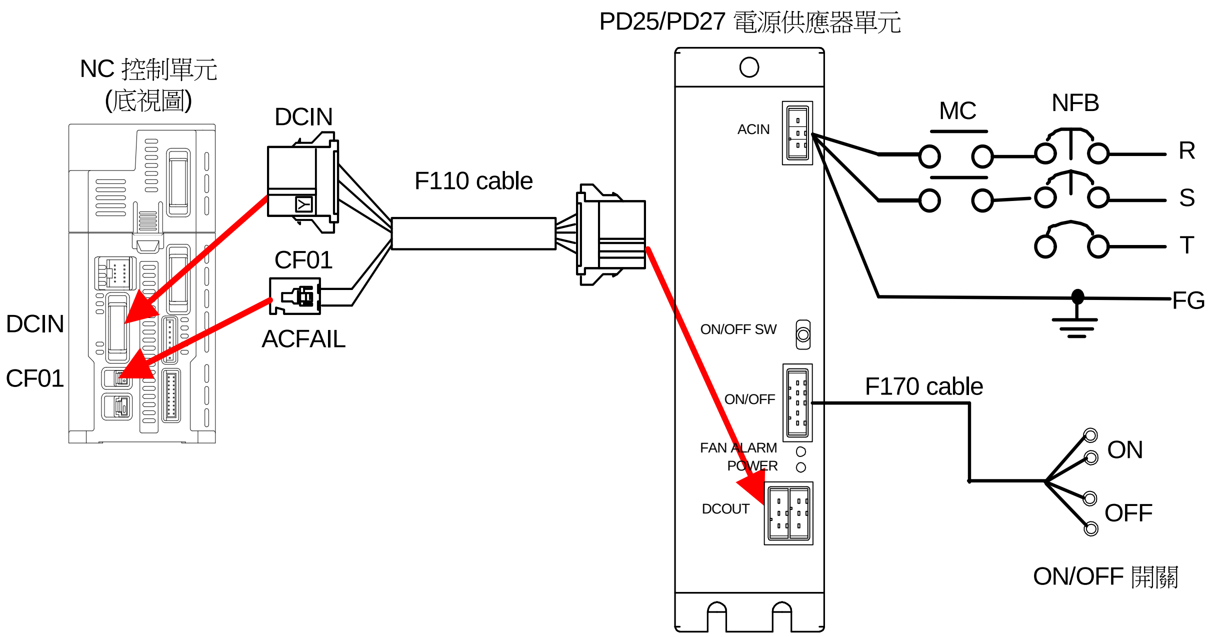
Item	PD25	PD27
Output voltage	200V to 230VAC +10%-15% 50/60Hz ± 1Hz	200V to 480VAC +10%-15% 50/60Hz ± 3Hz
Output current	3A	8A
Dimension	130mm x 65mm x 230mm	170mm x 65mm x 230mm
Weight	1.5kg	2.5kg
Backup time	300ms (min)	300ms (min)

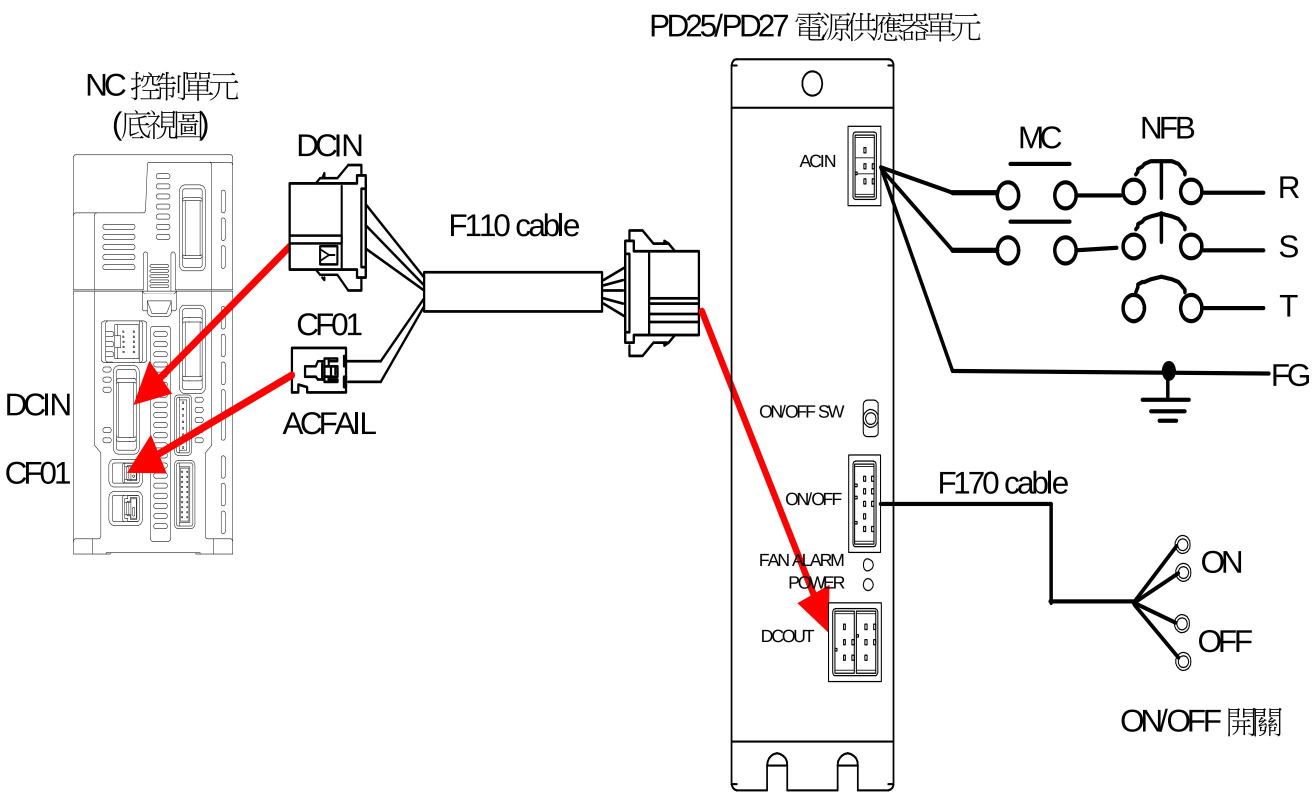
(3) Connect with PD25/PD27 power supply

M700 series



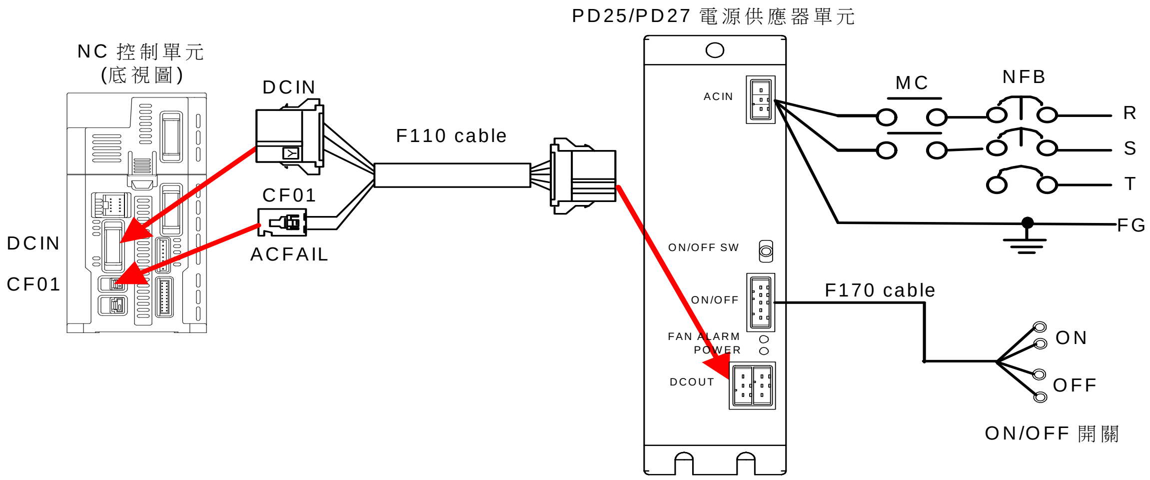
M70 series


PD25/PD27 電源供應器單元
NC 控制單元
(底視圖)
DCIN
F110 cable
CF01
ACFAIL
DCIN
CF01
ACIN
MC
NFB
R
S
T
FG
ON/OFF SW
ON/OFF
F170 cable
FAN ALARM
POWER
DCOUT
ON
OFF
ON/OFF 開關


PD25/PD27 電源供應器單元
NC 控制單元
(底視圖)
DCIN
F110 cable
CF01
ACFAIL
DCIN
CF01
ACIN
MC
NFB
R
S
T
FG
ON/OFF SW
ON/OFF
F170 cable
FAN ALARM
POWER
DCOUT
ON
OFF
ON/OFF 開關

1.4 Connecting with Operation Panel I/O unit

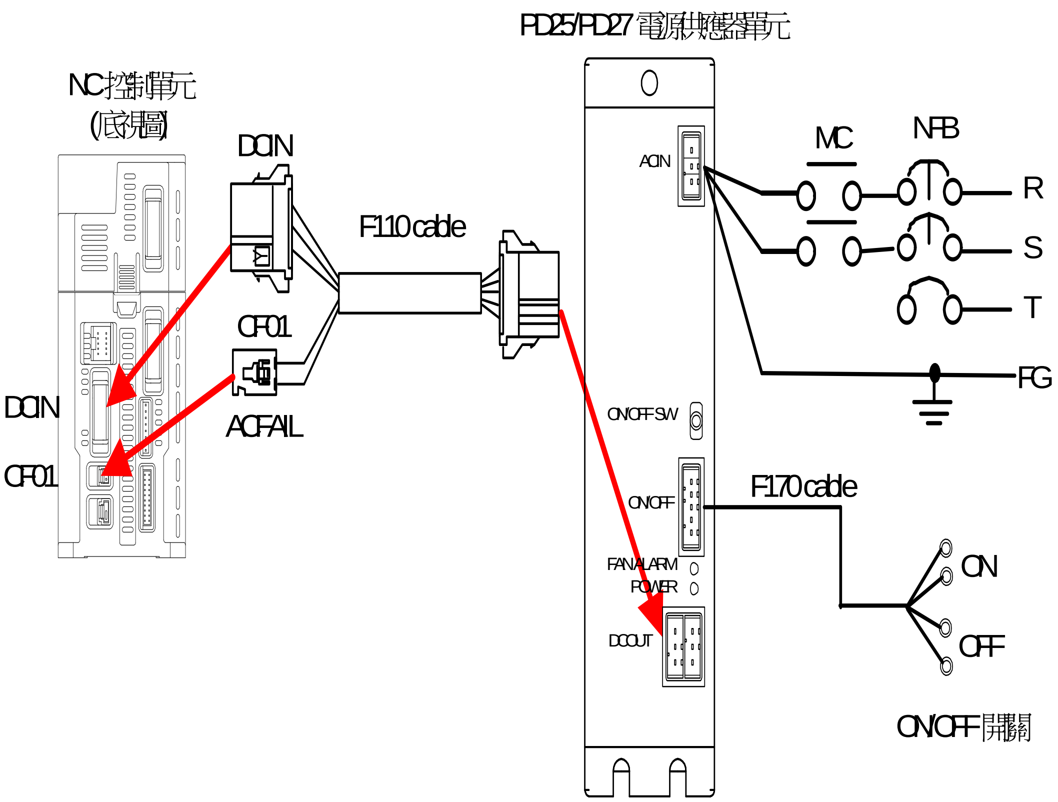
Connect operation panel I/O to the connector OPI。



1.5 Connect with Remote I/O unit

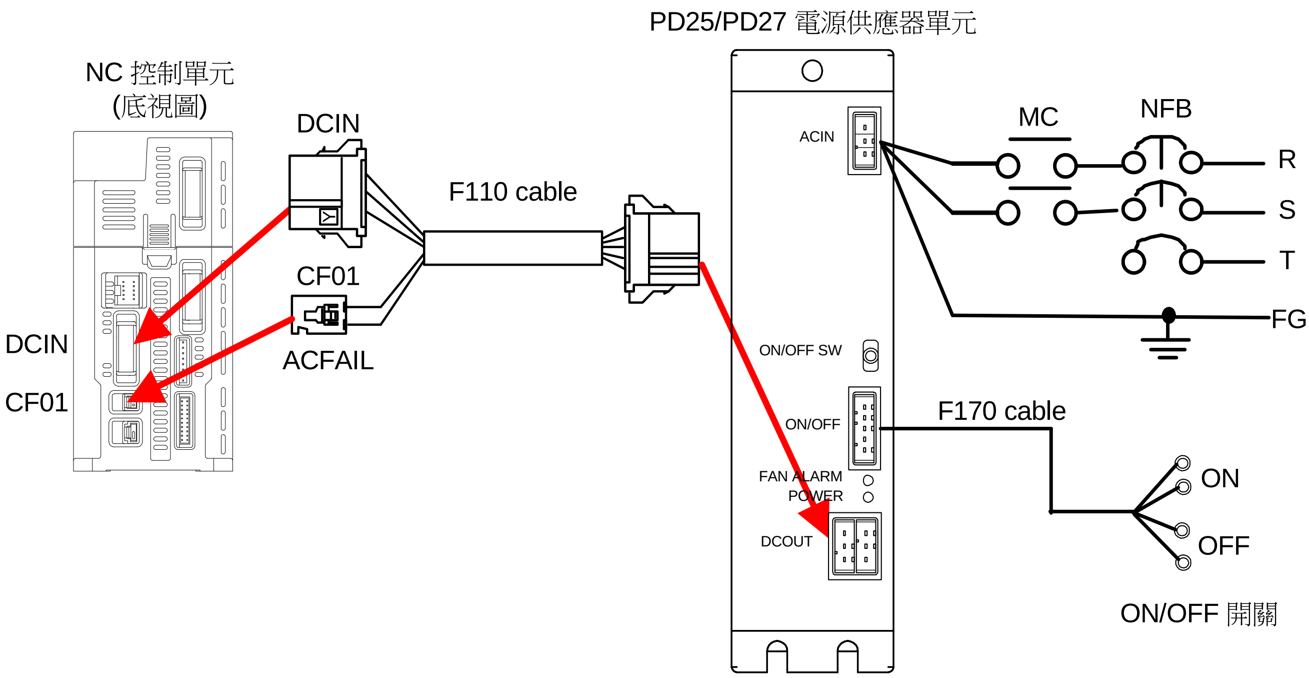
Connect remote I/O unit to the connector RI01、RI02.

M700 series



1. Basic Configuration

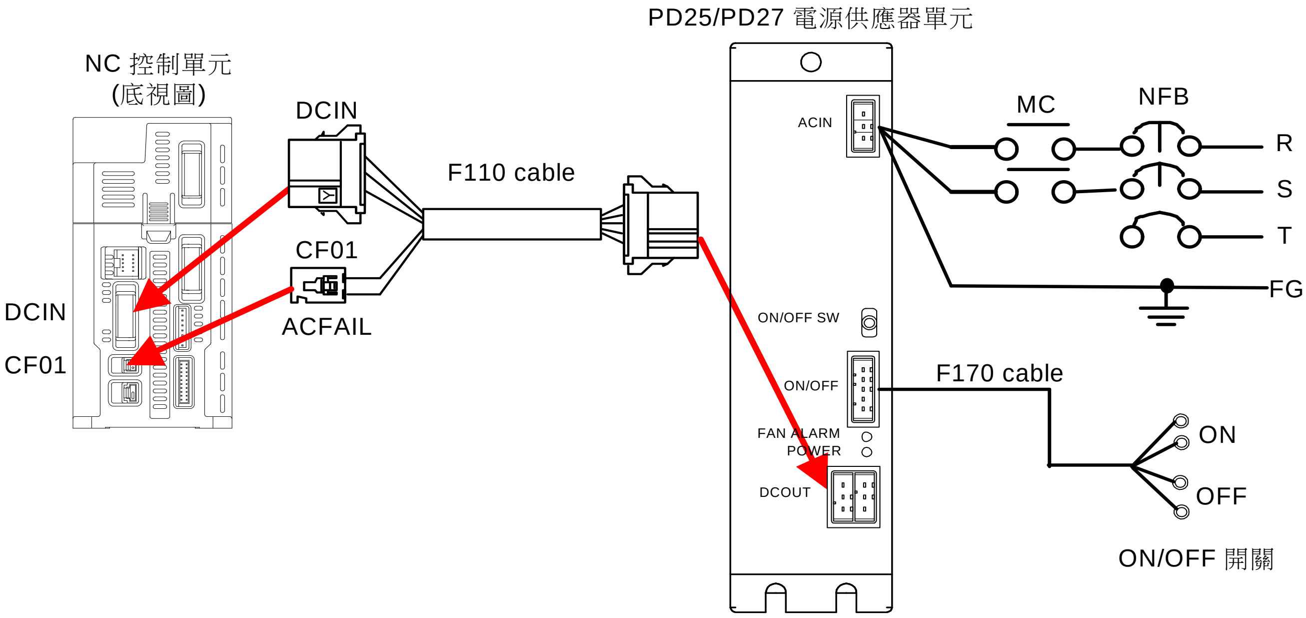
M70 series

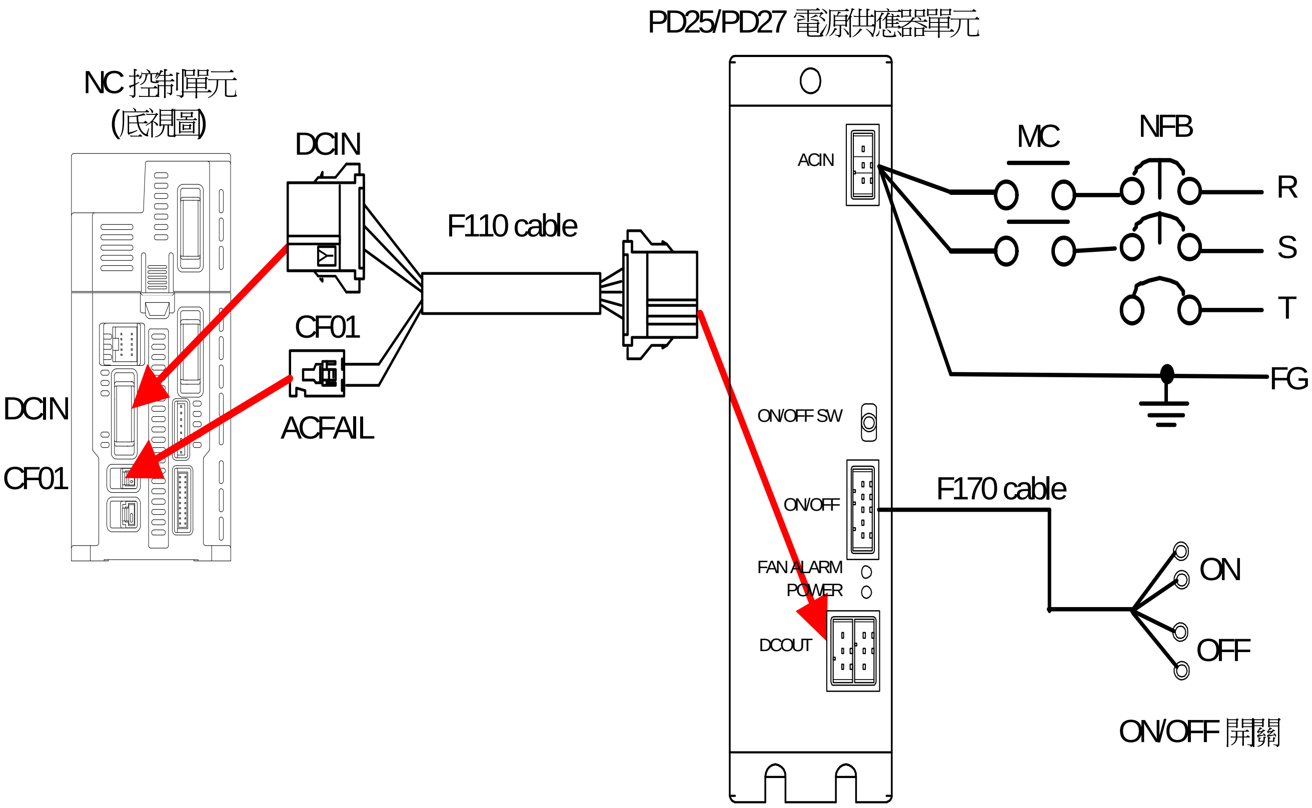


1.6 Connecting with Optical Communication Servo Drive Unit：MDS-D/DH

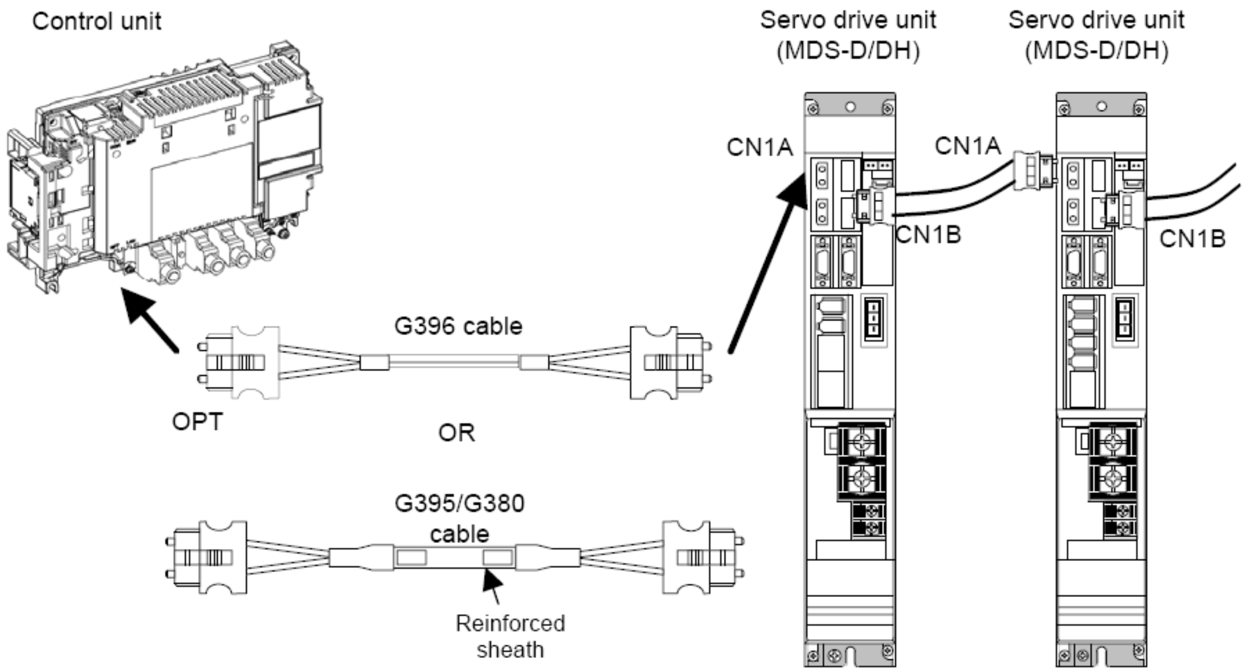
Connect servo drive unit MDS-D/DH series to the connector OPT1.

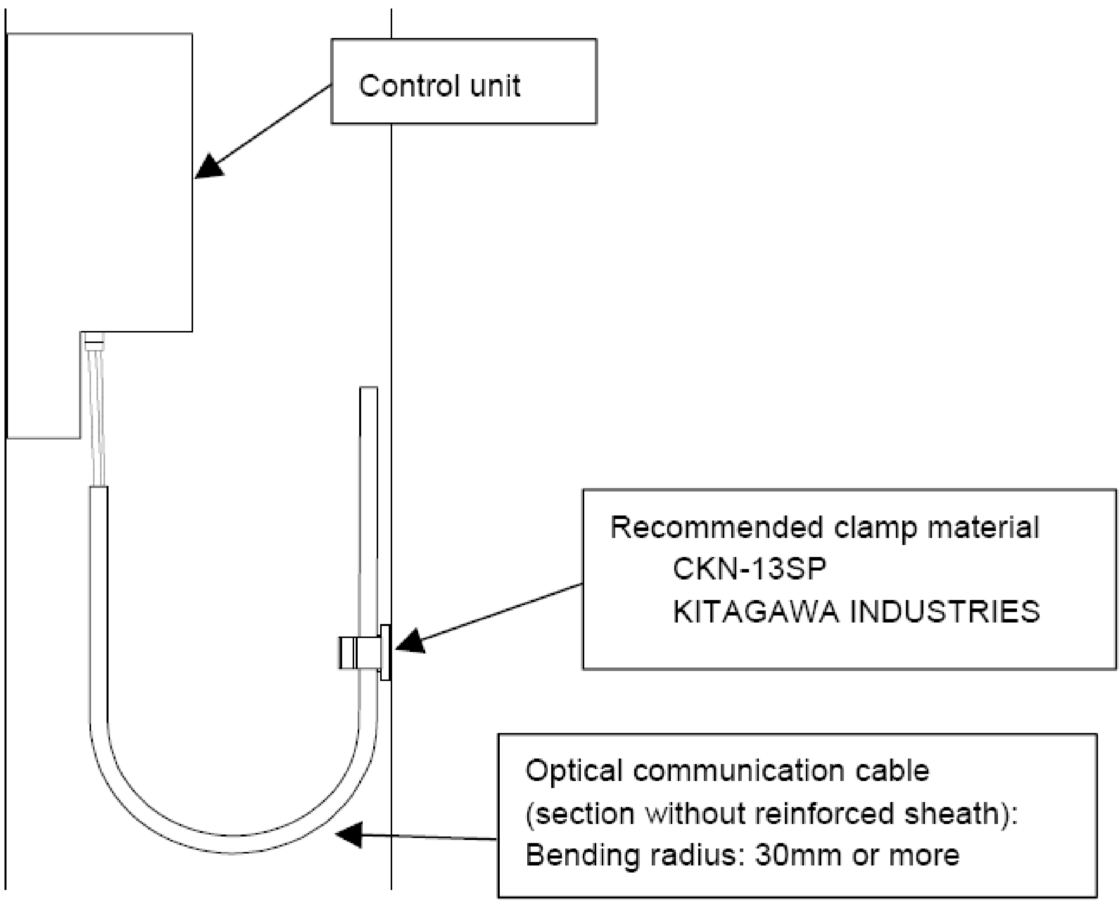
M700 series





M70 series


Control unit
Servo drive unit
(MDS-D/DH)
Servo drive unit
(MDS-D/DH)
CN1A
CN1A
CN1B
CN1B
G396 cable
OPT
OR
G395/G380
cable
Reinforced
sheath


Control unit
Recommended clamp material
CKN-13SP
KITAGAWA INDUSTRIES
Optical communication cable
(section without reinforced sheath):
Bending radius: 30mm or more

1.7 Number of control axis

1.7.1 Number of basic control axis（NC axis）

	M720	M730	M750	M70B	M70A
M system	○3	○3	○3	○3	○3
L system	○2	○2	○2	○2	○2

1.7.2 Number of Max control axis（NC axis + spindle + PLC axis）

	M720	M730	M750	M70B	M70A
M system	12	16	16	9	11
L system	12	16	16	9	11

There are two channels to connect to servo axis and spindle. Every channel can connect 8 axes.

Max NC axis number（Include Multi-system NC）

	M720	M730	M750	M70B	M70A
M system	6	16	16	4	6
L system	12	16	16	4	7

Max spindle Number

	M720	M730	M750	M70B	M70A
M system	2	4	4	2	2
L system	2	4	4	2	3

Max PLC axis number

	M720	M730	M750	M70B	M70A
M system	2	2	2	4	4
L system	2	2	2	4	4

1.7.3 Number of auxiliary axis（MR-J2-CT）

	M720	M730	M750	M70B	M70A
M system	4	4	4	0	0
L system	4	4	4	0	0

Auxiliary axis：J2-CT can connect from channel（SV2）.

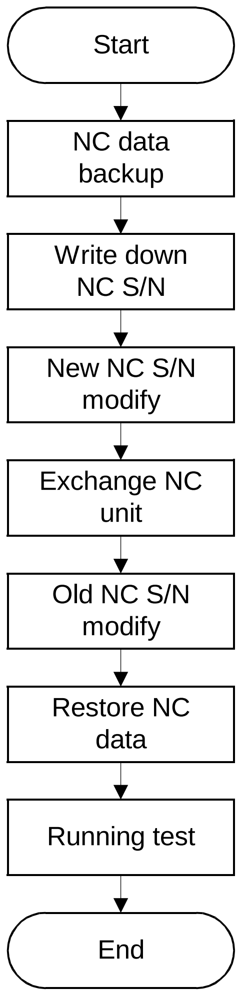
1.7.4 Number of Max simultaneous axis

	M720	M730	M750	M70B	M70A
M system	4	4	8	4	4
L system	4	4	8	4	4

2. NC controller exchange procedure

For M700 series, backup whole data on NC controller when it changed before. After data is installed into new one when controller changed. The procedure is as below:

(1) Backup data (parameters, PLC, SRAM…..)
(2) Write down series number of controller when it exchanged before.
(3) To modify series number of controller unit comes into new one.
（Old S/N of NC →New S/N of NC）
(4) Exchange controller unit.
(5) To modify series number of controller unit comes into old one.
（New S/N of NC →Old S/N of NC）
(6) Restoring backup data comes into controller.
(7) Running test.



2.1 NC data backup

(1) Three file data must be backup before when exchange NC unit of M700 series.

(a) SRAM （SRAM.BIN）

(b) PLC （USERPLC.LAD）

(c) APLC （APLC.BIN）

Regarding these data as above can used “All backup” under mainte function key.

(2) There are three storage equipments can backup.

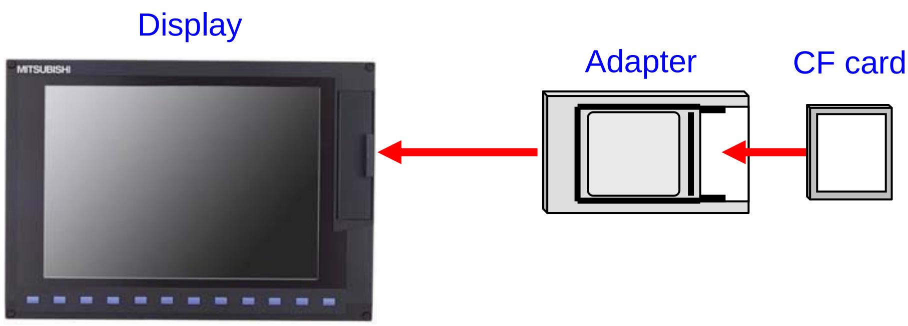
(a) PCMCIA card (Front of display panel) --- The device name is” Memory card”.

(b) Hard Disk (Internal hard disk with NC unit) --- The device name is” HD”.

(c) CF card (Internal interface of NC controller) --- The device name is” DS”.

(3) What is the procedure when data is stored.（example: “Memory card” front of display ）

(a) CF card connect with PCMICIA adapter that plug in front of display panel.



※ CF card add adapter is recommended that CF card also use in CF card of NC controller interface.

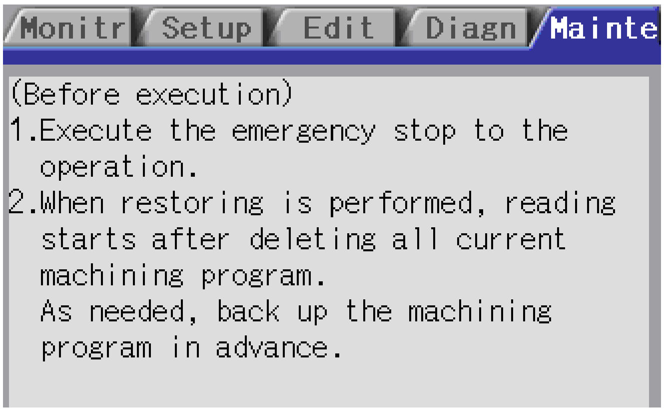
(b) 「MAINTE」 

 key →「maintenance」（Mainte）→「password input」（Psswd input）→key in password “MPARA” and then press「INPUT」key.

(c) Selection “ALL backup” function key under screen.

(d) Choice ”Device select” → find out「Memory card」
Also hard disk as 「HD」can selected or CF card as「DS」.

(e) There are some described procedures when backup key is pressed showing on screen as follows.

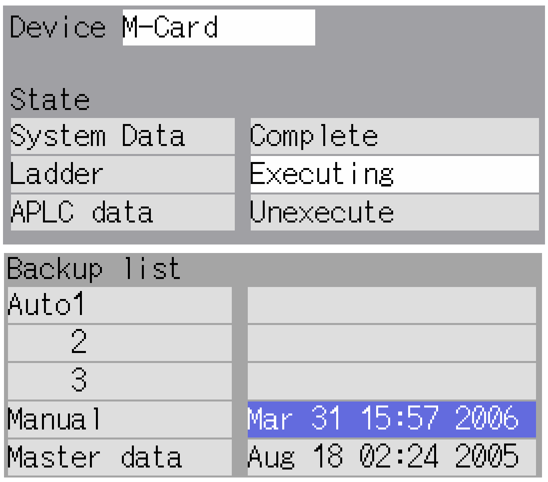


(f) On Backup list select 「Manual」→ and press 「INPUT」key → appearing a message down right side in the screen . " OK?(Y/N) "

Press "Y" key for backup execution. The state in screen will display "backup execution"

There are three data for backup system data and PLC data and APLC data.

The indication on state will display "Execution completed" when backup process is done. For all backup function that APLC data designed by MTB, otherwise the APLC data block will show unexecuted.



(g) When backup data save in 「BACKUP_MANUAL」file of CF card. Windows explorer file is able to check the data for CF card .

Example：CF card is device “E”

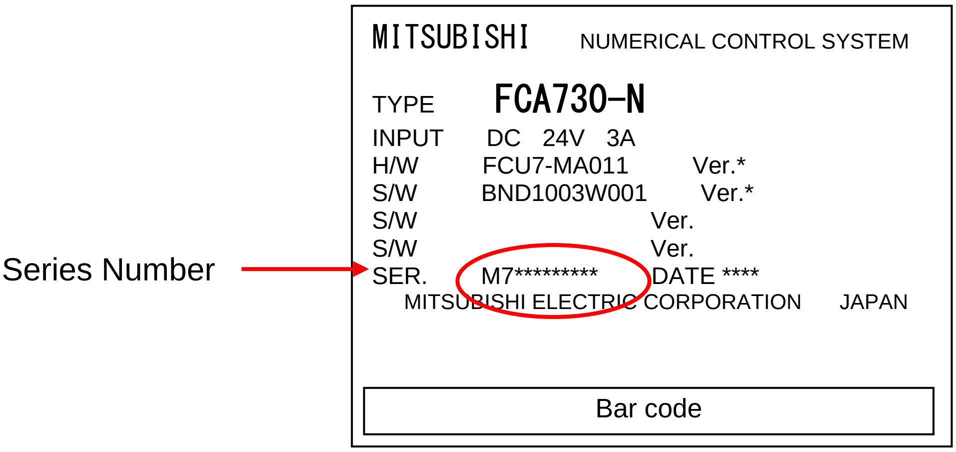
E:\BACKUP_MANUAL\SRAM.BIN	：	SRAM data
USERPLC.LAD	：	PLC　data
APLC.BIN	：	APLC data

※ The procedure of backup will prohibited download APLC data when “all backup” function without APLC data execution .

2.2 Modification series number of NC

The guarantee system of Mitsubishi is base under NC series number. Therefore NC series have to mark and restore writing when the engineer exchange control unit after. Meanwhile the tag on cover of NC series number has to same as display on screen. It is sample to change the cover of control unit for the tag, but there are some methods to modify internal storage series number of control unit.

(1) Writing down series number of control unit when it is changed before.
Regarding series number is pasted on controller unit above.



(2) Modification series number with (1) step into display on screen
※ The operation procedure is acceptable on same number with internal data and number of cover. (It is possible only Mitsubishi person)

Serial No.	M7**********
Model Name	FCA730-N
Unit Name	FCU7-MU011

(3) In order to recognize the warranty certification is assured. The old controller is changed and replace into new series number first. The same as series number of new unit is took a place of old number.

(4) Do not forget exchange the cover of control unit.

2.3 Replacement of control unit

(1) Replacement of control unit.

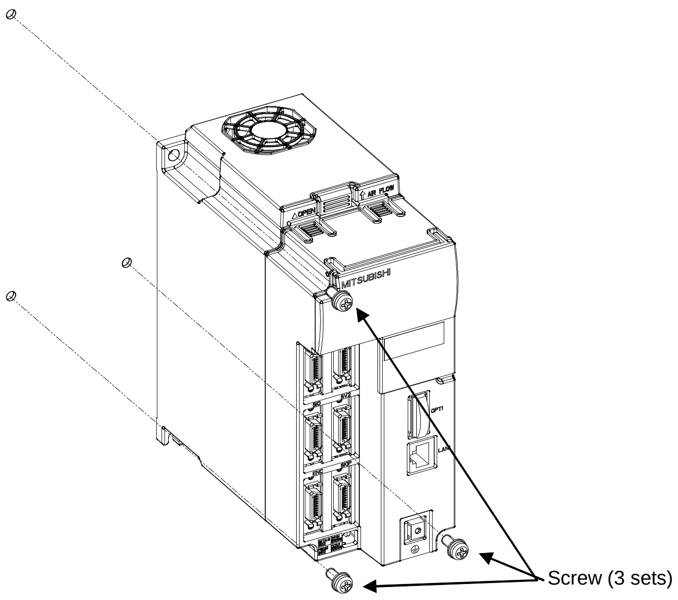
(a) Remark on related label of cable and position of connection.

(b) Take off cables

(c) Take off control unit.

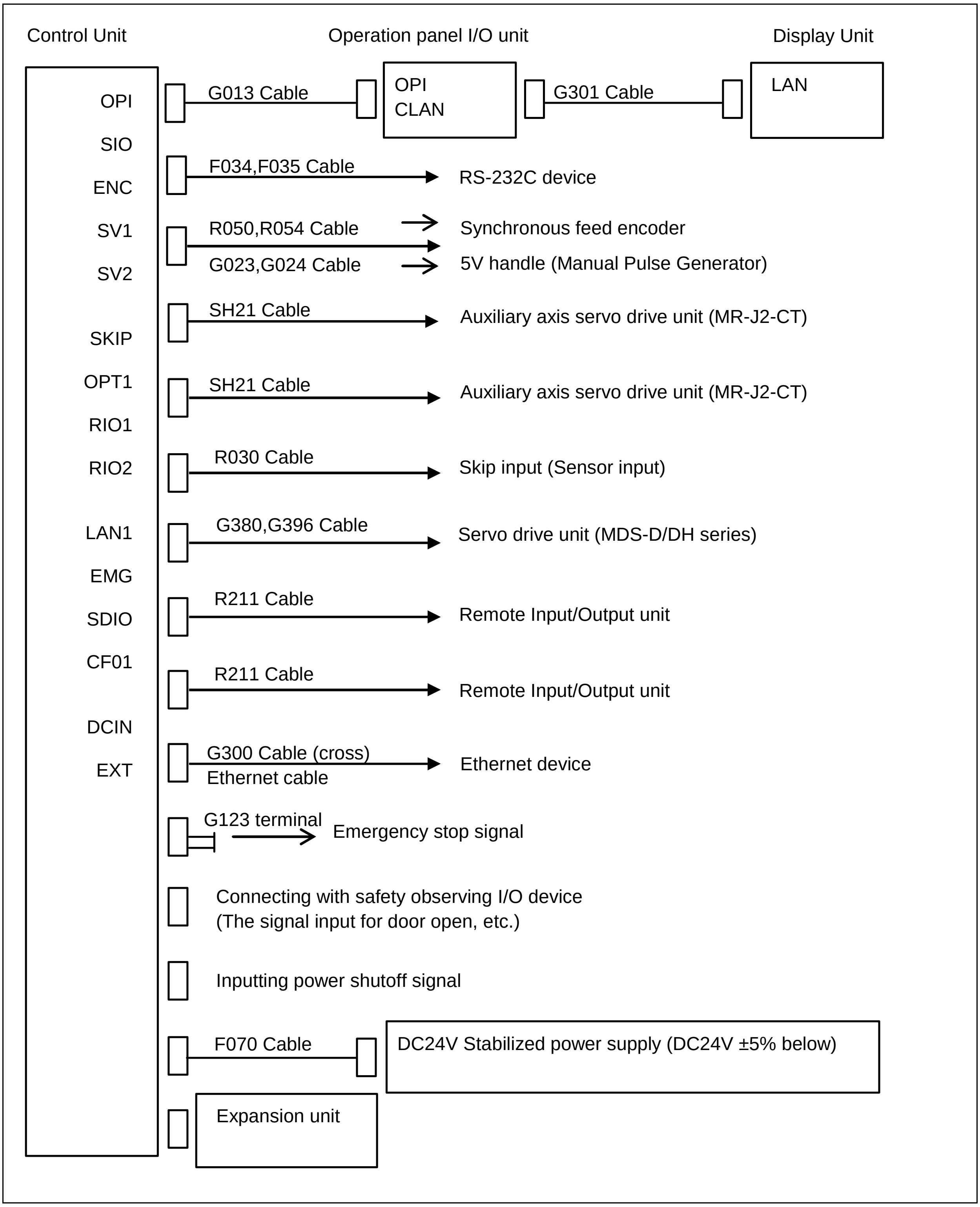
(d) Installation new control unit.

(f) Installation cables.



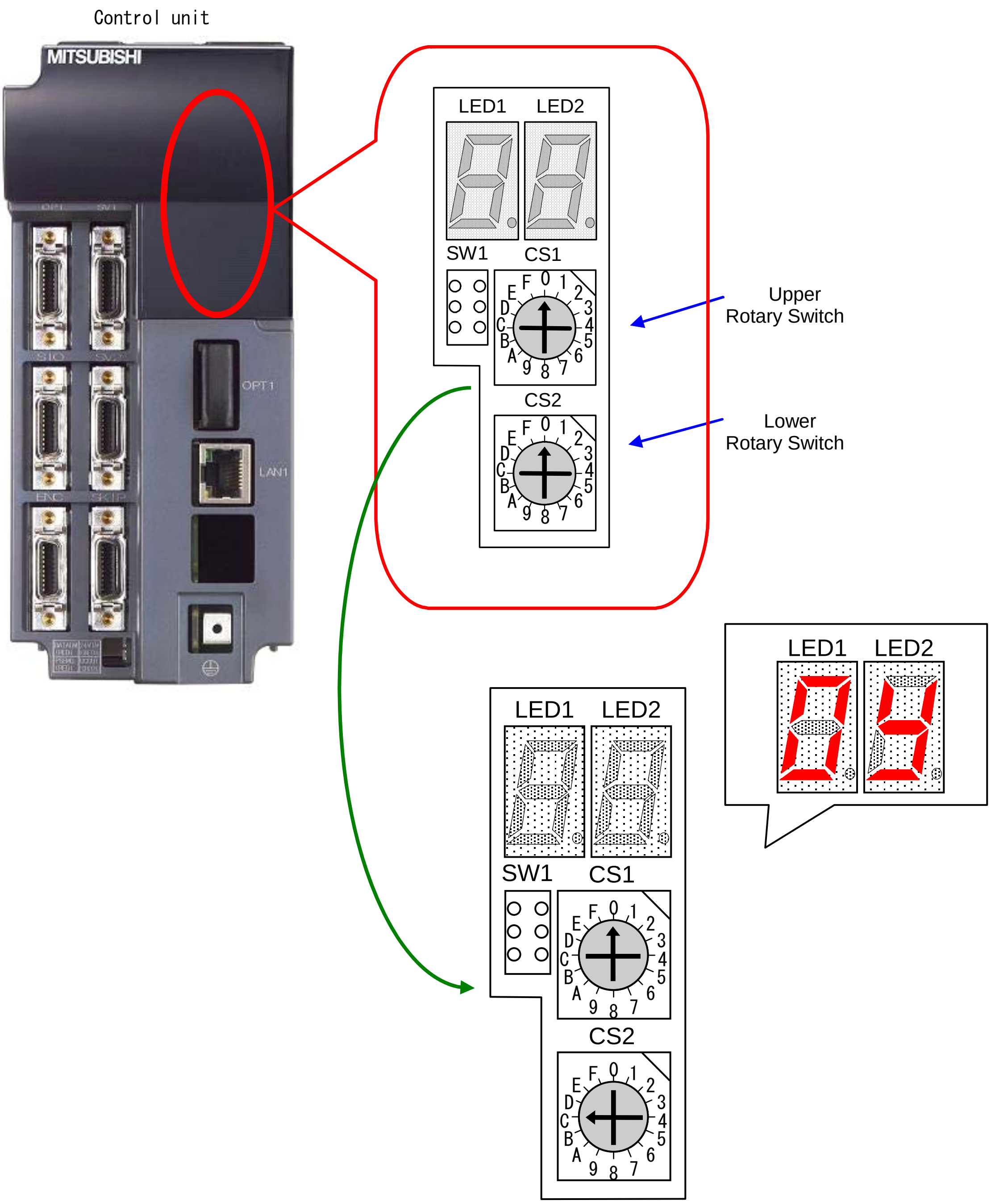
Control unit of M700 series

(2) Control unit connection system drawing：



(3) The SRAM data clear all when control unit is exchanged.

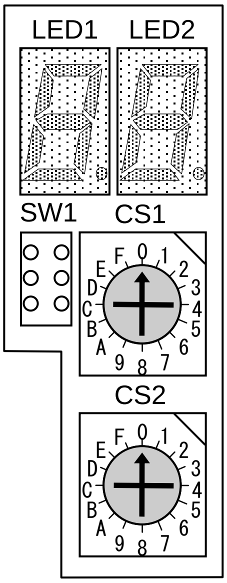
(a) The rotary switch on control unit CS1 set ”0” , the other switch CS2 set ”C” When turn on the power before.



(b) The 7 segment number display as follows「08.」 → 「00」 → 「01」・・・「9.0」 → 「0y」are continuously variation. It is procedure over for clear when screen is displayed all the time.（approximate 30 seconds）.

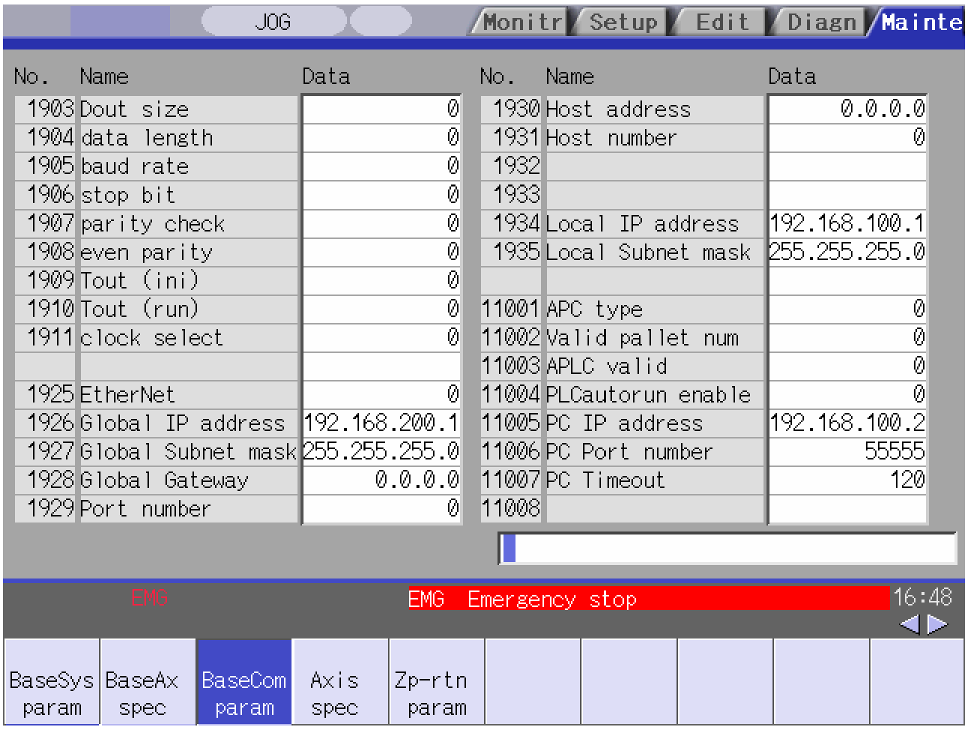
(c) Switch off the power.

(d) Turning rotary switch CS2 set “0”.



【Note】 The IP address will be initialed after SRAM cleared when power is turn on.

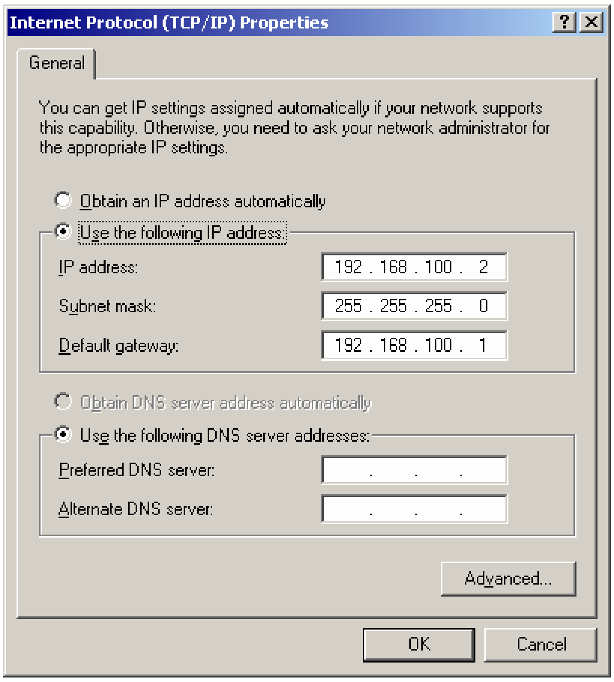
<Base Com/ param >



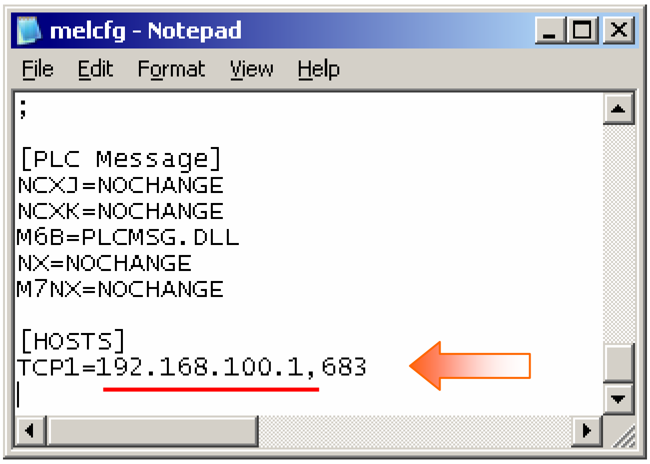
No.	Name	Data	No.	Name	Data
1903	Dout size	0	1930	Host address	0.0.0.0
1904	data length	0	1931	Host number	0
1905	baud rate	0	1932		
1906	stop bit	0	1933		
1907	parity check	0	1934	Local IP address	192.168.100.1
1908	even parity	0	1935	Local Subnet mask	255.255.255.0
1909	Tout (ini)	0			
1910	Tout (run)	0	11001	APC type	0
1911	clock select	0	11002	Valid pallet num	0
			11003	APLC valid	0
1925	EtherNet	0	11004	PLCautorun enable	0
1926	Global IP address	192.168.200.1	11005	PC IP address	192.168.100.2
1927	Global Subnet mask	255.255.255.0	11006	PC Port number	55555
1928	Global Gateway	0.0.0.0	11007	PC Timeout	120
1929	Port number	0	11008		

(e) When the customer has altered inside IP address in his own company, after RAM CLEAR, NC relevant IP address that set up IP show as above, but because different from IP address of PC side, so it will cause NC screen to be unable to open. So start the machine and can resume normal NC screen again after the establishment of the project is finished at this moment. When the user should carry out the all system to back up, relevant IP setting that you had better have write down first, after otherwise even revise the following TCP/IP and establishment value of melcfg.ini. After using the all system restore, relevant IP parameters of NC are set up will get back to the establishment before backing up, that will cause NC unable to start the machine once again.

IP address on the M700 series PC side initial setting.



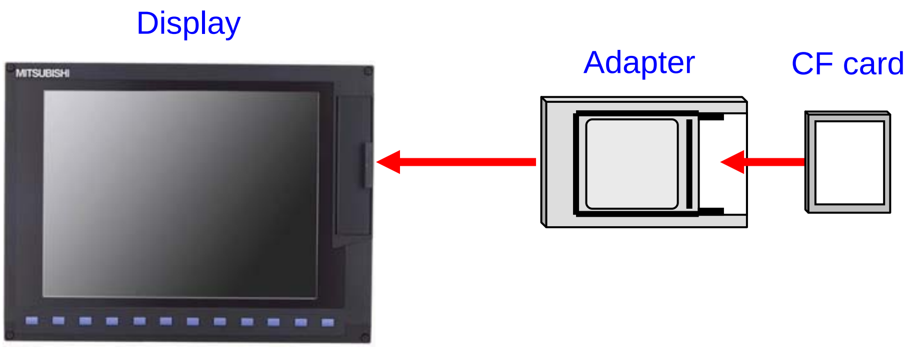
(f) In order to connect with monitor screen the #1934 parameters and directory of 「C:\WINDOWS\melcfg.ini」 numbers in M700 must be same.
Please confirm same as value for 「C:\WINDOWS\melcfg.ini」 as above .



2.4 Restore NC data

Regarding backup data restore that all backup function is useful for data into control unit.

(1) CF card for storage data from control unit connect with PCMICIA adapter that plug in front of display panel.



(2) 「MAINTE」  key →「maintenance」（Mainte）→「password input」（Psswd input）→key in password “MPARA” and then press「INPUT」key.

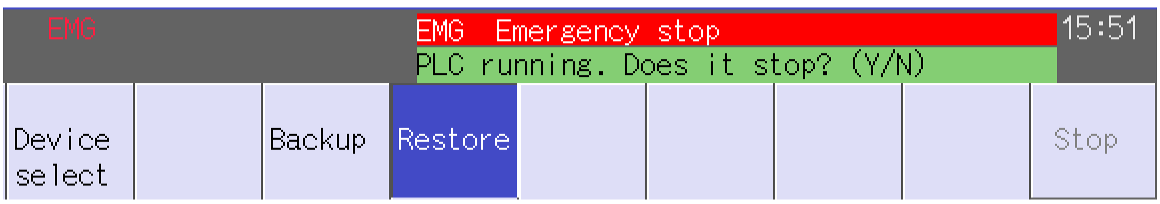
(3) Selection “ALL backup” function key under screen.

(4) Choice ”Device select” → find out「Memory card」
Also hard disk as 「HD」that data read from hard disk or CF card as「DS」that data read from CF card under control unit can selected to restore.

(5) Press key on “Restore” and then selection “Manual” key under “Backup list” on screen.
→「INPUT」,appearing indication on down screen as ”OK?(Y/N)” and press “Y”

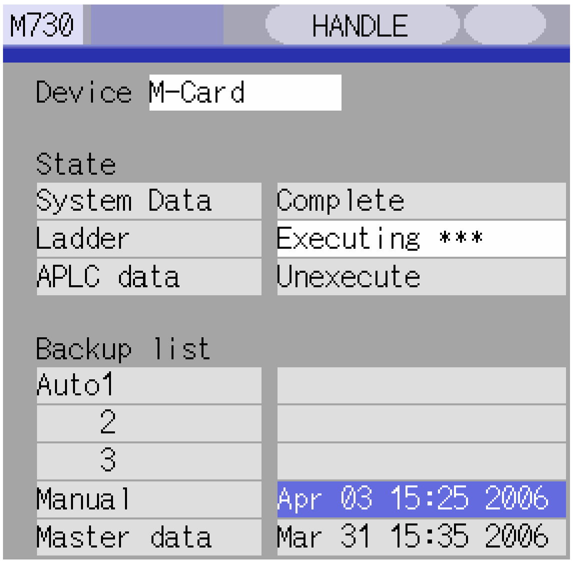
Backup list	
Auto1	
2	
3	
Manual	Mar 31 15:57 2006
Master data	Aug 18 02:24 2005

(6) The state of PLC operation is displayed as ”PLC running. Does it stop？(Y/N) ” and then press “ Y ”
※ If condition is under PLC stop state, the message did not show on screen.



【Note】 It is necessary to modify parameter for language format when RAM CLEAR operation was executed that character display is English format.

(7) ”Executing” for restore message show on the down screen, the real executing indication will step by step executed under state area on upper screen.
The state show as from “＊＊＊＊＊”（Executing）” to “Complete” that data is restored.
“Unexecuted” indicate if data is restored yet.



(8) If all data is restored finish, indication with”Restore complete” message will show on down screen.
(9) When control unit is exchanged finish, please switch off the power and turn on again.
(10) Confirming series number for control unit and machining.

3 Display unit exchange procedures

Before the M700 series display unit exchanges, please back up the controller data in the display unit at present. After changing the new display unit, store the data backed up in the new display, but it reads data will depend on the display " WindowsXPe display unit" and " WindowsCE display unit" that are different .

3.1 Data back up

3.1.1 In WindowsXPe

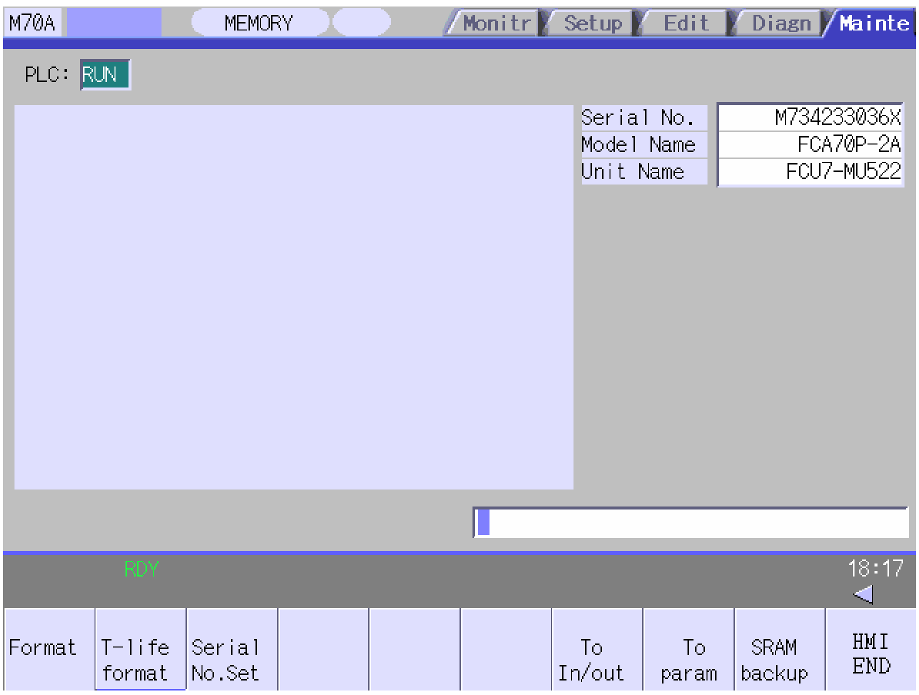
Copy below three files：

C:\ncsys\config.ini
C:\ncsys\customdef.ini
C:\WINDOWS\melAppCtrl.ini

(1) Close HMI screen

①Select MAINTE → MAINTE → PSS/INPUT → input password “MPARA”. Then press「INPUT」key.

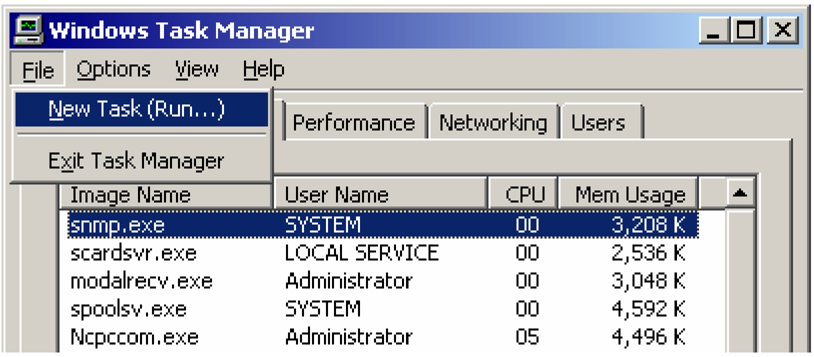
②「NEXT」 → 「HMI END」 press “Y” key to input.



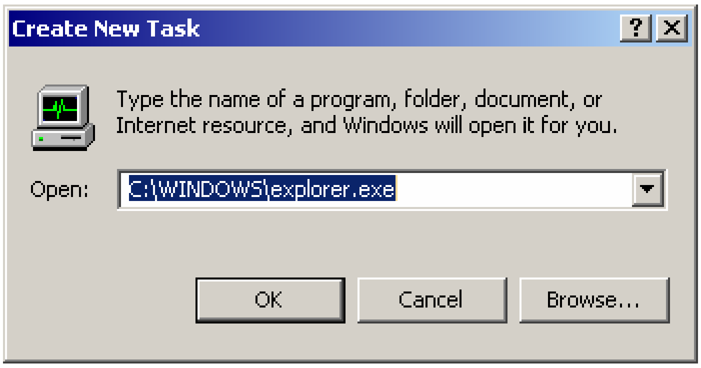
3. Display unit exchange procedure

(2) Start Explorer

①Press NC keyboard ALTER → CTRL → DELETE keys to call out Windows task Manager.
②Frequently input ALT → F keys and then selects New Task (Run…) .



③Input "EXPLORER" or "C:\WINDOWS\EXPLORER" to execute EXPLORER.
If you before had executed above command you can use scroll bar to carry out explorer and press OK key to continue.



(3) Copy below path files to CF card.

C:\ncsys\config.ini
C:\ncsys\customdef.ini
C:\WINDOWS\melAppCtrl.ini

3.1.2 WindowsCE display unit

Below is needed to back up data.

(1)System is M type

C:\ncsys\config_m.ini
C:\ncsys\customdef_m.ini
C:\WINDOWS\melAppCtrl.ini

(2)System is L type

C:\ncsys\config_l.ini
C:\ncsys\customdef_l.ini
C:\WINDOWS\melAppCtrl.ini

(3)To close HMI screen.

(4) Start Explorer

①「Shift」 → 「→|」 → 「INPUT」step by step to input 、Start Menu start.
②「Start」 → 「Programs」 → 「Windows Explorer」selection.

(5)Copy below path file to CF card.

①System is M type
C:\ncsys\config_m.ini
C:\ncsys\customdef_m.ini
C:\WINDOWS\melAppCtrl.ini
②System is L type
C:\ncsys\config_l.ini
C:\ncsys\customdef_l.ini
C:\WINDOWS\melAppCtrl.ini

3.2 Display unit exchanged

The display unit replace procedures please follow below procedure.

(1) Connection position that please pay attention to the relevant lines before exchanging. Recover the relevant lines in the original position after change the new display and confirm really joining.

(2) After the display exchanges, power ON.

(3)Write backup data.

Before chapter is it is it finished duplicate data in the display unit.

Caution	Display unit software version must same as before. If it is different with before please refer 「M700 version up manual (BNP-C9489-013)」.

①HMI screen end.
②Explorer start.
③Copy before chapter backup data in CF card to device C:

(4)Windows XPe display unit

C:\ncsys\config.ini
C:\ncsys\customdef.ini
C:\WINDOWS\melAppCtrl.ini

(5)Windows CE display unit

①System is M type
C:\ncsys\config_m.ini
C:\ncsys\customdef_m.ini
C:\WINDOWS\melAppCtrl.ini
②System is L type
C:\ncsys\config_l.ini
C:\ncsys\customdef_l.ini
C:\WINDOWS\melAppCtrl.ini

(6)Power OFF and turn ON again. The display unit exchanges finished.

4. Hard Disk replacement

The hard-disc copy machine is used in HD repairing of M700 series that make a data backup and restore. Copy machine is inconvenience and expensive cost; usually personal computer is popular equipment tool for engineer. On personal computer, USB HD adapter and Norton GHOST software are tools for backup data in HD.
Ghost software has some advantage for saving huge capacity in HD and convenience carry and HD amount can reduce.

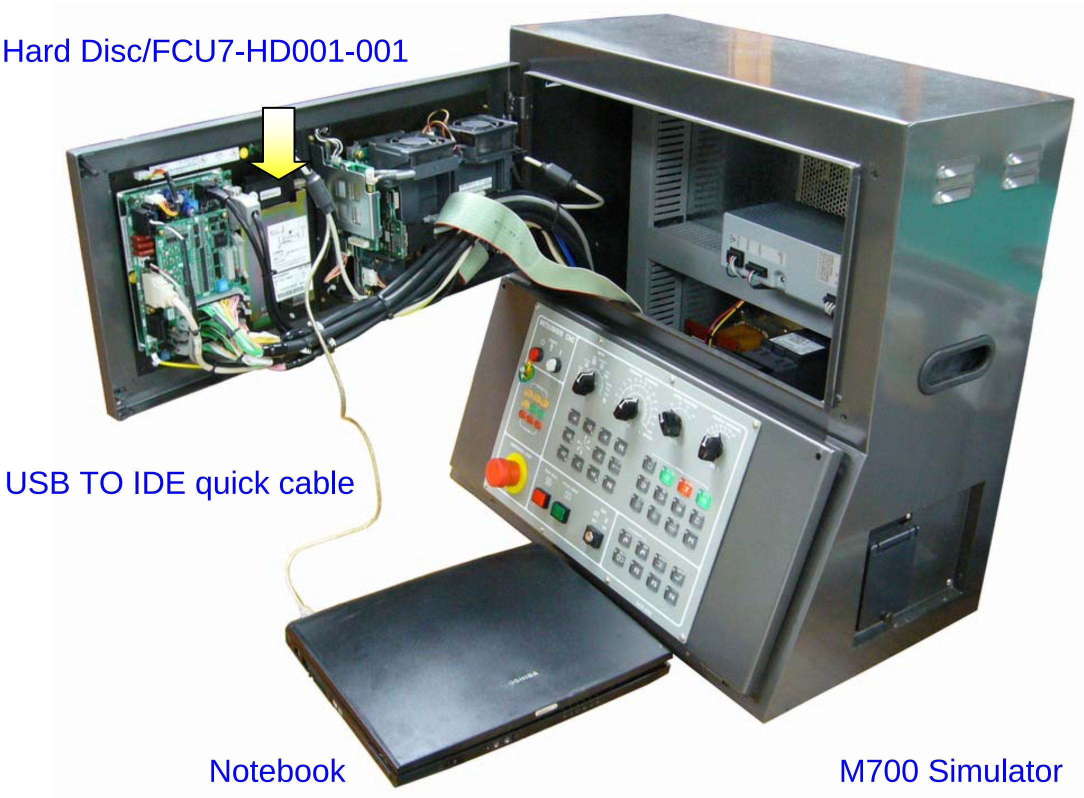
4.1 Preparing tools

(1) Personal computer（Recommendable : WINDOWS 2000/NT/XP）
(2) Norton GHOST Software（VER：7.7 version above）
(3) Hard disc with FCU7-HD001-001 by Mitsubishi series number.
(4) 2.5" hard disc adapter box with USB (or “USB TO IDE” equipment take over USB adapter box)

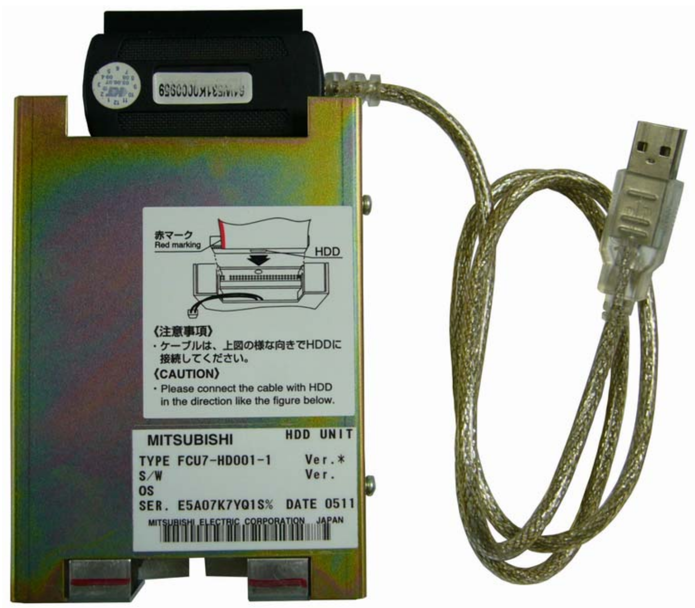
【Note】 It does not remove the cover for hard disc FCU7-HD001-001 and on line to maintain directly.

4. Hard Disk replacement

The HD of FCU7-HD001-001 does not take off cover to connect with extend cable.



This quick cable of USB TO IDE can connect with Hard Disc for 2.5 and 3.5 inch.
The HD of FCU7-HD001-001 does not take off cover when use USB TO IDE cable.
Connection as below:



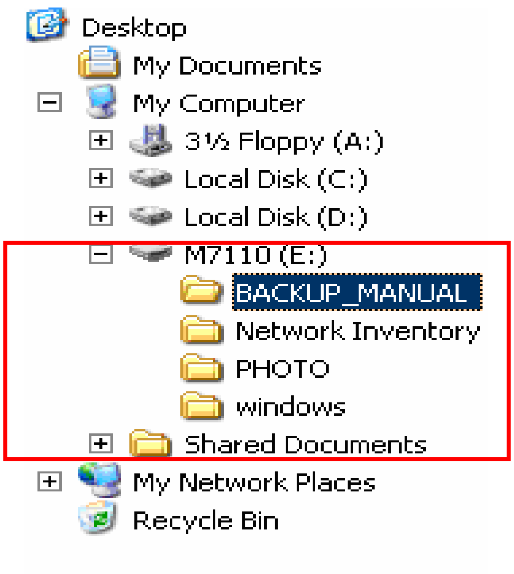
4.2 Installation

(1) Connect with USB TO IDE and Hard disc FCU7-HD001-001

(2) Personal computer base on WINDOWS 2000/NT/XP could automatic detect when USB TO IDE cable plug in. If new device appear under screen it is completed.

【Note】 Please read user manual if it can not connect with PC.

(3) There are two division section under M700 series HD if explore file open. The hard disc name is G and H as below.



(4) The initial disc division section is C and D on M700 controller. These data of NC are storage in directory file D :\ NCFILE. This data folder can be copied used explore file to another personal computer . For disc C, there is some OS system files stored, so backup procedure has to use GHOST software.

(5) When these data are backup for disc C with GHOST and disc D with file copy after that external hard disc can be removed is used this method as below.

(a) Click this icon and used mouse right key under screen to remove USB device. As “USB Mass Storage Device “message will show on screen. Moving cursor to find a device if you need to cancel.

(b) When the “Safe to remove hardware” information is pop on the screen after USB connection can take off.

4.3 Used occasion

(1) The control unit of M700 can not switch on normally due to the hard disc is fault. Firstly backup data to faulty hard disc and then judgment what’s problem on this. In software problems, this software have to get some one with original version and then restoring backup data to faulty hard disk.

(2) Backup all software of control unit of M700 and machine side under hard disc. With convenience purpose for maintenance that GHOST software can backup NC and machine builder’s software under hard disc.

(3) Not only applying to M700 series and Japanese machine for MAZAK and CITIZEN do a maintenance tool but also do a external hard disc on personal computer.

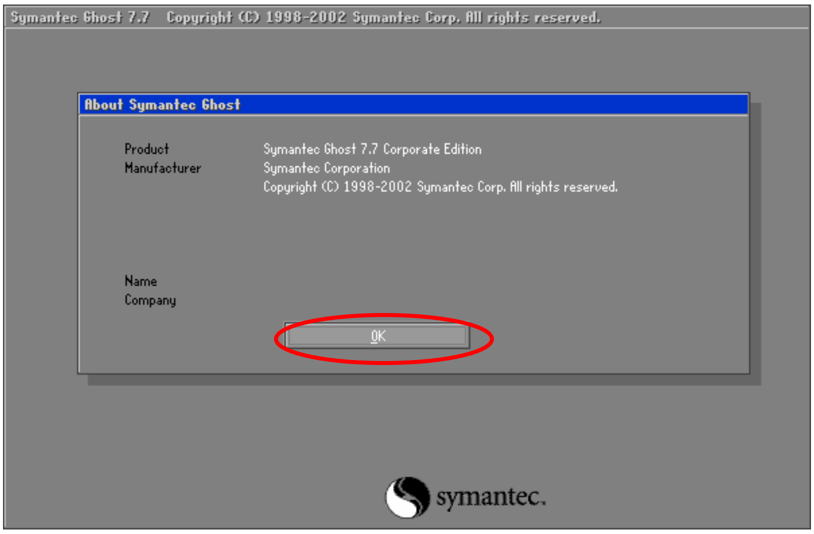
4.4 To backup and restore method by GHOST software

Basically working principle on the GHOST is a data transformed between hard discs (copy, backup, restore) that copy hard disc each other and copy between difference partition on a hard disc. There are six modes on this. Here to explain two methods about partition to image and partition from image.

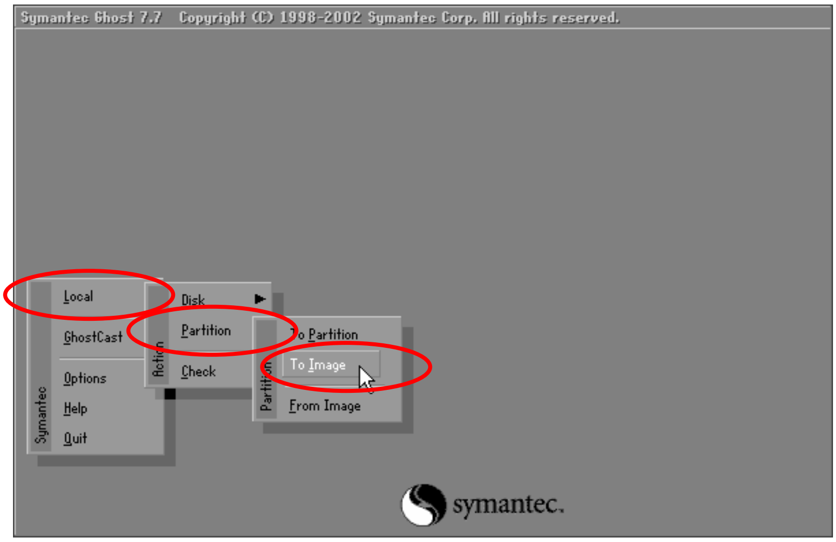
4.4.1 Partition To Image

This is a form of image file that is assigned directly to save file. The backup method is below:

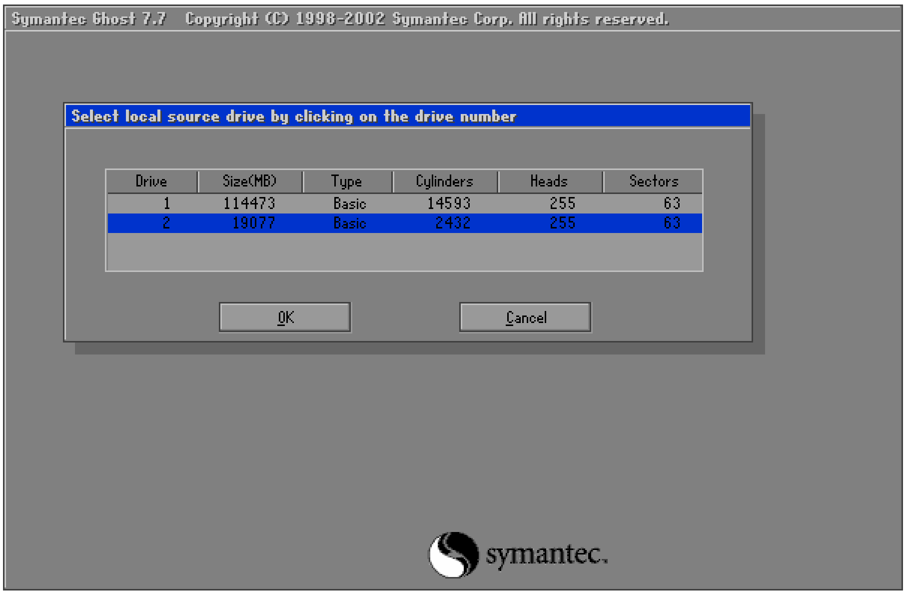
(1) Execution GHOST.EXE



(2) Find out Local→Partition→To Image



(3) The backup disc is selected



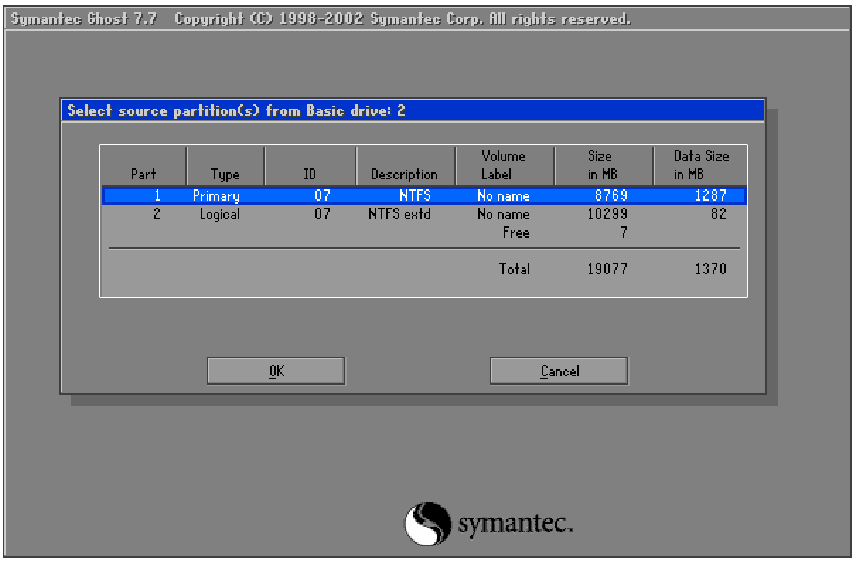
Caution：

(a) To take off USB connector if the hard disc can not displayed on screen. Otherwise plug in the USB connector when computer is re-booted after.(The driver software for O/S of Win95/98 is necessary to install . The Win2000/NT/XP do not need.)

(b) To avoid a mistake selection on hard disc. Otherwise the data can not backup. The second hard disc is showed on screen connect by USB. If not, the first hard disc is the data of original for personal computer.

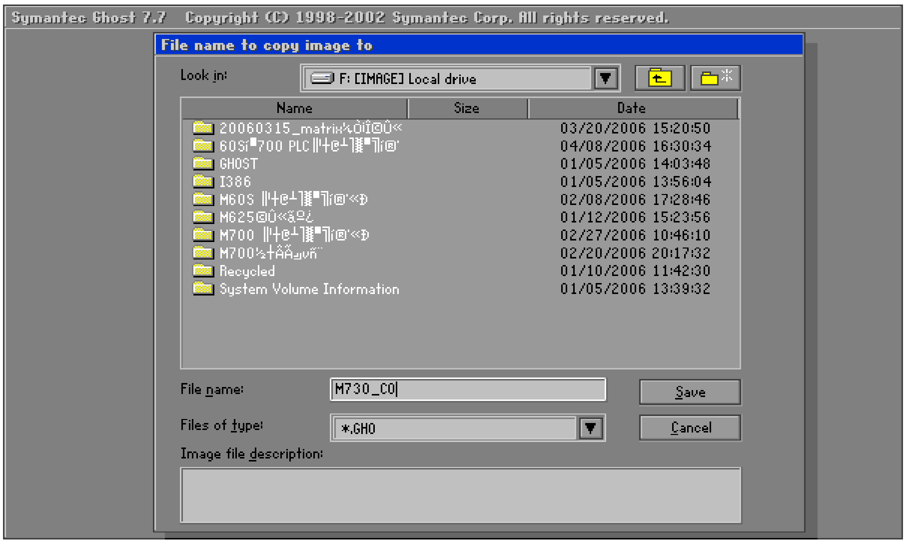
(c) The capacity of hard disc can determine whether it is correct. Following chart above, The FCU7-HD001-001 capacity is 20GB that Driver2 is selected capacity size show as 19077MB.

(4) Select source partition and find Part 1 Primary

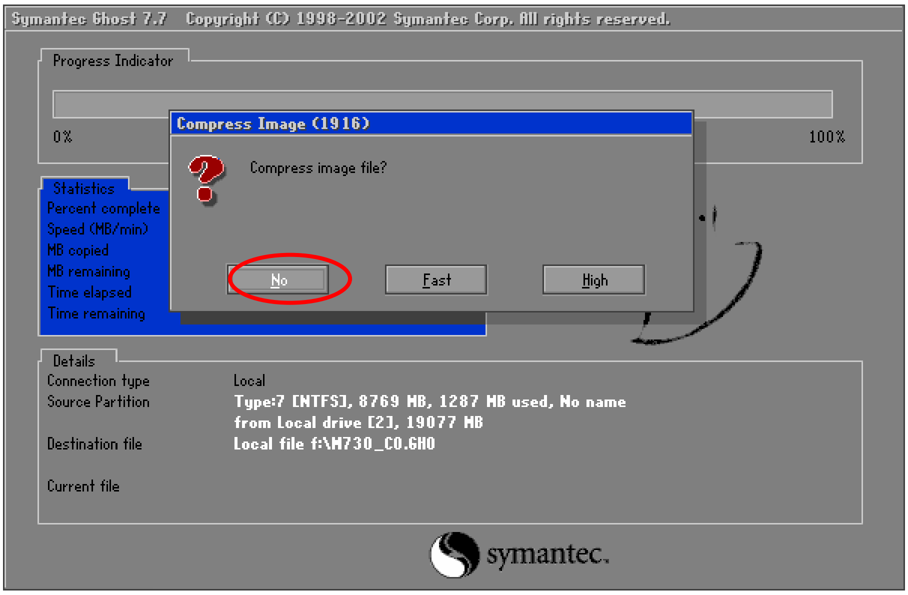


【Note】 The hard disc of FCU7-HD001-001 with M700 must be divide two sectors.
The primary is selected it is backup O/S and program.

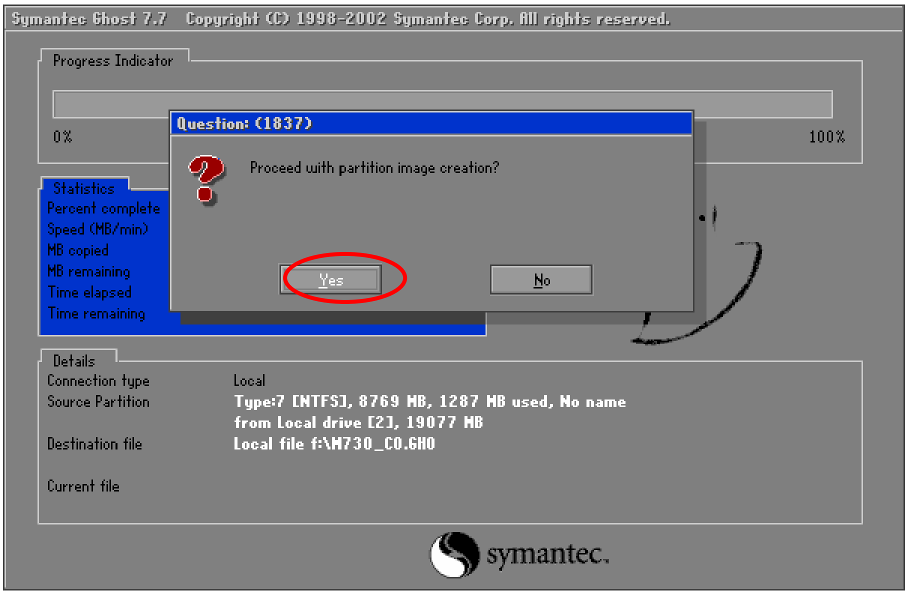
(5) To save file route and file name.



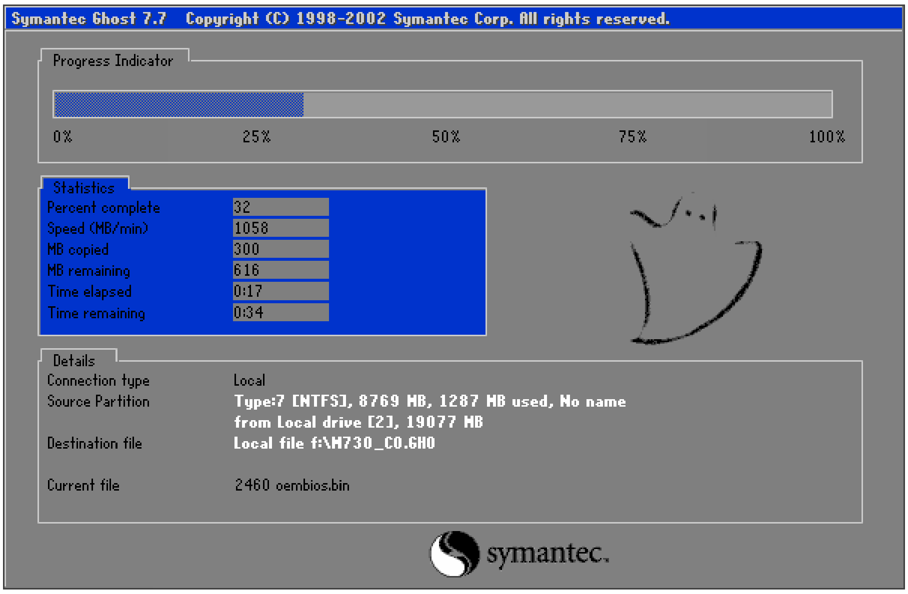
(6) Indication “Compress Image File? “ show on screen，Select “No”



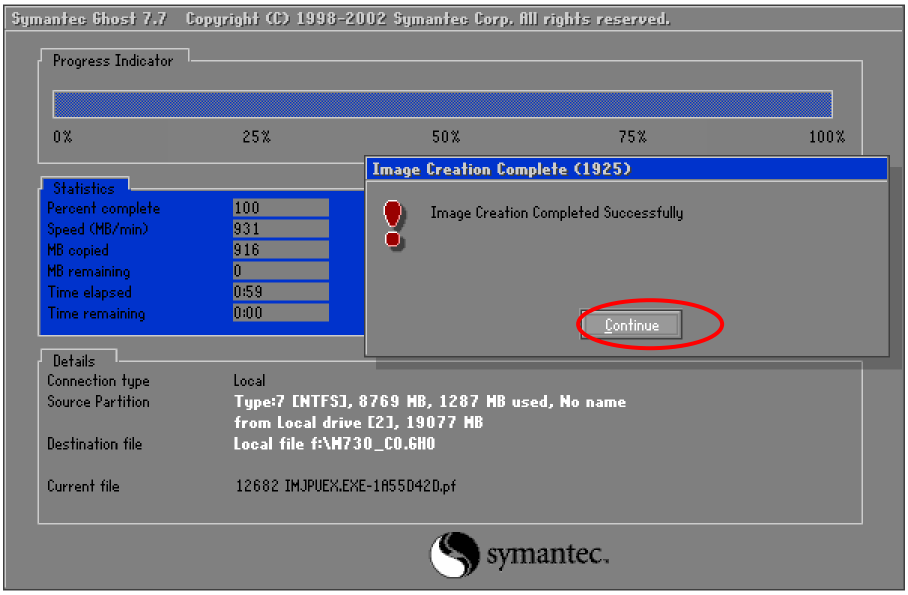
(7) Indication “Proceed with partition image creation? “ show on screen，Select “Yes”



(8) Executing



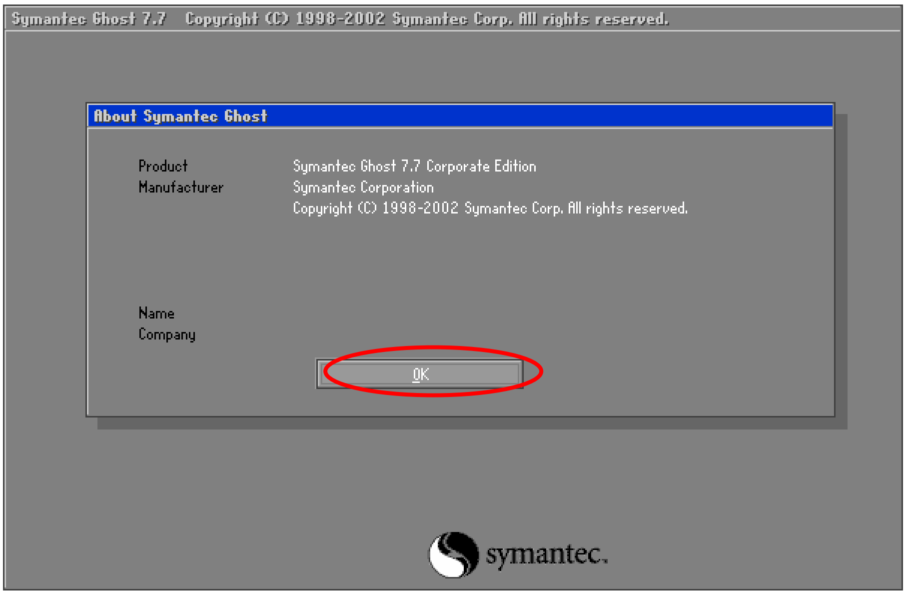
(9) “Image Creation Completed Successfully” show on screen when execution is complete. Selection “Continue” is to finish.



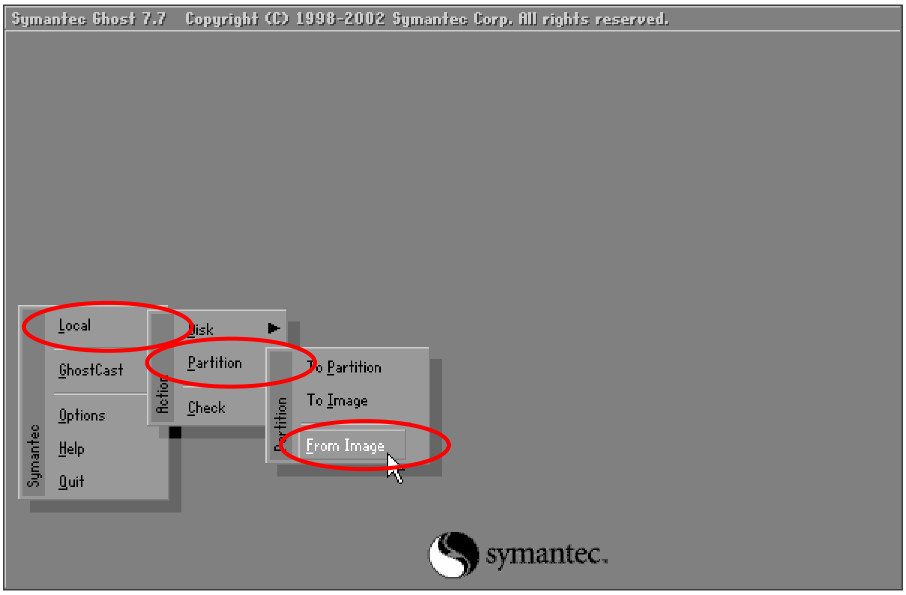
4.4.2 Partition from Image

Partition restore from image file that re-back a file of image status. Restoring method as below:

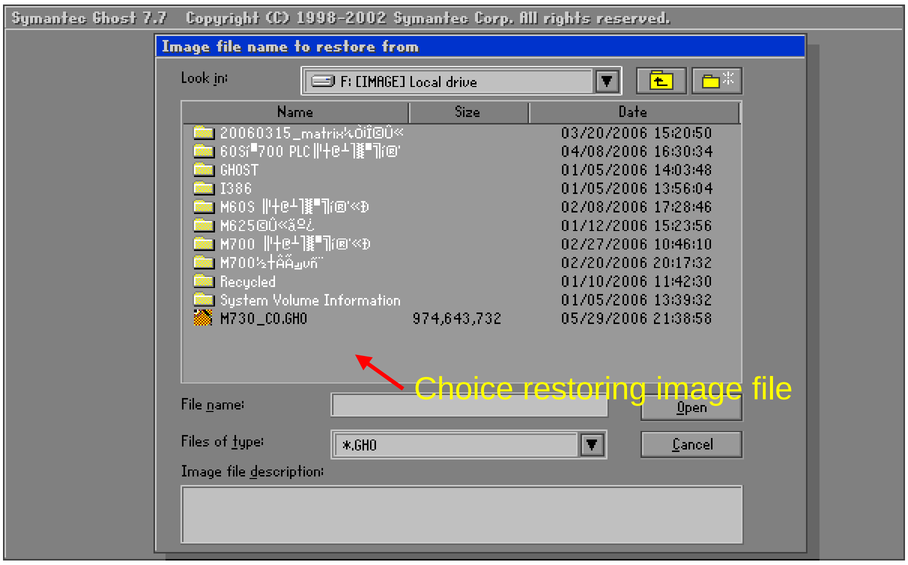
(1) GHOST.EXE



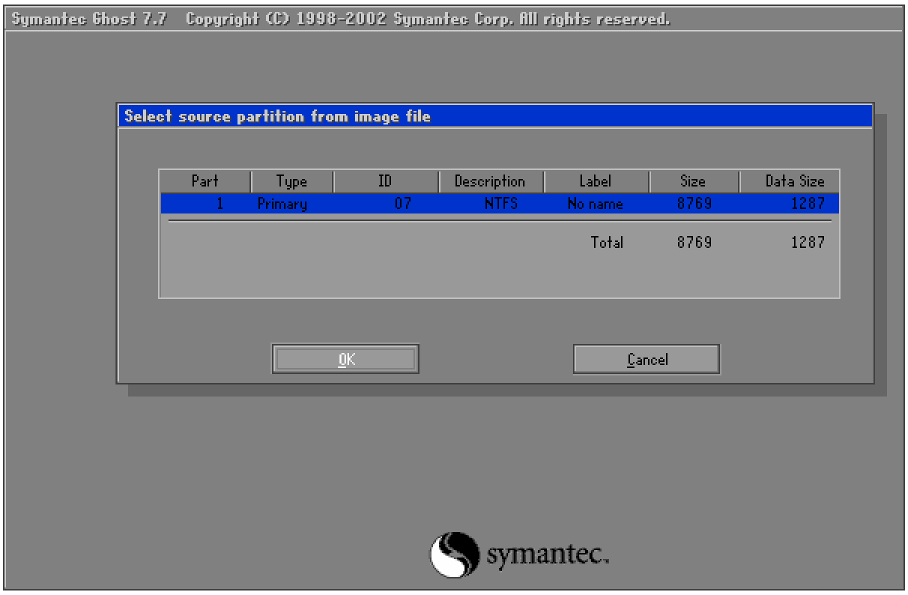
(2) Local→Partition→From Image



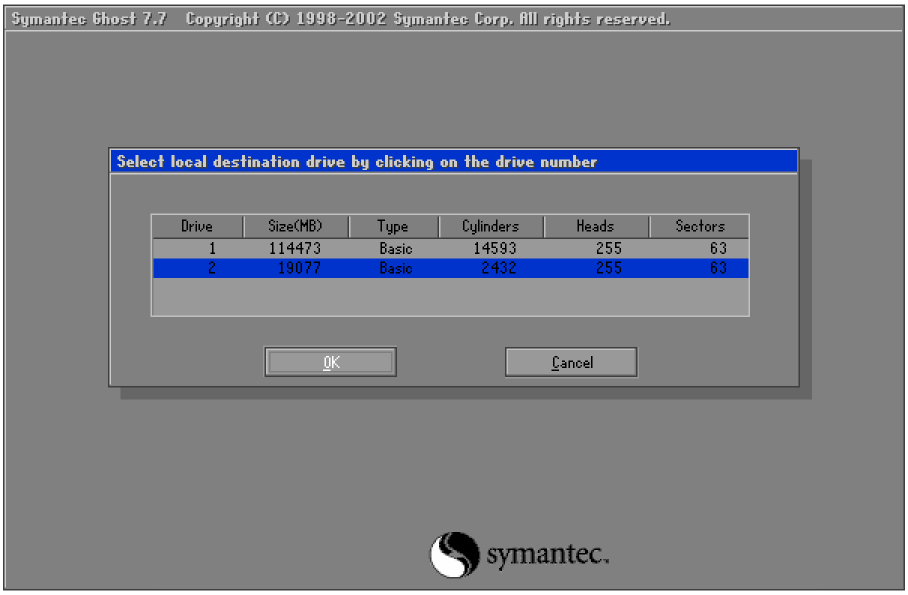
(3) Find out image file



(4) Find out original partition area to select part1 primary.



(5) Selection restoring hard-disc

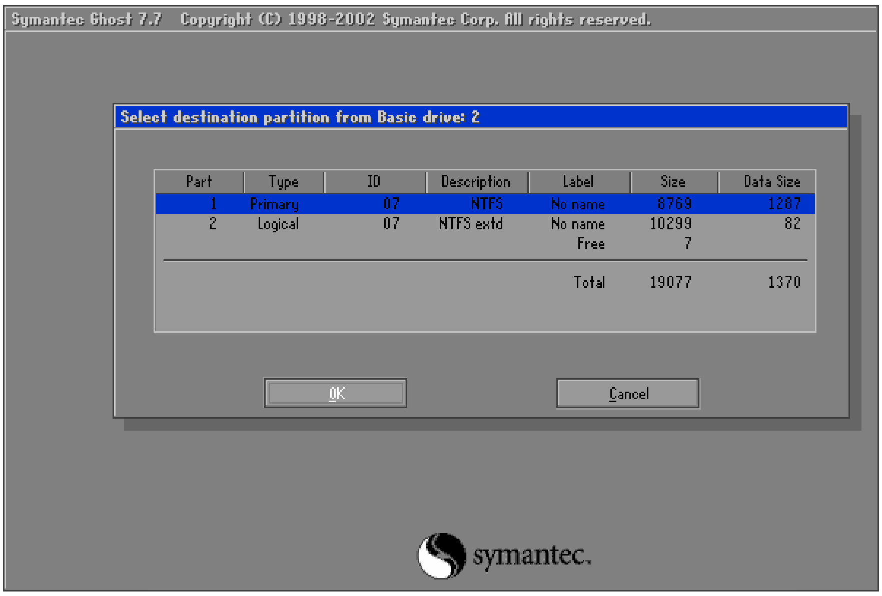


Caution：

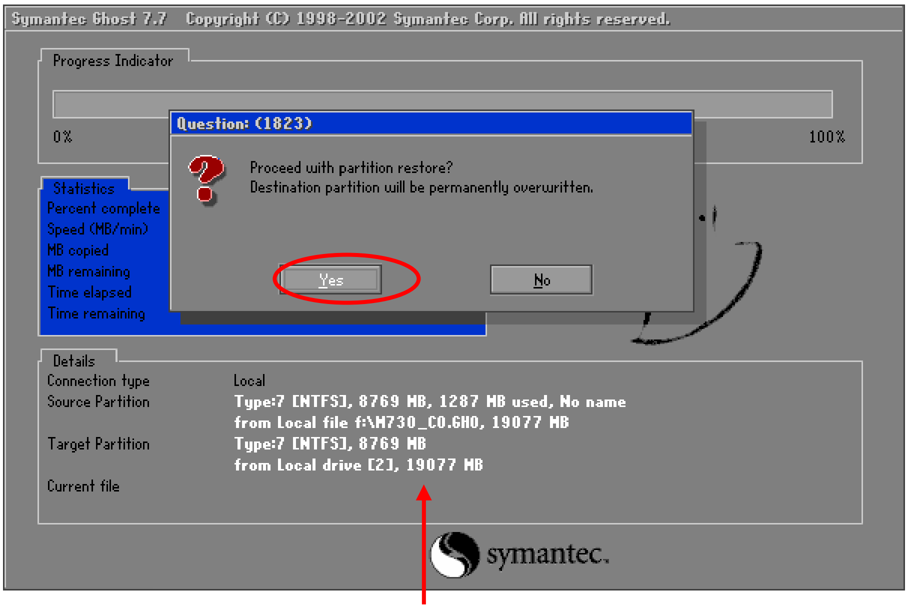
(a) Usually the Drive2 is selected. The image file will be recovered into system file if Driver1 is selected that this procedure is serious mistake.

(b) The capacity of hard-disc can be determined whether you want.
The Driver2 capacity is 20GB for FCU7-HD001-001 show as screen.
The capacity size is 19077MB.

(6) Selection restoring partition. To choice part1 primary.

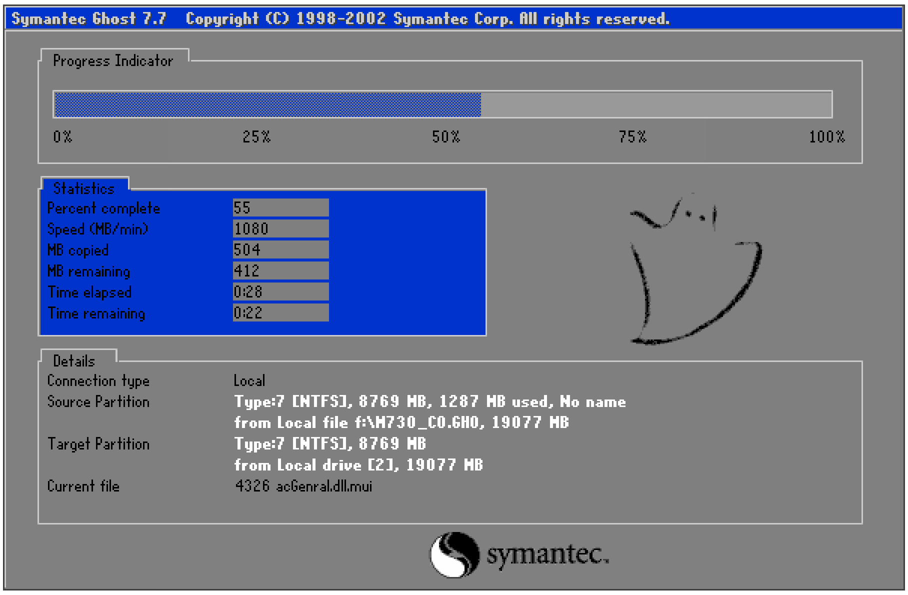


(7) Pop up in screen as Proceed with partition restore ? Select" Yes"

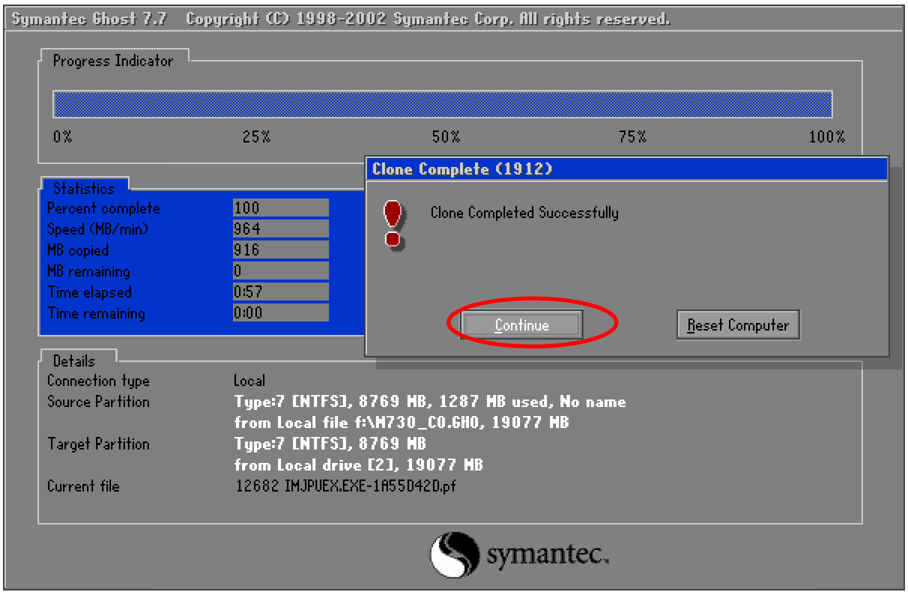


The target disc confirms again when it is partitioned before.
The target disc is secondary if note-book computer is used.

(8) Executing



(9) Clone completed successfully display is finish. Click “continue is for end.

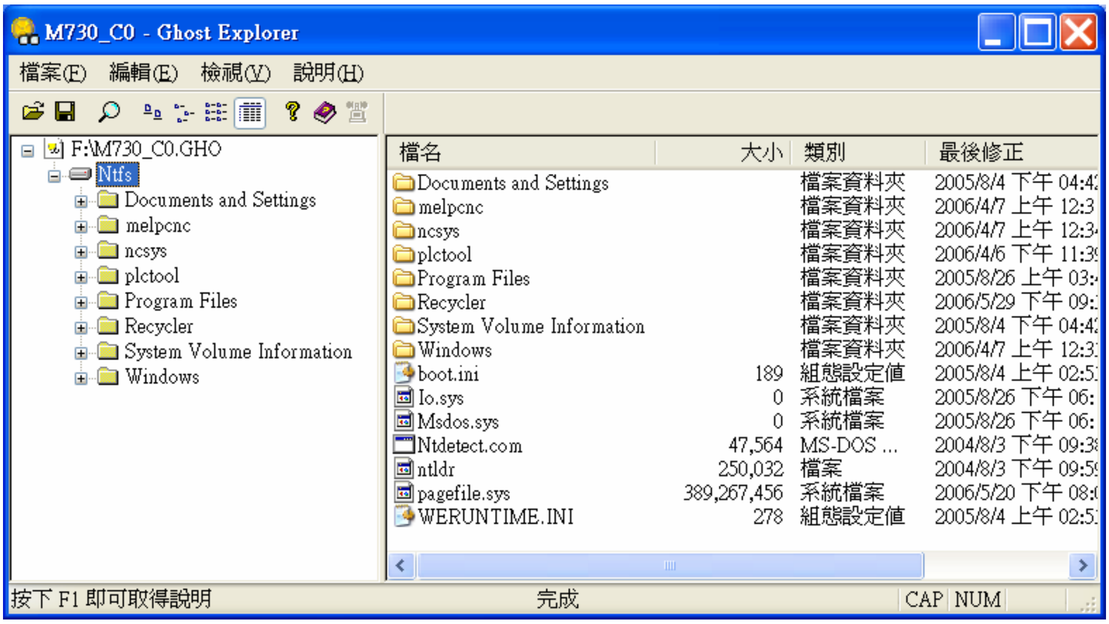


4.5 Ghost Explorer

This tool is usefully for operator to explorer the Ghost file when Ghost is complete.
The Ghost file can be picked if it is needed but did not take a hard disc to restore a file.

(1) Ghostexp.EXE to execute “ GHOST explorer”

(2) Select File → Open file Opening GHOST file to reading the content of hard disc.
The demand file can be copy from hard disc.



4.6 Others

(1) Please keep the latest virus to prevent influence when file is restored during backup.

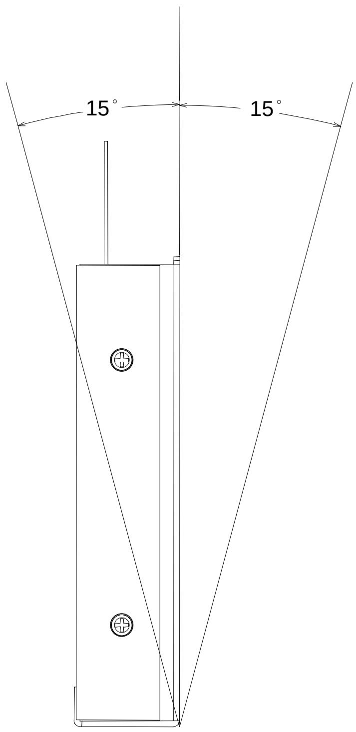
(2) The file name is recommended using easy to discriminate and remark version of system software.

(3) Please confirmation version of hard-disc because it will be alarm with" CAN NOT CONNECT TO NC" if the version level is difference for NC S/W and PC S/W.

(4) The Ghost version base on DOS previous. So it can not execute on WINDOWS 2000 / NT/XP systems.

(5) The hard disc must be stop when USB take off before.(The lamp of external box glisten is stop)
Safely remove procedure is executed until message is show on appear and then pull out. Otherwise the hard-disc will be damaged.
Replacement new hard-disc when backup procedure is completed.

(6) The hard-disc position must be within ±15 degree on vertical angle (as chart as below)
If the angle is large this, it will cause damage.

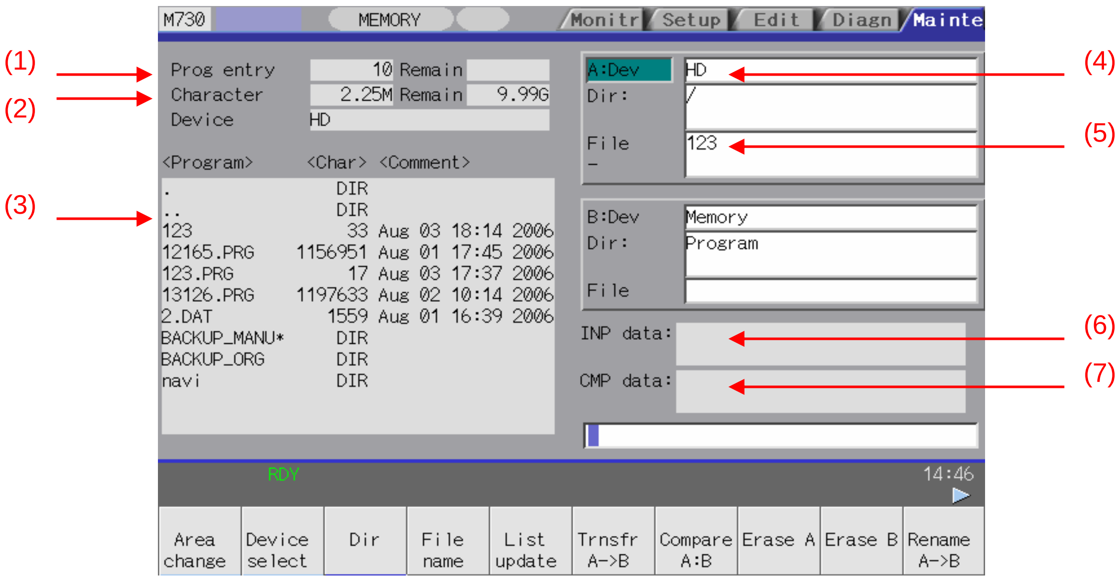


5. Data input/output

5.1 Input / Output screen

This screen is a communication interface between NC data and internal memory or external device. The HD is under NC device that is looking at external device.

5.1.1 Explanation items on screen



(1) Program entry and remain amount (Note1)

This displays the registration information of machining program of the selected device.

Number of programs registered:

This displays number of programs previously registered as user machining programs.

Remainder:

This displays the remaining number of programs that can be registered.

When “Memory” is selected as the device, the total of the number of programs registered and the remainder is the maximum number of registrations set in the specifications.

(2) Number of memory characters and remainder (Note1)

This displays number of characters of the machining program of the selected device.

Number of memory characters:

This displays number of characters previously registered as user machining programs.

Remainder:

This displays remaining number of characters that can be registered. The total of the number of memory characters and the remainder is the maximum number of memory characters set in the specifications.

(3) List：（Note2）

This displays a contents list (directory and file name)of the directory in the setting column(file setting column A or B) where the cursor is currently located.

A. Program:

When “Memory” is selected for the device, this displays the file name(program No.) of the machining programs already registered. The file names are displayed in order from the smallest number, from 1 to 99999999.When a device other than memory is selected, this displays the file name and directory to be included in the directory that is set in the current setting column.

B. Character:

The size of each file (when memory is selected for the device, the number of characters in the machining program).When directory is selected ,this displays “DIR”.

C. Comment:

This displays the comment (up to 17 alphanumeric characters and symbols) of each file.

The date which the file is updated is displayed for the HD, FLD, memory card, DS or Ethernet.

When the number of characters exceeds 17, the excess is not displayed.

(4) File setting column A

This sets the device, directory, and file name of the target file transfer, compare, earsing ,etc., operations.

When transferring, the file name of the transfer origin file is set. When renaming, the file name before renaming is set. When earsing ,the earsing range is set. When the number of characters exceeds 28, the excess is not displayed.

(5) File setting column B

This sets the device, directory, and file name of the target file transfer, compare, erasing ,etc., operations.

When transferring, the file name of the transfer origin file is set. When renaming, the file name before renaming is set. When earsing ,the earsing range is set. When the number of characters exceeds 28, the excess is not displayed.

(6) Input data

This displays the data being transferred.

(7) Comparison data:

This displays the data being compared. If an error occurs during comparison, the block with the error is displayed.

【Note1】 Depending on the device, some items are not displayed.

Device / Display item	Memory	HD	RS232	Memory card	DS	Ethernet	FLD
Number of programs registered	○	○	×	○	○	○	○
Remainder	○	×	×	×	×	×	×
Number of memory characters	○	○	×	○	○	○※	○
Remainder	○	○	×	○	○	×	○
List	○	○	×	○	○	○	○

○ : Displayed × : Not displayed

※ : When the Ethernet parameter#97*1 Host n no total siz" is set to 1,the number of host memory characters will not appear.

【Note2】 The list does not appear when using serial.

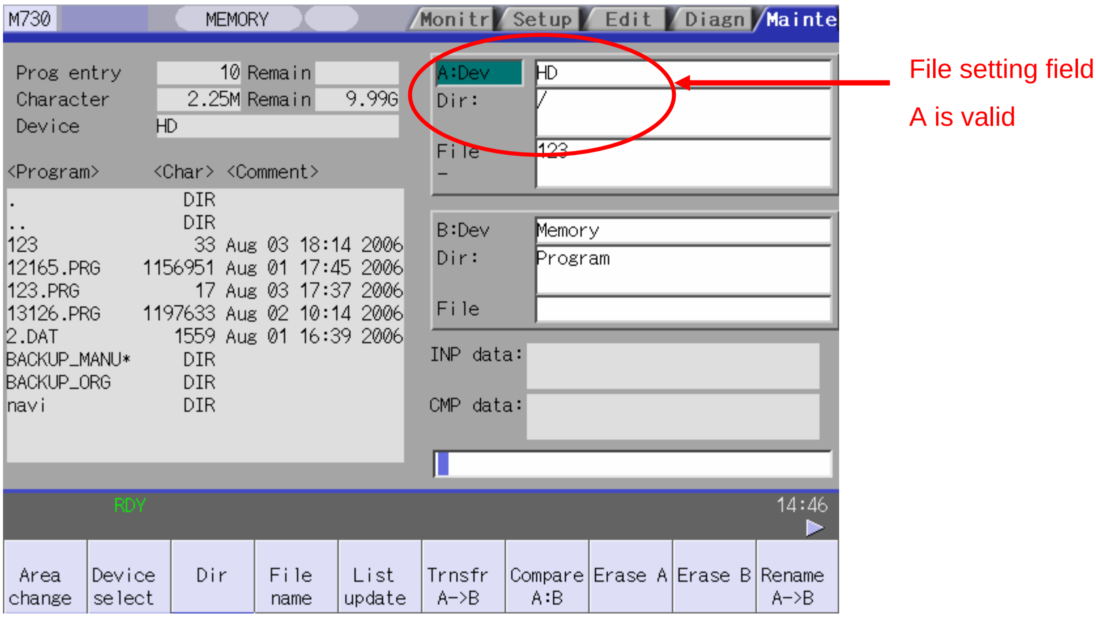
5.1.2 Menus

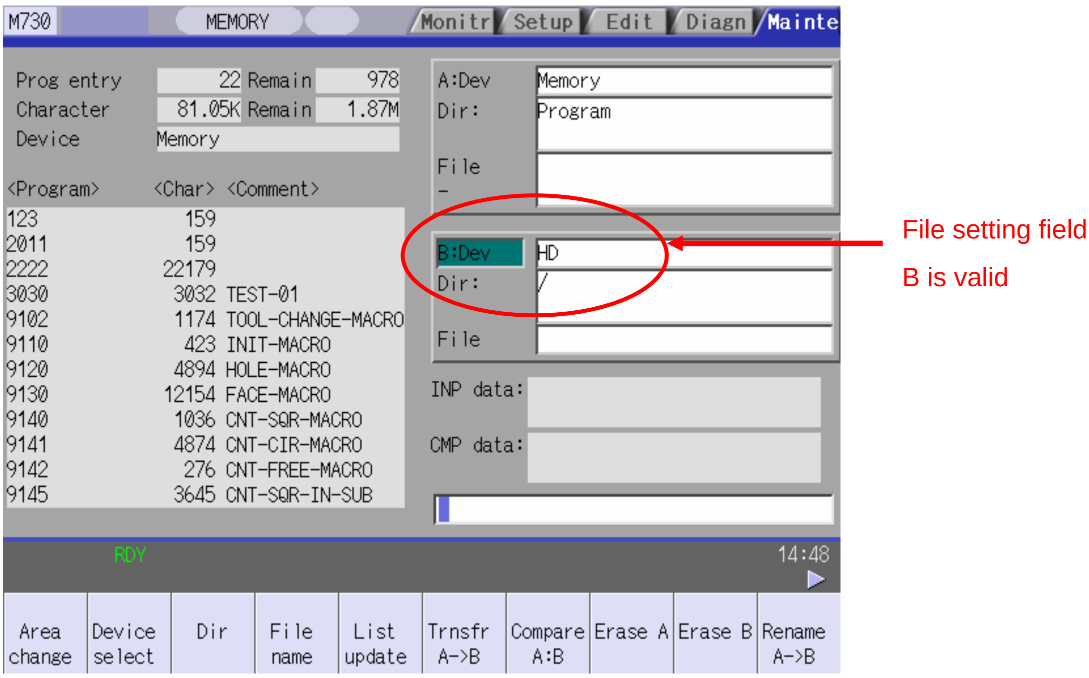
Menu	Details
Area change	This changes the setting area to file setting column A(transfer origin) or file setting column B(transfer destination).The display of the valid area (A or B) is highlighted.
Device select	This displays the submenu of the machining program storage area.When the submenu is selected,the device is confirmed ,and if a directory exists it is set in the root. The memory is selected as the default.
Dir	This menu sets the directory that carries out input/output operations,and is on standby for input.Note that when memory is selected for the device,the directory can be selected from the submenu.
File name	This menu sets the file name that carries out input/ output operations, and is on standby for input. When memory is selected for the device, setting is not necessary if the directory is not the program.
List update	This updates the list. The list of the directly selected in the currently valid file setting column (A/B) is updated.
Transfr A→B	This copies the file in file setting column A (transfer origin) to the file setting column B (transfer destination). (The transfer origin file is not changed.) A message appears during transfer and when the transfer is completed.
Compare A：B	This compares the files in file setting column A (transfer origin) and file setting column B (transfer destination).
Erase A	This erases the file in file setting column A. 【Note】The NC memory (excluding programs), serial and Ethernet (host file) cannot be erased.
Erase B	This erases the file in file setting column B. 【Note】The NC memory (excluding programs), serial and Ethernet (host file) cannot be erased.
Rename A→B	This changes the name of the file in file setting column A (transfer origin) to the name of the file in file setting column B (transfer destination). 【Note】The same device must be selected for A and B. The NC memory (excluding programs) and serial cannot be renamed.
Dir create	This creates a new directory in the directory of the currently valid file setting column (A/B). The directory can be created when HD, FLD, memory card or DS is selected for the device.

Menu	Details
Merge B→A	The file contents in the file setting column B are added to the file in the file setting column A. (The file in the file setting column B is not changed.) 【Note】The NC memory (excluding programs), serial and Ethernet (host file) cannot be merged.
FLD format	This formats the FLD.
MenCrd format	The formats the front IC card.
DS format	This formats the NC compact flash memory.
Stop	This interrupts the process (transfer, compare, etc.) during execution.

5.1.3 Changing the Valid Area

When setting the file setting field A or B device, directory and file name on this screen, the area containing these must be valid.
The display area can be changed by pressing the menu key [Area change] or the cursor key [↑] and [↓].
After changing, the data setting operation is valid in that area.





5.1.4 Selecting a Device, Directory and File

【Device】（Select from the sub menu）→【Directory】（Input the full path or select from the list.）→【File】（Input the file name or select from the list）

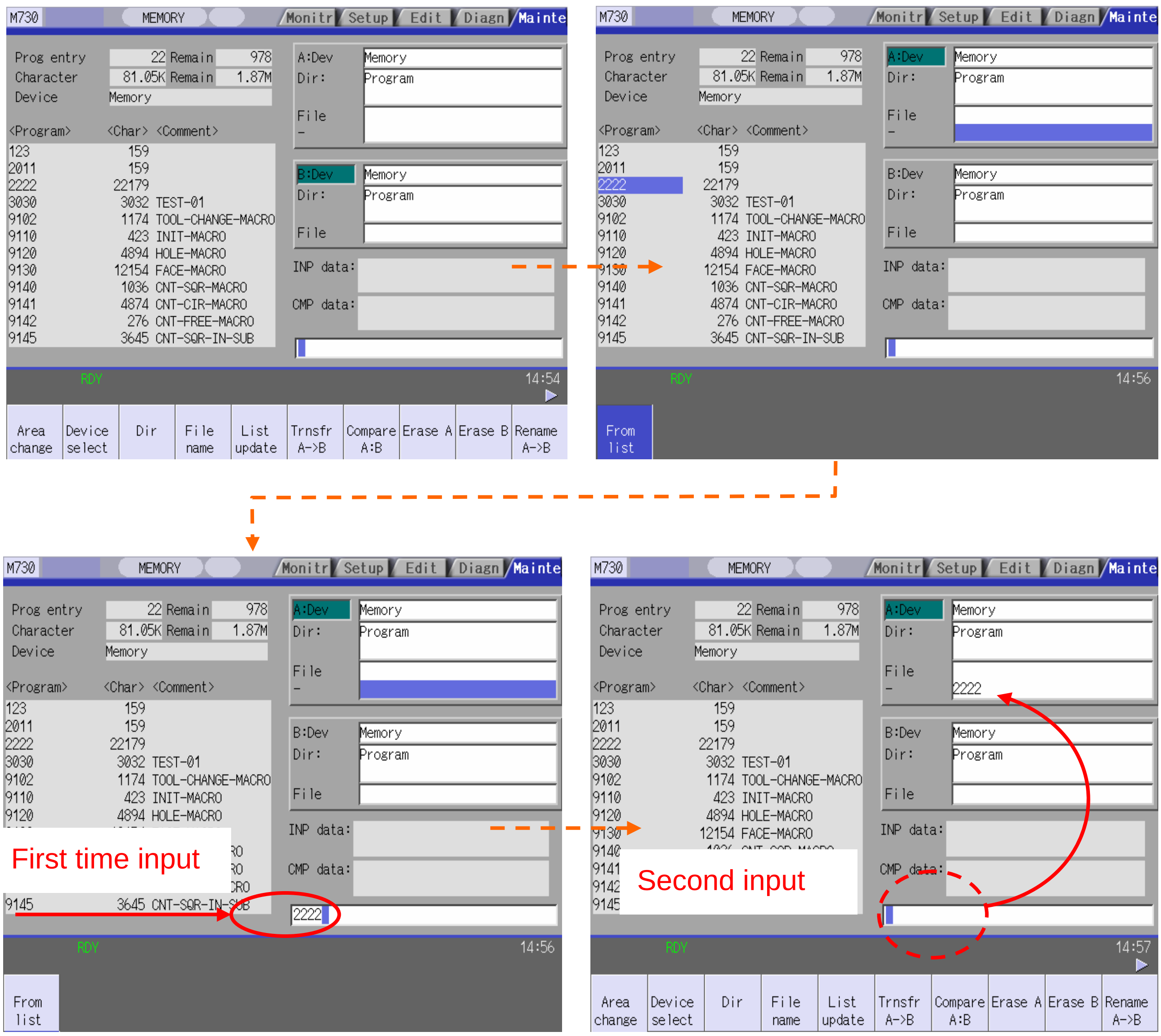
(1) Device select：

Menu	Details
Memory	This selects the NC memory (program, parameter, user PLC, NC data).
HD	This selects the hard disk.
RS232	This selects the RS-232C device (PC, tape, etc.).
Memory card	This selects the front IC card.
DS	This selects the NC compact flash memory.
Ethernet	This selects the Ethernet-connected host computer.
FLD	This selects the floppy disk.

(2) Dir (other than memory) and File name menu submenus : From list

The cursor appears in the list display. The list contents can be selected with the INPUT key.When a directory is selected; the contents of the selected directory are displayed in the list. Continued selection is possible.

When a file name is selected, the file name is temporarily displayed in the input area. When the INPUT key is pressed again, it is fixed.



5.1.5 Selecting methods for device, directory, and file name

Device	Designation target file	Designation method		
		Device	Directory	File name
NC memory	• Machining program • User macro • Fixed cycle	Select from the submenu	- (Default)	Key input in the input area, and press INPUT Select from the list
	Other than the Machining program	Select from the submenu	Select from the submenu	- (Fixed)
Other than the NC memory	All	Select from the submenu	Key input in the input area, and press INPUT Select from the list	Key input in the input area, and press INPUT Select from the list

The device can be selected from the submenu. (The devices that can be used will differ depending on the specifications.)
One of the following methods can be used to designate the directory (for devices other than the NC memory) and file name.

(1) Set the directory path (full path) or file name in the input area, and press the INPUT key.

(2) Press submenu From list of the menu Dir or File name . Move the cursor to the target directory or file name, and press the INPUT key.

(3) A wild card (*) can be used when selecting a file name.

(4) Notes when selecting a file

(a) During directory and file name setting, the designated directory, path or file name will be set, even if it does not actually exist. This will not cause an error. Note that the previously set directory is overwritten.

(b) When a file in the NC memory other than a machining program is designated, it is not necessary to set the file name. (The file name is fixed.)

(c) When a file name is selected from the menu, it first is displayed in the input area. However, at this time the file name has not yet been fixed. Press the INPUT key again to fix the file name.

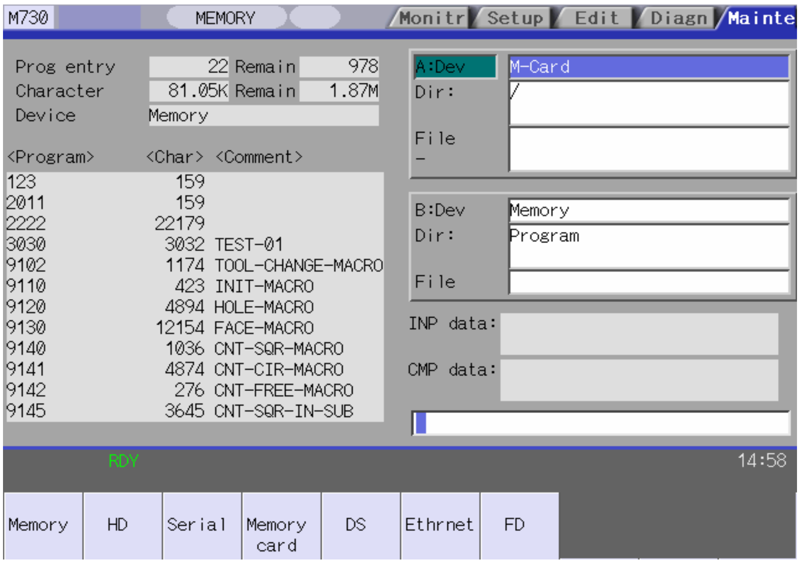
(d) When the ◁ key is pressed when setting a file name, the file name in the input area is erased.

(e) When a fixed cycle program is designated, the basic common parameters "#1166 fixpro" must be set. Select "Memory" for the device, and "Program" for the directory.

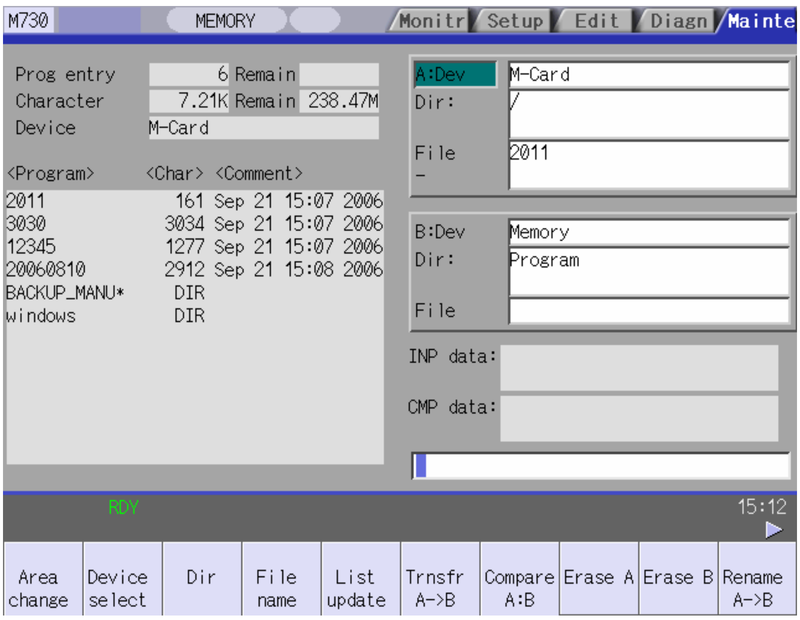
5.1.6 Transferring a File

Operating method :

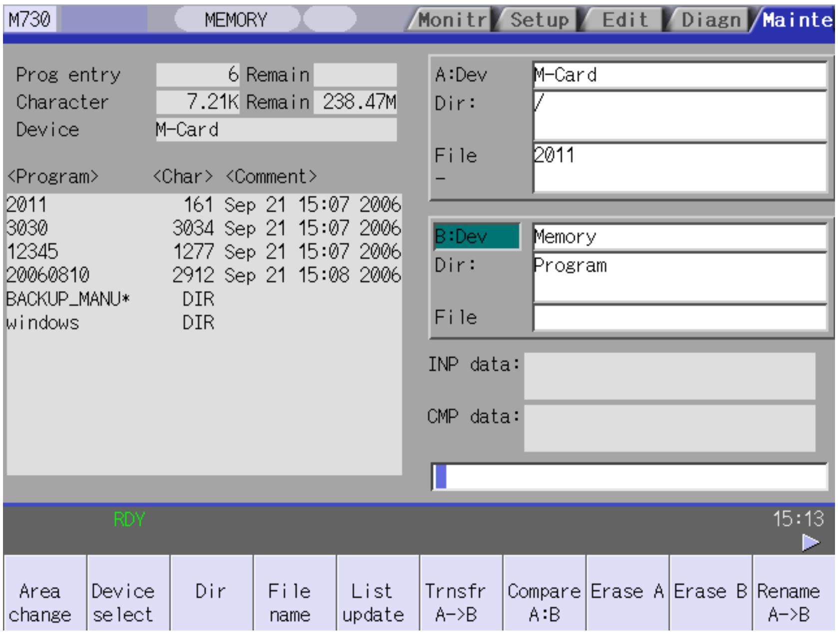
(1) Press the menu [Area change] , and select file setting column A .



(2) Designate the transfer origin device, directory and file name.
The designated file appears.
Multiple files can be designated in the file setting column A. Designate the first and last file name of the target range. A wildcard "*" can be designated for the file name .

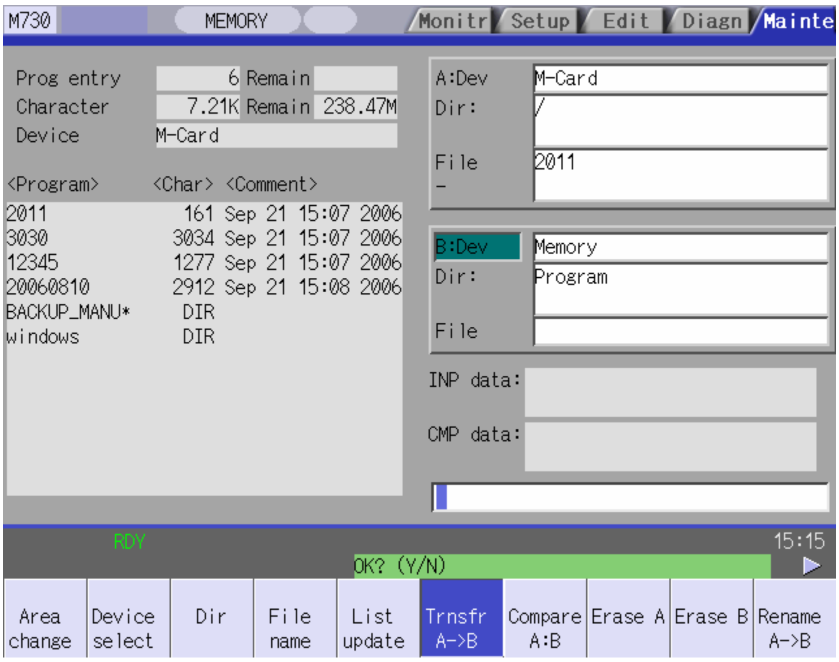


(3) Press the menu [Area change] , and select file setting column B .

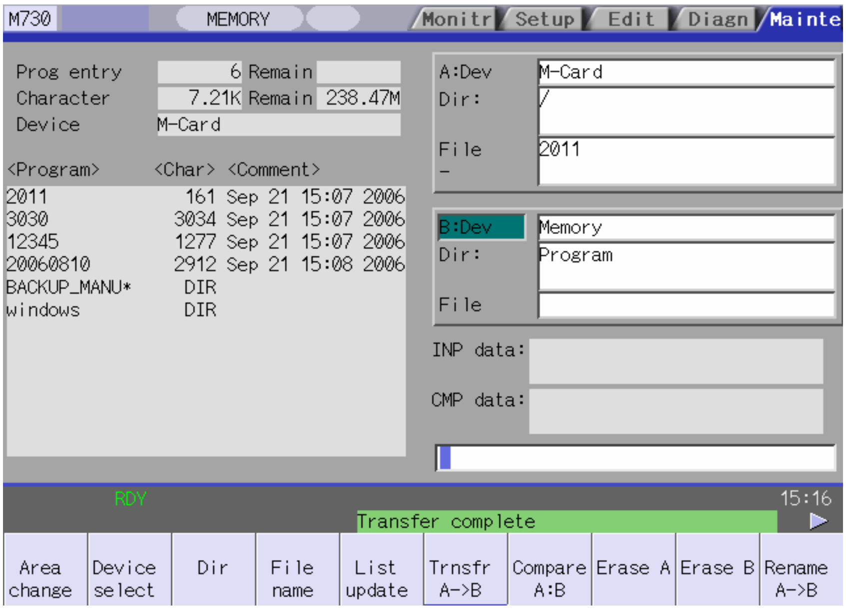


(4) Designate the transfer destination device, directory and file name.
The designated file appears.

(5) Press the menu [Trnsfr A ->B] . :
A message appears to confirm the transfer.



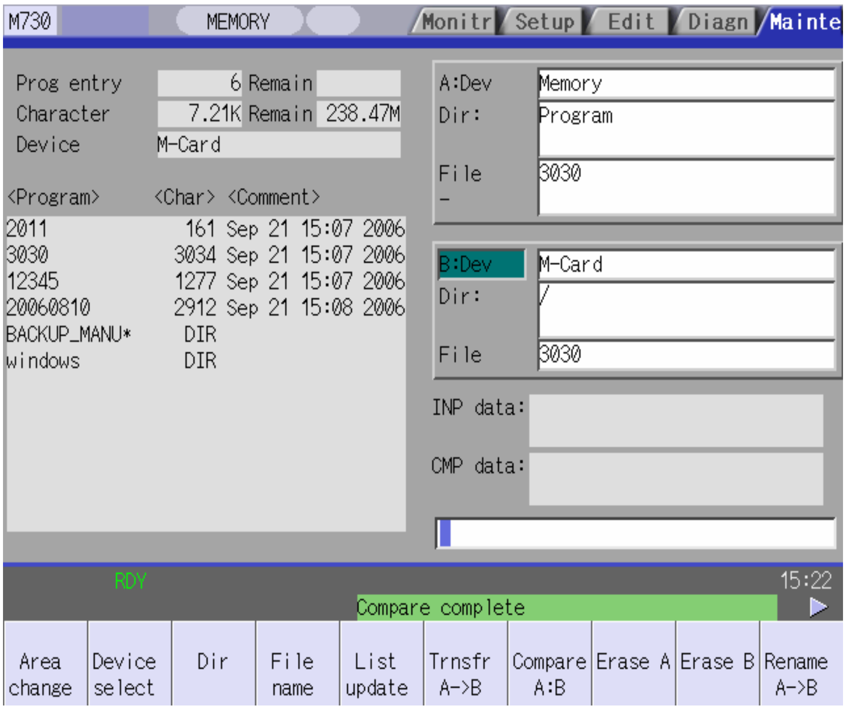
(6) Press [Y] or [INPUT] :



The file transfer starts. The data being transferred appears in the input data display column. A message appears when the transfer is completed.

5.1.7 Comparing Files (Compare)

(1) Press the menu [Area change] , and select file setting column A.
(2) Designate the device, directory and file name to be compared.
(3) Press the menu [Area change] , and select file setting column B.
(4) Designate the other side device, directory and file name to be compared.
(5) Press the menu [Compare A:B] . :
The file comparison starts. The data being compared appears in the comparison data display column.
A message appears when the comparison is completed.
If a comparison error occurs, the block with the error is displayed in the comparison data display column on the screen.



(6) The files can not compare when a characters of block exceed 251 or above.
It will be appeared alarm message. So that one block data must down 250 characters.

5.1.8 Formatting an FLD ,Memory card, DS：

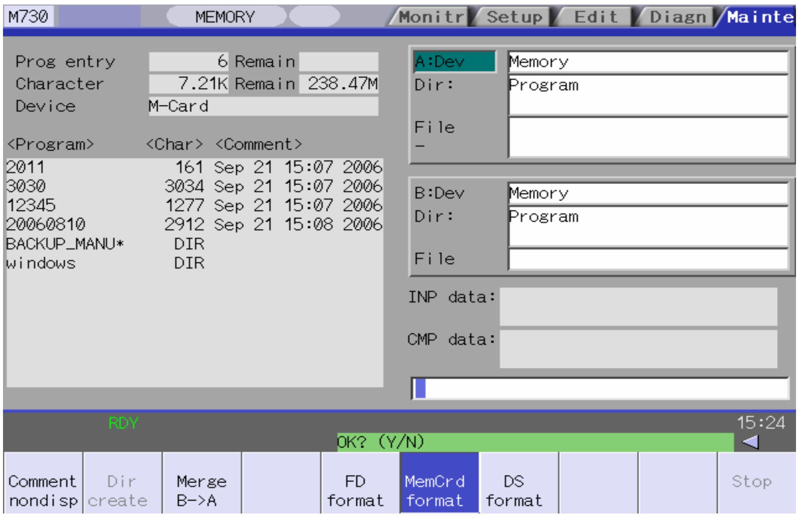
(1) Operation method (Formatting a FLD)：

(a) Insert a floppy disk in the FLD drive, and press FLD format .

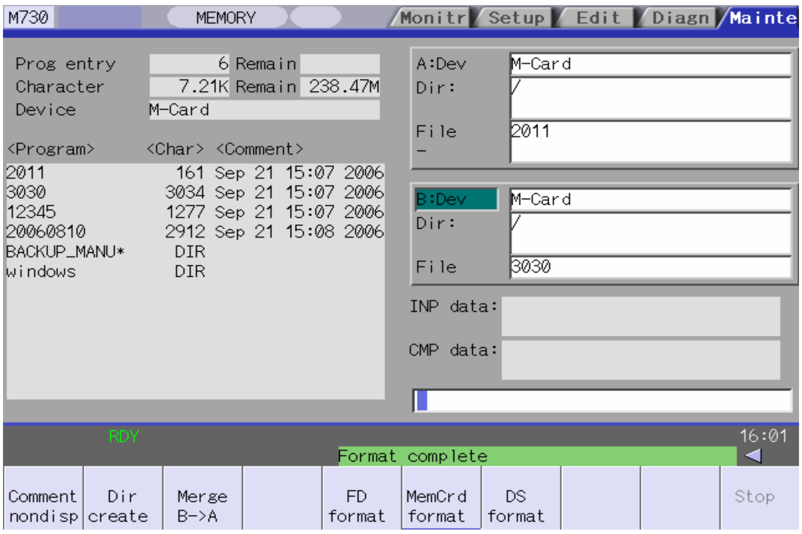
(b) A message confirming the formatting appears. Press Y or INPUT .
The FLD is formatted.
A message appears when the formatting is completed.

(2) Operation method (Formatting a memory card and DS)：

(a) Press the menu MemCrd format or DS format
A message confirming the formatting appears.



(b) Press Y or INPUT
The memory card or DS is formatted.
A message appears when the formatting is completed.



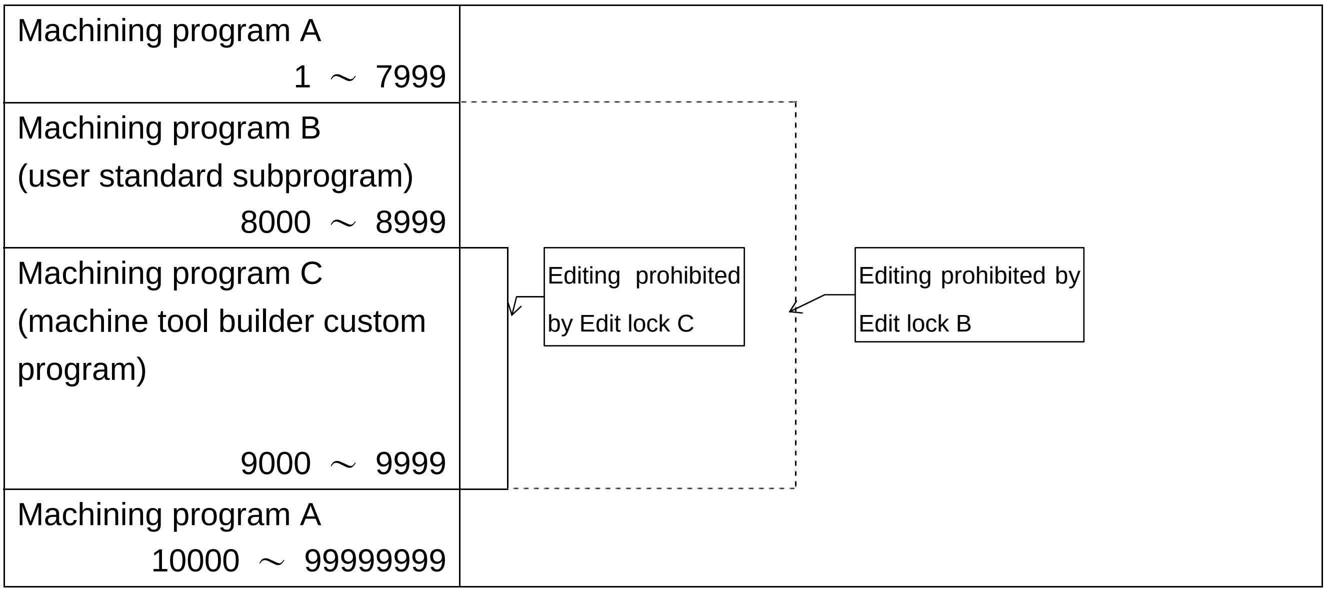
5.1.9 List of File Names

There is a directory for each type of data in the NC memory.
Each directory and file name (fixed) in the NC memory is shown below.
Do not change the extensions (.XXX) when storing in a device other than the NC memory.

Data type	NC memory directory path	Fixed file name
Machining program	/PRG/USER	(Program No.)
Fixed cycle program	/PRG/FIX	(Program No.)
Parameters Parameters [User, machine] (Text format) Auxiliary axis parameter	/PRM	 ALL.PRM
User PLC	/LAD	USERPLC.LAD
NC data Tool compensation amount data Tool life management data Common variable data SRAM data	/DAT	 TOOL.OFS TLIFE.TLF COMMON.VAR SRAM.BIN

5.1.10 Edit Lock B and C

This function prohibits editing, erasing, etc., of the machining programs B and C, and protects the machining programs in NC memory.



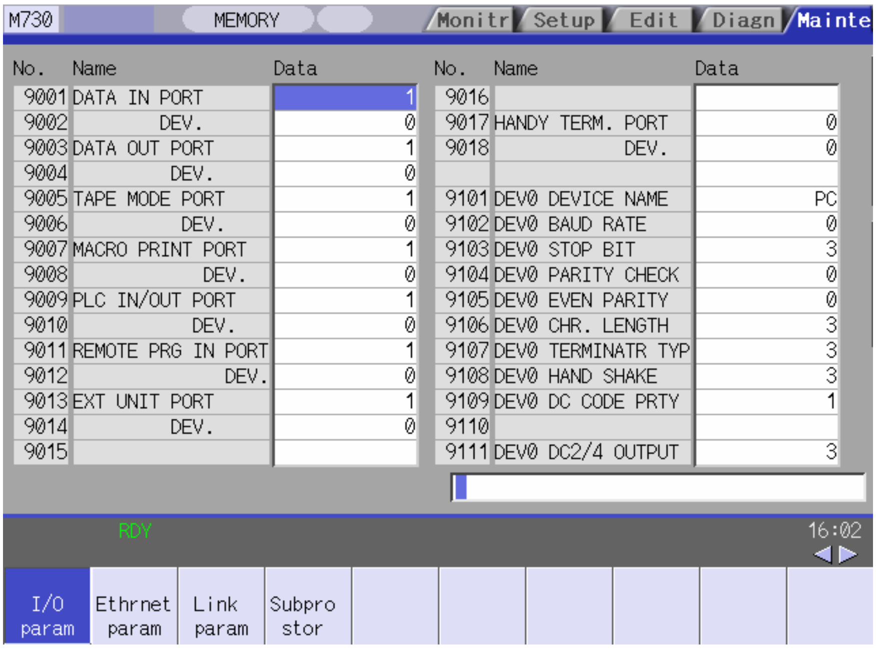
The operations below in the Edit MDI and the Input/Output screens are influenced by the edit lock setting.
An error will result if operations that are not possible are attempted.
When the edit lock is valid, processing is executed (except the edit lock target program) by the input/output function.

○ : Operation possible
× : Operation not possible

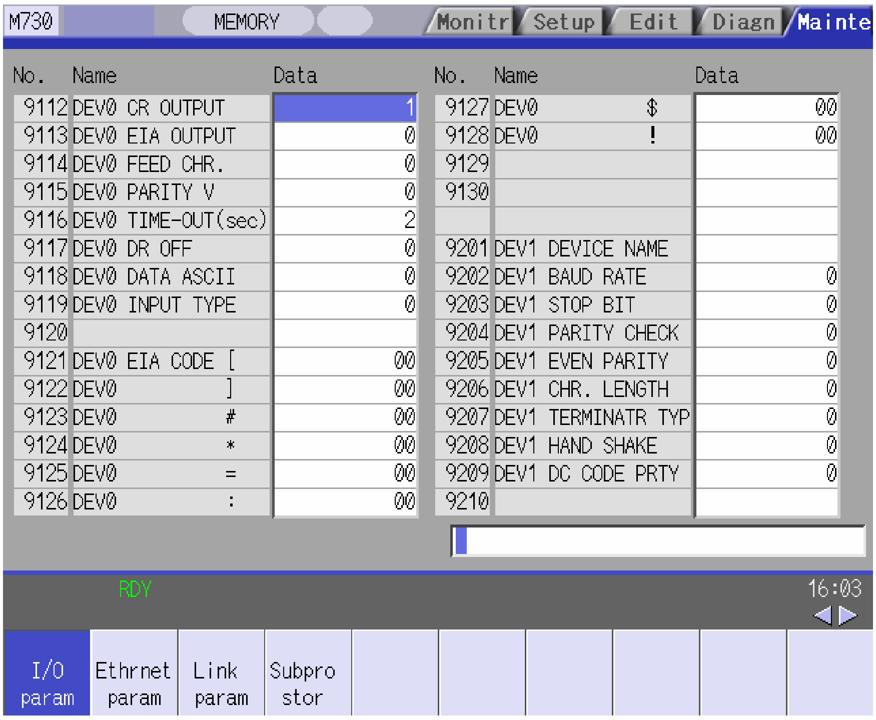
Screen	Screen	Edit lock B			Edit lock C		
		Machining program			Machining program		
		A	B	C	A	B	C
Edit	Search	○	○	×	○	○	×
	Edit	○	×	×	○	○	×
	MDI registration	○	×	×	○	○	×
Input/Output	Transfer	○	×	×	○	○	×
	Compare	○	×	×	○	○	×
	Copy	○	×	×	○	○	×
	Merge	○	×	×	○	○	×
	Rename	○	×	×	○	○	×
	Erase	○	×	×	○	○	×
Monitor	Buffer correction	○	×	×	○	○	×

5.2 RS-232C I/O parameter install and cable connect

5.2.1 Parameter installation



No.	Name	Data	No.	Name	Data
9001	DATA IN PORT	1	9016		
9002	DEV.	0	9017	HANDY TERM. PORT	0
9003	DATA OUT PORT	1	9018	DEV.	0
9004	DEV.	0			
9005	TAPE MODE PORT	1	9101	DEV0 DEVICE NAME	PC
9006	DEV.	0	9102	DEV0 BAUD RATE	0
9007	MACRO PRINT PORT	1	9103	DEV0 STOP BIT	3
9008	DEV.	0	9104	DEV0 PARITY CHECK	0
9009	PLC IN/OUT PORT	1	9105	DEV0 EVEN PARITY	0
9010	DEV.	0	9106	DEV0 CHR. LENGTH	3
9011	REMOTE PRG IN PORT	1	9107	DEV0 TERMINATR TYP	3
9012	DEV.	0	9108	DEV0 HAND SHAKE	3
9013	EXT UNIT PORT	1	9109	DEV0 DC CODE PRTY	1
9014	DEV.	0	9110		
9015			9111	DEV0 DC2/4 OUTPUT	3



No.	Name	Data	No.	Name	Data
9112	DEV0 CR OUTPUT	1	9127	DEV0 $	00
9113	DEV0 EIA OUTPUT	0	9128	DEV0 !	00
9114	DEV0 FEED CHR.	0	9129		
9115	DEV0 PARITY V	0	9130		
9116	DEV0 TIME-OUT(sec)	2			
9117	DEV0 DR OFF	0	9201	DEV1 DEVICE NAME	
9118	DEV0 DATA ASCII	0	9202	DEV1 BAUD RATE	0
9119	DEV0 INPUT TYPE	0	9203	DEV1 STOP BIT	0
9120			9204	DEV1 PARITY CHECK	0
9121	DEV0 EIA CODE [	00	9205	DEV1 EVEN PARITY	0
9122	DEV0]	00	9206	DEV1 CHR. LENGTH	0
9123	DEV0 #	00	9207	DEV1 TERMINATR TYP	0
9124	DEV0 *	00	9208	DEV1 HAND SHAKE	0
9125	DEV0 =	00	9209	DEV1 DC CODE PRTY	0
9126	DEV0 :	00	9210		

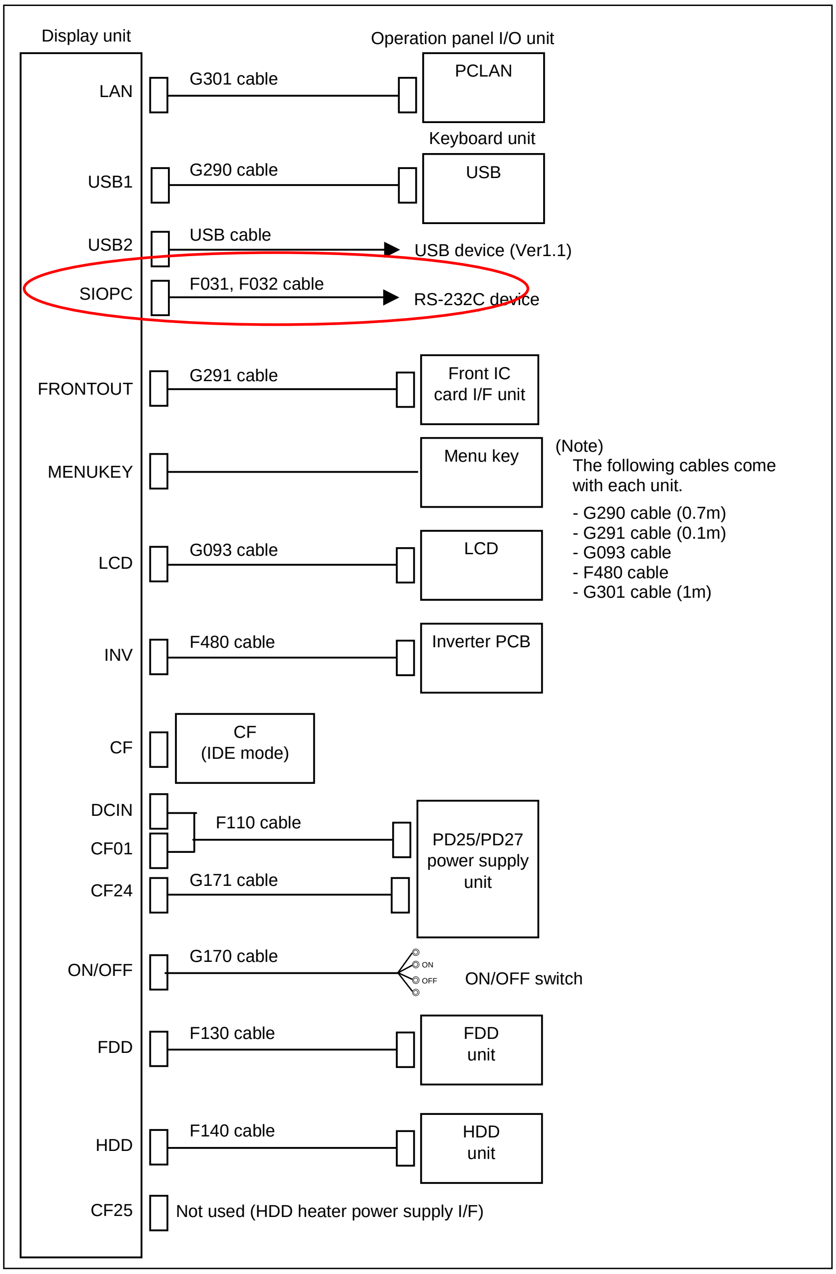
The parameter address for #9*02 is transmission speed. The value of bps set as below .
0:19200bps, 1=9600bps, 2=4800bps, 3=2400bps

5.2.2 Outline of connection

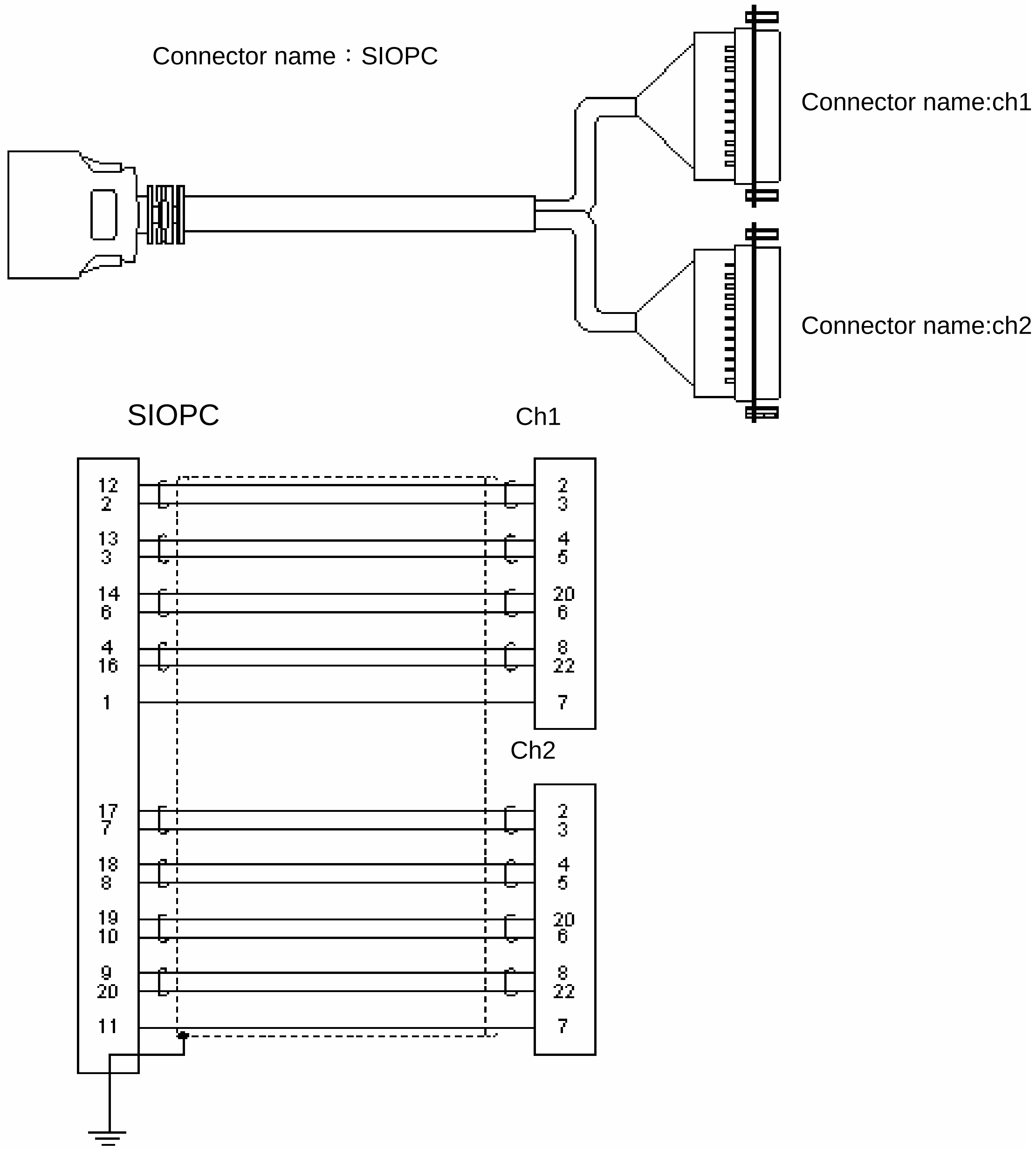
The M700 series offer two interface ports for communication. The display of WinXP for SIOPC is a connection for usual communication. The connection of SIO by NC controller provide interface for DNC mode. Depend on using function to connect the cables.

(1) XP monitor side（for general data【SIOPC】）

(a) RS-232C interface outline

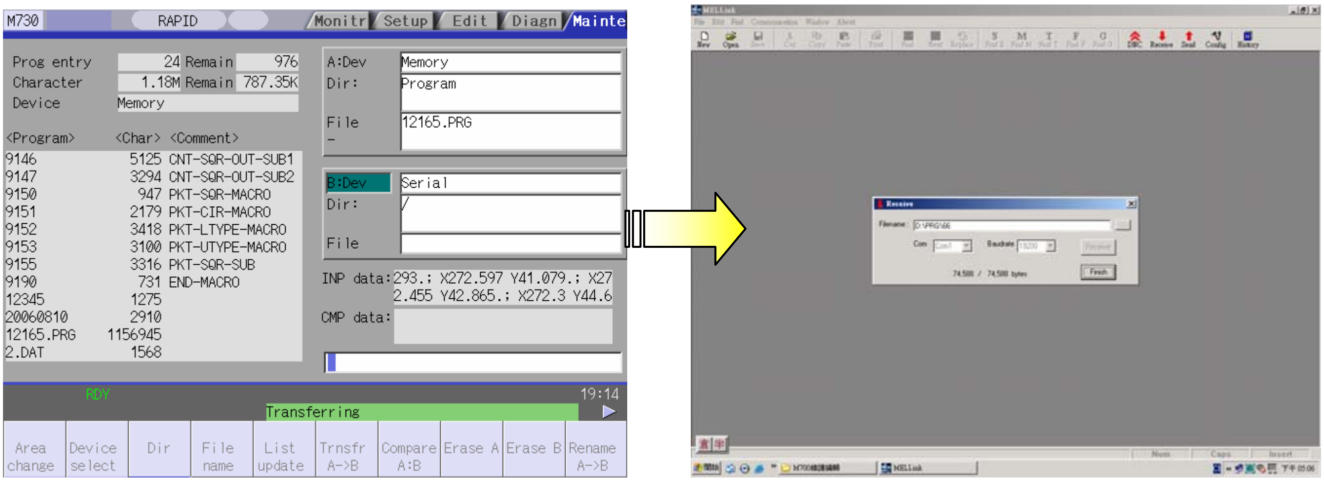


(b) F031/032 Cable connection

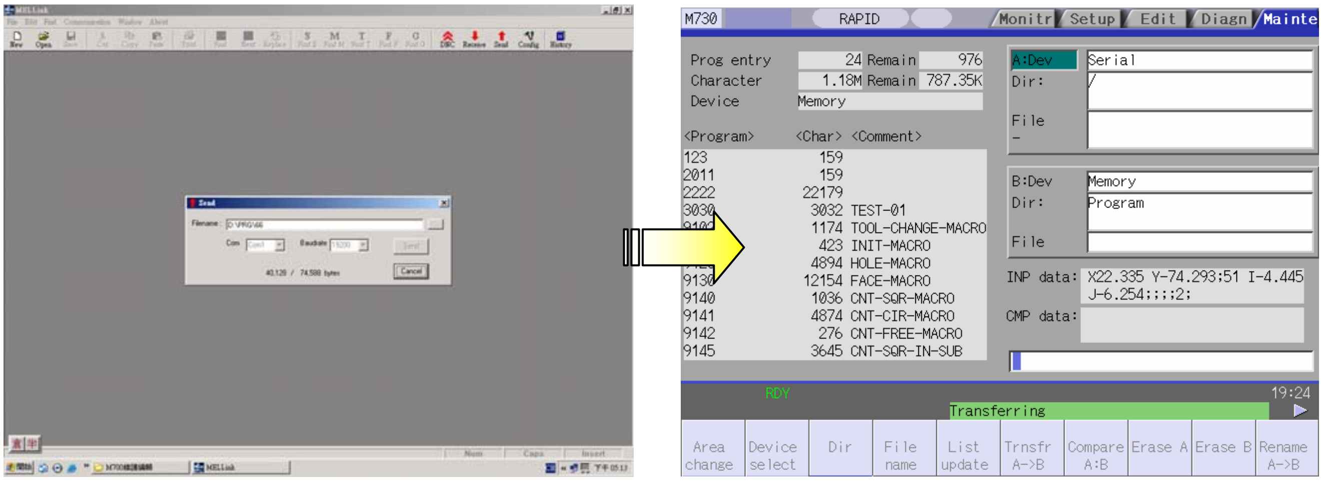


(c) Data IN/OUT screen（Example with MELLINK）

Output from NC to personal PC

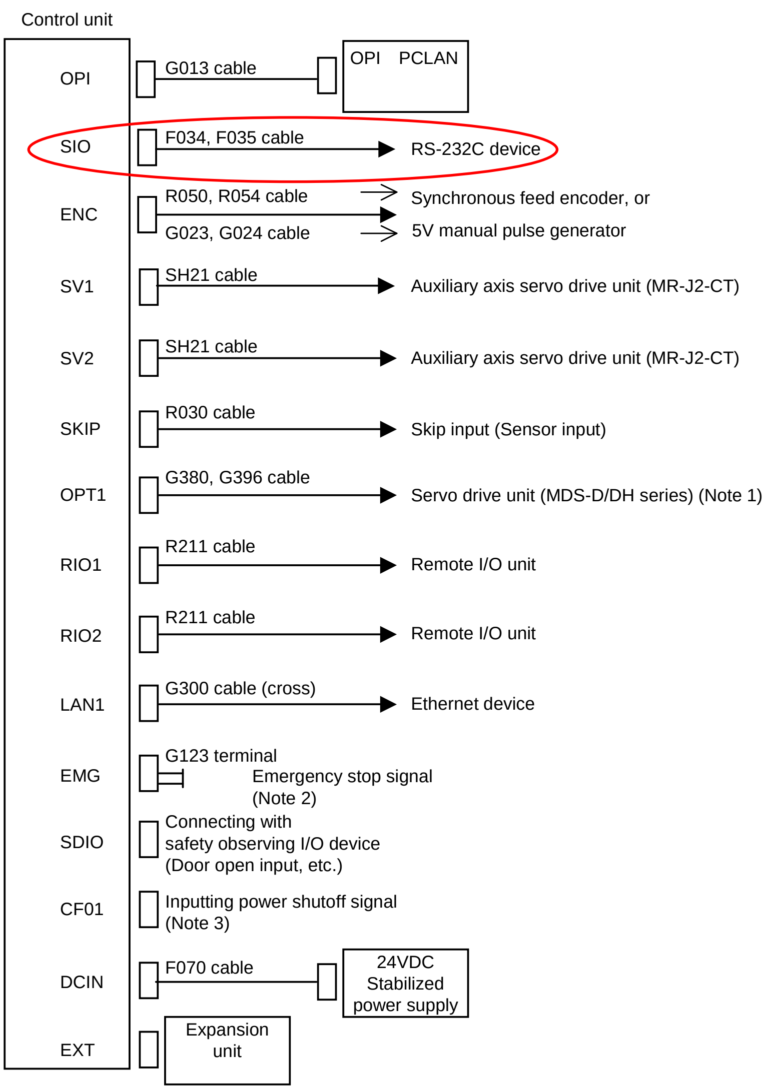


Input from personal PC to NC

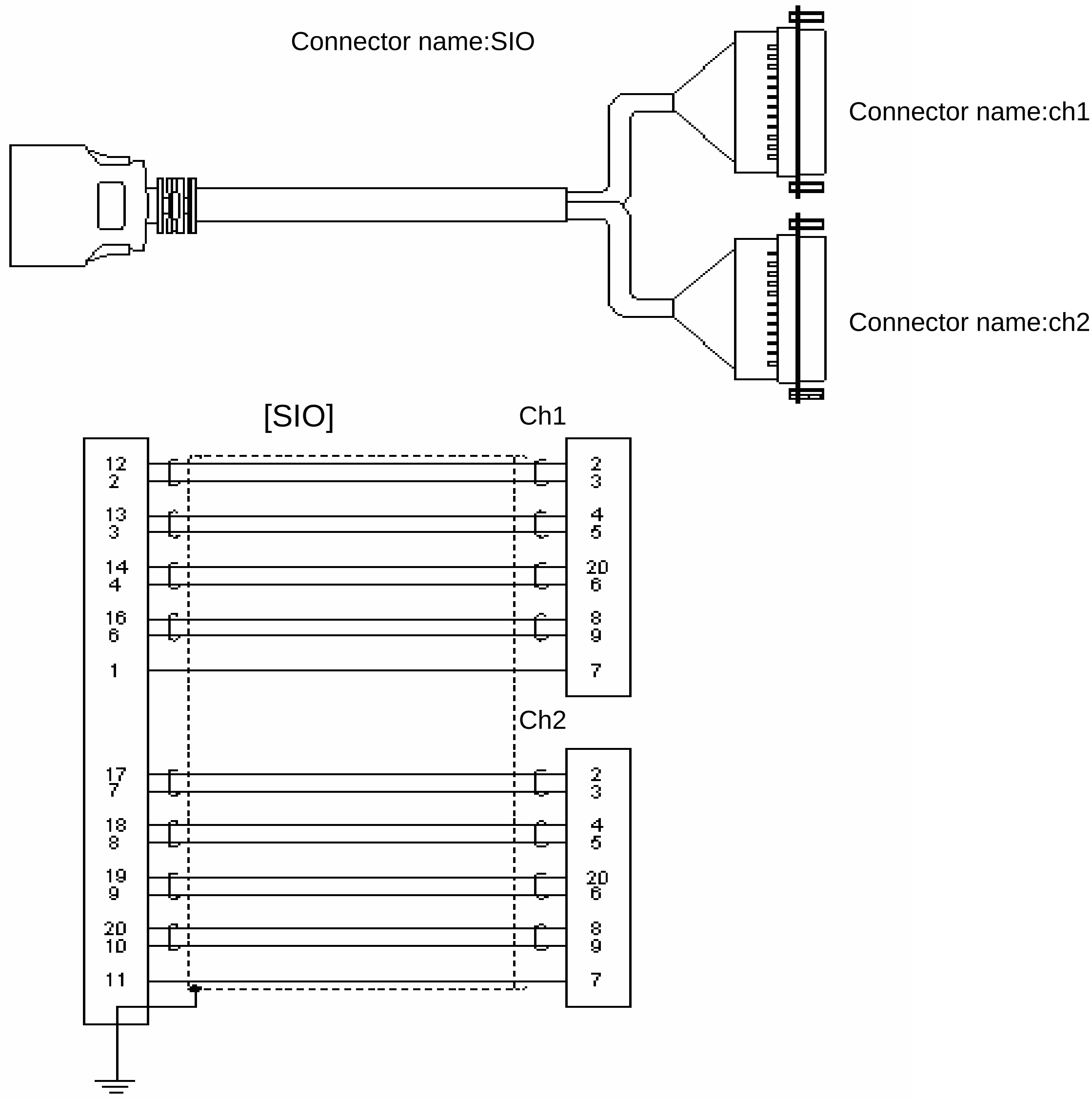


(2) NC controller side（Reserved for DNC operation【SIO】）

(a) RS-232C interface outline

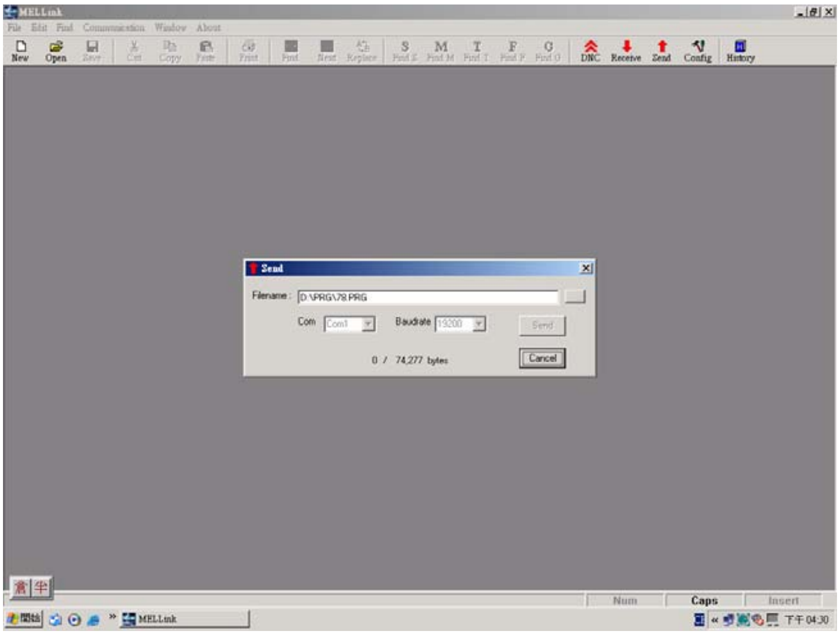


(b)　F034/035 Cable connection

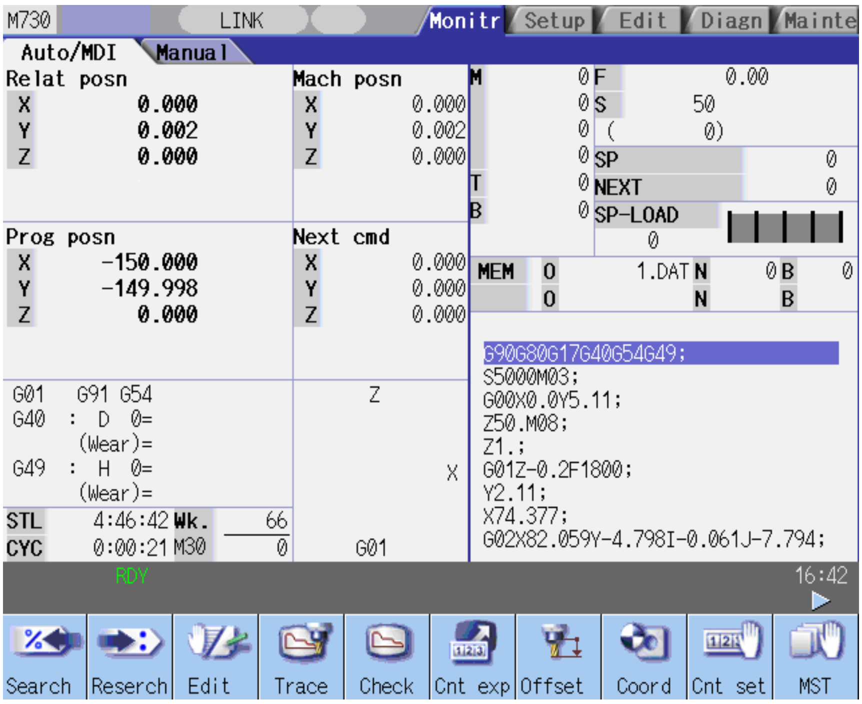


(c) The screen for DNC operation（Example with MELLINK）

Standby to transit on PC side

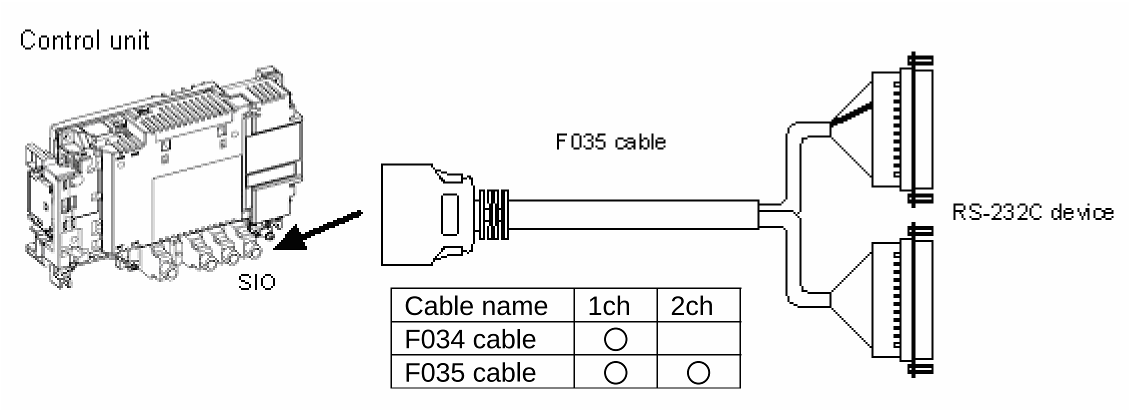


The switch move into DNC mode .Start on Cycle Star .



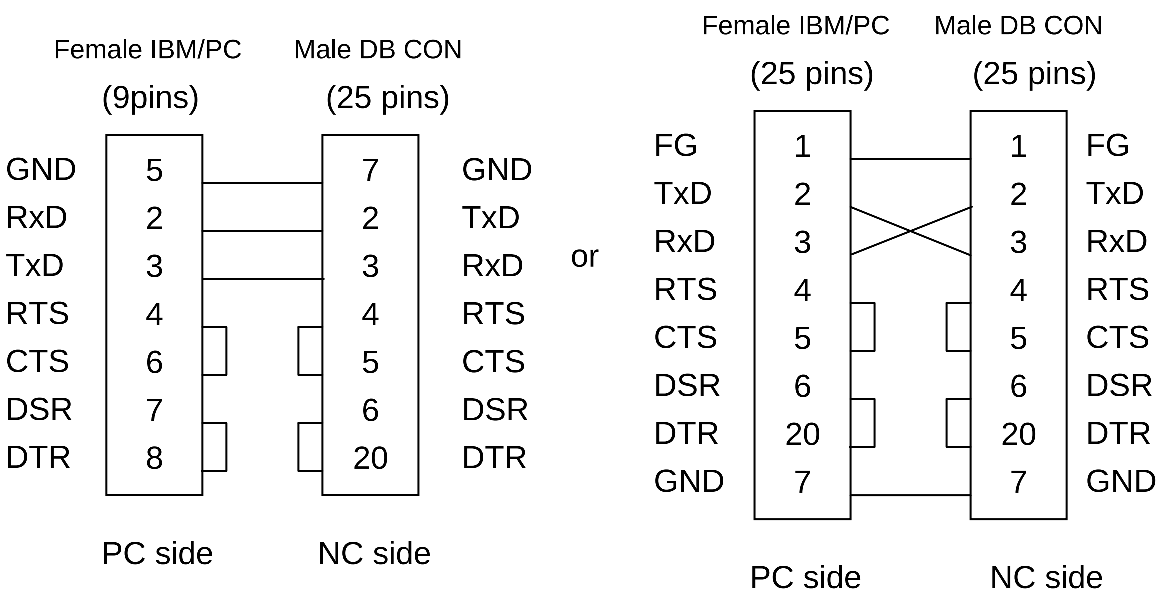
DNC MODE will follow #8109 parameter change the NC screen up left will appear "LINK" or "TAPE"

M70 RS-232C interface【SIO】

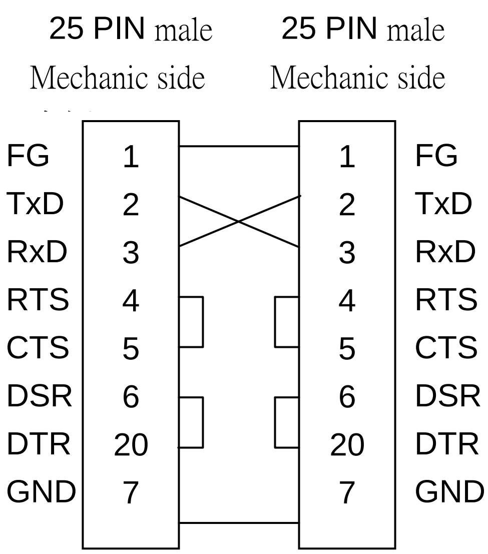


Cable name	1ch	2ch
F034 cable	○	
F035 cable	○	○

(3) Cross cable connection diagram



(4) Machine connects to machine cable connection diagram.

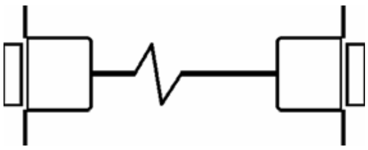


5.3 M700／M70 connect with M60S explanation

RS-232C transmit it is CNC data communication basically transmit and common use input / output device. general user factory machine has Mitsubishi new and old serial CNC types, in order to enable using and transmitting each other more effectively. RS-232C is transmitted for the most simply and conveniently and does not take extra new equipment way. Explain as follows is how to set up M700/ M70 series to use RS-232C to transmit data to M60S series.

(1)M70 series connect to M60S series in RS-232C cable

RS-232C cable



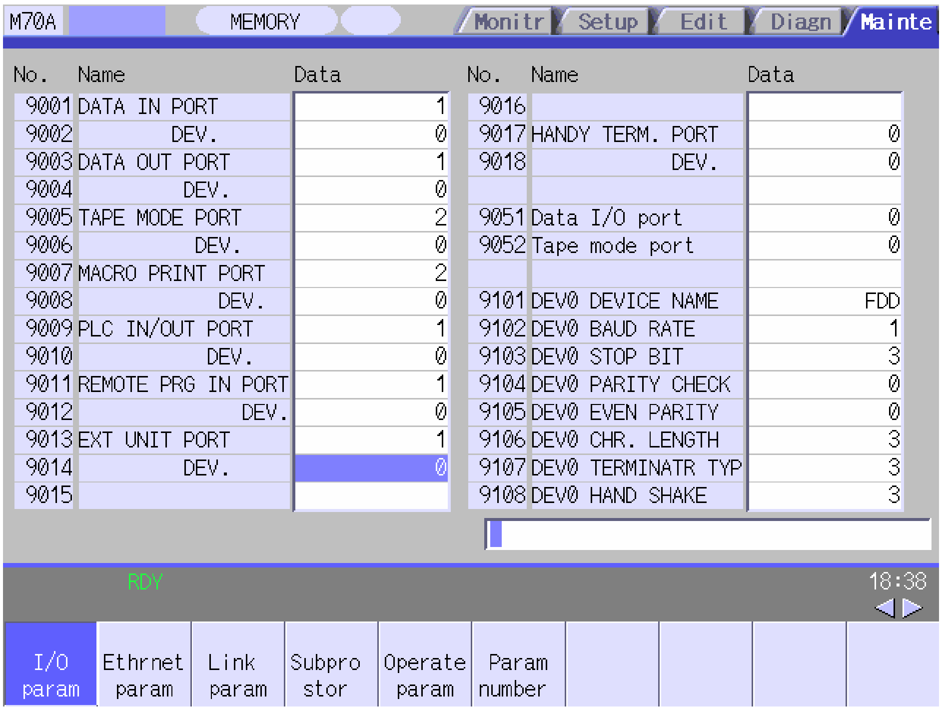
M70/700 M60S

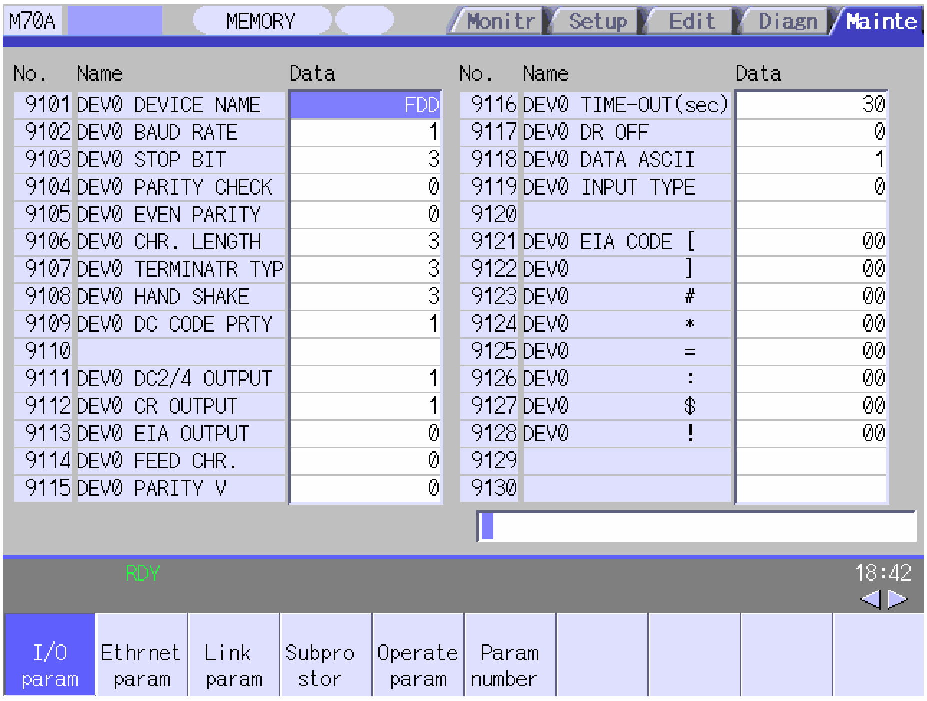
①M60S I/O parameters setting

```
[I/O BASE PARAM]                  M60S                  PARAM 2. 1/ 7

<I/O>             # <PORT NO.>    # <DEV. NO.>   <DEV. NAME>
DATA IN           9001     2      9002     0        FDD
DATA OUT          9003     2      9004     0        FDD
TAPE MODE         9005     2      9006     0        FDD
MACRO PRINT       9007     2      9008     0        FDD
PLC IN/OUT        9009     2      9010     0        FDD
REMOTE PROG IN    9011     2      9012     0        FDD
EXT UNIT          9013     2      9014     0        FDD

#(    _) DATA( )
LSK  mm ABS G40 G54              MEMORY
     WORK           PROCESS        I/O PAR        SETUP          MENU
```

```
[I/O DEVICE PARAM]     M60S    ===== DEV. 0 =====               PARAM 2. 2/ 7

#                          #                            #
9101 DEVICE NAME      FDD  9111 DC2/DC4 OUTPUT      3   9121 EIA CODE [        00
9102 BAUD RATE          1  9112 CR OUTPUT           1   9122          ]        00
9103 STOP BIT           3  9113 EIA OUTPUT          0   9123          #        00
9104 PARITY CHECK       0  9114 FEED CHR.         100   9124          *        00
9105 EVEN PARITY        0  9115 PARITY V            0   9125          =        00
9106 CHR. LENGTH        3  9116 TIME-OUT (sec)     30   9126          :        00
9107 TERMINATOR TYPE    3  9117 DR OFF              0   9127          $        00
9108 HAND SHAKE         3  9118 DATA ASCII          1   9128          !        00
9109 DC CODE PARITY     1  9119 INPUT TYPE          0   9129
9110                       9120                         9130

#(    _) DATA(     )
LSK  mm ABS G40 G54              MEMORY
     WORK           PROCESS        I/O PAR        SETUP          MENU
```

②M70 I/O parameters setting

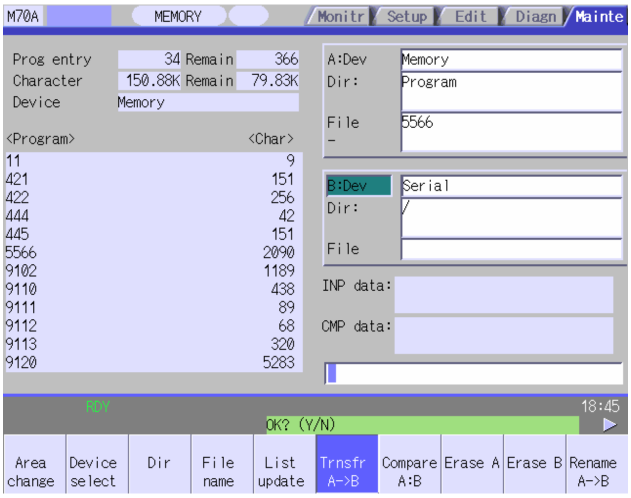


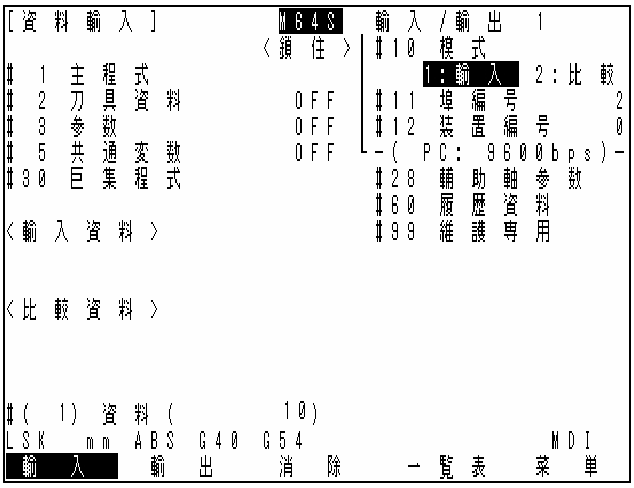


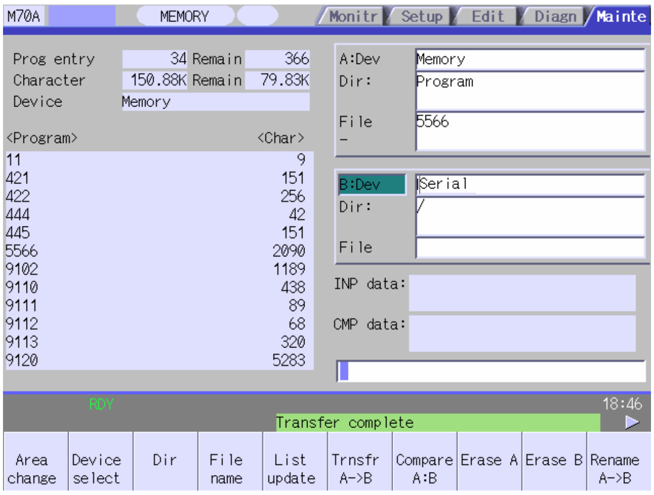
(2)NC screen setting（M70 input －＞ M60S output）

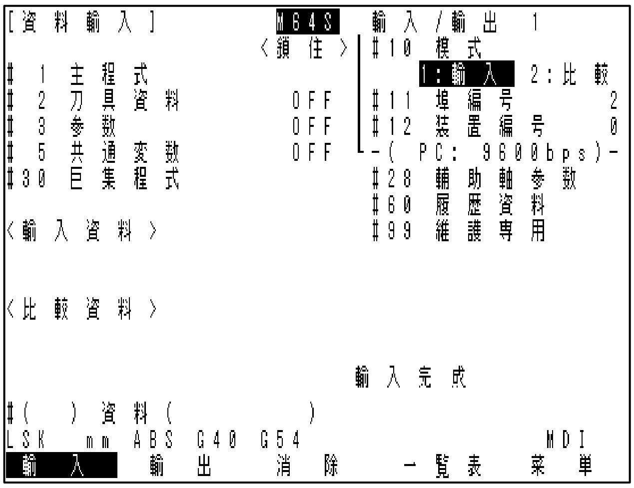
M70 input setting

M60S output setting









①M70 Assign device A output source data name、directory and file name on M70series controller.

②Set device B is serial port on the M70 screen.

③M60S side press DIAGN IN/OUT → MENU → INPUT and in #( ) to input″ 1″ for main Program, in DATA ( ) input program name is″ 10″ and press INPUT CALC to start transfer data.

④M70 side press Trnsfr A->B menu key, it will appear OK? (Y/N) and press “ Y” or INPUT CALC to transfer data to M60S controller.

⑤M70 will ”Transfer completed ” ，M60S will appear ”Input completed”.

(4) RS232C connects main points

①The cable must has isolate net device（NC and PC side connect it must has isolate net connect to avoid noise）.

②The cable length cannot over 15 meters.

③Avoid tied with other power cable.

④Please add MISO232T device to prevent electricity leakage from PC side that to damage P.C.B of NC side. This is the main reason why the circuit board is damaged when NC is transmitted.

⑤The software control method according to transmitting, this cable is DC code or RTS/CTS connection it must match parameter#9108 setting.

⑥Whether PC side conforms to NC side communication protocol parameter.

⑦NC side data input, output or Tape mode < PORT NO.> designate whether correct. M60/M60S series is port “2” .

6 ETHERNET function

6.1 System connection diagram

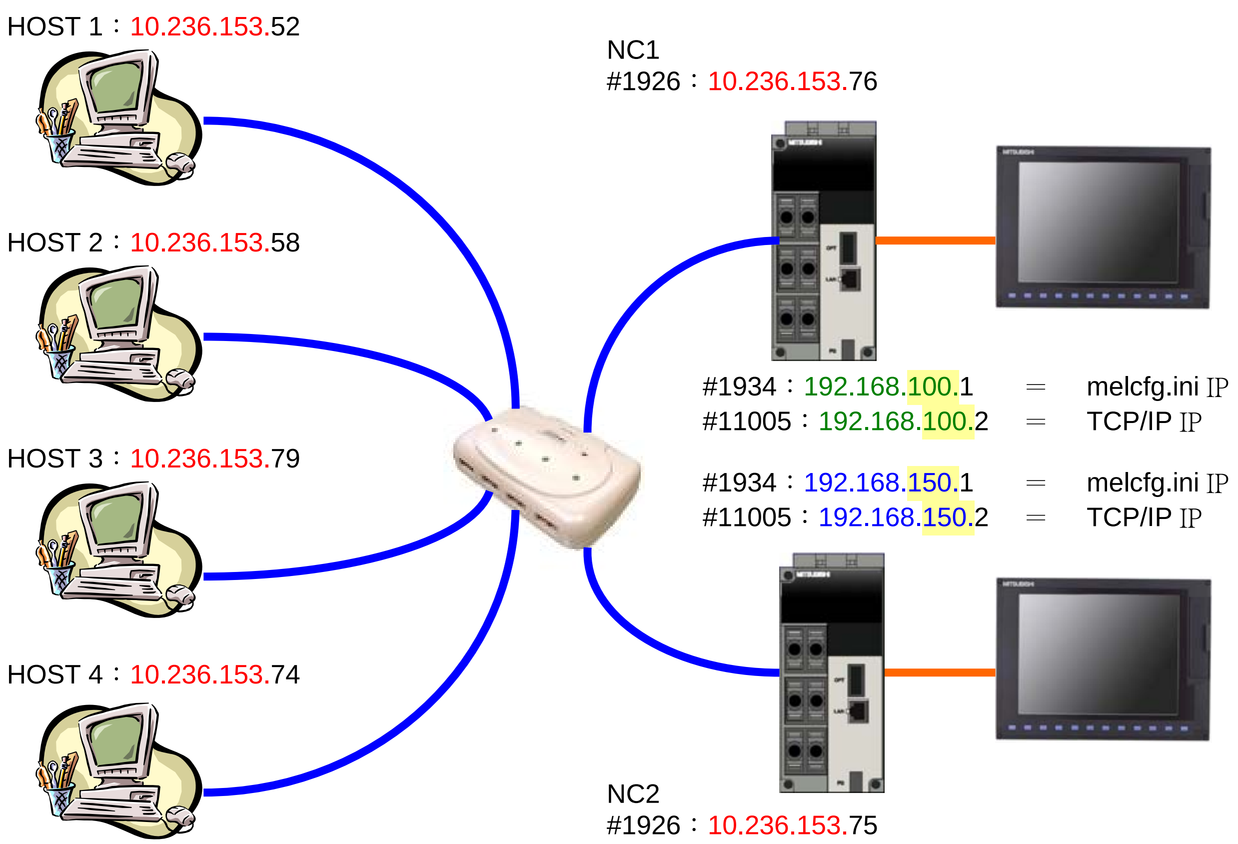
The network connects as below picture showing for Mitsubishi Electric Taiwan:
There is IP address of several groups within NC unit. If the beginner is not familiar with wantonly while revising IP address. It is very easy to cause the phenomenon that NC be unable to start. While to change relevant IP addresses, be sure to the corresponding relation IP address.

GLOBAL IP： It is for NC side network domain IP address.

The setting normally is same as PC side setting in front of three IP numbers.

LOCAL IP：For NC internal setting please don't modify.

#1934 setting must same as C:\windows\melcfg.ini bottom line setting.
And the setting needs same as TCP/IP Default gateway.
#11005 setting must same as TCP/IP of IP address of PC side.



⚠ Caution	The following addresses must be set up same, otherwise unable to open to NC picture. ①First it needs alter NC side relevant IP than alter PC side IP, otherwise PC side IP altered the system will be halted. But if it is correct that only turn on again. ②Before change the relevant parameters of NC. Please confirm that had already carried out the backup such relevant parameter, etc. To avoid the system halted after carry out RAM CLEAR.

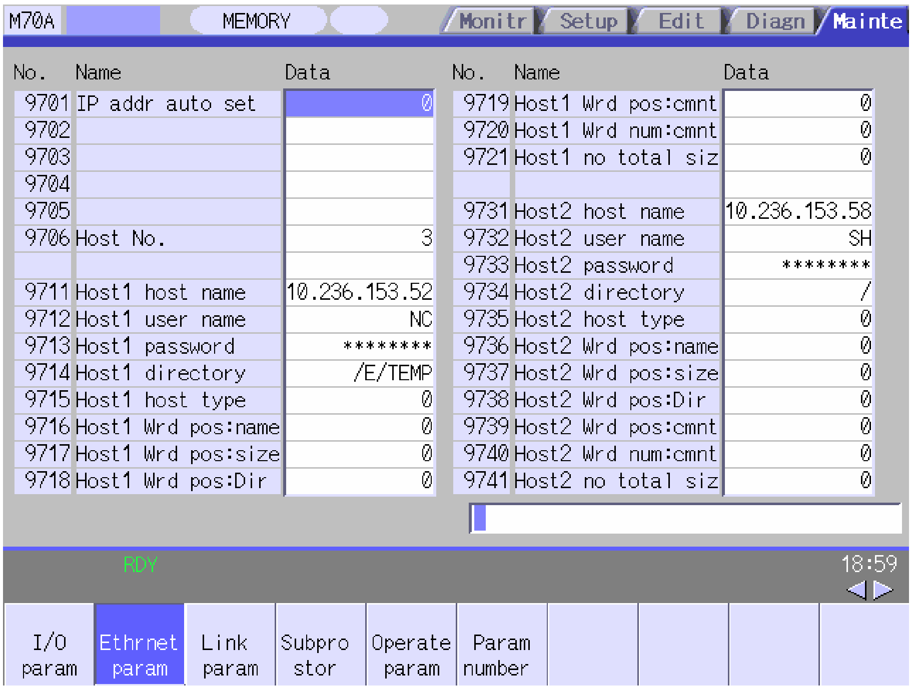
6.2 NC side related IP address

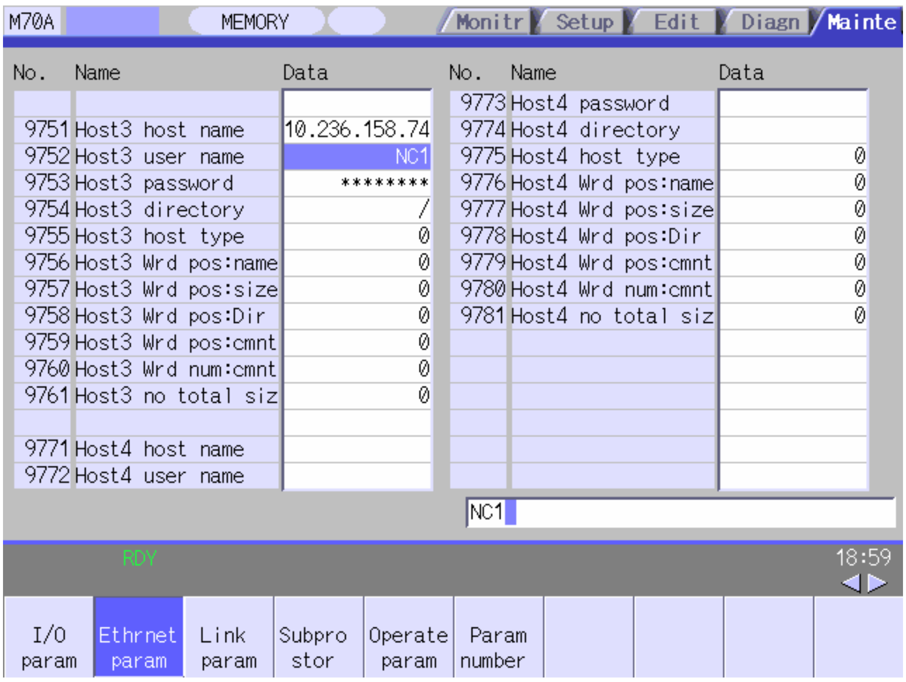
6.2.1 NC related IP setting

(1)Input parameter password「MPARA」.

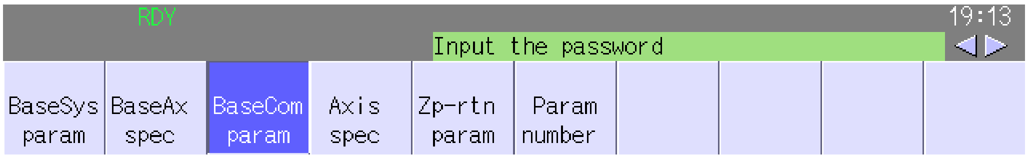
(2) Change screen to「MAINTE」 and press menu key 「PARA」.

(3) Press right base menu key on the screen 「▶」 and select 「Ethernet Para」to set related PC side seeting for HOST IP address. If you use network hard disk you don’t need set this parameters.

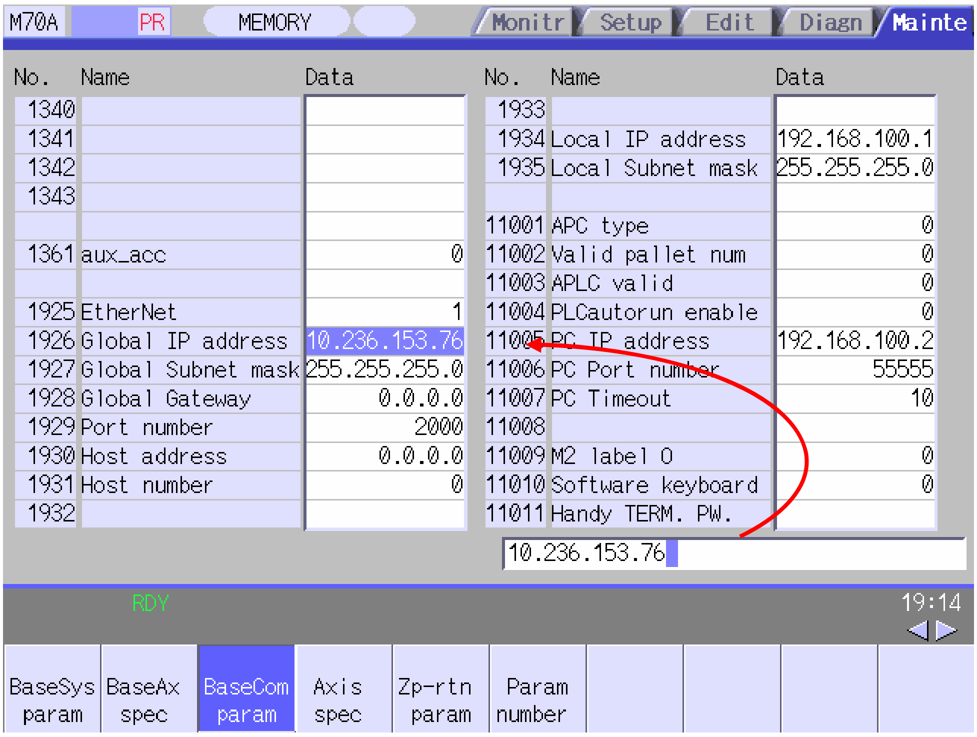




(4)Press right base next page of menu key on the screen「▶」 and select「 COMON PRM」.
If you don't input password it will show a message of "please input password".



(5)Set NC area network IP address.



(6)After setting this page parameter the NC left top will show a PR word.的 It means must restart NC power.

(7) Parameter #1934 and #11005 are for internal IP of NC. The initial setting is same as following picture showing. It likes as:

#1934 = 192.168.100.1

#11005 = 192.168.100.2

If it has connect above two NC units please check front three number of IP address they must set to same. For example, the second NC unit can set like below：

#1934 = 192.168.150.1

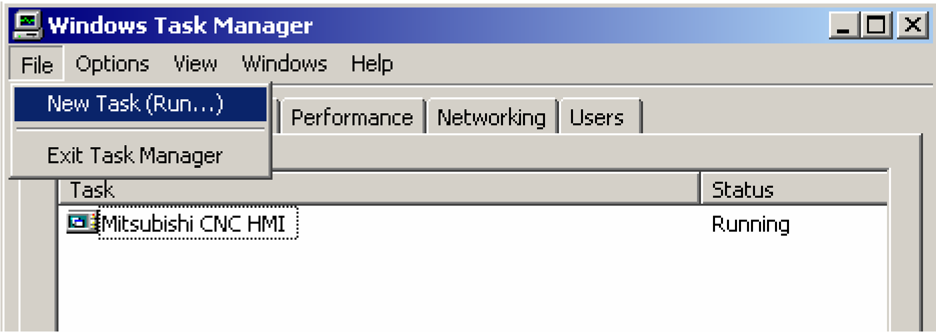
#11005 = 192.168.150.2

6.2.2 The IP address install on NC controller

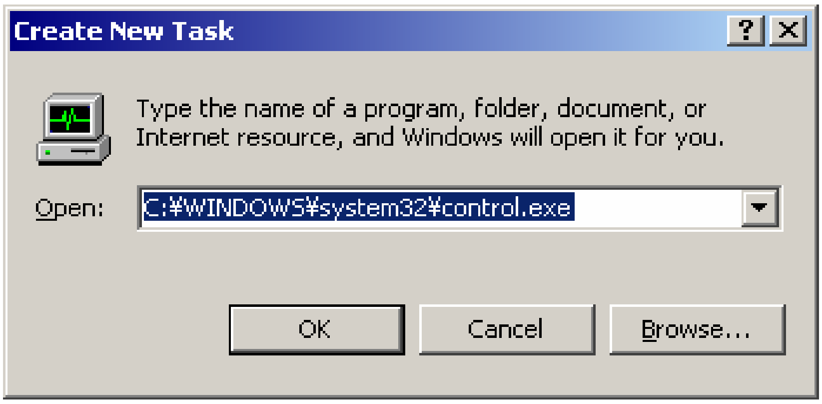
The position IP of Host PC is changed if used IP position as above.

(1) Press [ALTER] + [CTRL] + [DELETE] keys and call out Windows Security screen.

(2) Press the down middle key【Task Manager】and show “Windows Task Manager” screen as below.

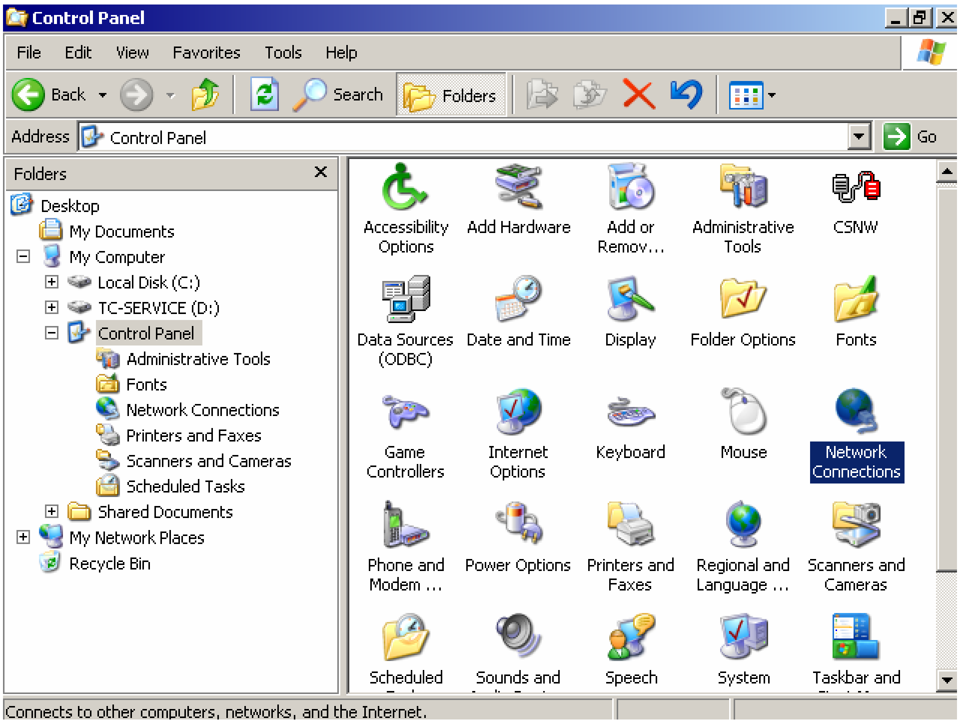


(3) Press [Alt] + [F] key and select “New Task” next to “Control.exe”（control panel）and enter [OK] as below.

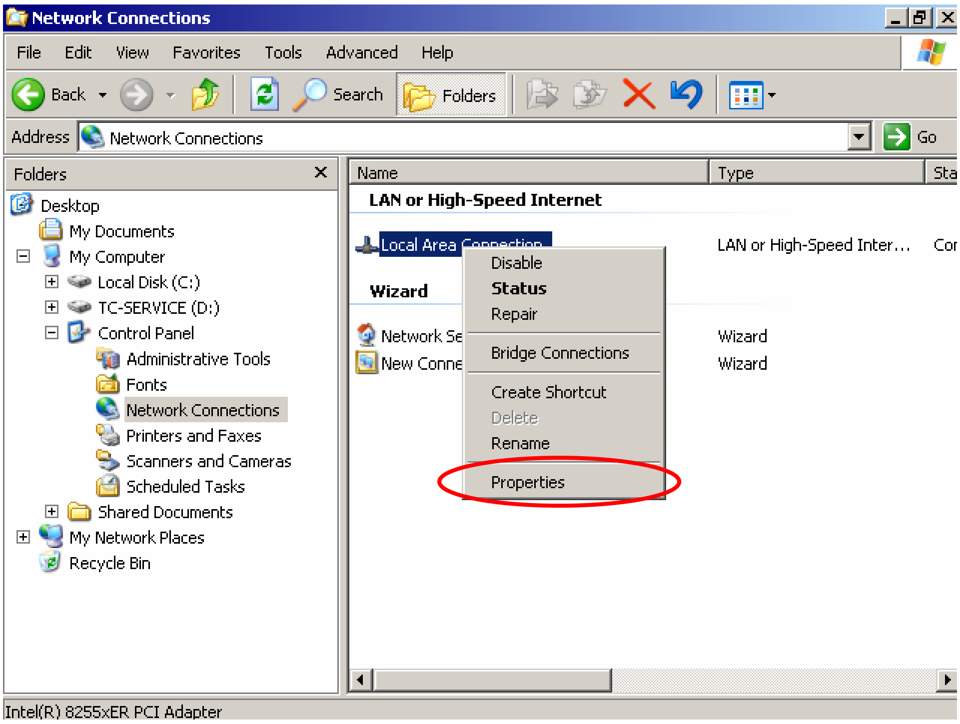


(3)Set Controller’s PC IP address.

①Start Network Connection in the control panel like as below showing.



②In network connection ICON use mouse to click it and select （Properties）.

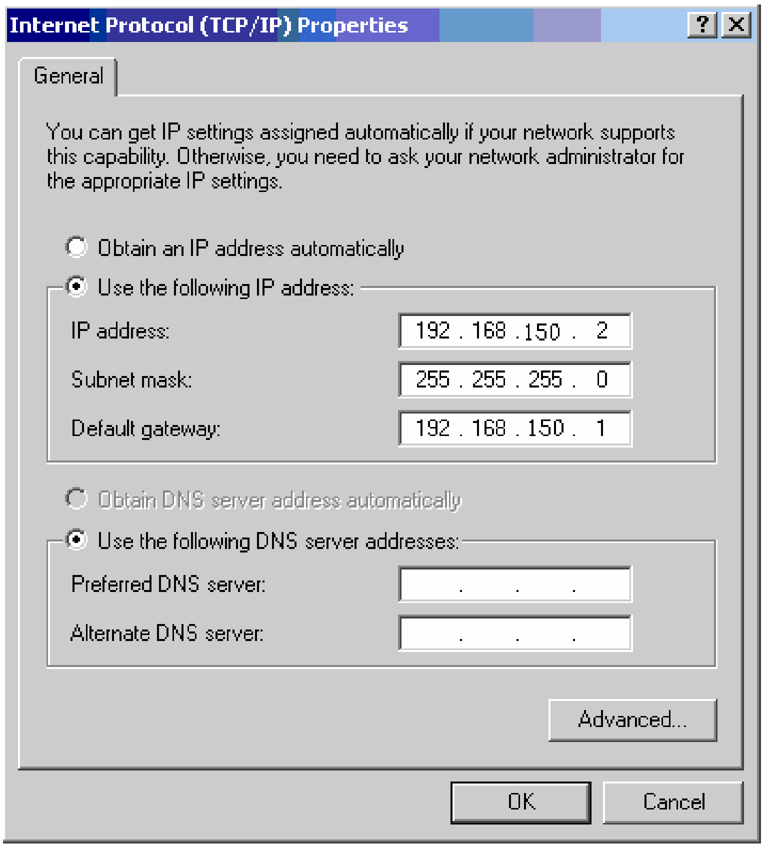


③Below window is setting IP address of controller PC side. If you want to modify please set same with parameter #11005.

（EX） the second NC setting.

IP address： 192.168.150.2

Default gateway： 192.168.150.1



④When according to the above-mentioned steps change IP address, because IP address of NC side must restart power is effective. But IP address of PC side in Windows XPe system is immediately valid. So different IP will cause NC cannot start problem please confirm it.

6.2.3 M700 WinCE related IP address setting

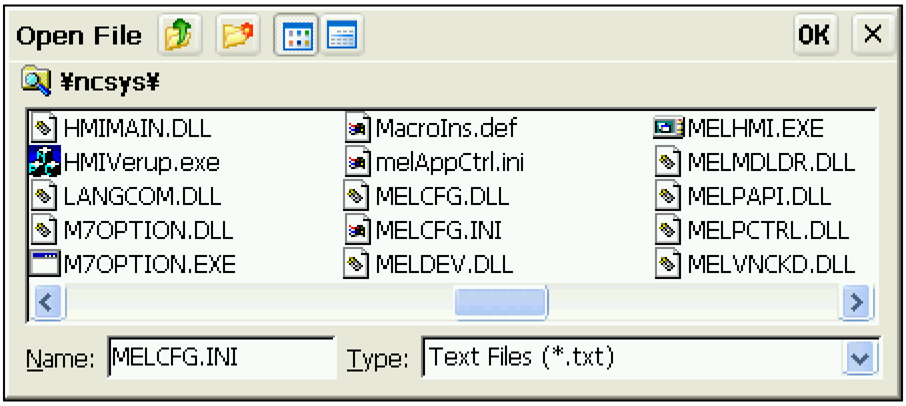
(1)**Set IP address in "melcfg.ini"**

①Carry out "Notepad"

Start → Programs → Notepad

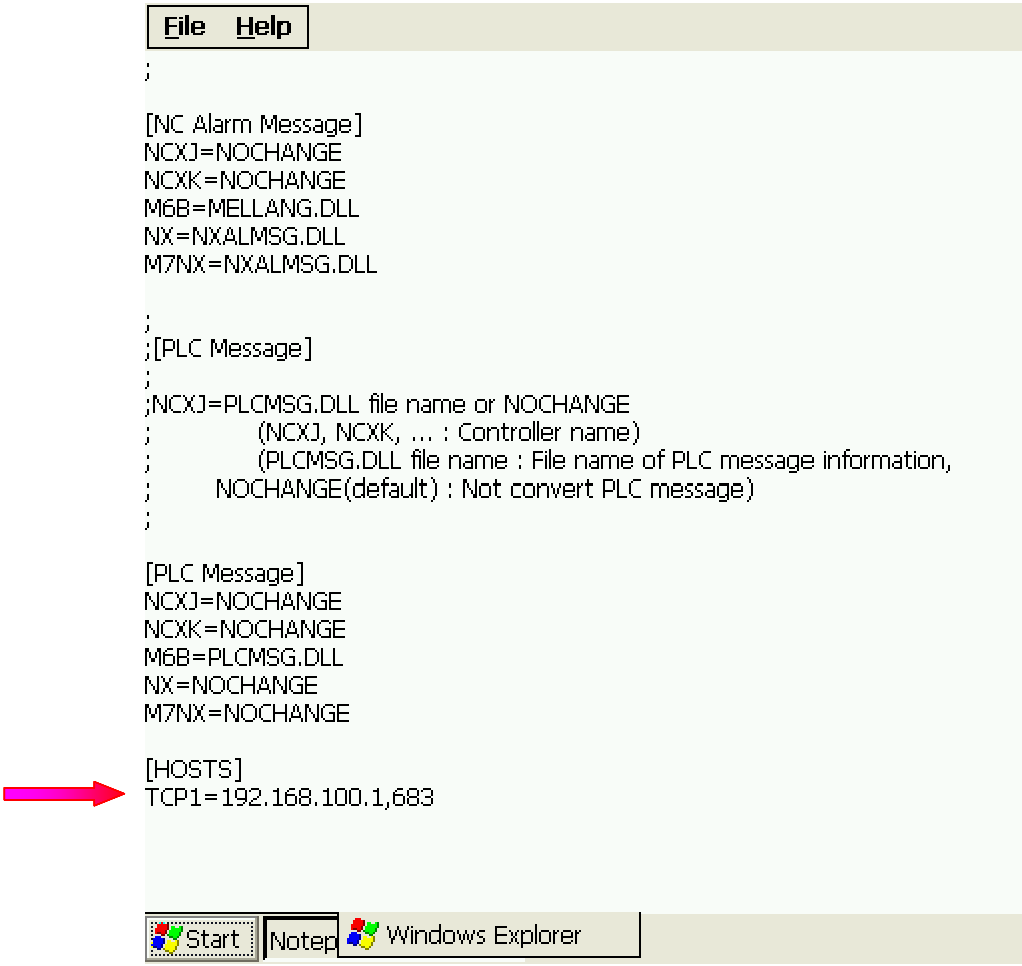
②Open "melcfg.ini"

File → Open，carry out "melcfg.ini" in the c:\ncsys document.



③The last line of below picture of IP setting must same as parameter #1934.

（Ex）第二台 NC 設定參考範例，設定爲 TCP1=192.168.150.1,683。

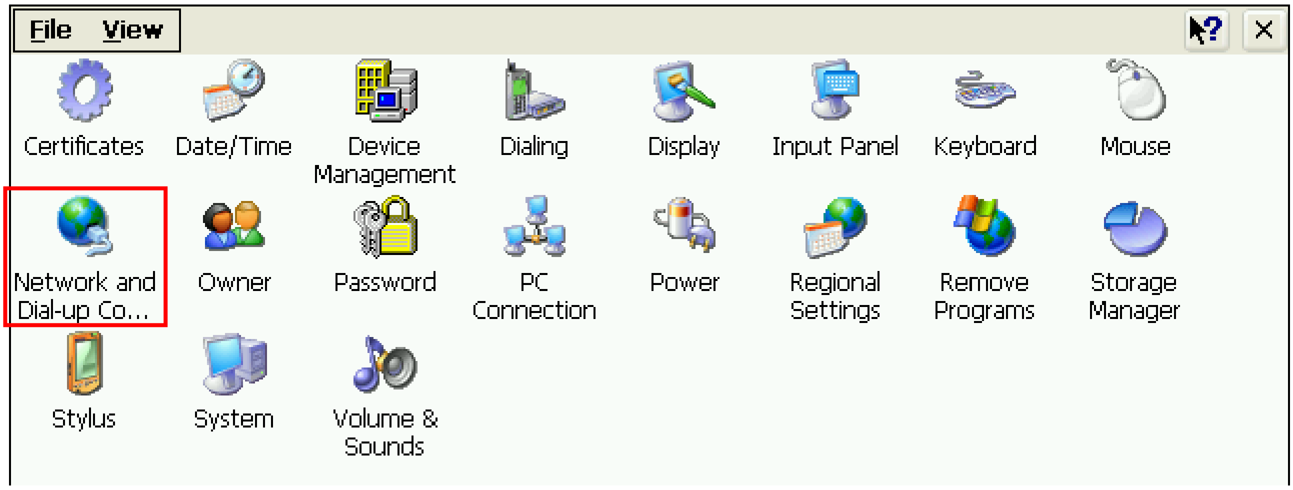


```
File  Help
;

[NC Alarm Message]
NCXJ=NOCHANGE
NCXK=NOCHANGE
M6B=MELLANG.DLL
NX=NXALMSG.DLL
M7NX=NXALMSG.DLL

;
;[PLC Message]
;
;NCXJ=PLCMSG.DLL file name or NOCHANGE
;           (NCXJ, NCXK, ... : Controller name)
;           (PLCMSG.DLL file name : File name of PLC message information,
;       NOCHANGE(default) : Not convert PLC message)
;

[PLC Message]
NCXJ=NOCHANGE
NCXK=NOCHANGE
M6B=PLCMSG.DLL
NX=NOCHANGE
M7NX=NOCHANGE

[HOSTS]
TCP1=192.168.100.1,683

Start  Notep  Windows Explorer
```

(2) Set IP address

①Open Control panel

②Start → Settings → Control Panel and select Network and Dial-up Connections。



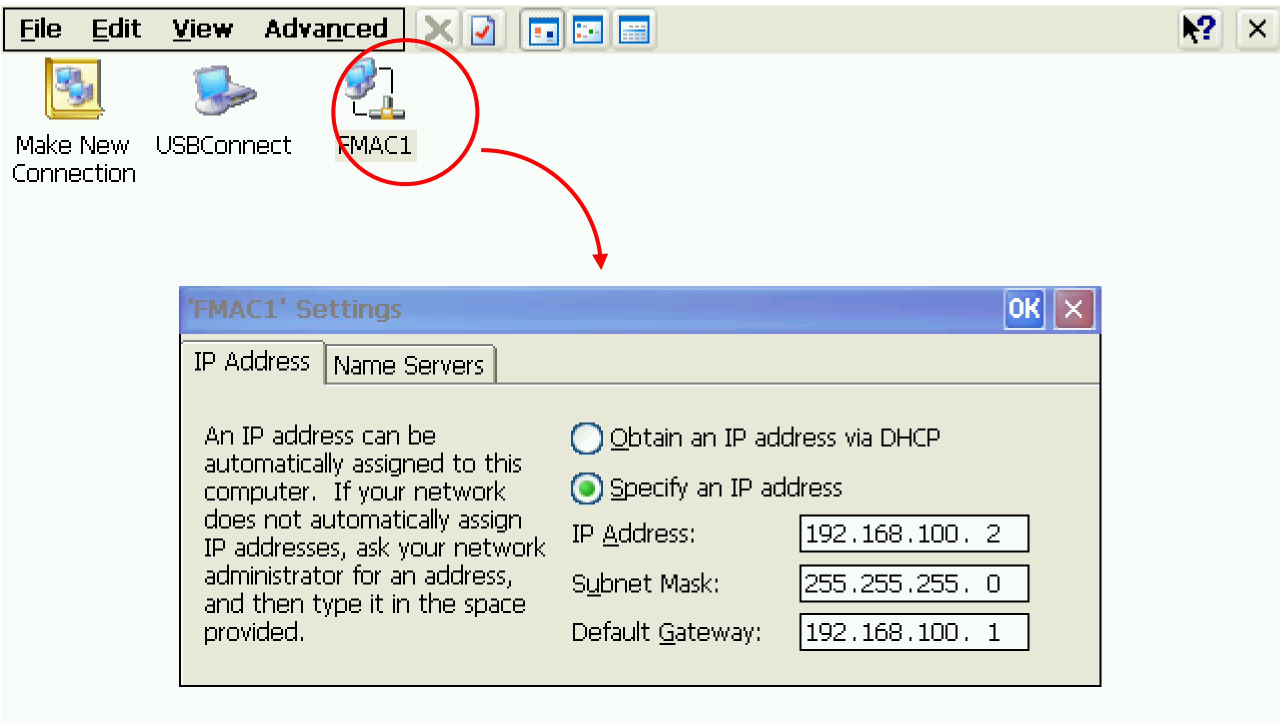
③ Open FMAC1 and set IP address.

④ After appear below picture, can set NC side of PC of IP address. It is initial setting If need modify please set same as parameter #11005.

（EX）Second NC setting.

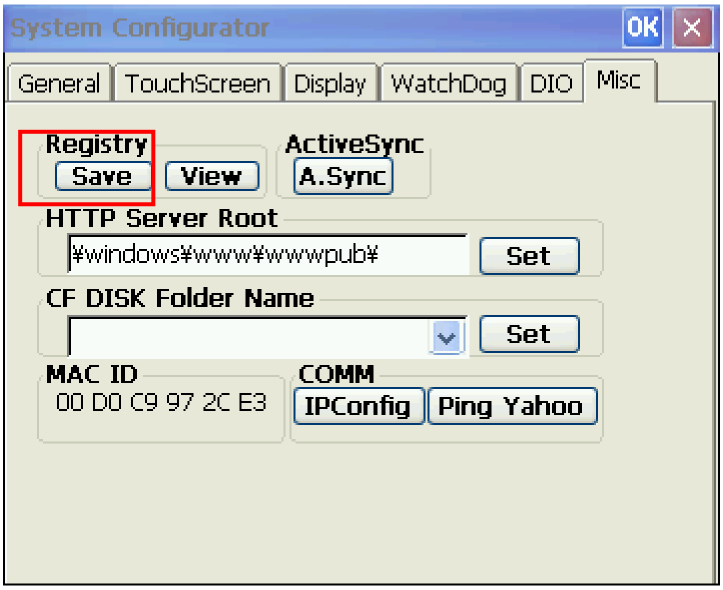
IP address： 192.168.150.2

Default gateway： 192.168.150.1



(3) Registry information

Start → Programs → System Configurator will show below window. Please select Registry of column Save.

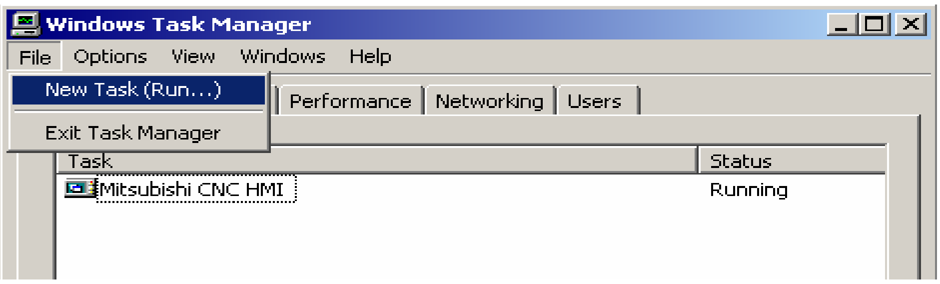


! Caution	WinCE system need registry setting information. Otherwise NC restart, the NC will come back original setting. If change IP setting maybe cannot open HMI screen.

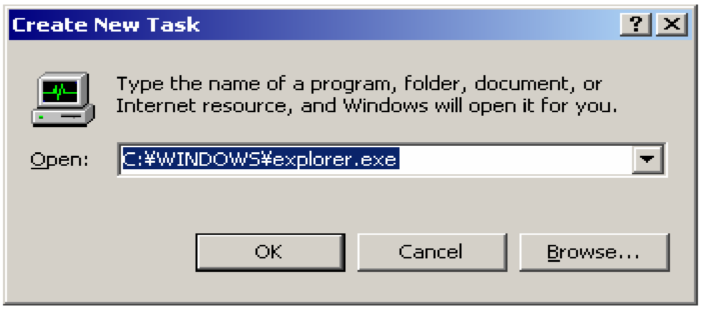
6.3 The data folder share installation（Usually data folder use to D:\ncfile directory in resource sharing.

(1) Press ALTER + CTRL + DELETE key and call out Windows Security screen.

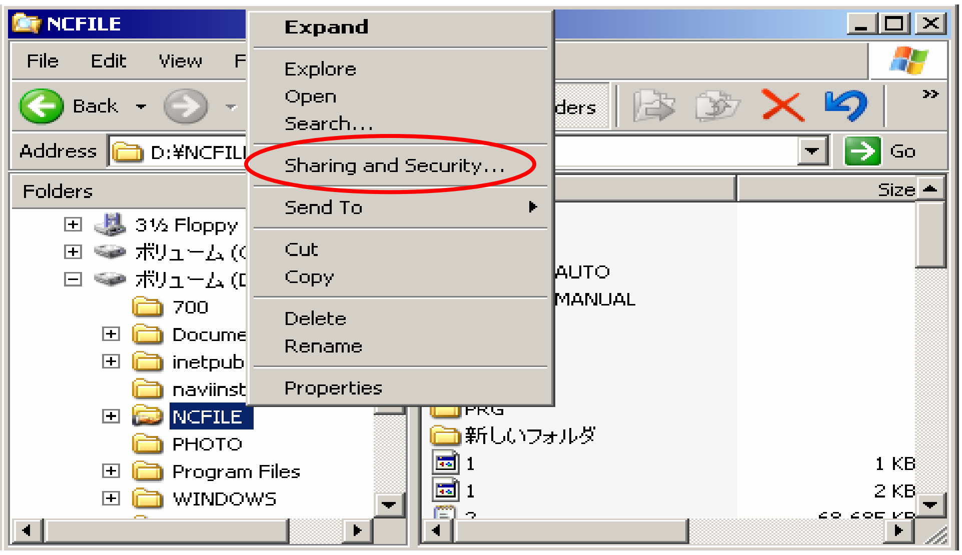
(2) Press the down middle key【Task Manager】and show “Windows Task Manager” screen as below.



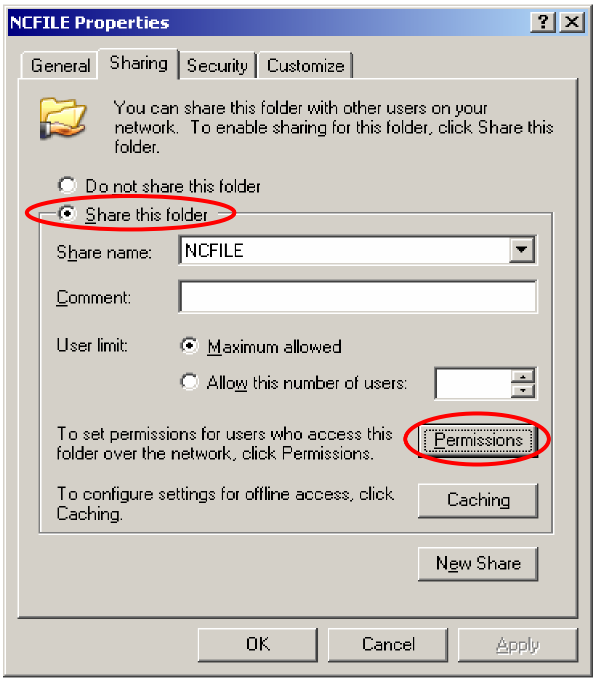
(3) Press Alt + F key and select [New Task] show as below. To open directory of explorer.exe and choice OK



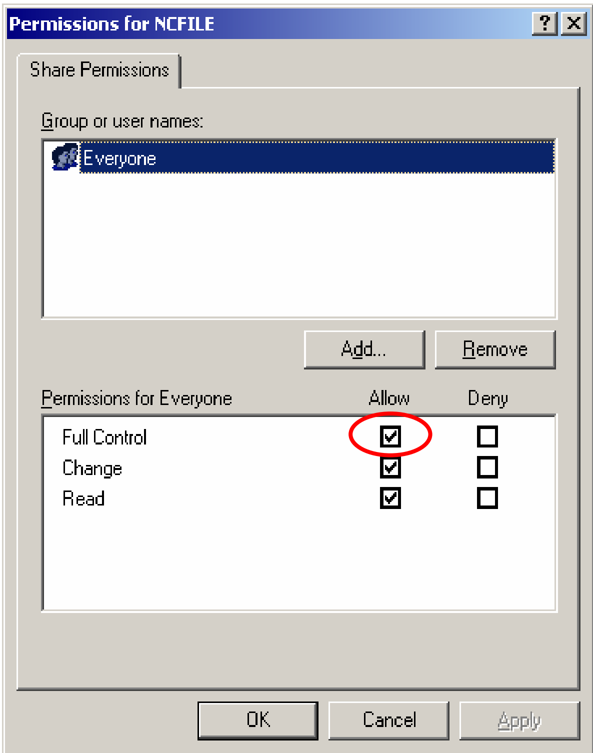
(4) In “D:\ncfile” directory is selected and click the folder by the right key of mouse or Alt + F keys and find out Sharing and Security…



(5) To select “Share this folder” and $\boxed{\text{Permissions}}$ mode.



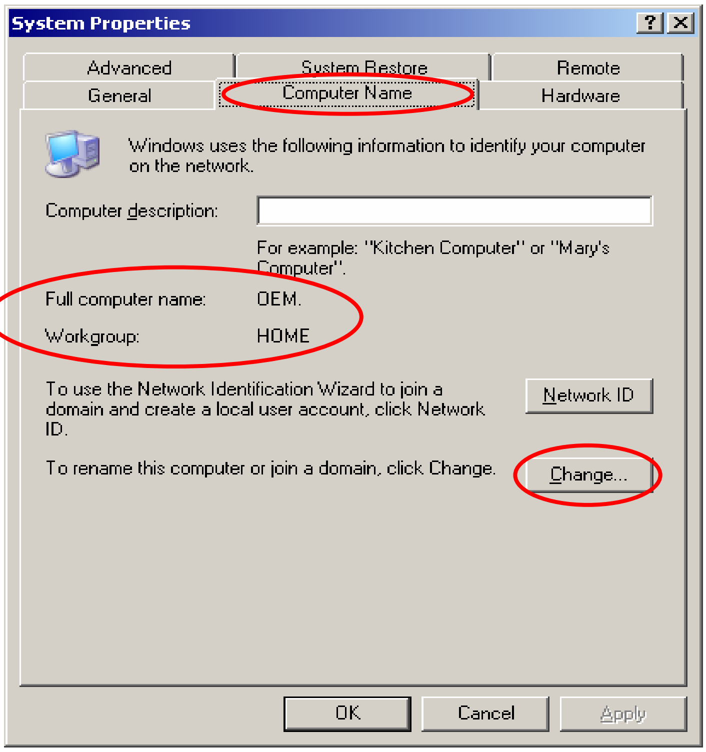
(6) The “Full Control” function mark available and then click $\boxed{\text{OK}}$.



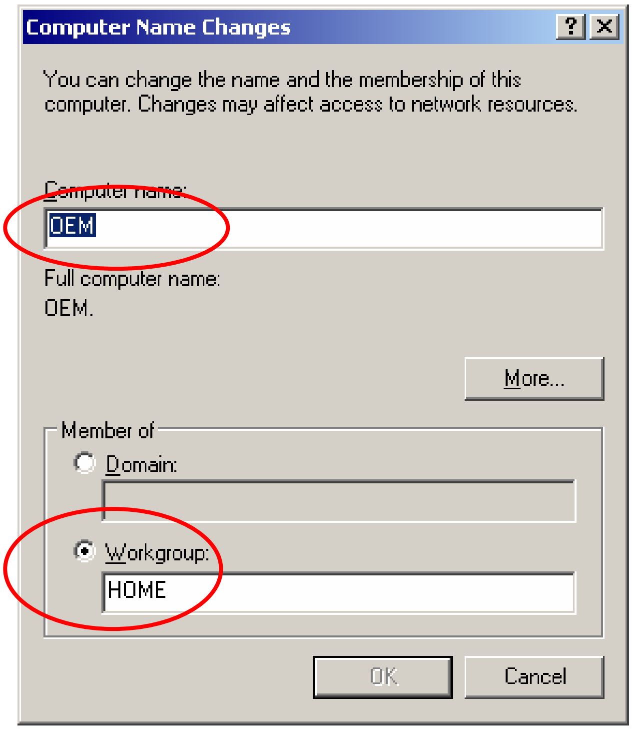
6.4 Computer's name and workgroup install (They need installation both Host PC and Win XPe)

(1) The System icon is selected on control panel.

(2) Computer name of system properties is selected and decision the full computer name and workgroup .Please be careful ,computer name should be independent name and workgroup should be same as Host PC name.(workgroup name of inner LAN)
If need to changed press Change… key.



(3) Computer name and workgroup is renamed and whole finished next to OK .

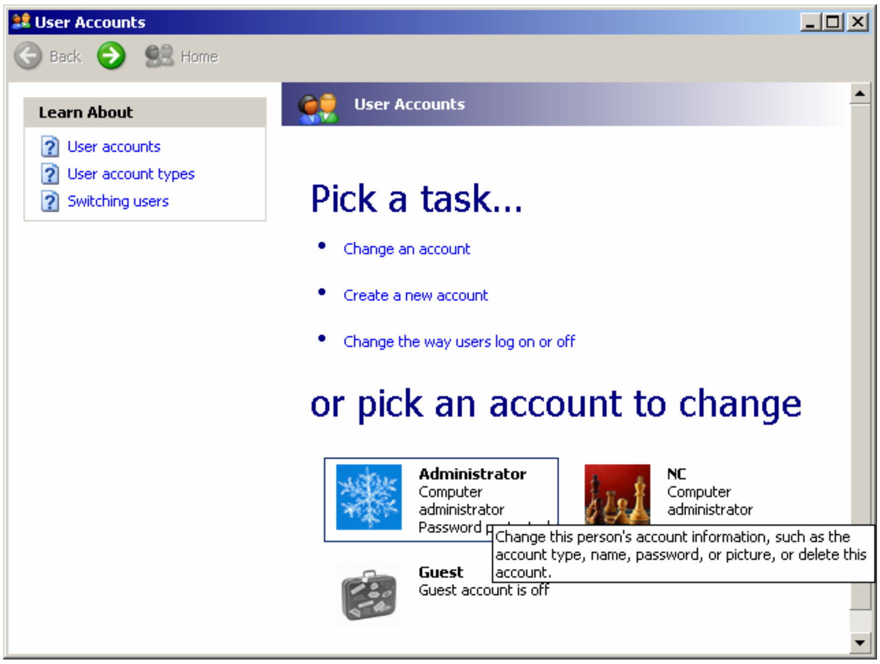


6.5 The password of administrator on Win XPe system（Only set in on screen for Win XPe）

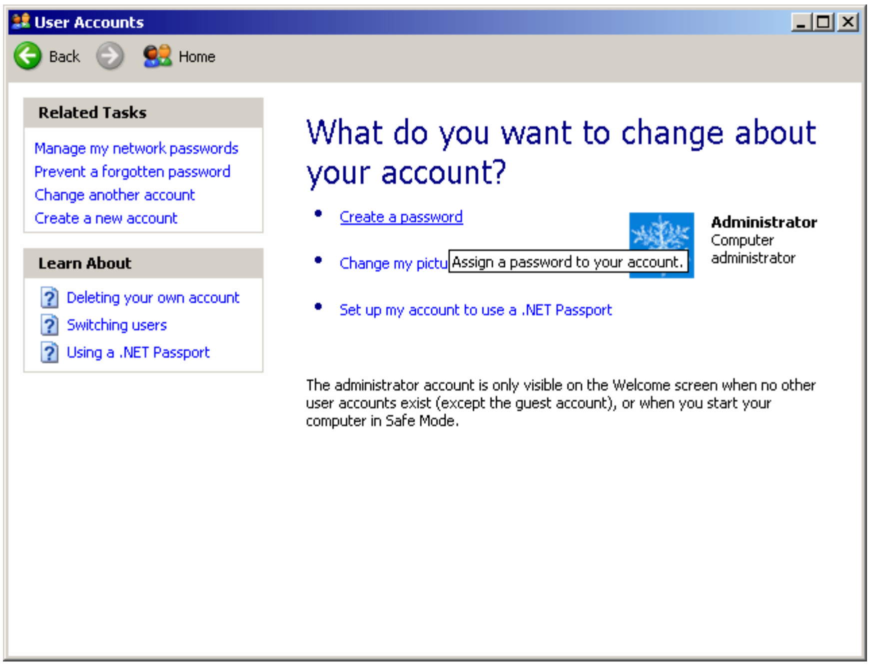
The Windows XPe can be automatic log on by administrator when power turn on.
Data folders can not store through LAN from outside if user's password do not set.
Thus, following method as below

(1) Opening control panel and selection" User Accounts".

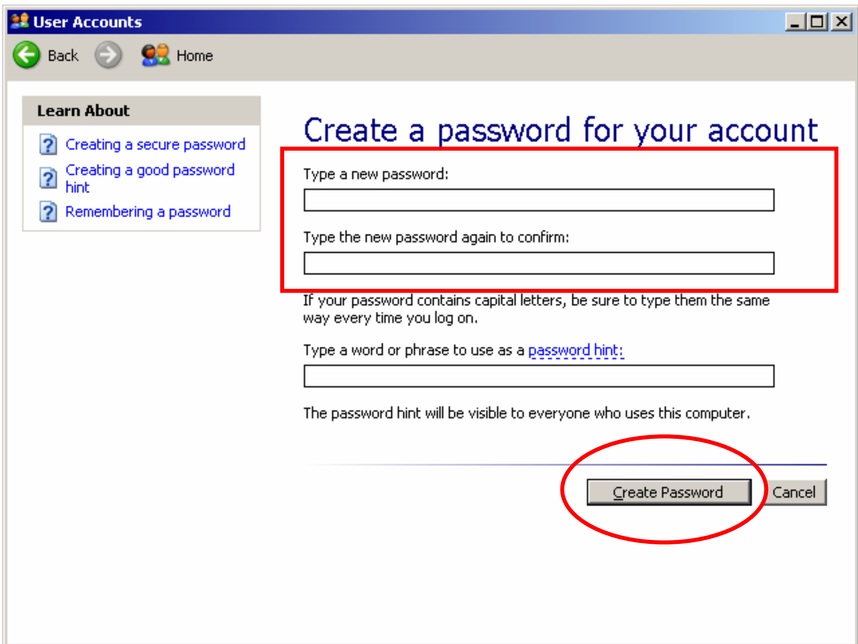
(2) Selection Administrator



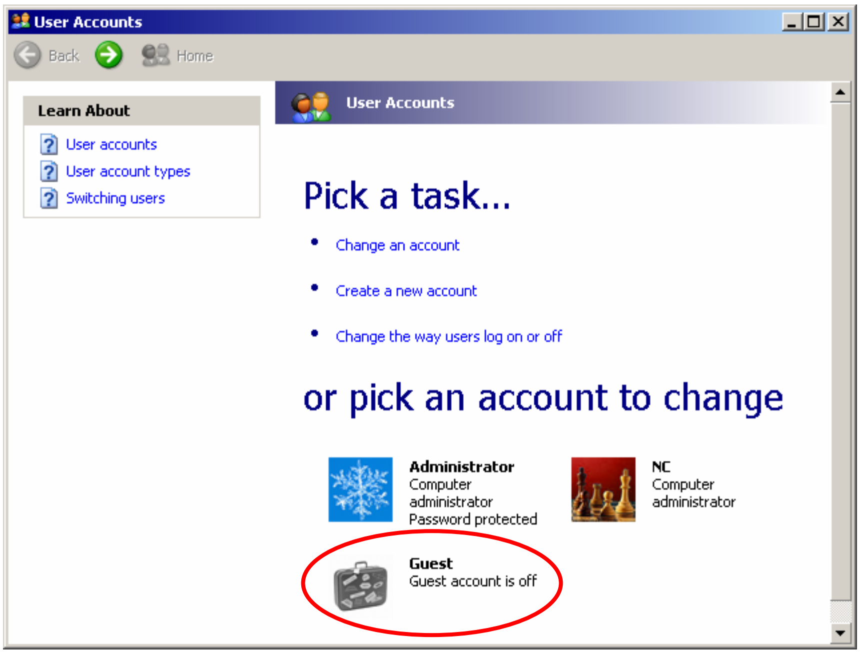
(3) Press “Create a password”



(4) Entrance password at [Type a new password:] and [Type the new password again to confirm:] and then click on [Create Password] .



(5) The Guest account must be off

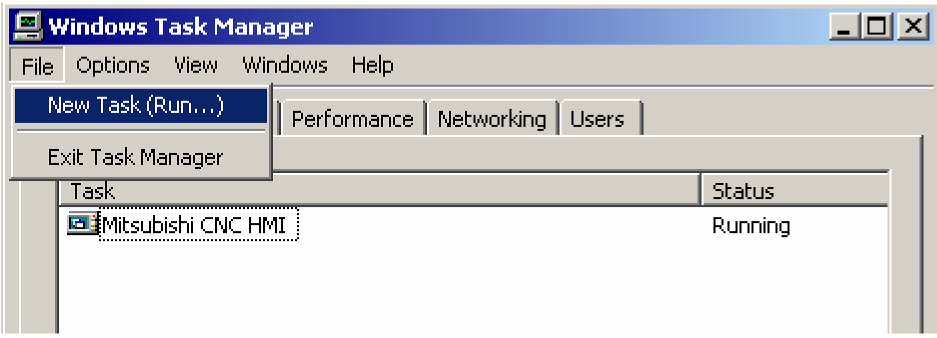


6.6 Win XPe automatically log on system enter（Only set in on screen for WinXPe）

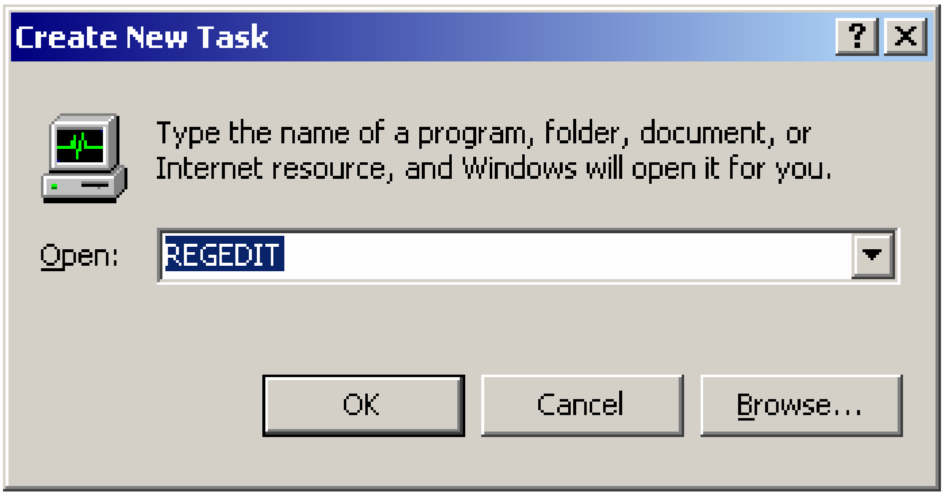
The Windows XPe can be automatic log on by administrator when power turn on.
The password should log on by automatically in order to install administrator password before.
The procedure like as below.

(1) Press ALTER + CTRL + DELETE keys and call out the “Windows Security”screen.

(2) Press the down middle key 【Task Manager】and show “Windows Task Manager” screen as below.

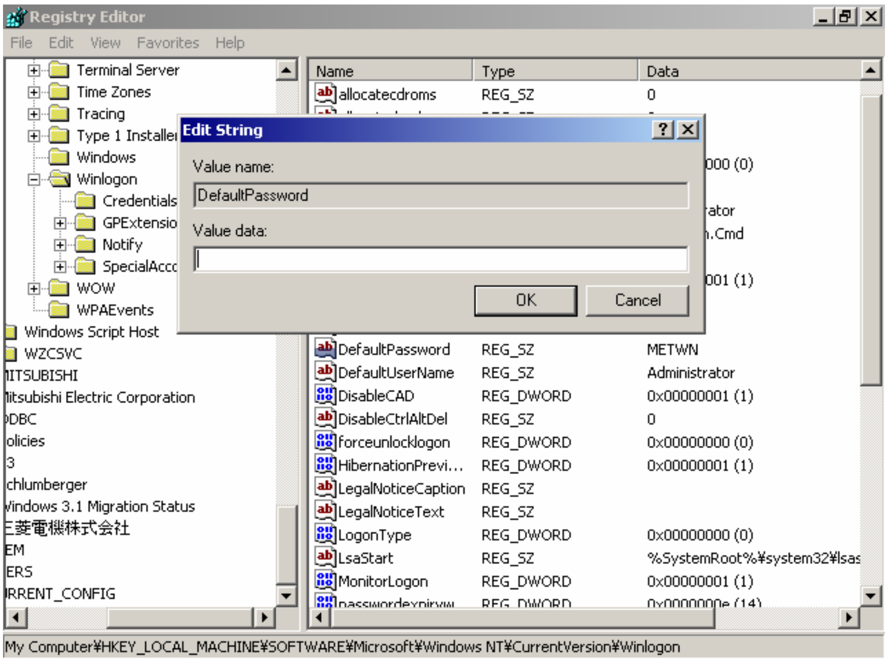


(3) Press Alt + F key and selection “New Task”as below and then open ”REGEDIT” program name to OK .



(4) The directory name of inner code as below:
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\Current Version\Winlogon

Name	Type	Value
AutoAdminLogon	REG_SZ	1 (Installed)
DefaultUserName	REG_SZ	administrator (Installed)
DefaultPassword	REG_SZ	Input<WinXP with password of administrator >
		Password on step four.



6.7 Host PC setting（Personal Computer）

(1)Carry out Windows "Console " function and input below command on the line c:\ ：

First NC connection setting

route –p add 192.168.100.0 mask 255.255.255.0 10.236.153.76

Second NC connection setting

route –p add 192.168.150.0 mask 255.255.255.0 10.236.153.75

【Command】

route –p add IP address 1 mask 255.255.255.0 IP address 2

IP address 1 PC side IP address of NC last code is 0

Ex：PC side IP address of NC1 is 192.168.100.2。

IP address 2 #1926 parameter setting

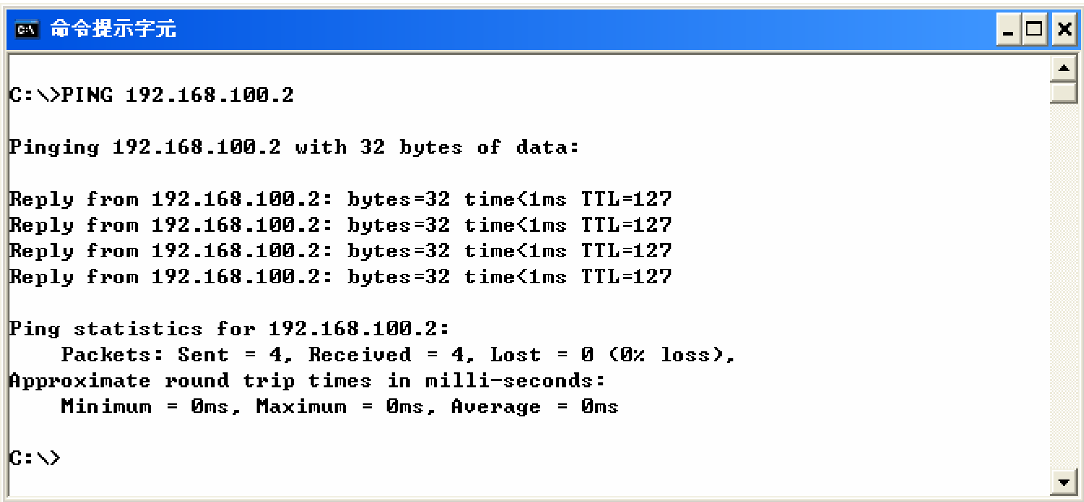
Ex：GLOBAL IP address of NC1 is 10.236.153.76。

(2) After finished below two steps please carry out ping NC to check related IP is valid or not. If it cannot connect please restart PC.

Check related Hardware.

Example IP address please check again：

192.168.100.2	PC side IP address of NC1（#11005）
192.168.100.1	（#1934）
10.236.153.76	NC side IP address of NC1（#1926）
192.168.150.2	PC side IP address of NC2（#11005）
192.168.150.1	PC side of NC2 default gate address（#1934）
10.236.153.75	NC side IP address of NC2（#1926）

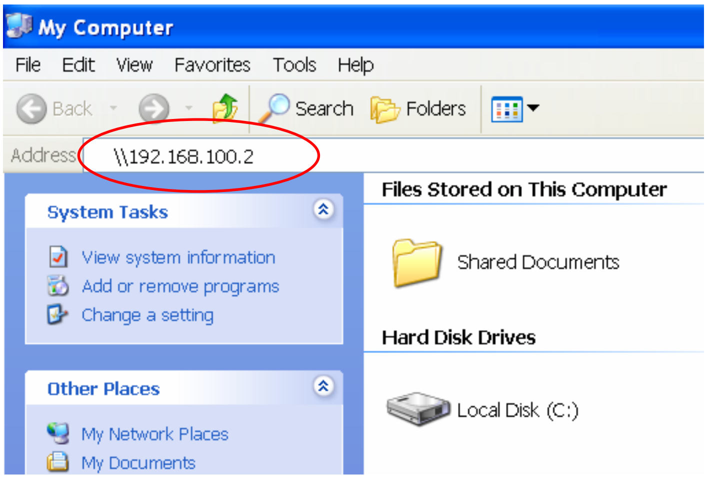


(3)If above step carry out also cannot ping the NC related IP please input「route –f」 command and run items (1)(2) step again.

```
C:\>route -f
```

6.8 Network sharing function

(1)In Host PC side Address column of explorer input \\192.168.100.2（Second NC \\192.168.150.2）



(2)When Host PC want to read WinXPe display unit sharing folder it will show a login window.

User Name： administrator

Password： CNC

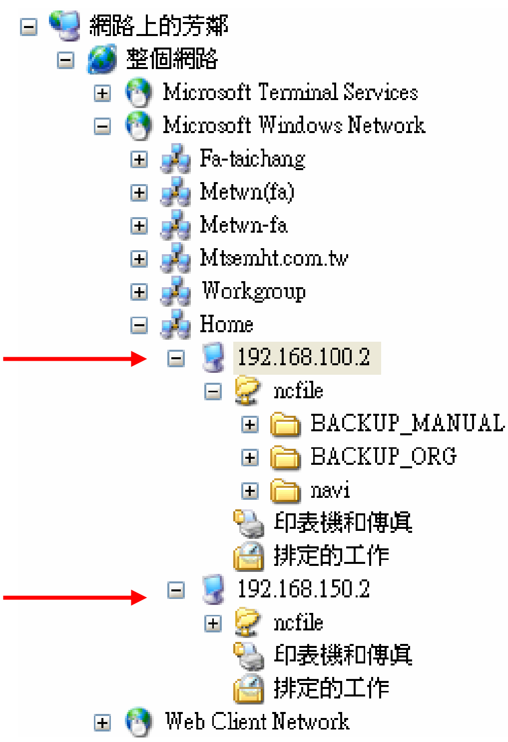
Input <WinXP setting administrator password of display unit>

the step 4 password.

After input you can see sharing folder.

First NC IP address

Second NC IP address



7 ETHERNET FTP connection

700 series controller operates in Ethernet function. Not only HD sharing you also can use FTP software to connect. But this transmit speed is slower than HD sharing function. Below is the comparison：

mode / Capacity	FTP	HD shearing
196MB	160 sec.	25 sec.

Because customer's use habit is different, to play this controller's multi-function support features in here to explain FTP setting procedure.

7.1 NC unit parameters setting

(1)The parameters list：

Parameter	set
#1926(Global IP address)	192.168.200.1
#1927(Global Subnet mask)	255.255.255.0
#1928(Global Gateway)	192.168.200.254 (0.0.0.0 is ok)
#11005(PC IP address) (NC XPe display unit)	192.168.100.2
#9705(Timeort)	10
#9706(Host No.)	1
#9711(Host1 host name) (PC IP address)	192.168.200.10
#9712(Host1 user name)	NC (set same as PC user name)
#9713(Host1 password)	Ok (set same as PC)
#9714(Host1 directory)	/ (set same as PC folder)
#9715(Host1 host type)	0 (Standard)
#9716~9721	0 (When #9715=0 standard setting)

(2)ETHERNET parameter

Carry out Ethernet input/output related parameters setting.

The symbol of (PR) parameter it means restart NC power.

9701～9706 parameters：

When several TCP/IP drivers are installed and the IP address is set manually ("#9701 IP address automatic setting" is set to 0), the same setting will be made for all parameters.

9711～9781 parameters：

Set the server information required for using the Ethernet function.
Server information for up to four units can be set.

#	Item	Contents	Setting range (unit)
9701 (PR)	IP addr auto set	The IP address is automatically assigned from the DHCP server. **(Note)** When this setting is validated, the following parameters "#9702 IP address", "#9703 Sub-net address" and "#9704 Gateway setting" will be invalid.	0: Manual setting 1: Automatic setting
9702 (PR)	IP address	Set the IP address. This sets the IP address of the TCP/IP assigned to the NC (Windows) computer. Contact the network controller for the address to be set.	15 characters or less Dot notation numeric value train
9703 (PR)	Subnet mask	This sets the subnet mask of the TCP/IP assigned to the NC (Windows) computer. Contact the network controller for the subnet mask to be set.	15 characters or less Dot notation numeric value train
9704 (PR)	Gateway	This sets the gateway of the TCP/IP assigned to the NC (Windows) computer.	15 characters or less Dot notation numeric value train
9705	Timeout	This sets the timeout time (s) for when the communication is not completed correctly, or when there is no communication response.	10 to 99 (s) (Standard: 30)
9706	Host No.	This selects the number of the host to be used from host 1 to host 4.	1 to 4 : Host No.
9711	Host1 host name	This sets the host computer name. This parameter allows the NC to easily recognize the host computer on the network. Set the host computer's name (name registered in C:¥windows¥hosts) or the IP address. <Setting example> For host name : Mspc160 For IP address : 150.40.0.111 **(Note)** Set the host computer's TCP/IP address if communication is not carried out correctly.	15 characters (alphanumeric) or less
9712	Host1 user name	This sets the user name when logging into the host computer.	15 characters (alphanumeric) or less
9713	Host1 password	This sets the password when logging into the host computer.	15 characters (alphanumeric) or less
9714	Host1 directory	This sets the directory name of the host computer. Refer to **(Note 4)** for details.	31 characters (alphanumeric) or less

#	Item	Contents	Setting range (unit)
9715	Host1 host type	This sets the type of host computer. **(Note)** When "0" is set, the settings for the following parameters will be invalid. • Wrd pos: name • Wrd pos: size • Wrd pos: Dir • Wrd pos: cmnt • Wrd num: cmnt	0: UNIX/PC automatic judgment 1: UNIX 2: PC (DOS)
9716	Host 1 Wrd pos: name	This sets the file name display position (nth word from left) of the list displayed when the ftp command "dir" is executed. **(Note)** One word designates a character string divided by one or more spaces.	0 to 100 0: Default value
9717	Host 1 Wrd pos: size	This sets the size display position (nth word from left) of the list displayed when the ftp command "dir" is executed. **(Note)** One word designates a character string divided by one or more spaces.	0 to 100 0: Default value
9718	Host 1 Wrd pos: Dir	This sets the <DIR> display position (nth word from left) of the list displayed when the ftp command "dir" is executed. **(Note)** One word designates a character string divided by one or more spaces.	0 to 100 0: Default value
9719	Host 1 Wrd pos: cmnt	This sets the comment (date, time, etc.) display position (nth word from left) of the list displayed when the ftp command "dir" is executed. **(Note)** One word designates a character string divided by one or more spaces.	0 to 100 0: Default value
9720	Host 1 Wrd num: cmnt	This sets the number of words to be displayed as a comment. **(Note)** One word designates a character string divided by one or more spaces.	0 to 100 0: Default value
9721	Host 1 no total siz	This sets whether to display the total number of characters registered in the machining programs of host1 when displaying the file list. If there are many files in the directory to be referred to, the list can be updated quickly by setting "1".	0: Display 1: Do not display

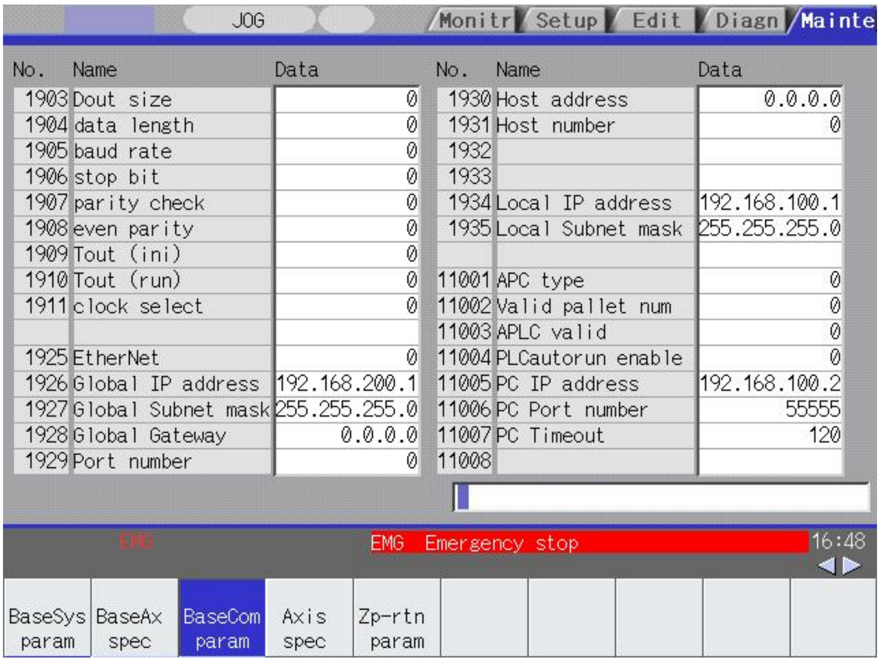
9731 to	Set the same settings for host 2.	
9751 to	Set the same settings for host 3.	
9771 to	Set the same settings for host 4.	

【Note】

(Note 1) The user name and password are required when logging in.
(Note 2) It is necessary to enable reading/writing when exchanging files.
(Note 3) With the Personal WEB Server and Windows NT 4.0 fpt Server, the file list format can be selected from DOS or UNIX.
(Note 4) The directory released to the client (NC unit) with the host computer's server is handled as the root directory by the NC unit.

Above parameters position is like below picture showing：

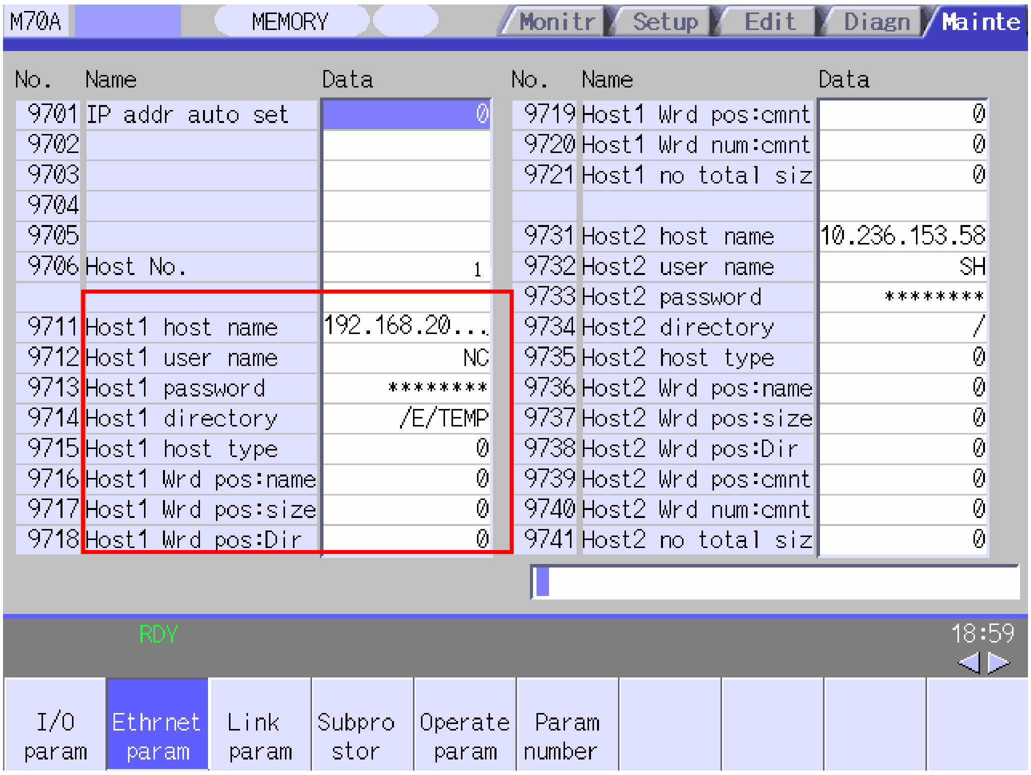
(1) Common Parameters



【Caution】Please don't easy to modify the other parameters to avoid NC cannot start.

(2)Ethernet Parameters

Below mark setting need set same with PC side setting.



7.2 Personal computer setting

7.2.1 PC side related IP setting

(1) Please confirm below items：

①This computer network can connect company internal local network.

②If without connect company internal network it only two PCs connect each other, please use cross cable.（PIN1,3 jump，PIN2,6 jump， other is straight ） and confirm you can connect another PC.

③In START → RUN input PING xxx.xxx.xxx.xxx . The「x」is meaning IP address of NC（PC）.

④If it can PING IP in NC（PC）just can connect success.

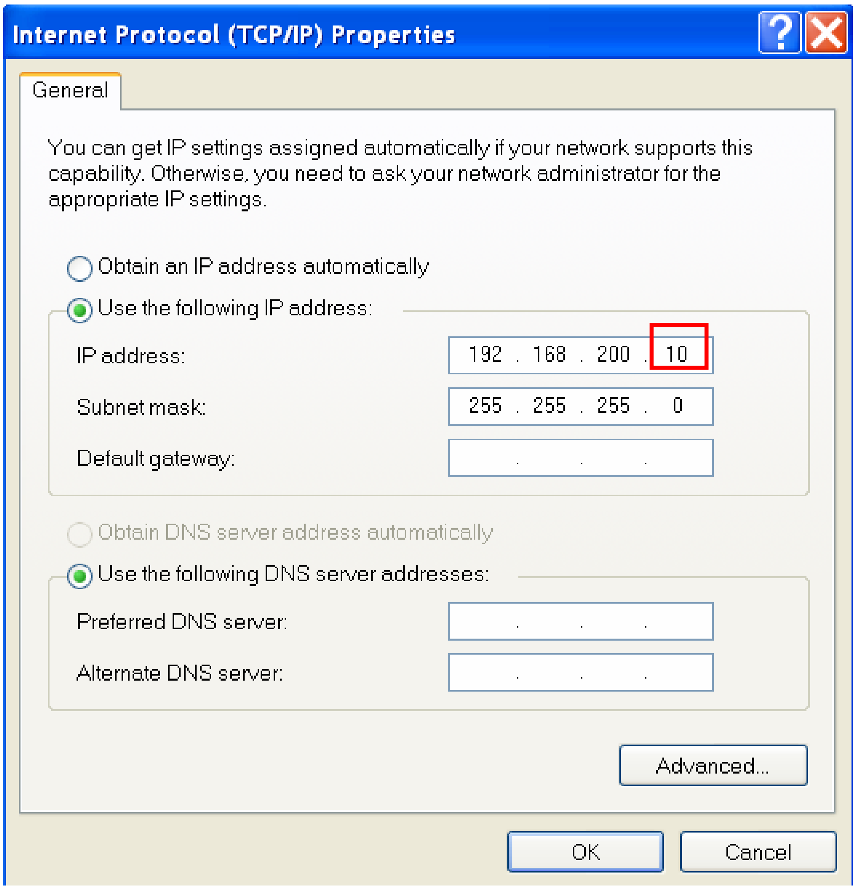
⑤This chapter does not introduce PC Windows operation system please refer related operation manual.

(2)Change PC side TCP/IP setting

①In right side ICON uses mouse double click it will appear local network states on the screen.

②Frequently select Properties → Internet Protocol (TCP/IP) → Properties will appear window.

③Change below IP numbers, the number of red circle need set 0～255 and cannot same with NC or other network IP address of PC.



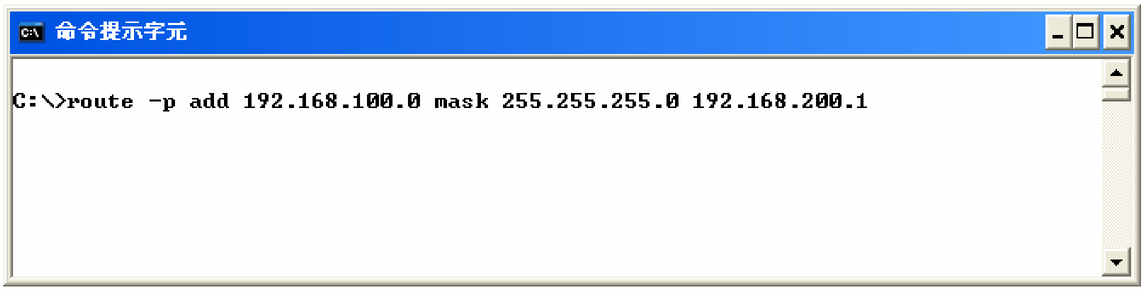
④After setting to press OK .

(2)Console command input.

①Carry out " CONSOLE" command.

②Input below command：

route -p add 192.168.100.0 mask 255.255.255.0 192.168.200.1

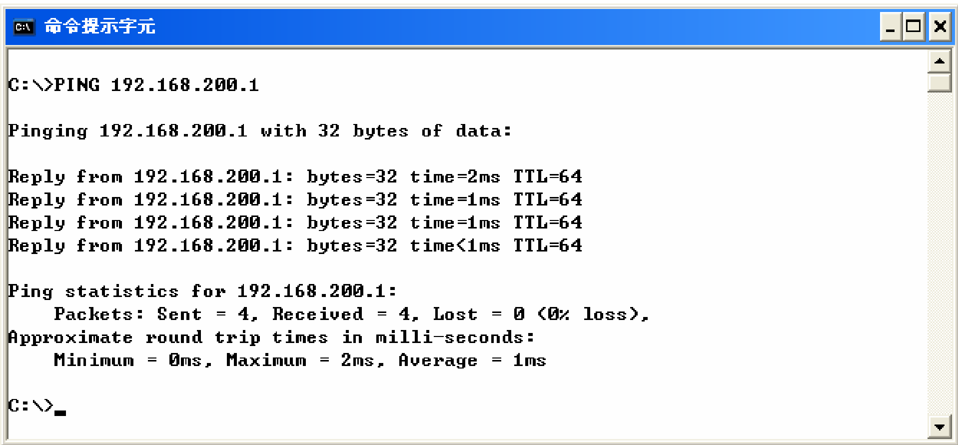


If without input, it can not connect to NC.

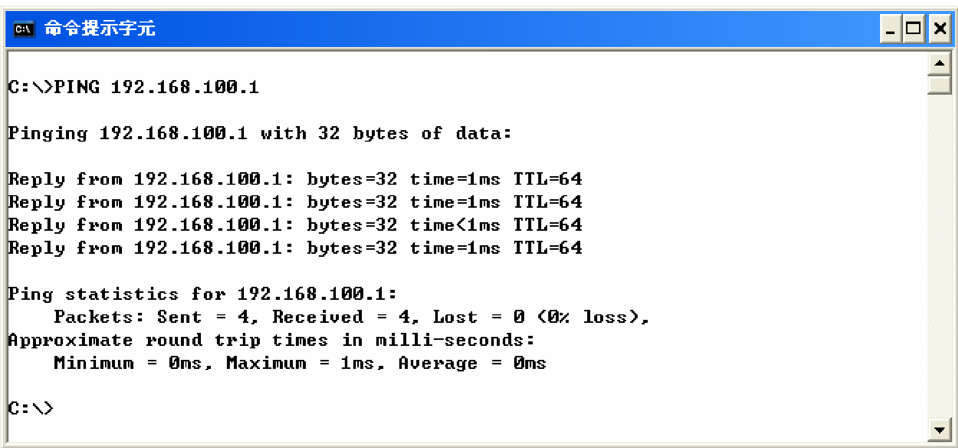
(3)Use PING command to test.

①Carry out " CONSOLE".

②Input “PING 192.168.200.1” to test.



③Input “PING 192.168.100.1” to test.



④Input “PING 192.168.100.2” to test.

命令提示字元

```
C:\>PING 192.168.100.2

Pinging 192.168.100.2 with 32 bytes of data:

Reply from 192.168.100.2: bytes=32 time<1ms TTL=127
Reply from 192.168.100.2: bytes=32 time<1ms TTL=127
Reply from 192.168.100.2: bytes=32 time<1ms TTL=127
Reply from 192.168.100.2: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.100.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

【Caution】The above screen is connection working screen. You can begin next setting procedures.

⑤IP Cannot PING screen.

命令提示字元

```
C:\>PING 192.168.100.1

Pinging 192.168.100.1 with 32 bytes of data:

Destination host unreachable.
Destination host unreachable.
Destination host unreachable.
Destination host unreachable.

Ping statistics for 192.168.100.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>_
```

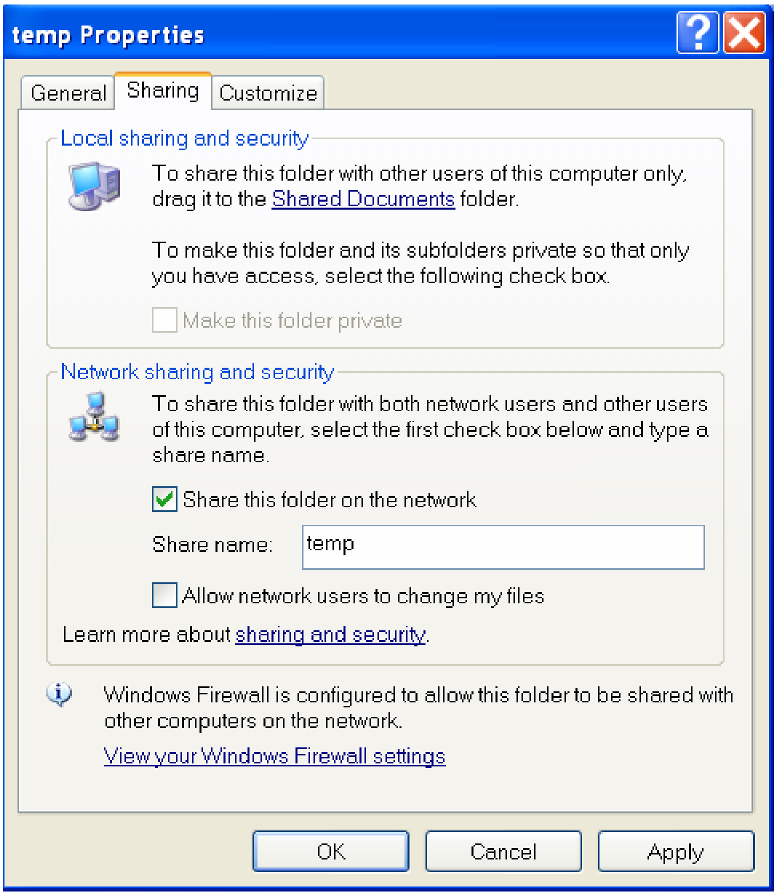
【Caution】If show the above picture, it is meaning can not connect please contact computer company. It might be Ethernet card related setting problem or H/W trouble.

(4)Network sharing and security setting

① Open windows explorer .

②move cursor to wanted sharing folder. Then use mouse right button to select Sharing and security(H)… 。

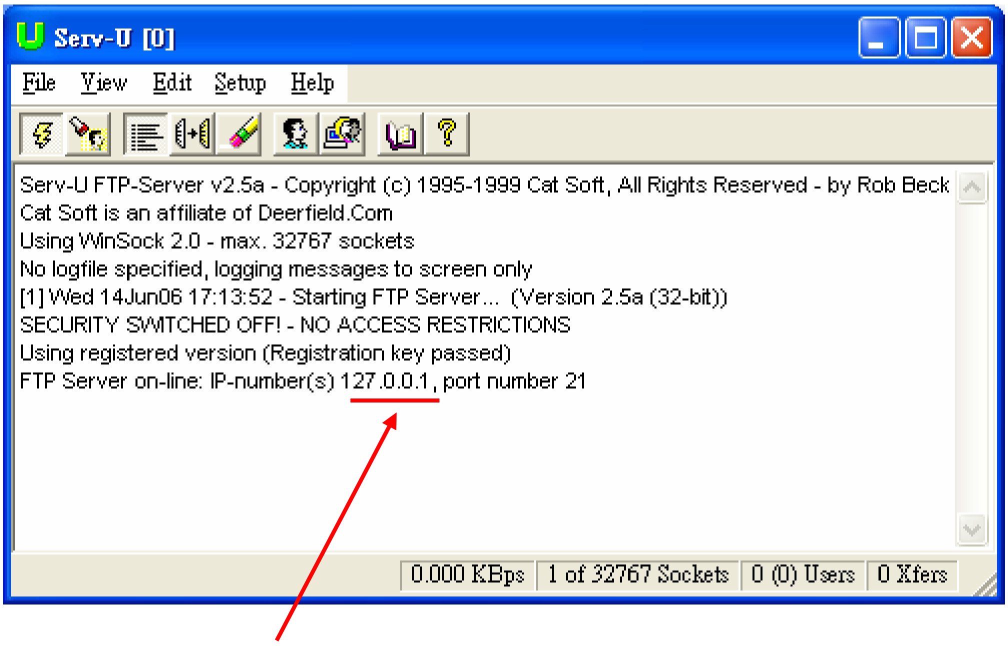
③In Network share and safety two items to mark them. The name please use 8 characters.



④After above mention setting, the folder will appear a mark of share symbol and it meaning setting is completed.

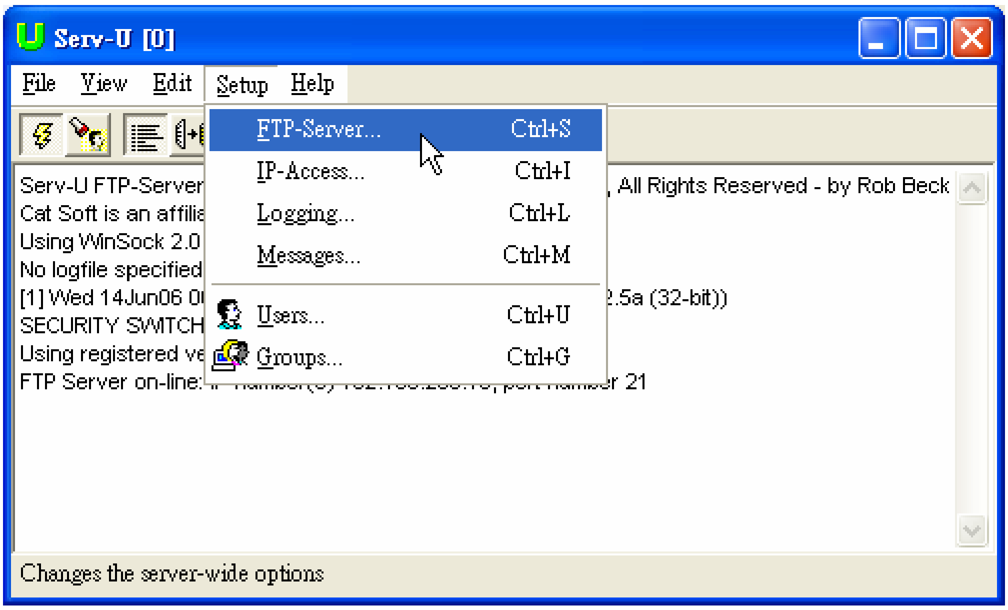
7.2.2 FTP software of SERV-U setting

(1)Start “ serv-U” software

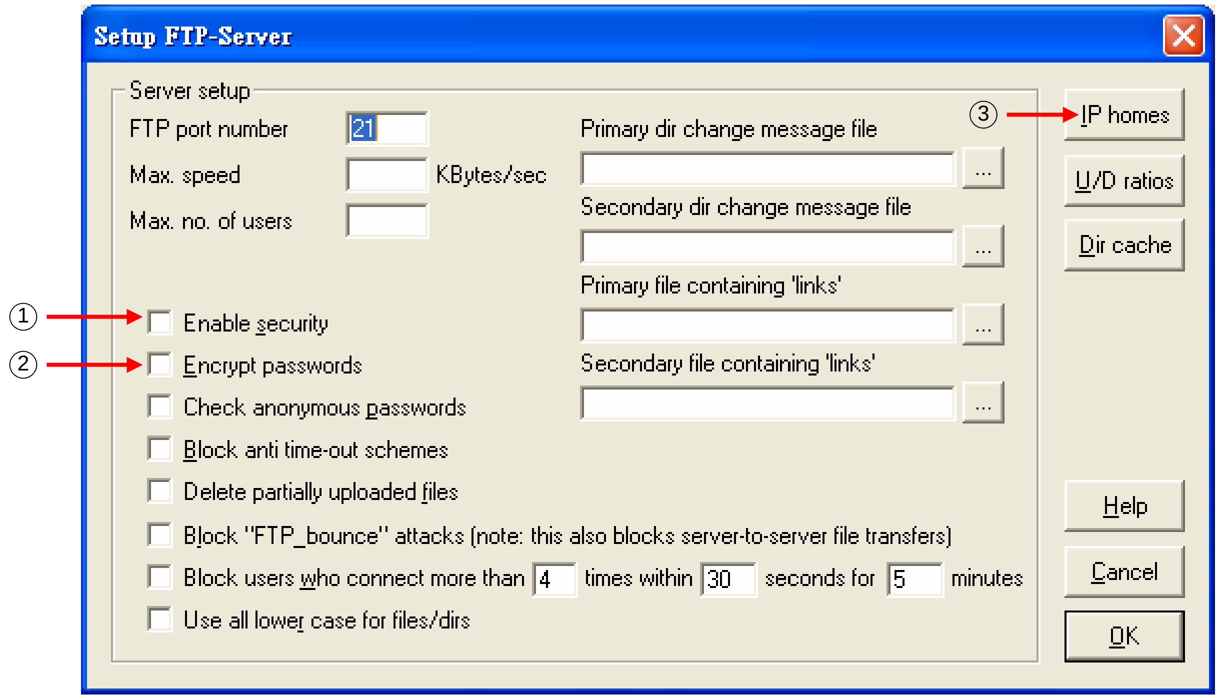


For Windows XP the unconnection IP shall show this number but if network is working it will show setting IP.

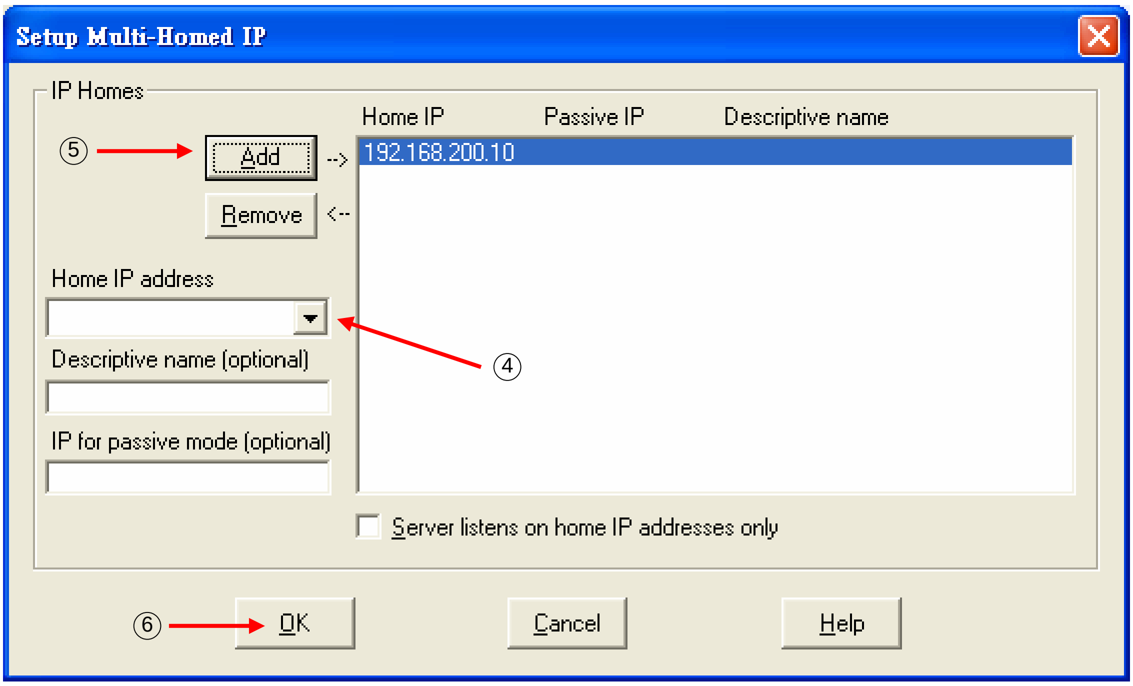
(2)Set FTP-Server… .



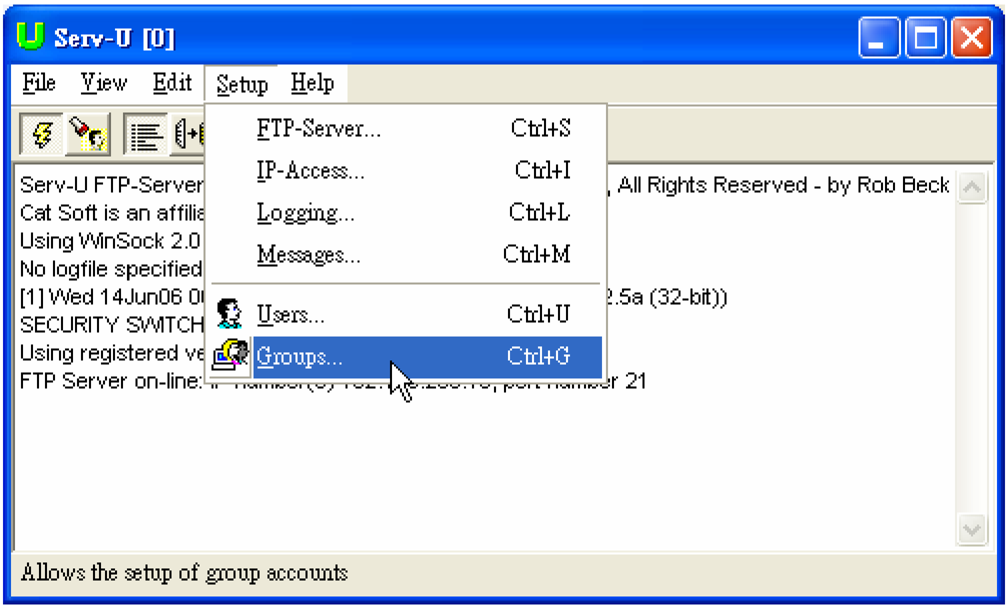
(3)Cancel left side related items then click up right corner button IP homes .



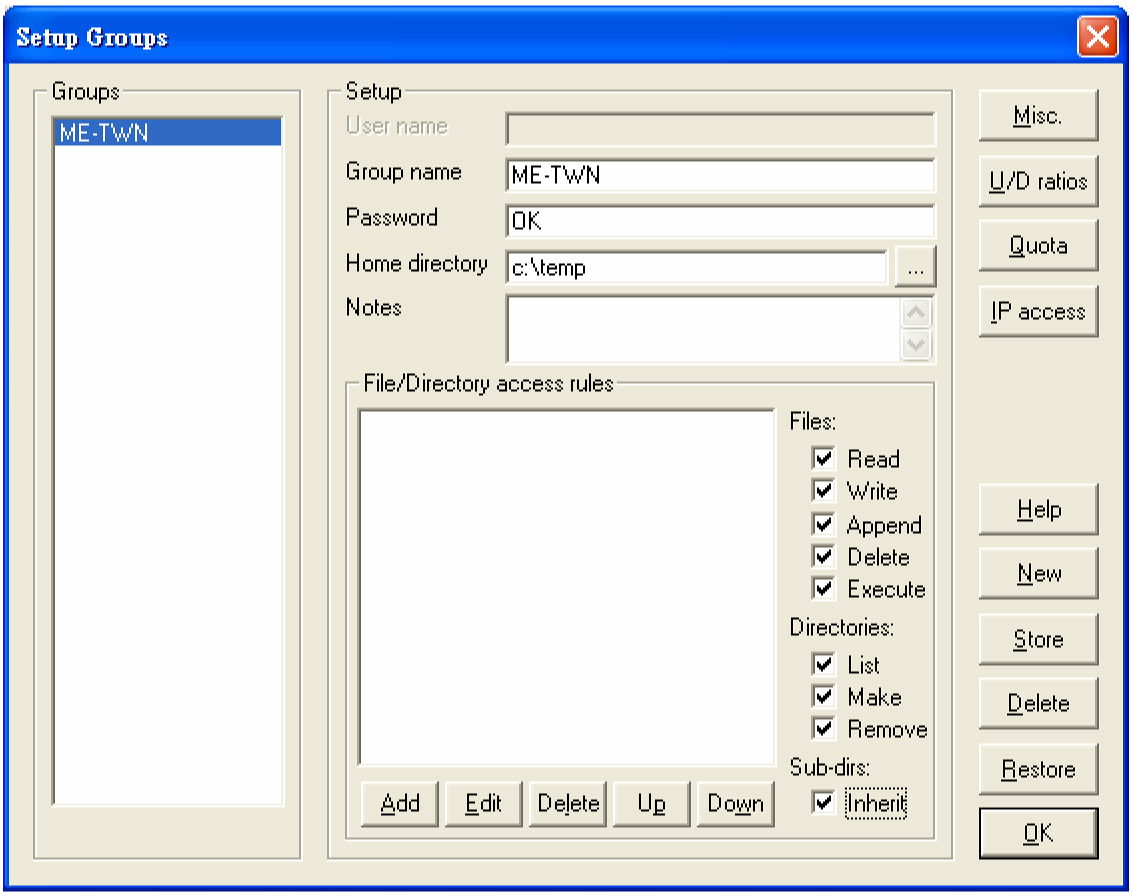
(4)Press Home IP address right side roll window to select IP address, then press Add .When IP address of PC has set you can see Home IP address in the screen.



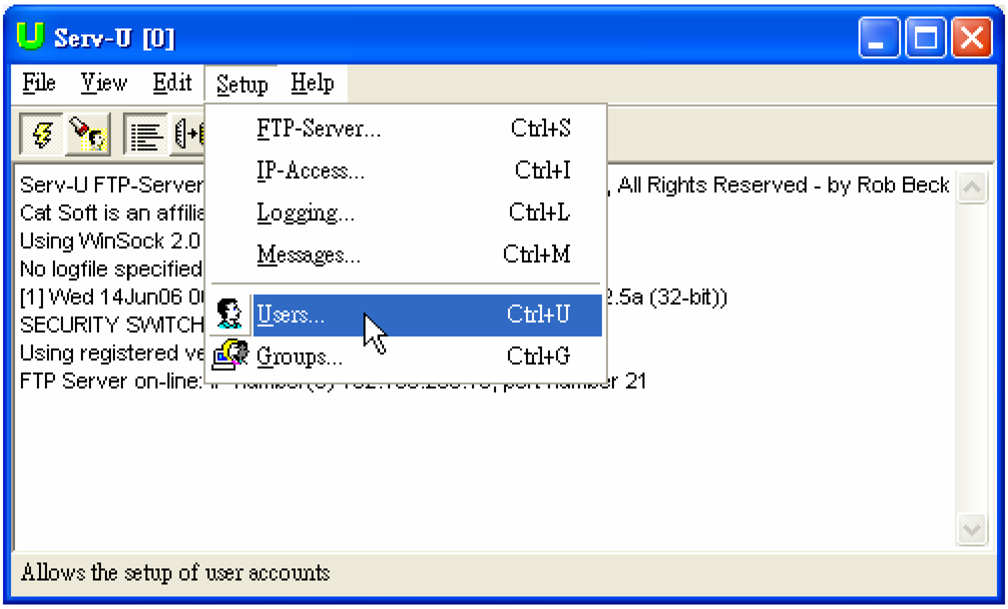
(5)Select Groups…



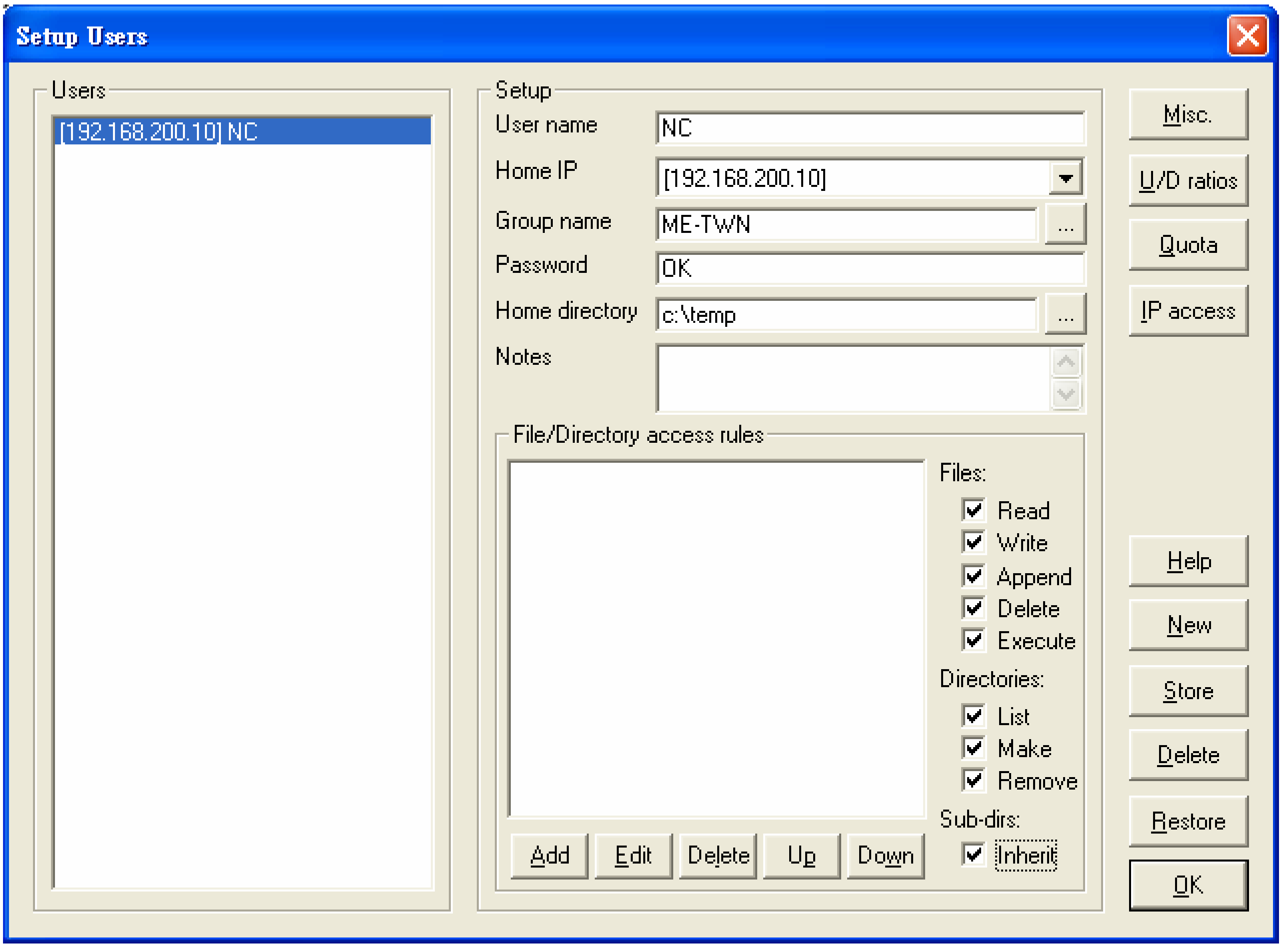
(6) Set Groups.



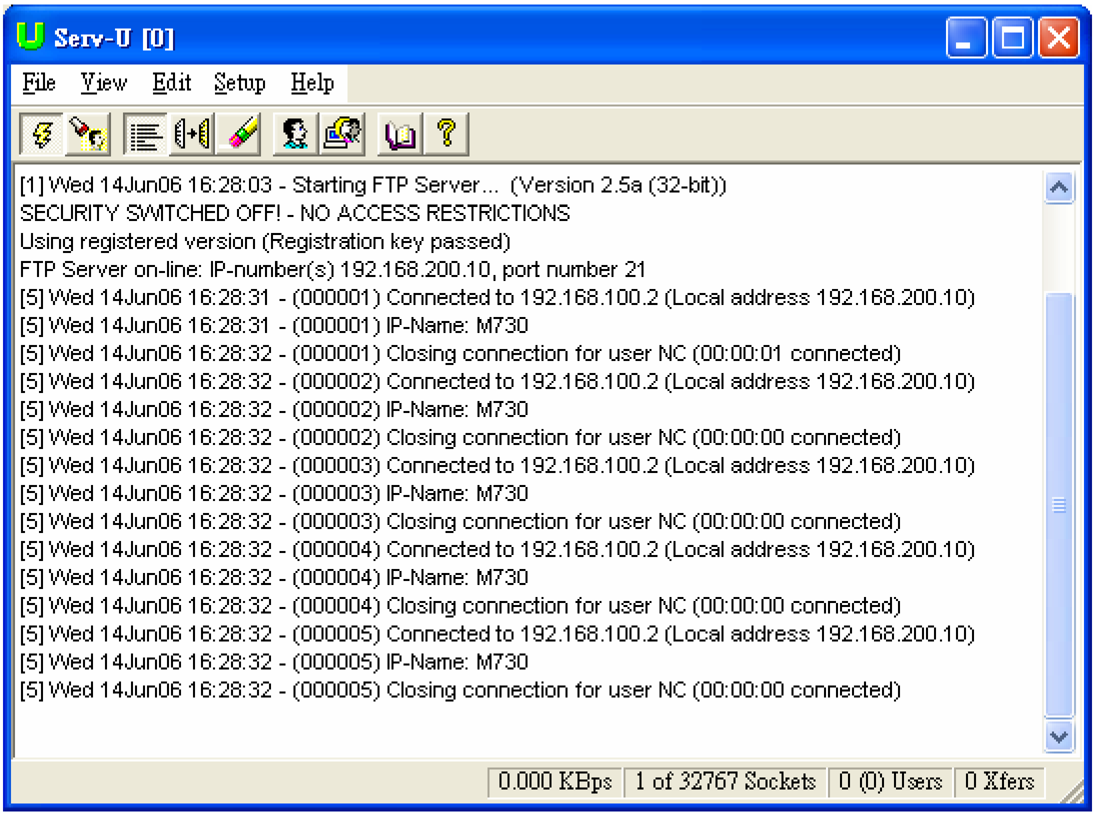
(7)Set Users…



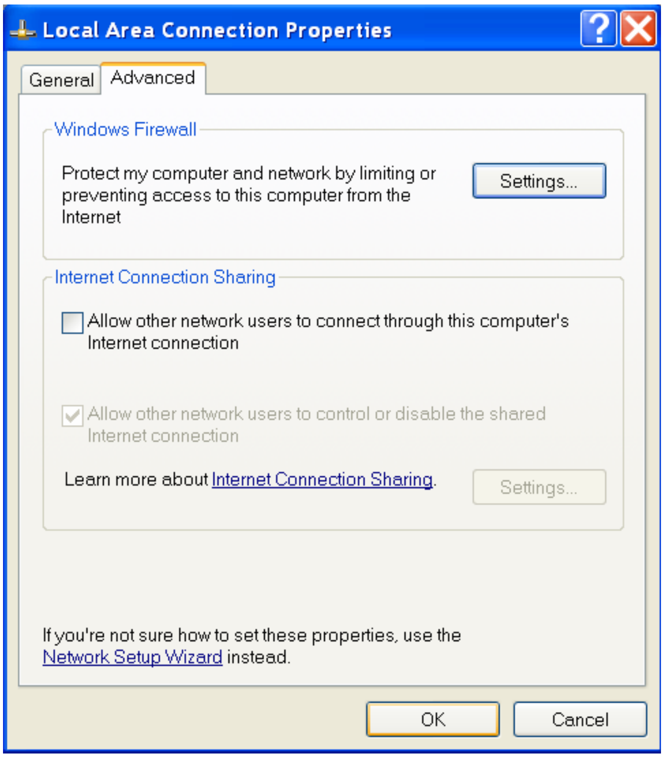
(8)Set users.



(9)Below picture is showing the Ethernet connection success.



(10)When above steps cannot connect please to cancel【Network firewall】.



7.3 FTP transmission procedure

In M60S series machining program through ETHERNET transmit shall have a special operation screen but M700 series is merging in interface of data transmission. This function is only user to customize M700 data transmission interface. It only change input source to A：Dev and enter Device select then choose Ethernet . The target assign to memory or hard disk（HD）.

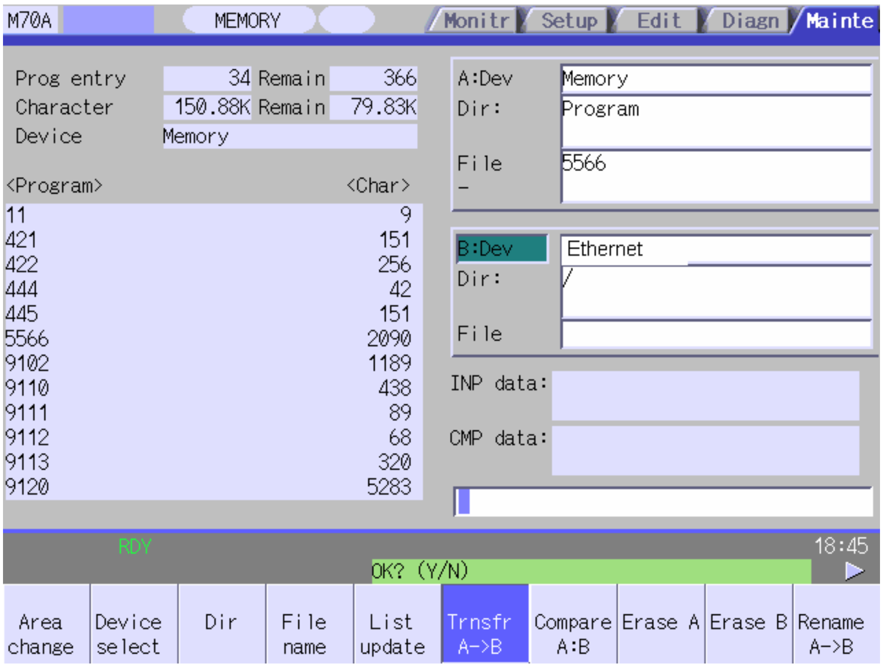
(1) Start SERV-U on the PC. The screen will show like below.

(2) Change NC screen to INPUT/OUTPUT screen Device select → Ethernet → Dir → Form list. It will appear a saving folder.

(3) After connection success, the NC left right will appear folder content on the screen. Press Form list can use keyboard to select demanded file name to transmit. Press INPUT again. The machining program name will appear on the A：Dev of File column.

(4) B：Dev can choose memory or HD. Below example in HD for explain.

(5) Press Trnsfr A→B it will show below window. If you want to transmit, press ”Y” or press INPUT key to transfer data.



(6) If the program is exist, it will appear Overwrite file?(Y/N) message. Press INPUT to rewrite.

(7) The Transfer complete message appeared after file transfer completed.

(8) NC side has 4 sets can set to PC. The parameters are #9711、#9731、#9751、#9771. These 4 groups setting can set in control parameter #9706. The default is setting「1」. User can follow real condition to change HOST PC.

8. MITSUBISHI CNC Network application

This tool software is suitable for M700 and M70 series, the user can be to carrying out file transfer among controller and PC on the PC side. It is not only offer customer use but also transfer speed is fast than FTP software. It sets up simple and beginner user can easy understand but M60S and before version is unable to use.

8.1 Install software

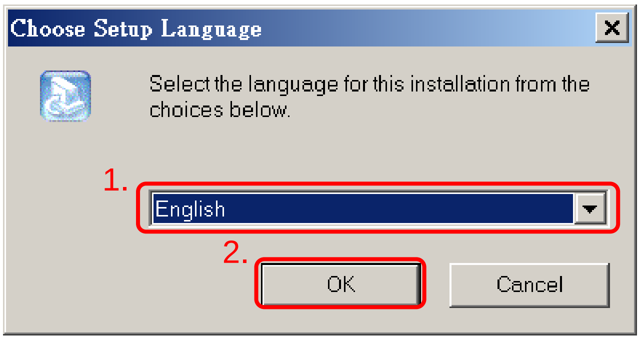
Before install MITSUBISHI CNC Network it is need install Customer API. If it is without this software therefore it is unable to operate. And the PC installed too much software also cannot normal operate.

※ This chapter only introduce WINDOWS 2000 and XP operation system for example.

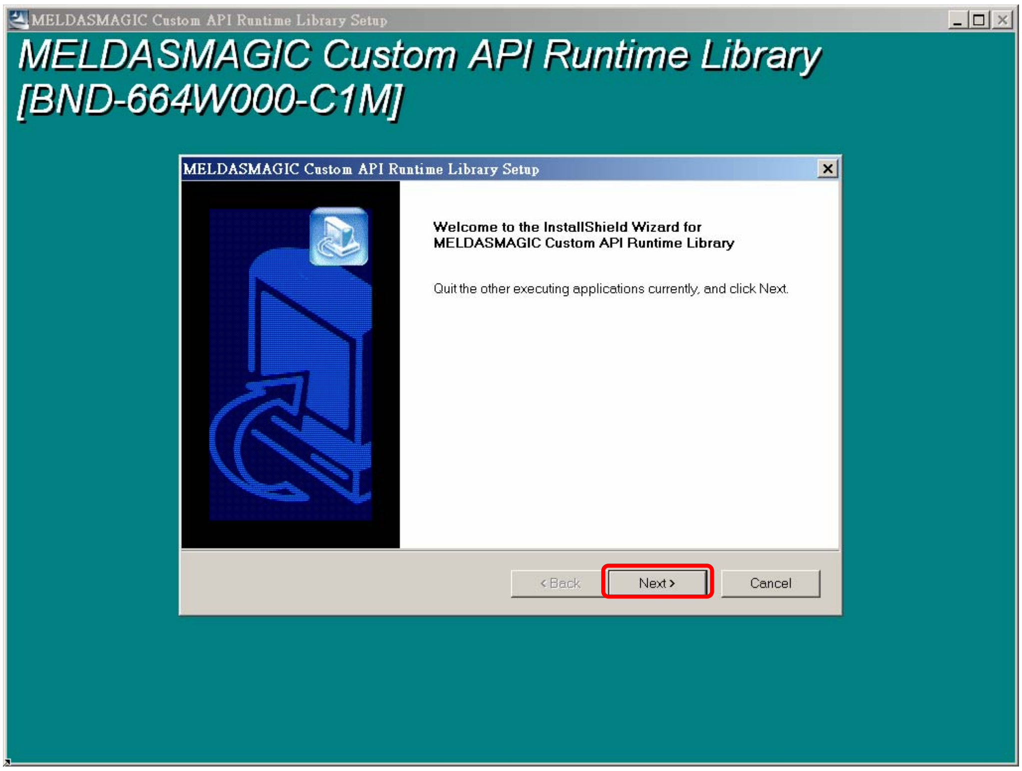
8.1.1 Install Customer API

Open “api_rt\Disk1” folder. Press “Setup.exe” to start Customer API installation.

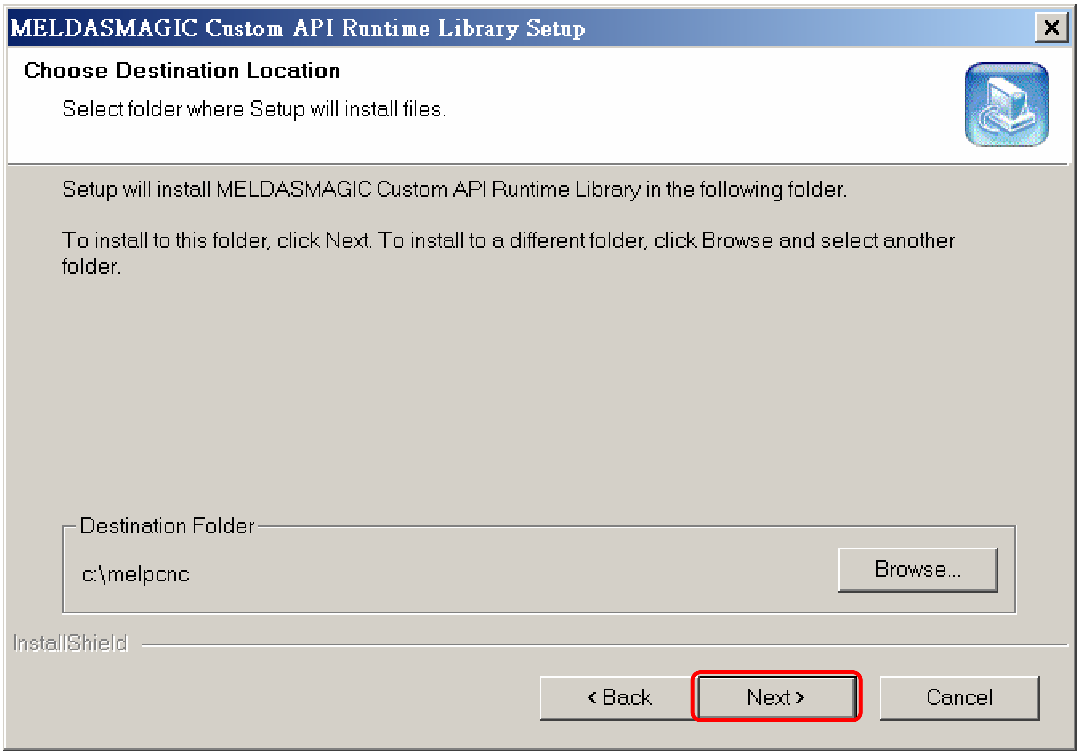
(1) To choose setup language（**select ENGLISH**） and press OK key.



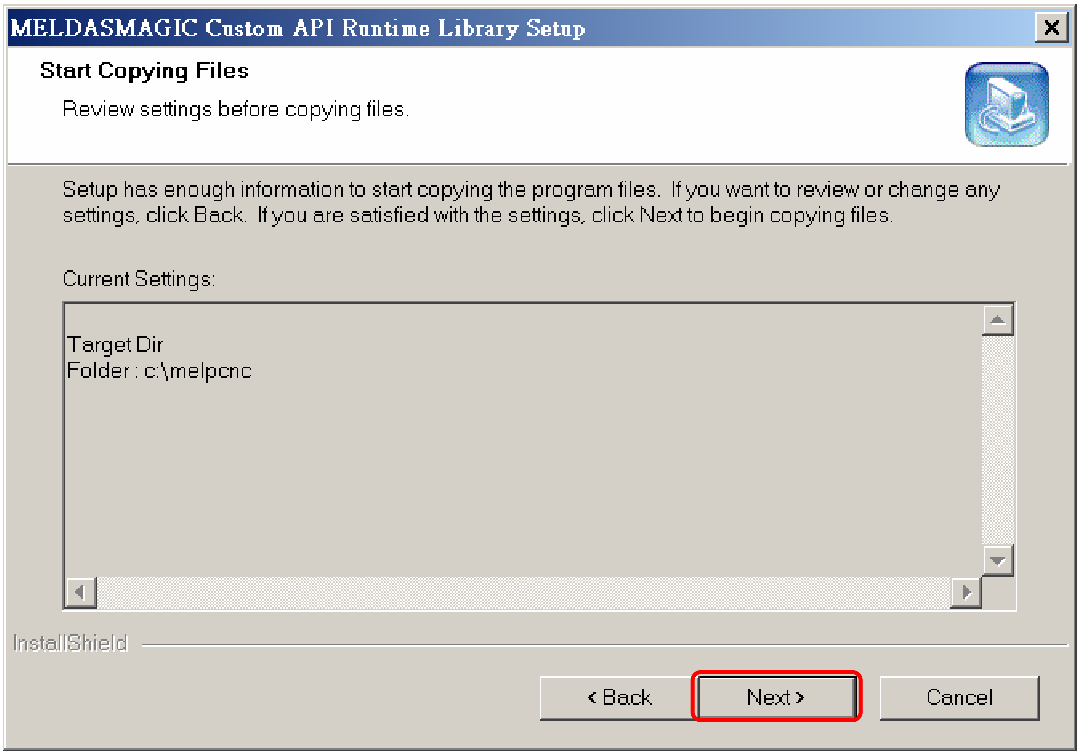
(2) Press Next > to next step.



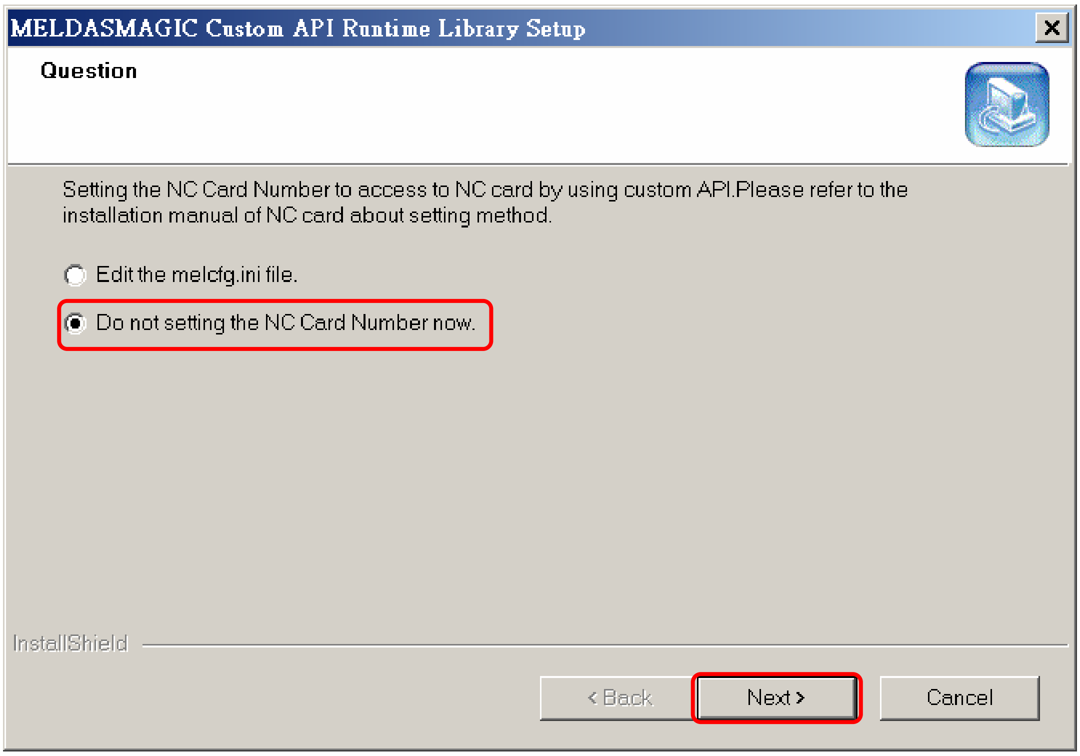
(3) Press Next > to next step. If you want to install to different folder, click Browe… and select another folder. ◦



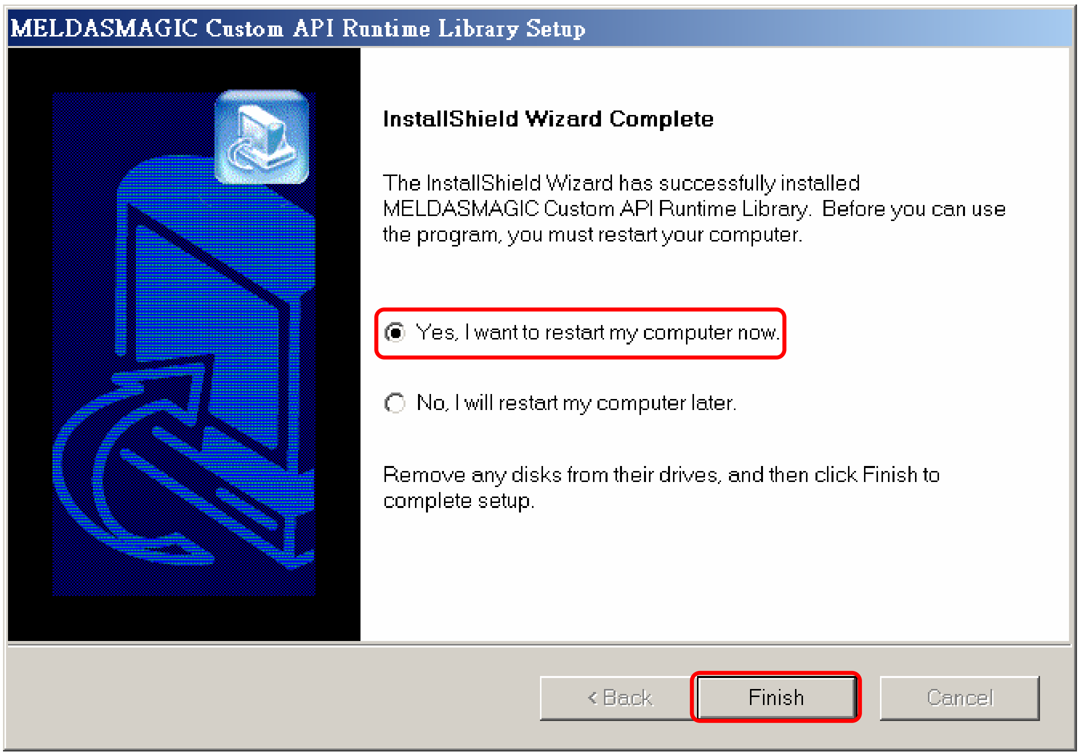
(4) Press Next > to next step.



(5) After installation select「⊙ Do not setting the NC Card Number now.」 and then press Next > .



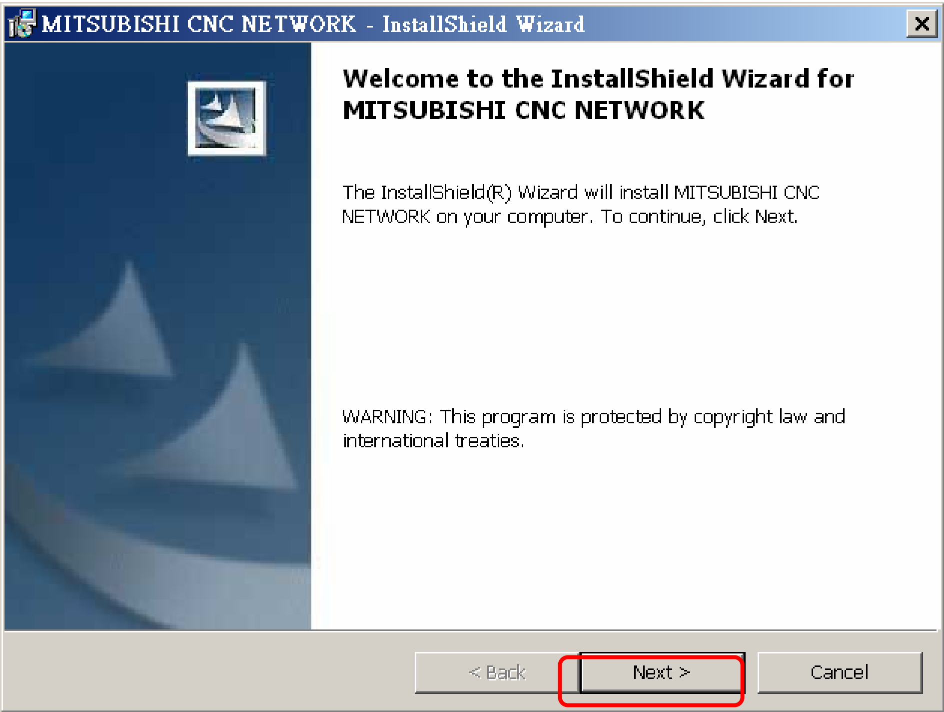
(6) Select 「☉ Yes , I want to restart my computer now.」 and press Finish key.



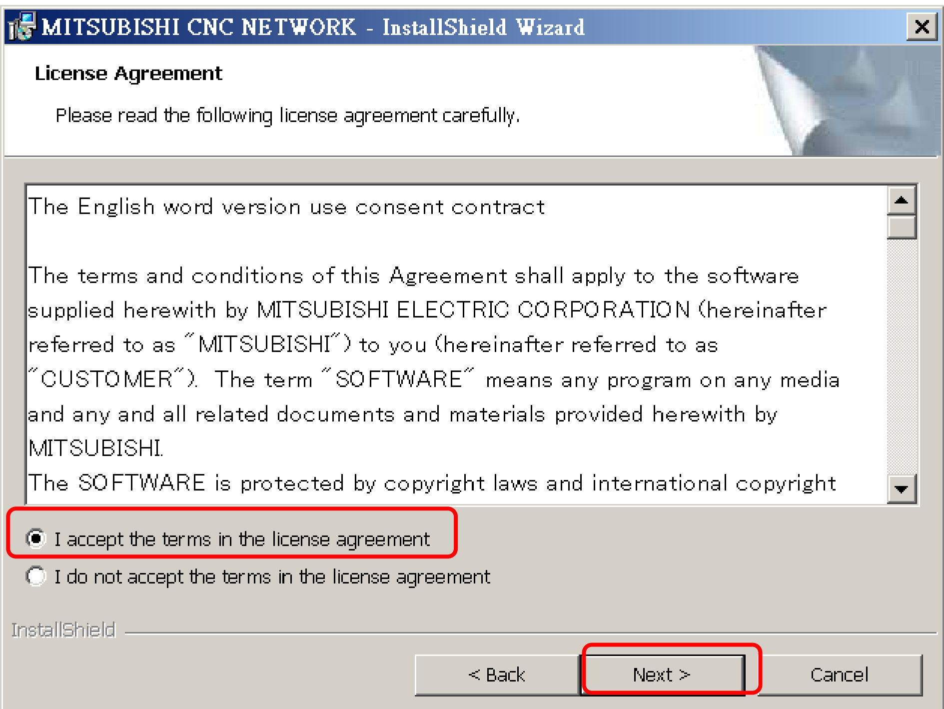
8.1.2 Install MITSUBISHI CNC Network

Open folder of MITSUBISHI CNC NETWORK\Setup and carry out “setup.exe”.

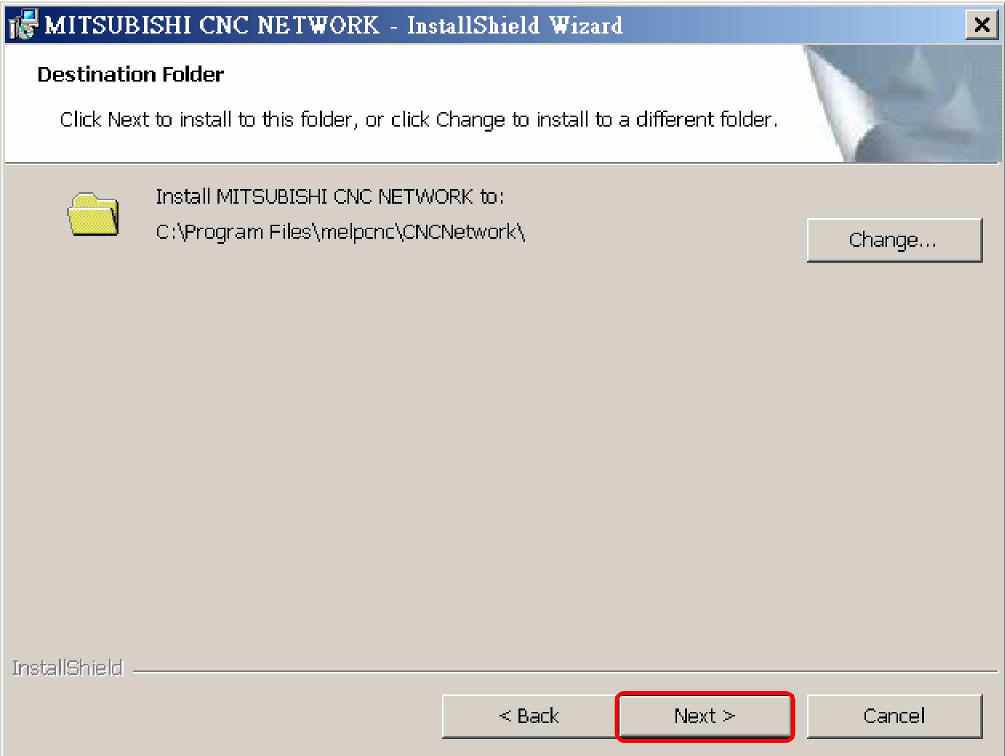
(1) Press Next > to start setup.



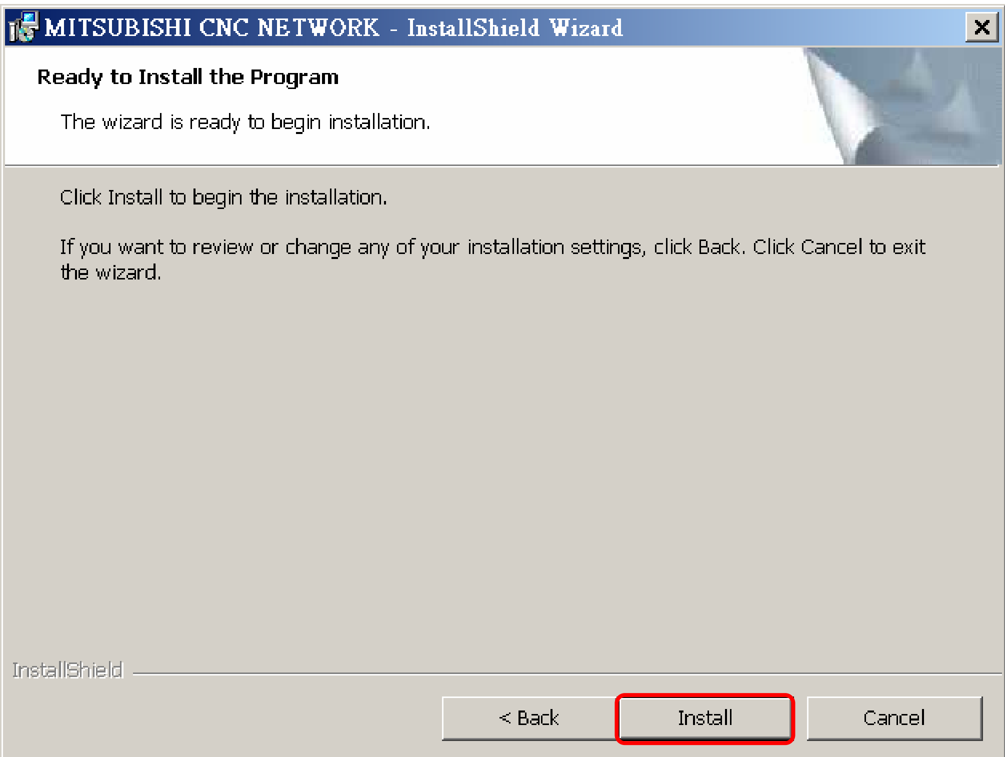
(2) Choose「⊙ I accept the terms in the license agreement」and press Next > .



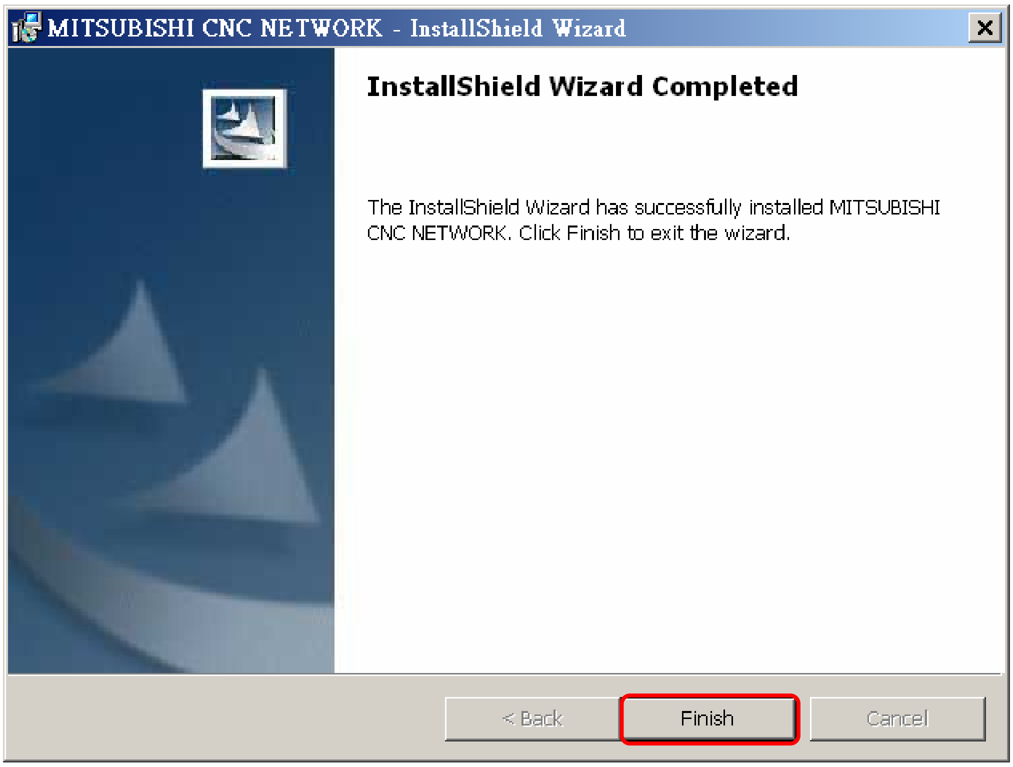
(3) Change installation folder to press [Change…] , otherwise directly press [Next >] to continue next step.



(4) Press [Install] to start install MITSUBISHI CNC Network.

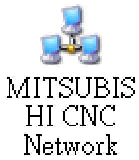


(5) Press Finish key to finished.

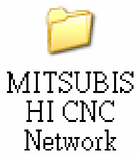


(6) Install successful the top desk will show a ICON of MITSUBISHI CNC Network. If the software installed unsuccessful it will show a folder.

Success →



FAULT →



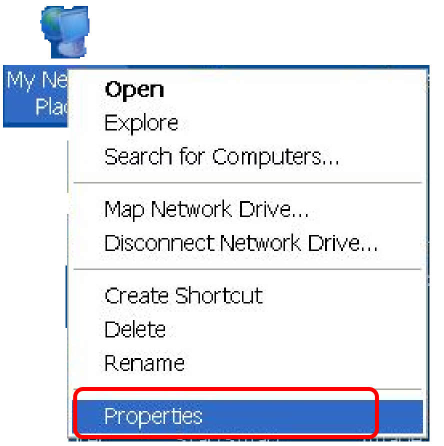
! **Caution**	①Please confirm whether to install Customer API when setup failed. ②When if it is unsuccessful to install please reinstallate the operating system or change the computer to test. ③This software will conflict to some extent because of other software. ④MITSUBISHI CNC Network and Customer API only support WINDOWS 2000 and WINDOWS XP or new version.

8.2 MITSUBISHI CNC Network setting

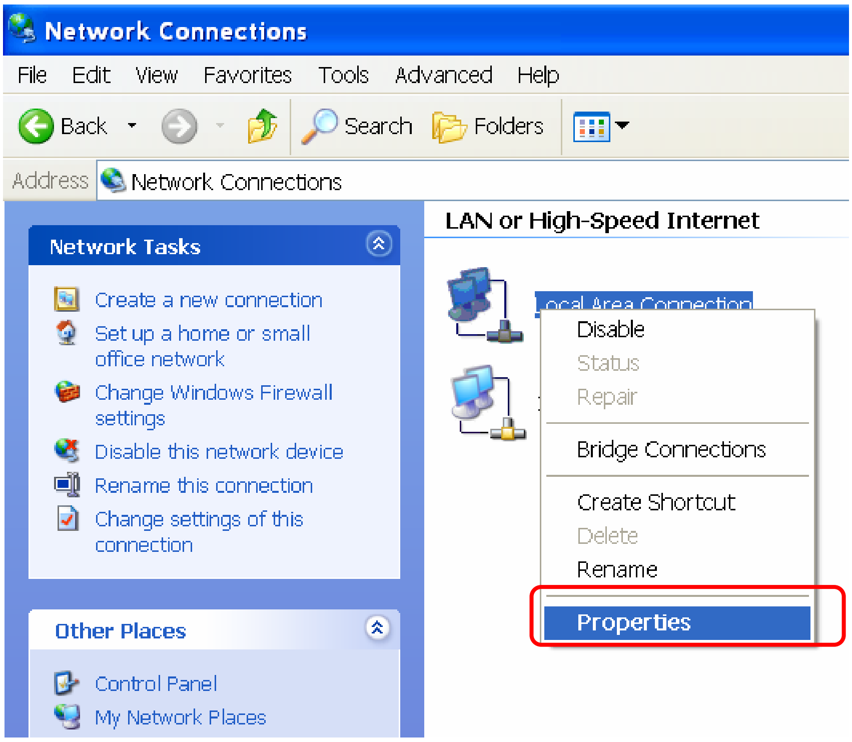
8.2.1 PC side setting

(1) **Set IP address from PC side**

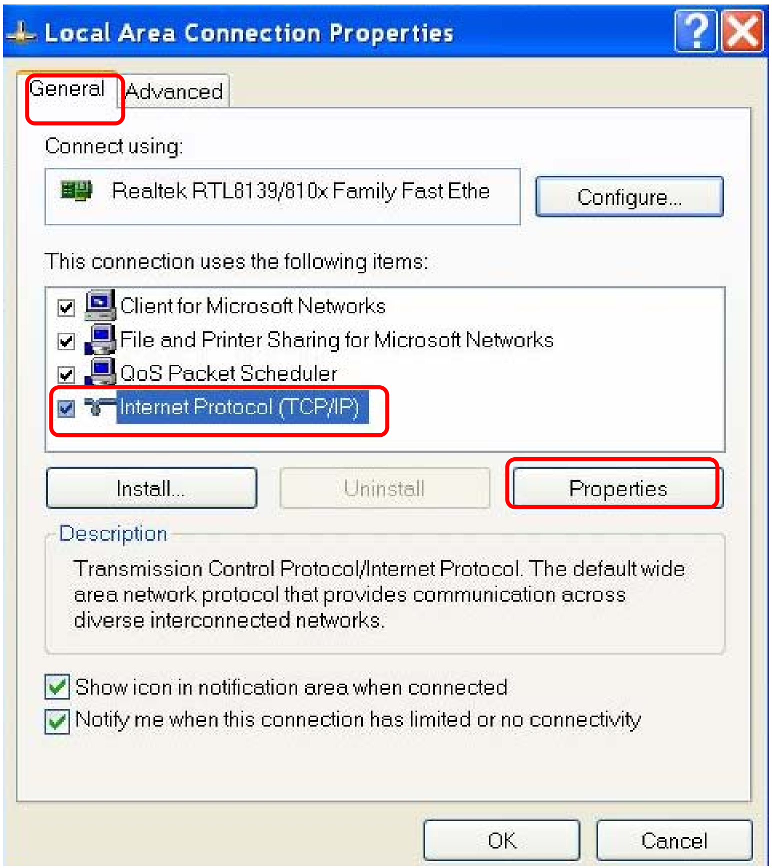
①Click NEWORK from Top desk and select Properties(R) 。



②Appear Ethernet window and select Local network right key Properties(R) .

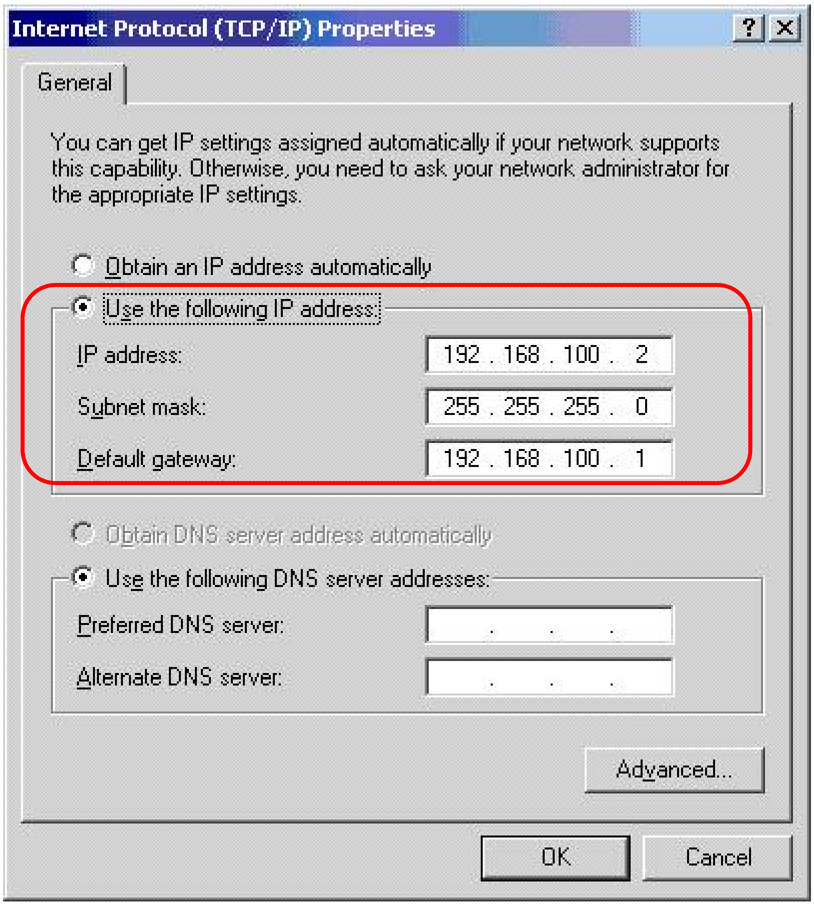


③Choose up side【General】column and press「□ Internet Protocol(TCP/IP)」then select Properties (R) 。



④Set IP address and Sub mask only the other don't need to set：

IP address ahead three number need same with NC side IP（#1926）.

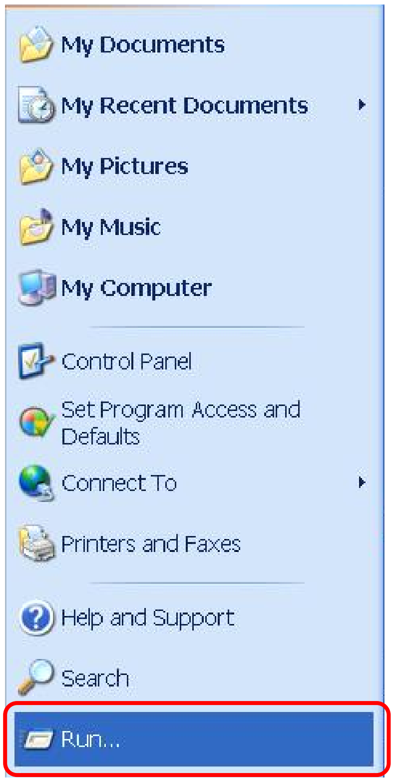


(2) Setting procedure for the controller with Hard disk

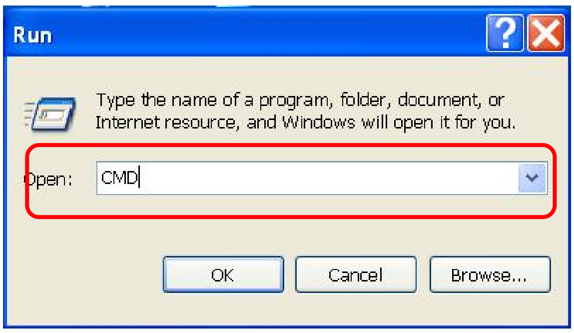
If controller is with hard disk (Windows XPe) the PC must execute "ROUTE" command that just can read controller internal HD data. Otherwise, it is unable to read data from HD. Below is an example.

①Press Start on the desk.

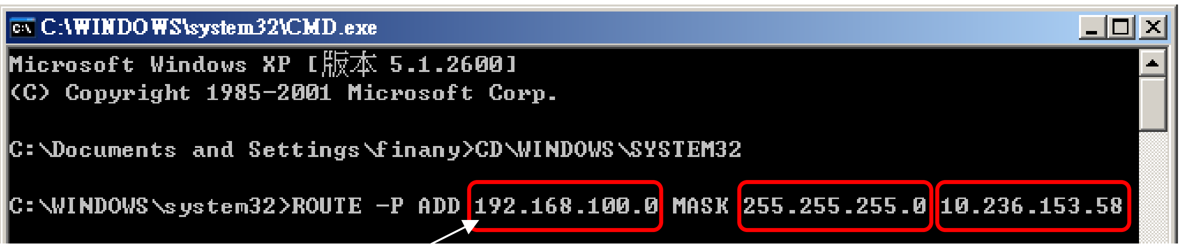
②Press Run (R)… 。



③Input "CMD" in the column and then press Ok



④Input ROUTE command in C:\windows\system32



Ahead three number same with #1934 and last set to 0

#1935 parameter

#1926 parameter

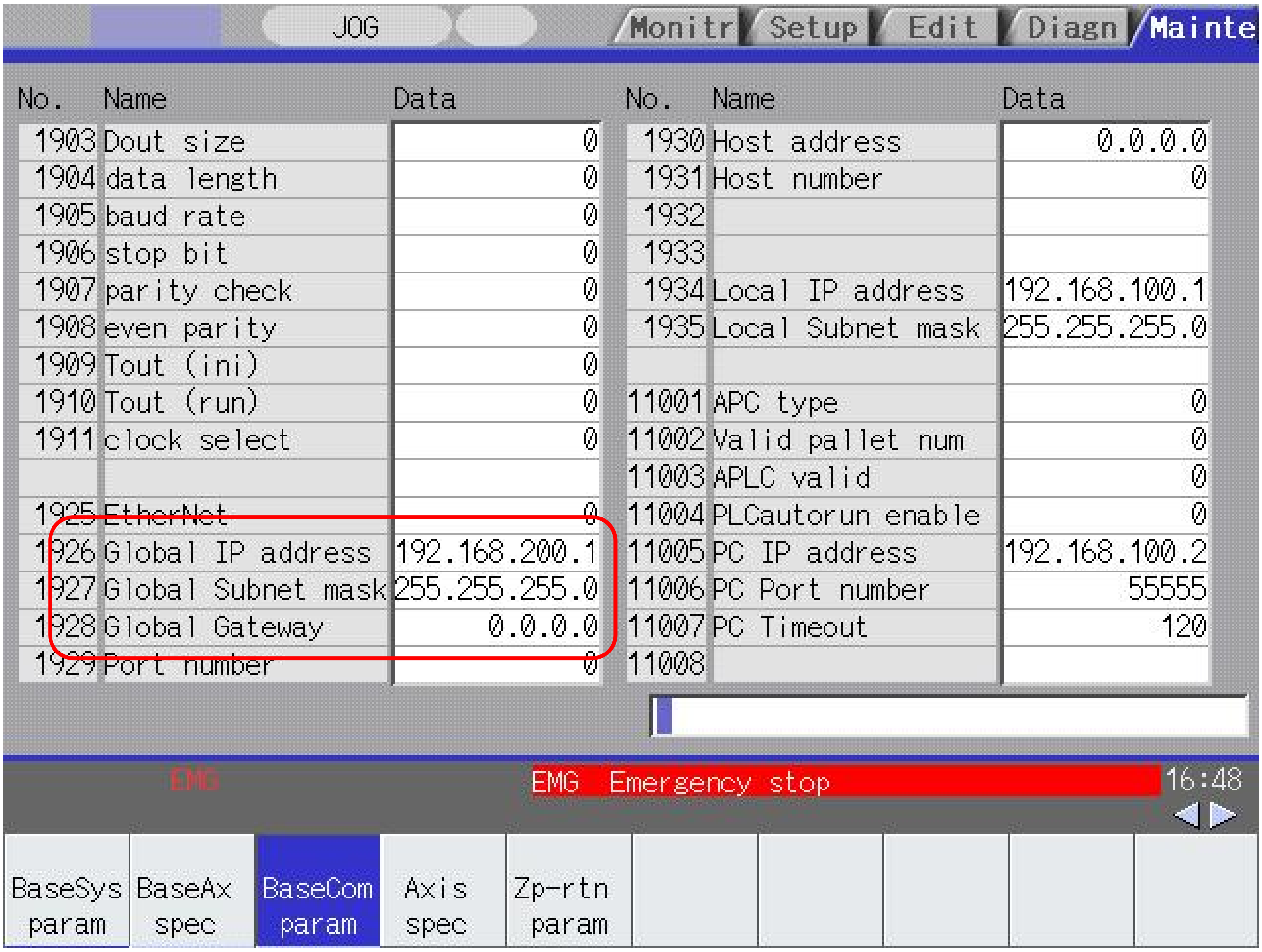
8.2.2 NC side setting

(1) Input parameter password「MPARA」.

(2) Change screen to「MAINTE」, press「PARA」this menu key.

(3) Press down right side menu key「▶」next page key to select「COMM PRM」key.

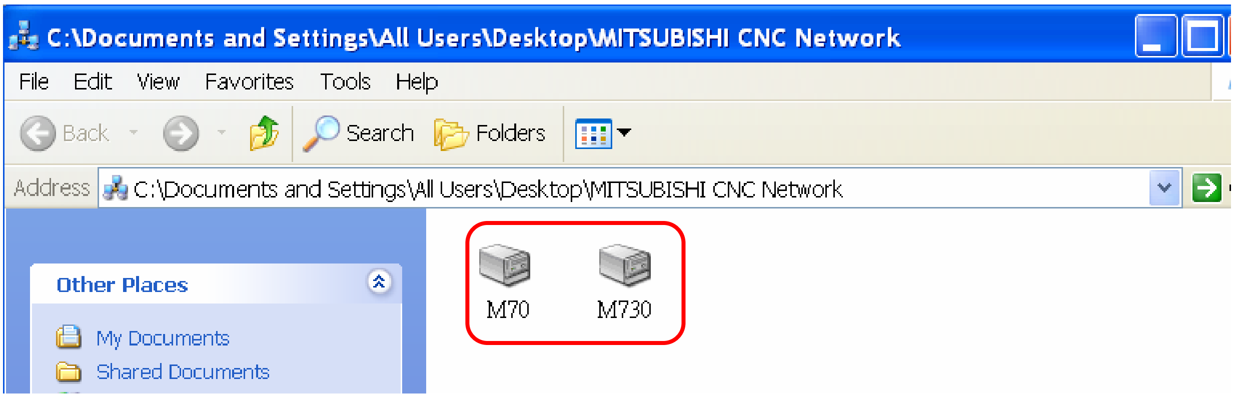
(4) Set #1926、#1927 and #1928 but #1926 front three number IP must same PC side IP address. And #1927 and #1928 must same with PC side setting.



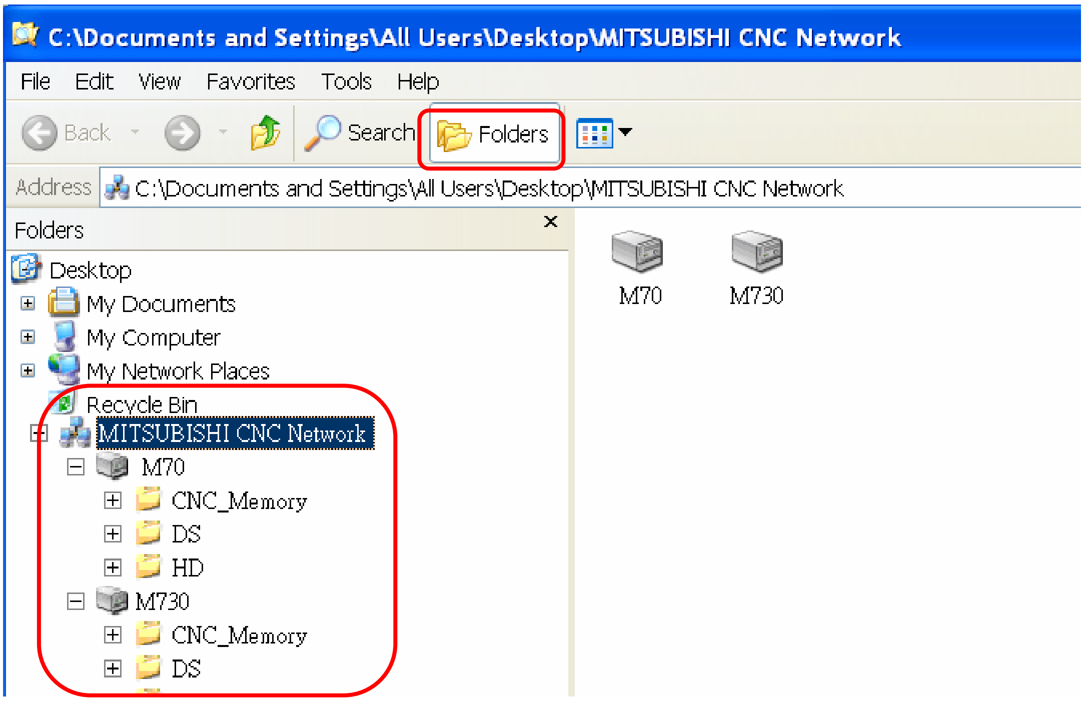
Start to connect.

8.3 MITSUBISHI CNC Network connect application

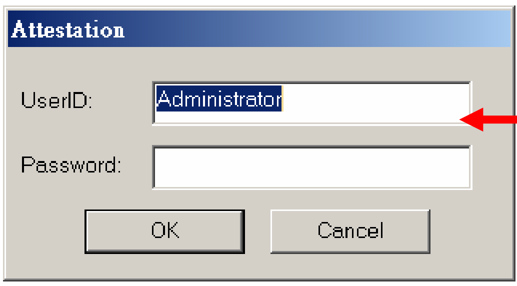
When finished setup the top desk will appear a ICON of MITSUBISHI CNC Network. Click it will show below dialogue window.



Press Folder to see internal data.



If you want see HD data it must input UserID and Password.



※ Attention for capital word or small.

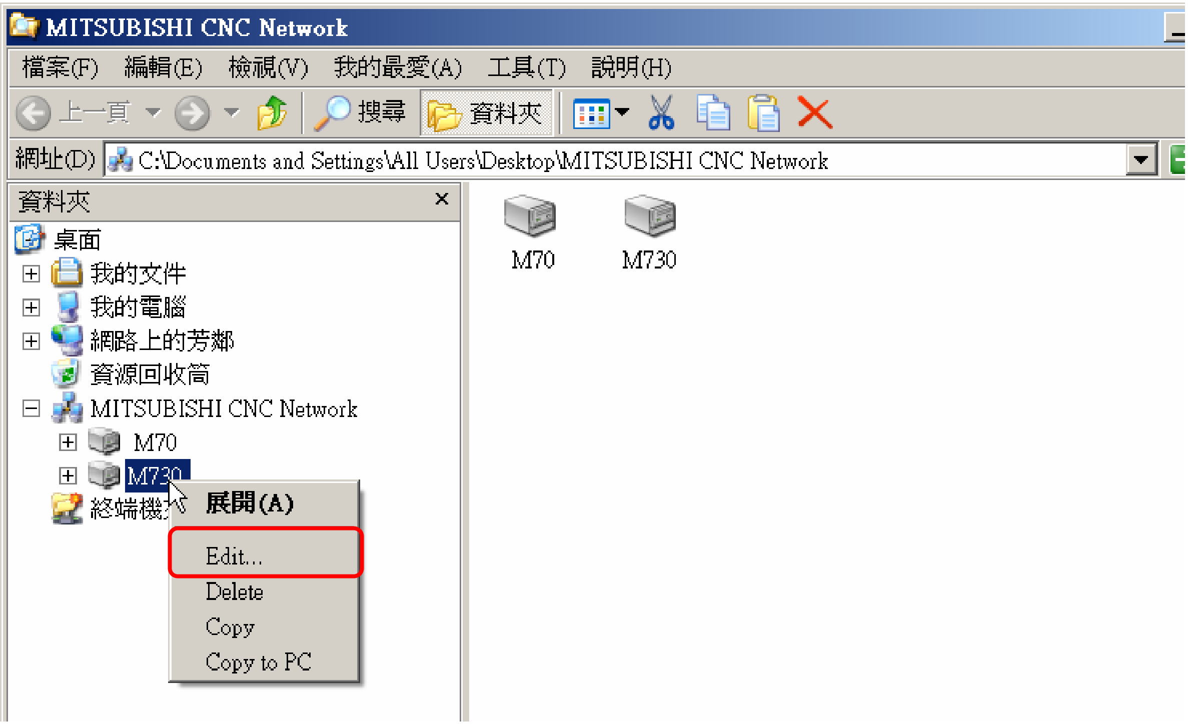
UserID：Administrator

Password：CNC

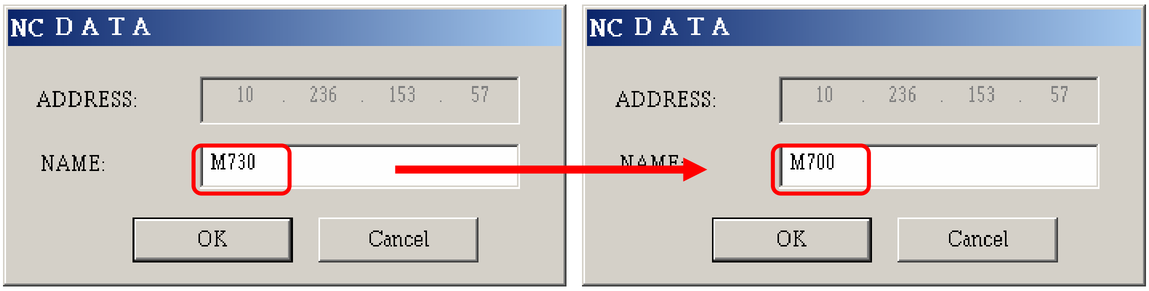
8.3.1 Rename controller

Because this software can connect many M700/M70 controllers, if controller name is the same it will cause the unnecessary trouble. So should revise the controller name. The procedures please refer below steps.

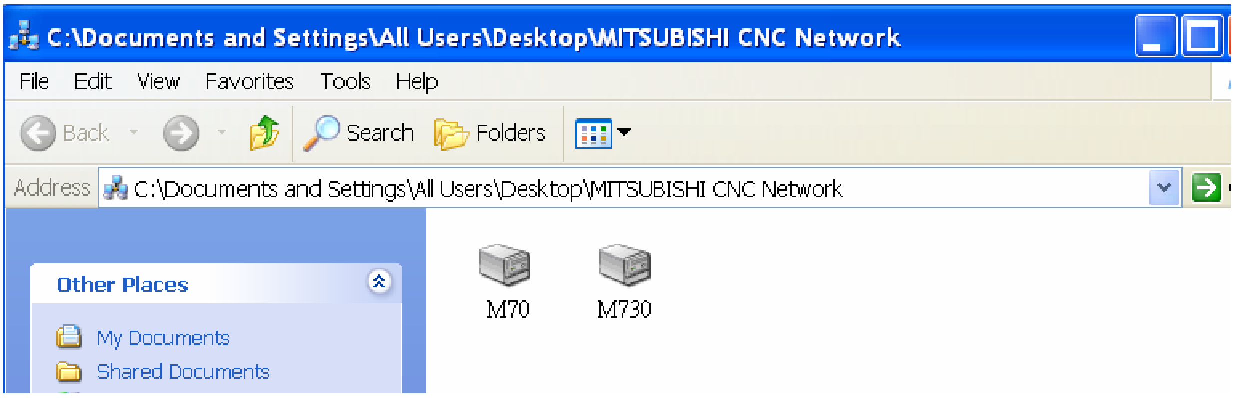
(1) Click mouse right button and select Edit…



(2)Input NC name（example：M700）and click OK .



(3) After rename you need close original MITSUBISHI CNC Network screen and open again to update list.

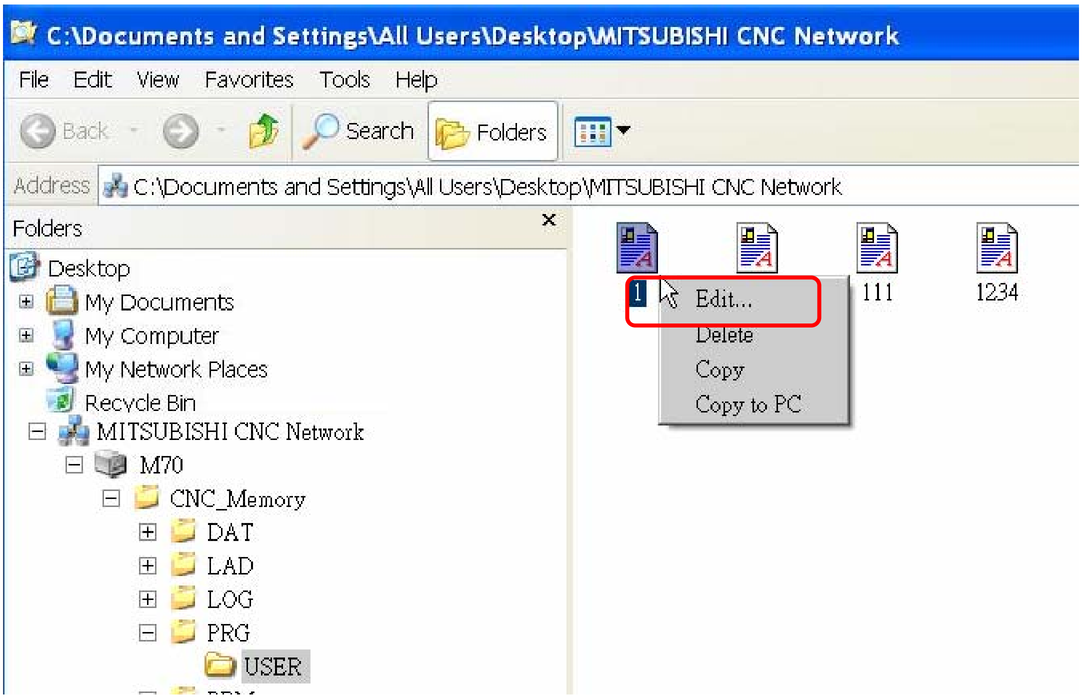


8.3.2 MITSUBISHI CNC Network application

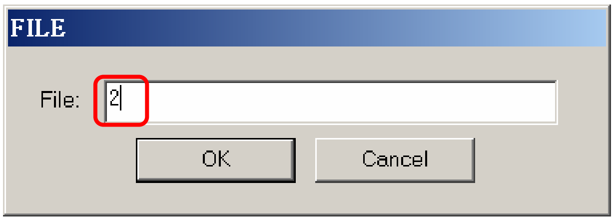
This software feature is you can transmission data, rename file, create a folder and delete file in PC side.

(1) File edit（Edit）

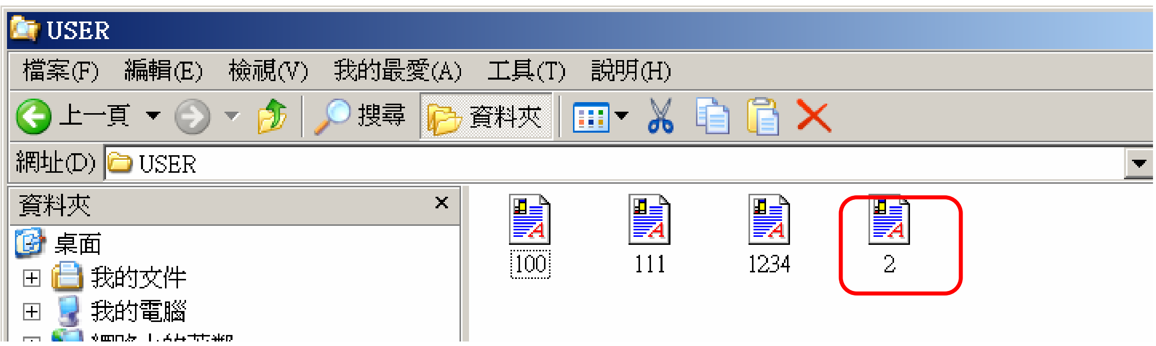
①Attempt to rename file 1 to 2 please use press right key on the mouse to select Edit….



②Appear FILE window, input “2” and press OK .

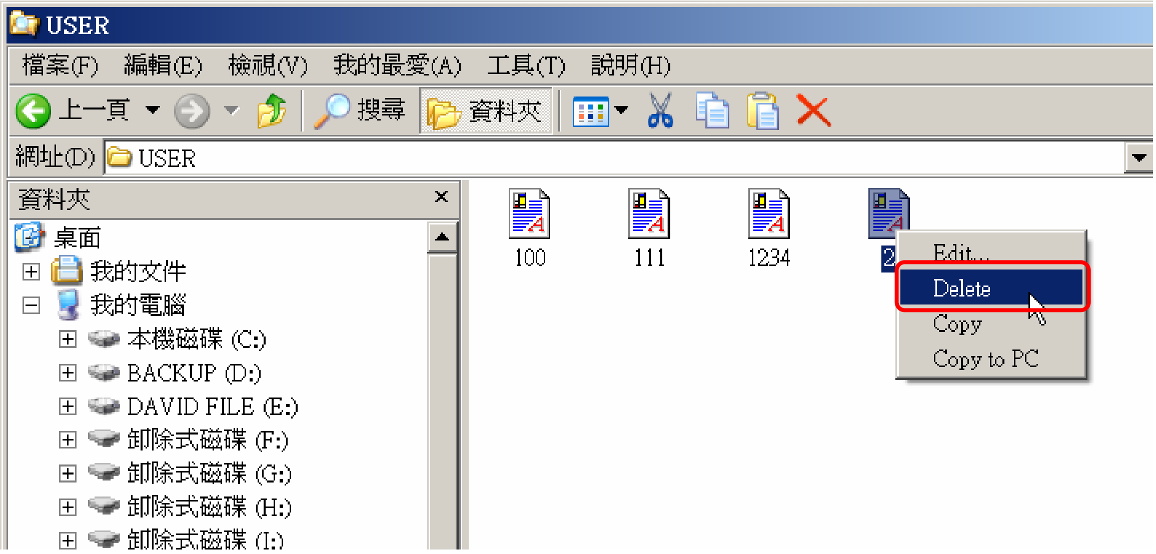


③Open the ICON again.

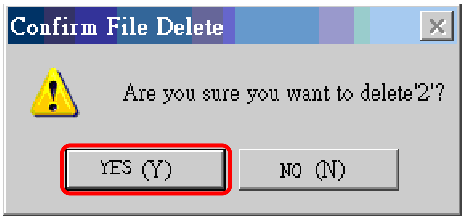


(2)File delete（Delete）

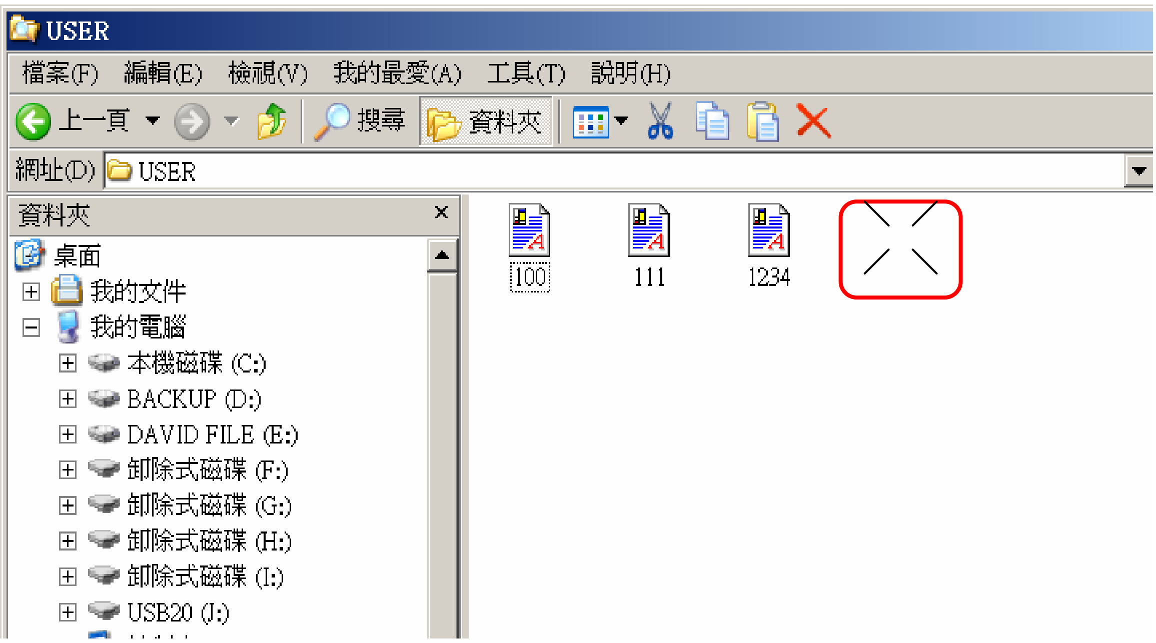
①Attempt to delete file 2 please use mouse right bottom to select Delete .



②Press YES (Y) .



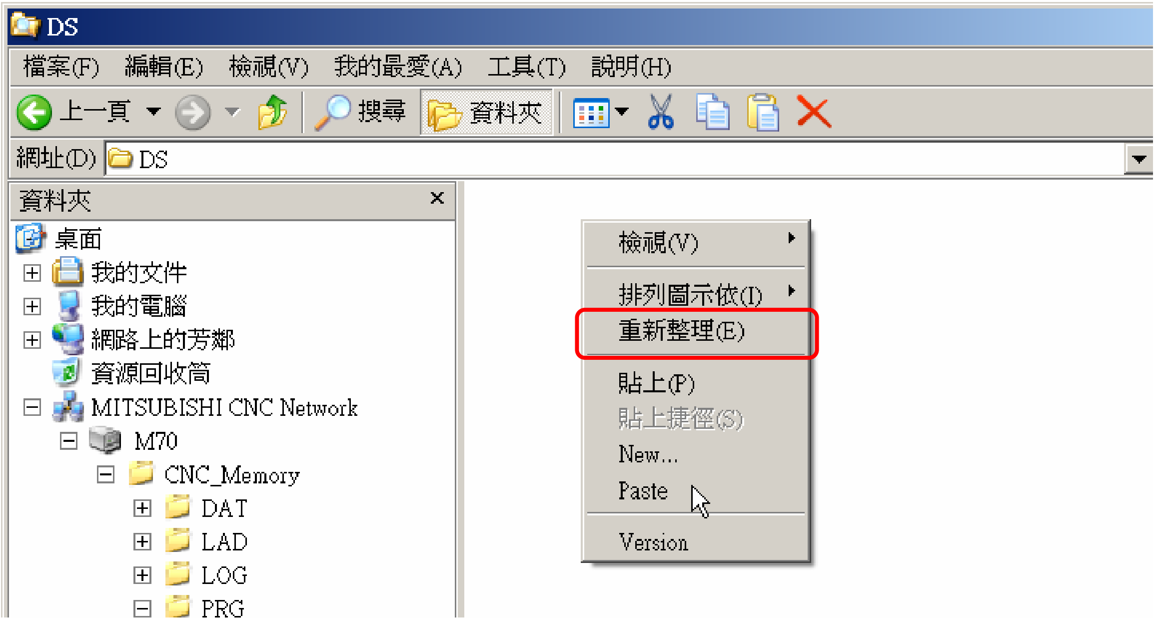
③Open the ICON again.



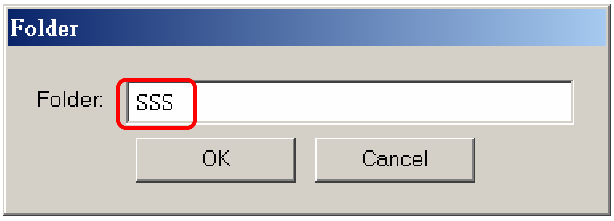
(3) Create a folder（New）

①Create a new folder it cannot in CNC_Memory. Otherwise, it will appear below error message.

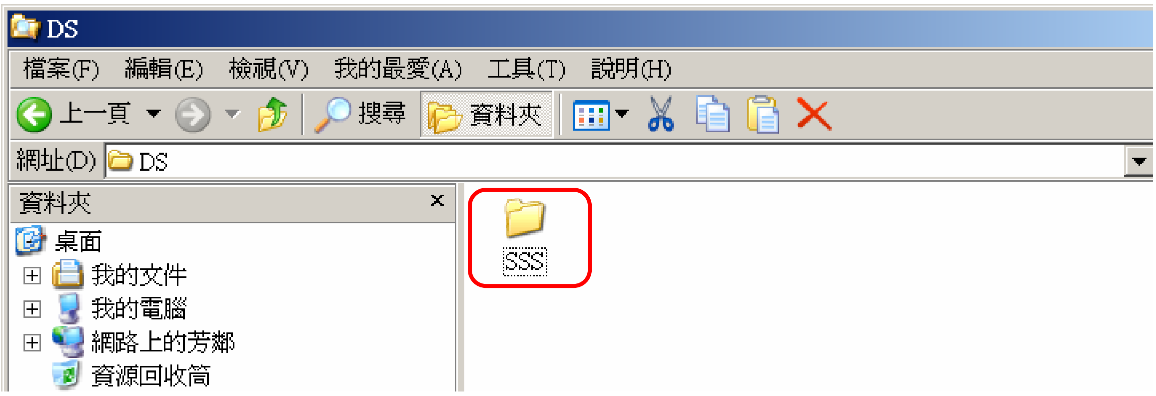
②For instant, create a SSS folder in DS device. Use mouse right bottom press [New…] .



Appear a Folder window, Input “SSS” and press [OK] .



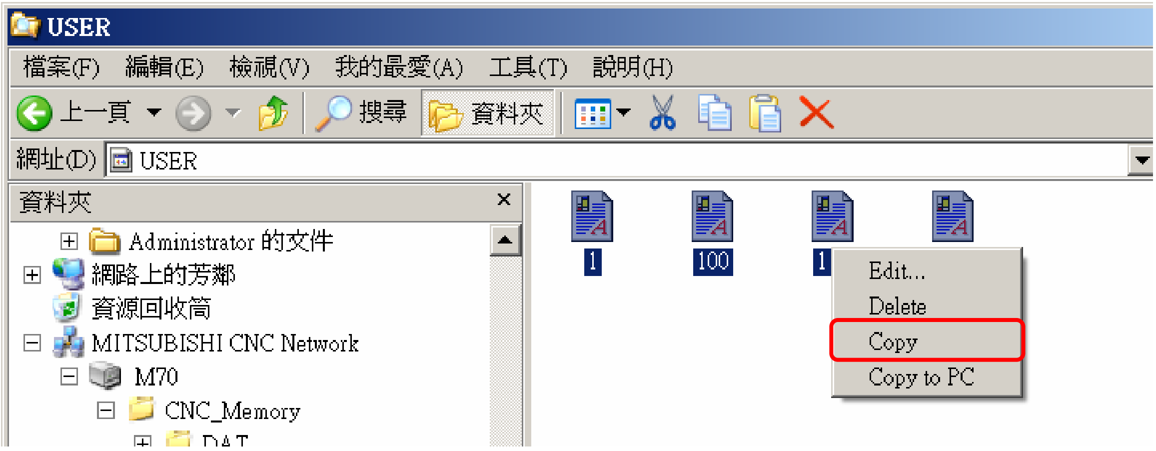
Open the ICON again.



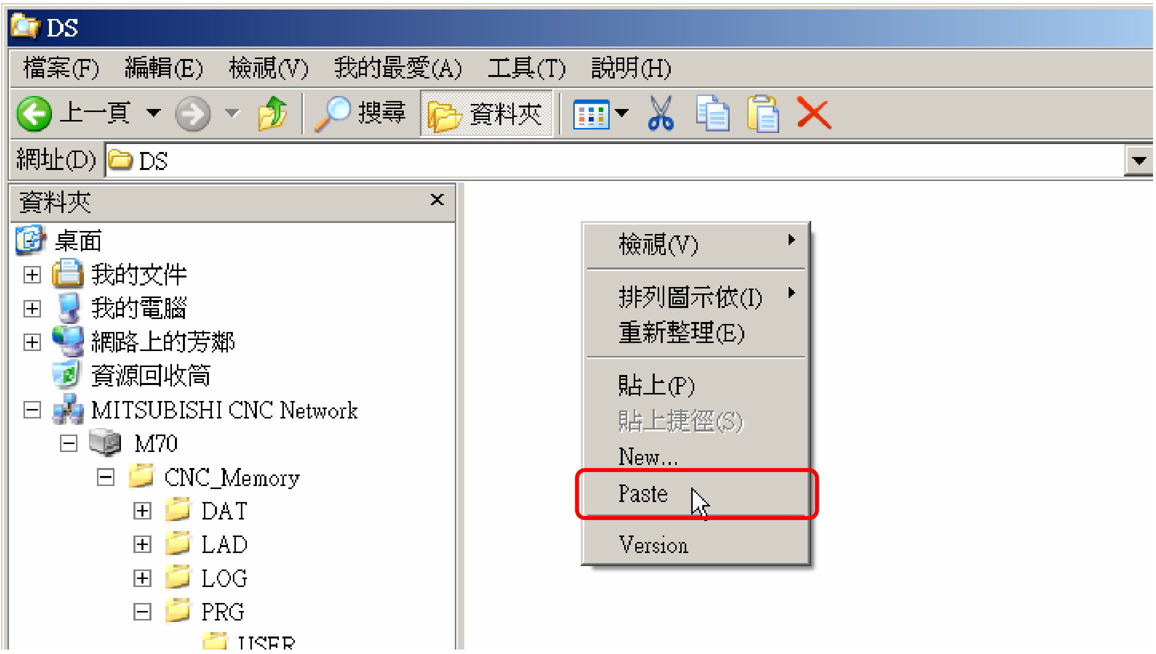
File copy（Copy）

You can copy files between memory、DS or HD.

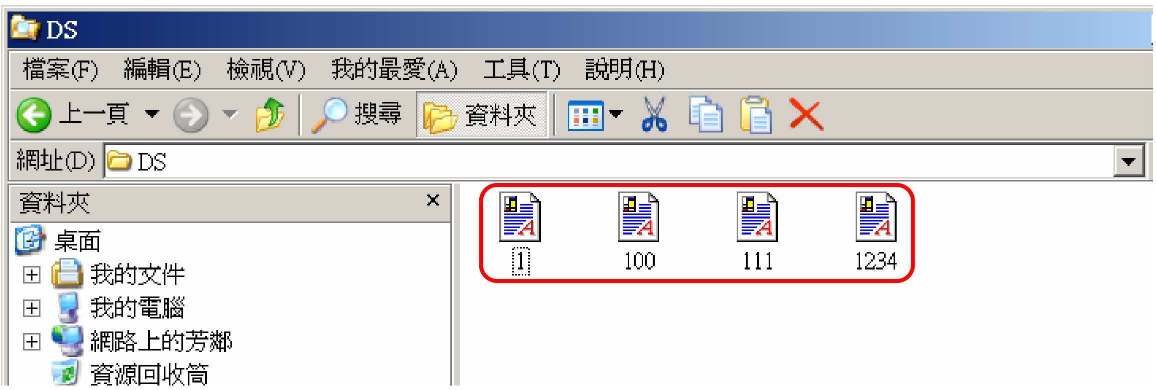
Below example is CNC_Memory\USER copy various data to DS.



In “DS” icon use mouse click Paste . 。（Select “Paste” not “Paste (P)”）



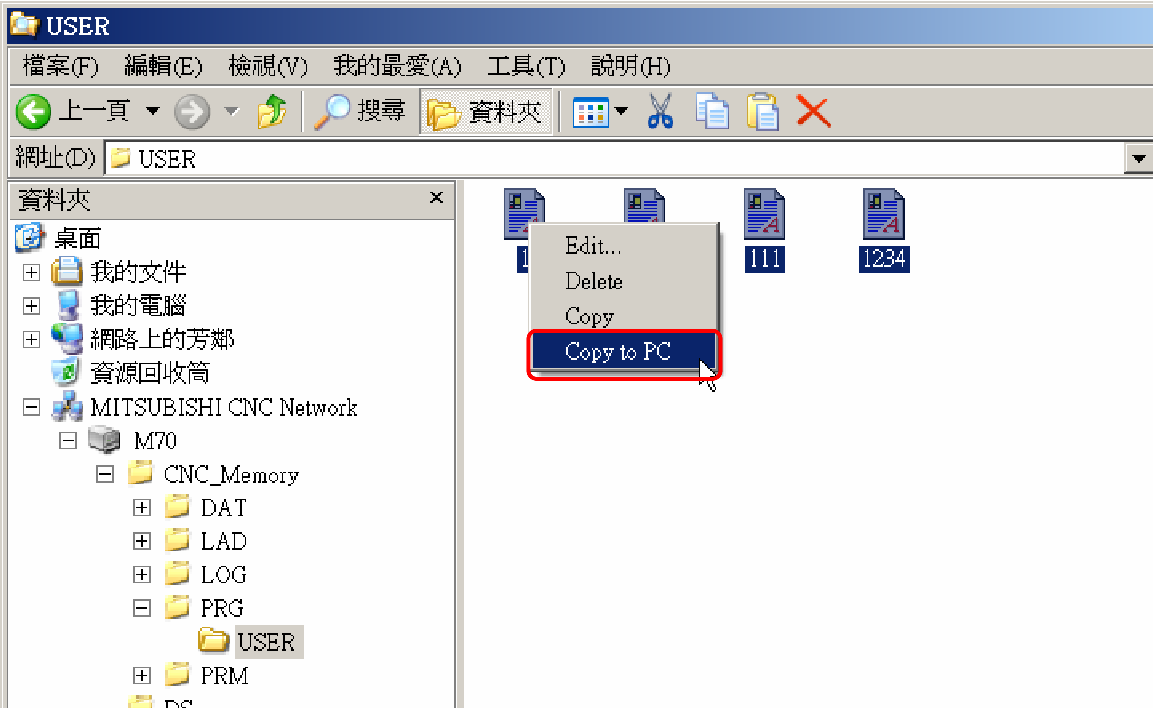
Restart window.



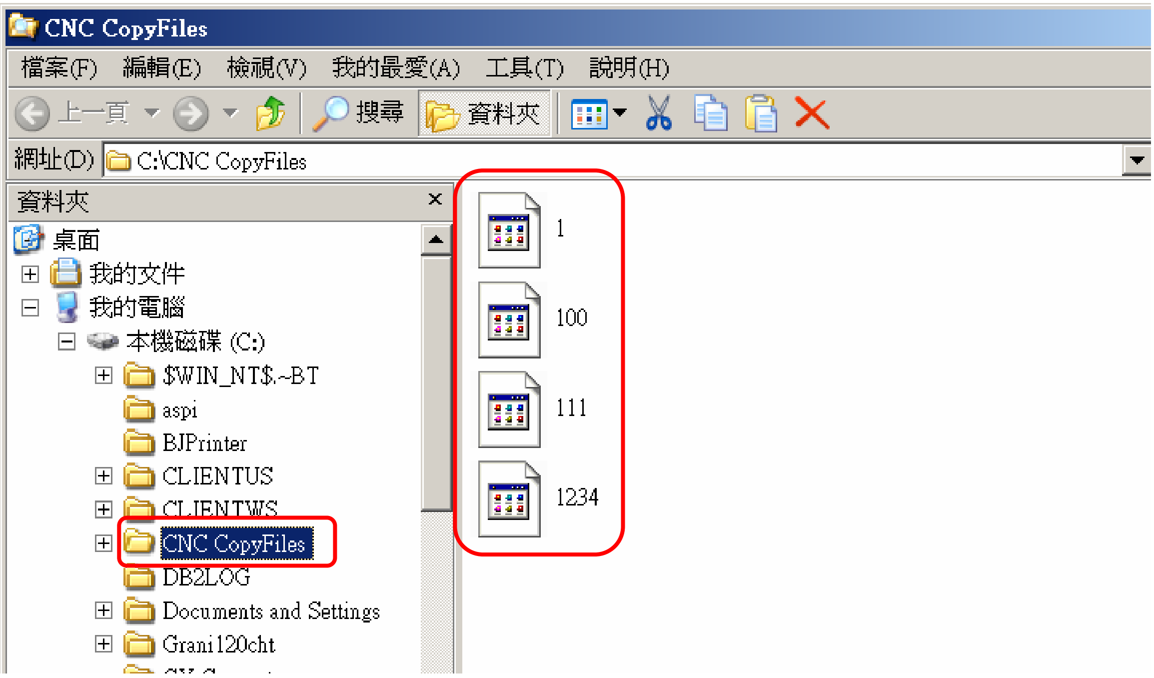
File copy to PC（Copy to PC）

Copy multiple files to PC from CNC_Memory\USER. Choose data and copy to PC.

Select files and use mouse right button click Copy to PC 。



The file will copy to "CNC CopyFiles" folder. If C dick is without this folder it will automatically create.



Caution	When NC data copy to PC it only can use command of "Copy to PC". And the file is in "CNC CopyFiles" folder. The PC data transmit to NC it is used "Paste" of English not paste command.

9. NC system configuration

9.1 Outline

The configuration of system data is assigned used input/output screen which the hardware and software and version information are outputted. This procedure is useful data storage for initial installation of machine. Further advantage is to establish complete guaranty system for data base of machine when warranty is applied also attachment these datum.
These data are base on document file and open with word editor software.
This function is standard.

9.2 Configuration

The system data is outputted for information of software and hardware.
The output data configure as show below. Also data contents are same as diagnosis screen and servo diagnosis display.

9.2.1 Data configuration

```
[COMMON]
FILE=ASSEMBLY
DATE=04.11.01 } Output date and time for system installation
TIME=15:30:00
NC_TYPE=MITSUBISHI CNC 730M  <------- NC Type
（1） NC Unit Configuration              (「H/W」display)
（2） H/W Configuration                  (「H/W」display)
（3） Servo driver information           (「Servo Unit」display)
（4） Spindle driver information         (「Spindle Unit」display)
（5） Power supply Unit information      (「Power Unit」display)
（6） Auxiliary axis information (「Auxiliary axis Unit」display)
（7） S/W Configuration                  (「S/W」display)
（8） Ladder Configuration               (「Ladder」display)

[F_END]
```

9.2.2 Contents

(1) NC Unit Configuration

Data Type	Example
NC Unit configuration	TYPE=NC_UNIT
NC Type	NC_NAME=FCA750MN
Unit Model Name	UNIT_NAME=FCA7-MU001
Unit series number	NC_SN=M1234567890

(2) H/W Configuration （H/W information of NC）

Data Type		Example
H/W configuration		TYPE=HARDWARE
Repeatedly data label(1)		[DATA1]
	Model Name	HW_NAME=HN145
	H/W Version	REVISION=A
Repeatedly data label(2)		[DATA2]

:

Repeatedly data label(n)	[DATAn]

PCB or Unit data output

n：Quantity for PCB or Unit

(3) Servo driver information （NC system identify possibly for servo information）

Data Type		Example
Servo driver information		TYPE=SV_AMP
Repeatedly data label(1)		[DATA1]
	NC servo axis number	AX_NO=1
	NC servo axis name	AXIS=X
	Unit model name	AMP=DV2-8080
	Unit series number	AMP_SN=4705049
	System number＋Version	AMP_VER=1501W001-A0
	Encoder for motor side	MOT_ENC=OSA105
	Series number for encoder of motor side	MENC_SN=4705050
	Encoder for mechanical side	AX_ENC=*
	Series number for encoder of mechanical side	AENC_SN=538000A
	Motor model name	MOT_NAME=HF-154
Repeatedly data label(2)		[DATA2]
:		
Repeatedly data label(n)		[DATAn]

Separately data output for each servo axis connection

(4) Spindle driver information （NC system identify possibly for spindle information）

Date Type		Example
Spindle driver information		TYPE=SP_AMP
Repeatedly data label(1)		[DATA1]
	Spindle number	AX_NO=1
	Spindle name	AXIS=SP1
	Unit model name	AMP=DS1-80
	Unit series number	AMP_SN=SP123456
	System number＋Version	AMP_VER=1501W002-A0
Repeatedly data label(2)		[DATA2]
:		
Repeatedly data label(n)		[DATAn]

Separately data output for spindle connection

n： The spindle quantify connection

(5) Power supply unit information（NC system identify possibly for power unit information）

Data Type	Example
Power supply unit information	TYPE=CV_AMP
Repeatedly data label(1)	[DATA1]
Connection axis number	AX_NO=1
Connection axis name	AXIS=SP1
Unit model name	AMP=C1CV-260
Unit series number	AMP_SN=00000000
System number＋Version	AMP_VER=538000A
Repeatedly data label(2)	[DATA2]
:	
Repeatedly data label(n)	[DATAn]

Separately data output for power unit connection

n： The power unit quantifys connection

(6) Auxiliary axis information

Data Type	Example
Auxiliary axis information	TYPE=AUX_AMP
Repeatedly data label(1)	[DATA1]
Auxiliary axis number	AX_NO=1
Auxiliary axis name	AXIS=AUX1
Unit model name	AMP=J2-10CT
Unit series number	AMP_SN=0328588
System number＋Version	AMP_VER=BND-517W000-C5
Motor model name	MOT_NAME=HC-MF053
Repeatedly data label(2)	[DATA2]
:	
Repeatedly data label(n)	[DATAn]

Separately data output for auxiliary axis connection

(7) S/W configuration （The reality S/W version on NC installation）

Data Type	Example
S/W configuration	TYPE=SW_VERSION
Repeatedly data label(1)	[DATA1]
S/W name	SW=NCMAIN
System number＋Version	VER=BND-1003W000-B0
Repeatedly data label(2)	[DATA2]
:	
Repeatedly data label(n)	[DATAn]

Separately data output for NC MAIN、PLC、HMI、NC OS

n： The S/W quantify connection (NC MAIN、PLC、HMI、OS)

(8) Ladder configuration （The reality ladder version on NC installation）

Data Type	Example
Ladder configuration	TYPE=LADDER
Repeatedly data label(1)	[DATA1]
Name	NAME=MAIN.DAT
Label	TITLE=LAD-B0
Repeatedly data label(2)	[DATA2]
:	
Repeatedly data label(n)	[DATAn]

Separately data output for ladder files

n： The register quantify for ladder files

9.2.3 Example file

Outline

File content	Description
[COMMON]	The record label for file title
FILE=ASSEMBLY	The file label information（File Type）
DATE=04.11.01	Date information for output
TIME=15:30:00	Time information for output
NC_TYPE=MITSUBISHI CNC 750M	NC type information (M or L)
[FILE]	The record label for data title
TYPE=NC_UNIT	Data type（NC unit configuration）
NC_NAME=FCA750MN UNIT_NAME=FCA7-MA001 NC_SN=M1234567890	The item name and data record
[END]	End of record label
[FILE]	
TYPE=HARDWARE	Data type（H/W configuration）
[DATA1]	Repeatedly data label (First)
HW_NAME=HN145 REVISION=A	The item name and data record
[DATA2] :	Repeatedly data label (Second)
[DATAn]	Repeatedly data label (**n**)
HW_NAME=HN081 REVISION=A	The item name and data record
[END]	
:	
[FILE] : [END]	
[F_END]	End of file identify label

This data output information is demo for three servo axes and one spindle as below:

```
[COMMON]
FILE=ASSEMBLY
DATE=06.05.26
TIME=17:33:38
NC_TYPE=MITSUBISHI CNC 720M
[FILE]
TYPE=NC_UNIT
NC_NAME=FCA720-NP
UNIT_NAME=FCU7-MU002
NC_SN=M7123456789
[END]
[FILE]
TYPE=HARDWARE
[DATA1]
HW_NAME=HN081
REVISION=B
[DATA2]
HW_NAME=HN116
REVISION=A
[DATA3]
HW_NAME=HN482
REVISION=B
[DATA4]
HW_NAME=RX312
REVISION=
[DATA5]
HW_NAME=RX322-1
REVISION=
[DATA6]
HW_NAME=
REVISION=
[DATA7]
HW_NAME=
REVISION=
[DATA8]
HW_NAME=
REVISION=
[DATA9]
HW_NAME=
REVISION=
[DATA10]
HW_NAME=
REVISION=
[DATA11]
HW_NAME=
REVISION=
[DATA12]
HW_NAME=HN392
REVISION=
[DATA13]
HW_NAME=HN397
REVISION=
[DATA14]
HW_NAME=
REVISION=
[DATA15]
HW_NAME=
REVISION=
[DATA16]
HW_NAME=
REVISION=
[DATA17]
HW_NAME=
REVISION=
[END]
[FILE]
TYPE=SV_AMP
[DATA1]
AX_NO=1
AXIS=X
AMP=DV2-8080
AMP_SN=5208216
AMP_VER=1501W001-A5
MOT_ENC=OSA105
MENC_SN=
AX_ENC=*
AENC_SN=
MOT_NAME=HF-204
[DATA2]
AX_NO=2
AXIS=Y
AMP=DV2-8080
AMP_SN=5208216
AMP_VER=1501W001-A5
MOT_ENC=OSA105
MENC_SN=
AX_ENC=*
AENC_SN=
MOT_NAME=HF-204
[DATA3]
AX_NO=3
AXIS=Z
AMP=DV1-160
AMP_SN=5222302
AMP_VER=1501W001-A5
MOT_ENC=OSA105
MENC_SN=
AX_ENC=*
AENC_SN=
MOT_NAME=HF-453
[END]
[FILE]
TYPE=SP_AMP
[DATA1]
AX_NO=1
AXIS=SP1
AMP=DS1-160
AMP_SN=SAMPLE
AMP_VER=1501W002-A5A
[END]
[FILE]
TYPE=CV_AMP
[DATA1]
AX_NO=1
AXIS=SP1
AMP=D-CV-370 E
AMP_SN=00000000
AMP_VER=588000A0
[END]
[FILE]
TYPE=AUX_AMP
[END]
[FILE]
TYPE=SW_VERSION
[DATA1]
SW=NCMAIN
VER=BND-1003W003-C1
[DATA2]
SW=PLC
VER=
[DATA3]
SW=NC OS
VER=BND-1000W014-C0
[DATA4]
SW=APLC
VER=
[DATA5]
SW=USER1
VER=
[DATA6]
SW=LANG1
VER=BND-1003W210-C1
[DATA7]
SW=LANG2
VER=BND-1003W211-C1
[DATA8]
SW=LANG3
VER=BND-1003W217-C1
[DATA9]
SW=LANG4
VER=BND-1003W216-C1
[DATA10]
SW=LANG5
VER=BND-1003W214-C1
[DATA11]
SW=LANG6
VER=BND-1003W212-C1
[DATA12]
SW=LANG7
VER=BND-1003W215-C1
[DATA13]
SW=LANG8
VER=BND-1003W213-C1
[DATA14]
SW=HMI
VER=BND-1003W200-C1
[END]
[FILE]
TYPE=LADDER
[DATA1]
NAME=MAIN
TITLE=
[END]
[F_END]
```

9.2.4 Notice

(1) If there are not any axis source ,it will be display data type only without [DATAn] line.

Example) The auxiliary is none connect.

```
[FILE]
TYPE=AUX_AMP
[END]
```

(2) The item of data source invalid and data is empty.

Example) the servo drivers do not connect. The servo drivers information have axis number and name ,but driver data is empty.

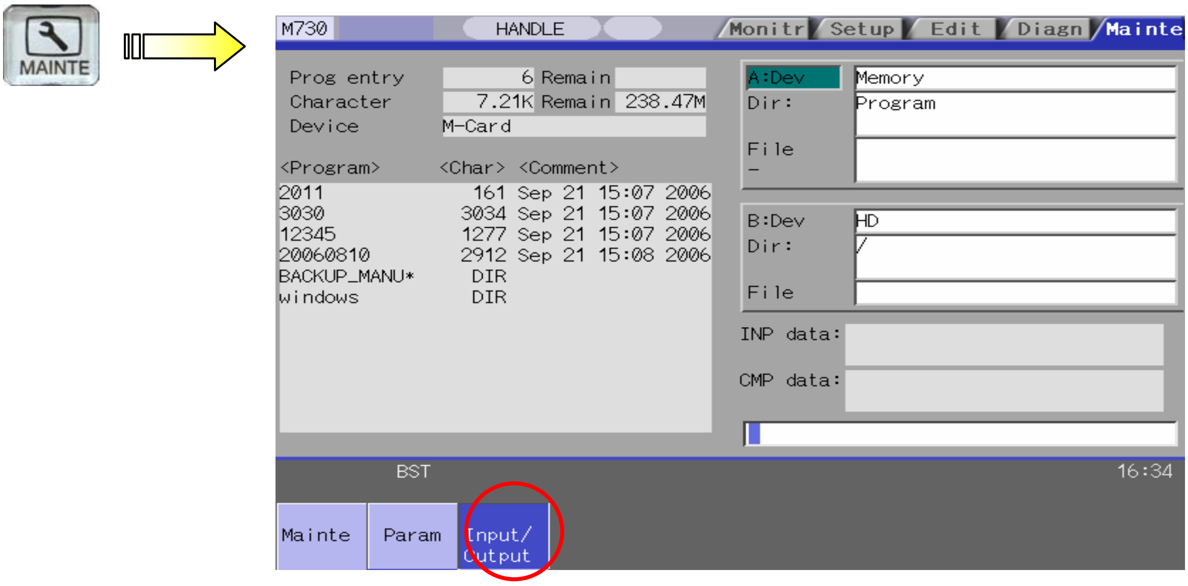
```
[FILE]
TYPE=SV_AMP
[DATA1]
AX_NO=1
AXIS=X
AMP=
AMP_SN=
AMP_VER=
MOT_ENC=
MENC_SN=
AX_ENC=
AENC_SN=
MOT_NAME=
[END]
```

(3) The link number begin from 「1」 with integer for axis number and repeatedly data label.In S/W configuration, the「OS ID」can not output on S/W table.

9.3 Data output

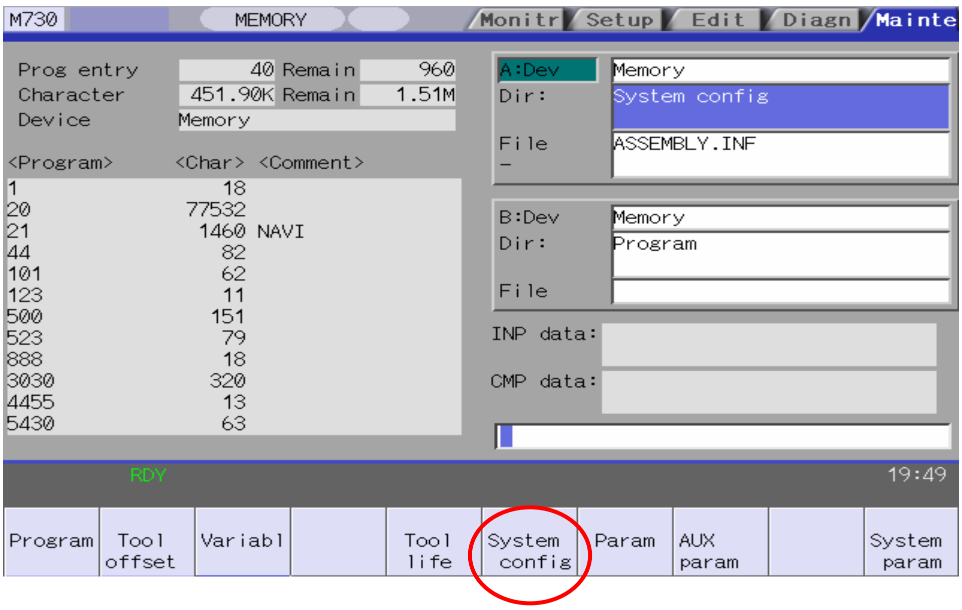
9.3.1 Output procedures

(1) Select function key「MAINTE」and press menu key「Input/Output」.

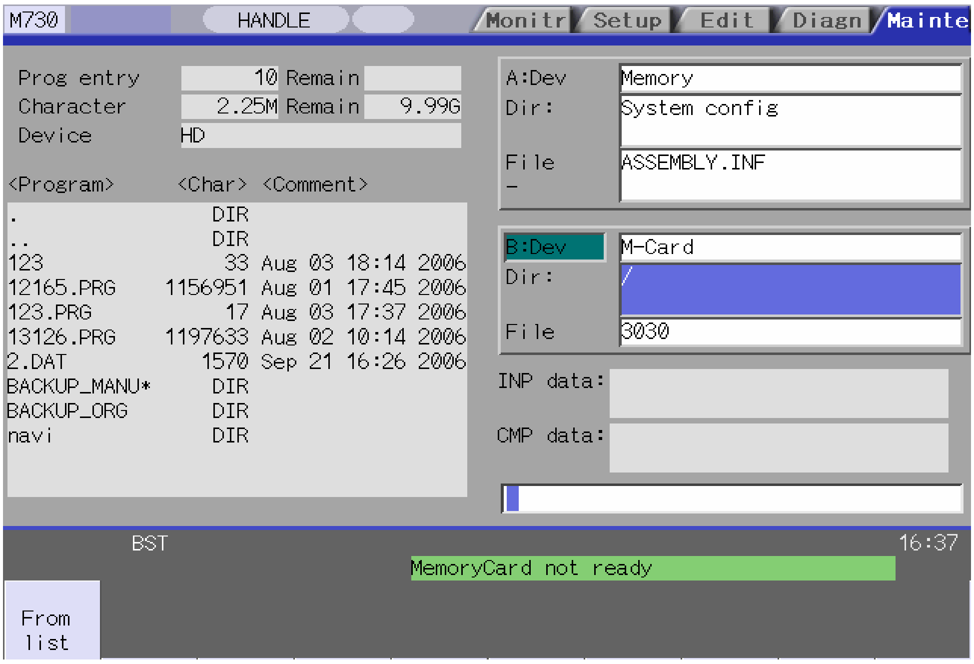


(2) Select Input/Output screen and press Area change key to choice「A:Dev」and press Device select key to select 「Memory」.

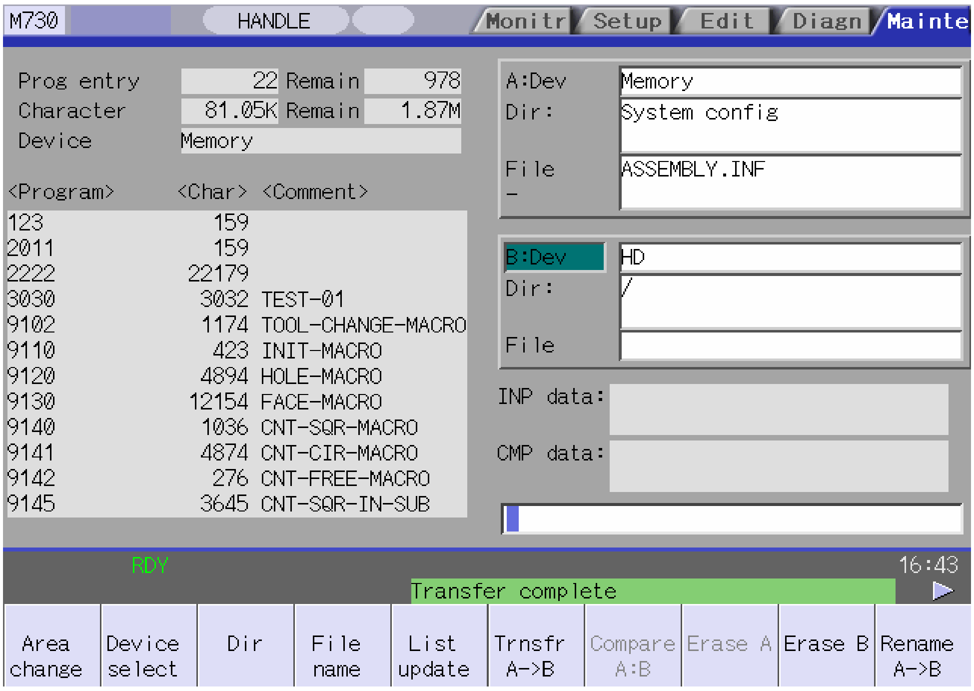
(3) Press Dir key and selection 「 System config 」 block and then 「 System config 」 will display in 「Dir」block .The block of file display automatic for ASSEMBLY.INF .



(4) Press [Area change] key to move to「B:Dev」device and select Device select key for「Memory card」.If Memory card is not insert and" MemoryCard not ready "message will appear. Not only save in on front panel for Memory card but also select save in H/D.



(5) Press Tranfr A→B key and confirmation message will appear under screen. Press [INPUT] key again to transfer data. The screen will appear message for " Transfer complete " when data transfer already.



9.3.2 Attention matters for data output

(1) The system config data able to output function but do not make Input and compare functions.

(a) On B:Dev directory assign system config data then select TrnsfrA→B to input key.
The screen Can't write file for dev B will display

(b) A:Dev and B:Dev are assigned system config data. Compare A:B Key will be display gray can not selected.

(2) The system config data output by ASCII
When output data use RS-232C device .The parameter on #9004 「Data output device」 set with EIA output for “0” ,and DATA ASCII set for “1”.
（When device “0” is #9113 「EIA output」 and #9118「DATA ASCII」）
Please reference Set up manual（IB-1500037）for more detail.
If parameter set error even if could be output. It can not ensure content of file.

(3) When ladder data is renewing, the system config data output does not executing.
The content of ladder configuration data can not ensure if ladder data output under renewing.

(4) RS-232C can not support Japanese language code.
The ladder title includes Japanese language code that it can not output by RS-232C.

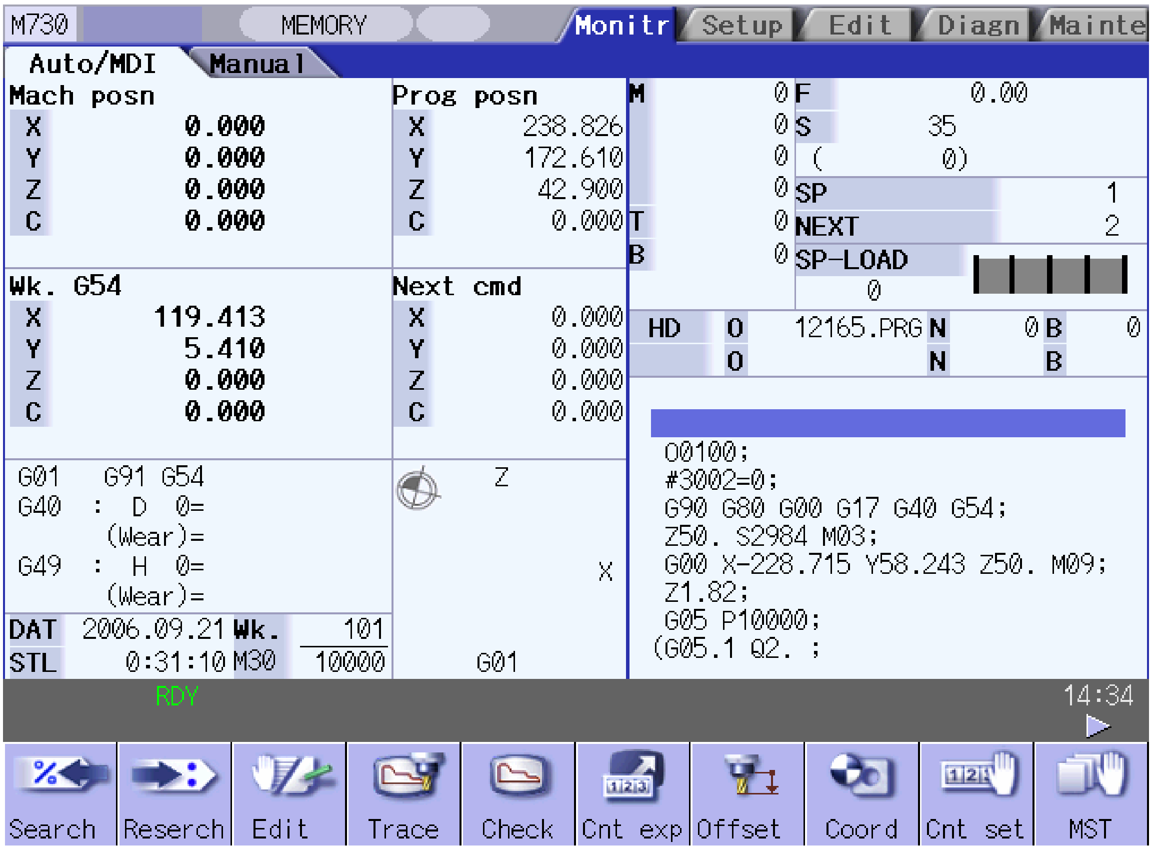
9.4 NC controller list

This functions could support suitable and version type as below.

NC Type		Version
		＊
MITSUBISHI CNC 720	L / M	B0 version
MITSUBISHI CNC 730	L / M	B0 version
MITSUBISHI CNC 750	L / M	B0 version

10. Grabbing the NC screen

M700 series is based on Win OS of PC that can be copied for screen on HMI data, due to report and investigate demands it can transmit message and understanding quick if you are not close machine and need to know. Making a report becomes sample thing.



10.1 External USB operate method

(1) Opening protection cover between display screen and keyboard as photo below.

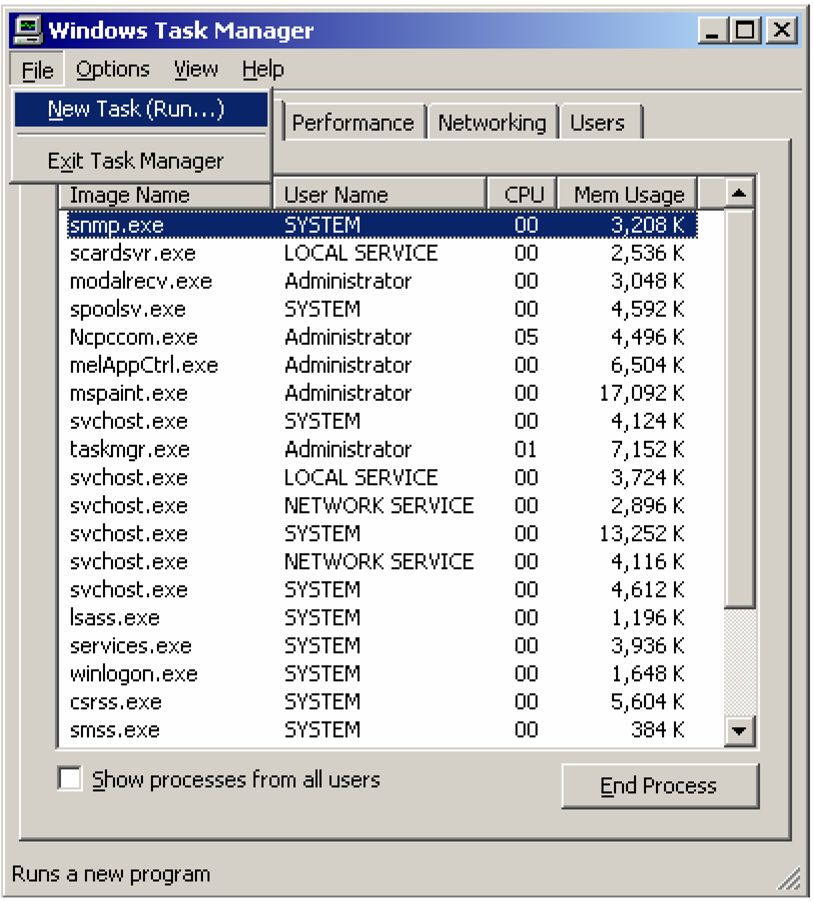
(2) To find out screen data if you want catching, select key Print Screen（sometimes show as PrtSc）

(3) Press keys sequence:
ALTER → CTRL → DELETE ①
Find out administer of Windows

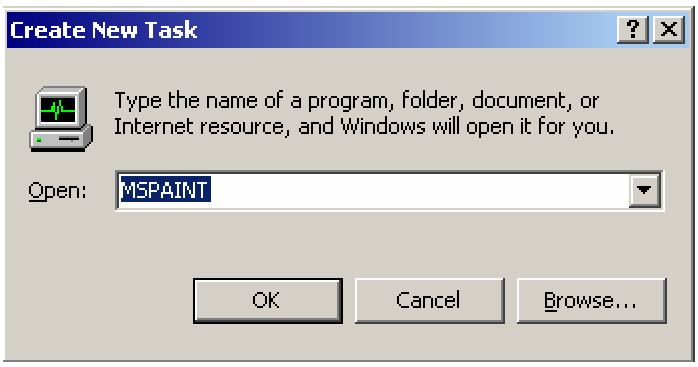
ə

③

(4) Click key [ALT] → [F], and then select [New Task (Run…)]

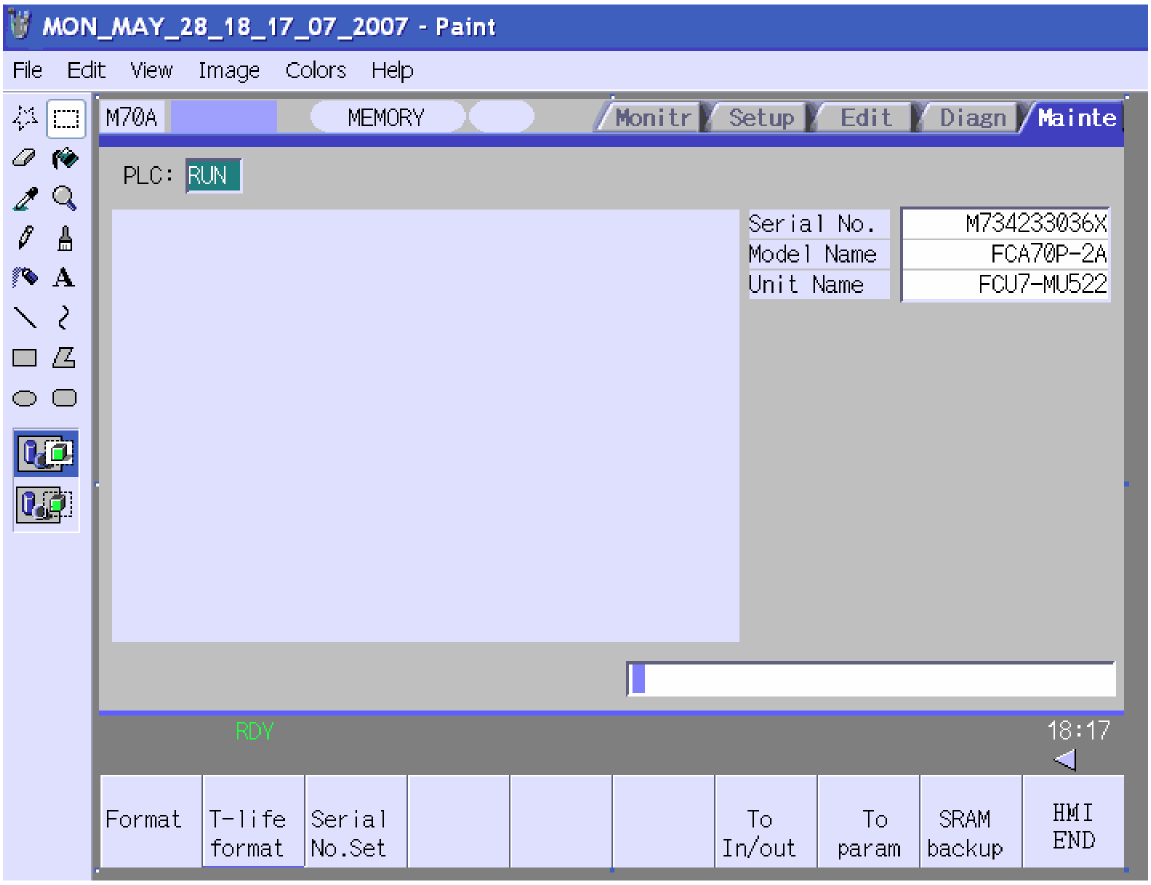


(5) Write down “MSPAINT” in black space into paint function.



【Note】 For first time have to write “MSPAINT”, after that command selected by direction Key up or down to find used before.

(6) Under paint function, push down Ctrl + V key to paste which the screen was copied.



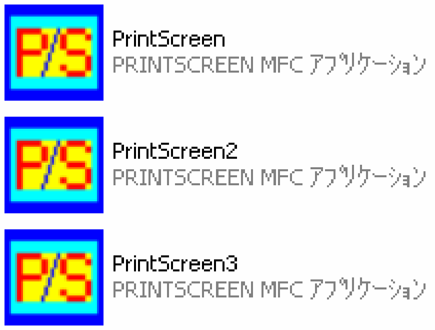
(7) To save file name.
Program sub-name suggest for BMP format.

10.2 The other tools operate method for grabbing chart

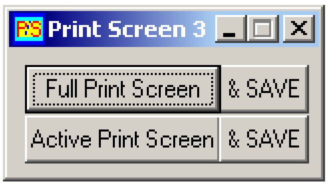
There is much kind of tools for grab chart. It can down load by web site free of charge.
Or in charge to purchase software. Example: ACDSee software also has this function.
The MATRIX series of MAZAK machine have grabbing chart tool base on folder C:\MAINTE in the maintenance tool. As PrintScreen3 as key below：

(1) Opening the software:

Double Click
Executing software



(2) The upper level is show up the function in application software.



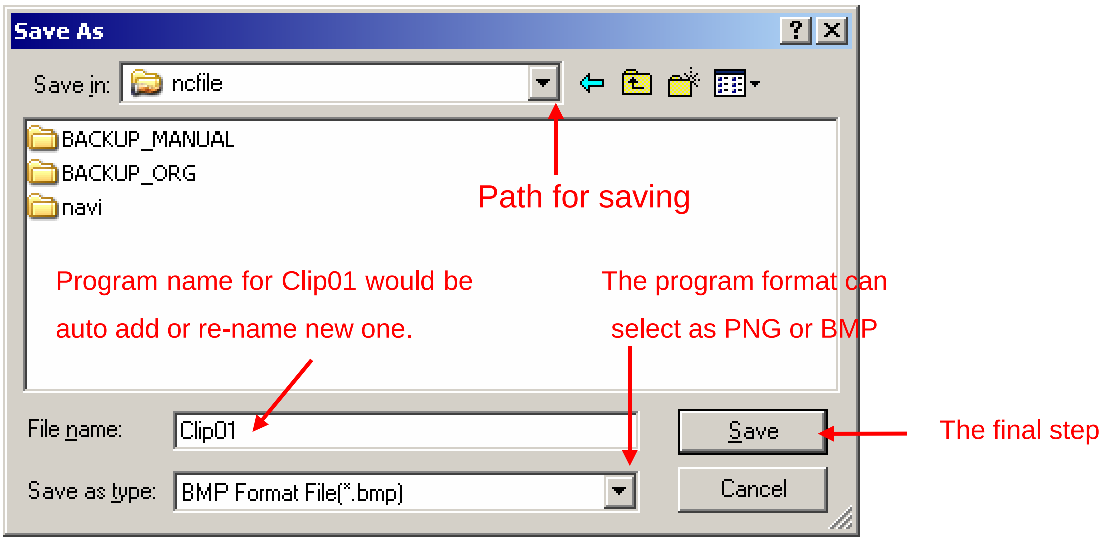
(3) There are four items could be selected.
   (a) Full Print Screen（up left）：The full screen clapped to scrapbook.
   (b) Full Print Screen & SAVE（up right）：The full screen clapped to scrapbook and saving display indication.
   (c) Active Print Screen（down left）：Active screen displayed to clip to scrapbook.
   (d) Active Print Screen & SAVE（down right）：Active screen displayed to clip to scrapbook and saving display indication.

(4) Example: To grab and save for active screen：

(a) To move mouse on &SAVE indication when the target screen want be grabbed.

The result indicates show as below.

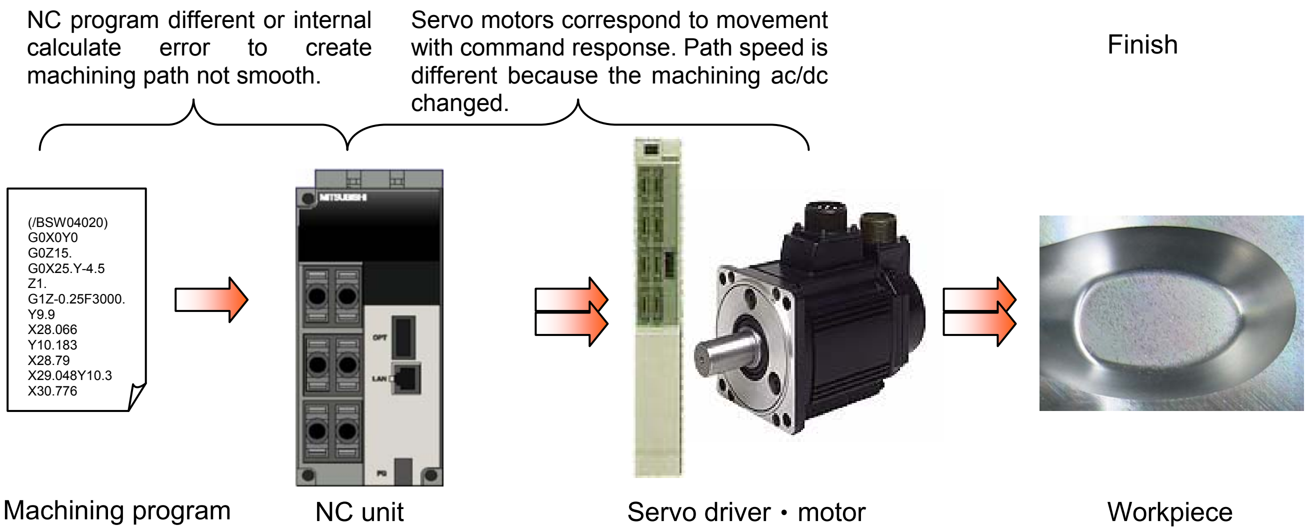
(b) To find the program format like path and name and format (Using BMP sub-name advise).



11. High speed & High accuracy Function

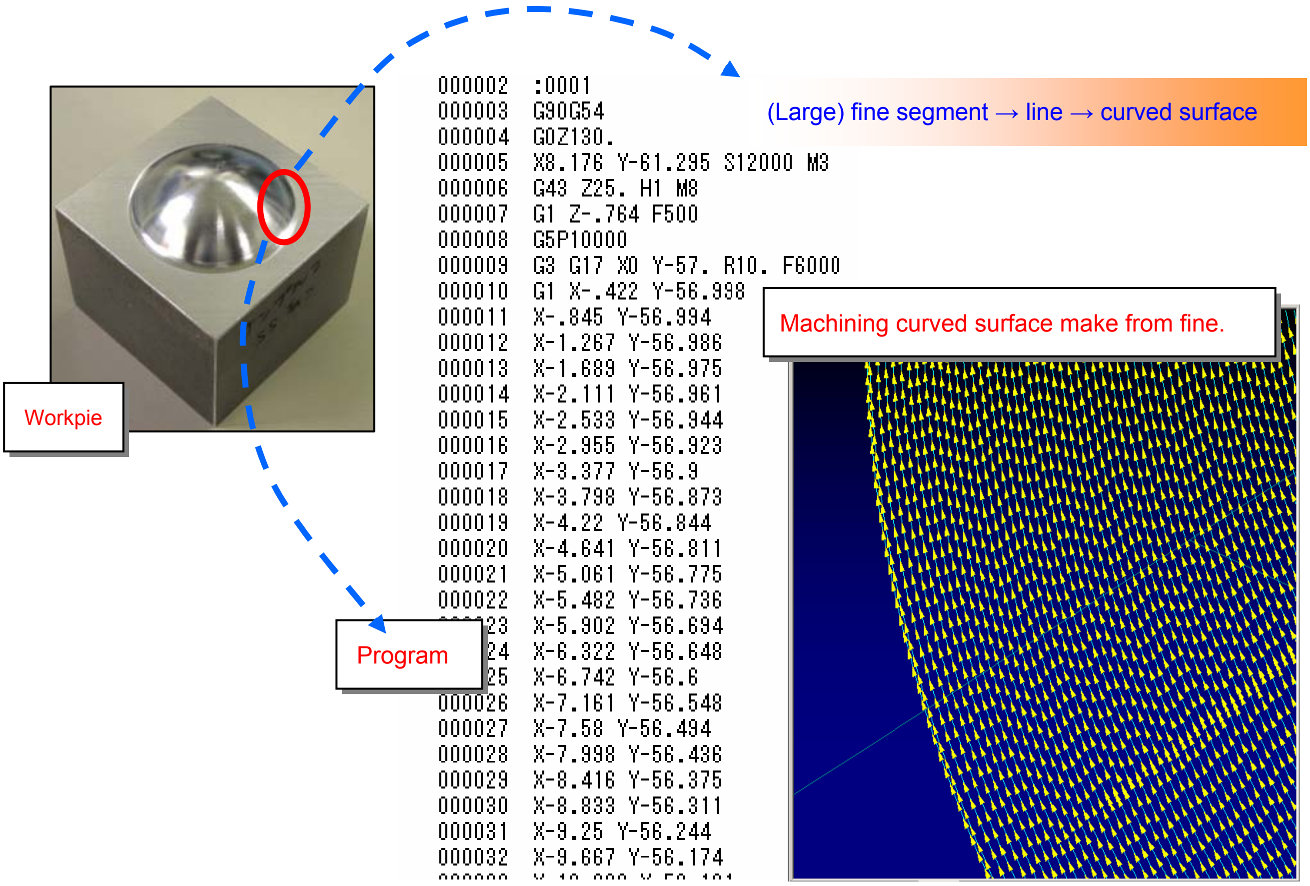
High-speed High-accuracy is machine function performance. The work piece has a nice cutting result. Except for mechanical relation precision or character that also need high effective control system to process machining program from CAD/CAM. That could cut high precision mold efficiently.

Machining programs search and start from NC unit. Then, through servo drive to motor which perform high speed and high accuracy machining control. As shown below:



11.1 What is High-speed & High-accuracy model

This function is for die mold maker. This function runs a machining program that approximates a freely curved surface with fine segments at high speed and high accuracy. This is effective in increasing the speed of machining dies of a freely curved surface.



The precision generally are separate to shape error and surface rough.

(1) Shape error：An error is occurred on NC commands or servo feedback.

(2) Surface rough：Because servo motor vibrate or spindle balance to effect surface precision.

11.2 Definition High speed & High accuracy machining function speed

Small line segment process ability mean 3-aixes simultaneous and 1mm small line conditions can perform machining process.

	M720-N	M720-NP	M730
G05P1 High speed mode Ⅰ	16.8	16.8	16.8
G05P2 High speed mode Ⅱ	33.7	67.5	135
G05.1Q1 High speed & High accuracy control Ⅰ	16.8	16.8	33.7
G05P10000 High speed & High accuracy control Ⅱ	33.7	67.5	135
SSS SSS control	○	○	○

Unit：m/min

【Note】

(1) These functions are corresponding on C0 Version above.
(2) The front IC performance ability is 33.7m/min maximum.
(3) The SSS command performs by shape judgment under specifically range.
The control method is not same as above.

11.3 High speed & High accuracy control function

High speed & high accuracy machining control mode（G61.1／G08P1／G05P3／G05.1Q1／G05.1Q2／G05P10000／SSS）has many different G code. The G code of function also difference. So users must to know the feature of these G codes that can extreme perform high speed & high accuracy machining function in the machine.

(1)High speed & high accuracy control mode Ⅱ

①Use next step and machining shape（The Curvature of line）to control machining speed.
②The corner uses angle between 2 blocks to determine the corner pass speed control.

(2) SSS control

Collection on the basis of the information of vast route (The camber, corner) ,Carry out the speed (Acceleration) Control. SSS control can collect wide range information in machining shape and calculate right speed of acceleration control.

【Command】

#1267 BIT0 = 0		#1267 BIT0 = 1	
Valid	Invalid	Valid	Invalid
G61.1	G64	G08P1	G08P0
		G05P1	G05P0
		G05P2	G05P0
		G05.1Q1	G05.1Q0
		G05P10000	G05P0
		SSS（#8090=1）	（#8090=0）

【Note】
- ※ The OPTION parameters are available.
- ※ Base parameter #1267 BIT0 setting and power return for NC unit is required if this parameter is changed.
- ※ G05.1Q1、G05P10000、G05.1Q2、SSS could not use G43 or M/G CODE Otherwise”P34 G CODE ERROR” will be occurred.
- ※ SSS command is same as G05P10000 and process parameter#8090 must set「1」.

11. High speed & High accuracy Function

※ Depend on the demand of end user make a conformable process parameters and high speed &high accuracy function mode.

(1) The G code for High speed &High accuracy control on M700 series

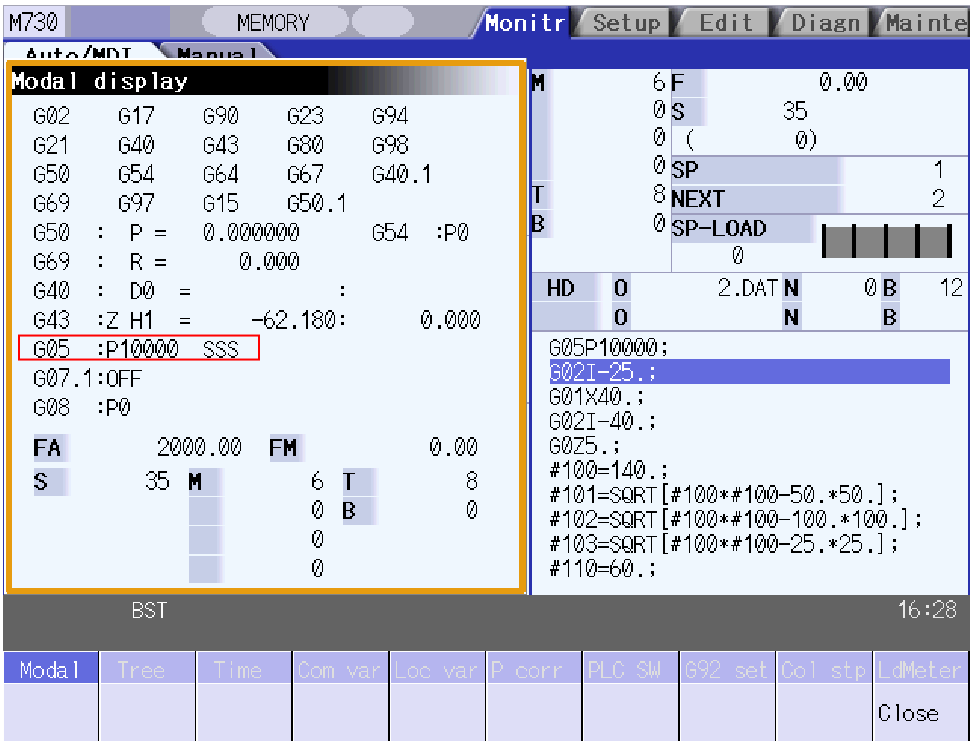
	M720-N	M720-NP	M730
G61.1 / G08P1	●	●	●
G05P1	●	●	●
G05P2	●	●	●
G05P3	×	×	×
G05.1Q1	●	●	●
G05.1Q2	×	×	×
G05P10000	●	●	●
SSS	●	●	●

● : available

× : non-available

【Note】 These functions are supported above C0 version.

(2) The screen is displayed a status with present command mode for High speed &High accuracy. The sample is a SSS function show as G05P10000 SSS.



11.4 Related parameters explain with High speed &High accuracy

There are many related parameters for High speed & High accuracy. In addition to search parameters at Mainte function , there is a convenient key to sort out about related group function parameters.

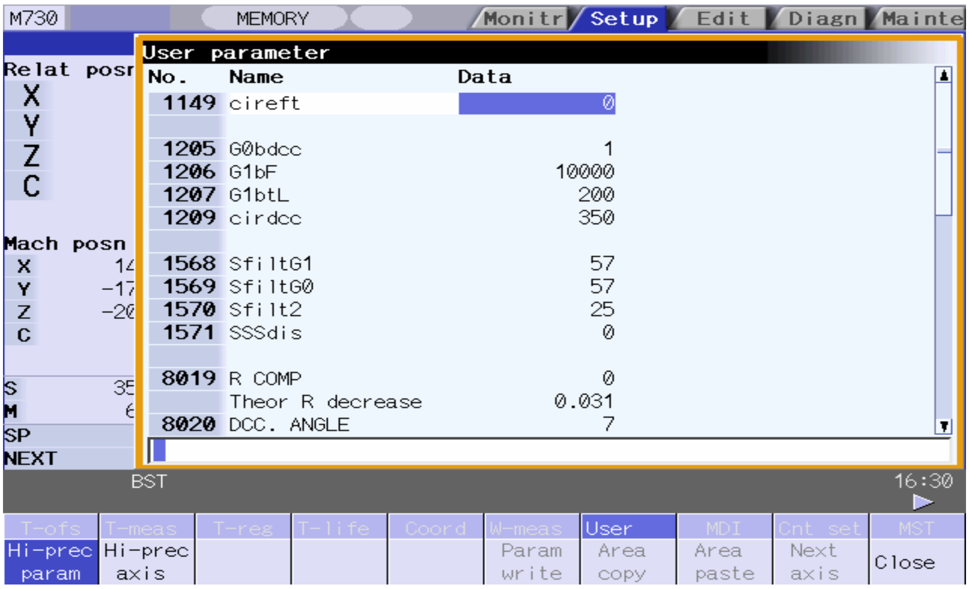
Pressing 

→ User , find out Hi-prec param and Hi-prec axis both items.

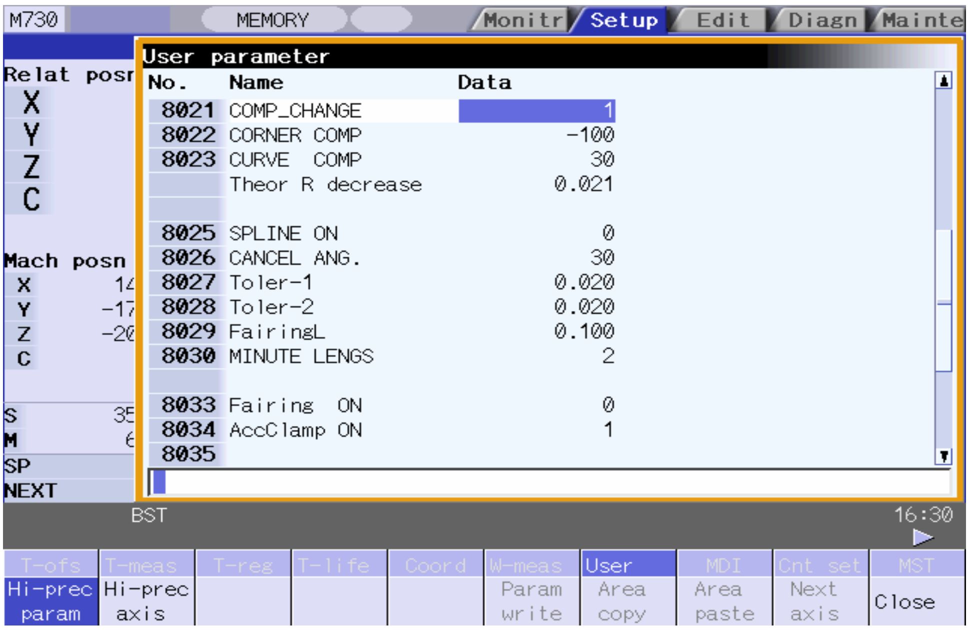
This is related parameters to install for High speed & High accuracy function.

(1) High accuracy parameters :

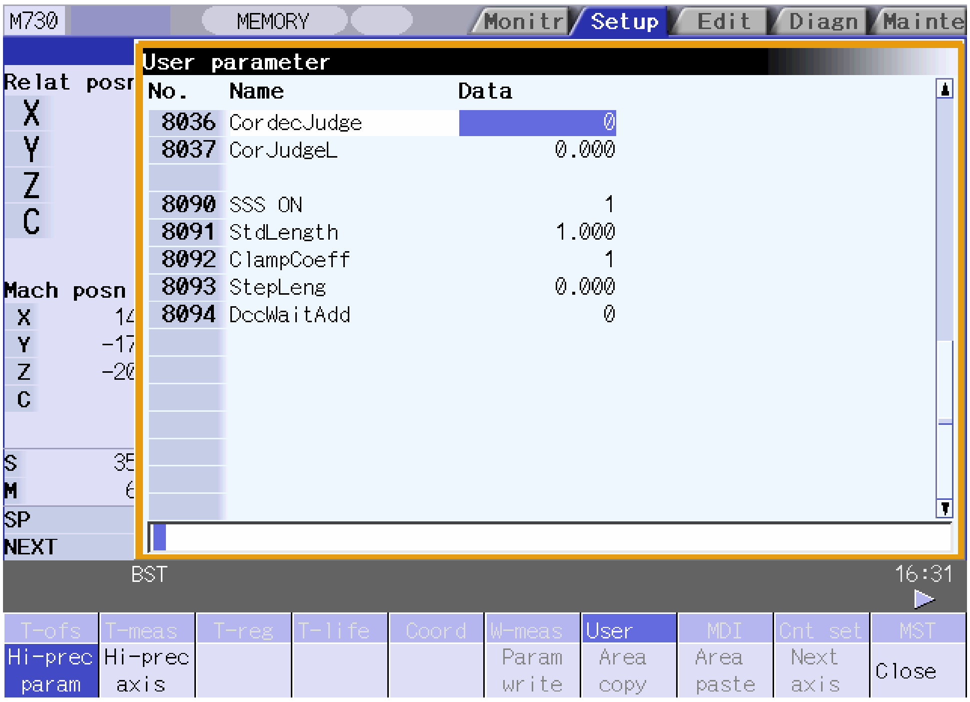
(a) The first page :



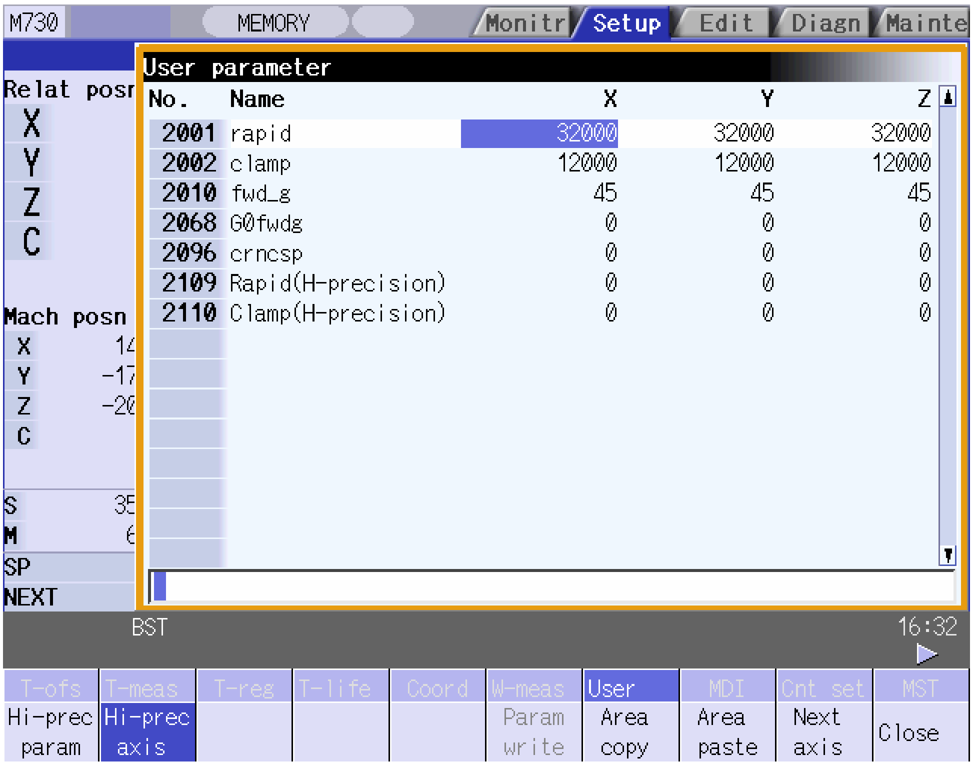
(b) The second page :



(c) The third page :



(2) High accuracy axis parameters :



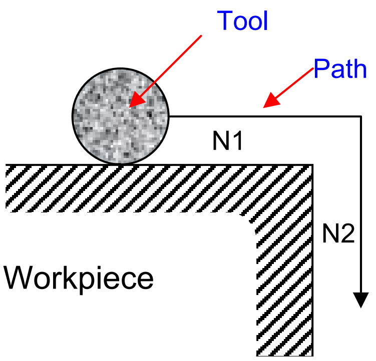
11.4.1 High speed and high accuracy machining function explanation

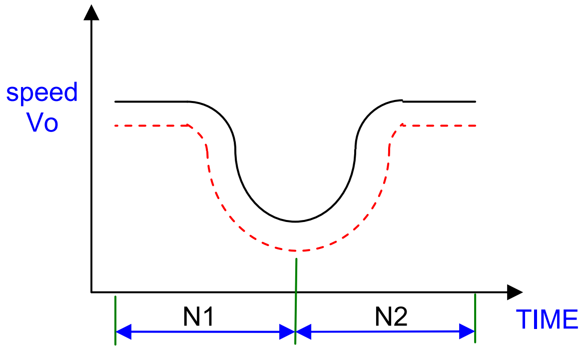
(1) Before interpolation speed：

(a) Reliable corner deceleration：

$$Vo = \frac{\Delta V}{\sqrt{2(1-\cos\theta)}} \times \frac{100 - Ks}{100}$$

Ks = precision factor





Curvature (radius) forced：

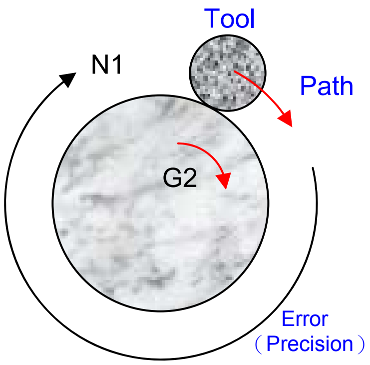
$$Vc = \sqrt{\frac{Acc}{r}\left(\frac{100 - Ks}{100}\right)}$$

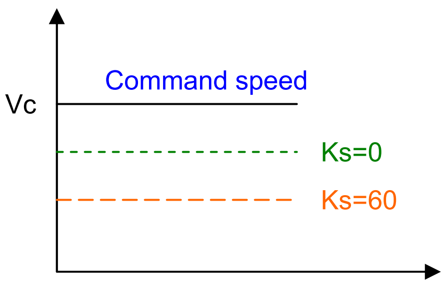
Ks = precision factor

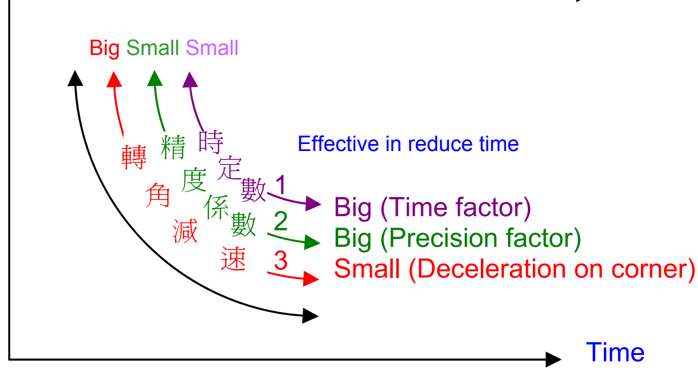
Small ←→ Big

Normal precision ←→ fine precision

Short time ←→ Long time



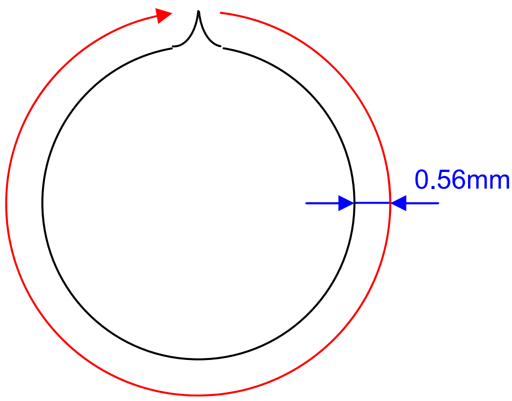




(2) #8019 R COMP：Suggest value 60 (0.560)

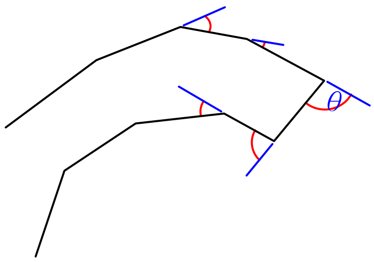
Precision computation

When getting a high precision that the speed will slowly is a theory as above.



(3) #8026 "Spline Cancel" angle：usually 20 ～ 40

It is indicated a line if angle is more than setting value.

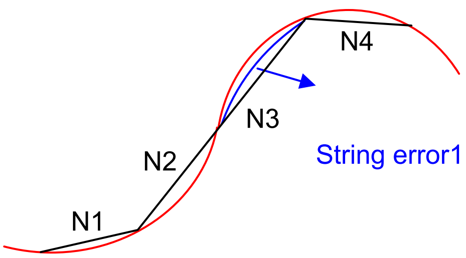


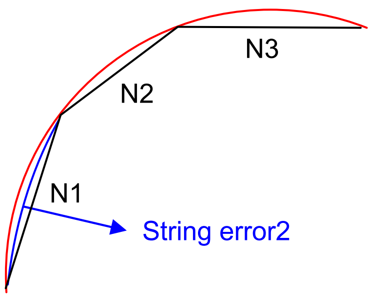
(4) String error：

#8027 string error 1 ：suggest value 0.01 ～ 0.05 mm

#8028 string error 2 ：suggest value 0.01 ～ 0.05 mm

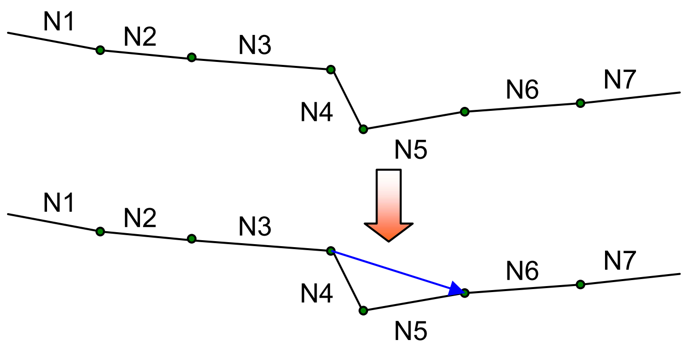
String error 1 ≦ string error 2

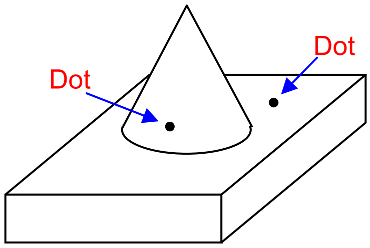




(5) #8029 Fairing L ：Suggest value 0

To ignore CAM compute error to cause fine segment BLOCK. It could avoid a scar on the work piece.

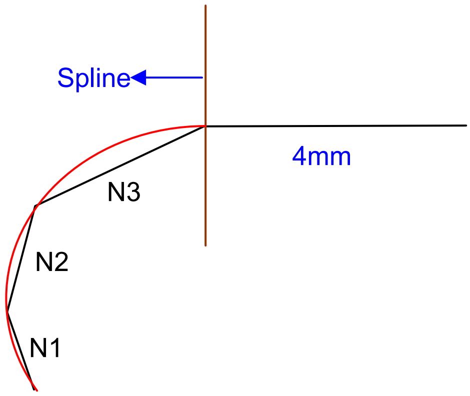




(6) #8030 MINUTE LENGTH：suggest value 1 ～ 2 mm

As regards min length sets over range that shall take a line machining.

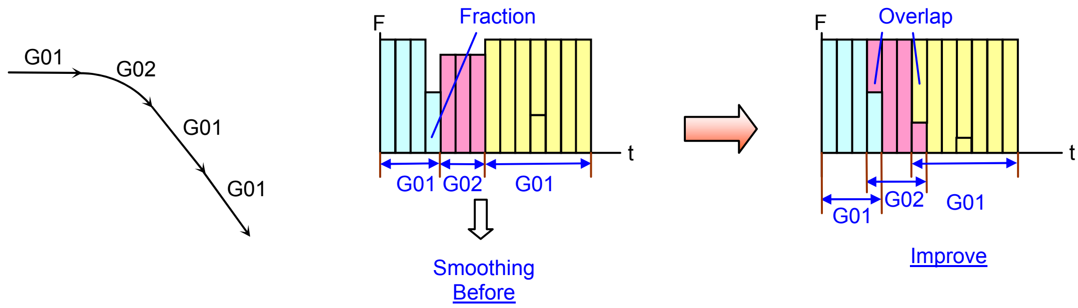
When setting is –1.All segments are on Spline machining.



11.4.2 High-speed High-Accuracy control II (G05P10000)

(1) CIRCLE OVERLAPPING

Overlap feed between G01-G02/G03,G2/G3-G1,G2/G3-G2/G3 BLOCKS.

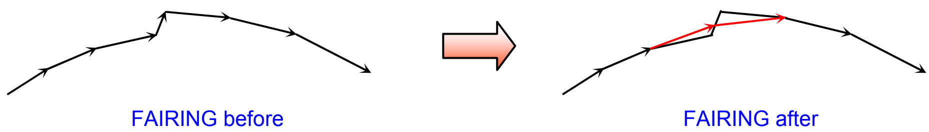


(2) FAIRING

In the machining program create by CAM system. If there is unsmooth for special path, the protruding

have to deleted making smoothly surface between paths.

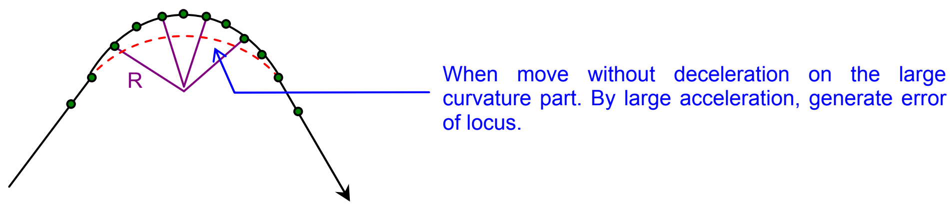
（Done by block length and angle of 3 block paths）



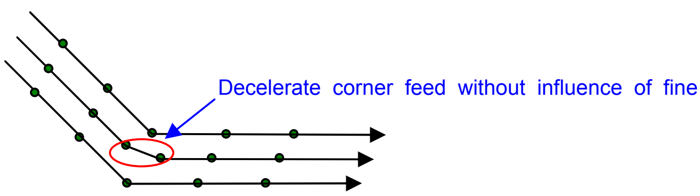
(3) Acceleration clamp

Clamp feed do not exceed the limitation of acceleration for moving block.

The angle of each block varies less but the whole curve is getting large.

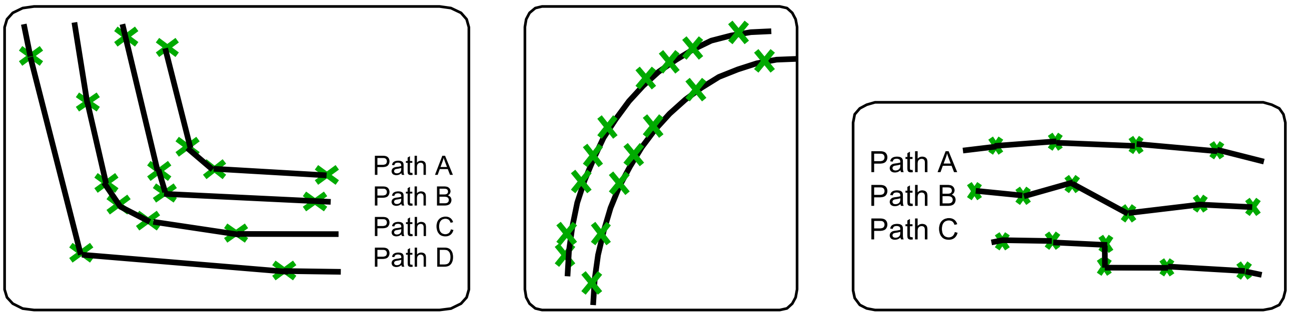


(4) Corner deceleration improvement

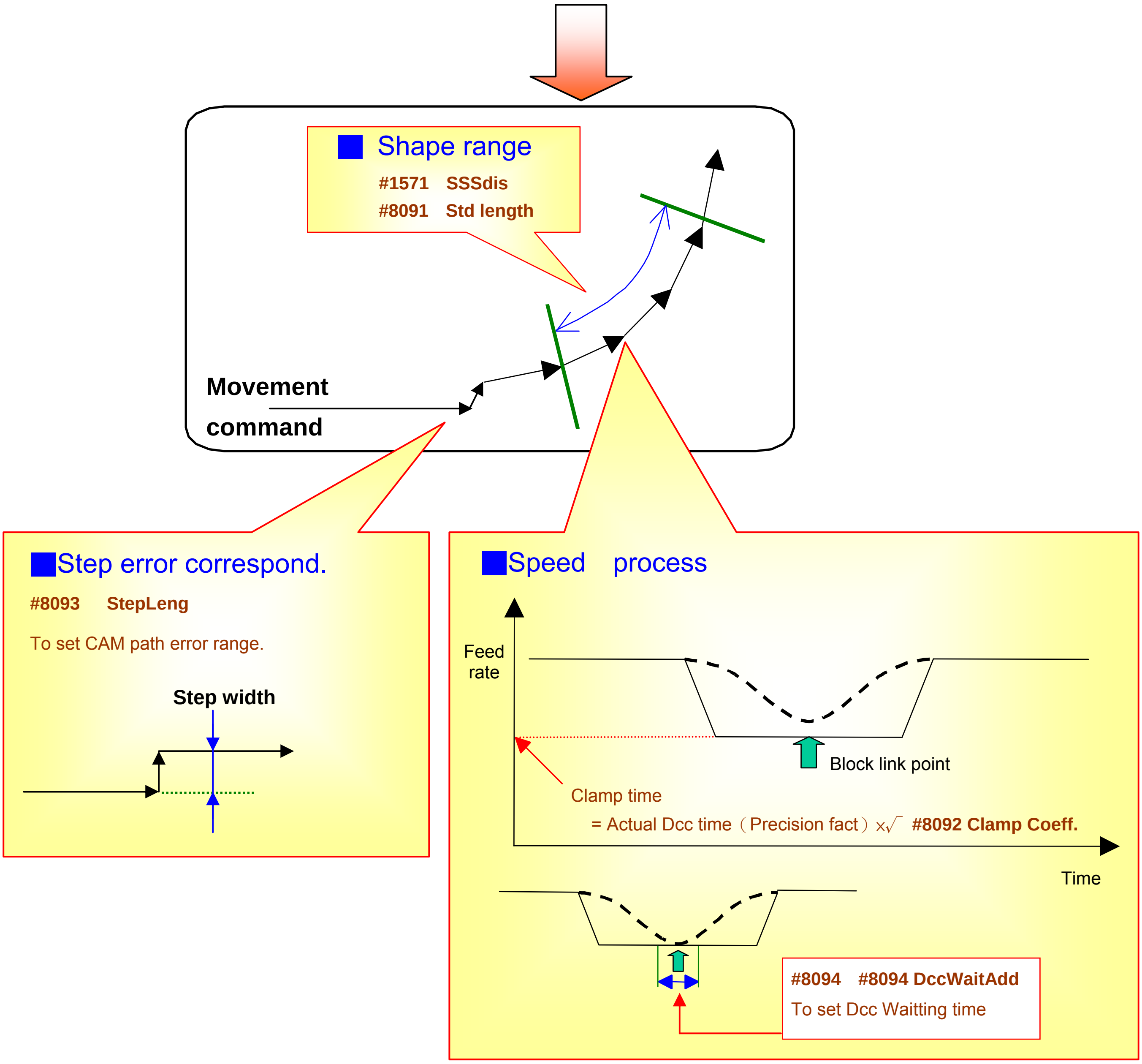


11.4.3 SSS simple introduction

On the basis of whole machining block path to speed control. To use pre-read block function to compute all machining shape. It can execute suitable speed control function and perform high quality of mold machining.

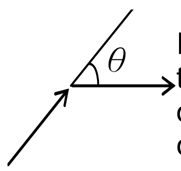


Abnormal corner. Different length and angle. Min step, retrogress and S shape.



11.4.4 High-speed & High accuracy parameters list

<High accuracy control>

#	Item	Contents	Setup range(unit)
8019	R COMP	Set up a compensation factor for reducing a control error in the reduction of a corner roundness and arch radius. Indicates a maximum control error (mm) in parentheses. The larger the setup value, the smaller the theoretical error will be. However, since the speed at the corner goes down, the cycle time is extended. Coefficient = 100 - setting value Note: This is valid when “#8021 COMP CHANGE” is set to “0”.	0～99 (%)
8020	DCC ANGLE	Set up the minimum value of an angle (external angle) that should be assumed to be a corner. When at inter-block angle (external angle) in high-precision mode is larger than the set vale, it is determined as a corner and the speed goes down to sharpen the edge.  If the set value is smaller than θ, the speed goes down to optimize the corner. Note: If “0” is set, it will be handled as 5 degrees. The standard setting value is “0”	0～89 (°) 0：The angle will be “5”
8021	COMP CHANGE	Select whether to share or separate the compensation coefficient at the corner/curve 0：Share (#8019 R COMP) 1：Separate ・Corner(#8022 CORNER COMP) ・Curve(#8023 CURVE COMP)	0 / 1
8022	CORNER COMP	Set the compensation coefficient to further reduce the roundness at the corner during the high-accuracy control mode. Coefficient = 100 – setting value Note: This is valid when “#8021 COMP CHANGE” is set to “1”	-1000～99 (%)

< High precision >

#	Item	Contents	Setup range(unit)
8023	CURVE COMP	Set the compensation coefficient to further reduce or increase the radius reduction amount at the curve (arc, involute, spline) during the high-accuracy control mode. Coefficient = 100 – setting value Note: This is valid when “#8021 COMP CHANGE” is set to “1”	-1000～99 (%)
8025	SPLINE ON (for M system only)	Specify whether to enable the fine spline function 0：Disable the fine spline function. 1：Enable the fine spline function.	0 / 1
8026	CANCEL ANG (for M system only)	When the angle made by block exceeds the set value, spline interpolation is canceled temporarily. In consideration of the pick feed, set a value a little smaller than the pick feed angle.	0～180 (°) 0：180 (°)
8027	Toler-1 (for M system only)	Specify the maximum chord error in a block that includes an inflection point. Set the tolerance applicable when the applicable block is developed to fine segments by CAM. (normally about 10μm) When 0.000 is set, the applicable block is linear.	0.000～100.000 (mm)
8028	Toler-2 (for M system only)	Specify the maximum chord error in a block that includes no inflection point. Set the tolerance applicable when the applicable block is developed to fine segments by CAM. (normally about 10μm) When 0.000 is set, the applicable block is linear.	0.000～100.000 (mm)
8029	FairingL (for M system only)	Set the length of the block subject to fairing. (Valid when #8033 Fairing ON is set to 1.)	0～100.000 (mm)
8030	MINUTE LENGTH (for M system only)	When the length of one block exceeds the set value, spline interpolation is canceled temporarily and linear interpolation is performed. Set a value a little smaller than linear block length of the workpiece to be machined.If – 1 is set, spline interpolation is performed regardless of block length.	-1～127 (mm) 0：1 (mm)

< Fairing >

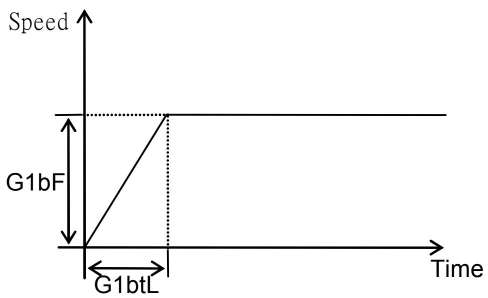
#	Item	Contents	Setup range(unit)
8033	Fairing ON (for M system only)	Set whether to use the fairing function. 0：Fairing invalid 1：Fairing valid	0 / 1
8034	AccClamp ON (for M system only)	Set the method for clamping the cutting speed. 0：Clamp with parameter "#2002 clamp" or the comer deceleration function 1：Clamp the cutting speed with acceleration judgment. (Valid when #8033 Fairing ON is set to 1.)	0 / 1
8035	AccClampMag	Not used.	0
8036	CordecJudge (for M system only)	Change the conditions for judging a comer. 0：Judge the corner from the angle of the neighboring block 1：Judge the corner from the angle of the neighboring block, excluding minute blocks. (Valid when #8033 Fairing ON is set to 1.)	0 / 1
8037	CorJudgeL (for M system only)	Set the length of the block to be excluded. (Valid when #8036 CordecJudge is set to 1.)	0～99999.999 (mm)

< SSS Control >

#	Item	Contents	Setup range(unit)
8090	SSS ON (For M system only)	Set whether to validate SSS control with G05P10000 0：Invalid 1：Valid	0 / 1
8091	Std Length (For M system only)	Adjust the maximum value of the range for recognizing the shape. To eliminate the effect of step or errors, etc...,set a large value. To enable sufficient deceleration, set a small value. If “0.000” is set, the standard value「0.000」will be applied.	0～100.000 (mm)
8092	Clamp Coeff (For M system only)	Adjust the clamp speed at the cured section configured of fine segments. Coefficient = √ setting value	1～100
8093	Step Leng (For M system only)	Set the width of the step at which the speed is not to be deceleration.(Approximately the same as the CAM path difference[tolerance].)If 0 is set, the standard value(5μm) will be applied.If a minus value is set, the speed will decelerate at all minute steps.	-1.000～0.100 (mm)
8094	(For M system only)	Set the time to wait for deceleration when the speed FB dose not drop to the clamp speed.	0～100 (ms)

Parameter	Function	Purpose
#8020 DCC. ANGLE	Corner DCC angle.	Corner：small＝High precision・Low speed. Curve：Big＝Low precision・High speed. ※To use with「#8095 Tolerance」.
#8022 CORNER COMP	Corner precision	Big＝High precision・Low speed
#8023 CURVE COMP	Curve precision	Big＝High precision・Low speed
#8092 Clamp Coeff	Curve precision	Big＝Low precision・High speed ※Normal is standard setting. Control on「#8023 CURVE COMP」
#8095 Tolerance	Trace error	Small＝High precision・Low speed

<Base specification parameters>

#	Item	Contents	Setup range(unit)
1149	Arc deceleration Speed change (Cireft)	Specify whether to enable deceleration at the arc entrance or exit. 0：Disable 1：Enable	0 / 1
1205	Acceleration and Deceleration before G0 interpolation (G0bdcc)	0：G00 acceleration and deceleration are selected as those after interpolation. 1：The G00 acceleration/deceleration is the acceleration/deceleration before interpolation regardless of whether the mode is the high accuracy control mode. (Note) “1”cannot be set for the 2nd system.	0 / 1
1206	Maximum speed (G1bF)	Set up a cutting feedrate when selecting acceleration and deceleration before interpolation.	1～999999(mm/min)
1207	Time constant	Set up a cutting feed time constant when selecting Acceleration and deceleration before interpolation  	1～5000(ms)
1209	Arc deceleration speed	Specify the deceleration speed at the arc entrance or exit.	1～999999(mm/min)
1568	G01 soft acceleration /deceleration filter	This is the filter time constant for smoothly changing the acceleration rate for the cutting feed acceleration/deceleration in pre-interpolation acceleration/deceleration.	0 ～ 200 (ms)
1569	G00 soft acceleration /deceleration filter	This is the filter time constant for smoothly changing the acceleration rate for the rapid traverse acceleration/deceleration in pre-interpolation acceleration/deceleration.	0 ～ 200 (ms)
1570	Soft acceleration/ deceleration filter2	This is the filter time constant for smoothly changing the acceleration rate during pre-interpolation acceleration/deceleration. This is invalid when 0 or 1 is set	0 ～ 50 (ms)
1571	SSS control adjustment coefficient fixed value selection	The shape recognition range for SSS control is fixed.	0 / 1

<Axis parameters>

#	Item	Contents	Setup range(unit)
2001	Rapid traverse rate	Set up the rapid traverse feedrate for each axis. The maximum value to be set differs with mechanical systems.	1～1000000(mm/min)
2002	Cutting feedrate for clamp function	Define the maximum cutting feedrate for each axis. Even if the federate in G01 exceeds this value ,the clamp will be apply at this feedrate.	1～1000000(mm/min)
2010	Feed forward gain	Set up a feed forward gain for pre-interpolation acceleration/deceleration. The larger the set value,the smaller the theoretical control error will be.However,if a mechanical vibration occurs. the set value must be reduced.	0～200(%)
2068	G0 feed forward gain	Specify the feed forward gain applicable to acceleration/deceleration before G0 interpolation. The greater the set value, the shorter the positioning. Time during in-position checking. If machine vibration occurs, decrease the set value.	0～200 (%)
2069	Axis arc radius error correction efficient	The amount of arc radius error correction can be Increased or decreased between -100% to 100% for each axis.	-100.0～+100.0 (%)
2109	Rapid traverse rate for high accuracy control mode	Set the rapid traverse rate for each axis in the high accuracy controlmode.#2001 rapid is used when “0” is set.	0～1000000(mm/min)
2110	Cutting feed clamp speed for high speed control mode.	Set the cutting feed maximum speed for each axis in the high accuracy control mode.#2002 clamp is used when “0” is set.	0～1000000(mm/min)

11.5 High Speed & High Accuracy Machining Control functions parameter table

(1) G05P10000 relation parameters list

Parameter NO.	For General Mold machining	For shoes Maker	For Small Mold machining	Micro mold machining	Small cutting
1086	0	0	0	0	0
1149	0	0	0	0	1
1205	1	1	1	1	1
1206	10000	10000	10000	10000	10000
1207	200 ～ 400	200 ～ 400	100 ～ 300	200	170
1209	350	0	0	0	2000
1568	57	57	57	57	57
1569	57	57	57	57	57
1570	29	29	29	29	29
1571	0	0	0	0	0
1572	1	1	1	1	0
2007~9	30	30	30	30	15
2010	45	40	40	40	55
2096	0	0 or 1000	0	0	0
2139	1	1	1	1	1
2146	0.05	0.05	0.05	0.05	0.05
2147	0.05	0.05	0.05	0.05	0.05
2148	20	20	20	20	20
2149	0	0	0	0	0
8019	0	0	60	60	60
8020	7	7	5	1	5
8021	1	0	0	0	0
8022	-200	0	0	0	0
8023	35	0	0	0	0
8025	0	0	1	0	0
8026	0	0	15	15	0
8027	0.000	0	0.010	0.020	0.000
8028	0.000	0	0.010	0.020	0.000
8029	0.010	0	0.100	0.100	0.000
8030	0	0	2	1	0
8033	1	1	1	1	1
8034	1	1	1	1	1
8036	1	0	0	0	0
8037	0.3	0	0	0	0

【Note】

(a) When the process speed is too fast .The two parts of machining pattern can not very suitable.
So when they put together will get error in connect.

(b) If the shoe mold process use the others process parameter .The surface of the shoe parts will have some small holes appear.

(c) The value of work piece is little in the small mold process. When you want to advance the machining shape accuracy that the process time will become long.

(d) The small mold & arc cutting is used circle cutting. And the arc circle around usually is small (R1).The speed is also fast there may happen the over-cutting. Therefore, we must cancel arc cutting speed overlap (#1572=0) and to advance work piece accuracy. The speed in the linear and corner appears different and over-cutting can't happen again.

(e) Please attention the process parameter for #8090 set "0

(f) The general mold and small mold parameter group is recommended setting for initial.
You can refer this Parameter form. Actually, you must depend on your process situation.

(2) SSS control model parameter list

No.	Speed priority	Precision priority			
1086	0	0			
1149	0	0			
1205	1	1			
1206	10000	10000			
1207	200 ~ 400	200 ~ 400			
1209	0	0			
1568	57	57			
1569	57	57			
1570	29	29			
1571	0	0			
1572	1	1			
2007~9	30	30			
2010	45	45			
2096	0	0			
2139	1	1			
8019	0	0			
2146	0.05	0.05			
2147	0.05	0.05			
2148	20	20			
2149	0	0			
8020	20	20			
8021	1	1			
8022	-200	20			
8023	35	80			
8025	0	0			
8026	0	30			
8027	0.000	0.020			
8028	0.000	0.020			
8029	0.000	0.100			
8030	0	2			
8033	0	0			
8034	1	0			
8090	1	1			
8091	1.000	1.000			
8092	1	1			
8093	0.000	0.005			
8094	0	0			
8095	0.000	0.003			

【Note】

(a) SSS control function just adjust parameter #8022 and #8023.

(b) SSS function is control on G05P10000 command. It will display on G code command screen「G05P10000S」 when turn on this function.

11.6 Programs often happen on machining for high speed & accuracy

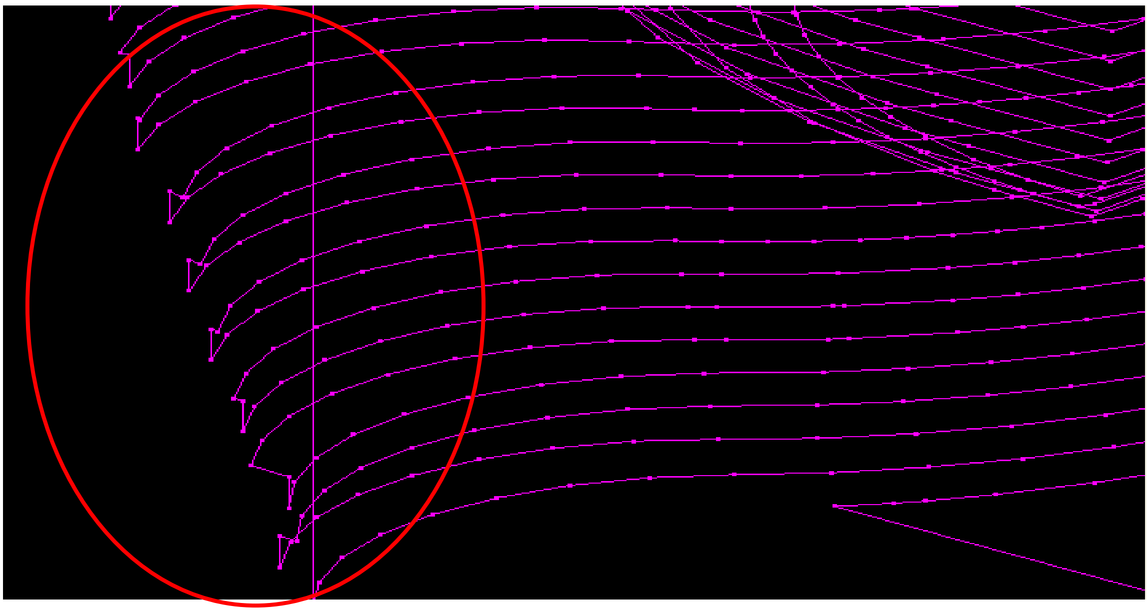
These example situations are real case occurring during at end user.

11.6.1 The sound of impact happens when machine is machining.

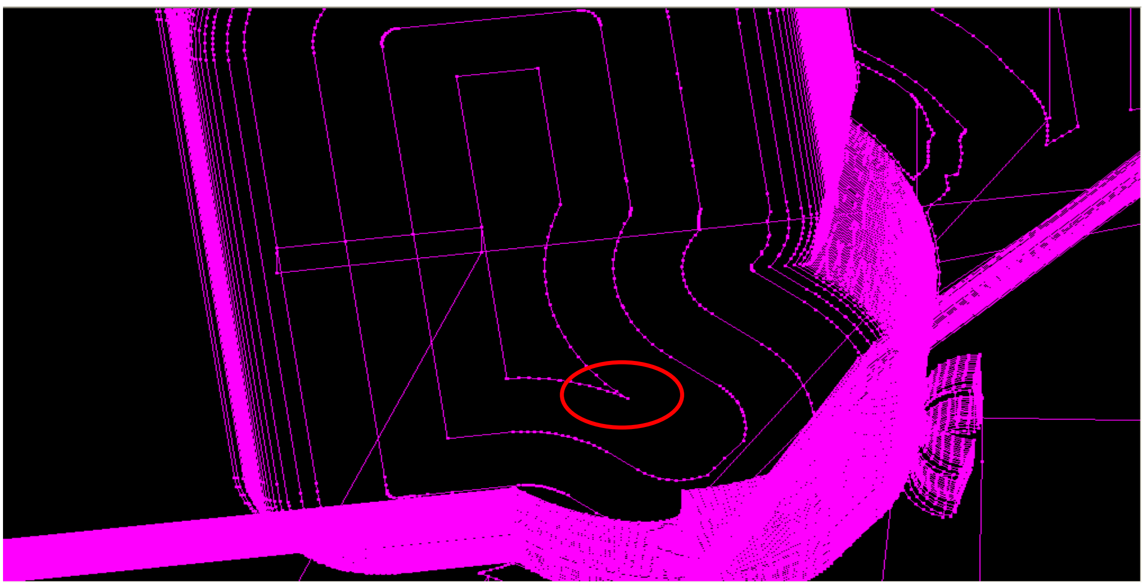
(1) The program has a problem transmission from CAD/CAM .

Example 1:

(a) The segments are error when program route reverse.



(b) There are shapes angle during program route.



(2) Not only the high speed& accuracy control mode is not defined for program but also the initial high precision control mode #1148 is set “0”

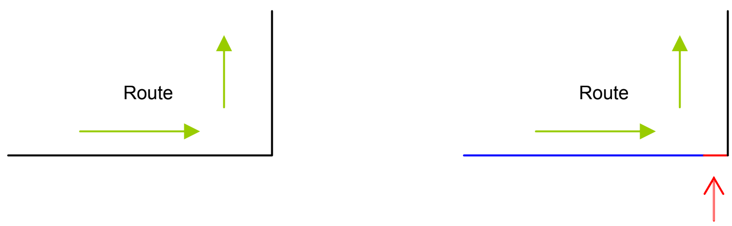
(3) The parameter setting or system of NC judge problems.

11.6.2 The speed does not reduce and slow down too more on corner.

(1) The inner of NC system process
The old system that CPU process speed time is slowly and software limitation the speed on corner will reduce more for high speed and high accuracy control mode.
The newly control have an appropriate reduce speed by auto judgment on corner to avoid a large speed drop and then influence machining efficiency.

(2) Setting parameters（speed priority、precision priority）
The parameters can affect machining speed.
Example: The precision factor (High precision but low speed)
The deceleration angle (The included angle between both blocks whether correspond with condition of deceleration.)
Acceleration/deceleration constant.

(3) Program process
The cutting route is straight line connection right angle machining. On M60S system,the cutting feed rate is fast on this corner.
The gantry machine has a large inertia so that high machining speed will make a trace in surface of work piece. To reduce the cutting speed will get a better surface, but machining time become longer on straight cutting.
There is better method to add a block on corner before, then setting lower feed speed. Set a higher speed when corner block is passed. Neither get a trace on surface nor machining time longer.

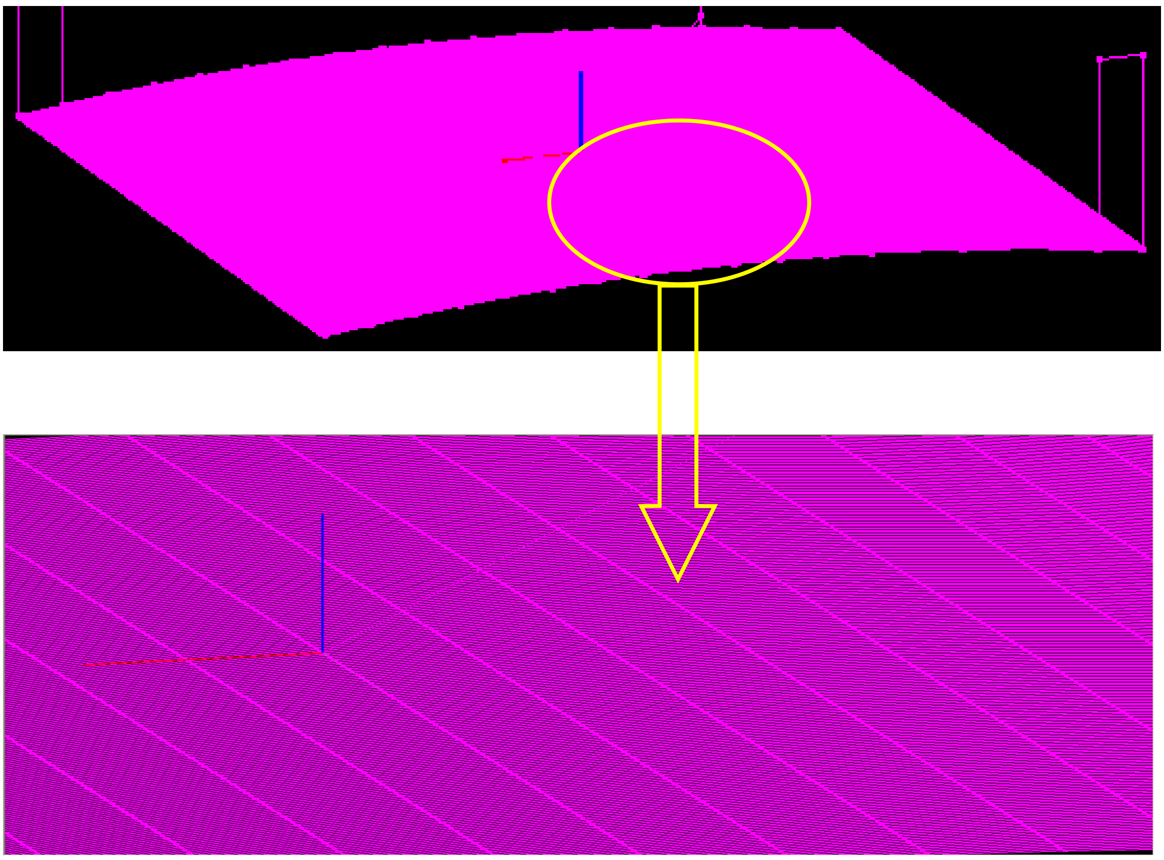


To add a block on corner useful servo to reduce

11.6.3 There are pieces on flat for curve surface

When the CAD/CAM parameter set a big resolution that the capacity of program is less even the block of curve is too less.

So there is a poor surface for each block combination. This is so why the curve surface have pieces on flat.



11.6.4 How to get a solution if the work piece is straight angle become circle angle.

(1) Confirmation whether use high speed and high accuracy control function.

(2) Confirmation whether use SHG(smooth high gain) and fwd_g (feed forward) function.

(3) Increasing precision factor and reducing deceleration angle.

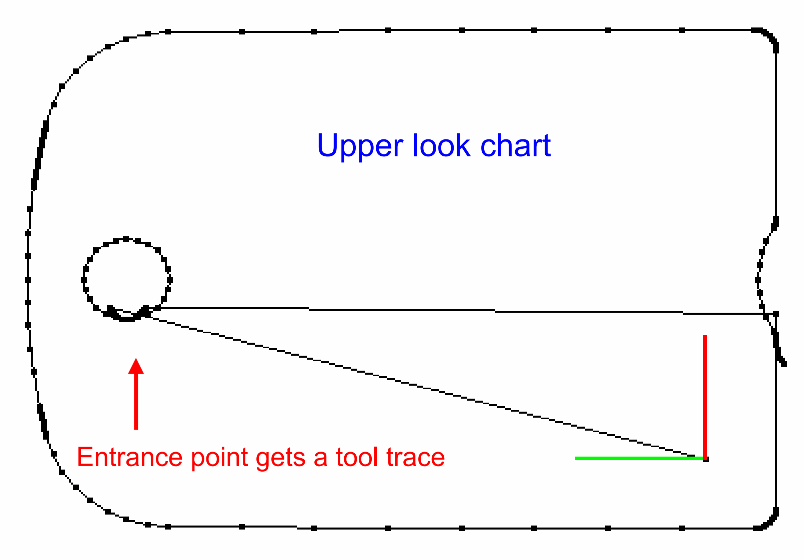
(4) To used judgment software(ex: NC Sentry or GD Viewer) confirm whether program trouble.

(5) To make a cutting for straight angle machining whether the problem on NC or mechanical.

11.6.5 The internal circle for entrance point get a trace on mobile phone panel.

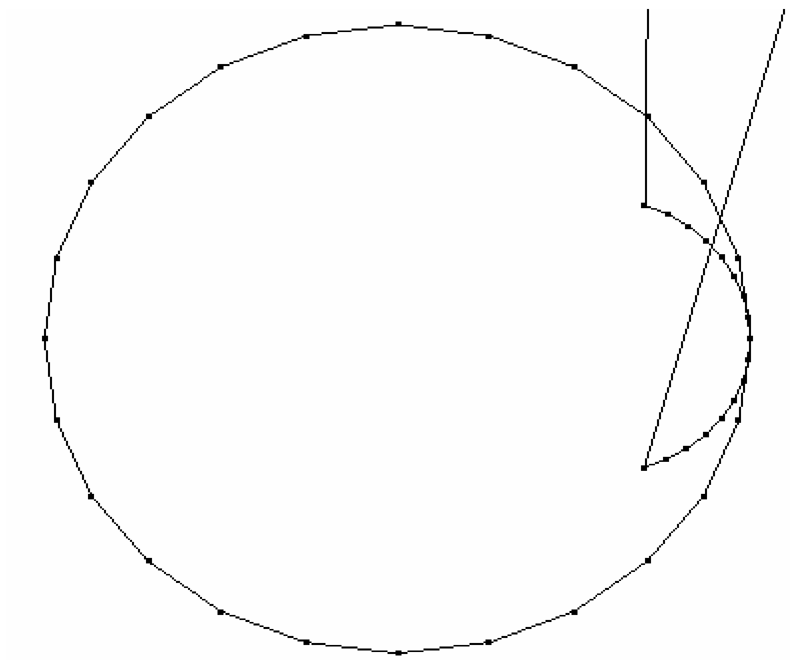
(1) Problems：

There is a trace on entrance point under circle hole of work piece. It can be change program to get solution.



(2) Solution：

A circle path machining is not creating from G02/03 but program is recommended from CAD/CAM. Servo motor will perform smoothly machining and avoiding to remain a notch on surface of workpiece that tool entrance point use inner circle feed and pull return point has to exceed the crossing point in the circle surface.



11.6.6 What's difference between after and before acceleration and deceleration interpolation

(1) Acceleration and deceleration after interpolation

It is a necessary condition to move axis from NC.

A machining program (or PLC) let axis to move or stop situation about acceleration and deceleration depend on the axis parameter setting mode and time's constant, beside the special functions (auto corner compensation "OVERRIDE)

Basically the acceleration and deceleration is performed by program command and PLC signal.

(2) Acceleration and deceleration before interpolation

According to program command and PLC signal perform acceleration and deceleration, in order to shape ensure on machining workpiece or high precision and high speed /accuracy function are valid for reducing machining time. The acceleration and deceleration function can be performed automatically on NC.

[For example] : the speed reduce through on corner , come and go out point on arc , acceleration and deceleration on curve. A shape of workpiece and speed of control axis on user parameter can be determined to perform acceleration and deceleration by NC.

The setting for acceleration and deceleration mode and time's constant are difference parameter address between after and before interpolation.

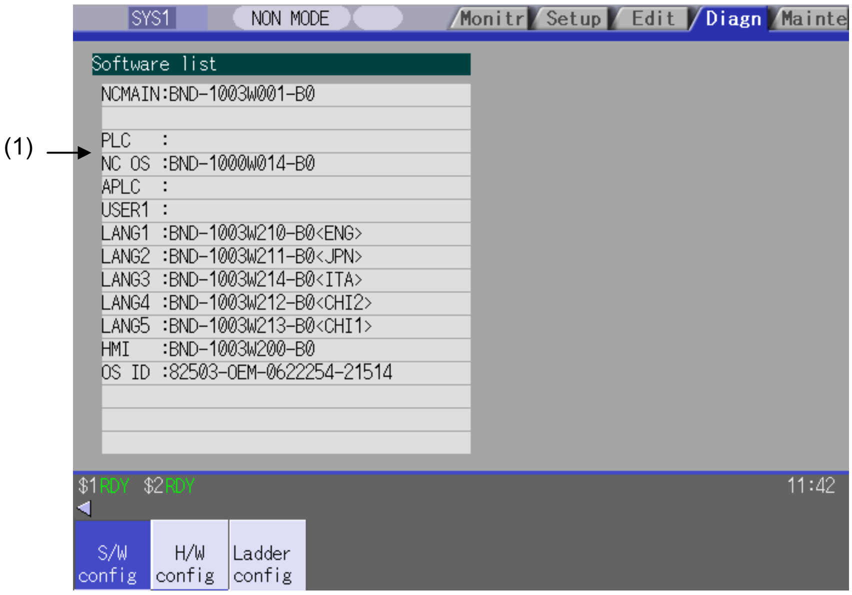
12 Diagnosis Screens

When CNC machine happened troubles you can use diagnosis screen in the CNC controller to get machine alarm information. As refer to maintain and repair basis.

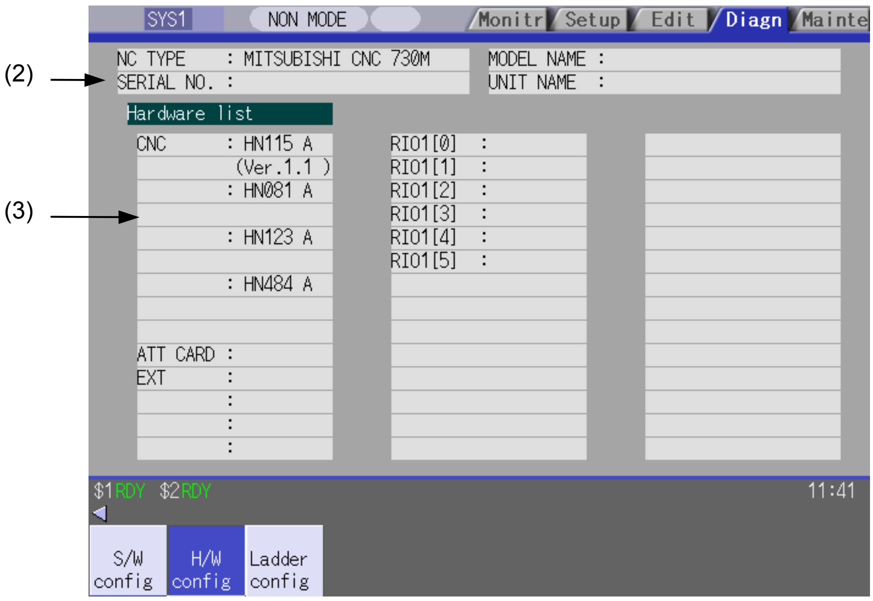
12.1 H/W and S/W configuration screen

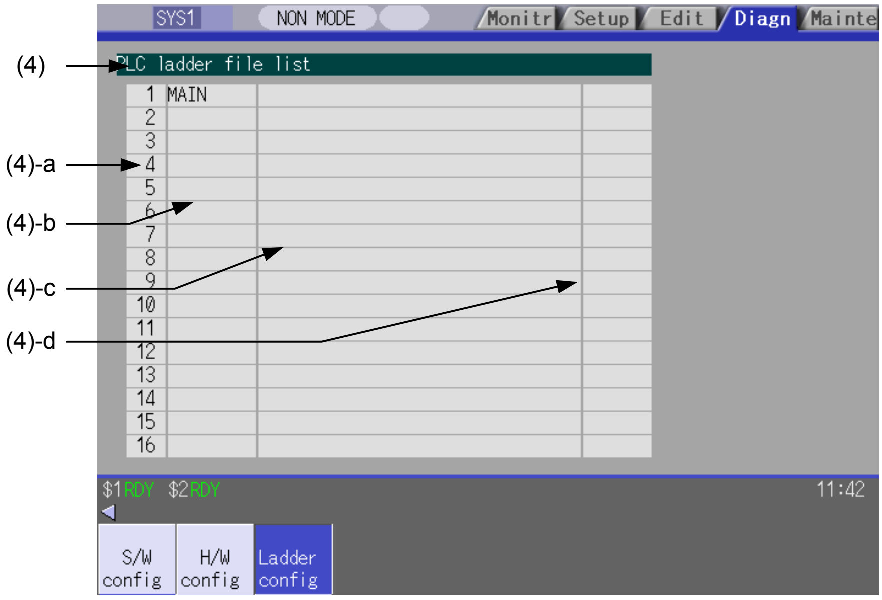
The software configuration（The serial number of the software and serial number）and the hardware configuration(The name of every controller and serial number) detailed information to be shown in this screen.

(1) Software configuration



(2) Hardware configuration





(3) Display items explanation

Display item	Details	
(1) Software list	This displays a list of the software being used.	
(2) NC serial No.	This displays the NC model name, serial No, model type, and unit type.	
	NC TYPE: MITSUBISHI CNC 75XL	NC type (The model names include 730M, 735M, 750L and 755L.)
	MODEL NAME: FCA730	Model name (The model names include FCA720, FCA730 and FCA750.)
	SERIAL NO.: M7123456789	Serial No.
	UNIT NAME: FCU7-MU011	Unit type (The unit type differs according to the model.)
(3) Hardware list (to the next page)	This displays each hardware name.	
	CNC : HN115A : HN081A : HN122A : HN48xA	Main card with LANCPU Power card CPU card (Differs between M720, M730, M750) Memory card (Differs between M720, M730, M750 (hardware option)) The CNC unit is composed of four PCBs. Bus connections are used with all cards.
	ATT CARD : HN392A	Card enclosed with CNC card. The operation board I/O unit are connected to it. The operation board I/O unit uses a remote IO connection.
	EXT : EX891 : HR553 : HR577	Back panel Extension unit Extension unit The extension unit is a hardware option. The PLC high-speed engine or PROFIBUS card, etc. is connected. The back panel + up to three cards are displayed.

<table>
<tr><th>Display item</th><th colspan="3">Details</th></tr>
<tr><td>(from the previous page)</td><td colspan="2">RI01 [n] :
RI02 [n] :
RI03 [n] :</td><td>Remote IO unit 1 (n = 1 to 8)
Remote IO unit 2 (n = 1 to 8)
Remote IO unit 3 (n = 1 to 6)

There are up to three channels. The 7th and 8th station of the RIO3 channel is fixed for use with the handle I/F and is not displayed.</td></tr>
<tr><td rowspan="5">(4) PLC ladder file list</td><td colspan="3">This displays the file name, file label, execution type for each PLC ladder program.
Use ↑ , ↓ keys to change the pages and refer it.</td></tr>
<tr><td>(a)
Registration No.</td><td colspan="2">This displays the registration No. of each PLC program file.
Registration size is max. 32 files.
The target file to be executed is max. 20 files.</td></tr>
<tr><td>(b)
File name</td><td colspan="2">This displays the file name of PLC program file. (data of GX Developer)
Max. 8 characters.</td></tr>
<tr><td>(c)
File label</td><td colspan="2">This displays this file label of PLC program file. (data of GX Developer)
Max. 32 characters.</td></tr>
<tr><td>(d)
Execution type</td><td colspan="2">This displays the execution type of PLC program.
<table><tr><th>Display</th><th>Meaning</th></tr><tr><td>HIGH</td><td>High-speed PLC program</td></tr><tr><td>MIDDLE</td><td>Middle-speed PLC program</td></tr><tr><td>INTIAL</td><td>Initial state of PLC program</td></tr><tr><td>WAIT</td><td>Standby PLC program</td></tr><tr><td>LOW</td><td>Low-speed PLC program</td></tr><tr><td>(blank)</td><td>Not the target of the execution.</td></tr></table></td></tr>
</table>

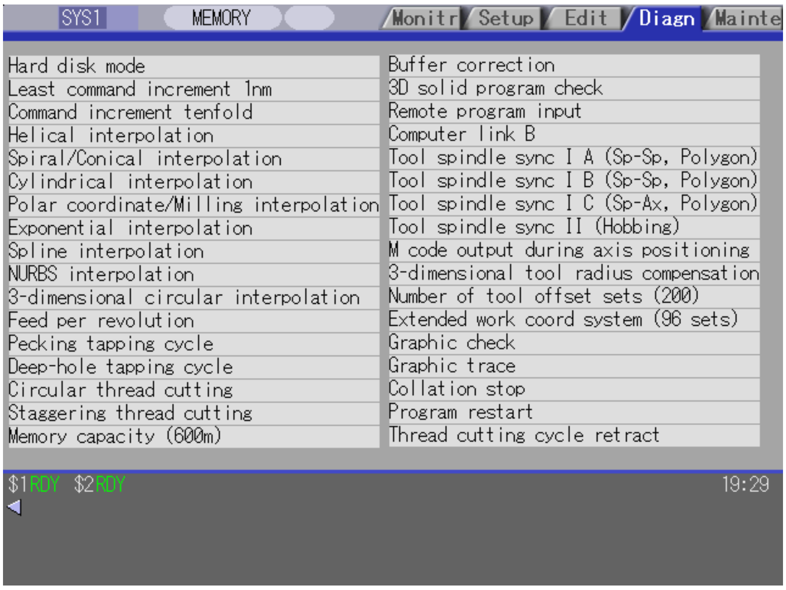
Menu keys explanation

Menu	Details	Type	Reference
S/W config	This displays the software list.	C	
H/W config	This displays the hardware list.	C	
Ladder config	This displays the PLC program list (file name, file label, and execution type	C	

12.2 Option display screen

NC internal option function is showed in this screen. Every option functions was used and showed by function name. You can use next page key to change screen display.

(1)



Display items explanation

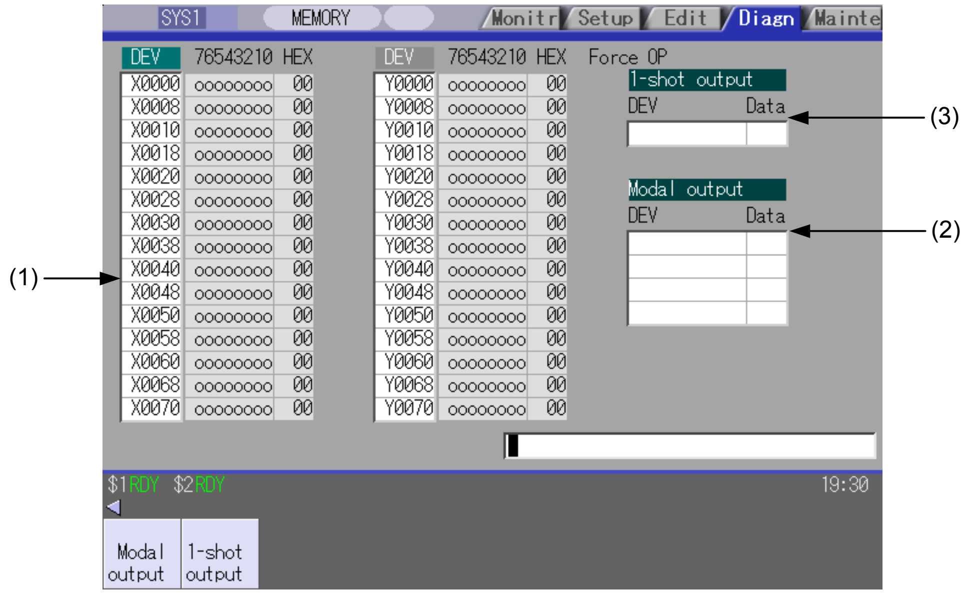
Like above picture showing, the blue color bar items is the option function can use. The function can work.

Display item	Details
(1) Option items	The list of currently usable options are displayed. The options set when the power is turned ON are displayed.

12.3 I/F Diagnosis screen

The various input/output signals for the PLC (Programmable Logic Controller) control can be displayed and set in this screen.
These signals can be used in confirmation of the machine sequence operation during PLC development, and in confirmation and forced output, etc., of the input/output data between the NC and PLC.

(Note) Pay close attention to the sequence operation when using these functions during machine operation.



Display item explanation

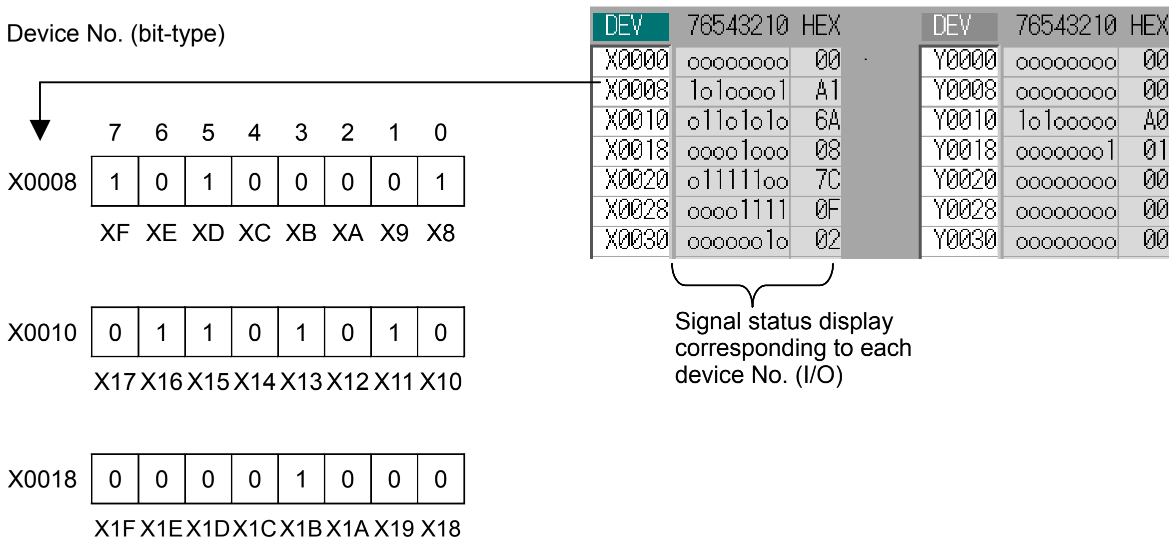
Display item	Details
(1) Device No. and input/ output signal value (binary/ hexadecimal display)	This displays the data from the device Nos. designated in the setting area in numerical order. The data is displayed as binary (bit units) and hexadecimal values. Individual device Nos. can be displayed separately in the left area and right area. Select the valid area with theand |← key when →| operations such as display changeover and data setting are carried out. Each X, Y, M, F, L, SM, TI, TO, TS, TA, STI, STO, STS, STA, CI, CO, CS, CA, D, R, SB, B, V, SW, SD, W, P, K, and H data is the target data.
(2) Modal output	This displays the data and device to carry out modal output. The details to be defined are set here when carrying out the modal type forced output of PLC interface signals. Refer to "5.3.2 Carrying Out Modal Output" for details.
(3) 1-shot output	This displays the data and device to carry out one-shot output. The details to be defined are set here when carrying out the one-shot type forced output of PLC interface signals. Refer to "5.3.3 Carrying Out One-shot Output" for details.

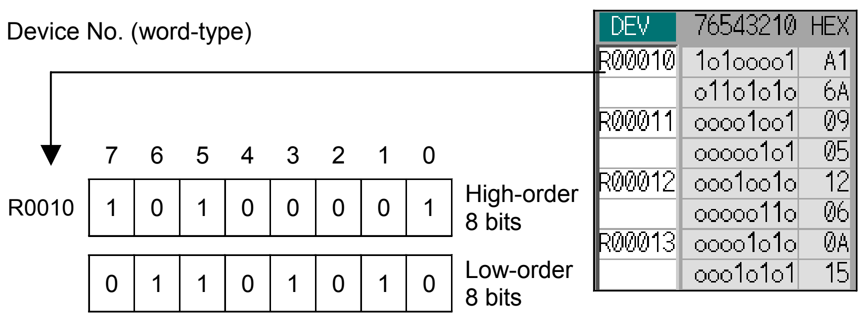
Menu key explanation

Menu	Details	Type	Reference
Modal output	This changes the setting area to an input standby status. The signal is forcibly output (modal).	A	5.3.2 Carrying out modal output
1-shot output	This changes the setting area to an input standby status. The signal is forcibly output (one-shot).	A	5.3.3 Carrying out one-shot output

How to read device and display data

A device is an address for classifying a signal handled in the PLC. A device No. is a series of numbers attached to that device.





PLC device list

Device	Device No.	No. of points	Units	Details
X (*)	X0 to X1FFF	8192	1-bit	Input signals to the PLC. Machine input, etc.
Y	Y0 to Y1FFF	8192	1-bit	Output signals to the PLC. Machine output, etc.
M	M0 to M10239	10240	1-bit	For temporary memory
F	F0 to F1023	1024	1-bit	For temporary memory. Alarm message interface.
L	L0 to L511	512	1-bit	Latch relay (Backup memory)
SM (*)	SM0 to SM127	128	1-bit	Special relay
TI	TI0 to TI703	704	1-bit	Timer contact
TO	TO0 to TO703	704	1-bit	Timer output
TS	TS0 to TS703	704	16-bit	Timer setting value
TA	TA0 to TA703	704	16-bit	Timer current value
STI	STI0 to STI63	64	1-bit	Integrated timer contact
STO	STO0 to STO63	64	1-bit	Integrated timer output
STS	STS0 to STS63	64	16-bit	Integrated timer setting value
STA	STA0 to STA63	64	16-bit	Integrated timer current value
CI	CI0 to CI255	256	1-bit	Counter contact
CO	CO0 to CO255	256	1-bit	Counter output
CS	CS0 to CS255	256	16-bit	Counter setting value
CA	CA0 to CA255	256	16-bit	Counter current value
D	D0 to D2047	2048	16-bit	Data register
R (*)	R0 to R13311	13312	16-bit	File register
SB	SB0 to SB1FF	512	1-bit	MELSEC NET/10 link special relay
B	B0 to B1FFF	8192	1-bit	MELSEC NET/10 link relay
V	V0 to V255	256	1-bit	MELSEC NET/10 edge relay
SW	SW0 to SW1FF	512	16-bit	MELSEC NET/10 link special register
SD	SD0 to SD127	128	16-bit	MELSEC NET/10 special register
W	W0 to W1FFF	8192	16-bit	MELSEC NET/10 link register

(Note) The use of devices marked with a * mark in the device column has been determined.
Do not use devices other than those corresponding to the input/output signals with the machine side (input/output signals of the remote I/O unit), even if it is an undefined vacant device.

12.3.1 Display PLC device information

The various status signals and register data used in the PLC can be monitored and displayed. When this screen is first selected, the respective 16-byte amounts of input/output data are displayed from device "X0000" on the left display area, and from device "Y0000" on the right side.
This screen constantly monitors and displays the PLC signal statuses. Consequently, when signals are changed in the PLC, the display is changed according to the changes.
Note that because time differences occur between the PLC signal change and the signal display, there may be a delay in the display. The machine may also not be able to correspond to extremely brief signal changes.

Displaying the data of a arbitrary device No. "X0020"

(1) Press the menu tab key [⇤], [⇥], and select the area to display the data.

(2) Set the device No. (X0020), and press the [INPUT] key.
→ The device "X0020" appears at the head of the valid display area.

DEV	76543210	HEX	DEV	76543210	HEX
X0020	11111111	FF	Y0000	oooooooo	00
X0028	o1oooooo	40	Y0008	ooooooo1	01
X0030	oooo111o	0E	Y0010	oooooooo	00
X0038	oooooooo	00	Y0018	oooooooo	00

(Note) When setting the device No., an error will occur if a number exceeding the specifications or an illegal address is set.

The valid area device Nos. change in page units when [↑]/[↓] is pressed. Changing of the pages stops within the range of device numbers of which the device has.

(1) Press the [↓] key.
→ The data is displayed from the next number currently displayed.

DEV	76543210	HEX	DEV	76543210	HEX
X0000	1oooooo1	81	Y0000	oooooooo	00
X0008	oooooo1o	02	Y0008	ooooooo1	01
X0010	oooo1111	0F	Y0010	oooooooo	00
X0018	1oo11111	9F	Y0018	oooooooo	00

DEV	76543210	HEX	DEV	76543210	HEX
X0080	11111111	FF	Y0000	oooooooo	00
X0088	o1oooooo	40	Y0008	ooooooo1	01
X0090	oooo1111	0F	Y0010	oooooooo	00
X0098	oooooooo	00	Y0018	oooooooo	00

12.3.2 Carrying out module output

Modal type forced output of PLC interface signals is carried out. Once set, this data is held until cancelled, the power is turned ON/OFF, or other data is overwritten. There are four sets of devices that modally output. If this number is exceeded, the previously existing data is overwritten.

Menus used in modal output

Menu	Details	Type	Reference
Modal clear	This releases the modal output for the device at the cursor position in the modal output area. The released data is erased from this area.	C	"Releasing the modal output"

Modally outputting data "1" to device "X0048"

(1) Press the menu key [Modal output]. → The modal output mode is entered, and the cursor appears at the modal output area.

(2) Using the [↑] and [↓] keys, move the cursor to the setting position.

(3) Set the device and data, and press the [INPUT] key.

X0048/1 [INPUT]

→ Modal output is executed, and the cursor disappears. The data that was in the cursor position is overwritten by the input data, and is invalidated.
The modal output mode is cancelled by pressing the [◁] key.

(Note 1) The data of the modally output device is displayed in order in the selected area.
This modal output is held until the output is cancelled or the power is turned OFF.

(Note 2) When no data is set (Ex."X0048/","X0048"), the operation message "Setting Data not found" is displayed.

Releasing the modal output

(1) Press the menu key [Modal output]. → The modal output mode is entered, and the cursor appears at the modal output area.

(2) Using the [↑] and [↓] keys, move the cursor to the data to be released.

(3) Press the menu key [Modal clear]. → The data that was in the cursor position is released from modal output. The "DEV" and "Data" columns become blank.
The modal output mode is cancelled by pressing the [◁] key.

⚠ Caution

⚠ Pay close attention to the sequence operation when carrying out forced data setting (forced output) in the I/F diagnosis screen during machine operation.

12.3.3 Carrying out one-shot output

The one-shot type PLC interface signal forced output is forcibly output only once during the screen operations.
Thus, it may not be possible to confirm the PLC interface signals updated with the PLC on the screen.

One-shot outputting data "1" to device "X0042"

(1)	Press the menu key [1-shot output].	➡	The one-shot output mode is entered, and the cursor appears at the one-shot output area.
(2)	Set the device and data, press the [INPUT] key. X0042/1 [INPUT]	➡	The input data is overwritten in the one-shot output area, and is one-shot output. The cursor in the one-shot output area disappears. The data of the one-shot output device is displayed in order in the selected area. The one-shot output mode is cancelled by pressing the [◁] key.

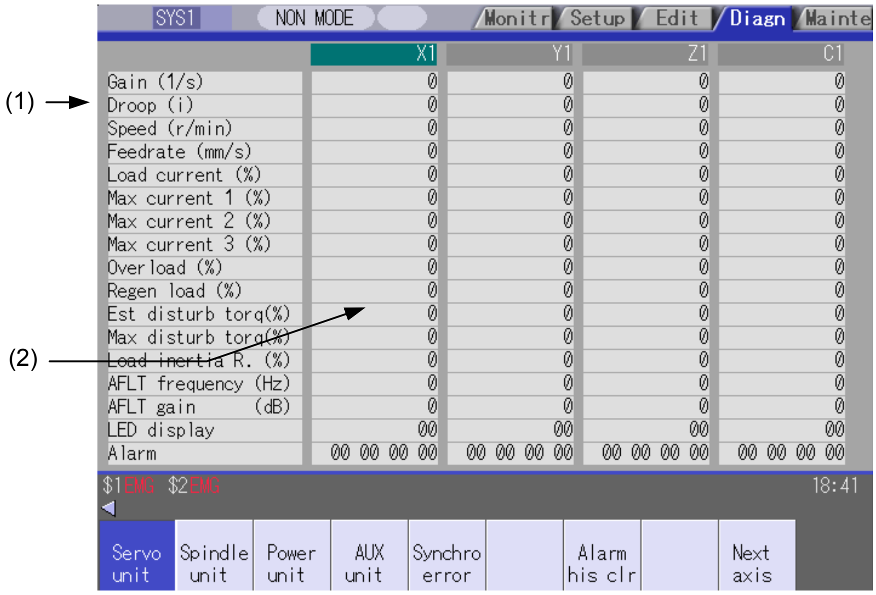
(Note 1) Because the input signal (X, etc.) to the PLC is updated at the head of each PLC cycle, the machine immediately returns to the normal state, even if one-shot type forced output is carried out.
(Note 2) When no data is set (Ex.: "X0048/","X0048"), the operation message "Setting Data not found" is displayed.

⚠ Caution

⚠ Pay close attention to the sequence operation when carrying out forced data setting (forced output) in the I/F diagnosis screen during mach

12.4 Drive monitor screen

The diagnosis information from the drive section can be monitored with this screen.
Servo axis unit, spindle unit, power supply unit and synchronous error information is displayed.



Display items explanation

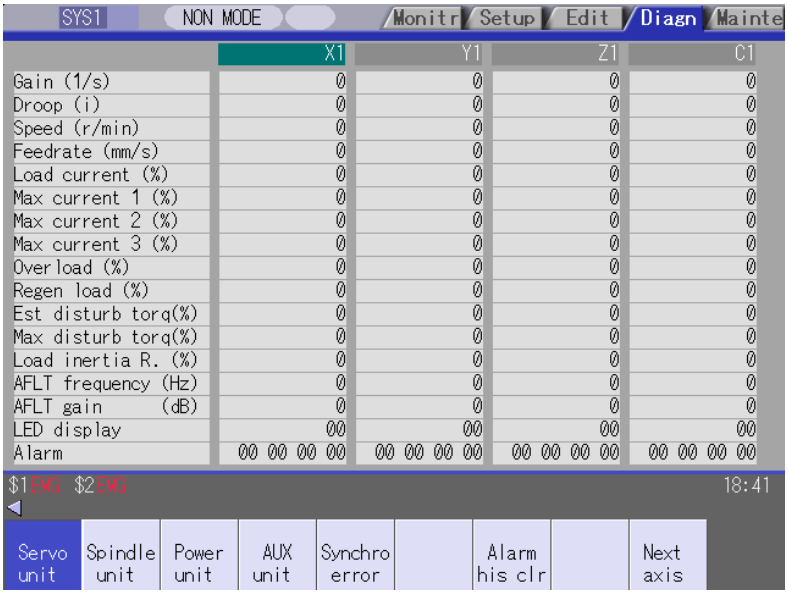
Display item	Details
(1) Monitoring items	This displays each item being monitored. The display is changed using the page changeover keys.
(2) Data of each axis and unit	This displays the data of each axis or each unit being monitored.

Menu keys explanation

Menu	Details	Type	Reference
Servo unit	This displays the diagnosis information of the servo unit in the data display area.	B	5.4.1 Servo axis unit display items
Spindle unit	This displays the diagnosis information of the spindle unit in the data display area.	B	5.4.2 Spindle unit display items
Power unit	This displays the diagnosis information of the power supply unit in the data display area.	B	5.4.3 Display items for the power supply unit
AUX unit	This monitors the various data related to the auxiliary axis (MR-J2-CT) servo control. The menu appears and operation is possible only when there is one or more valid auxiliary axes in the auxiliary axis control.	B	5.4.4 Display items for the auxiliary axis unit
Synchro error	This displays the diagnosis information of the synchronous error in the data display area. The menu appears and operation is possible only when the synchronous control axis option is valid.	B	5.4.5 Display items for the synchronous error
Alarm his clr	This clears the diagnosis information alarm history.	A	5.4.6 Clearing the alarm history
Next axis	This displays the data for the next four axes. The menu appears and operation is possible only when diagnosis information for five or more axes is displayed.	C	

12.4.1 Servo Axis Unit Display Items

The various data related to the servo axis (NC axis, PLC axis) is monitored.
To reference, change the display items using the ↑ key and ↓ key.



The axis name set in the base axis specification parameter "#1022 axname2" appears at the axis name.

Display items explanation

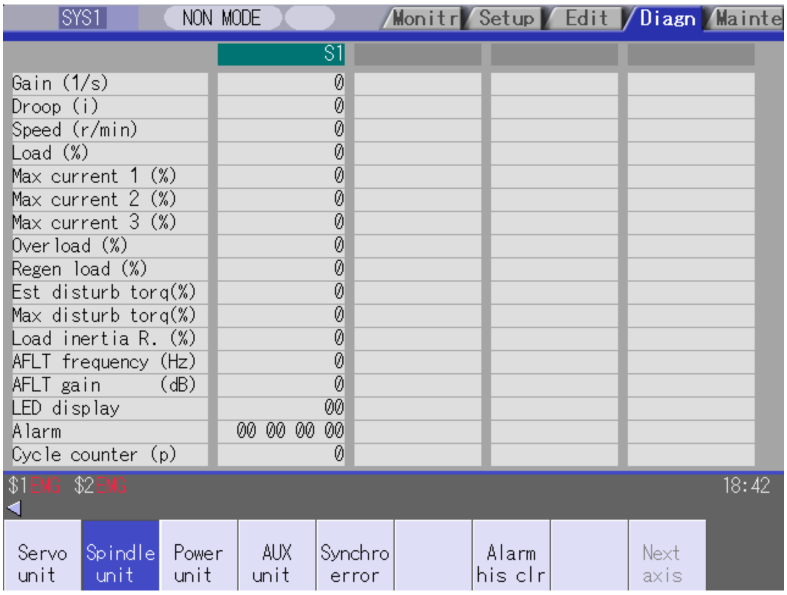
Display item	Details
Gain (1/s)	This displays the position loop gain. Position loop gain : $\dfrac{\text{Feedrate (mm/s)}}{\text{Tracking delay error (mm)}}$
Droop (i)	The error of the actual machine position to the command position is called droop. This error is proportional to command speed value.
Speed (r/min)	This displays the actual rotation speed of motor.
Feedrate (mm/s)	This displays the feedrate detected by the detector mounted on the machine end.
Load current (%)	This displays the FB value of the motor current in terms of continuous current during stalling.
Max current 1 (%)	This displays the motor current command in terms of continuous current during stalling. An absolute value of the current command peak value sampled after the power ON is displayed.
Max current 2 (%)	This displays the motor current command in terms of continuous current during stalling. An absolute value of the current command peak value sampled in most recent 2 seconds is displayed.
Max current 3 (%)	This displays the FB value of the motor current in terms of continuous current during stalling. An absolute value of the current FB peak value sampled in most recent 2 seconds is displayed.
Overload (%)	This is the data used to monitor the motor overload.
Regen Load (%)	This is the data used to monitor the resistance overload state when the resistance regenerative power supply is connected.
Est disturb torq (%)	This displays the estimated disturbance torque in terms of stall rated torque when the disturbance observer is valid.

Display item	Details
Max disturb torq (%)	This displays the estimated disturbance torque in terms of stall rated torque when the collision detection function is adjusted. An absolute value of the estimated disturbance torque peak value sampled in most recent 2 seconds is displayed.
Load inertia R. (%)	This displays the estimated load inertia ratio when the collision detection function is adjusted.
AFLT frequency (Hz)	This displays the present operation frequency of the adaptive filter.
AFLT gain (dB)	This displays the present filter depth of the adaptive filter.
LED display	This displays the 7-segment LED of the driver.
Alarm	This displays the alarms and warnings other than the LED display (displayed on drive unit side).
Cycle counter (p)	This displays the position within one rotation of the encoder detector. The position is displayed as a grid point value as "0", within one rotation in the range of "0" to "RNG (movement units) × 1000".
Grid space	This displays the grid space for the reference position return. (Command unit)
Grid amnt	This displays the distance from the dog-off point to the grid point when the dog-type reference position return is displayed. The grid mask amount is not included. (Command unit)
Machine posn	This displays the NC basic machine coordinate system position. (Command unit)
Motor end FB	This displays the feedback value of the speed detector. (Command unit)
Machine end FB	This displays the feedback position of the machine end position detector. (Command unit)
FB error (i)	This displays the error of the motor end FB and machine end FB.
DFB compen amnt (i)	This displays the compensation pulse amount during dual feedback control.
Remain command	The remaining movement distance of one block is displayed. (Command unit)
Currnt posn (2)	The value of the tool compensation amount subtracted from the current position is displayed. (Command unit)
Man int amt	The amount of interrupt movement in the manual absolute OFF state is displayed. (Command unit)
Abs pos command	This displays the coordinates of absolute position excluding the machine error compensation amount. (Command unit)
Mach err comp val	This displays the machine error compensation amount. (Command unit)
Control input 1L 1H : 6L 6H	This indicates the control signal input from NC. This is used by the system.
Control output 1L 1H : 6L 6H	This indicates the control signal output to NC. This is used by the system.
Detection system	This displays the detector type symbol of the absolute position detection system. ES : Semi-closed encoder EC : Ball screw end encoder LS : Linear scale MP : MP scale ESS : Semi-closed high-speed serial encoder ECS : Ball screw end high-speed serial encoder INC : Incremental

Display item	Details
Power OFF posn	This displays the coordinate at NC power OFF in the basic machine coordinate system. (Command unit)
Power ON posn	This displays the coordinate at NC power ON in the basic machine coordinate system. (Command unit)
Current posn	This displays the current coordinate in the basic machine coordinate system. (Command unit)
R0	This displays the multi-rotation counter value of the detector stored in the memory during basic point setting.
P0	This displays the position within one rotation of the detector stored in the memory during basic point setting.
E0	This displays the absolute position error stored in the memory during basic point setting.
Rn	This displays the multi-rotation counter value of the current detector.
Pn	This displays the position within one rotation of the detector.
En	This displays the absolute position error during NC power OFF.
ABS0	This displays the absolute position reference counter.
ABSn	This displays the current absolute position.
MPOS	This displays the offset amount of the MP scale when the power is turned ON.
Unit type	This displays the servo driver type.
Unit serial No.	This displays the servo driver serial No.
Software version	This displays the servo side software version.
Control method	SEMI : Semi-closed loop CLOSED : Closed loop DUAL : Dual feedback
Motor end detector	This displays the motor end detector type.
Motor end detect No	This displays the motor end detector serial No.
Machine end detector	This displays the machine end detector type. The type is displayed when the control method is CLOSED or DUAL. * is displayed when the method is SEMI.
Mach. end detect No	This displays the machine end detector serial No.
Motor	This displays the motor type.
Work time	This displays the READY ON work time. (Units: 1hr)
Alarm hist 1: Time 1: Alarm : 8: Time 8: Alarm	This displays servo alarms that occurred in latest order with the following formats. Time : Work time when the alarm occurred. Alarm No. : Number of the servo alarms that occurred.
Maint hist 1 to 4	This displays the maintenance dates. Year : One digit Month : 1 to 9, X (Oct.), Y (Nov.), Z (Dec.)
Maint status	This displays the maintenance status.

12.4.2 Spindle unit monitor screen

The various data related to the spindle is monitored.
Change the display items using the ↑ key and ↓ key to refer to the data.



Display items explanation

Display items	Details
Gain (1/s)	This displays the position loop gain. Position loop gain : $\dfrac{\text{Feedrate (mm/s)}}{\text{Tracking delay error (mm)}}$
Droop (i)	The error of the actual machine position to the command position is called droop. This error is proportional to command speed value.
Speed (r/min)	This displays the actual rotation speed of motor.
Load (%)	This displays the motor load.
Max current 1 (%)	This displays the motor current command in terms of continuous current during stalling. An absolute value of the current command peak value sampled after the power ON is displayed.
Max current 2 (%)	This displays the motor current command in terms of continuous current during stalling. An absolute value of the current command peak value sampled in most recent 2 seconds is displayed.
Max current 3 (%)	This displays the FB value of the motor current in terms of continuous current during stalling. An absolute value of the current FB peak value sampled in most recent 2 seconds is displayed.
Overload (%)	This is the data used to monitor the motor overload.
Regen load (%)	This is the data used to monitor the resistance overload state when the resistance regenerative power supply is connected.
Est disturb torq (%)	This displays the estimated disturbance torque in terms of stall rated torque when the disturbance observer is valid.
Max disturb torq(%)	This displays the estimated disturbance torque in terms of stall rated torque when the collision detection function is adjusted. An absolute value of the estimated disturbance torque peak value sampled in most recent 2 seconds is displayed.
Load inertia R. (%)	This displays the estimated load inertia ratio when the collision detection function is adjusted.

Display items	Details
AFLT frequency (Hz)	This displays the current operation frequency of the adaptive filter.
AFLT gain (dB)	This displays the current filter depth of the adaptive filter.
LED display	This displays the 7-segment LED of the driver.
Alarm	This displays the alarms and warnings other than the LED display.
Cycle counter (p)	This displays the position within one rotation of the encoder detector. The position is displayed within one rotation in the range of "0" to "RNG (movement units) × 1000" using the grid point value as "0".
Grid space	This displays the grid space for the reference position return. (Command unit)
Grid amnt	This displays the distance from the dog-off point to the grid point when the dog-type reference position return is displayed. The grid mask amount is not included. (Command unit)
Machine posn	This displays the NC basic machine coordinate system position. (Command unit)
Motor end FB	This displays the feedback value of the speed detector. (Command unit)
FB error (i)	This displays the error of the motor end FB and machine end FB.
DFB compen amnt (i)	This displays the compensation pulse amount during dual feedback control.
Sync tap err (mm)	This displays the synchronous error width between the spindle and the drilling axis during the synchronous tapping. (mm) (Note 1) (When the parameter "#1041 I_Inch" is set to "1", "Sync tap err (inch)" is displayed.)
Sync tap err (deg)	This displays the synchronous error angle between the spindle and the drilling axis during the synchronous tapping. (degree) (Note 1)

(Note) Synchronous tapping error

This displays the maximum values of the synchronous tapping error that occur during the synchronous tapping.
The synchronous tapping error means the motor tracking delay for the commanded positions of the spindle and the tapping axis.
The positive synchronous tapping error means that the tapping axis is delayed responding to the spindle, and the negative synchronous tapping error means that the spindle is delayed responding to the tapping axis.

Data name	Details
Synchronous tapping error width (Max value)	• This outputs the data of which absolute value is the largest among the synchronous tapping error width (-99999.999 to 99999.999 mm) during the synchronous tapping modal. • This data will be initialized to "0" when entering the synchronous tapping modal or restoring the power. Other than that, the data continues to display the maximum value.
Synchronous tapping error angle (Max value)	• This outputs the data of which absolute value is the largest among the synchronous tapping error angle (-99999.999 to 99999.999 °) during the synchronous tapping modal. • This data will be initialized to "0" when entering the synchronous tapping modal or restoring the power. Other than that, the data continues to display the maximum value.

<table>
<tr><th>Display item</th><th>Details</th></tr>
<tr><td>Control input 1L
Control input 1H</td><td>This displays the control input signals from the NC.
<table>
<tr><th></th><th>Bit</th><th>Details</th></tr>
<tr><td rowspan="8">1L</td><td>0</td><td>READY ON command</td></tr>
<tr><td>1</td><td>Servo ON command</td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td>Alarm reset command</td></tr>
<tr><td rowspan="8">1H</td><td>8</td><td>Torque limit selection command 1</td></tr>
<tr><td>9</td><td>Torque limit selection command 2</td></tr>
<tr><td>A</td><td>Torque limit selection command 3</td></tr>
<tr><td>B</td><td></td></tr>
<tr><td>C</td><td></td></tr>
<tr><td>D</td><td></td></tr>
<tr><td>E</td><td></td></tr>
<tr><td>F</td><td></td></tr>
</table>
</td></tr>
<tr><td>Control input 2L
Control input 2H</td><td>This displays the control input signals from the NC.
<table>
<tr><th></th><th>Bit</th><th>Details</th></tr>
<tr><td rowspan="8">2L</td><td>0</td><td></td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td></td></tr>
<tr><td rowspan="8">2H</td><td>8</td><td></td></tr>
<tr><td>9</td><td>Speed observation command valid</td></tr>
<tr><td>A</td><td>Door closed (controller)</td></tr>
<tr><td>B</td><td>Door closed (all drive units)</td></tr>
<tr><td>C</td><td></td></tr>
<tr><td>D</td><td></td></tr>
<tr><td>E</td><td></td></tr>
<tr><td>F</td><td></td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Display item</th><th>Details</th></tr>
<tr><td>Control input 3L

Control input 3H</td><td>This displays the control input signals from the NC.
<table><tr><th></th><th>Bit</th><th>Details</th></tr><tr><td>3L</td><td>0</td><td></td></tr><tr><td></td><td>1</td><td></td></tr><tr><td></td><td>2</td><td></td></tr><tr><td></td><td>3</td><td></td></tr><tr><td></td><td>4</td><td></td></tr><tr><td></td><td>5</td><td></td></tr><tr><td></td><td>6</td><td></td></tr><tr><td></td><td>7</td><td></td></tr><tr><td>3H</td><td>8</td><td></td></tr><tr><td></td><td>9</td><td></td></tr><tr><td></td><td>A</td><td></td></tr><tr><td></td><td>B</td><td></td></tr><tr><td></td><td>C</td><td></td></tr><tr><td></td><td>D</td><td></td></tr><tr><td></td><td>E</td><td></td></tr><tr><td></td><td>F</td><td></td></tr></table></td></tr>
<tr><td>Control input 4L

Control input 4H</td><td>This displays the control input signals from the NC.
<table><tr><th></th><th>Bit</th><th>Details</th></tr><tr><td>4L</td><td>0</td><td rowspan="3">Spindle control mode selection command 1, 2, 3</td></tr><tr><td></td><td>1</td></tr><tr><td></td><td>2</td></tr><tr><td></td><td>3</td><td></td></tr><tr><td></td><td>4</td><td></td></tr><tr><td></td><td>5</td><td>Gear selection command 1</td></tr><tr><td></td><td>6</td><td>Gear selection command 2</td></tr><tr><td></td><td>7</td><td></td></tr><tr><td>4H</td><td>8</td><td></td></tr><tr><td></td><td>9</td><td></td></tr><tr><td></td><td>A</td><td></td></tr><tr><td></td><td>B</td><td></td></tr><tr><td></td><td>C</td><td>M-coil switch command</td></tr><tr><td></td><td>D</td><td>L-coil switch command</td></tr><tr><td></td><td>E</td><td>Sub-motor selection command</td></tr><tr><td></td><td>F</td><td></td></tr></table></td></tr>
</table>

Display item	Details
Control input 5L Control input 5H	This displays the control input signals from the NC.
Control input 6L Control input 6H	This displays the control input signals from the NC.

	Bit	Details
5L	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
5H	8	
	9	
	A	
	B	
	C	
	D	
	E	Spindle holding force up
	F	

	Bit	Details
6L	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
6H	8	
	9	
	A	
	B	
	C	
	D	
	E	
	F	

Display item	Details
Control output 1L Control output 1H	This displays the control output signals to the NC.
Control output 2L Control output 2H	This displays the control output signals to the NC.

	Bit	Details
1L	0	In READY ON
	1	In Servo ON
	2	
	3	
	4	
	5	
	6	
	7	In alarm occurrence
1H	8	In torque limit selection 1
	9	In torque limit selection 2
	A	In torque limit selection 3
	B	
	C	In-position
	D	In torque limitation
	E	
	F	In warning occurrence

	Bit	Details
2L	0	Z-phase passed
	1	
	2	
	3	In zero speed
	4	
	5	
	6	
	7	In external emergency stop
2H	8	
	9	In speed observation
	A	Door closed (controller)
	B	Door closed (local drive units)
	C	
	D	
	E	
	F	

Display item	Details
Control output 3L Control output 3H	This displays the control output signals to the NC.
Control output 4L Control output 4H	This displays the control output signals to the NC.

	Bit	Details
3L	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
3H	8	
	9	
	A	
	B	
	C	
	D	
	E	
	F	

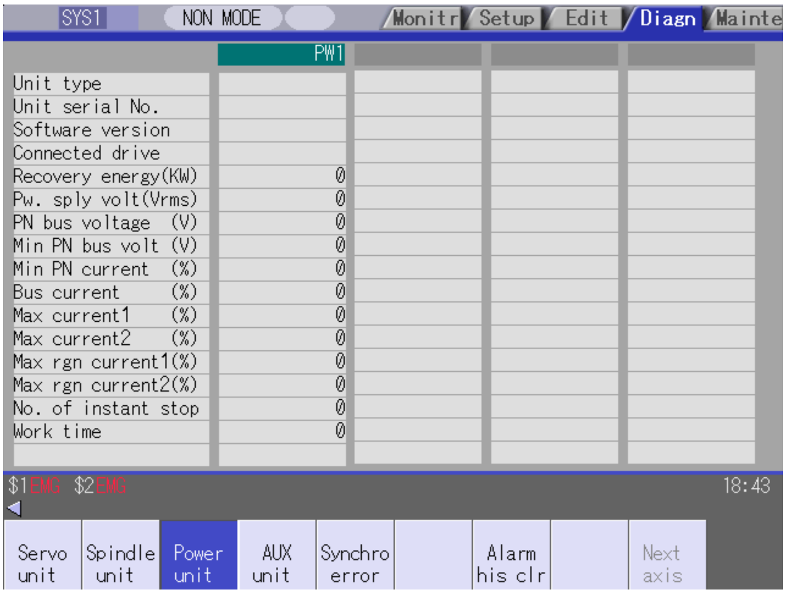
	Bit	Details
4L	0	Spindle control mode selected 1, 2, 3
	1	
	2	
	3	
	4	
	5	Gear selected 1
	6	Gear selected 2
	7	
4H	8	
	9	
	A	
	B	
	C	M-coil switched
	D	L- coil switched
	E	Sub-motor selected
	F	

<table>
<tr><th>Display item</th><th>Details</th></tr>
<tr><td>Control output 5L
Control output 5H</td><td>This displays the control output signals to the NC.
<table>
<tr><th></th><th>Bit</th><th>Details</th></tr>
<tr><td rowspan="8">5L</td><td>0</td><td>Current detection</td></tr>
<tr><td>1</td><td>Speed detection</td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td>In coil changeover</td></tr>
<tr><td>7</td><td></td></tr>
<tr><td rowspan="8">5H</td><td>8</td><td>1-amplifire 2-motor switching</td></tr>
<tr><td>9</td><td>2nd speed detection</td></tr>
<tr><td>A</td><td></td></tr>
<tr><td>B</td><td></td></tr>
<tr><td>C</td><td></td></tr>
<tr><td>D</td><td></td></tr>
<tr><td>E</td><td>In spindle holding force up</td></tr>
<tr><td>F</td><td>2nd in-position</td></tr>
</table>
</td></tr>
<tr><td>Control output 6L
Control output 6H</td><td>This displays the control output signals to the NC.
<table>
<tr><th></th><th>Bit</th><th>Details</th></tr>
<tr><td rowspan="8">6L</td><td>0</td><td></td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td></td></tr>
<tr><td rowspan="8">6H</td><td>8</td><td></td></tr>
<tr><td>9</td><td></td></tr>
<tr><td>A</td><td></td></tr>
<tr><td>B</td><td></td></tr>
<tr><td>C</td><td></td></tr>
<tr><td>D</td><td></td></tr>
<tr><td>E</td><td></td></tr>
<tr><td>F</td><td></td></tr>
</table>
</td></tr>
</table>

Display item	Details
Unit type	This displays the spindle type.
Unit serial No.	This displays the spindle serial No.
Software version	This displays the software No. and version on the spindle side.
Motor end detect No	This displays the motor end detector serial No.
Mach. end detect No	This displays the machine end detector serial No.
Work time	This displays the READY ON cumulative time. (Units: 1hr)
Alarm hist 1: Time 1: Alarm : 8: Time 8: Alarm	This displays servo alarms that occurred in latest order with the following formats. Time : Work time when the alarm occurred. Alarm No. : Number of the servo alarms that occurred.
Maint hist 1 to 4	This displays the maintenance dates. Year : One digit Month : 1 to 9, X (Oct.), Y (Nov.), Z (Dec.)
Maint status	This displays the maintenance status.

12.4.3 Display Items for the Power Supply Unit

The various data related to the power supply is monitored.
Change the display items using the ↑ key and ↓ key to refer to the data.



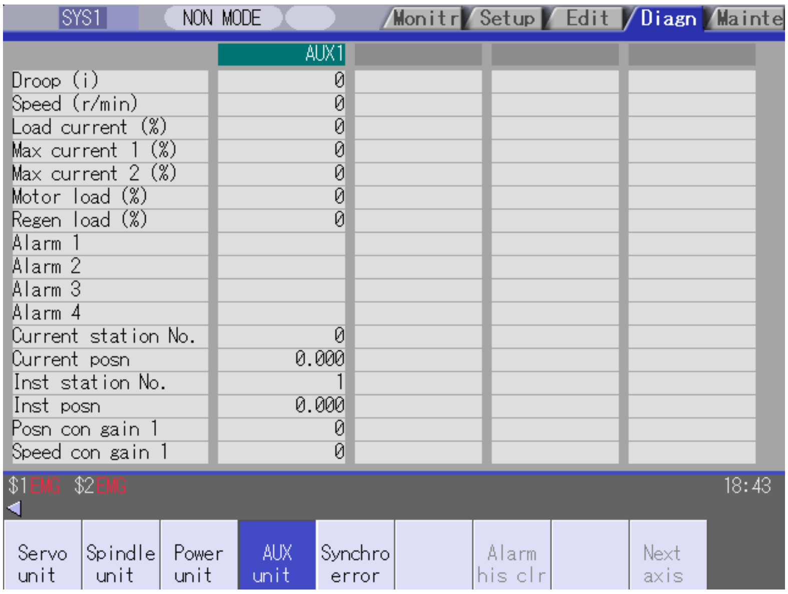
Display items explanation

Display item	Details
Unit type	This displays the power supply unit type.
Unit serial No.	This displays the serial No. of the power supply unit.
Software version	This displays the software version.
Connected drive	This displays the I/F channel No. (mcp_no, smcp_no) of the drive unit connected to each power supply unit.
Recovery energy(KW)	This displays the regenerative power every two seconds. (0 to 999kW)
Pw. sply volt (Vrms)	This displays the effective value of the power supply voltage. (0 to 999Vrms)
PN bus voltage (V)	This displays PN bus voltage. (0 to 999V)
Min PN bus volt (V)	This displays the minimum PN bus voltage after the NC power ON. (0 to 999V)
Min PN current (%)	This displays the bus current when PN bus voltage is at minimum. (driving: +、regenerative: -) (0 to 999%)
Bus current (%)	This displays the bus current. (driving: +、regenerative: -) (0 to 999%)
Max current1 (%)	This displays the maximum driving current after the NC power ON. (0 to 999%)
Max current2 (%)	This displays the maximum driving current in most recent 2 seconds. (0 to 999%)
Max rgn current1(%)	This displays the maximum regenerative current after the NC power ON. (0 to 999%)
Max rgn current2(%)	This displays the maximum regenerative current in most recent 2 seconds. (0 to 999%)
No. of instant stop	This displays the number of instantaneous stop exceeding 1 cycle of the power. (0 to 9999 times)
Work time	This displays the READY ON cumulative time. (Units: 1hr)

Display item	Details
Alarm hist 1: Time 1: Alarm : 8: Time 8: Alarm	This displays servo alarms that occurred in latest order with the following formats. Time : Work time when the alarm occurred Alarm No. : Number of the servo alarms that occurred
Maint hist 1 to 4	This displays the maintenance dates. Year : One digit Month : 1 to 9, X (Oct.), Y (Nov.), Z (Dec.)
Maint status	This displays the maintenance status.

12.4.4 Display Items for the Auxiliary Axis Unit

"Auxiliary axis unit" appears only when there is one or more valid auxiliary axis. (Base common parameter "#1044 auxno" is "1" or more).
The various data related to the auxiliary axis (MR-J2-CT) servo control is monitored.
For reference, change the display items using the ⬆ key and ⬇ key.



Data for the number of axes (up to four) set with the base common parameter "#1044 auxno (No. of connected MR-J2-CT units)" is displayed.

Display items explanation

Display item	Details
Droop (i)	The error of the actual machine position to the commanded position is called droop. This difference is displayed.
Speed (r/min)	This displays the actual rotation speed of the motor.
Load current (%)	This displays the continuous executable load torque. This is 100% when the constant torque is generated.
Max current 1 (%)	This displays the commanded torque.
Max current 2 (%)	This displays the maximum generation torque of the commanded torque.
Motor load (%)	This displays the rate of the load torque to the tolerable load torque as a percentage.
Regen load (%)	This displays the rate of the regenerative power to the tolerable regenerative power as a percentage.
Alarm 1 to 4	This displays the system alarm, servo alarm, system warning, servo warming, operation alarm No. and alarm information.
Current station No.	This displays the number of the currently stopped station.
Current posn	This displays the coordinate of current position. (Unit: °)
Inst station No.	This displays the commanded station number for automatic operation, or the nearest station number to be stopped at for manual operation.
Inst posn	This displays the coordinate position corresponding to the target station number. (Unit: °)
Display item	**Details**
Posn con gain 1	This displays the position control gain 1.

Speed con gain 1	This displays the speed control gain 1.
Posn con gain 2	This displays the position control gain 2.
Speed con gain 2	This displays the speed control gain 2.
Speed int comp	This displays the speed integral compensation value.
Load inertia	This displays the estimated motor shaft conversion load inertia ratio value in respect to the motor's rotor inertia.
Unit type	This is the unit type.
Software version	This is the servo drive unit software version.
Motor type	This is the motor type.
Unit serial No.	This displays the unit serial No.
Alarm hist 1: No. 1: State : 6: No. 6: State	Alarm history : Alarm number Alarm history : Alarm details information

12.4.5 Display Items for the Synchronous Error

The "Synchronous error" appears only when the synchronous control axis option is valid.
The various data related to the synchronous error is monitored.

Display items explanation

Display item	Details
Slave axis	This displays the slave axis name which is controlled following the master axis. The axis name corresponding to the axis No. set in the axis specification parameter "#1068 slavno (slave axis No.)" is displayed. The name set in the base axis specification parameter "#1022 axname2 (No. 2 axis name)" is displayed for the slave axis.
Command error	This is the deviation of the slave axis machine position in respect to the master axis. The error of the commanded position to the servo control section before pitch error compensation, relative position compensation and backlash compensation is displayed. If this error occurs, the parameters that should be the same for the synchronous axes are different. Command error = Command s - command m -Δ Command s : Slave axis commanded position Command m : Master axis commanded position Δ : Command s - command m at start of synchronous control
FB error	This is the deviation of the slave axis feedback position in respect to the feedback position from the master axis servomotor. The actual error of the machine position is displayed. The synchronous error check is carried out on this error. FB error = FBs - FBm - Δ FBs : Slave axis feedback position FBm : Master axis feedback position Δ : FBs - FBm at start of synchronous control
FB error MAX1	This displays the maximum FB error after the start of the synchronous control.
FB error MAX2	This displays the maximum FB error approx. every 30 seconds after the start of the synchronous control.
Machine posn	This displays the commanded machine position for the master axis.

12.4.6 Clearing the Alarm History

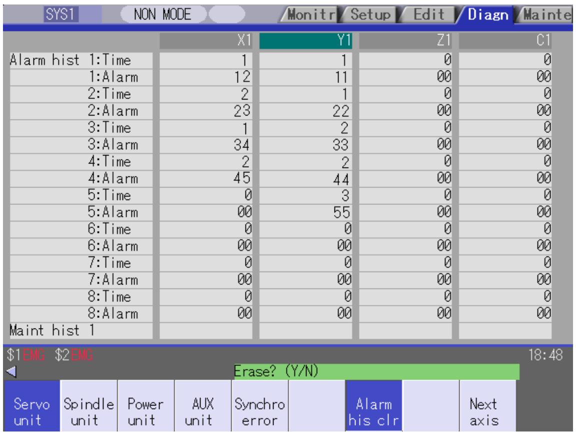
Operation method

(1) Press the menu [Servo unit] or [Spindle unit].

(2) Using the menu [Next axis], tab keys [⇤] and [⇥], select the axis (device) from which to clear the alarm history.

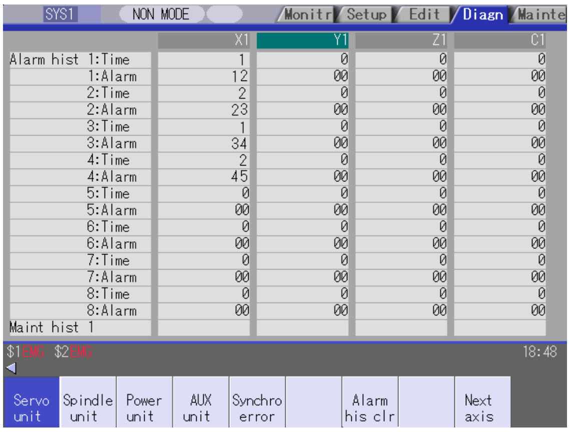
(3) Press the menu [Alarm his clr].

➡ The menu is highlighted, and a message appears to confirm the erasing.
The alarm history1: Time appears at the head.



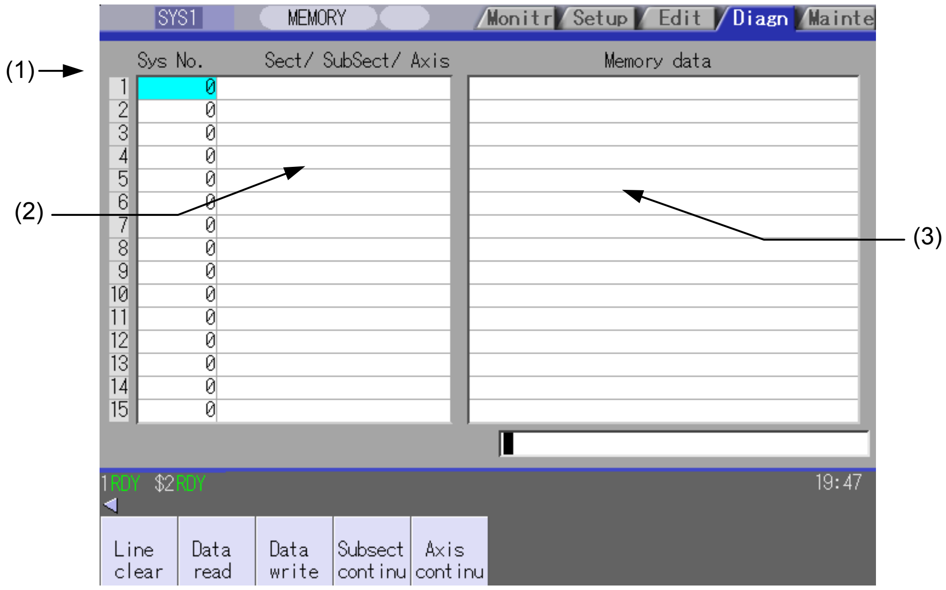
(4) Press the [Y] key.

➡ The alarm history data for the selected axis (device) is cleared to zero.



12.5 NC Memory Diagnosis Screen (NC Memory Diagn Screen)

The NC internal data can be displayed and rewritten on the screen. The custom API library's NC data read/write interface is used to display and rewrite the NC's internal data. The contents of the NC data can be displayed by designating the part system No., section No., sub-section No. and axis No. on this screen.



Display items explanation

Display item	Details
(1) Index No.	This displays the registration No. of the NC memory data. When one of the "2. Data contents" is set, the number is highlighted indicating that the normal display of the data contents has stopped.
(2) Data contents	Part system No.: Designate the part system No. Designate "0" to designate the data common for the part systems. Section/sub-section/axis: Designate the section No., sub-section No. and axis No. of the data to be set and displayed. The setting format is, section No./sub-section No./axis No. **(Note)** The axis No. "1" is handled as the first axis. Designate "0" for the data which does not require an axis designation.
(3) Memory data	This displays the contents of the data.

Menu keys explanation

Menu	Details	Type	Reference
Line clear	This erases the information in the line where the cursor is. (One entire line becomes blank.) The cursor does not move at this time.	C	
Data read	The contents of the set address data (Part system No, Section/sub-section/axis) for all the lines are constantly displayed. The Index No. highlight (indicating data is being set) is released. The cursor appears in "Part system No" of that line.	C	5.5.1 Writing/Reading the Data Using the NC Data Designation
Data write	This writes the data (Note) in the setting area to the NC memory indicated by address data at the cursor position. The Data No. highlight (indicating data is being set) is released, and constant display is started. After writing, the cursor moves to "Part system No" of the next line.	A	
Subsect continu	Based on the data of the address data where the cursor is, this displays the continuous data to which the sub-section No. has been added to the address data from the line where the cursor is. The cursor moves to "Part system No " of that line.	C	
Axis continu	Based on the data of the address data where the cursor is, this displays the continuous data to which the axis No. has been added to the address data from the line where the cursor is. The cursor moves to "Part system No " of that line.	C	

(Note) Decimal, hexadecimal, floating point data and character string data writing is possible.
Note that hexadecimal, floating point data and character strings may not be settable depending on the data.

Decimal : Integers without decimal points....... (Example) -1234
Hexadecimal : An "H" is necessary at the end........ (Example) 1234H
Floating point data : Data with a decimal point .... (Example) -12.3
Character string data : Character string .... (Example) X

12.5.1 Writing/Reading the Data Using the NC Data Designation

When reading the Process parameter "#8007 Auto corner override", the following data is set.

(Example) Part system No. : 1
Section No. : 126
Sub-section No. : 8007
Axis name : 0

Setting the data

(1) Using the menu cursor keys, move the cursor to the "Part system No." position.
→ The cursor moves to the "Part system No." position.

(2) Set the part system No.

1 [INPUT]

→ The index No. is highlighted, and the set value is displayed.
The cursor moves to the right item position.

	Sys No.	Sect/ SubSect/ Axis
1	1	37/ 1/ 1
2	1	37/ 1/ 2
3	1	
4	0	
5	0	

(3) Separate the section No., sub-section No., axis No. with a "/", and set.

126/8007/0 [INPUT]

→ The set value appears.
The cursor moves to the right item position.

(4) Press the menu key [Data write].

(5) Set the data, and press the [INPUT] key.
→ Write processing is executed.
The Index No. highlight returns to normal.

Reading the data

(1) Set the part system No., section No., sub-section No., axis No. in the same way as step “Setting the data”.

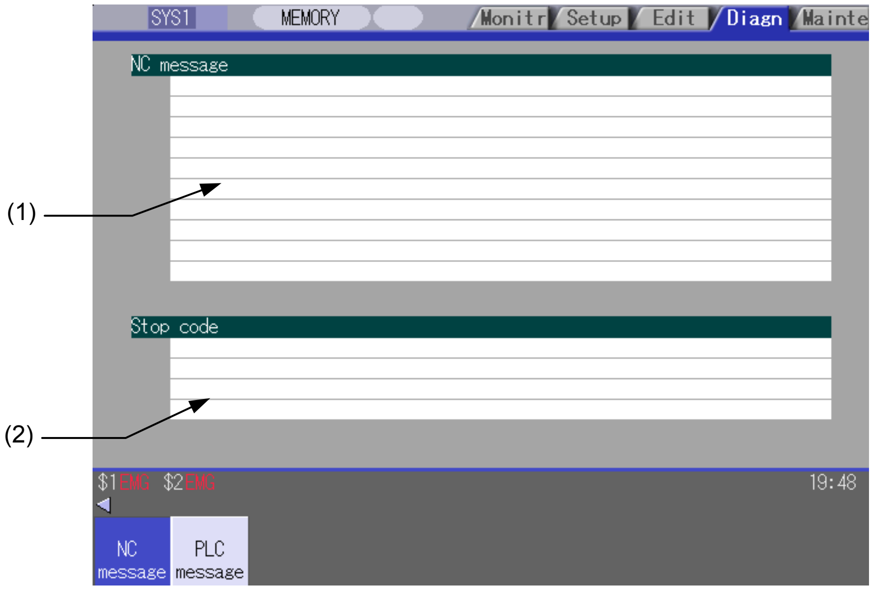
(2) Press the menu key [Data read] .
→ The index No. highlight is released, and the normal display of the memory data starts.
The data format (data size, display format) of the data displayed in the memory data differs according to the data type to be displayed.

(Note) The cursor is constantly displayed. Using the cursor keys, the cursor can be moved to the part system No. area, section/sub-section/axis area.

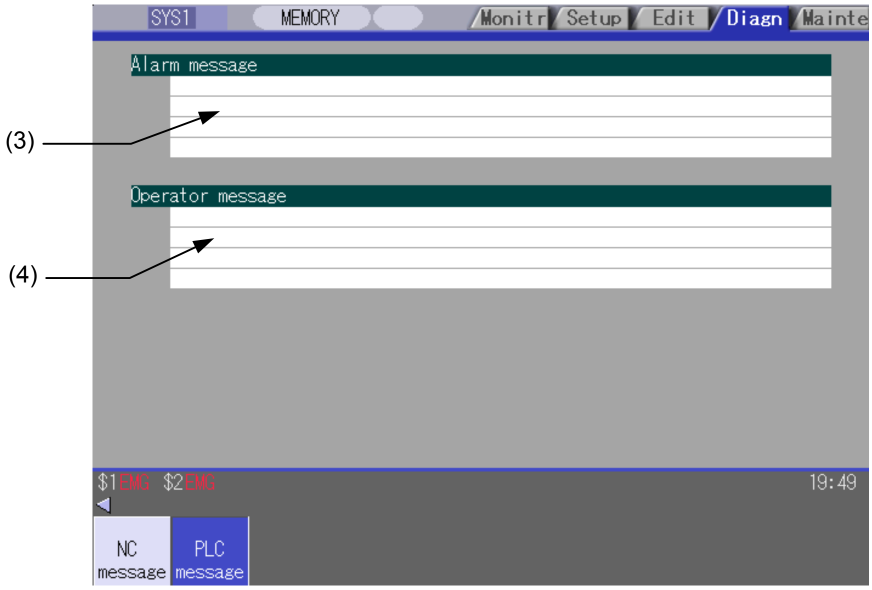
12.6 Alarm Screen

A list of currently occurring alarms or messages can be displayed on this screen.
The displayed messages include the NC alarms, stop codes, alarm messages, operator messages, etc.

NC message



PLC message



Display items explanation

Display item	Details
(1) NC alarm	This displays the operation alarms, program errors, MCP alarms, servo alarms, system alarms, etc. Up to 10 messages are displayed in order of priority.
(2) Stop code	This displays the automatic operation status or stop status during automatic operation. Up to 4 messages are displayed in order of priority.
(3) Alarm message	Using the PLC programs, this displays messages such as details of machine abnormalities. Up to 4 messages are displayed.
(4) Operator message	Using the PLC programs, this displays operator information messages. Macro alarm messages are also displayed in this field. Up to 4 messages are displayed.

Message display colors

The messages are color-coded in the following manner.

Message type		Character color	Background color
NC message	Alarm	White	Red
	Warning	Black	Yellow
Stop code		Black	Yellow
Alarm message		White	Red
Operator message		Black	Yellow

Axis name display

The axis name is displayed in messages for each axis. The axis name is displayed as shown below according to the axis type.

Axis type	Axis name display	Display example	Remarks
NC axis	Control axis name (Name of axis in part system)	XYZ	If the same message occurs for each part system, several NC axes are displayed together.
Spindle	'S' + spindle No.	S1S2	If the same message occurs, several spindles are displayed together.
PLC axis	'P' + PLC axis No.	P1P2	If the same message occurs, several PLC axes are displayed together.
Auxiliary axis	'A' + auxiliary axis No.	A1A2	If the same message occurs, several auxiliary axes are displayed together.

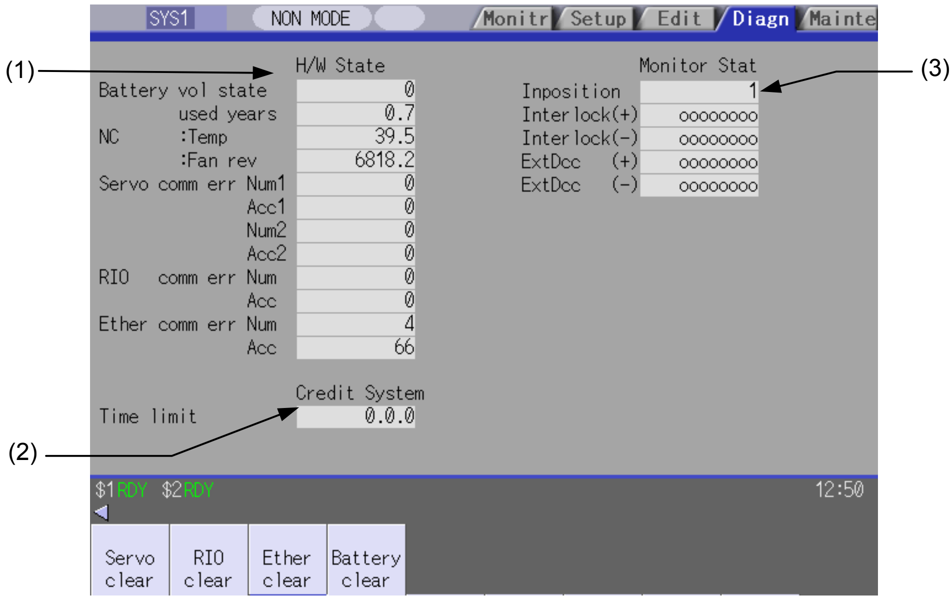
If the same message occurs for different axis types, they will appear as separate messages.

Part system display

The part system name is also displayed if the message is output for each part system. The part system name set in "#1169 system name" is displayed. The part system name does not appear for the 1-part system.

12.7 Self Diagnosis Screen

The H/W state and NC operation state can be confirmed on this screen.



Display items explanation

Display item	Details
(1) H/W state (common for part systems)	This displays H/W state of NC unit and display unit. As for the NC unit, the contents are as follows.

Display item	Details	
NC		
Battery vol state	This displays the current state of the battery voltage as 0 to 3 below.	
	Condition	Classification
	0 (normal state)	--
	1 (battery drop)	Cautions (gray)
	2 (detector error) 3 (no battery)	Warning (yellow)
used years	This displays approximate time of the battery used from the last replacement.	
	Condition	Classification
	Recommended battery use (5 years) ≤ Time for the battery used	Warning (yellow)
NC :Temp	This displays the current temperature of the control unit.	
	Condition	Classification
	-8°C<Control unit temp.≤-3°C	Cautions (gray)
	63°C≤ Control unit temp.<68°C	
	Control unit temp.≤-8°C	Warning (yellow)
	68°C≤ Control unit temp.	
:Fan rev	This displays the current fan rotation speed of the control unit.	
	Condition	Classification
	Fan rot. speed ≤ 4000 r/min	Warning (yellow)

(Continues to the next page)

Display item	Details
(Continued from the previous page)	Communication between NC unit and display unit
	Servo comm err Num1: This displays the count of occurrence for "Y02 SV commu er: Recv frame No. 0051 xx04" after the power ON.
	Acc1: This displays the cumulated count of occurrence for " Y02 SV commu er: Recv frame 0051 xx04". Press the [Servo clear] menu to clear the cumulated count to "0".
	Servo comm err Num2: This displays the count of occurrence for "Y02 SV commu er: Data ID error 0051 xx03" after the power ON.
	Acc2: This displays the cumulated count of occurrence for "Y02 SV commu er: Data ID error 0051 xx03". Press the [Servo clear] menu to clear the cumulated count to "0".
	RIO comm err Num: This displays the count of occurrence for RIO communication error after the power ON.
	Acc: This displays the cumulated count of occurrence for RIO communication error. Press the [RIO clear] menu to clear the cumulated count to "0".
	Ether comm err Num: This displays the count of occurrence for "Ether communication error" after the power ON.
	Acc: This displays the cumulated count of occurrence for " Ether communication error ". Press the [Ether clear] menu to clear the cumulated count to "0".

<table>
<tr><th>Display item</th><th>Details</th></tr>
<tr><td>(2) Operation state
(Depends on part system)</td><td>This displays the state when the operation seems to be stopped in spite that the alarm does not occur. The following state can be confirmed.
<table>
<tr><th>State</th><th>Details</th></tr>
<tr><td>In-position</td><td>This displays "1" (in-position state) when the following conditions are satisfied for even one axis.
• No acceleration/deceleration delay for all axes
• Within the in-position width set in the parameter for all axes</td></tr>
<tr><td>Interlock(+)</td><td>When the auto interlock +n-th axis signal or the manual interlock +n-th axis signal is OFF, "1" appears for the n-th axis.
(Explanation of the display) o o o o o o 1 o
8th axis … 1st axis
In the above case, the 2nd axis is interlocked.
Even when the number of usable axes is less than 8 in 1 part system, this displays 8 axes fixed.</td></tr>
<tr><td>Interlock(-)</td><td>When the auto interlock -n-th axis signal or the manual interlock -n-th axis signal is OFF, "1" appears for the n-th axis.
The explanation of the display is same as for the "Interlock (+)".</td></tr>
<tr><td>ExtDcc (+)</td><td>When the control axis is moving in (+) direction, "1" appears for the axis if the external deceleration speed is valid, and the feedrate is clamped, exceeding the set value of the external deceleration speed.
(Explanation of the display) o o o o o 1 o 1
8th axis … 1st axis
In the above case, the 1st axis and the 3rd axis are in external deceleration speed.
Even when the number of usable axes is less than 8 in 1 part system, this displays 8 axes fixed.</td></tr>
<tr><td>ExtDcc (-)</td><td>When the control axis is moving in (-) direction, "1" appears for the axis if the external deceleration speed is valid, and the feedrate is clamped, exceeding the set value of the external deceleration speed.
The explanation of the display is same as for the "ExtDcc" (+).</td></tr>
</table>
</td></tr>
<tr><td>(3) Credit system</td><td>This displays the valid term by the credit system when the credit system is valid.
This does not display when the credit system specification is invalid.</td></tr>
</table>

Menu keys explanation

Menu	Details	Type	Reference
Servo clear	This clears the cumulated count of the servo communication error 1 and 2 to "0".	A	Clearing the cumulated counter to zero
RIO clear	This clears the cumulated count of the RIO communication error to "0".	A	
Ether clear	This clears the cumulated count of the Ether communication error to "0".	A	
Battery clear	This clears the time the battery has been used to "0".	A	

Clearing the cumulated counter to zero

(Example) Clearing the cumulated count of the servo communication error

(1)	Press the menu [Servo clear].	➡	A confirmation message will be displayed.
(2)	Press [Y] or [INPUT].	➡	The cumulated count of the servo communication error 1 and 2 will be cleared to "0". When other keys are pressed, it will not clear to "0".

This also applies to [RIO clear], [Ether clear] and [Battery clear] menu.
When using the multi-part system specification, switch the displayed part system by [Next system] menu or the part system switching key [$⇔$].

13 OPTION installation

OPTION in the biggest difference of M700 series can just open the option function through Mitsubishi Electric engineer. Tell Mitsubishi Electric the serial number at first, Mitsubishi Electric engineer download OPTION file through log-in of website. But this set up main point is taught customer how about makes and set up OPTION function.

13.1 Get OPTION file

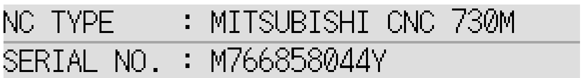
(1) Confirm NC series number

Into 

→ 

→ 

and record left side NC number.



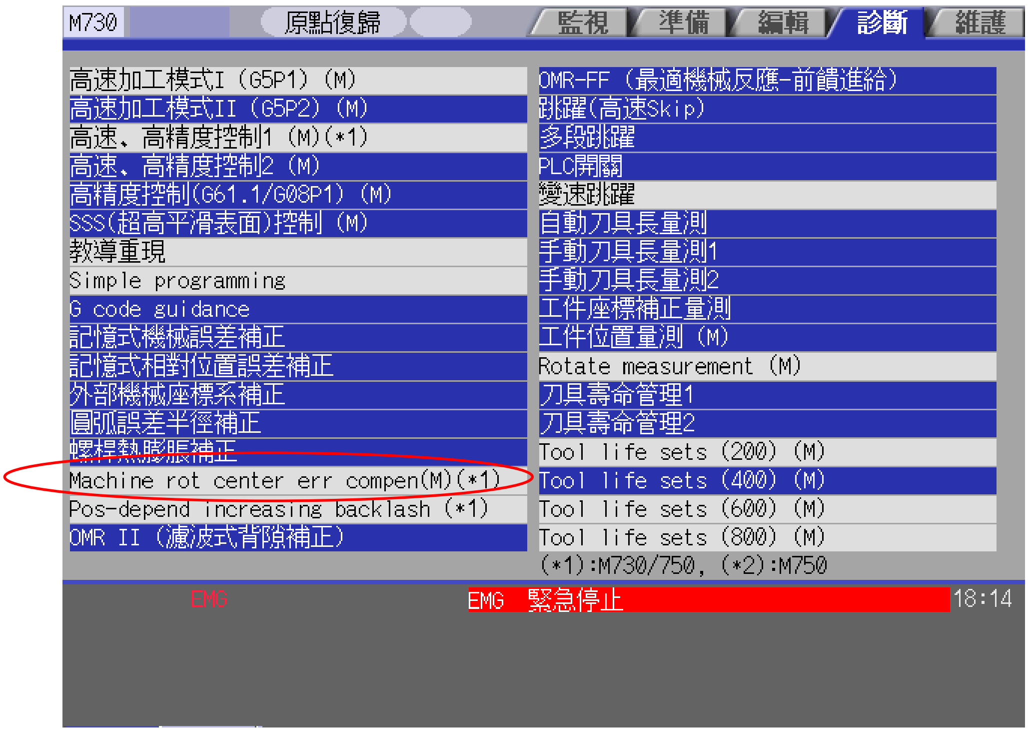
(2) Check OPTION function.

Into 

→ 

。

【NOTE】此 Below example is added（Pos-depend increasing backlash）this function to explain.



(3) Inform Mitsubishi about NC series number and demanded OPTION function.

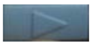
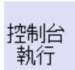
(4) Get OPTION file, please discuss with Mitsubishi relates division.

13.2 Set OPTION function

(1) Carry out ”Console”.

①Into 

→ 

→  next page → 

②Same as above picture, input “M7OPTION” . If it cannot execute, please confirm execution file or OPTION file.

③put in same folder.

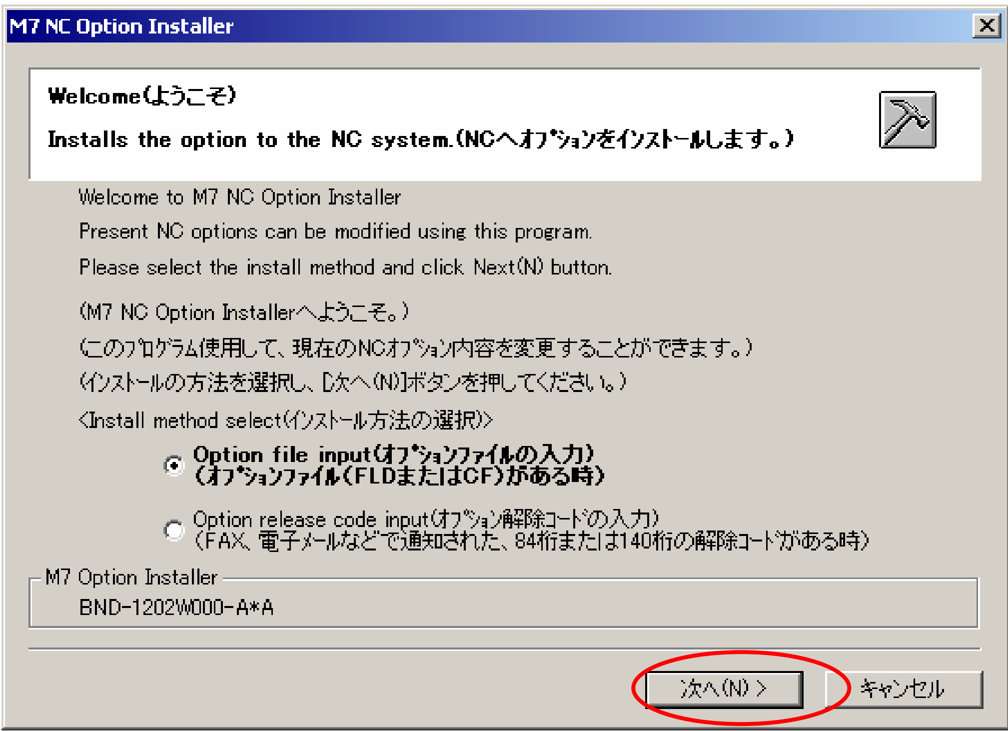
file configuration：

M7OPTION.exe （needed）

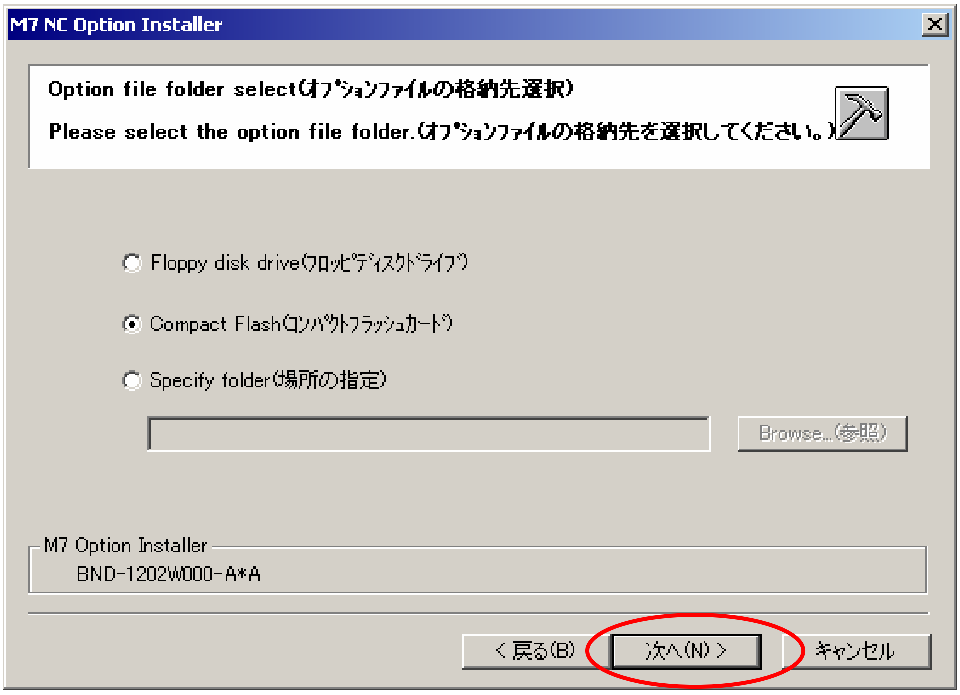
M7OPTION.dll （needed）

M766858044Y.opt （The file name is following NC serial number, sub name is .OPT）

(2) OPTION setting tool screen. Select “ OPTION file input” and press “Next”.

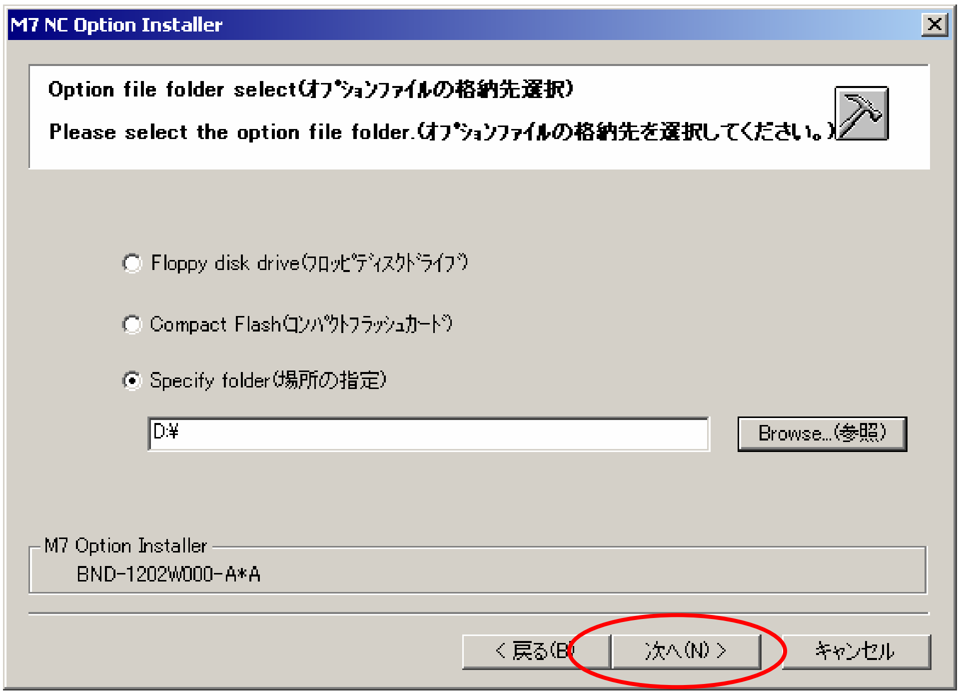


(3) The default folder is front CF card slot, Press next to continue.

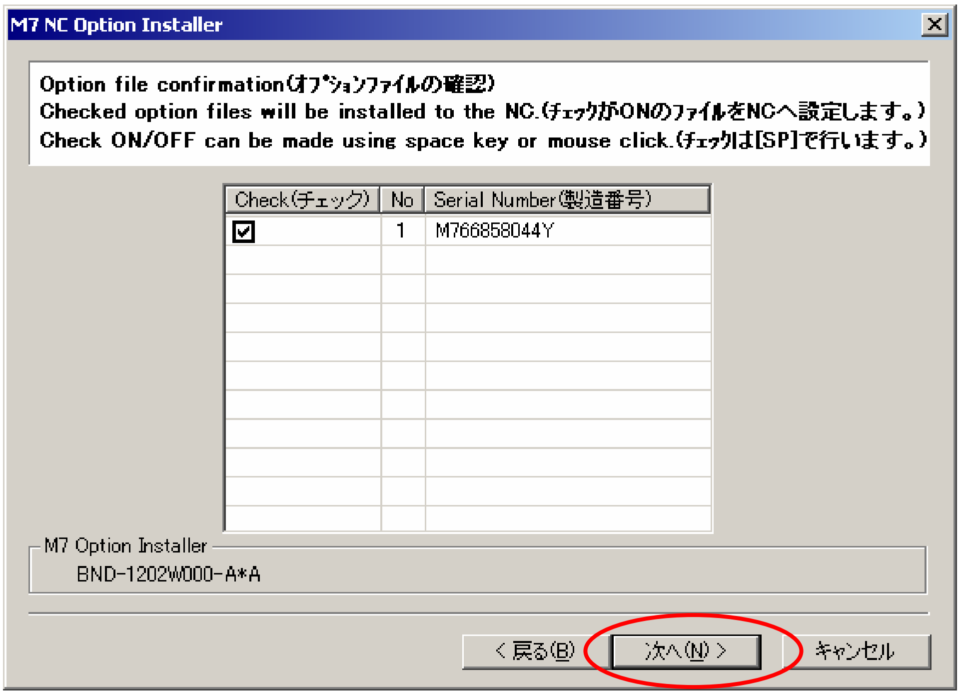


(4) If no OPTION file it will appear below error message.

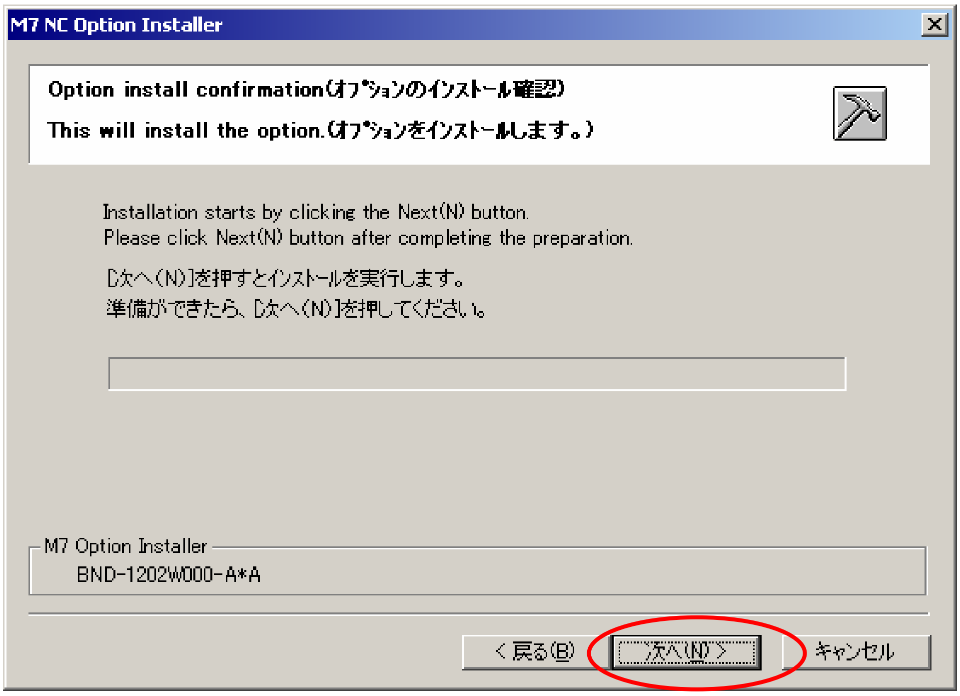
(5) Change file folder.



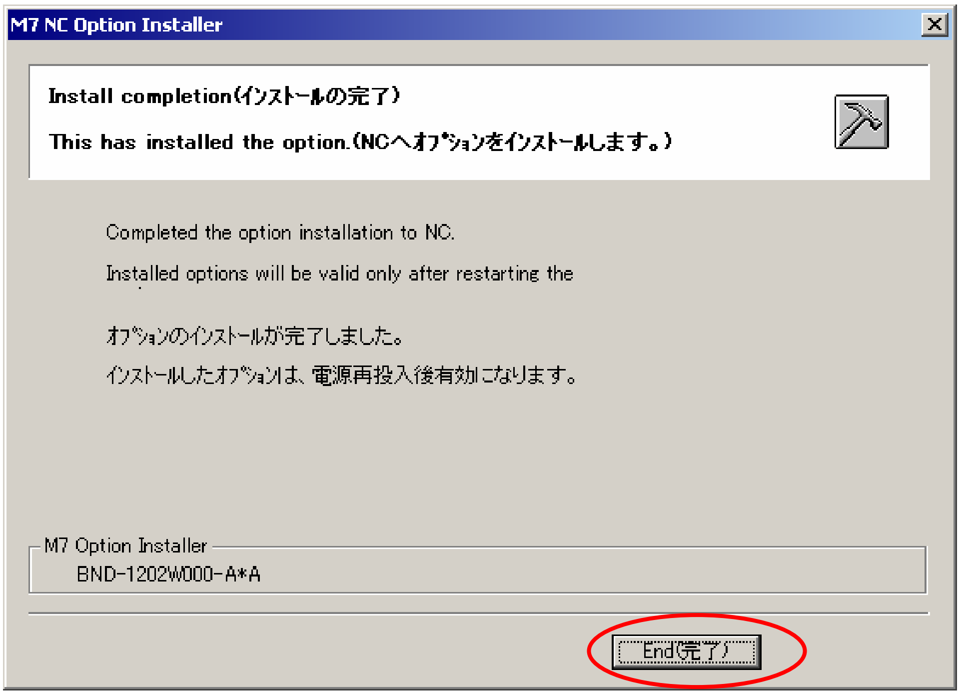
(6) Correct OPTION file.



(7) Press next to start installation.



(8) Installation complete.



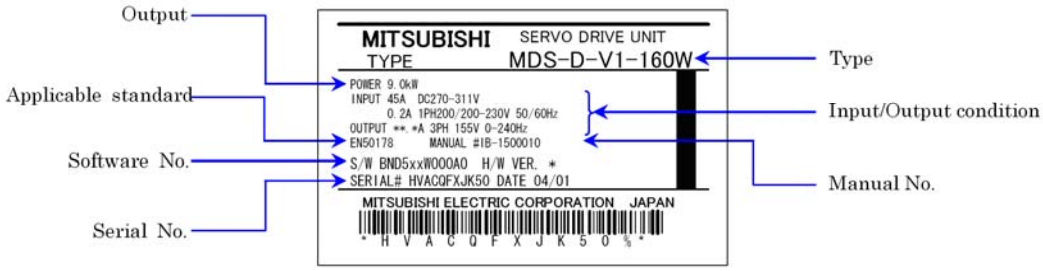
(9) Turn off and restart power again.

(10) Check OPTION screen and confirm option function.

2. SERVO UNIT INTRODUCTION

14. Servo drive unit type

14.1 Servo drive type



Rating nameplate

MDS-D- ə

1-axis servo drive unit			Compatible motor																			
ə Type MDS-D-	Nominal Maximum current	Unit width	HF□										HP□									
			75	105	54	104	154	204	354	453	703	903	54	104	154	224	204	354	454	704	903	1103
V1-20	20A	60mm	●	●																		
V1-40	40A				●	●							●	●								
V1-80	80A						●	●							●	●	●					
V1-160	160A								●	●								●	●			
V1-160W	160A	90mm									●									●		
V1-320	320A	120mm										●									●	
V1-320W	320A	150mm																				●

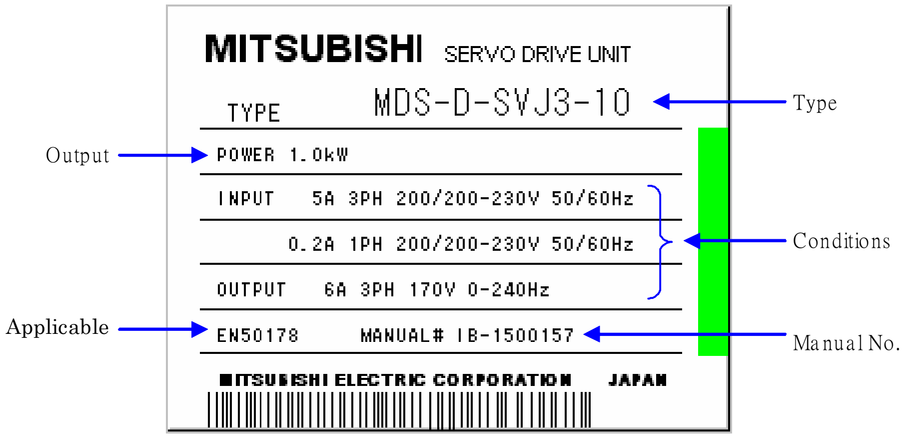
● Indicates the compatible motor for each servo drive unit .

2-axis servo drive unit				Compatible motor																			
ə Type MDS-D-	Nominal Maximum current	Unit width	axis	HF□										HP□									
				75	105	54	104	154	204	354	453	703	903	54	104	154	224	204	354	454	704	903	1103
V2-2020	20+20A	60mm	LM	●	●																		
V2-4020	40+20A		L			●	●							●	●								
			M	●	●																		
V2-4040	40+40A		LM			●	●							●	●								
V2-8040	80+40A		L					●	●							●	●	●					
			M			●	●							●	●								
V2-8080	80+80A		LM					●	●							●	●	●					
V2-16080	160+80A	90mm	L							●	●								●	●			
			M					●	●							●	●	●					
V2-160160	160+160A		LM							●	●								●	●			

● Indicates the compatible motor for each servo drive unit.

Caution	The dynamic brake unit（MDS-D-DBU）is requiredv for the MDS-D-V1-320W

14.1.1 MDS-D-SVJ3 series



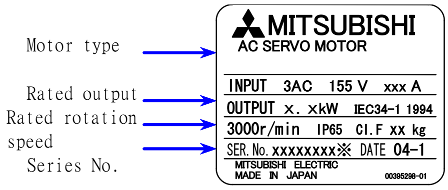
Nameplate

MDS-D-SVJ3 □

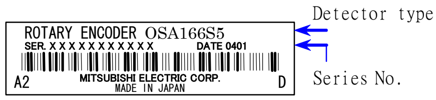
Servo drives			Corresponding motor						
type MDS-D-SVJ3-	Rated Output	Width	HF□ 75	105	54	104	154	204	354
03	0.3kW	40mm							
04	0.4kW	40mm							
07	0.7kW	60mm	●	●	●				
10	1.0kW	90mm				●			
20	2.0kW	90mm					●	●	
35	3.5kW	90mm							●

●can correspond motor

14.2 SERVO MOTOR TYPE



Motor rating nameplate



Detector rating nameplate

(1) HF series

HF ə ə ə - ə

ə Detector

Symbol	Detection method	Resolution	Detector type
A51	Absolute position	1,000,000 p/rev	OSA105S5
A74		16,000,000 p/rev	OSA166S5

ə Shaft end structure

Symbol	Shaft end structure
S	Straight
T	Taper

ə Magnetic brake

Symbol	Magnetic brake
None	None
B	With magnetic brake

ə Rated output · maximum rotation speed

Symbol	Rated output	Maximum rotation speed
75	0.75 kW	5000 r/min
105	1.0 kW	5000 r/min
54	0.5 kW	4000 r/min
104	1.0 kW	4000 r/min
154	1.5 kW	4000 r/min
204	2.0 kW	4000 r/min
354	3.5 kW	4000 r/min
453	4.5 kW	3500 r/min
703	7.0 kW	3000 r/min
903	9.0 kW	3000 r/min

(2) HP series

HP ə ə ə - ə

ə Detector

Symbol	Detection method	Resolution	Detector type
A51	Absolute position	1,000,000 p/rev	OSA105S5
A74		16,000,000 p/rev	OSA166S5

ə Shaft end structure

Symbol	Shaft end structure
S	Straight
T	Taper

ə Magnetic brake

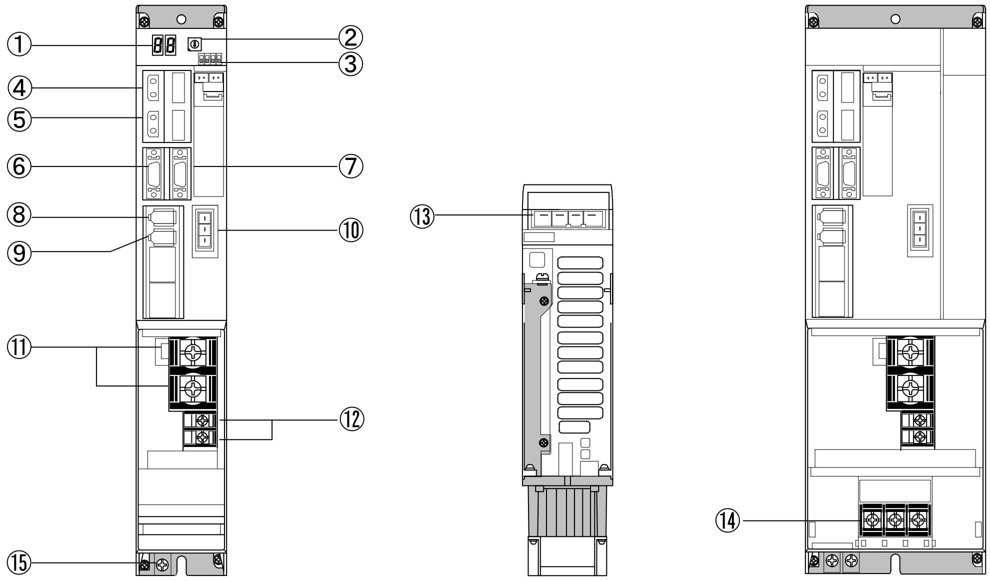
Symbol	Magnetic brake
None	None
B	With magnetic brake

ə Rated output，maximum rotation speed

Symbol	Rated output	Maximum rotation speed
54	0.5 kW	4000 r/min
104	1.0 kW	4000 r/min
154	1.5 kW	4000 r/min
224	2.2kW	4000 r/min
204	2.0 kW	4000 r/min
354	3.5 kW	4000 r/min
454	4.5 kW	4000 r/min
704	7.0 kW	4000 r/min
903	9.0 kW	3000 r/min
1103	11.0 kW	3000 r/min

14.3 Explanation for servo drive unit

14.3.1 MDS-D-V1 series



MDS-D-V1
Width 60mm

Bottom view

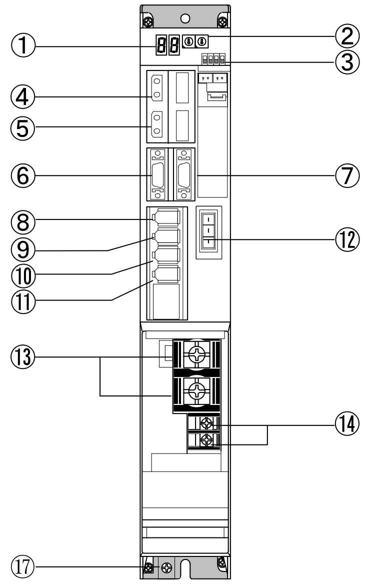
MDS-D-V1
Width 90mm

The connector and terminal block layout may differ according to the unit being used.
Refer to each unit outline drawing for details.

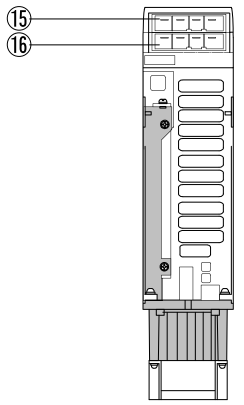
Each part name

		Name		Description
①	Control circuit	LED	–	Unit state indication LED
②		SWL	–	Axis No. setting switch
③		SW1		Unused axis setting switch（L,M axis）
④		CN1A	–	NC or master axis optical communication connector.
⑤		CN1B	–	Slave axis optical communication connector
⑥		CN9	–	Maintenance connector(usually not used)
⑦		CN4	–	Power supply communication connector
⑧		CN2L	–	Motor side detector connection connector
⑨		CN3L	–	Machine side detector connection connector
⑩		CN20	–	Motor brake/dynamic brake control connector
⑪	Main circuit	TE2	L+ L-	Converter voltage input terminal(DC input)
⑫		TE3	L11 L21	Control power input terminal(single-phase AC input)
⑬		TE1	U, V, W,⏚	Motor power supply output connector(3-phase AC output) Motor grounding terminal(for 60mm width)
⑭			U, V, W	Motor power supply output terminal(3-phase AC output) (for 90mm width or more)
⑮		PE	⏚	Grounding terminal Note that TE1 connector(above*(13)*)is Used for the motor grounding of the 90mm width unit.

14.3.2 MDS-D-V2 series



MDS-D-V2



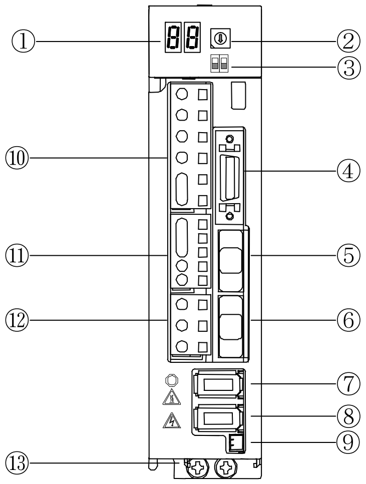
Bottom view

The connector and terminal block layout may differ according to the unit being used.
Refer to each unit outline drawing for details.

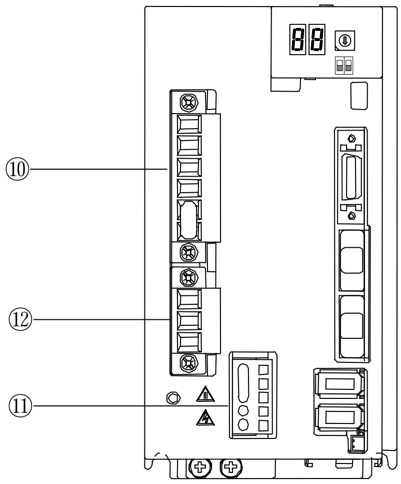
Each part name

		Name		Description
①	Control circuit	LED	–	Unit state indication LED
②		SWL,SWM	–	Axis No. setting switch（L,M axis）
③		SW1	–	Unused axis setting switch（L,M axis）
④		CN1A	–	NC or master axis optical communication connector.
⑤		CN1B	–	Slave axis optical communication connector
⑥		CN9	–	Maintenance connector(usually not used)
⑦		CN4	–	Power supply communication connector
⑧		CN2L	–	Motor side detector connection connector（L Axis）
⑨		CN3L	–	Machine side detector connection connector（L Axis）
⑩		CN2M	–	Motor side detector connection connector（M Axis）
⑪		CN3M	–	Machine side detector connection connector（M Axis）
⑫		CN20	–	Motor brake/dynamic brake control connector
⑬	Main circuit	TE2	L+ L-	Converter voltage input terminal(DC input)
⑭		TE3	L11 L21	Control power input terminal(single-phase AC input)
⑮		TE1	MU, MV, MW, ⏚	Motor power supply output connector（3- phase AC output）
⑯			LU, LV, LW, ⏚	
⑰		PE	⏚	Grounding terminal Used TE1 connector for the motor grounding.

14.3.3 MDS-D-SVJ3 series



MDS-D-SVJ3-03/04/07



MDS-D-SVJ3-10/20/35

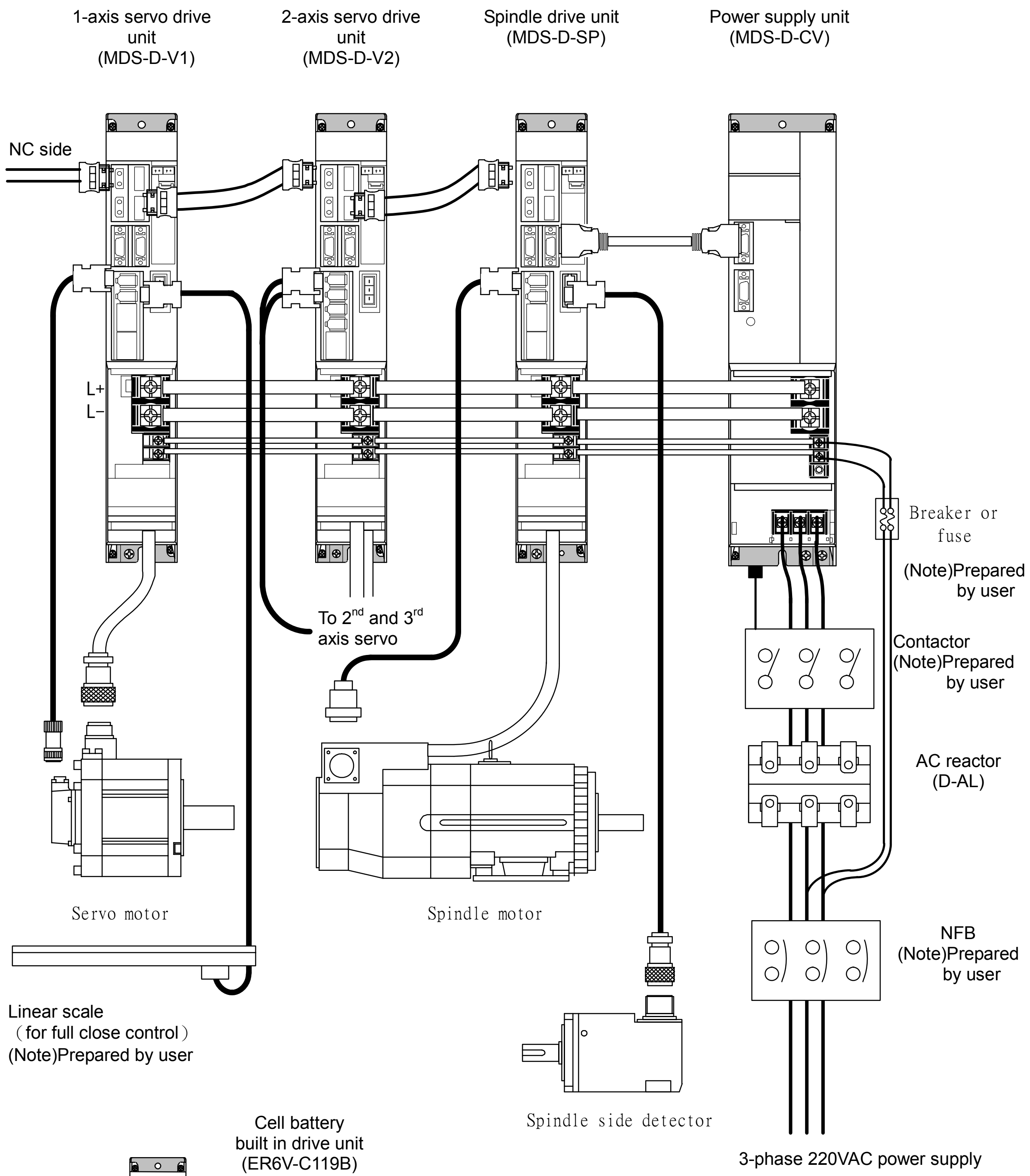
The connector and terminal block layout may differ according to the unit being used. Refer to each unit outline drawing for details.

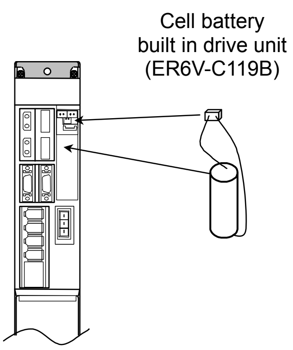
Each part name

		Name		Description	Screw size
(1)	Control circuit	LED	---	Unit status indication LED	---
(2)		SW1	---	Axis No. setting switch	---
(3)		SW2	---	For machine tool builder adjustment (Always ON)	---
(4)		CN9	---	DI/O or maintenance connector	---
(5)		CN1A	---	NC or master axis optical communication connector	---
(6)		CN1B	---	Slave axis optical communication connector	---
(7)		CN2	---	Motor side detector connection connector	---
(8)		CN3	---	Machine side detector connection connector	---
(9)		BAT	---	Battery connection connector	---
(10)	Main circuit	CNP1	L1,L2,L3 N,P1,P2	L1,L2,L3: 3-phase AC power input N,P1,P2: not used (short-circuit between the P1 and P2.)	---
(11)		CNP2	P,C,D L11,L21	Regenerative resistor connection terminal Control power input terminal (single-phase AC input)	---
(12)		CNP3	U, V, W	Motor power output terminal (3-phase AC output)	---
(13)		PE	⏚	Grounding terminal	M4 x 10

14.4 System configuration

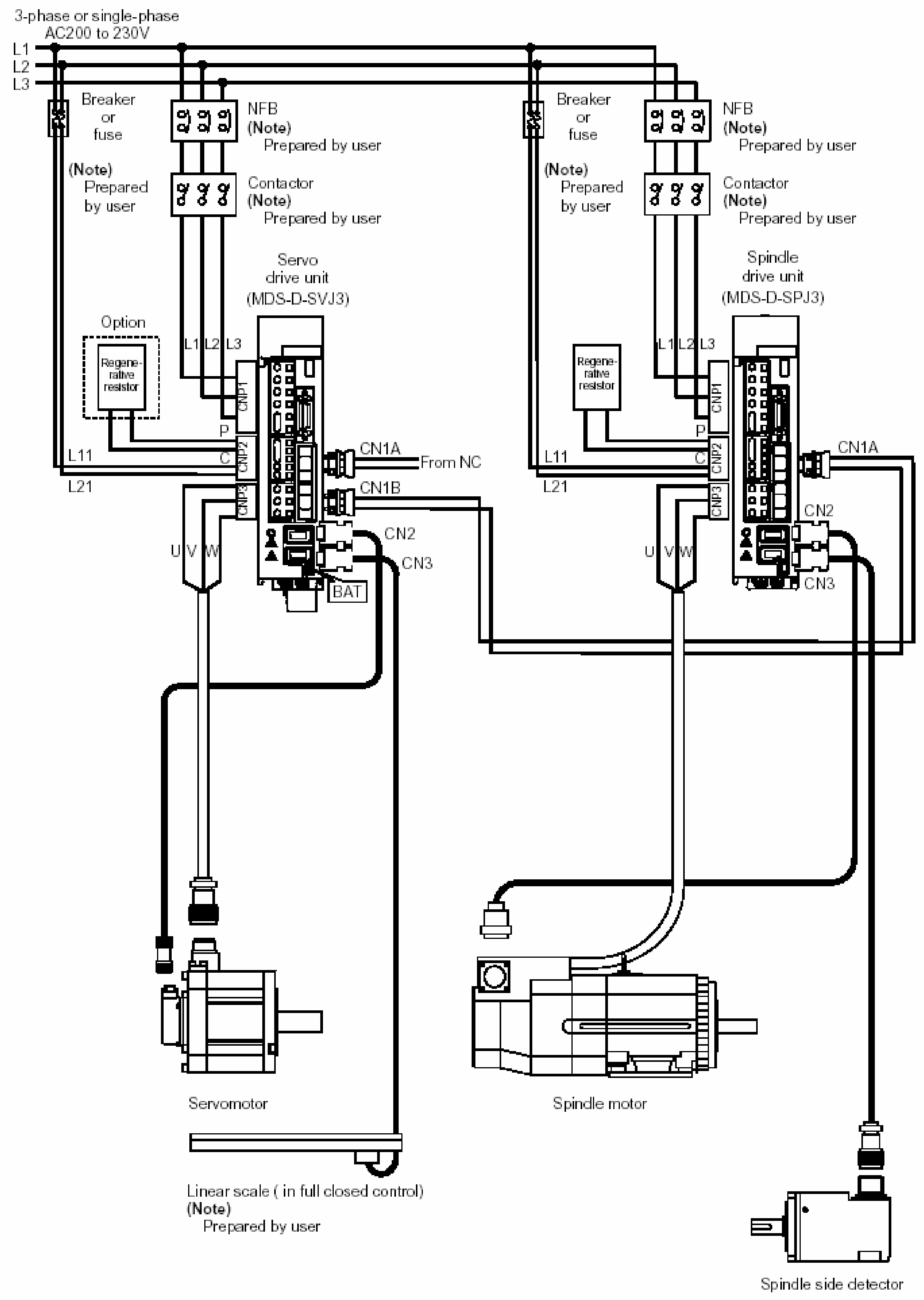
14.4.1 MDS-D-Vx system configuration





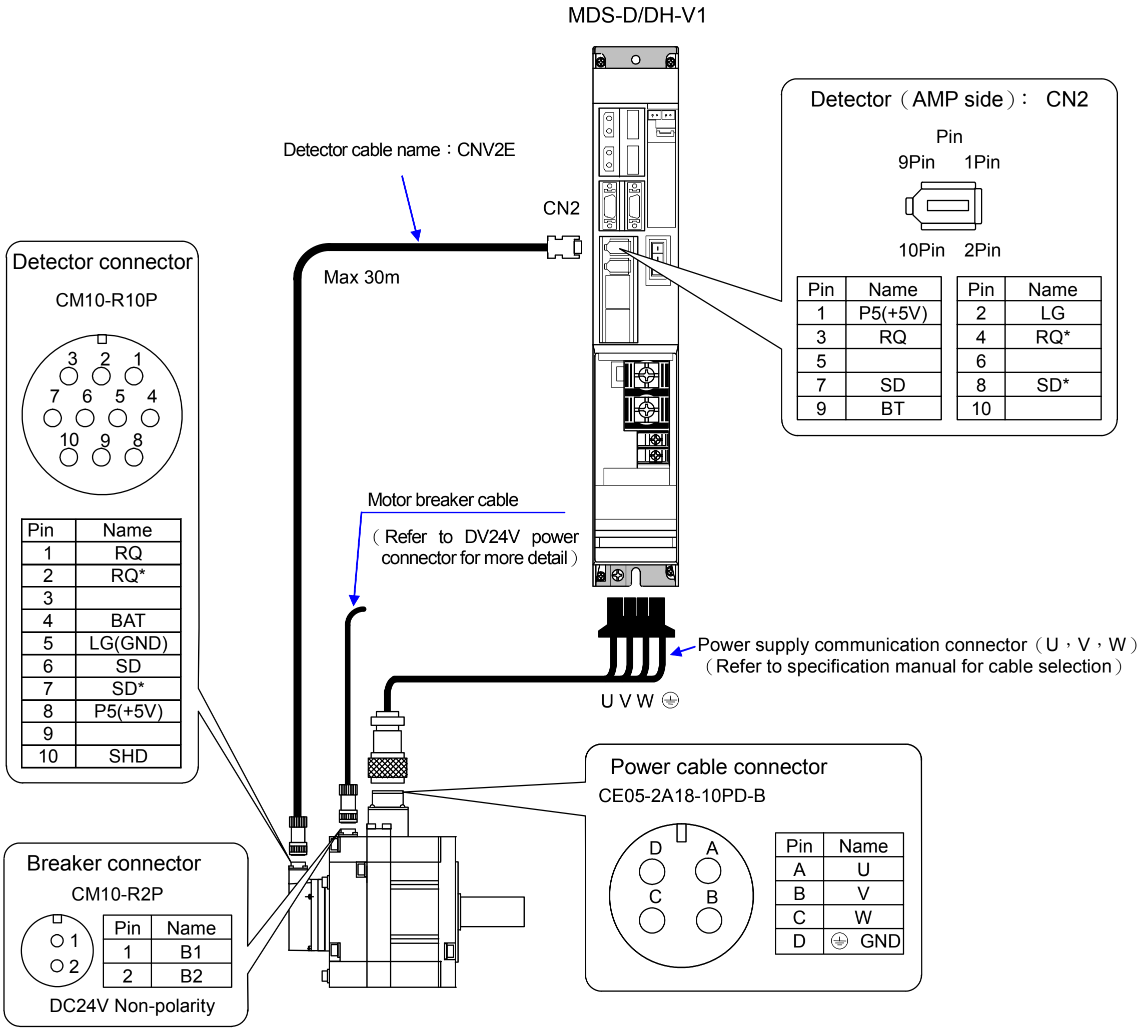
In addition to the cell battery in the above, the External battery unit (MDS-A-BT) can be also used.

14.4.2 MDS-D-SVJ3 system configuration



14.5 Motor / Detector connection

(1) HF75(B)，HF105(B)/HF54(B)，HF104(B)，HF154(B)，HP54(B)，HP104(B)，HP154(B)，HF-H75(B)，HF-H105(B)，HF-H54(B)，HF-H104(B)，F-H154(B)，HP-H54(B)，HP-H104(B)，HP-H154(B) connection.



Detector (AMP side): CN2

Pin	Name	Pin	Name
1	P5(+5V)	2	LG
3	RQ	4	RQ*
5		6	
7	SD	8	SD*
9	BT	10	

Detector connector CM10-R10P

Pin	Name
1	RQ
2	RQ*
3	
4	BAT
5	LG(GND)
6	SD
7	SD*
8	P5(+5V)
9	
10	SHD

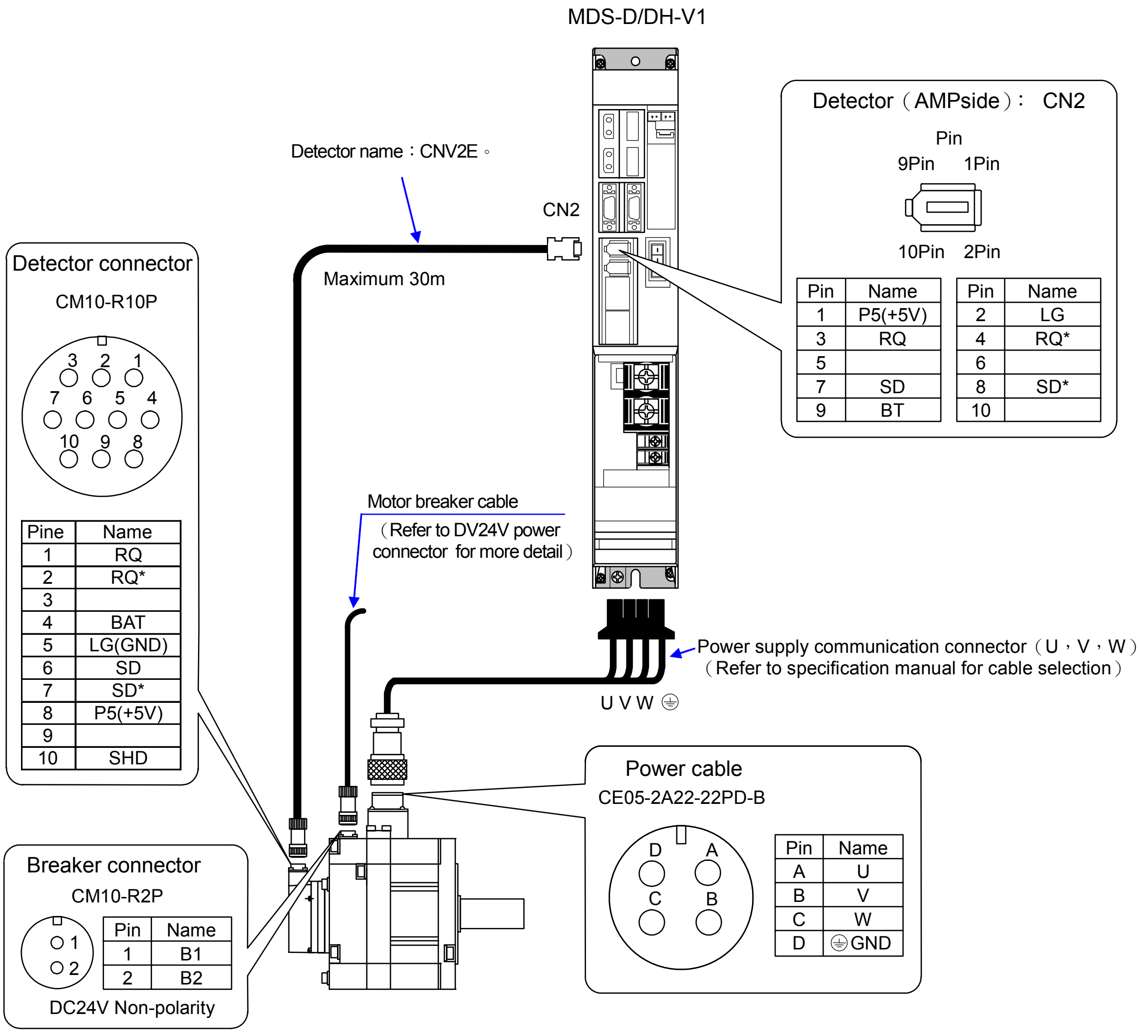
Power cable connector CE05-2A18-10PD-B

Pin	Name
A	U
B	V
C	W
D	⏚ GND

Breaker connector CM10-R2P

Pin	Name
1	B1
2	B2

(2) HF204(B)，HF354(B)，HF453(B)，HP204(B)，HP354(B)，HP454(B)，HF-H204(B)，HF-H354(B)，HF-H453(B)，HF-H703(B)，HP-H204(B)，HP-H354(B)，HP-H454(B)，HF-H704(B) connection.



Detector (AMPside): CN2

Pin	Name	Pin	Name
1	P5(+5V)	2	LG
3	RQ	4	RQ*
5		6	
7	SD	8	SD*
9	BT	10	

Detector connector CM10-R10P

Pine	Name
1	RQ
2	RQ*
3	
4	BAT
5	LG(GND)
6	SD
7	SD*
8	P5(+5V)
9	
10	SHD

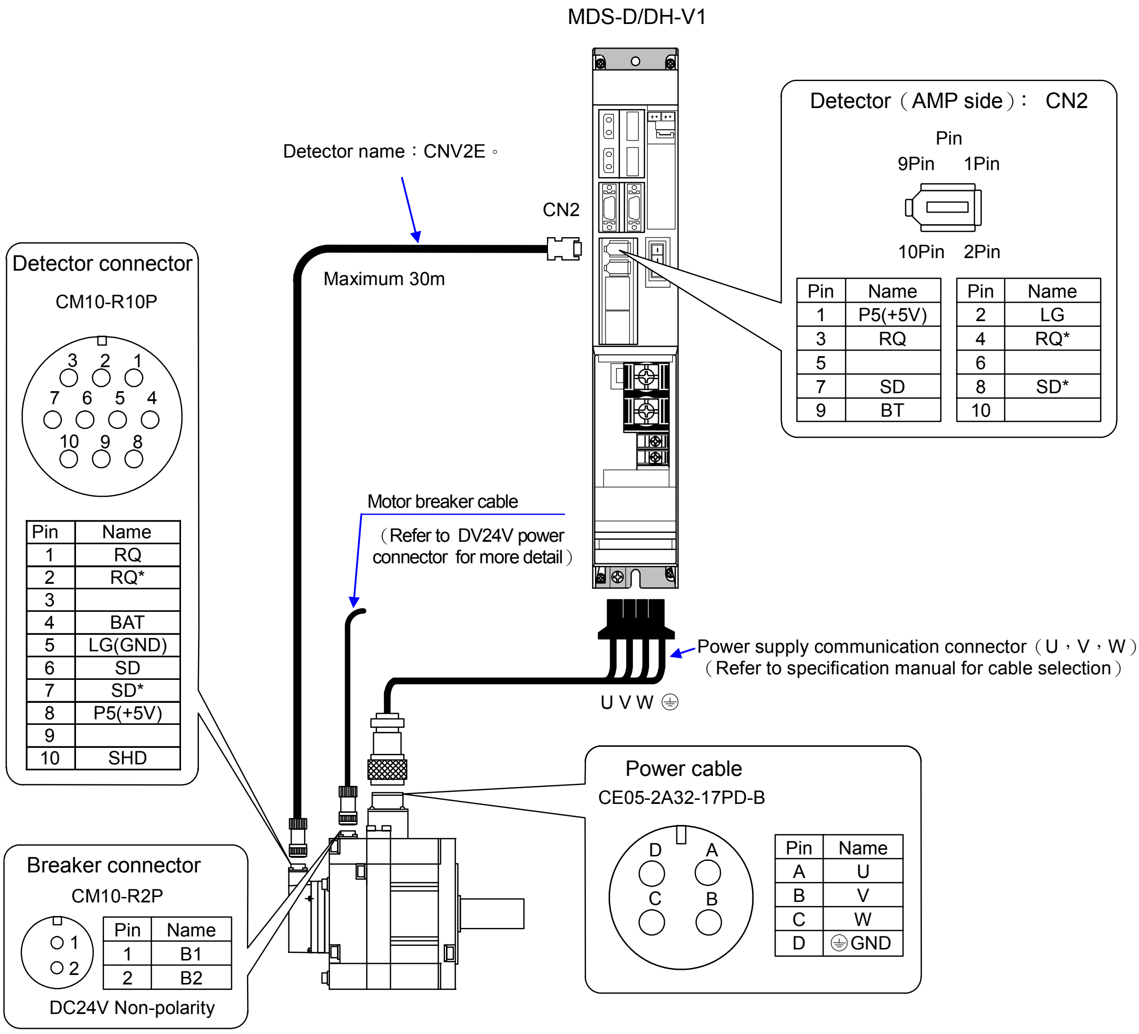
Power cable CE05-2A22-22PD-B

Pin	Name
A	U
B	V
C	W
D	⏚GND

Breaker connector CM10-R2P

Pin	Name
1	B1
2	B2

(3) HF703(B)，HF903(B)，HP704(B)，HP903(B)，HP1103(B)，HF-H903(B)，HP-H903(B)，HP-H1103(B) connection.



Detector (AMP side): CN2

Pin	Name	Pin	Name
1	P5(+5V)	2	LG
3	RQ	4	RQ*
5		6	
7	SD	8	SD*
9	BT	10	

Detector connector CM10-R10P

Pin	Name
1	RQ
2	RQ*
3	
4	BAT
5	LG(GND)
6	SD
7	SD*
8	P5(+5V)
9	
10	SHD

Power cable CE05-2A32-17PD-B

Pin	Name
A	U
B	V
C	W
D	⏚GND

Breaker connector CM10-R2P

Pin	Name
1	B1
2	B2

14.6 SVJ3 series regenerative resistor list

The list

Corresponding servo drive unit	Standard built-in regenerative resistor		External option regenerative resistor						
			MR-RB032	MR-RB12	MR-RB32	MR-RB30	MR-RB50	MR-RB31	MR-RB51
					GZG200W 120OHMK x 3 units	GZG200W39 OHMK x 3 units	GZG300W39 OHMK x 3 units	GZG200W20 OHMK x 3 units	GZG300W20 OHMK x 3 units
	Regenerative capacity		30W	100W	300W	300W	500W	300W	500W
		Resistance value	40Ω	40Ω	40Ω	13Ω	13Ω	6.7Ω	6.7Ω
MDS-D-SVJ3-03	10W	100Ω	○	○					
MDS-D-SVJ3-04	10W	100Ω	○	○					
MDS-D-SVJ3-07	20W	40Ω	○	○	○				
MDS-D-SVJ3-10	100W	13Ω				○	○		
MDS-D-SVJ3-20	100W	9Ω						○	○
MDS-D-SVJ3-35	100W	9Ω						○	○

Corresponding servo drive unit	Standard built-in regenerative resistor		External option regenerative resistor				
			FCUA-RB22	FCUA-RB37	FCUA-RB55	R-UNIT2	FCUA-RB75/2 2 units
	Regenerative capacity		155W	185W	340W	700W	680W
		Resistance value	40Ω	25Ω	20Ω	15Ω	15Ω
MDS-D-SVJ3-03	10W	40Ω					
MDS-D-SVJ3-04	10W	40Ω					
MDS-D-SVJ3-07	20W	40Ω	○				
MDS-D-SVJ3-10	100W	13Ω		○	○	○	○
MDS-D-SVJ3-20	100W	9Ω				○	○
MDS-D-SVJ3-35	100W	9Ω					

The power value in the table is a regenerative power by the resistor, not a rated power.

15. Servo drive replacement

15.1 How to get a drive

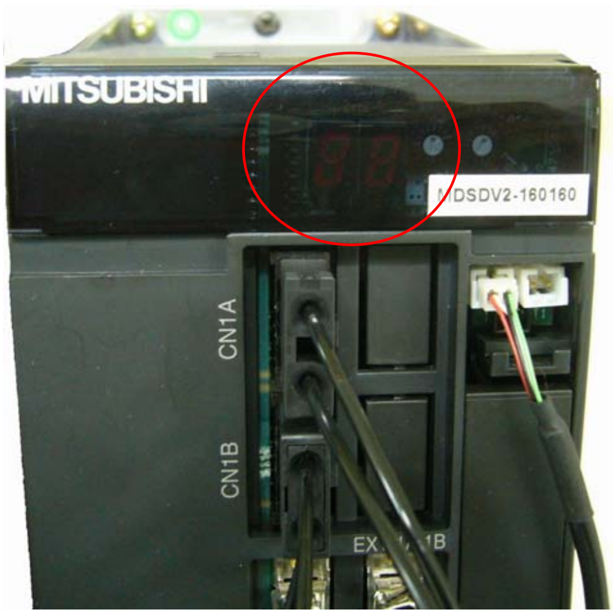
(1) The drive gets by Mitsubishi or dealer.

(2) The drive specification has to same when you purchase and provide complete type.
Example：MDS-D-V1-160

15.2 Replacement procedure

Following these methods exchange drive.

(1) Turn OFF main power until LED lamp of drives are not light.



(2) Take off connectors and cables in drive.

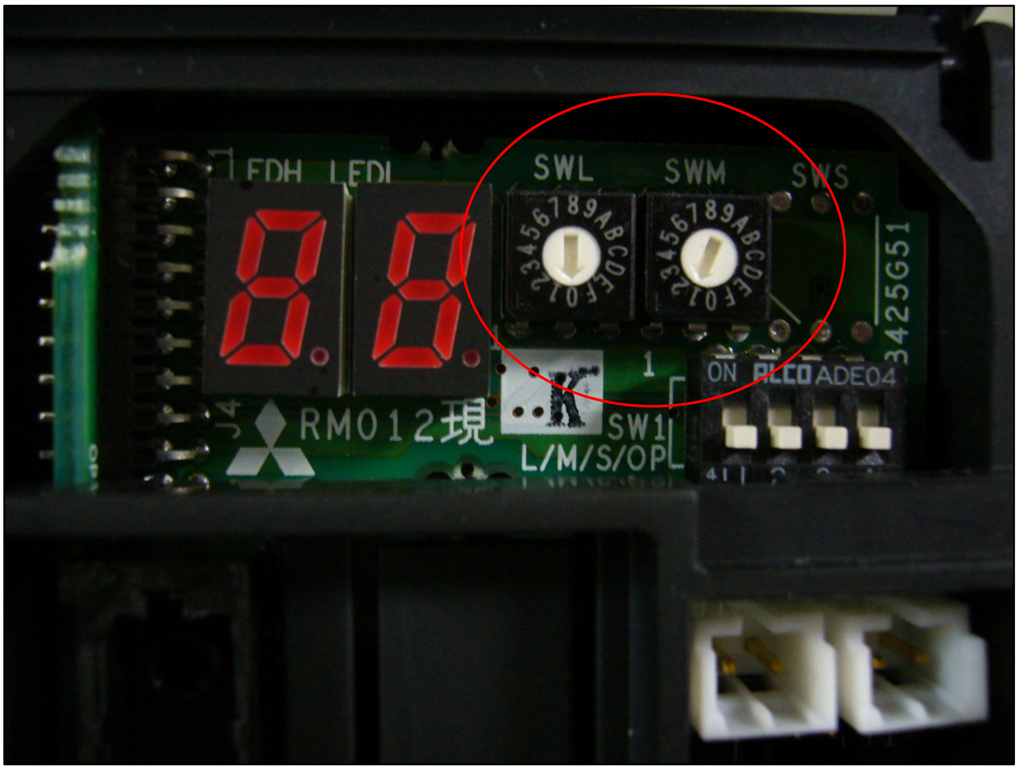
Caution	Please confirmation about cable located when drives take off before. If cables indication and mark are not recognized that make a label on cable for separation. The faulty connection is prohibited that will bring drives damage.

(3) Take off screws that they are fixed for drive.

Upper screw×1

Down screw×1

(4) Please make sure rotary switch on drive set a same position for each other.



(5) These new drivers install back by reverse sequence according to old drives take off.

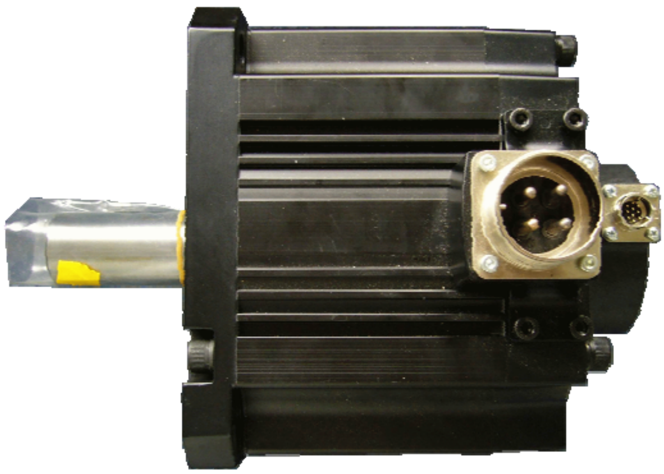
(6) Please make sure whether cables are fixed and faulty connection when the power turns ON before.

Caution	Depend on cable material and function are difference for drive even screws size and specification are difference. Please according to actually state and size use suitable screw drive to avoid stripped.

16. Encoder exchange procedure

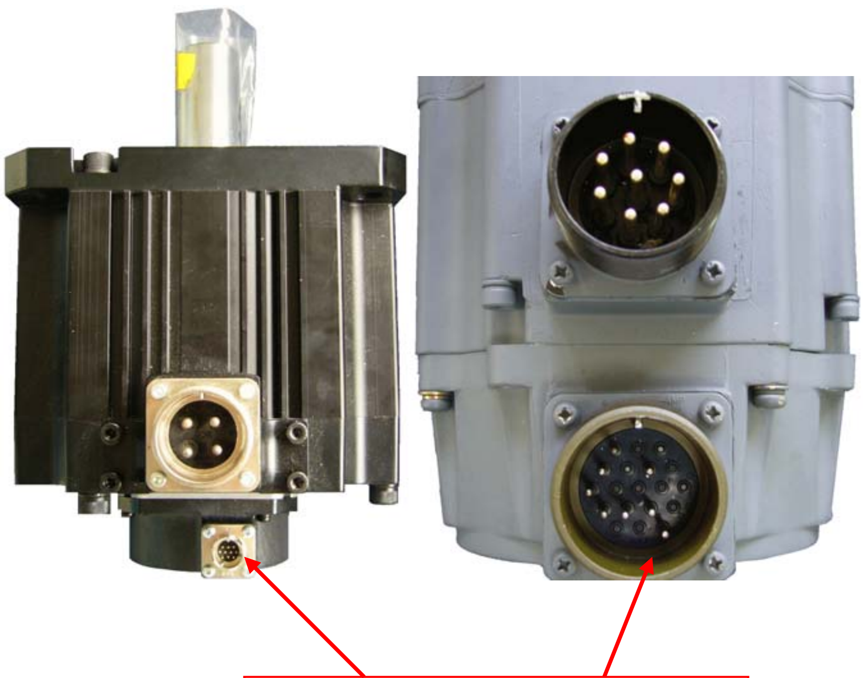
There is much kind of encoders on spindle and servo motors even functions. Spindle's encoder control speed or orientation functions. Servo's encoder control position and speed feedback functions. An encoder exchanges procedure for M700 Series OAS105S5 as below.

(1) HF-354S-A51 - servo motor



(2) In addition to torque ability and volume are difference even signal and power cables do not same for comparison between HF and HA motors.

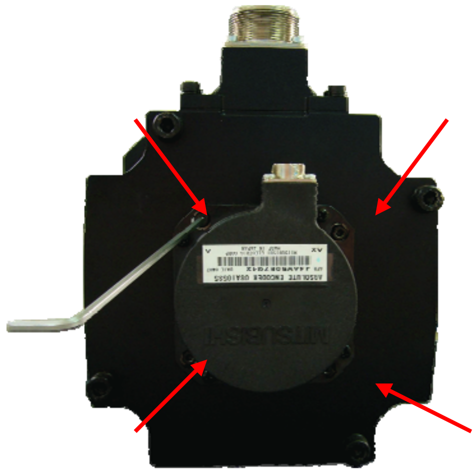
HF motor



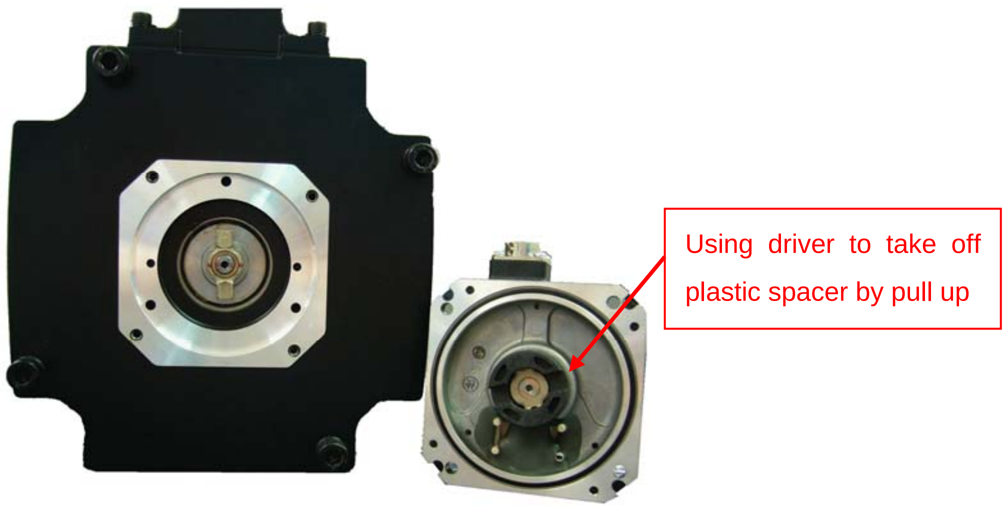
HA motor

The volume of encoder is difference.
OSA105S5 is very small in left side as arrow tip indicated.

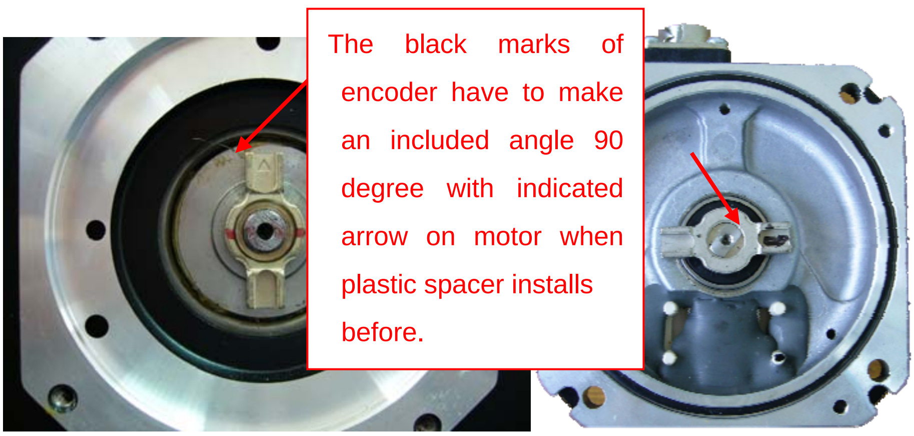
(3) Take off four cover's screws of encoder with hexagon driver .



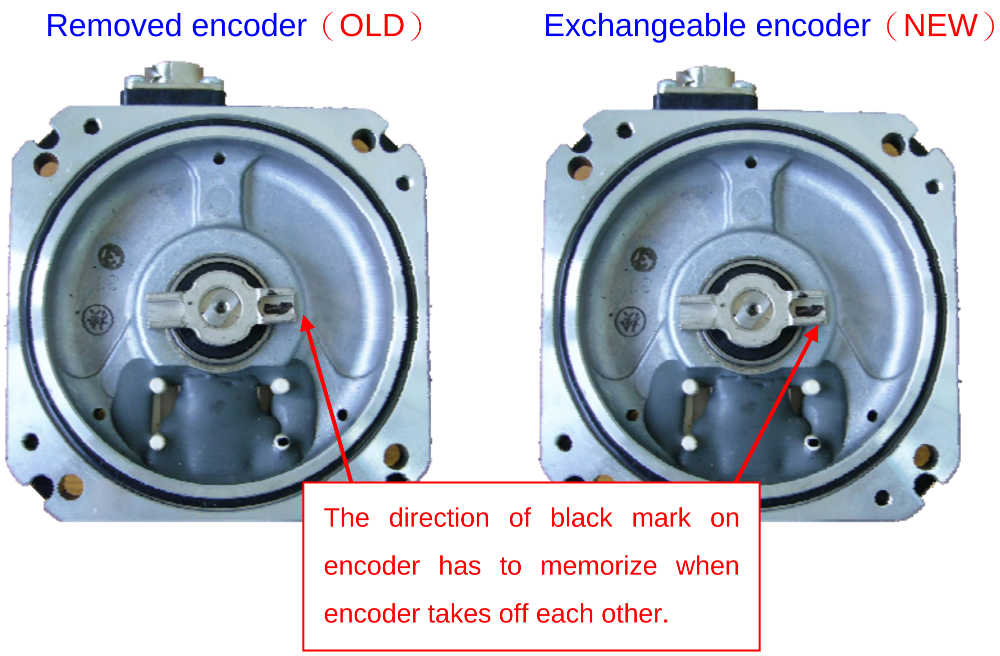
(4) Left side is servo motor and right side is encoder as below. Take off plastic spacer as indicated arrow tip for encoder.



(5) The direction of arrow indicate on concave trough and black mark of encoder have to memorize when encoder takes off.



(6) The other method make indicated arrow judgment for encoder exchange.



(7) The oil gasket has to exchange together with encoder.

(8) To install encoder according to reserve procedure.

(9) There are recommendable methods to avoid mistake installation when power turns ON before.

(a) Please break away mechanism or put motor aside to exchange encoder for unfamiliar operator.

(b) The work table of machine move middle to prevent crash.

(c) Please press down the emergency button when power turns ON before.

(d) Please put hand on emergency button on servo ready before that can press down immediately due to machine crash when power turns ON.

17. How to remove the axis

The servo axis and spindle axis can be removed used some steps as below.

17.1 Removal for servo axis:

The parameter set #1070 and #8201 to remove servo axis as below steps.

	Item	Standard	Removal setting
#1070	axoff	0	1
#8201	Ax release	0	1

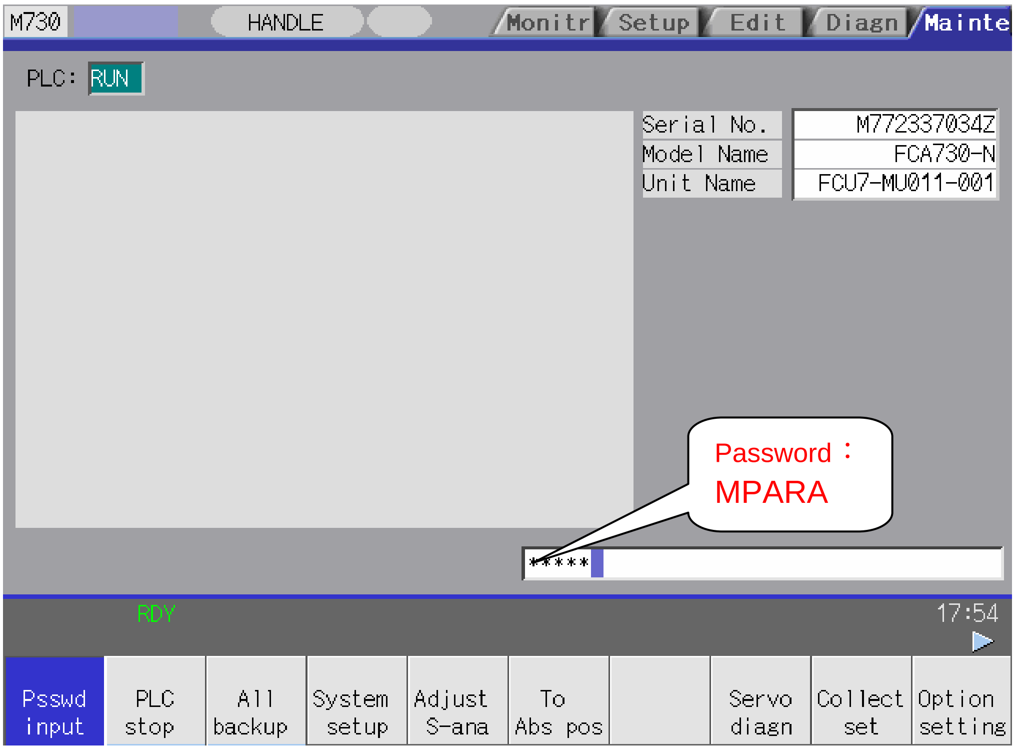
The Z axis is an example to explain the method for removal of servo axis.

(1) Opening machine parameter.

(a) In functions key to select MAINTE key and press as below.

(b) Press → Mainte → Psswd input

(c) The password input into on blank space with "[MPARA]" and then click $\boxed{\text{INPUT}}$

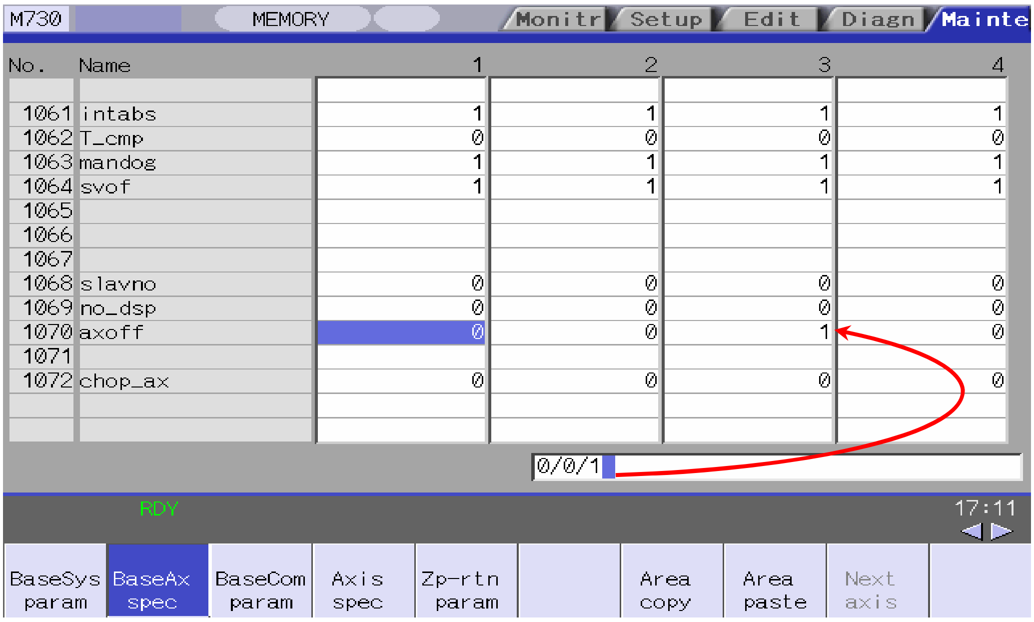


(d) Please make sure the characters with lowercase or formal word when input the password is mistaken. The message as below is show on screen for unaccepted password.

(2) Related parameters for removal axis of servo

(a) Press menu key MAINTE → Param → (menu key to search) BaseAx spec →

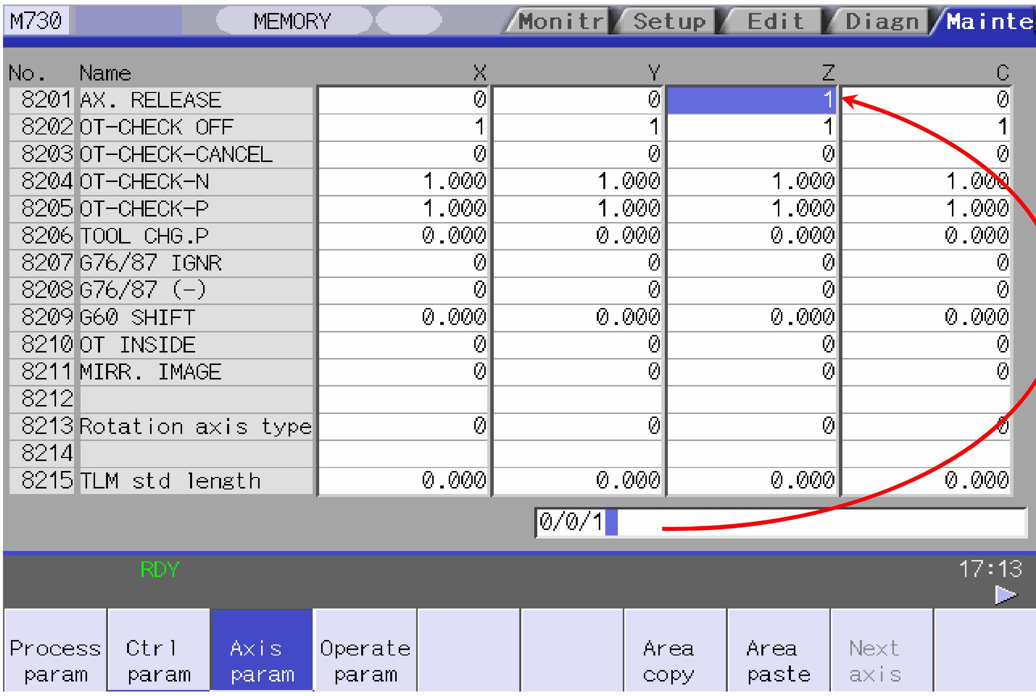
#1070 input “1”.



No.	Name	1	2	3	4
1061	intabs	1	1	1	1
1062	T_cmp	0	0	0	0
1063	mandog	1	1	1	1
1064	svof	1	1	1	1
1065					
1066					
1067					
1068	slavno	0	0	0	0
1069	no_dsp	0	0	0	0
1070	axoff	0	0	1	0
1071					
1072	chop_ax	0	0	0	0

(b) Press menu key MAINTE → Param → (menu key to search) Axis param →

#8201 input “1” Press INPUT

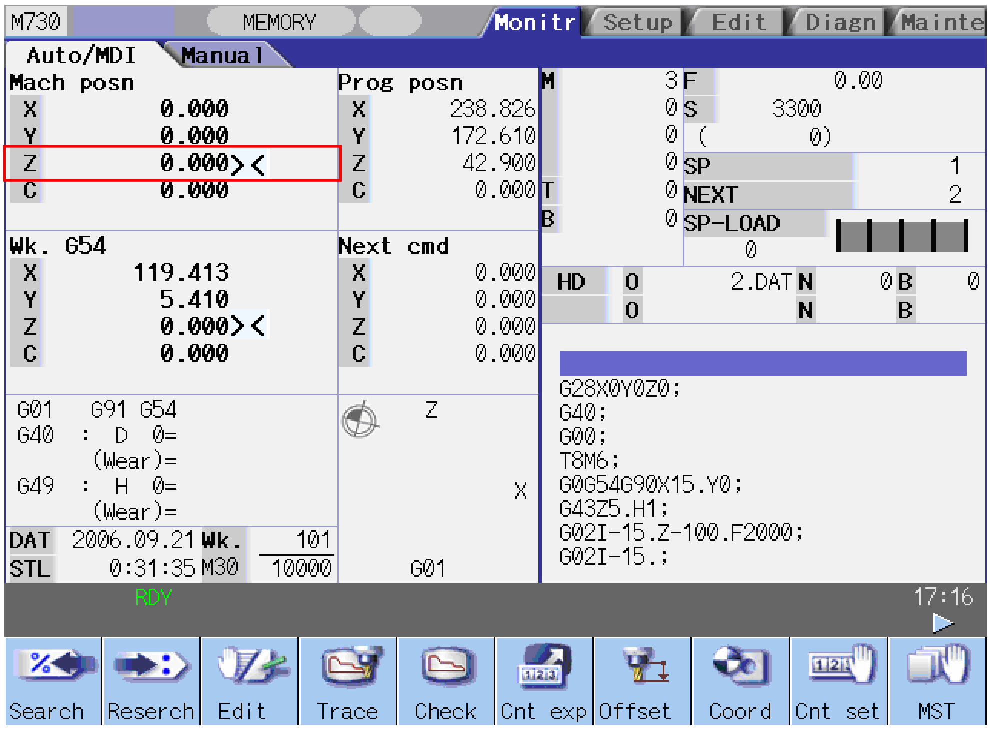


No.	Name	X	Y	Z	C
8201	AX. RELEASE	0	0	1	0
8202	OT-CHECK OFF	1	1	1	1
8203	OT-CHECK-CANCEL	0	0	0	0
8204	OT-CHECK-N	1.000	1.000	1.000	1.000
8205	OT-CHECK-P	1.000	1.000	1.000	1.000
8206	TOOL CHG.P	0.000	0.000	0.000	0.000
8207	G76/87 IGNR	0	0	0	0
8208	G76/87 (-)	0	0	0	0
8209	G60 SHIFT	0.000	0.000	0.000	0.000
8210	OT INSIDE	0	0	0	0
8211	MIRR. IMAGE	0	0	0	0
8212					
8213	Rotation axis type	0	0	0	0
8214					
8215	TLM std length	0.000	0.000	0.000	0.000

(c) These both parameters are available immediately when it modify without reboot again. Therefore removal axis of servo is completed.

(3) The removal setting can be inspected through NC screen and LED display on servo drive whether it is done.

(a) Display on NC screen：><



(b) Display on servo drive：E6

17.2 Removal for spindle

The #3024 and #2236 parameters set for removal of spindle.

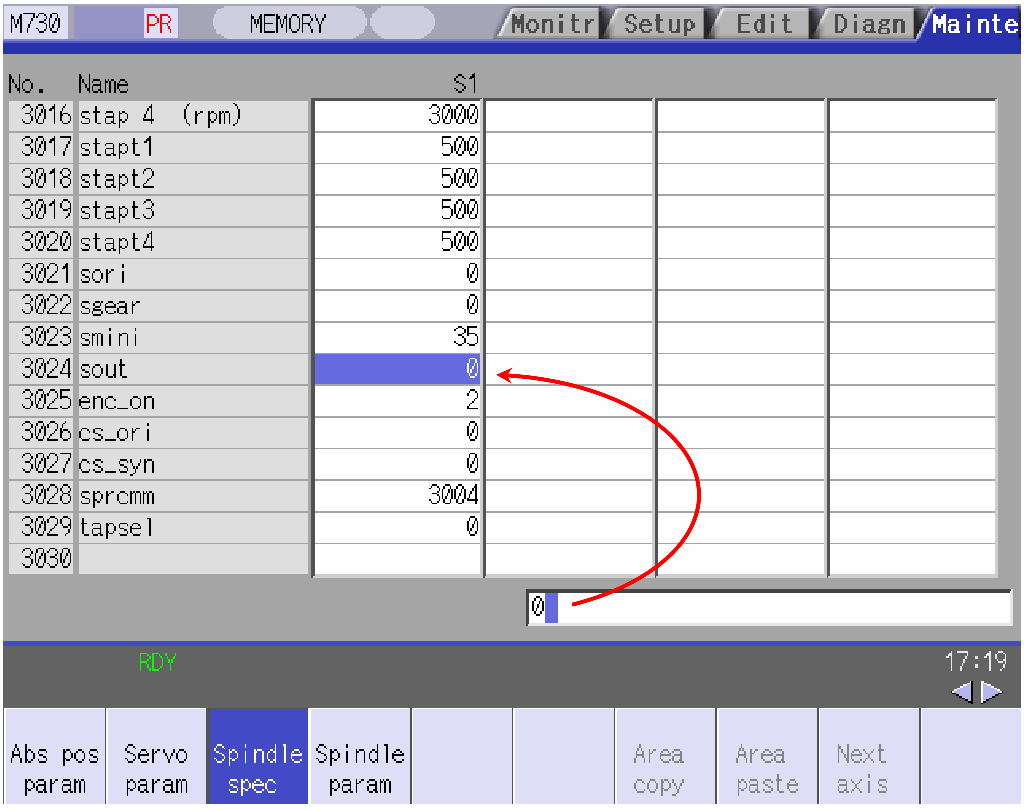
	Item	Detail
#3024	Spindle connection	0：No connection with the spindle 1：Series connection（BUS） 2~5：Analog output
#2236	Power supply Type	Set the power supply type

(1) Opening machine parameters

(2) Related parameters input for removal of spindle.

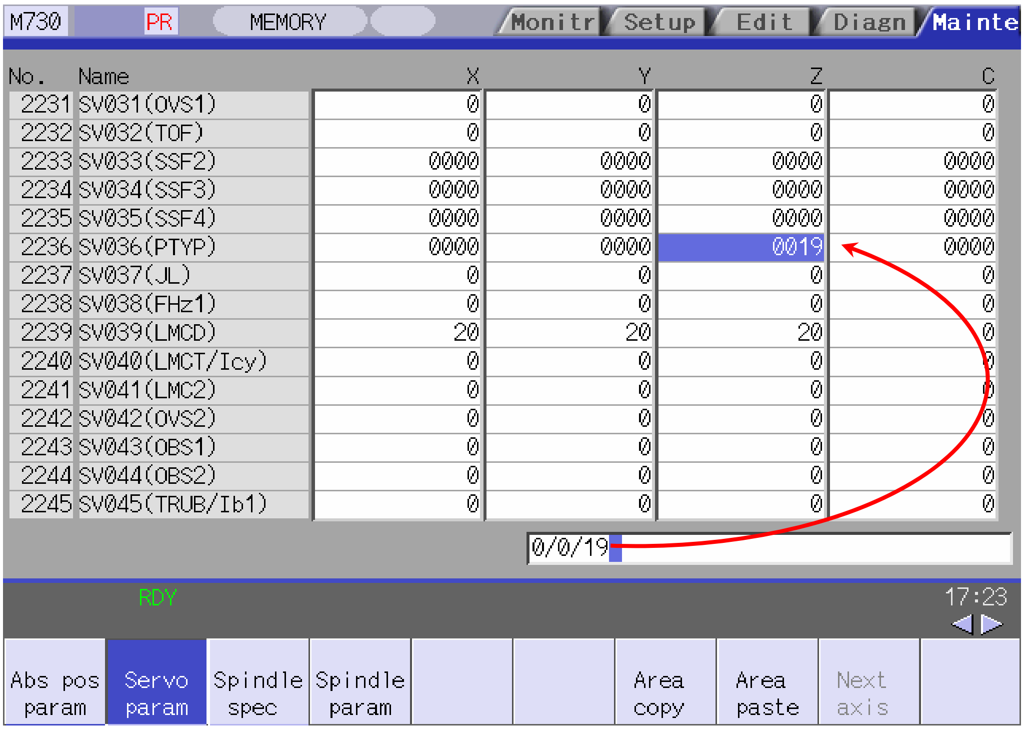
(a) Press menu key MAINTE ➔ Param ➔ (menu key to search) Spindle spec ➔

#3024 input “0” Press INPUT



(b) Press menu key MAINTE → Param → ▷ （menu key to search） Servo param →

#2236 input″ 19″ Press INPUT

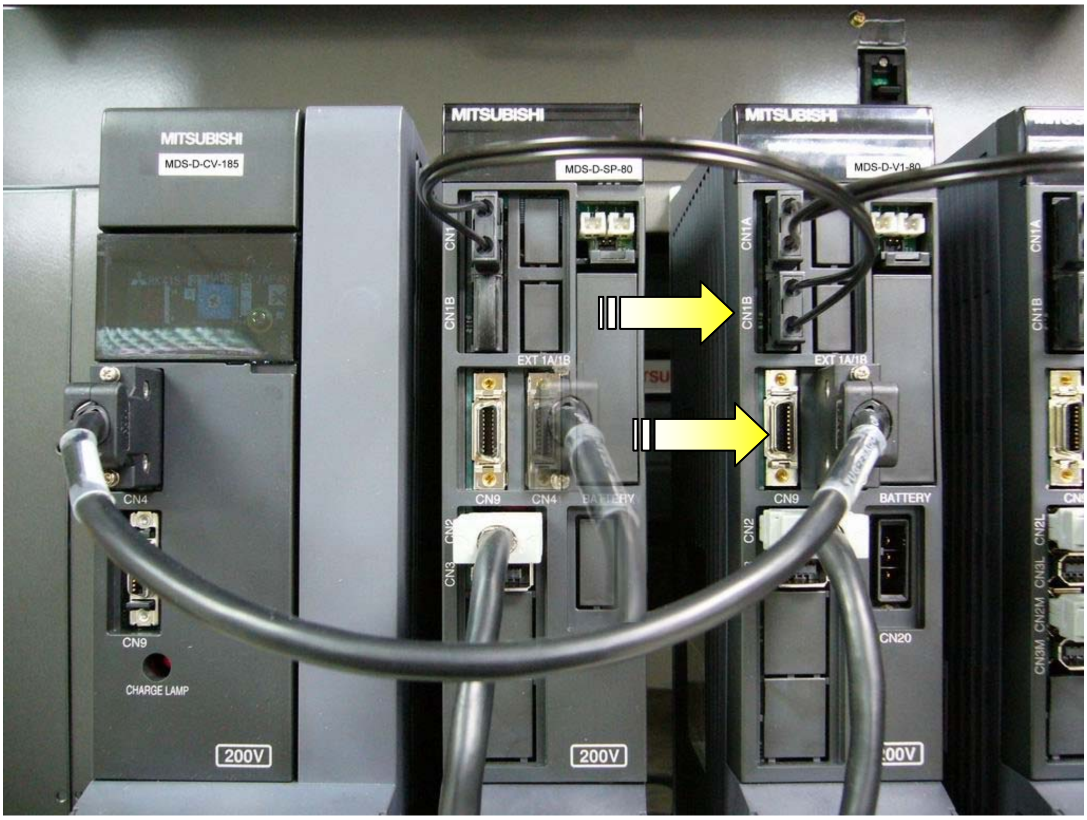


Caution	This setting type is base on MDS-D-CV-185 for power supply so setting value of PTYP is “19”.According to actually drive type set on maintenance.

(3) Hardware changed setting

(a) Turn OFF the main power.

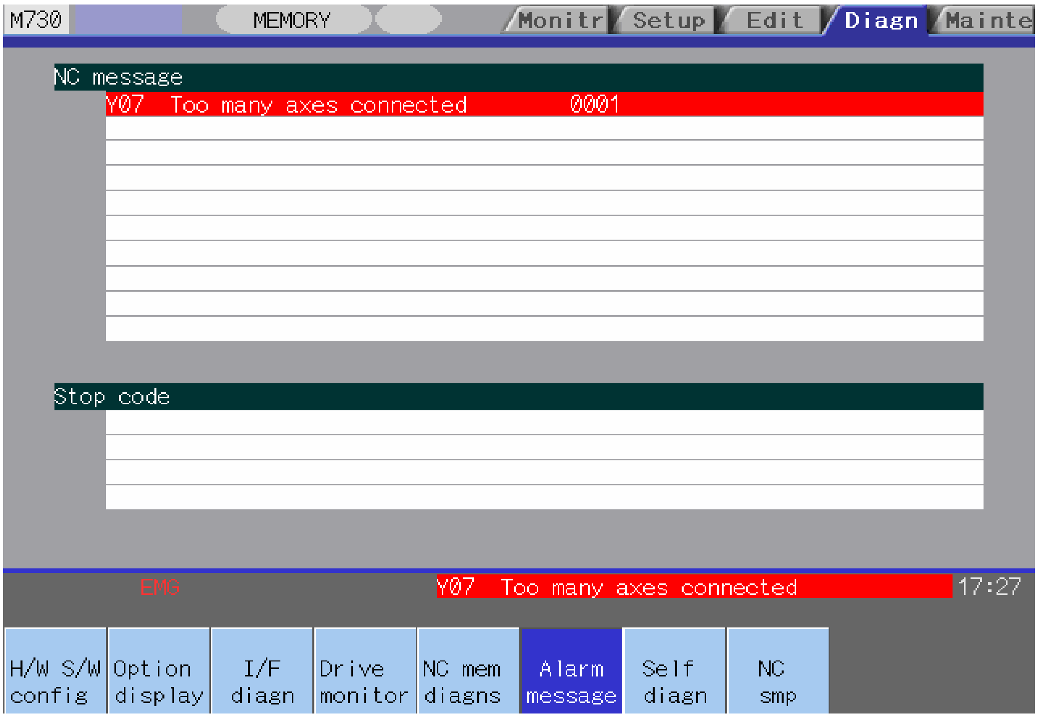
(b) The CN4 cable of spindle take it off that move into last servo drive in Z axis.(example of Z axis)



(c) Remove the optical cable of CN1B for Z axis.

(d) The terminal connector of CN1B with spindle take off and plug in CN1B of Z axis.

(4) The alarm message occurred for “Y07 Too many axes connected” if CN4 connector changed without terminal connector removed CN1B of Z axis.



(5) The LED segment display state when power turn ON as below:

(6) The LED state of spindle drive display “Ab” for standby situation because the spindle does not connect with NC unit. Related alarm message will display if drive defective.

18. Absolute position detection

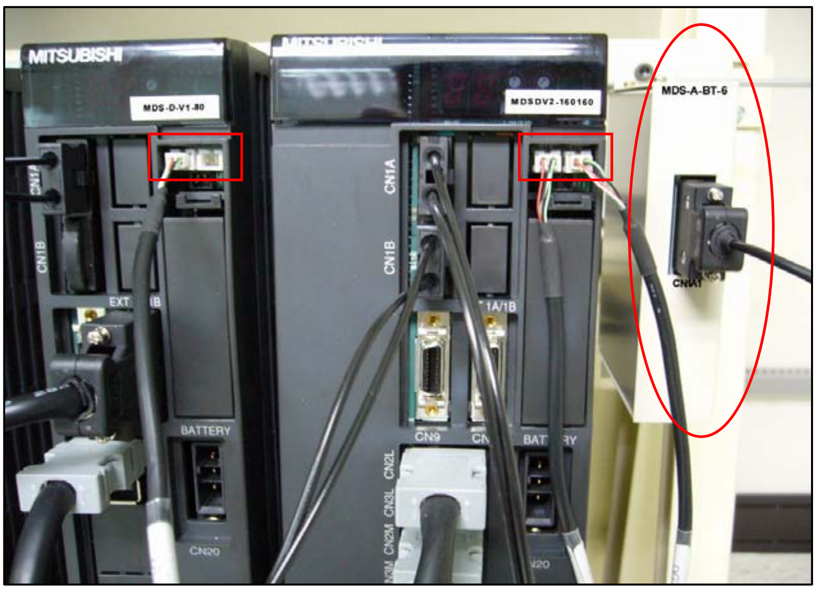
There are two specifications of increment and absolute for servo encoder. The increment encoder have to make a zero return process every time when power reboot. The absolute encoder can memorize zero position that just adjust zero point one time when power turn ON. The zero position of machine is base on first time adjustment setting when reboots again without zero return re-setting.

18.1 Installation device

Absolute position is necessary extending battery device for independent battery or battery unit when install before. This is an explanation for external battery unit to extend as below.

(1) Device：MDS-A-BT-6 battery unit and cable

(2) Connection with hardware device and drive



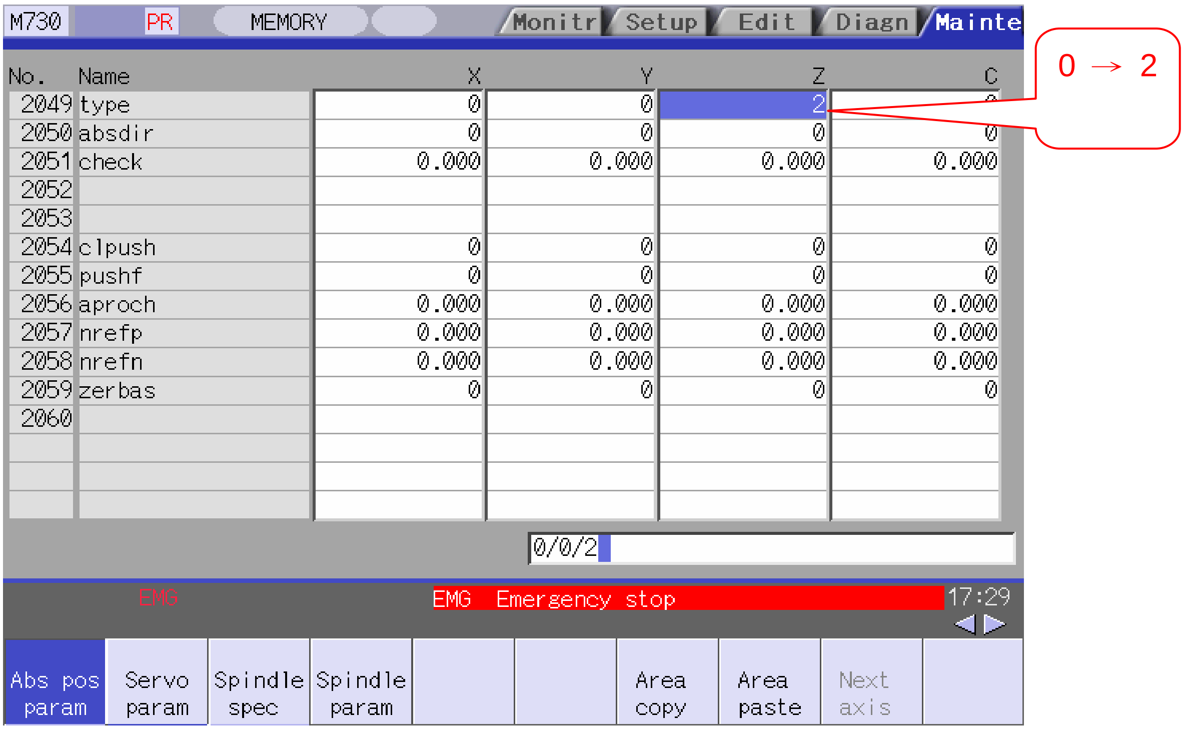
18.2 Parameters setting

(1) Opening machine's parameter：

Press menu key MAINTE ➔ Mainte ➔ Psswd input ➔ Input password：MPARA ➔ INPUT

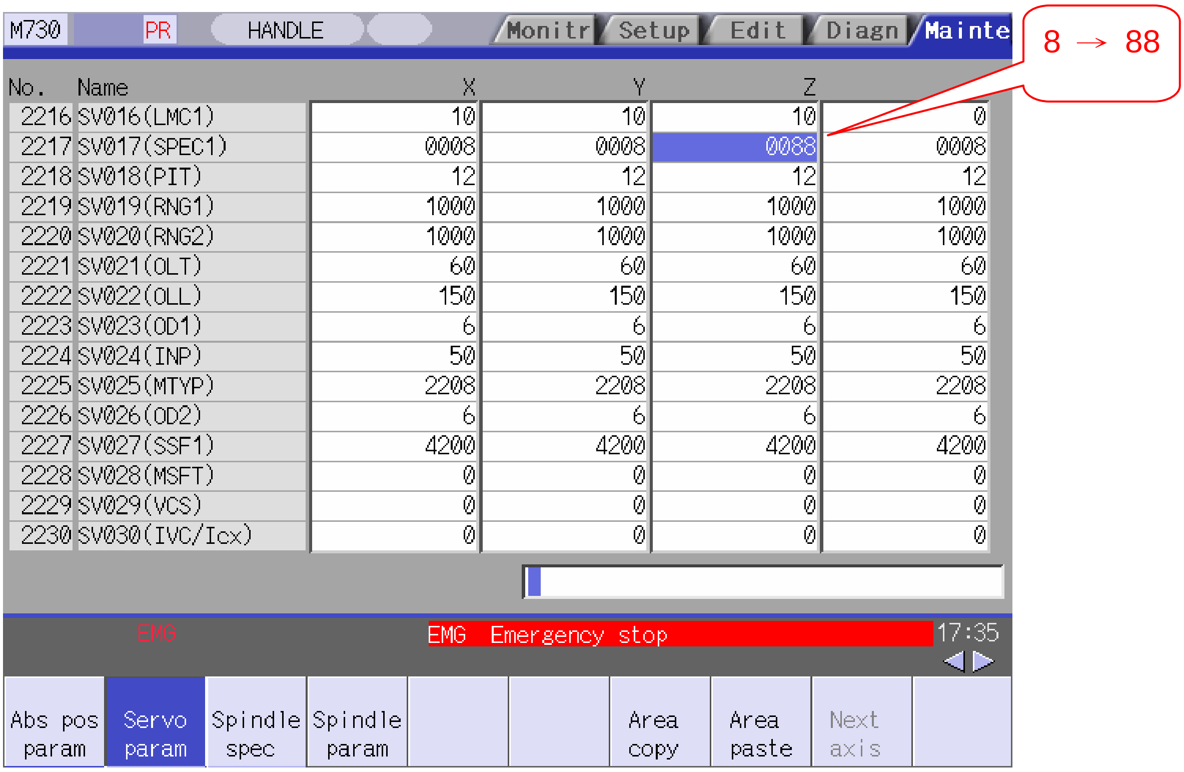
(2) Setting #2049

Press menu key MAINTE ➔ Param ➔ Abs pos param ➔ #2049 input "2" ➔ INPUT



(3) Setting #2217

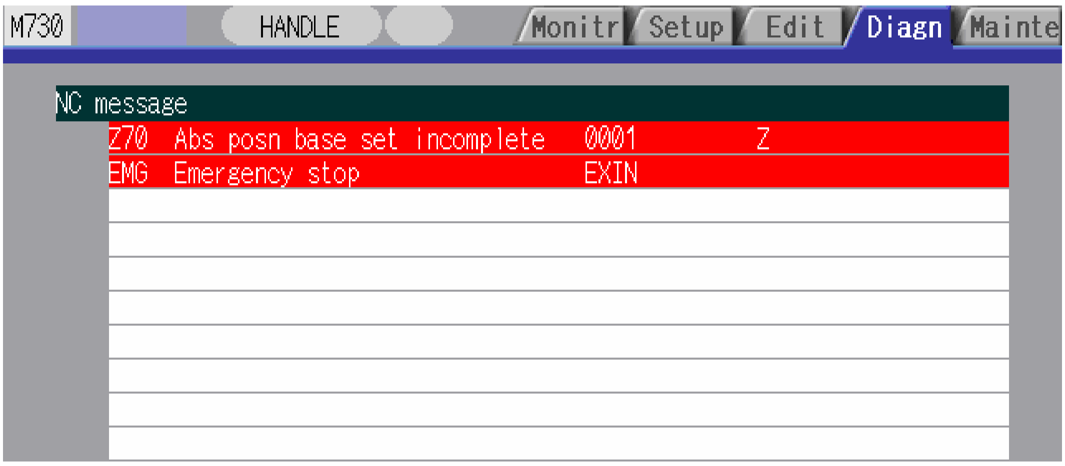
Press menu key  ➜ Param ➜ Servo param ➜ #2217 input “88” ➜ INPUT



No.	Name	X	Y	Z	
2216	SV016(LMC1)	10	10	10	0
2217	SV017(SPEC1)	0008	0008	0088	0008
2218	SV018(PIT)	12	12	12	12
2219	SV019(RNG1)	1000	1000	1000	1000
2220	SV020(RNG2)	1000	1000	1000	1000
2221	SV021(OLT)	60	60	60	60
2222	SV022(OLL)	150	150	150	150
2223	SV023(OD1)	6	6	6	6
2224	SV024(INP)	50	50	50	50
2225	SV025(MTYP)	2208	2208	2208	2208
2226	SV026(OD2)	6	6	6	6
2227	SV027(SSF1)	4200	4200	4200	4200
2228	SV028(MSFT)	0	0	0	0
2229	SV029(VCS)	0	0	0	0
2230	SV030(IVC/Icx)	0	0	0	0

Turn power OFF AC220V, otherwise alarm message will occur ALARM 25

(4) “Z70 Absolute position data error 0001 Z” alarm occur when NC power reboot again.



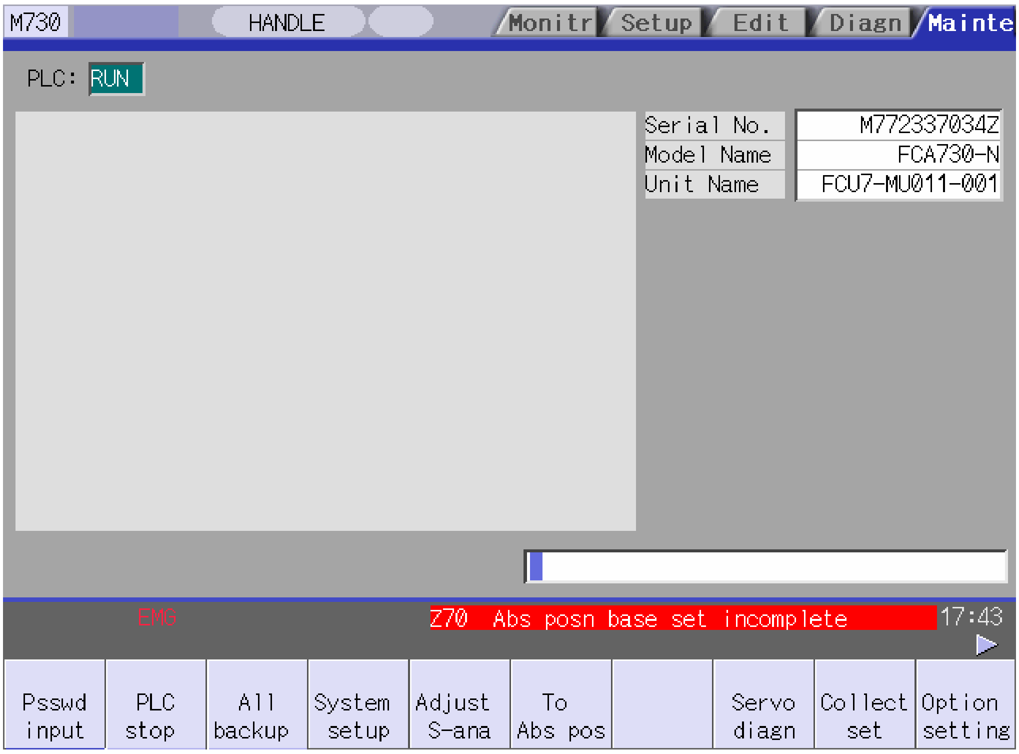
18.3 Setting absolute zero position

(1) Opening machine's parameter：

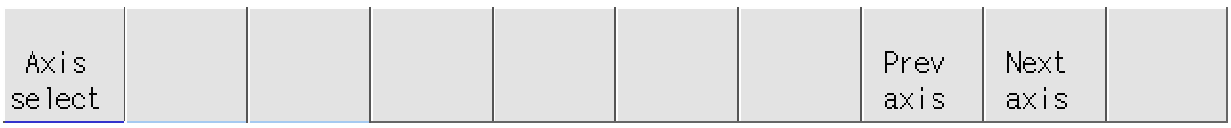
Press menu key MAINTE ➔ Mainte ➔ Psswd input ➔ input：MPARA ➔ INPUT

(2) Setting absolute position：

(a) Press menu key MAINTE ➔ Mainte ➔ ▷ ➔ To Abs pos

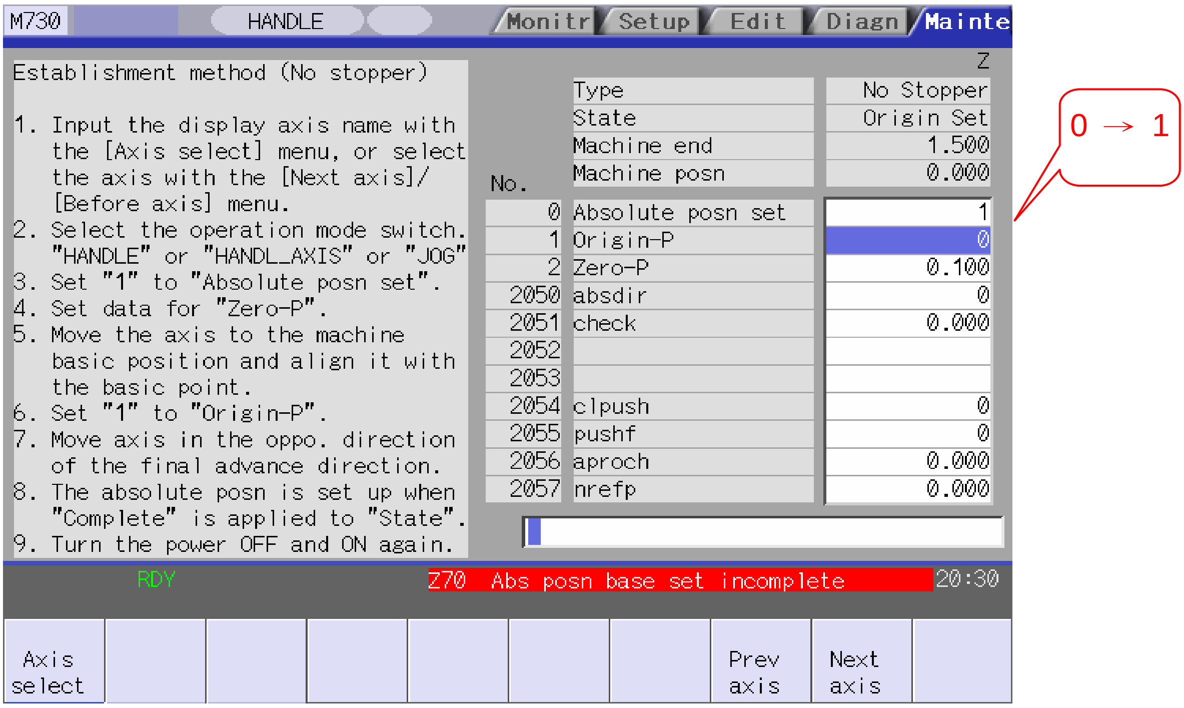


(b) Press Next axis selection Z axis



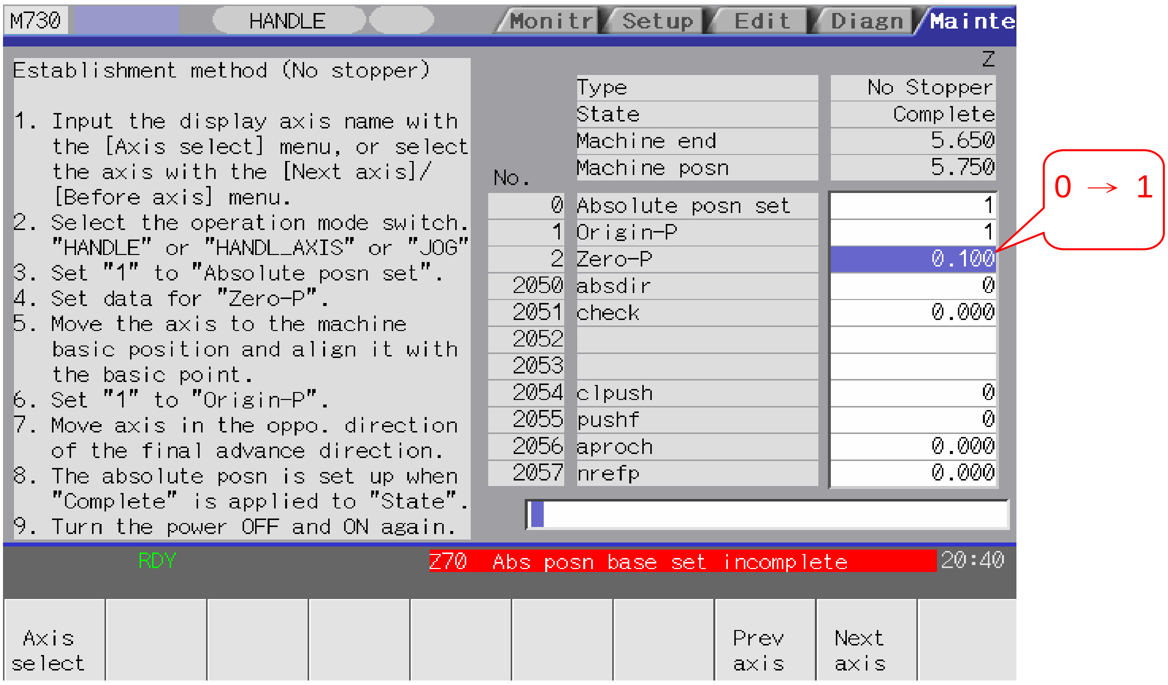
(c) Release EMERGENCY STOP

(d) On number “0” Absolute posn set input “1” and then INPUT



(e) Using handle moves to near zero position.

(f) On number 1 Origin-P setting "1" and then INPUT



(g) Using handle moves reverse direction comparing with prior direction.

(h) When【State】is【finished】that absolute position is done.

	Z
Type	No Stopper
State	Complete
Machine end	5.650
Machine posn	5.750

(I) Reboot NC power.

19 Servo adjustment procedure

Before if do the servo adjustment in M60S series. Generally, it need to use the wave form recorder of equipment (Memory Hicoder) to adjust. In M700 series controller operation will be simpler and commonly used. And servo adjustment becomes simple and convenient.

The new machine before adjust it must confirm machine specification and safety confirmation. During some time the machine runs and stable to start adjust some related servo gain adjustment procedure.

The machine specification

The gear ratio、Ball screw、Motor／Encoder specification、G0／G1 max speed…etc.

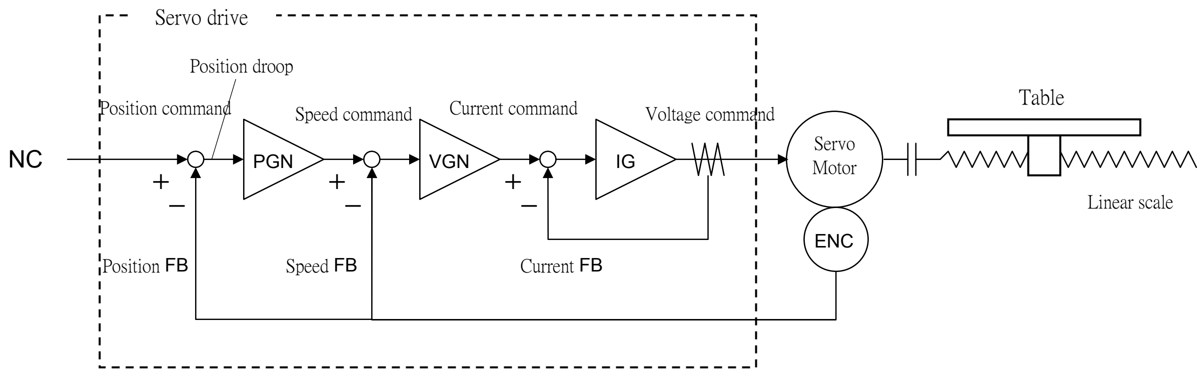
The safety confirmation

EMG release（ALARM message、NC can READY?）
Move handle wheel（Vibration condition）
Axis movement range（positive、 negative confirm）
Machine run（operation above 24hrs）

Servo control has current loop gain、Speed loop gain and position loop gain of three main loops. And functions are showing below：

Current loop gain → Regarding Mitsubishi standard setting.（Fixed）
Speed loop gain → Effect machining precision.
Position loop gain → Effect command and feed back of trace.

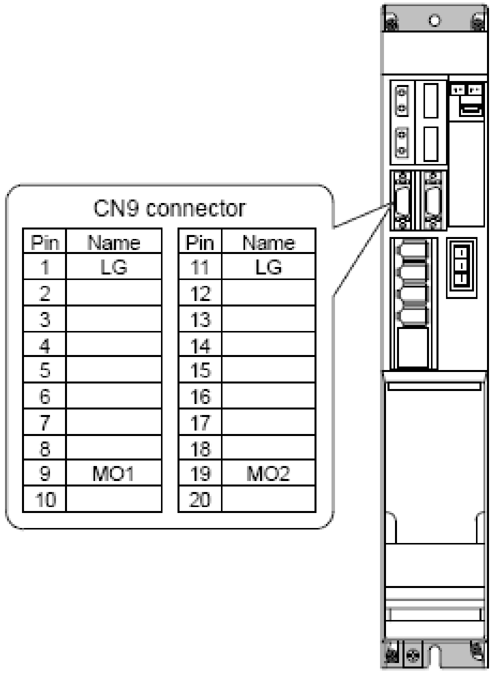
Servo control drawing



19.1 D/A output

19.1.1 MDS-D/DH-Vx D/A output specification

Item	Explanation
No. of channels	2ch
Output cycle	888μs (min. value)
Output precision	12bit
Output voltage range	0V to 2.5V (zero) to +5V
Output magnification setting	-32768% to +32767% (1% scale)
Output pin	CN9 connector MO1 = Pin 9 MO2 = Pin 19 GND = Pins 1, 11
Others	The D/A output for the 2-axis unit (MDS-D/DH-V2) is also 2ch. When using the 2-axis unit, set -1 for the output data (SV061, 62) of the axis that is not to be measured.



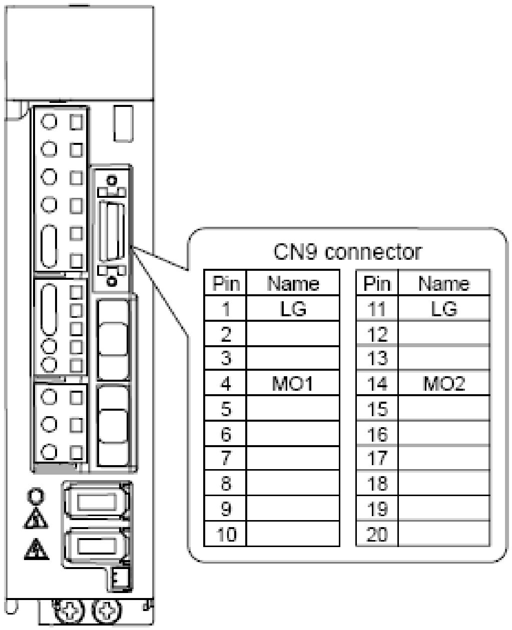
CN9 connector

Pin	Name	Pin	Name
1	LG	11	LG
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9	MO1	19	MO2
10		20	

MDS-D/DH-V2

19.1.2 MDS-D-SVJ3 D/A output specification

Item	Explanation
No. of channels	2ch
Output cycle	0.8ms (min. value)
Output precision	10bit
Output voltage range	0V to 2.5V (zero) to +5V
Output magnification setting	-32768% to +32767% (1% scale)
Output pin (CN9 connector)	MO1 = Pin 4 MO2 = Pin 14 GND = Pins 1, 11



CN9 connector

Pin	Name	Pin	Name
1	LG	11	LG
2		12	
3		13	
4	MO1	14	MO2
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

MDS-D-SVJ3

19.1.3 Output data settings

No.	Abbrev.	Parameter name	Explanation
SV061	DA1NO	D/A output channel 1 data No.	Input the No. of the data to be output to each D/A output channel.
SV062	DA2NO	D/A output channel 2 data No.	

No.	Output data	Standard output unit		Output cycle
		Linear axis	Rotary axis	
0	Commanded rotation speed	1000(r/min)/V		0.8ms
1	Motor rotation speed	1000(r/min)/V		0.8ms
2	Torque command	Motor stall rated ratio 100%/V		0.8ms
3	Torque feedback	Motor stall rated ratio 100%/V		0.8ms
8	Machine vibration frequency	500Hz/V		0.8ms
30	Collision detection estimated torque	Motor stall rated ratio 100%		0.8ms
31	Collision detection disturbance estimated torque	Motor stall rated ratio 100%		0.8ms
32*1	Estimated load inertia ratio or moving sections gross weight	100% or 100kg		0.8ms
35	Disturbance observer estimated disturbance torque	Motor stall rated ratio 100%		0.8ms
50	Position droop	1μm/V	1/1000° /V	0.8ms
51	Position command	1μm/V	1/1000° /V	0.8ms
52	Position feedback	1μm/V	1/1000° /V	0.8ms
53	Position F⊿T	1μm/s/V	1/1000° /s/V	0.8ms
54	Deviation from ideal position (considering servo tracking delay)	1μm/V	1/1000° /V	0.8ms
60	Position droop	1mm/V	1° /V	0.8ms
61	Position command	1mm/V	1° /V	0.8ms
62	Position feedback	1mm/V	1° /V	0.8ms
63	Position F⊿T	1mm/s/V	1° /s/V	0.8ms
64	Deviation from ideal position (considering servo tracking delay)	1mm/V	1° /V	0.8ms
70	Position droop	1m/V	1000° /V	0.8ms
71	Position command	1m/V	1000° /V	0.8ms
72	Position feedback	1m/V	1000° /V	0.8ms
73	Position F⊿T	1m/s/V	1000° /s/V	0.8ms
74	Deviation from ideal position (considering servo tracking delay)	1m/V	1000° /V	0.8ms
126	Saw tooth wave	0V to 5V		0.8ms
127	2.5V test data	2.5V		0.8ms

*1 The estimated load inertia ratio (unit: 100%) is applied for the rotary motor, and the moving sections gross weight (unit: 100kg) for the linear motor.

19.1.4 Setting the output magnification

Set when outputting other than the standard output unit. When "0" is set, the magnification will be the same as "100".

(Example 1) When SV061=1 and SV063=1000

The current command is output to D/A output channel 1 with 10%/V unit.

(Example 1) When SV062=2 and SV064=50

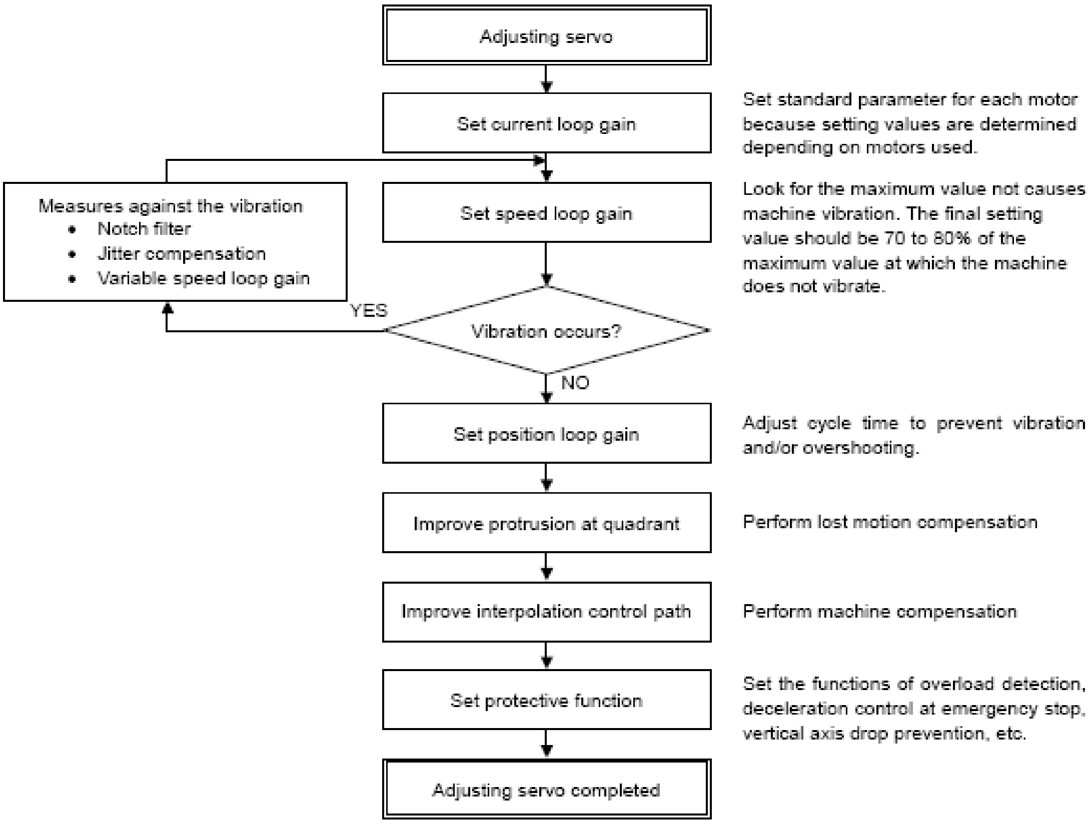
The current feedback is output to D/A output channel 1 with 200%/V unit.

No.	Abbrev.	Parameter name	Explanation	Setting range
SV063	DA1MPY	D/A output channel 1 output scale	Set the scale with a 1/100 unit. When "0" is set, the magnification is the same as when set to "100".	-32768 to 32767 (1/100-fold)
SV064	DA2MPY	D/A output channel 2 output scale		

19.1.5 Servo D/A output setting

D/A	Inertia	Current	Position droop	True circle
SV061 CH1	1	1	1	50
SV062 CH2	35	3	50	54
SV063 CH1 magnification	0	50	50	100
SV064 CH2 magnification	0	Change by Motor spec.	10	10

19.2 Servo adjustment procedure



⚠ CAUTION	Perform adjusting the servo in the factory configuration of the machine. When the servo is adjusted without having an enough running-in or a cover, friction torque, machine resonance frequency or resonance gain may be different, resulting in an incorrect adjustment.

19.3 Load inertia （JL）adjustment

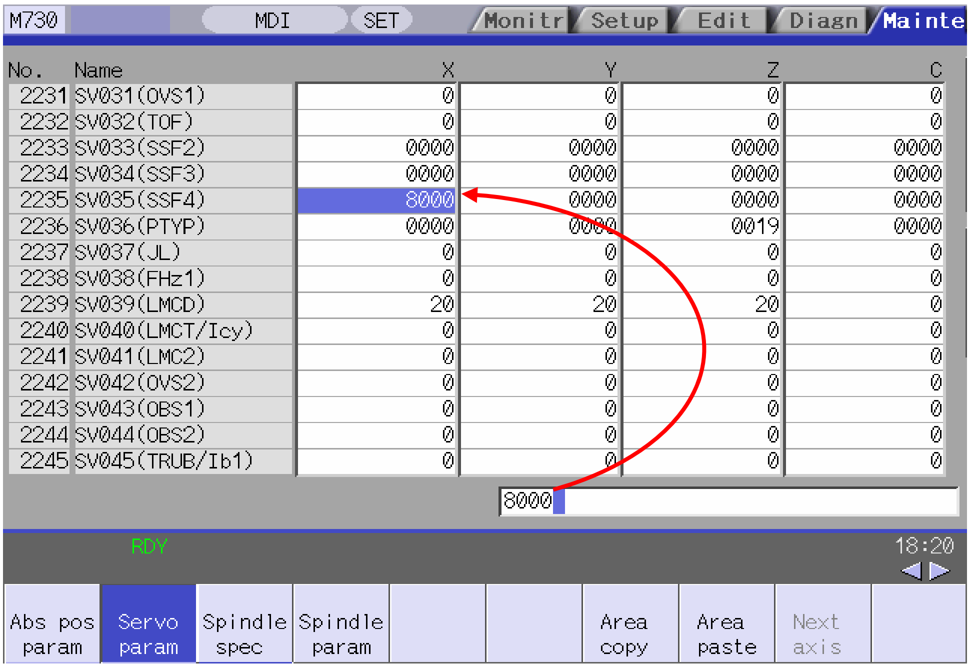
19.3.1Explanation for X axis

(1) Parameter setting：

No.	Items	Details	Setting range(unit)
SV035	Servo function selection4	BIT F / 0 / 1 Parameter content / standard / Monitor JL measurement	1
SV032	Torque offset	Set the unbalance torque of vertical axis and inclined axis	-100～100 (Stall [rated] current%)
SV045	Frictional torque	Set the frictional torque when using the collision detection function.	0～255 (Stall [rated] current%)

(a) Set the password for modification parameter “MPARA” .

(b) Setting parameter SV035 = 8xxx （Bit F = 1）

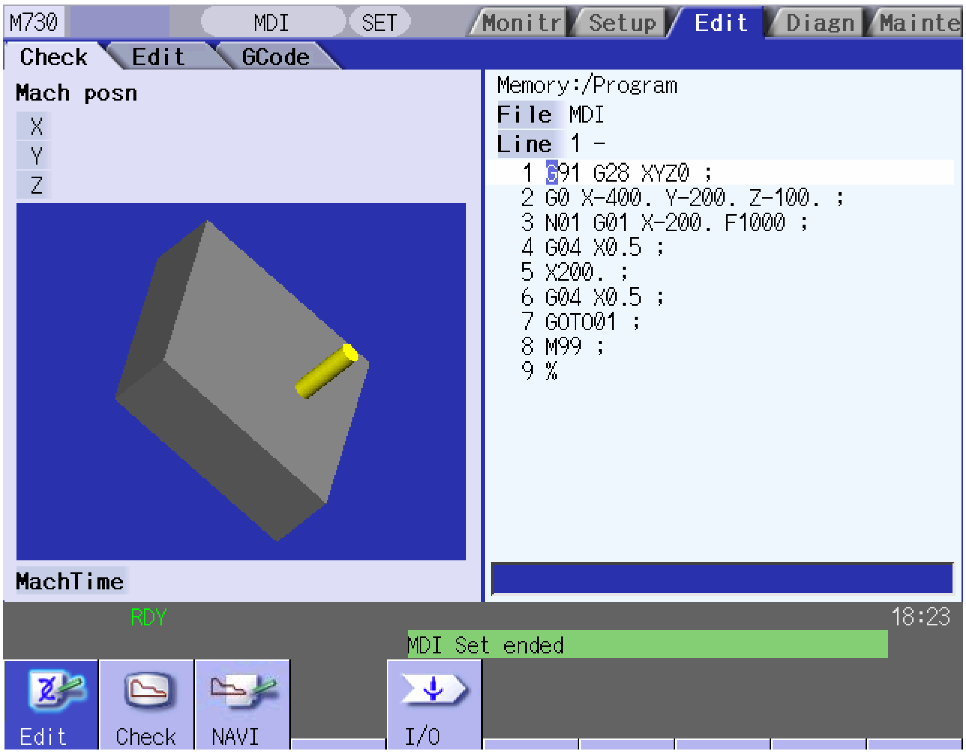


(c) This is a testing for X axis if testing for Y or Z axis set into related position.

(d) The machine has to moving back and forth for getting when SV032 unbalance torque and SV045 frictional torque value are obtained. .

(2) Testing program:

Moving table in machine's center and distance is 200mm by G01 F1000 speed moving back and forth.



(3) Frictional torque setting：

Carry out reciprocation operation (approx :F1000) with the axis to be observed the load current% on servo monitor screen. Recording and obtaining real value to calculate following expression below.

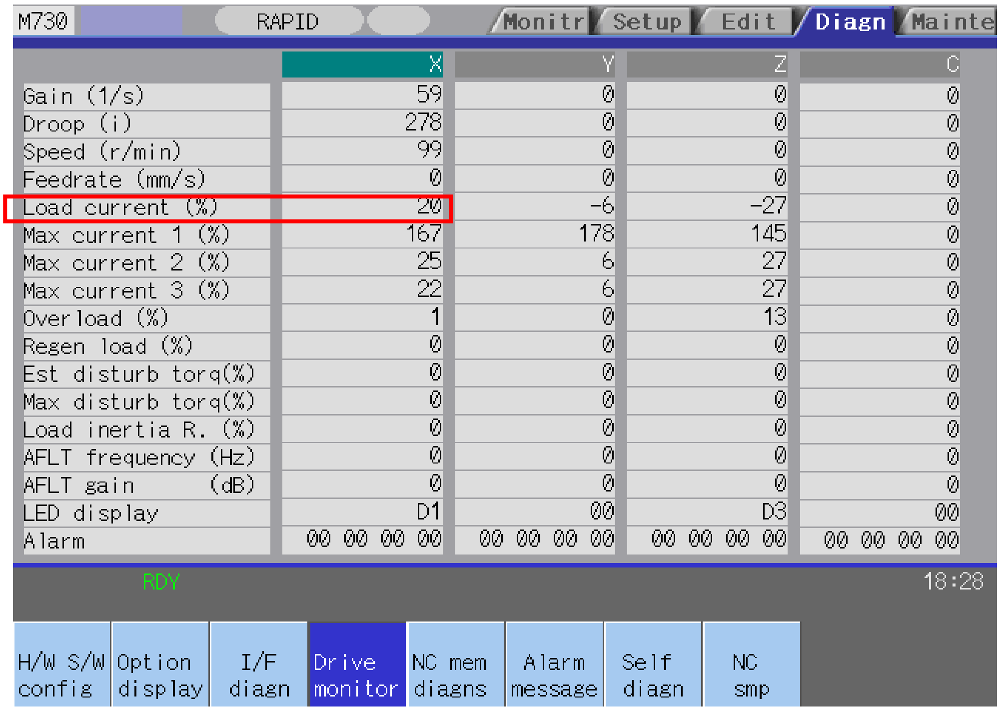
$$\text{Frictional torque} = \left| \frac{(+\text{feed load current\%}) - (-\text{feed load current \%})}{2} \right|$$

ex： Assume that the load current was 20% in +direction and -20% in the –direction when JOG feed was carried out at approx.F1000.The frictional torque is as show below:

$$\left| \frac{20 - (-20)}{2} \right| = 20\ \%$$

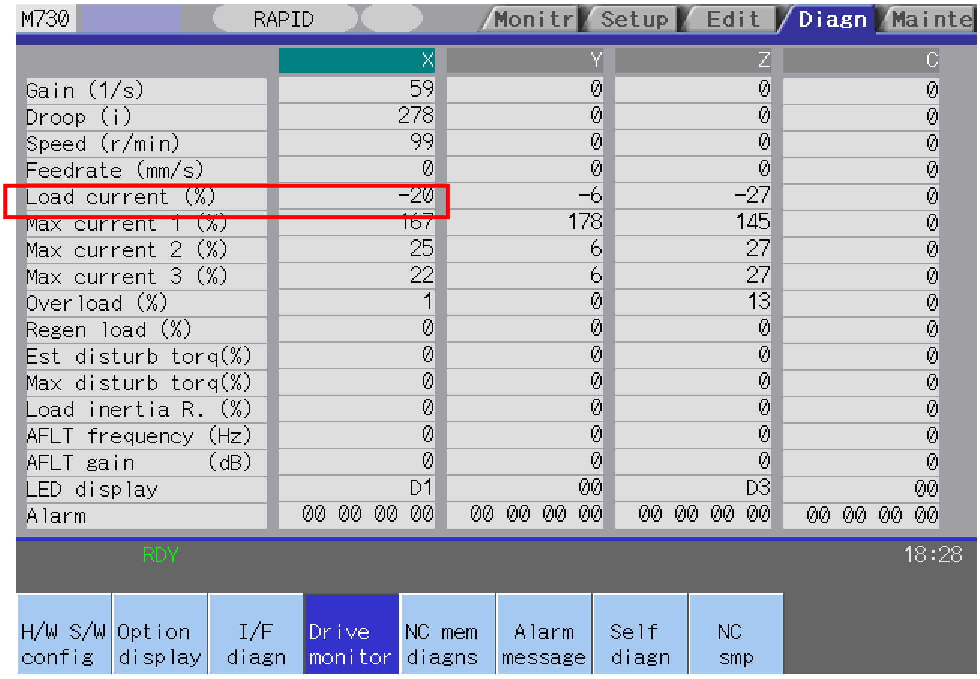
Obtaining value insert into SV045 （TRUB frictional torque）

(a) Load current in +direction= 20%

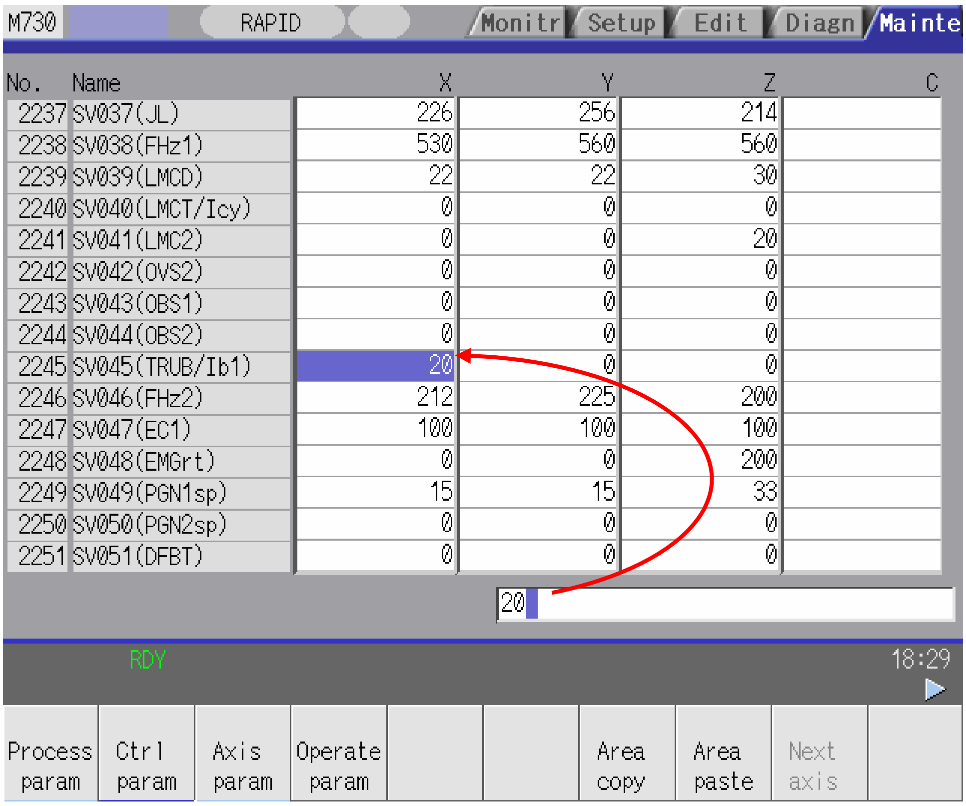


	X	Y	Z	C
Gain (1/s)	59	0	0	0
Droop (i)	278	0	0	0
Speed (r/min)	99	0	0	0
Feedrate (mm/s)	0	0	0	0
Load current (%)	20	-6	-27	0
Max current 1 (%)	167	178	145	0
Max current 2 (%)	25	6	27	0
Max current 3 (%)	22	6	27	0
Over load (%)	1	0	13	0
Regen load (%)	0	0	0	0
Est disturb torq(%)	0	0	0	0
Max disturb torq(%)	0	0	0	0
Load inertia R. (%)	0	0	0	0
AFLT frequency (Hz)	0	0	0	0
AFLT gain (dB)	0	0	0	0
LED display	D1	00	D3	00
Alarm	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00

(b) Load current in – direction = -20%



(c) Frictional torque value input into SV045 by formula calculation.



(4) Unbalance torque setting：

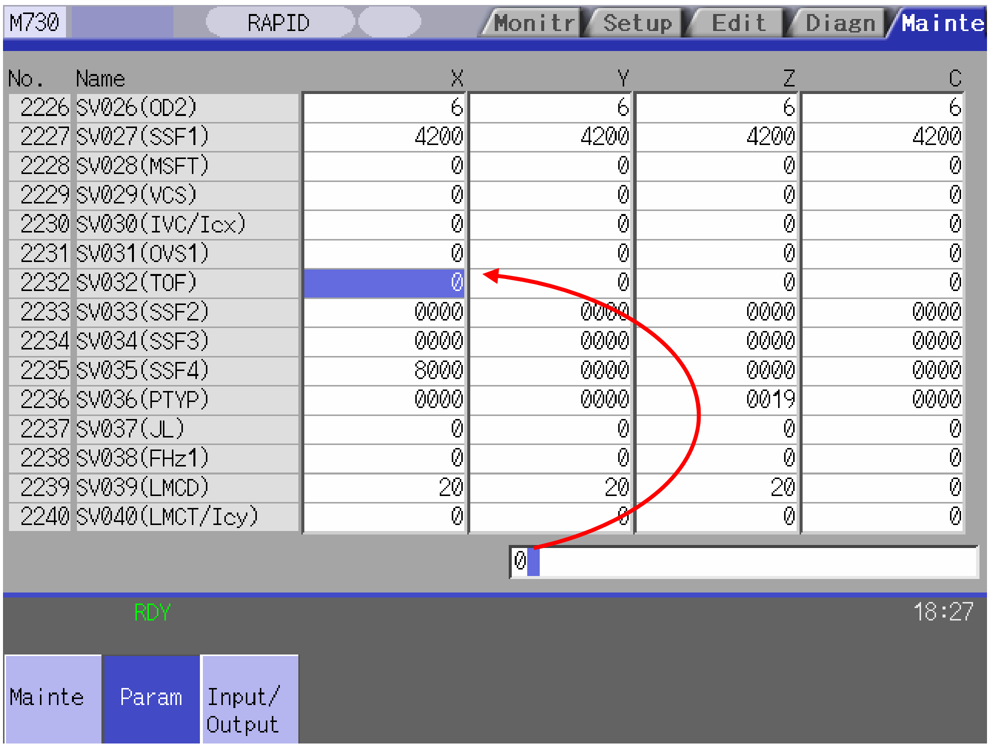
If the current is unbalance in reciprocally directions that the axis likes vertical or slant.

$$\text{Unbalance torque} = \frac{(+\text{feed load current\%}) + (-\text{feed load current\%})}{2}$$

ex： Assume that the load current was 20% in +direction and -20% in the –direction when JOG feed was carried out at approx.F1000.The unbalance torque is as show below:

$$\frac{20 + (-20)}{2} = 0\ \%$$

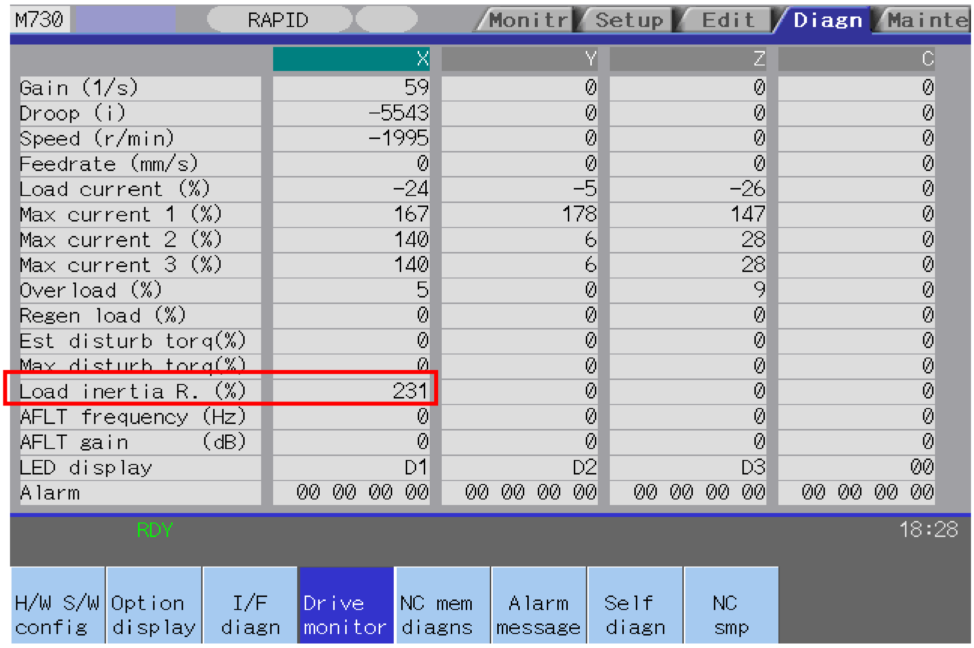
Obtaining value insert into SV032 （TOF Unbalance torque compensation）



No.	Name	X	Y	Z	C
2226	SV026(OD2)	6	6	6	6
2227	SV027(SSF1)	4200	4200	4200	4200
2228	SV028(MSFT)	0	0	0	0
2229	SV029(VCS)	0	0	0	0
2230	SV030(IVC/Icx)	0	0	0	0
2231	SV031(OVS1)	0	0	0	0
2232	SV032(TOF)	0	0	0	0
2233	SV033(SSF2)	0000	0000	0000	0000
2234	SV034(SSF3)	0000	0000	0000	0000
2235	SV035(SSF4)	8000	0000	0000	0000
2236	SV036(PTYP)	0000	0000	0019	0000
2237	SV037(JL)	0	0	0	0
2238	SV038(FHz1)	0	0	0	0
2239	SV039(LMCD)	20	20	20	0
2240	SV040(LMCT/Icy)	0	0	0	0

0

(5) The load inertia value displayed on monitor screen using rapid mode 100% speed with reciprocally movement .



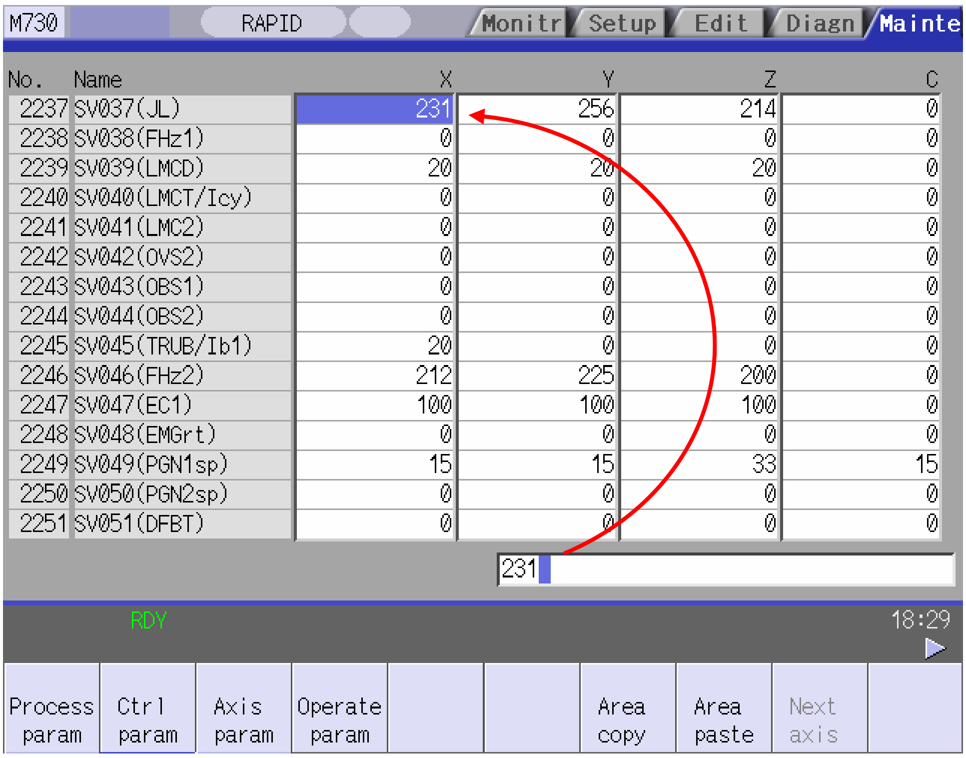
M730 RAPID Monitr Setup Edit Diagn Mainte

	X	Y	Z	C
Gain (1/s)	59	0	0	0
Droop (i)	-5543	0	0	0
Speed (r/min)	-1995	0	0	0
Feedrate (mm/s)	0	0	0	0
Load current (%)	-24	-5	-26	0
Max current 1 (%)	167	178	147	0
Max current 2 (%)	140	6	28	0
Max current 3 (%)	140	6	28	0
Overload (%)	5	0	9	0
Regen load (%)	0	0	0	0
Est disturb torq(%)	0	0	0	0
Max disturb torq(%)	0	0	0	0
Load inertia R. (%)	231	0	0	0
AFLT frequency (Hz)	0	0	0	0
AFLT gain (dB)	0	0	0	0
LED display	D1	D2	D3	00
Alarm	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00

RDY 18:28

H/W S/W config | Option display | I/F diagn | Drive monitor | NC mem diagns | Alarm message | Self diagn | NC smp

(6) Obtaining value on monitor screen inserts into SV037 for X axis load inertia scale.



M730 RAPID Monitr Setup Edit Diagn Mainte

No.	Name	X	Y	Z	C
2237	SV037(JL)	231	256	214	0
2238	SV038(FHz1)	0	0	0	0
2239	SV039(LMCD)	20	20	20	0
2240	SV040(LMCT/Icy)	0	0	0	0
2241	SV041(LMC2)	0	0	0	0
2242	SV042(OVS2)	0	0	0	0
2243	SV043(OBS1)	0	0	0	0
2244	SV044(OBS2)	0	0	0	0
2245	SV045(TRUB/Ib1)	20	0	0	0
2246	SV046(FHz2)	212	225	200	0
2247	SV047(EC1)	100	100	100	0
2248	SV048(EMGrt)	0	0	0	0
2249	SV049(PGN1sp)	15	15	33	15
2250	SV050(PGN2sp)	0	0	0	0
2251	SV051(DFBT)	0	0	0	0

231

RDY 18:29

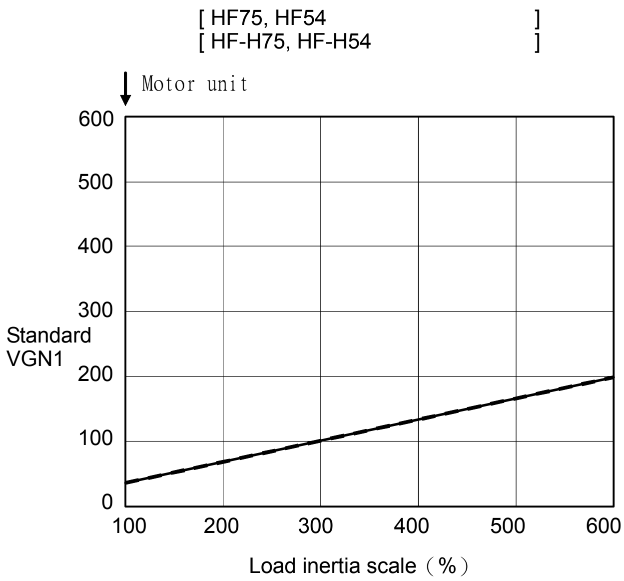
Process param | Ctrl param | Axis param | Operate param | | | Area copy | Area paste | Next axis

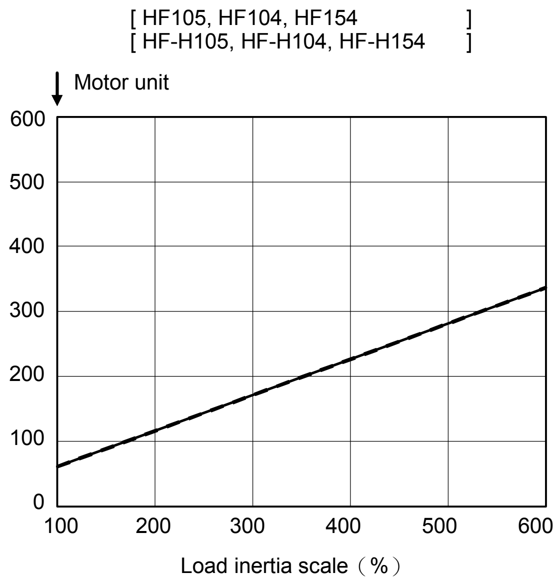
(7) Setting the SV035 value back to “0000”

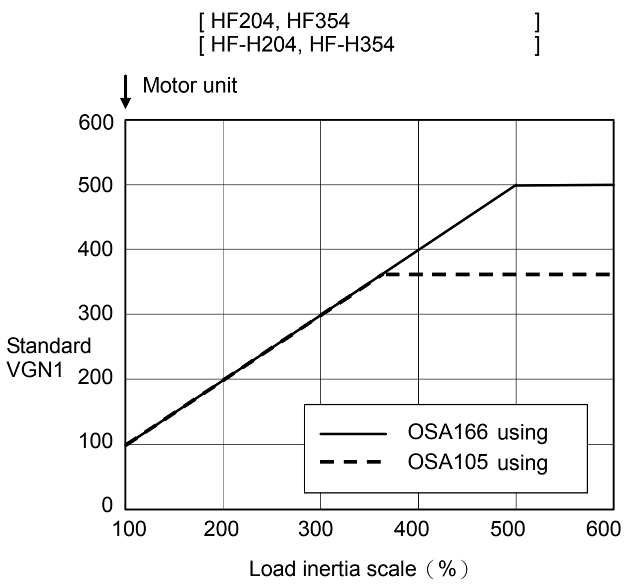
(8) There are two reasons why to obtain load inertia scale of motor .
  (a) To measure whether has a proper horsepower of motor.
  (b) The standard speed loop gain（VGN ）can be obtained.

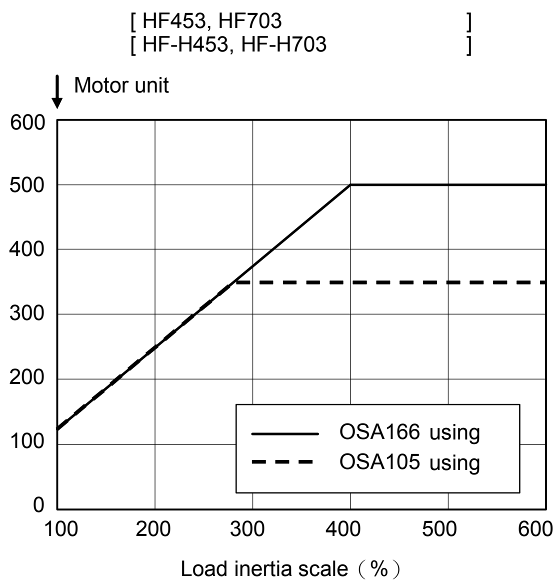
(9) The JL value is a judgment whether has a proper choice of motor.
  (a) The recommendatory value is under 200 when the machining is high speed and accuracy mode.
  (b) The recommendatory value is under 300 when the end user is parts machining.
  (c) The specification of motor chose too small when the value is 350 over.

(10) Obtaining standard VGN value by load inertia .（Servo motor HF、HF-H series）





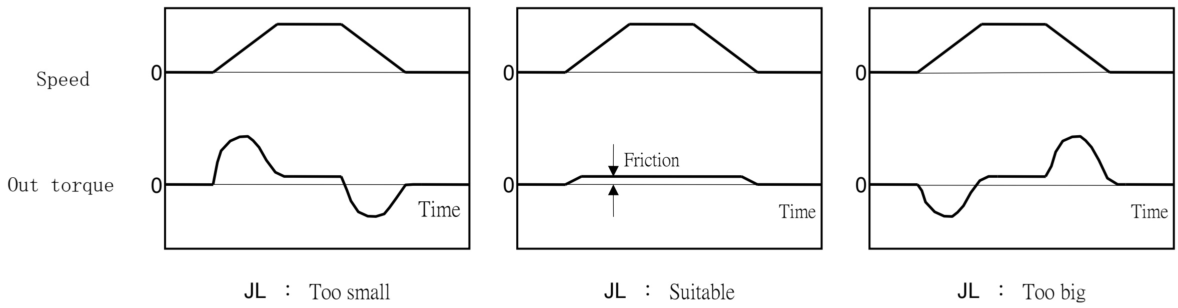




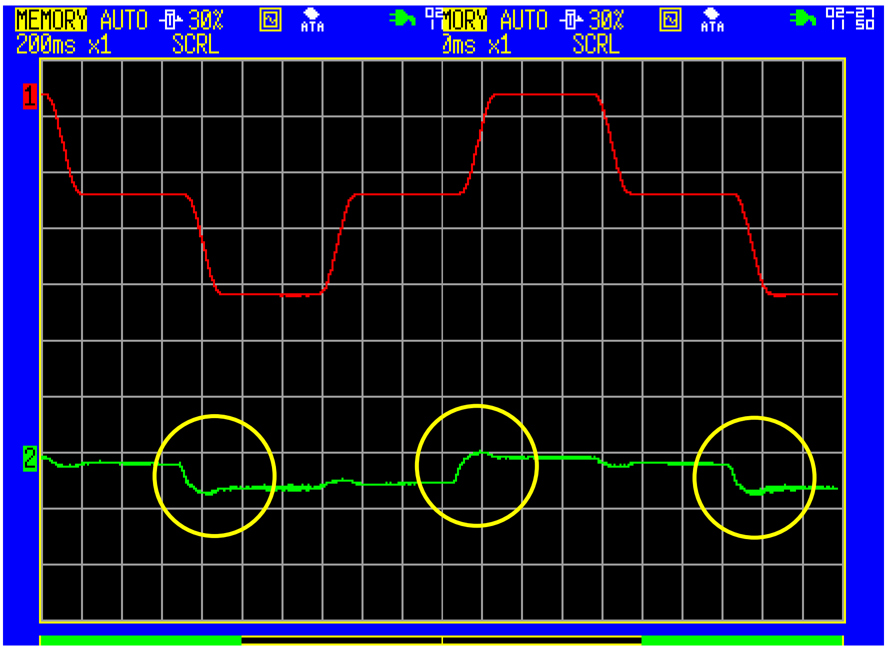
19.3.2 Use D/A output measurement

Set below parameters and match above chapter mentioned program to test.

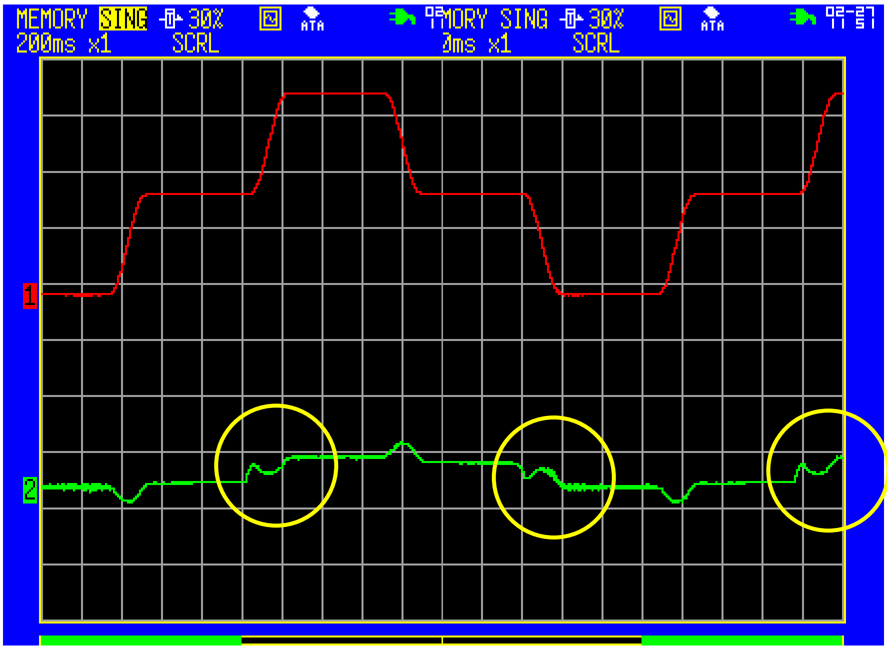
SV037 = 200
SV043 = 100
SV061 = 1
SV062 = 35
SV063 = 0
SV064 = 0



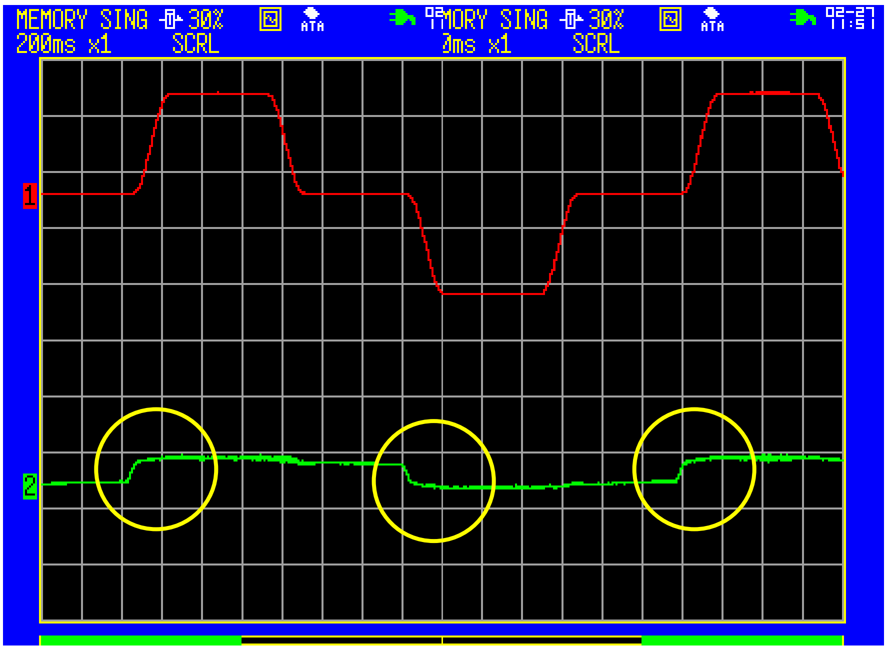
(1) JL value sets too small. Add SV037 setting.



(2) JL value sets too big. Reduce SV037 setting.



(3) JL value sets is ok.



19.4 Servo resonance adjustment

(1) Related adjusting parameter：

<table>
<tr><th>No.</th><th>Abbrev.</th><th>Parameter name</th><th>Explanation</th><th>Setting range</th></tr>
<tr><td>SV038</td><td>FHz1</td><td>Notch filter frequency 1</td><td>Set the vibration frequency to suppress if machine vibration occurs.
(Valid at 36 or move)When not using, set to “0”</td><td>0～9000
(Hz)</td></tr>
<tr><td>SV046</td><td>FHz2</td><td>Notch filter frequency 2</td><td>Set the vibration frequency to suppress if machine vibration occurs.
(Valid at 36 or move)When not using, set to “0”</td><td>0～9000
(Hz)</td></tr>
<tr><td>SV033</td><td>SSF2</td><td>Servo function selection 2</td><td colspan="2">
<table>
<tr><td>F</td><td>E</td><td>D</td><td>C</td><td>B</td><td>A</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td></td><td>zup</td><td></td><td></td><td colspan="2">dis</td><td></td><td></td><td colspan="3">nfd2</td><td>nf3</td><td colspan="3">nfd1</td><td></td></tr>
</table>
<table>
<tr><th colspan="2">bit</th><th>Meaning when “0”is set</th><th>Meaning when “1” is set</th></tr>
<tr><td>1
2
3</td><td>nfd1</td><td colspan="2">Set the filter depth for Notch filter1 (SV038).
Value 000 001 010 011 100 101 110 111
Deep ← Shallow
Depth (dB) -∞ -18.1 -12.0 -8.5 -6.0 -4.1 -2.5 -1.2</td></tr>
<tr><td>4</td><td>nf3</td><td>Notch filter3 stop</td><td>Notch filter3 start（1125Hz）</td></tr>
<tr><td>5
6
7</td><td>nfd2</td><td colspan="2">Set the operation frequency of Notch filter2(SV046)
Value 000 001 010 011 100 101 110 111
Deep ← Shallow
Depth (dB) -∞ -18.1 -12.0 -8.5 -6.0 -4.1 -2.5 -1.2</td></tr>
</table>
</td></tr>
<tr><td>SV087</td><td>FHz4</td><td>Notch filter frequency 4</td><td>Set the vibration frequency to suppress if machine vibration occurs.
(Valid at 80 or move)When not using, set to “0”</td><td>100~2250(Hz)</td></tr>
<tr><td>SV088</td><td>FHz5</td><td>Notch filter frequency 5</td><td>Set the vibration frequency to suppress if machine vibration occurs.
(Valid at 36 or move)When not using, set to “0”</td><td>100~2250(Hz)</td></tr>
<tr><td>Sv083</td><td>SSF6</td><td>Servo function selection 6</td><td colspan="2">
<table>
<tr><td>F</td><td>E</td><td>D</td><td>C</td><td>B</td><td>A</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="4">dos</td><td colspan="4">dis</td><td colspan="3">nfd2</td><td>nfd3</td><td colspan="3">nfd1</td><td>zck</td></tr>
</table>
<table>
<tr><th colspan="2">bit</th><th>Meaning when “0” is set</th><th>Meaning when “1” is set</th></tr>
<tr><td>1
2
3</td><td>nfd4</td><td colspan="2">Set the filter depth for Notch filter 4 (SV087)
Setting value Deep← →Shallow
000 001 010 011 100 101 110 111
Depth(dB) -∞ -18.1 -12.0 -8.5 -6.0 -4.1 -2.5 -1.2</td></tr>
<tr><td>4</td><td></td><td></td><td></td></tr>
<tr><td>5
6
7</td><td>nfd5</td><td colspan="2">Set the filter depth for Notch filter 5 (SV088)
Setting value Deep← →Shallow
000 001 010 011 100 101 110 111
Depth(dB) -∞ -18.1 -12.0 -8.5 -6.0 -4.1 -2.5 -1.2</td></tr>
</table>
</td></tr>
</table>

(2) The frequency and standard filter depth table set for resonance suppression filter .

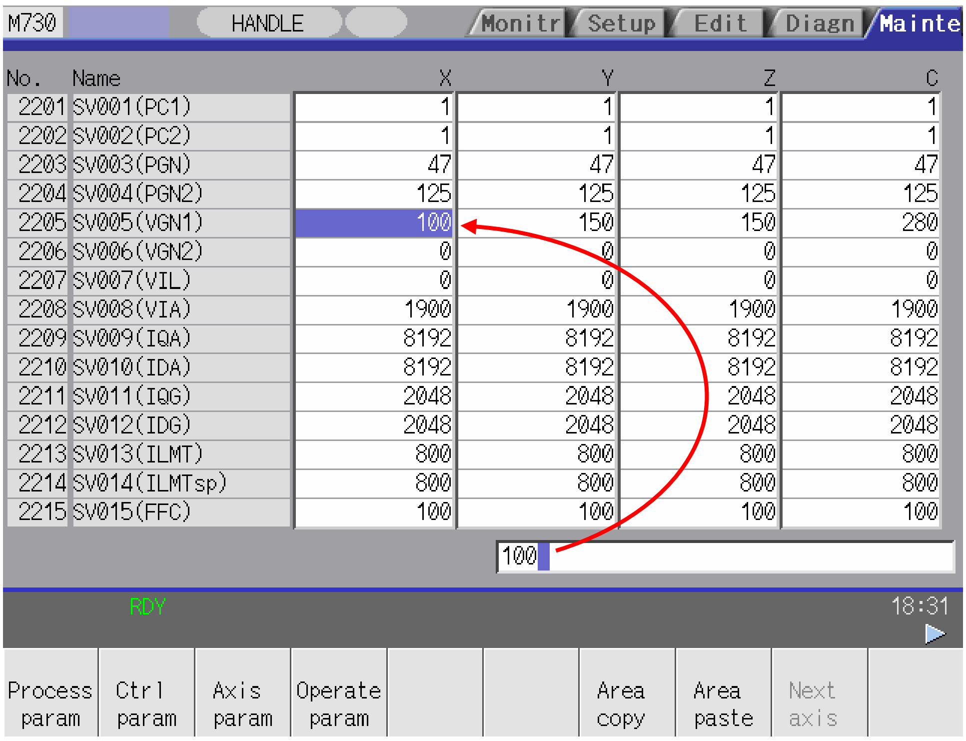
Setting frequency	Standard depth	Setting frequency	Standard depth	Setting frequency	Standard depth
2250Hz	0	529Hz	0	225Hz	4
1800Hz	0	500Hz	0	204Hz	4
1500Hz	0	474Hz	0	187Hz	8
1285Hz	0	450Hz	0	173Hz	8
1125Hz	0	429Hz	0	160Hz	8
1000Hz	0	409Hz	0	150Hz	8
900Hz	0	391Hz	4	132Hz	8
818Hz	0	375Hz	4	125Hz	8
750Hz	0	346Hz	4	112Hz	8
692Hz	0	321Hz	4	100Hz	C
642Hz	0	300Hz	4	90Hz	C
600Hz	0	281Hz	4	80Hz	C
562Hz	0	250Hz	4	70Hz	C

100Hz below
Setting difficulty

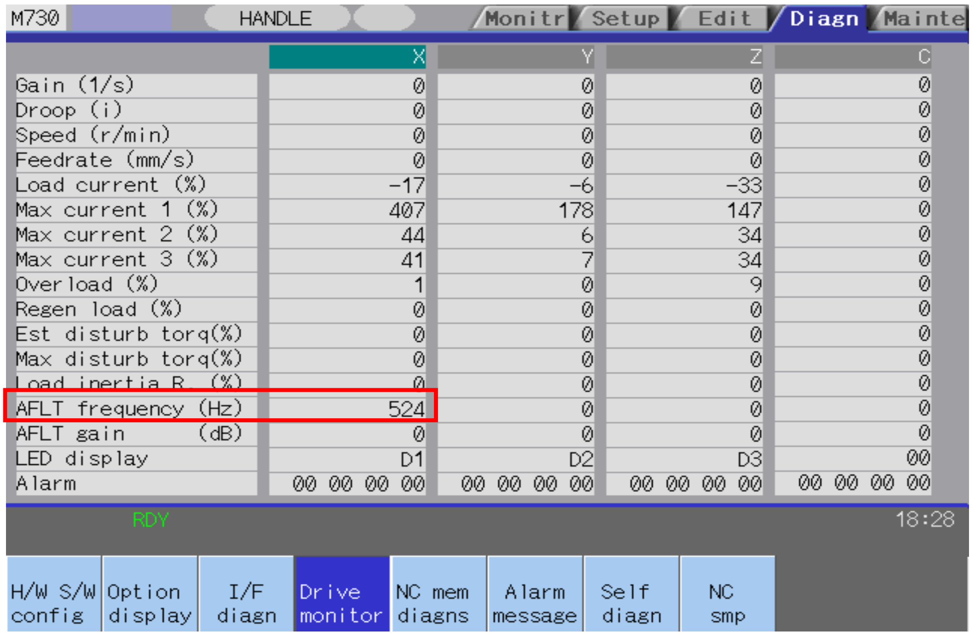
【Note】 (a) The setting value of hexadecimal on bit0 and bit4 is setting “0” for standard depth compensation.

(b) The standard depth is setting with standard value ,but depend on machine‘s condition changed the depth level.

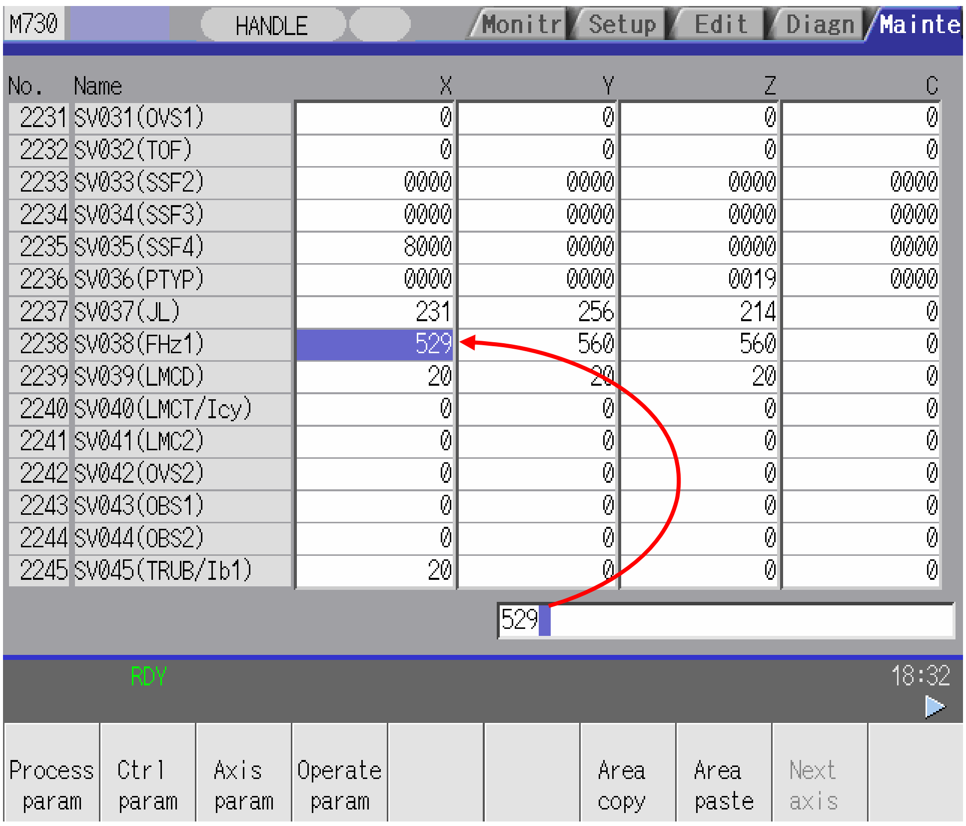
(3) All of parameter for resonance frequency set to “0”.The servo gain SV005 begins from 100 extending by moving with handle mode.



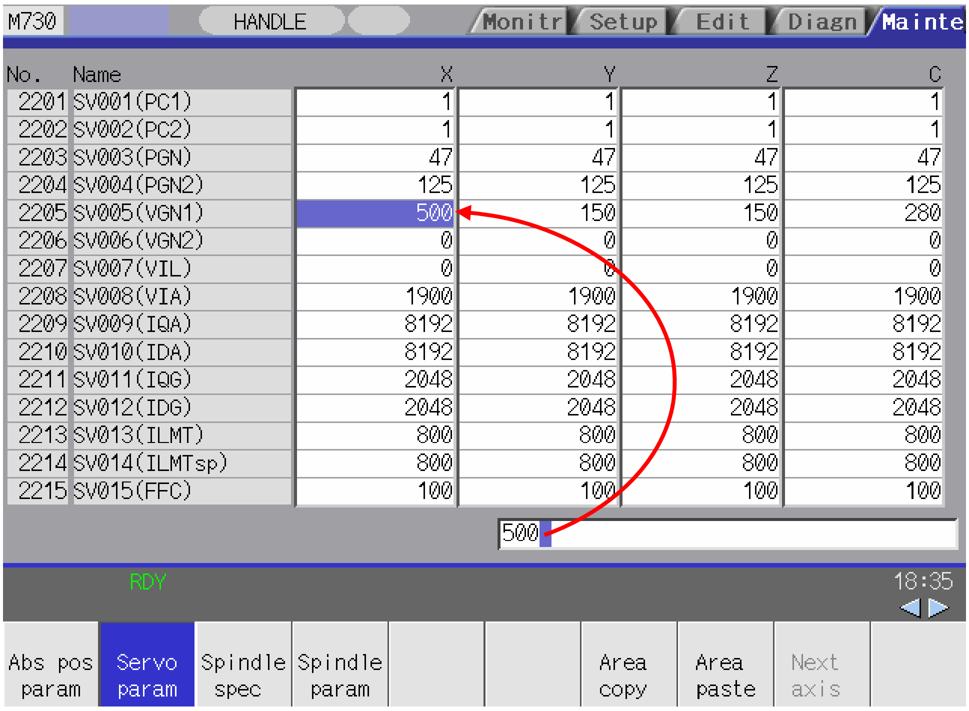
(4) Observing value of AFLT(Hz) frequency on servo monitor screen. According to item (2) find out approaching value to insert into vibration frequency on servo parameter.



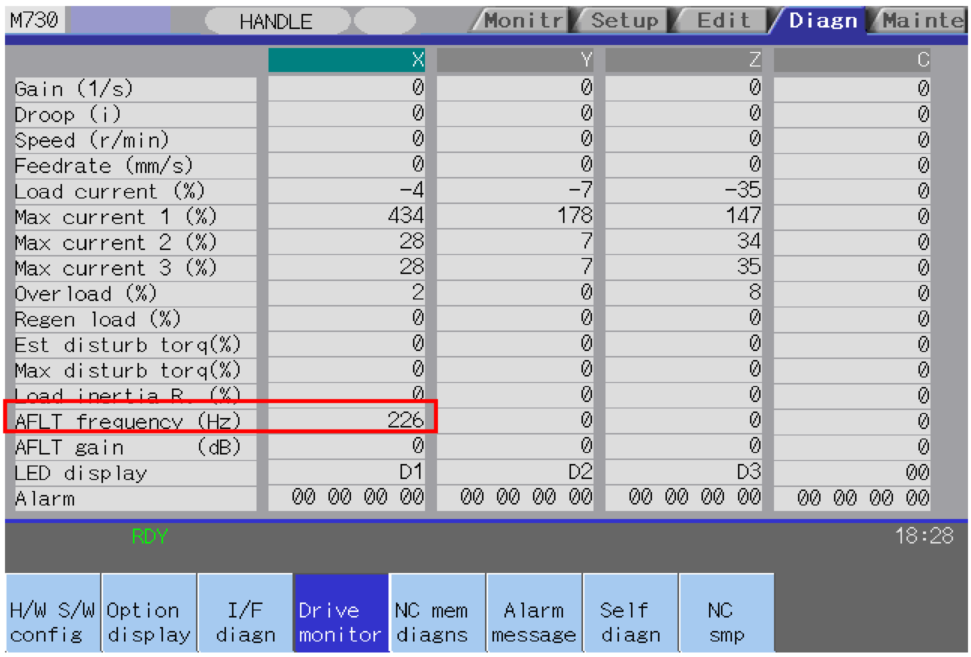
(5) The frequency is 524Hz when monitor screen indicated on AFLT that it is contrast with frequency table approaching value of 529Hz.This value of 529Hz inserts into SV038(FHz1).



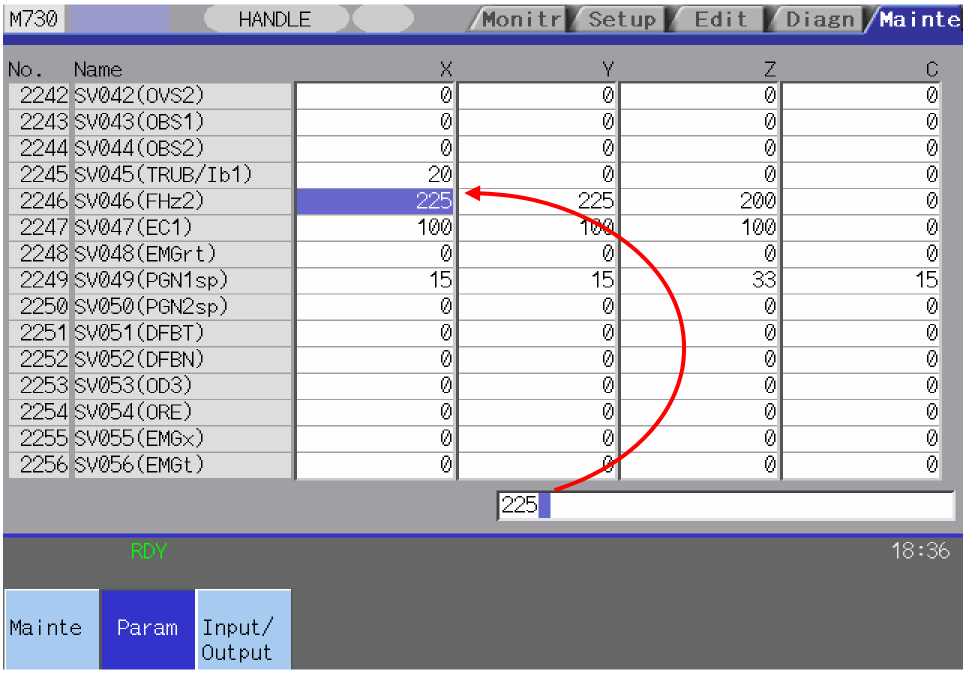
(6) Please confirm without vibration occurred by handle when resonance frequency set first time . Whether vibration occurred when each time increasingly add 50 to SV005 (VGN1). This is an example when frequency increases to 500 until second vibration frequency occurred.



(7) Observing value of AFLT(Hz) frequency on servo monitor screen. According to item (2) find out approaching value to insert into vibration frequency on servo parameter.

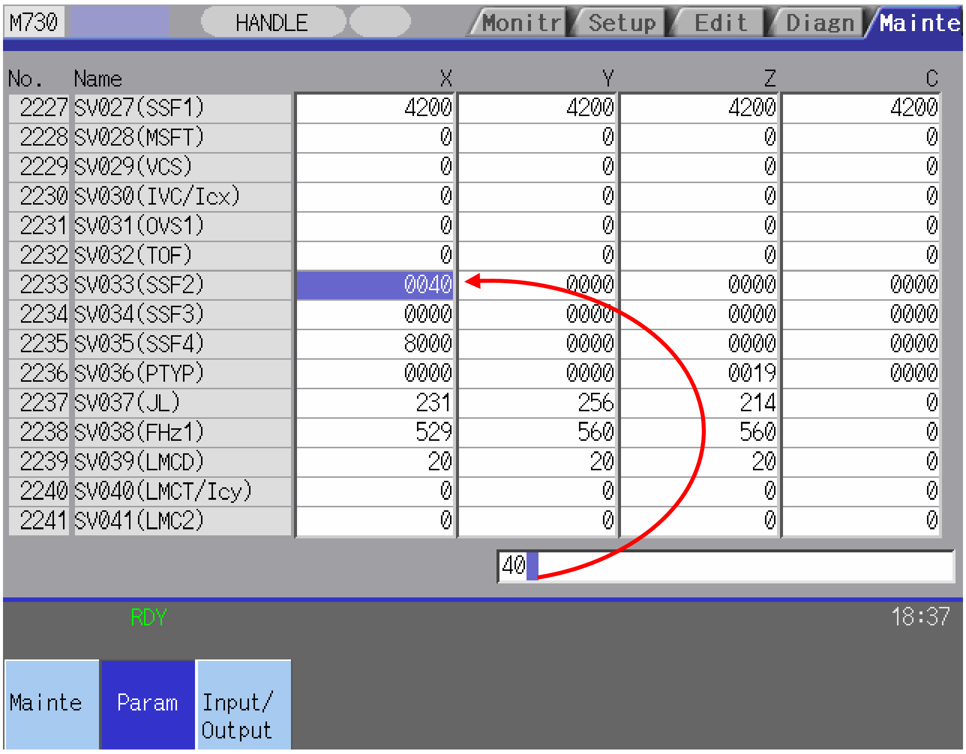


(8) The frequency is 226Hz when monitor screen indicated on AFLT that it is contrast with frequency table approaching value of 225Hz.This value of 225Hz inserts into SV046(FHz2).



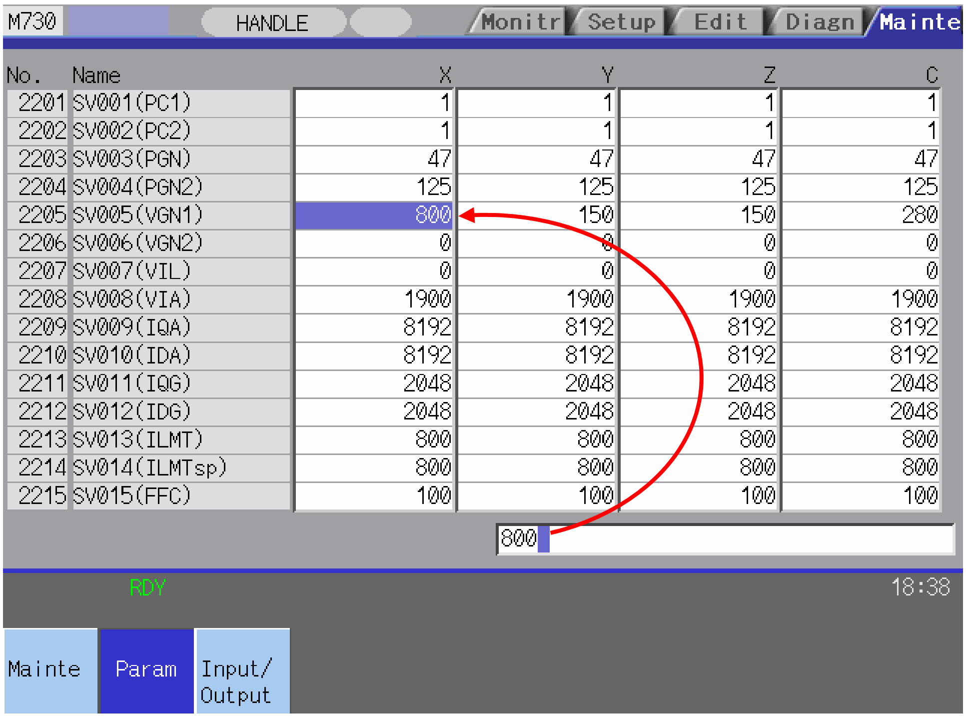
No.	Name	X	Y	Z	C
2242	SV042(OVS2)	0	0	0	0
2243	SV043(OBS1)	0	0	0	0
2244	SV044(OBS2)	0	0	0	0
2245	SV045(TRUB/Ib1)	20	0	0	0
2246	SV046(FHz2)	225	225	200	0
2247	SV047(EC1)	100	100	100	0
2248	SV048(EMGrt)	0	0	0	0
2249	SV049(PGN1sp)	15	15	33	15
2250	SV050(PGN2sp)	0	0	0	0
2251	SV051(DFBT)	0	0	0	0
2252	SV052(DFBN)	0	0	0	0
2253	SV053(OD3)	0	0	0	0
2254	SV054(ORE)	0	0	0	0
2255	SV055(EMGx)	0	0	0	0
2256	SV056(EMGt)	0	0	0	0

(9) The filter depth has to set when resonance frequency is 400Hz below. Refer to frequency table that setting depth for 225Hz is "4". This is the second resonance frequency, so SV033 value is "40".



No.	Name	X	Y	Z	C
2227	SV027(SSF1)	4200	4200	4200	4200
2228	SV028(MSFT)	0	0	0	0
2229	SV029(VCS)	0	0	0	0
2230	SV030(IVC/Icx)	0	0	0	0
2231	SV031(OVS1)	0	0	0	0
2232	SV032(TOF)	0	0	0	0
2233	SV033(SSF2)	0040	0000	0000	0000
2234	SV034(SSF3)	0000	0000	0000	0000
2235	SV035(SSF4)	8000	0000	0000	0000
2236	SV036(PTYP)	0000	0000	0019	0000
2237	SV037(JL)	231	256	214	0
2238	SV038(FHz1)	529	560	560	0
2239	SV039(LMCD)	20	20	20	0
2240	SV040(LMCT/Icy)	0	0	0	0
2241	SV041(LMC2)	0	0	0	0

(10) When the second level vibration frequency is decided. The value of SV005 (VGN1) increase until 800 if still does not occur vibration .This is a hard stabilization. According to load inertia contrast with VGN table will decide a VGN value. The VGN values can proper increase if precision demand highly.



No.	Name	X	Y	Z	C
2201	SV001(PC1)	1	1	1	1
2202	SV002(PC2)	1	1	1	1
2203	SV003(PGN)	47	47	47	47
2204	SV004(PGN2)	125	125	125	125
2205	SV005(VGN1)	800	150	150	280
2206	SV006(VGN2)	0	0	0	0
2207	SV007(VIL)	0	0	0	0
2208	SV008(VIA)	1900	1900	1900	1900
2209	SV009(IQA)	8192	8192	8192	8192
2210	SV010(IDA)	8192	8192	8192	8192
2211	SV011(IQG)	2048	2048	2048	2048
2212	SV012(IDG)	2048	2048	2048	2048
2213	SV013(ILMT)	800	800	800	800
2214	SV014(ILMTsp)	800	800	800	800
2215	SV015(FFC)	100	100	100	100

Caution	The speed loop gain adjustment maximum setting please regarding motor specification. Don't over setting. If setting big speed loop gain or add second vibration frequency. Please down speed loop gain value then slowly add value to avoid vibration noise.

19.5 Position loop gain adjustment procedure

Set below D/A parameters to test.

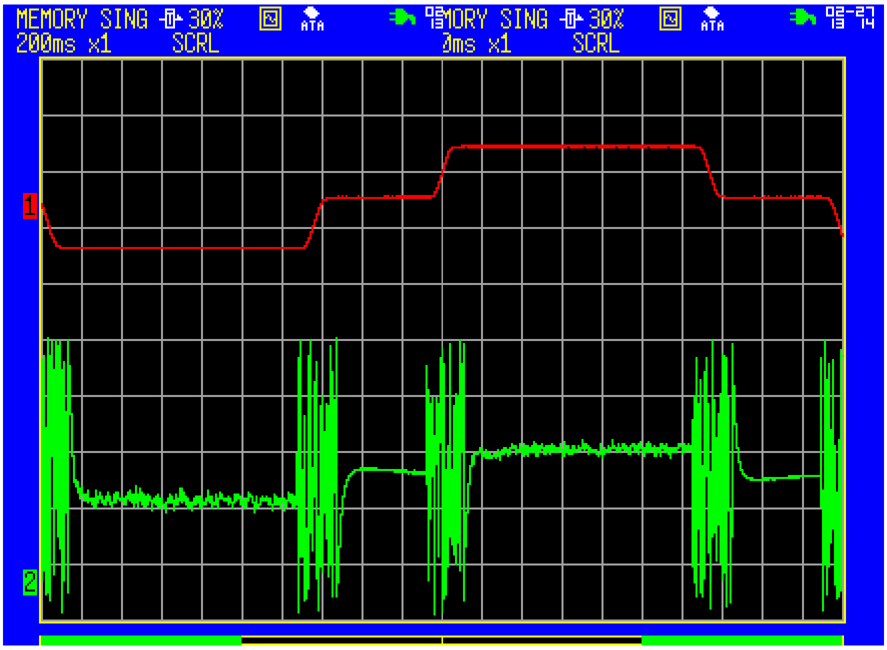
SV061 = 1

SV062 = 50

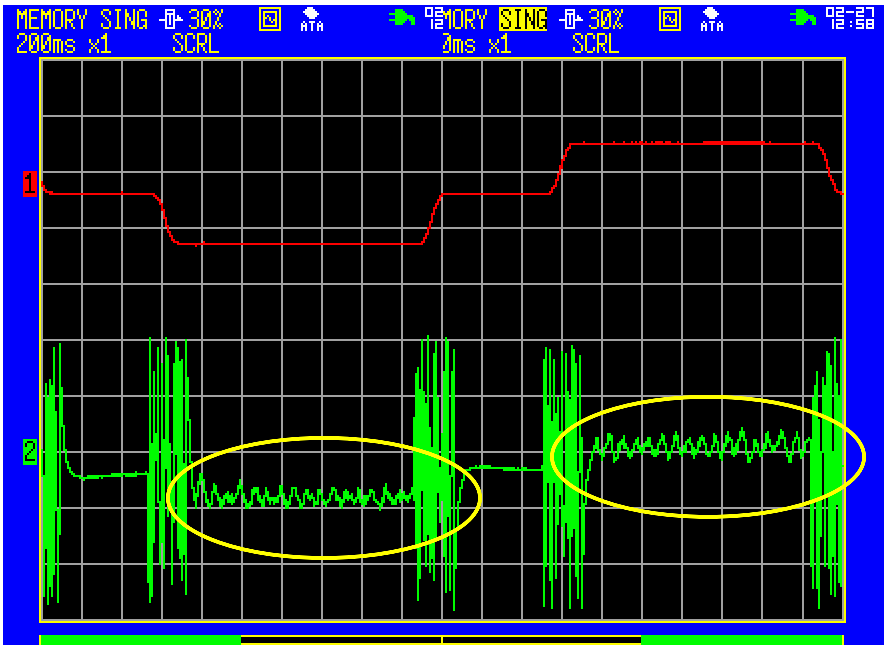
SV063 = 50

SV064 = 10

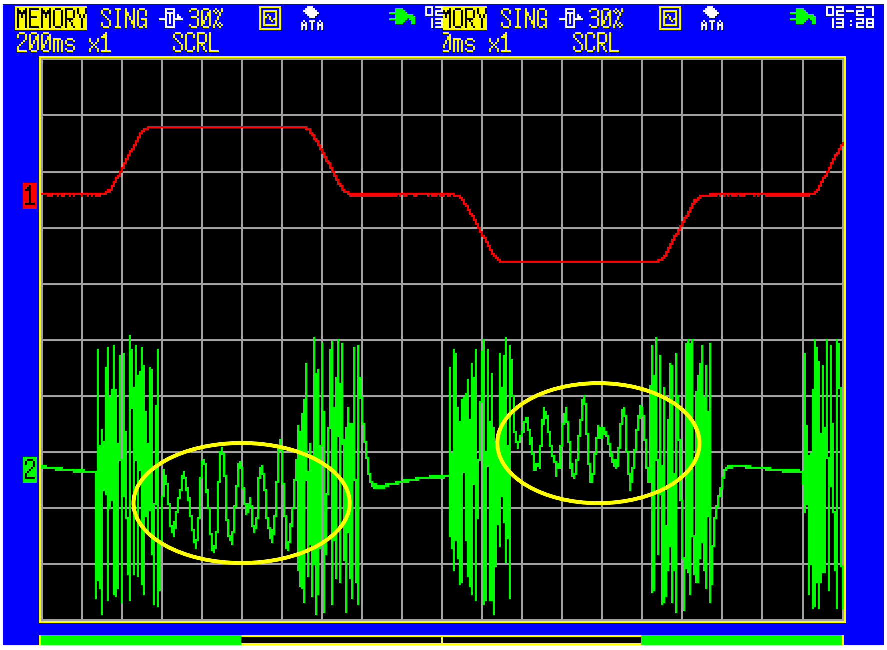
(1) Standard waveform



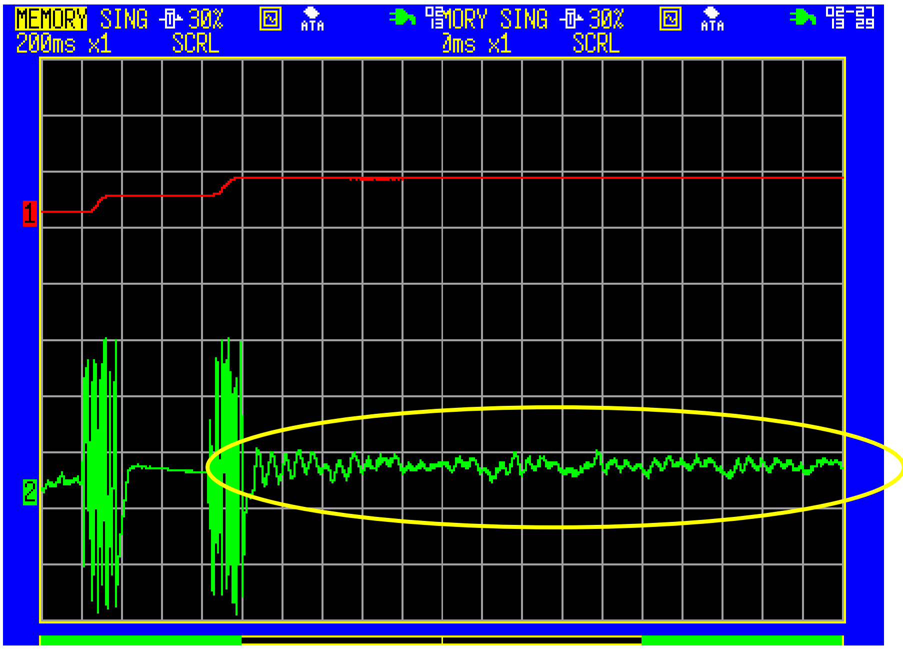
(2) Mechanical problem.



(3) Z axis balance shift has problem in G0 100% movement.



(4) Z axis balance shift has problem in G0 25 % movement.



(5) When machine contracture is not good, it must down position loop gain. Below is for SHG related setting.

No.	Abbrev	Name	Rate	Setting					Explanation	Setting rang
SV003 (SV049)	PGN1 (PGN1sp)	Position loop gain 1	1	23	26	33	38	47	It must set 3 sets parameter.	1～200 (rad/s)
SV004 (SV050)	PGN2 (PGN2sp)	Position loop gain 2	$\frac{8}{3}$	62	70	86	102	125		0～999 (rad/s)
SV057 (SV058)	SHGC (SHGCsp)	SHG control gain	6	140	160	187	225	281		0～1200 (rad/s)
SV008	VIA	Speed loop lead compensation	SHG control the standard setting is 1900.							1～9999
SV015	FFC	Acceleration rate feed forward gain	SHG control the standard setting is 100.							0～999 (%)

19.6 ACC/DEC time adjustment procedure

The adjustment of Rapid speed is adjust NC axis specification parameter in rapid speed and Acc/Dec time constant（G0t*）. The rapid is follow machine spec to set motor speed in motor specification. The Acc/ Dec time setting please use rapid G00 100% in rapid mode, that max current value is within below table value. For safety consider it sets in 70%.

Approach the max motor speed area, because output torque restrict so when check adjust the current feedback of Acc/Dec let waveform in spec range. The output voltage of drive unit is below fixed voltage will easy happen torque not enough and error over problem during Acc/Dec. Please pay attention in it.

Acc/Dec time constant adjusts max current command

MDS-D series（200V）		MDS-D-SVJ3 series（200V）	
Motor type	Max current command	Motor type	Max current command
HF75	within 350%	HF75	437
HF105	within 270%	HF105	337
HF54	within 420%	HF54	525
HF104	within 504%	HF104	439
HF154	within 378%	HF154	472
HF204	within 340%	HF204	356
HF354	within 331%	HF354	290
HF453	within 298%		
HF703	within 238%		
HF903	within 291%		

Acc/Dec speed adjustment method uses D/A output to carry out. MDS-D-SVJ3 with HF204 adjustment setting is like below：

Current magnification setting：
100x（100／1V current） ＝ SV063 or SV064 setting

Example：HF204 max current is ”249%” in 70%.

2V = 2.49%
1V = 1.245%
100x（100/124.5）≒ 80　　Input this number to SV063 or SV064
【Note】After set completed, the HICORDER uses 2 DIV to test.

19.7 Z axis drop prevention function

M／C machining centre in Z axis (vertical axis) motor with breaking function, willing has the vertical prevention drop function or slow speed cutting occurred power failure the tool can a bit up function to avoid tool drop the machining workpeice.

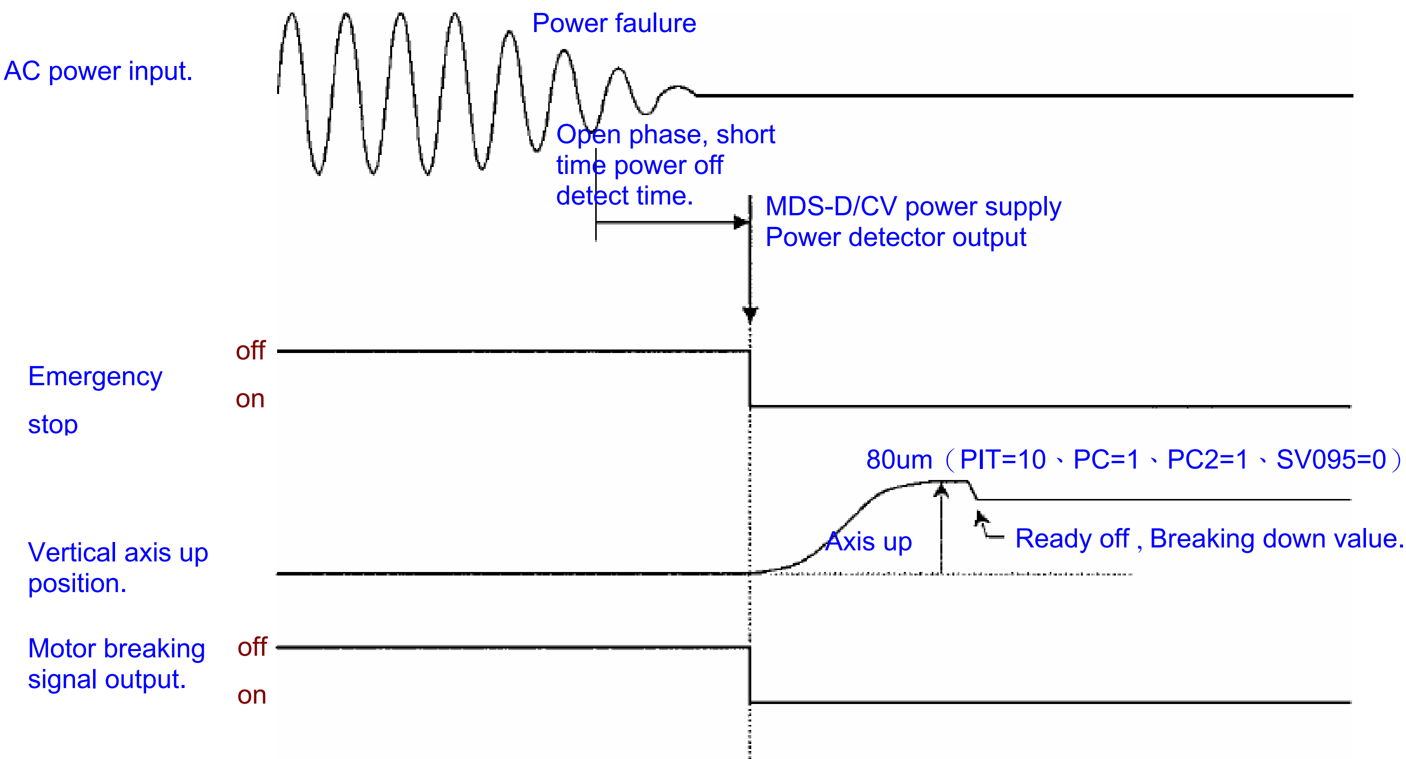
Action explanation

Vertical axis up function in power failure only valid in below conditions：

A ：While emergency stop, set axis motor speed below 60 rpm/min the function is on.

B ：While power stop, set axis motor speed below 60 rpm/min the function is on.

When A、B situation, the axis motor over 60 rpm/min this function is not working.



Corresponding parameters

#2233 (SV033) ＝ 4XXX

#2232 (SV032) ＝ imbalance torque. The symbol of number is for moving direction.

（The negative is moved up setting）

#2248 (SV048) ＝ 200

#2255 (SV055) ＝ 200

#2256 (SV056) ＝ same as #2004

#2295 (SV095) ＝ Setting axis up distance（0～2000）. Setting “0” is to motor 8/1000 Speed rpm.

Attention points（The corresponding software version）

MDS-D/DH-Vx series BND-1501W001-A4

MDS-D/DH-SP series BND-1501W002-A4

MDS-D/DH-CV series BND-588W000-A2

19.8 Servo motor standard parameter list

19.8.1 MDS-D-Vx standard motor HF series

Parameter			Motor	200V Standard motor HF Series									
				HF75	HF105	HF54	HF104	HF154	HF204	HF354	HF453	HF703	HF903
No.	Abbrev.	Details	Unit capacity	20	20	40	40	80	80	160	160	160W	320
SV001	PC1	Motor side gear ratio		-	-	-	-	-	-	-	-	-	-
SV002	PC2	Machine side gear ratio		-	-	-	-	-	-	-	-	-	-
SV003	PGN1	Position loop gain 1		33	33	33	33	33	33	33	33	33	33
SV004	PGN2	Position loop gain 2		0	0	0	0	0	0	0	0	0	0
SV005	VGN1	Speed loop gain 1		100	100	100	100	100	100	100	100	100	100
SV006	VGN2	Speed loop gain 2		0	0	0	0	0	0	0	0	0	0
SV007	VIL	Speed loop delay compensation		0	0	0	0	0	0	0	0	0	0
SV008	VIA	Speed loop lead compensation		1364	1364	1364	1364	1364	1364	1364	1364	1364	1364
SV009	IQA	Current loop q axis lead compensation		20480	10240	20480	10240	10240	8192	8192	6144	6144	4096
SV010	IDA	Current loop d axis lead compensation		20480	10240	20480	10240	10240	8192	8192	6144	6144	4096
SV011	IQG	Current loop q axis gain		768	512	3072	1280	1536	2048	2048	2048	2048	1536
SV012	IDG	Current loop d axis gain		768	512	3072	1280	1536	2048	2048	2048	2048	1536
SV013	ILMT	Current limit value		800	800	800	800	800	800	800	800	800	800
SV014	ILMTsp	Current limit value in special control		800	800	800	800	800	800	800	800	800	800
SV015	FFC	Acceleration rate feed forward gain		0	0	0	0	0	0	0	0	0	0
SV016	LMC1	Lost motion compensation 1		0	0	0	0	0	0	0	0	0	0
SV017	SPEC	Servo specification selection		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV018	PIT	Ball screw pitch		-	-	-	-	-	-	-	-	-	-
SV019	RNG1	Position detector resolution		-	-	-	-	-	-	-	-	-	-
SV020	RNG2	Speed detector resolution		-	-	-	-	-	-	-	-	-	-
SV021	OLT	Overload detection time constant		60	60	60	60	60	60	60	60	60	60
SV022	OLL	Overload detection level		150	150	150	150	150	150	150	150	150	150
SV023	OD1	Excessive error detection width during servo ON		6	6	6	6	6	6	6	6	6	6
SV024	INP	In-position detection width		50	50	50	50	50	50	50	50	50	50
SV025	MTYP	Motor/detector type		xx01	xx02	xx03	xx04	xx05	xx07	xx08	xx09	xx0A	xx0B
SV026	OD2	Excessive error detection width during servo OFF		6	6	6	6	6	6	6	6	6	6
SV027	SSF1	Servo function selection 1		4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
SV028				0	0	0	0	0	0	0	0	0	0
SV029	VCS	Speed at the change of speed loop gain		0	0	0	0	0	0	0	0	0	0
SV030	IVC	Voltage dead time compensation / current bias 1		0	0	0	0	0	0	0	0	0	0
SV031	OVS1	Overshooting compensation 1		0	0	0	0	0	0	0	0	0	0
SV032	TOF	Torque offset		0	0	0	0	0	0	0	0	0	0
SV033	SSF2	Servo function selection 2		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV034	SSF3	Servo function selection 3		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV035	SSF4	Servo function selection 4		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV036	PTYP	Power supply type		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV037	JL	Load inertia scale		0	0	0	0	0	0	0	0	0	0
SV038	FHz1	Notch filter frequency 1		0	0	0	0	0	0	0	0	0	0
SV039	LMCD	Lost motion compensation timing		0	0	0	0	0	0	0	0	0	0
SV040	LMCT	Lost motion compensation non-sensitive band /current bias 2		0	0	0	0	0	0	0	0	0	0
SV041	LMC2	Lost motion compensation 2		0	0	0	0	0	0	0	0	0	0
SV042	OVS2	Overshooting compensation 2		0	0	0	0	0	0	0	0	0	0
SV043				0	0	0	0	0	0	0	0	0	0
SV044				0	0	0	0	0	0	0	0	0	0
SV045				0	0	0	0	0	0	0	0	0	0
SV046	FHz2	Notch filter frequency 2		0	0	0	0	0	0	0	0	0	0
SV047	EC	Inductive voltage compensation gain		100	100	100	100	100	100	100	100	100	100
SV048	EMGrt	Vertical axis drop prevention time		0	0	0	0	0	0	0	0	0	0
SV049	PGN1sp	Position loop gain 1 in spindle synchronous control		15	15	15	15	15	15	15	15	15	15
SV050	PGN2sp	Position loop gain 2 in spindle synchronous control		0	0	0	0	0	0	0	0	0	0
SV051	DFBT	Dual feedback control time constant		0	0	0	0	0	0	0	0	0	0
SV052	DFBN	Dual feedback control non-sensitive band		0	0	0	0	0	0	0	0	0	0
SV053	OD3	Excessive error detection width in special control		0	0	0	0	0	0	0	0	0	0
SV054	ORE	Overrun detection width in closed loop control		0	0	0	0	0	0	0	0	0	0
SV055	EMGx	Max. gate off delay time after emergency stop		0	0	0	0	0	0	0	0	0	0
SV056	EMGt	Deceleration time constant at emergency stop		0	0	0	0	0	0	0	0	0	0
SV057	SHGC	SHG control gain		0	0	0	0	0	0	0	0	0	0
SV058	SHGCsp	SHG control gain in spindle synchronous control		0	0	0	0	0	0	0	0	0	0
SV059				0	0	0	0	0	0	0	0	0	0
SV060				0	0	0	0	0	0	0	0	0	0
SV061	DA1NO	D/A output channel 1 data No.		0	0	0	0	0	0	0	0	0	0
SV062	DA2NO	D/A output channel 2 data No.		0	0	0	0	0	0	0	0	0	0
SV063	DA1MPY	D/A output channel 1 output scale		0	0	0	0	0	0	0	0	0	0
SV064	DA2MPY	D/A output channel 2 output scale		0	0	0	0	0	0	0	0	0	0
SV065	TLC	Tool end compensation spring constant		0	0	0	0	0	0	0	0	0	0

Parameter			Motor	200V Standard motor HF Series									
				HF75	HF105	HF54	HF104	HF154	HF204	HF354	HF453	HF703	HF903
No.	Abbrev.	Details	Unit capacity	20	20	40	40	80	80	160	160	160W	320
(System parameter area)													
SV081	SPEC2	Servo specification selction 2		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV082	SSF5	Servo function selection 5		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV083	SSF6	Servo function selection 6		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV084	SSF7	Servo function selection 7		0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
SV085	LMCk	Lost motion compensation 3 spring constant		0	0	0	0	0	0	0	0	0	0
SV086	LMCc	Lost motion compensation 3 viscous coefficient		0	0	0	0	0	0	0	0	0	0
SV087	FHz4	Notch filter frequency 4		0	0	0	0	0	0	0	0	0	0
SV088	FHz5	Notch filter frequency 5		0	0	0	0	0	0	0	0	0	0
SV089 : SV256				0	0	0	0	0	0	0	0	0	0

19.8.2 MDS-D-SVJ3 standard motor HF series

Parameter			Motor	200V Standard motor HF Series						
				HF75	HF105	HF54	HF104	HF154	HF204	HF354
No.	Abbrev.	Details	MDS-D-SVJ3-	07	07	07	10	20	20	35
SV001	PC1	Motor side gear ratio		-	-	-	-	-	-	-
SV002	PC2	Machine side gear ratio		-	-	-	-	-	-	-
SV003	PGN1	Position loop gain 1		33	33	33	33	33	33	33
SV004	PGN2	Position loop gain 2		0	0	0	0	0	0	0
SV005	VGN1	Speed loop gain 1		22	100	45	45	45	90	110
SV006	VGN2	Speed loop gain 2		0	0	0	0	0	0	0
SV007	VIL	Speed loop delay compensation		0	0	0	0	0	0	0
SV008	VIA	Speed loop lead compensation		1364	1364	1364	1364	1364	1364	1364
SV009	IQA	Current loop q axis lead compensation		20480	10240	20480	15360	15360	8192	6144
SV010	IDA	Current loop d axis lead compensation		20480	10240	20480	15360	15360	8192	6144
SV011	IQG	Current loop q axis gain		1792	1280	3072	2560	2560	3072	2048
SV012	IDG	Current loop d axis gain		1792	1280	3072	2560	2560	3072	2048
SV013	ILMT	Current limit value		800	800	800	800	800	800	800
SV014	ILMTsp	Current limit value in special control		800	800	800	800	800	800	800
SV015	FFC	Acceleration rate feed forward gain		0	0	0	0	0	0	0
SV016	LMC1	Lost motion compensation 1		0	0	0	0	0	0	0
SV017	SPEC	Servo specification selection		0000	0000	0000	0000	0000	0000	0000
SV018	PIT	Ball screw pitch		-	-	-	-	-	-	-
SV019	RNG1	Position detector resolution		-	-	-	-	-	-	-
SV020	RNG2	Speed detector resolution		-	-	-	-	-	-	-
SV021	OLT	Overload detection time constant		60	60	60	60	60	60	60
SV022	OLL	Overload detection level		150	150	150	150	150	150	150
SV023	OD1	Excessive error detection width during servo ON		6	6	6	6	6	6	6
SV024	INP	In-position detection width		50	50	50	50	50	50	50
SV025	MTYP	Motor/detector type		xx01	xx02	xx03	xx04	xx05	xx07	xx08
SV026	OD2	Excessive error detection width during servo OFF		6	6	6	6	6	6	6
SV027	SSF1	Servo function selection 1		4000	4000	4000	4000	4000	4000	4000
SV028				0	0	0	0	0	0	0
SV029	VCS	Speed at the change of speed loop gain		0	0	0	0	0	0	0
SV030	IVC	Voltage dead time compensation / current bias 1		0	0	0	0	0	0	0
SV031	OVS1	Overshooting compensation 1		0	0	0	0	0	0	0
SV032	TOF	Torque offset		0	0	0	0	0	0	0
SV033	SSF2	Servo function selection 2		0000	0000	0000	0000	0000	0000	0000
SV034	SSF3	Servo function selection 3		0000	0000	0000	0000	0000	0000	0000
SV035	SSF4	Servo function selection 4		0000	0000	0000	0000	0000	0000	0000
SV036	PTYP	Power supply type		0000	0000	0000	0000	0000	0000	0000
SV037	JL	Load inertia scale		0	0	0	0	0	0	0
SV038	FHz1	Notch filter frequency 1		0	0	0	0	0	0	0
SV039	LMCD	Lost motion compensation timing		0	0	0	0	0	0	0
SV040	LMCT	Lost motion compensation non-sensitive band /current bias 2		0	0	0	0	0	0	0
SV041	LMC2	Lost motion compensation 2		0	0	0	0	0	0	0
SV042	OVS2	Overshooting compensation 2		0	0	0	0	0	0	0
SV043				0	0	0	0	0	0	0
SV044				0	0	0	0	0	0	0
SV045				0	0	0	0	0	0	0
SV046	FHz2	Notch filter frequency 2		0	0	0	0	0	0	0
SV047	EC	Inductive voltage compensation gain		100	100	100	100	100	100	100
SV048	EMGrt	Vertical axis drop prevention time		0	0	0	0	0	0	0
SV049	PGN1sp	Position loop gain 1 in spindle synchronous control		15	15	15	15	15	15	15
SV050	PGN2sp	Position loop gain 2 in spindle synchronous control		0	0	0	0	0	0	0
SV051	DFBT	Dual feedback control time constant		0	0	0	0	0	0	0
SV052	DFBN	Dual feedback control non-sensitive band		0	0	0	0	0	0	0
SV053	OD3	Excessive error detection width in special control		0	0	0	0	0	0	0
SV054	ORE	Overrun detection width in closed loop control		0	0	0	0	0	0	0
SV055	EMGx	Max. gate off delay time after emergency stop		0	0	0	0	0	0	0
SV056	EMGt	Deceleration time constant at emergency stop		0	0	0	0	0	0	0
SV057	SHGC	SHG control gain		0	0	0	0	0	0	0
SV058	SHGCsp	SHG control gain in spindle synchronous control		0	0	0	0	0	0	0
SV059				0	0	0	0	0	0	0
SV060				0	0	0	0	0	0	0
SV061	DA1NO	D/A output channel 1 data No.		0	0	0	0	0	0	0
SV062	DA2NO	D/A output channel 2 data No.		0	0	0	0	0	0	0
SV063	DA1MPY	D/A output channel 1 output scale		0	0	0	0	0	0	0
SV064	DA2MPY	D/A output channel 2 output scale		0	0	0	0	0	0	0
SV065	TLC	Machine side compensation spring constant		0	0	0	0	0	0	0

Parameter		Motor		200V Standard motor HF Series						
				HF75	HF105	HF54	HF104	HF154	HF204	HF354
No.	Abbrev.	Details	Unit capacity	20	20	40	40	80	80	160
(System parameter area)										
SV081	SPEC2	Servo specification selction 2		0000	0000	0000	0000	0000	0000	0000
SV082	SSF5	Servo function selection 5		0000	0000	0000	0000	0000	0000	0000
SV083	SSF6	Servo function selection 6		0000	0000	0000	0000	0000	0000	0000
SV084	SSF7	Servo function selection 7		0000	0000	0000	0000	0000	0000	0000
SV085	LMCk	Lost motion compensation 3 spring constant		0	0	0	0	0	0	0
SV086	LMCc	Lost motion compensation 3 viscous coefficient		0	0	0	0	0	0	0
SV087	FHz4	Notch filter frequency 4		0	0	0	0	0	0	0
SV088	FHz5	Notch filter frequency 5		0	0	0	0	0	0	0
SV089 : SV093				0	0	0	0	0	0	0
SV094	MPV	Magnetic pole position error detection speed		10	10	10	10	10	10	10
SV095 : SV256				0	0	0	0	0	0	0

20. Servo true circular adjustment

20.1 H/W preparation before measurement

(1) Computer or Note book.(CPU speed: PentiumⅢ above and USB device is possible)
  (a) Windows XP system be able to execute testing S/W that copy from external devices on H/D directly.
  (b) Windows CE system has to save sampling data with storage devices to analysis from external PC.

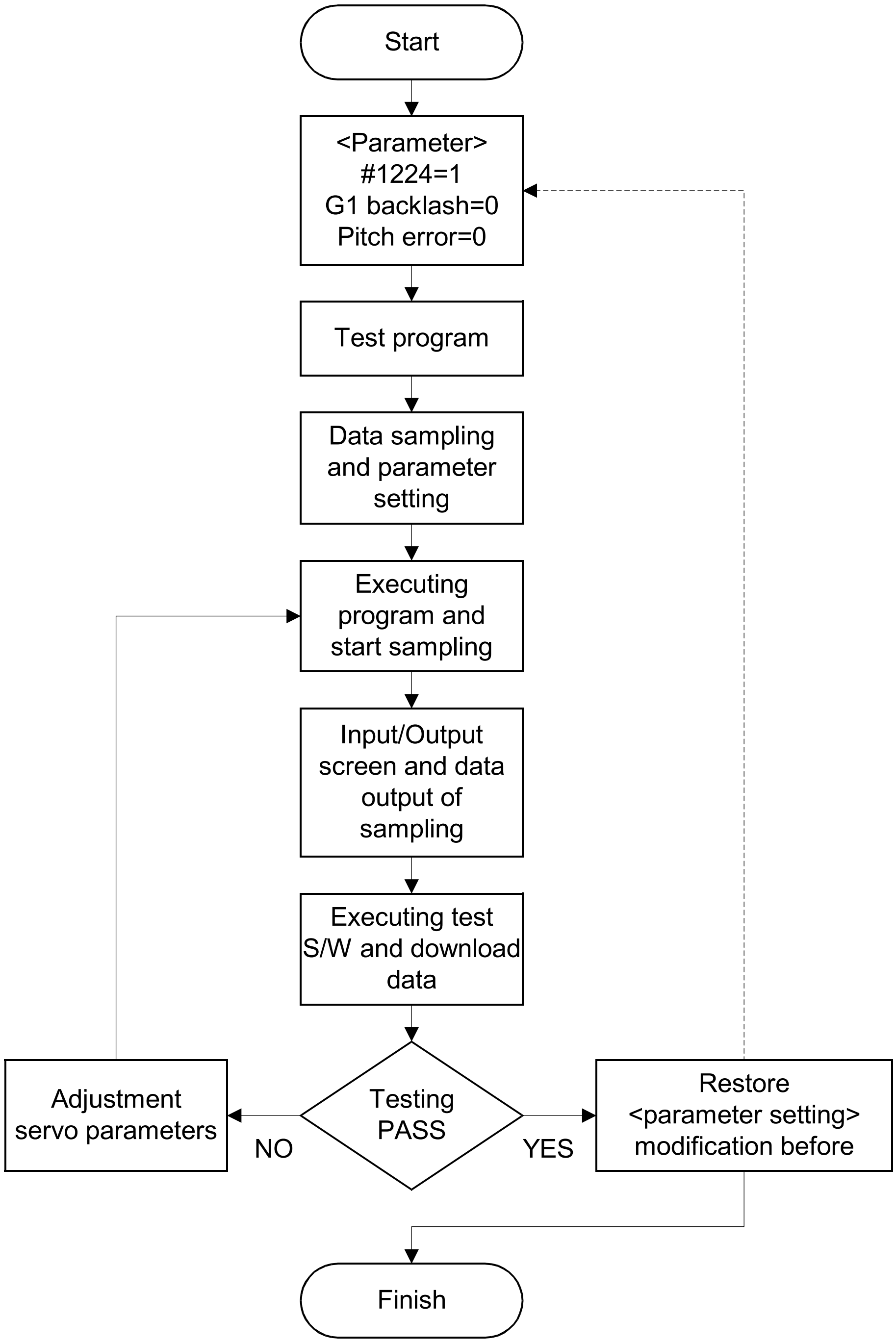
(2) Above Windows 98 SE system can support USB device.
（The true circular S/W have English and Japanese version. The Japanese version is recommended but OS system must base on Japanese）.

(3) USB or CF card device

(4) USB keyboard and mouse

(5) Ethernet cable
Windows CE system process ability is slow that it is necessary not only used external device for storage file of sampling (USB, CF card) but also Ethernet can backup files to personal computer for save a time.

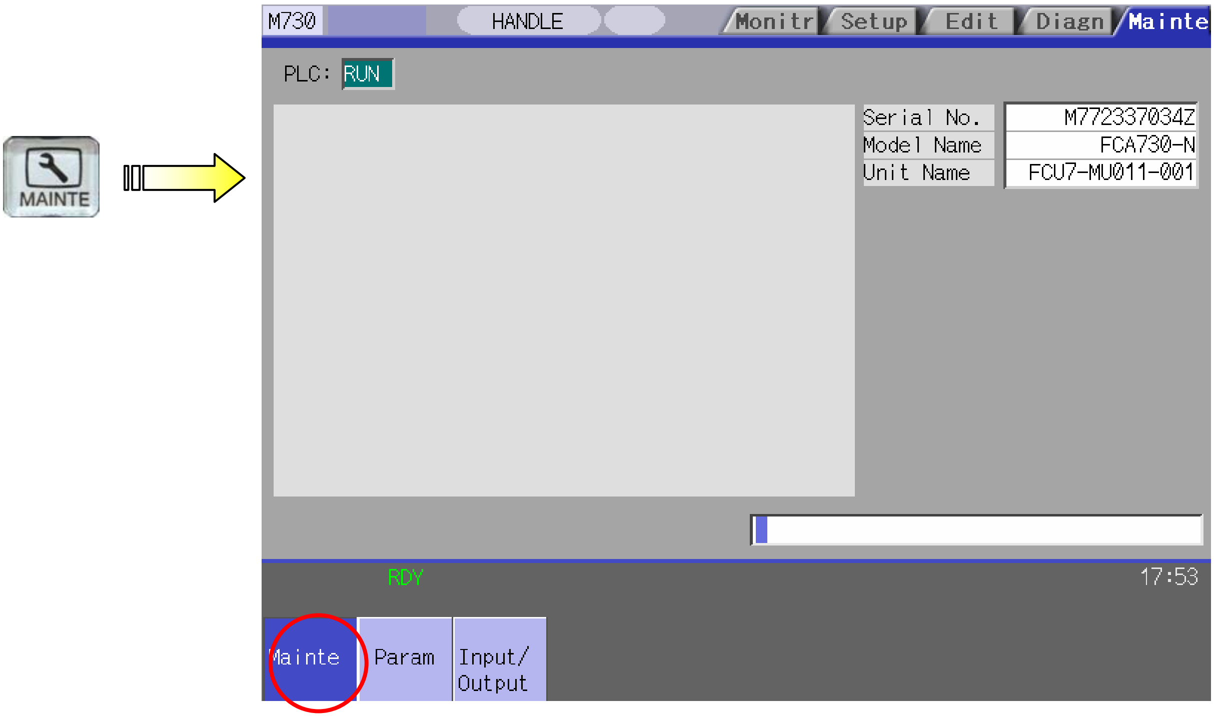
20.2 Flowchart



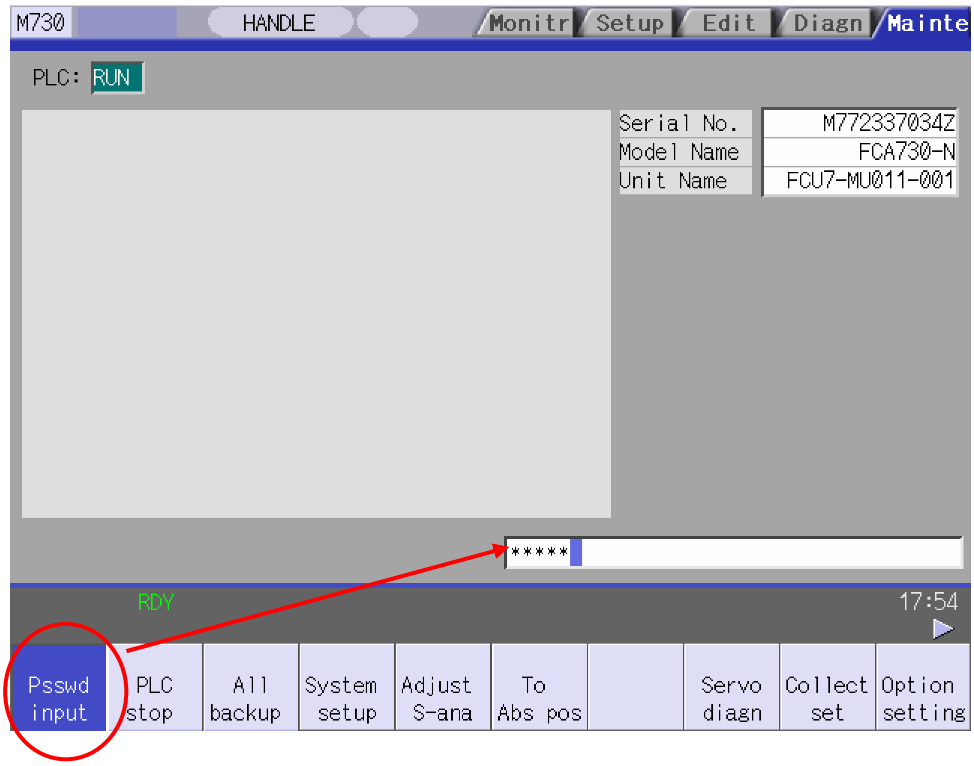
20.3 Preparation related parameters for adjustment

(1) Key in password when parameter are modified before.

(a) Function key move to 「MAINTE」 and press menu key for Mainte



(b) Press menu key for Psswd input and write down [MPARA] characters by hidden in block show as “*****”.

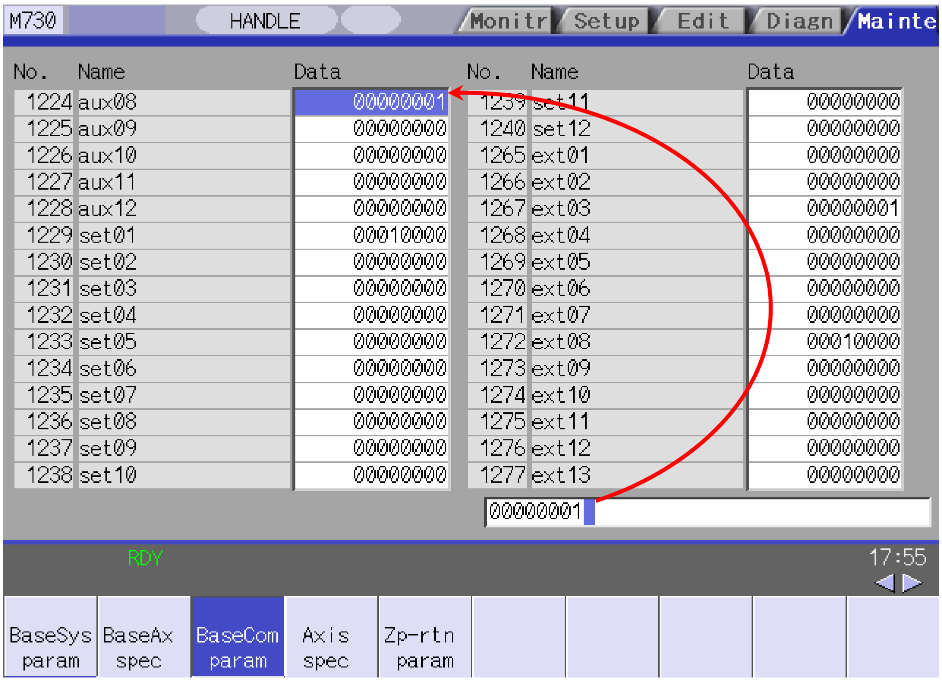


(2) Related parameters：

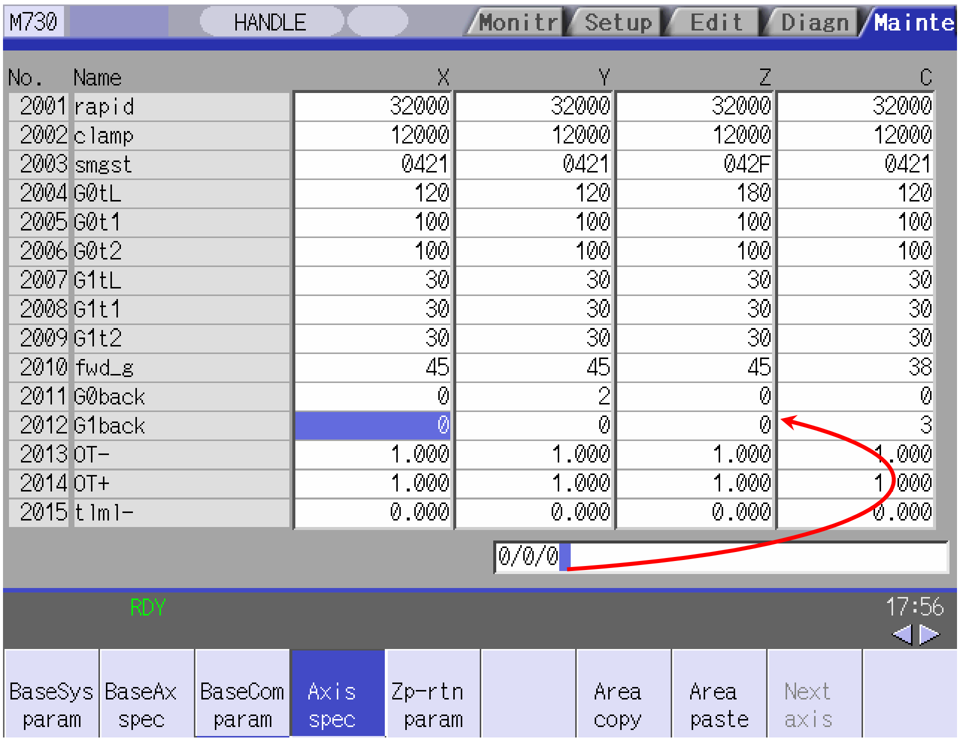
#No.	Details	Setting	Remark
#1224 Bit 0	Sampling output	1	1: invalid , 0:invalid
#2012	G1 backlash	0	※ Note
#4006	Pitch Error	0	※ Note
#1148	Initial high precision	1	It can be assigned on program without set in #1148.（It is not easy observe that the circle is too small without assigned.

【Note】 The both items are parameter of machine compensation. Please reservation numeric of parameter to restore. For convenient memory, you can copy #2012 address of parameter to #2264.

(a) Selection address #1224 Bit0 set to “1” on 

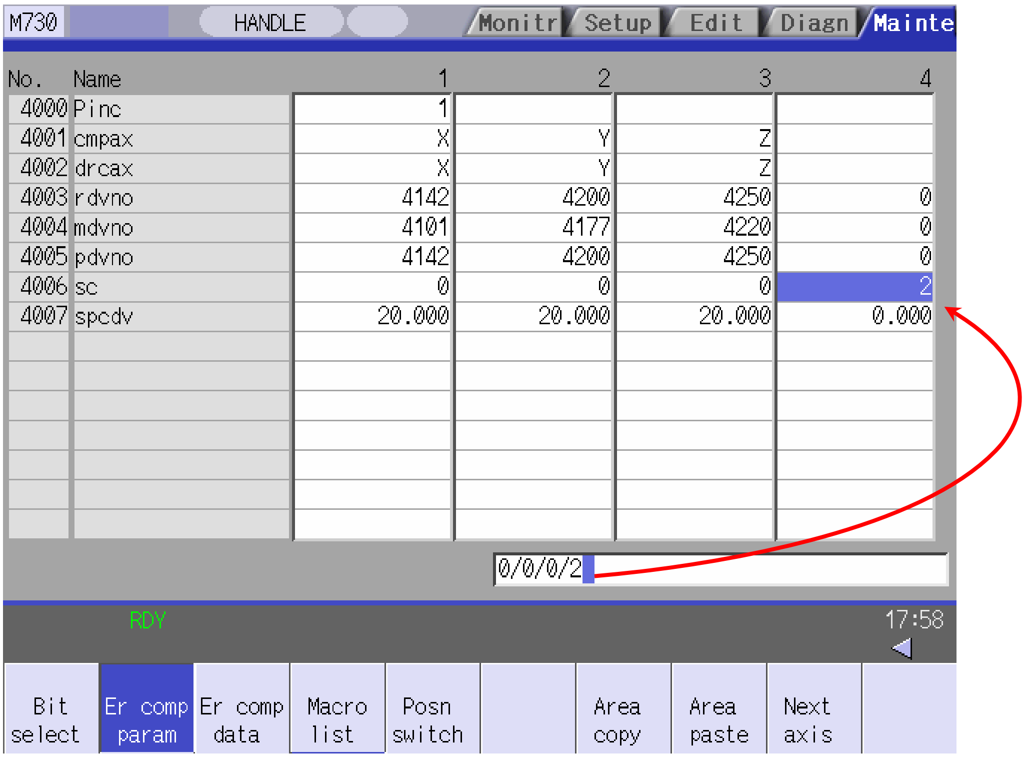


(b) Selection address #2012 set to “0” for all axes on Axis spec



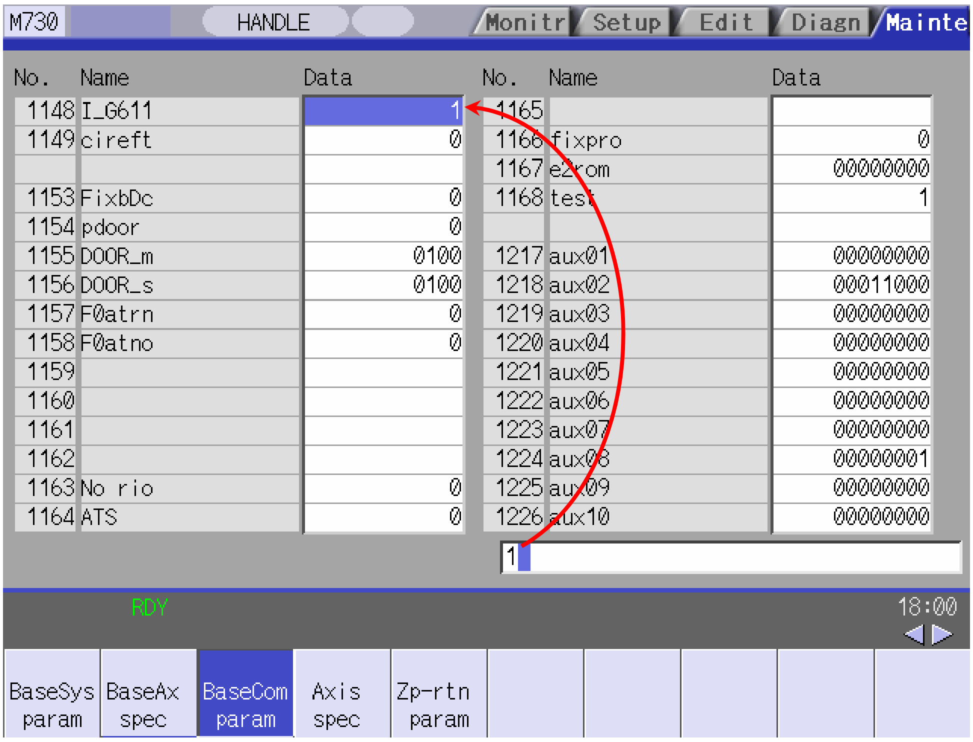
No.	Name	X	Y	Z	C
2001	rapid	32000	32000	32000	32000
2002	clamp	12000	12000	12000	12000
2003	smgst	0421	0421	042F	0421
2004	G0tL	120	120	180	120
2005	G0t1	100	100	100	100
2006	G0t2	100	100	100	100
2007	G1tL	30	30	30	30
2008	G1t1	30	30	30	30
2009	G1t2	30	30	30	30
2010	fwd_g	45	45	45	38
2011	G0back	0	2	0	0
2012	G1back	0	0	0	3
2013	OT-	1.000	1.000	1.000	1.000
2014	OT+	1.000	1.000	1.000	1.000
2015	tlml-	0.000	0.000	0.000	0.000

(c) Selection address #4006 set to “0” on Er comp param



No.	Name	1	2	3	4
4000	Pinc	1			
4001	cmpax	X	Y	Z	
4002	drcax	X	Y	Z	
4003	rdvno	4142	4200	4250	0
4004	mdvno	4101	4177	4220	0
4005	pdvno	4142	4200	4250	0
4006	sc	0	0	0	2
4007	spcdv	20.000	20.000	20.000	0.000

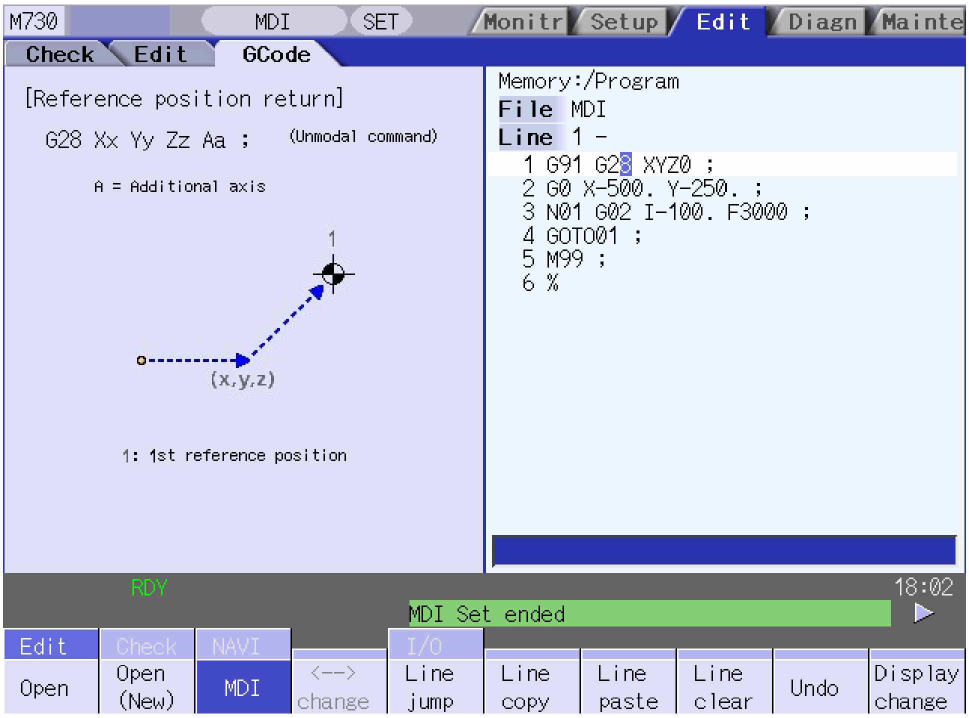
(d) Selection address #1148 set to "1" on BaseCom param



20.4 Sample testing program

(1) X Y plane program：

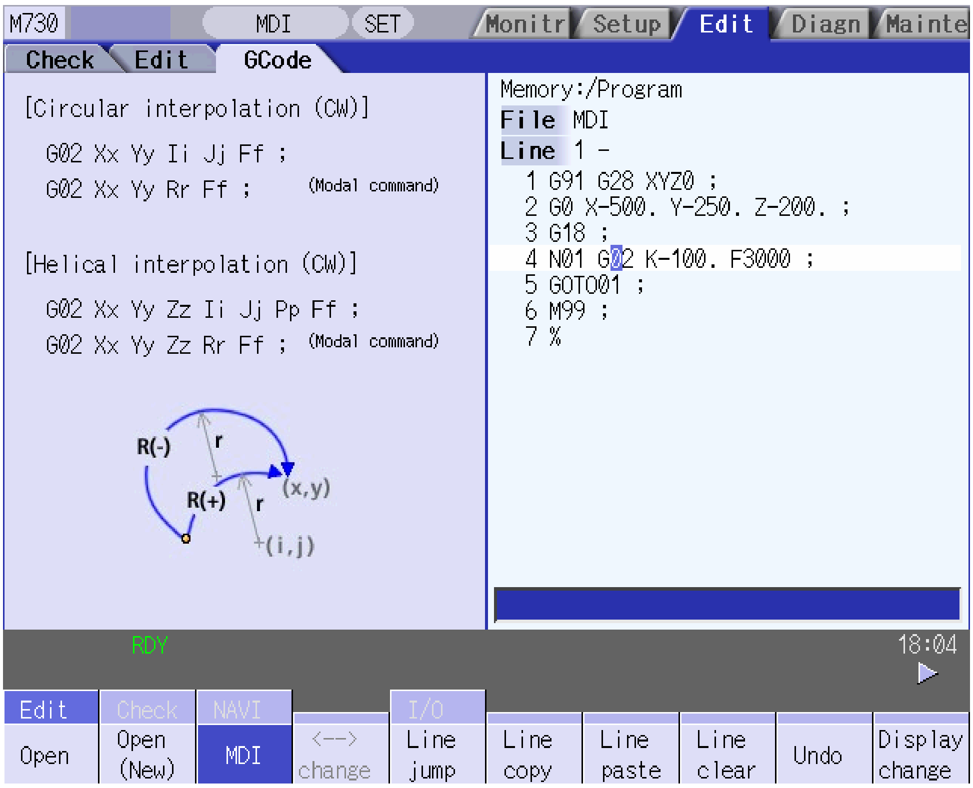
G91 G28 XYZ；
G00 X-500. Y-250.； ← ＋－symbol depend on MTB designed.
N01 G02 I-100. F3000；
GOTO 01； ↖ G code command of G17 should be added if initial value does not X Y plane.
M99；



【Note】 Please confirmation without dangerous for over travel and mechanical crash when the testing program run .

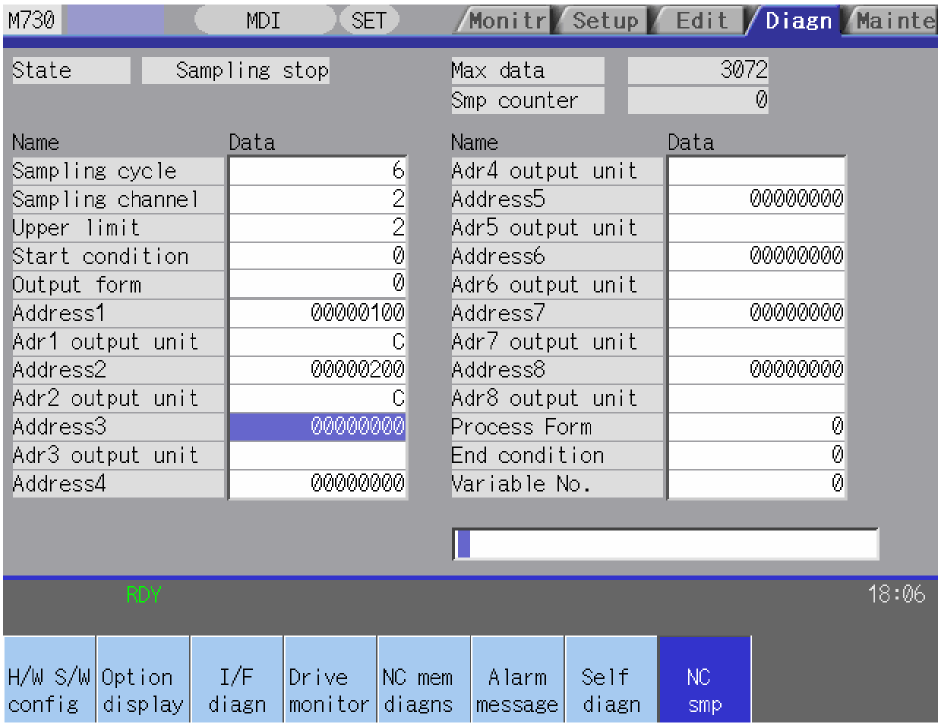
(2) Z X plane program：

G91 G28 XYZ；
G00 X-500. Y-250. Z-200.；
G18；
N01 G02 K-100. F3000；
GOTO 01；
M99；

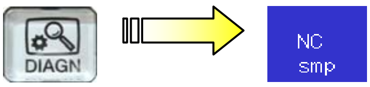


【Note】 Please confirmation without dangerous for over travel and mechanical crash when the testing program run .

20.5 Particular operation screen for M700 sampling



★ Screen position :



20.5.1 Related terms explain on screen

(1) State

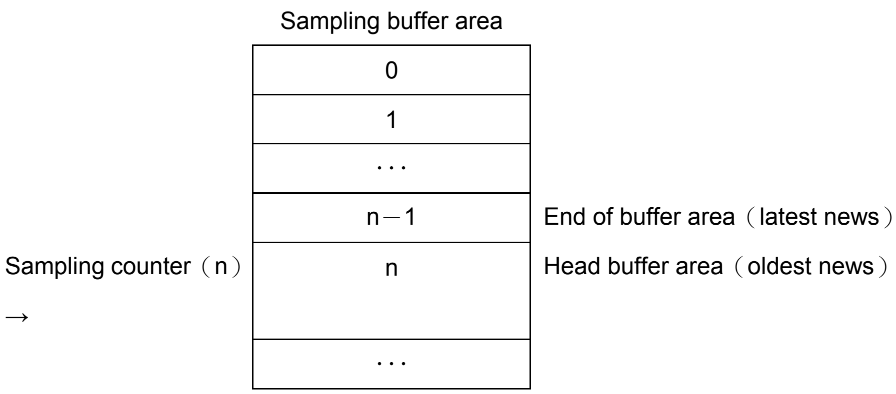
Show on this moment state.

"Data samplining" ：Sampling execution

"Data sampling stop" ：Sampling inexecution or completed.

(2) Sampling counter

Display sampling process on buffer area position of sampling.



(3) Sampling start

Select Smp start key for beginning data sampling. Procedure has to stop when cycle time reached.

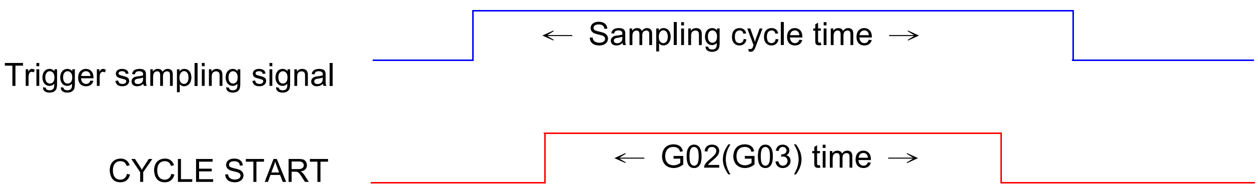
This stops sampling, and the state will be" sampling stop" The menu Smp end can be selected.

(4) Sampling cycle （Range：1～255）

Setting sampling cycle time

cycle = 1.7msec× setting value

ex）When the setting value is "1" : 1.7 ms cycle and setting value is "2" : 3.5 ms cycle.



(5) Sample route（Range：1～8）
Setting sampling channel
The capacity of sampling buffer area has to be division by channel. So each channel to add one then sampling capacity will decrease.

(6) Upper limit（Range：0～1279）
Set the capacity of the buffer to be used for sampling.
Buffer capacity = (setting value + 1) ∗ 1024 items
【Note】 When the setting value is 0: 1024 items
When the setting value is 1: 2048 items

(7) Maximum data
This displays the maximum number of data possible for sampling.
Normally, the number of data calculated from the setting value of "Upper limit" is displayed. The maximum number is 50% of the DRAM available memory.

(8) Start condition（Range：0～4）
Select the condition for starting sampling.
0： Manual start（「Smp start」menu is beginning from “1” ）
1： Variable No.（Sampling starts when the variable set in "Variable No." is 0 or a value other than null.）
2： PLC device（Sampling starts at the rising edge of the signal set in "PLC device".）
3： Address condition, true（Sampling starts when "Address", "Data" and "Data mask" conditions are true.）
4： Address condition, false（Sampling starts when "Address", "Data" and "Data mask" conditions are false.）

(9) Output form（Range：0～1）
Select the data format when outputting the sampling data in text style.
0： Outputs in decimal figure
1： Outputs in hexadecimal figure with 8 digits
※ When "Output form" is set to "1", and "#1004 ctlrunit" is "E (1nano)", the data larger than 1m will not be output correctly. When the output data exceeds 1m, the low-order 32bits of the sampling data will be output.

(10) Address1～8

Set the sampling address.

(a) Index No. Method

The index No. is fixed regardless of the axis configuration.

The low-order six digits of the address are explained below.

（If the high-order two digits are not set, the setting will be interpreted as 00.)

Setting range（Index No.）

Servo axis	1st AX	2nd AX	…	16th AX
Feedback position	000100	000200	…	000F00
Commanded position	000101	000201	…	000F01

Spindle	1st AX	2nd AX	…	4th AX
Feedback position	010000	020000	…	040000
Commanded position	010001	020001	…	040001

※ Examples of setting for each purpose are shown below.

- Synchronized tapping setting:
  3rd servo axis FB (000300) - 1st spindle FB (010000)
- High-accuracy setting (roundness):
  1st servo axis FB (000100) - 2nd servo axis FB (000200)
- Spindle synchronization setting:
  1st spindle FB (010000) - 2nd spindle FB (020000)

(b) Real address method

This sets the address targeted for applying "Data mask". (Note 1) However, if an illegal address (highest-order bit 0) is input, an error will occur.

※ The data sampling only offer 64 bit.

(11) Output unit（Range：0,B,C,D,E,S）

Set output unit for the sampling data of the each address.

0： No unit conversion

B： Outputs in micro metre

C： Outputs in sub-micro metre

D： Outputs in 10 nano metre

E： Outputs in 1 nano metre

S： Outputs in conventional interchangeable pulse of the spindle

※ For other than "0", set only data that internally complies with "#1004 ctrlunit (control unit)".

※ S set valid in index No. method and spindle setting.

(12) Process Form（Range：0～2）

Set the sampling process type.

0： One-shot

（The sampling stops when buffer is full.）

1： Repeat valid

（After the process ends (the buffer is full), the "Trigger wait" state will be entered again.）

2： Sampling buffer valid

(Sampling is executed as a ring buffer).

※ If a value other than "0" is set, the "End condition" must also be set. If not, the sampling process will not end until it is forcibly ended.

(13) End condition（Range：0～4）

Select the condition for ending the sampling process.

0： Sampling completed

（When the buffer is full, the sampling ends.）

1： Variable No.

（Sampling ends when the variable set in "variable No." is 0 or a value other than null）

2： PLC device

（Sampling ends at the rising edge of the signal set in "PLC device".）

3： Address condition, true

（Sampling ends when "address", "data" and "data mask" conditions are true.）

4： Address condition, false

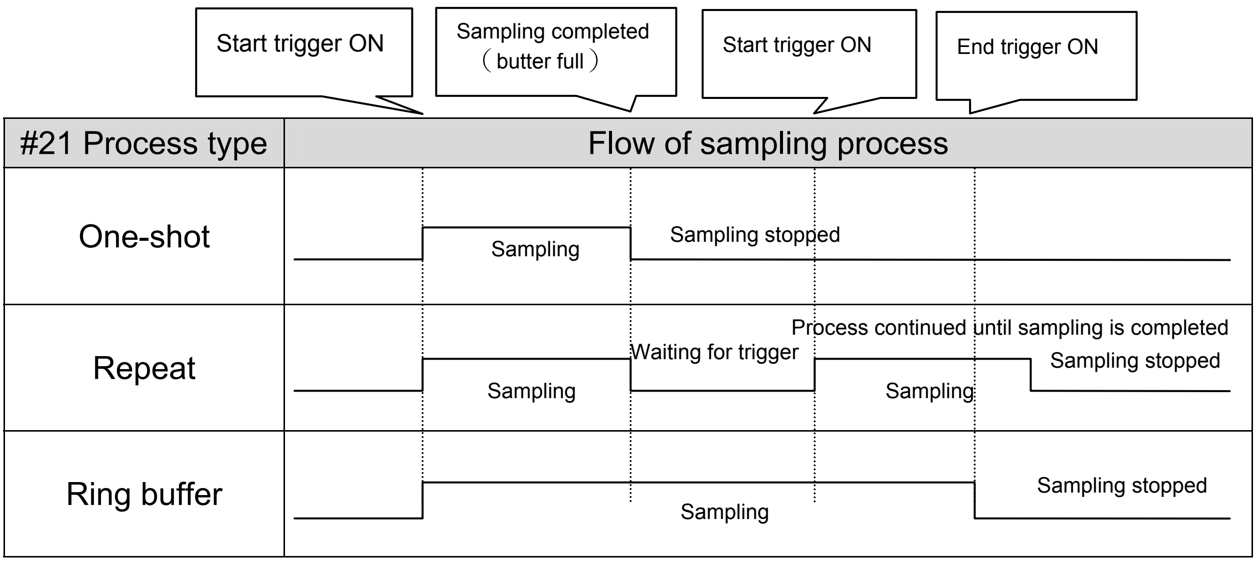
（Sampling ends when "address", "data" and "data mask" conditions are false.）

※1. When "3" or "4" is set in "Start condition", be sure to set the address, the data, and the data mask. This applies to "End condition" as well. If these are not set, sampling may not start.
When the same values are set in both "Start condition" and "End condition", sampling will not take a place.

※2. When "1" is set in "Start condition"/"End condition", the common variable uses the floating decimal point type. Thus, if the calculation results are used, an error will occur, and the value may not be recognized as "0" because of its calculation error.
When using a multi-part system, the trigger will turn ON when the conditions are satisfied even if only one part system is used.

※3. The variable data settings are validated immediately only from the program. These will not be validated immediately with settings from the screen or an external input.

※4. Even if "End condition" is satisfied, the subsequent flow will differ according to the value set in "Process type". (This also applies when ending manually.)



(14) Variable No.（Range：0～999）
This sets the variable No. that functions as the start/end trigger.
0：System variable（#1299）
Other than 0：Designated common variable (#100 or more, #500 or more)

20.5.2 Outputting the sampling data

Select the data format when outputting the sampling data in text style.

※ The data can not be output when the sampling is not executed.

※ The data can be output only when the sampling output valid parameter (#1224 aux08/bit0) is valid.

※ The output format differs depending on the sampling parameter "Output form".

※ The header information is not added to output sampling data.

(1) Output in decimal figure

The sampling parameter “output form” is set to “0”.

ex） When the number of channel is 3, the address is 1 to 3, and the output unit is E, it stops when 1ch is 100mm, 2ch is -100mm and 3ch is 50mm.

	1CH	2CH	3CH
1st data	200000000,	-200000000,	100000000
2nd data	200000000,	-200000000,	100000000
3rd data	200000000,	-200000000,	100000000
4th data	200000000,	-200000000,	100000000
5th data	200000000,	-200000000,	100000000
6th data	200000000,	-200000000,	100000000
7th data	200000000,	-200000000,	100000000
	• • •	• • •	• • •

(2) Output in hexadecimal figure

Sampling data is output in hexadecimal figure with 8 digits when the sampling parameter "Output form" is set to "1".

The output data is the sampling buffer dumped in the length of the long type data (32bits).

ex） When the number of channel is 3, the address is 1 to 3, and the output unit is C,

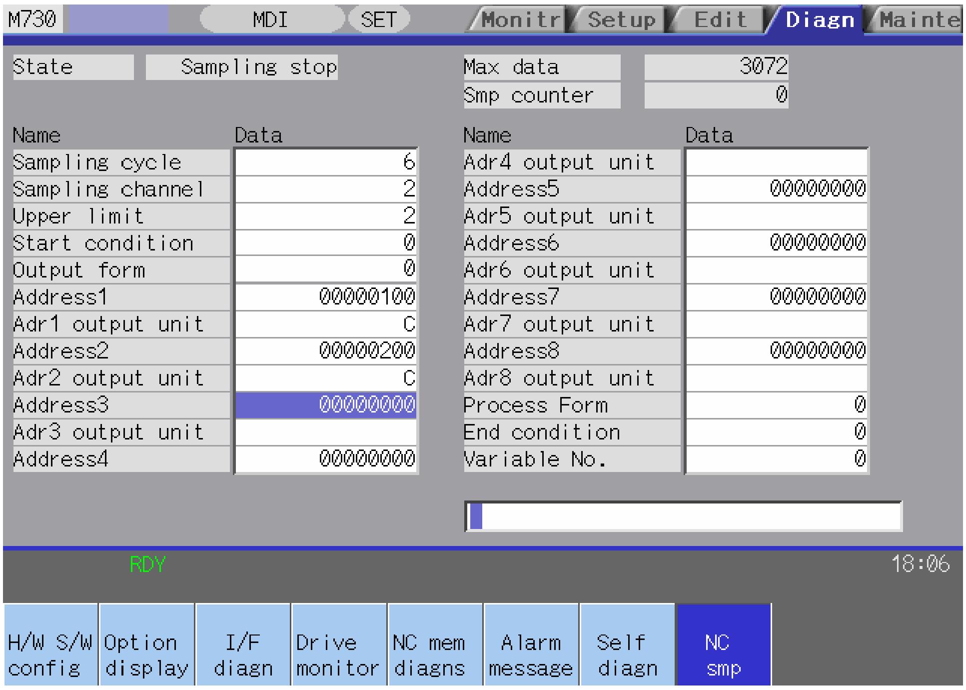
it stops when 1ch is 100mm, 2ch is -100mm and 3ch is 50mm.

1CH 1st data	0001E840
2CH 1st data	FFE17B80
3CH 1st data	000F4240
1CH 2nd data	0001E840
2CH 2nd data	FFE17B80
3CH 2nd data	000F4240
1CH 3rd data	0001E840
	・・・

20.6 XY Plane

(1) Testing program:
[Radius:100mm，Feed rate:F3000].
Please reference the item (1) with「13.4 Sample testing program」

(2) Screen setting：



★ According to setting procedure as below ,the display appear alike screen above.

(a) Sampling cycle： 6 （Radius: 100mm，Feed rate:F3000）

※ If radius and feed rate is changed, according to real time condition to set value on this for G02 or G03 to perform circle machining .

ex） R100mm F1000 set 10

F5000 set 4

(b) Sampling route : 2

(c) Buffer limitation value : 2

(d) Output format : 1

(e) Address1 : 100 （Address 1 set for X axis）

(f) Address1 output unit : C

(g) Address2 : 200 （Address 2 set for Y axis）

(h) Address2 output unit : C

(3) Block step position stop in “N01 G02 I-100. F3000. ; ” with single block.

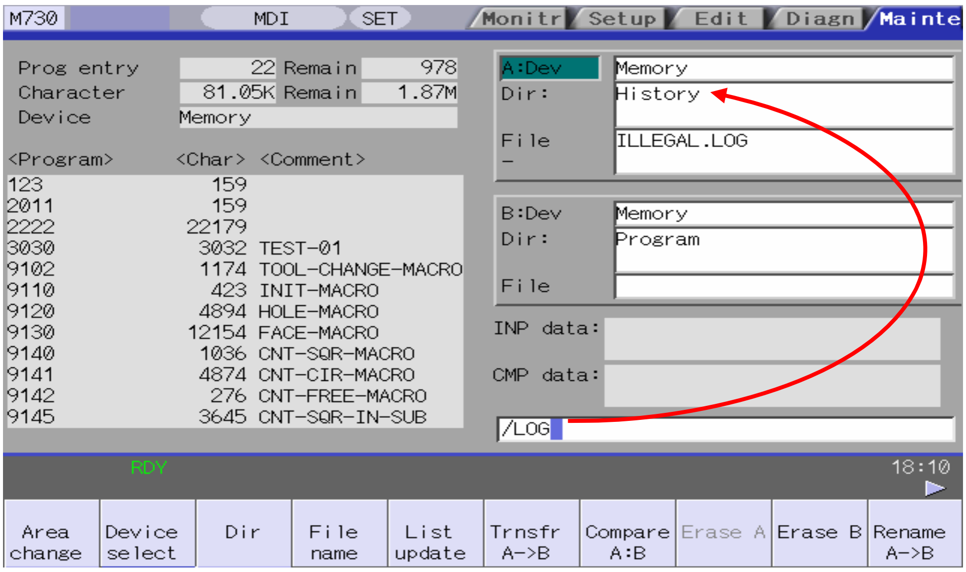
(4) Press （Sampling trigger start）and then press CYCLE START right now.
The Smp start state of data sampling appears on up left side.

State Sampling

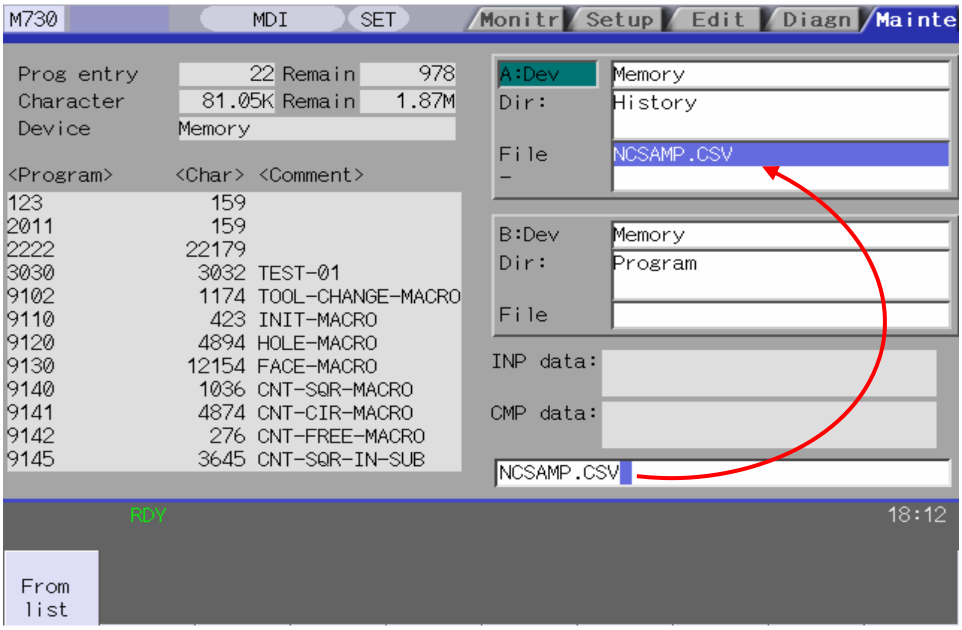
(5) Observation state on up left side whether recovering Data sampling stop if circle performance is done.
Date sampling become to Data sampling stop time is fast or slow then proper adjustment trigger time.

State Sampling stop

(6) Related transmission set on INPUT/OUTPUT screen(The setting characters will be memory by automatic without renew to input if data is not changed).
(a) Press Area change key move to「A : History Dev」select Device select key for「Memory」
(b) Press Dir key and input character in「/LOG」will displayed.



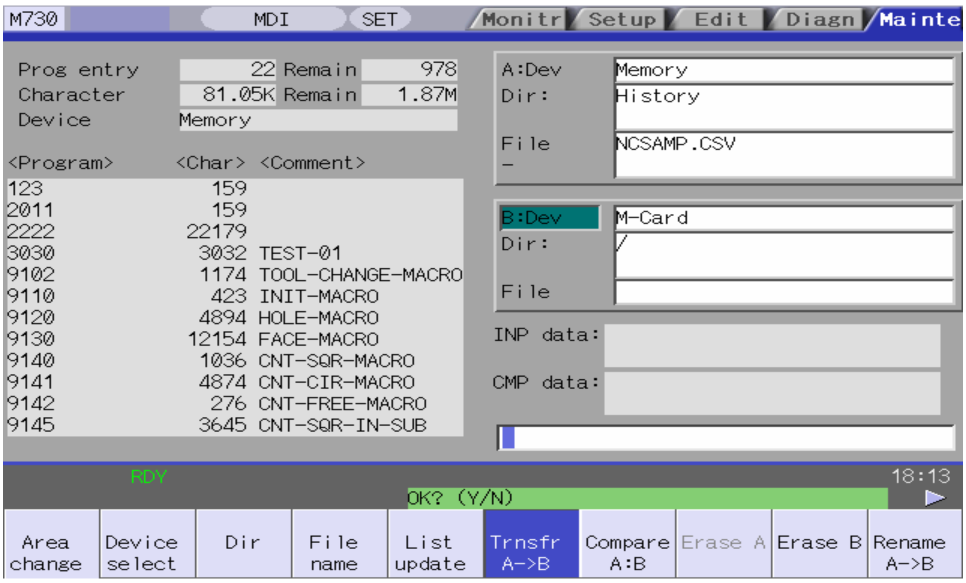
(c) The file name block write down 「NCSAMP.CSV」 for roundness.



(d) Press Area change key move to 「B : Dev」 selection Device select key for 「DS」.

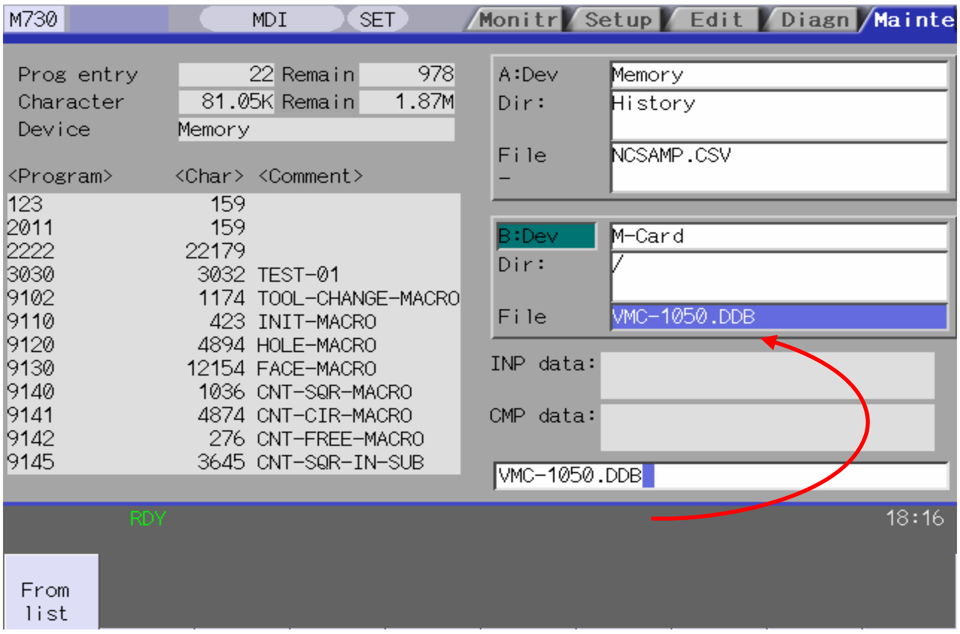
The HD device can be selected if target is not DS that is located in front of panel.

(e) Press Trnsfr A→B key the confirmation message will appear under the screen. One more press INPUT key for data transmission.



(f) There are same file name on target device Overwrite this file?(Y/N) that message will appear to prompt recover data. If file need recovered INPUT key is Transfer complete accepted.

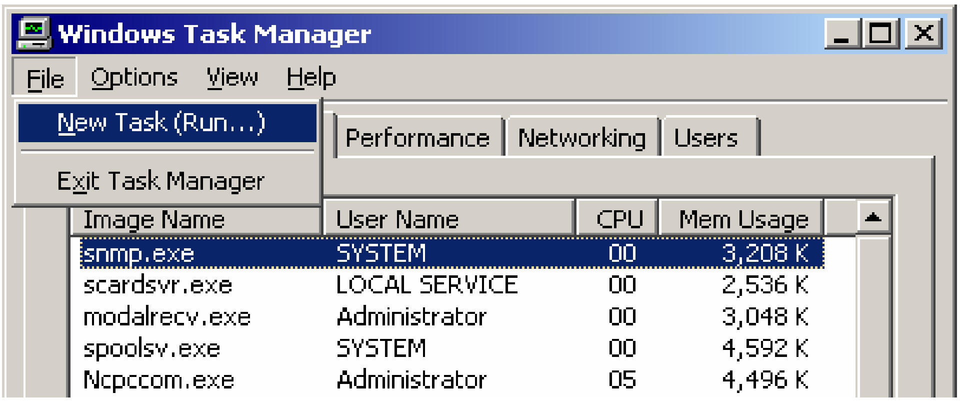
(g) When transmission is completed the message occurred.
The sub-file name of true circular precision S/W is defined for DDB.



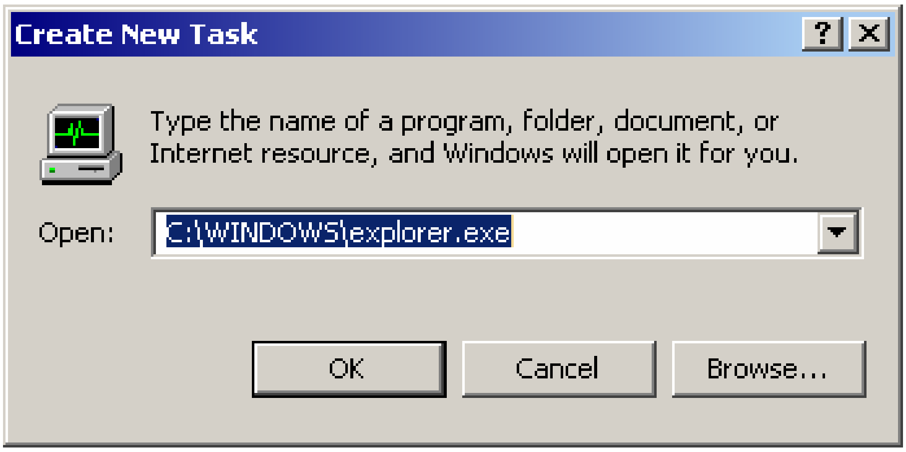
(7) Opening true circular precision S/W

(a) Step by step pressing the key on NC keyboard as ALTER → CTRL → DELETE to call out management of Windows.

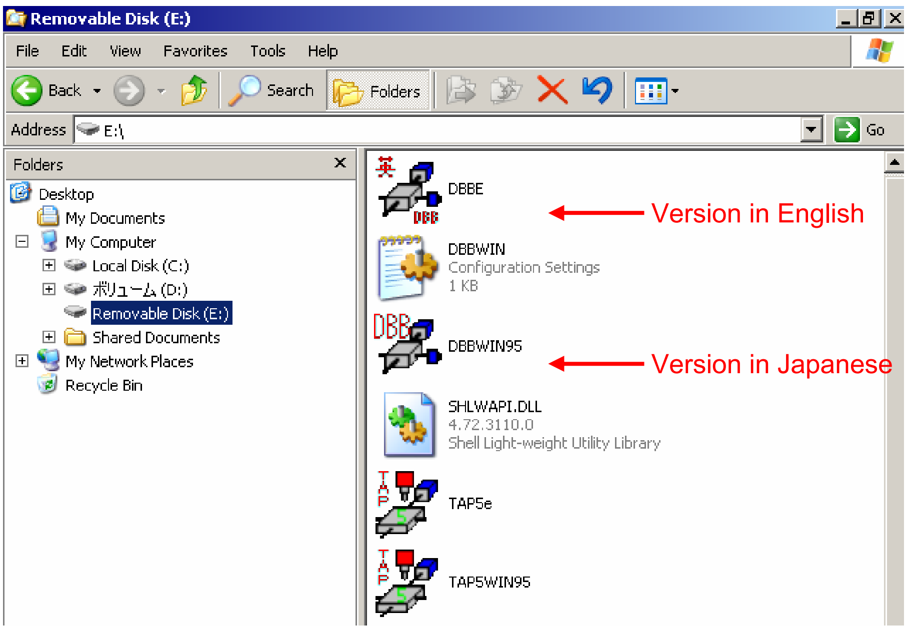
(b) Press ALT → F key and selection New Task (Run…)



(c) Input ”EXPLORER” or ”C:\WINDOWS\EXPLORER” directory file.



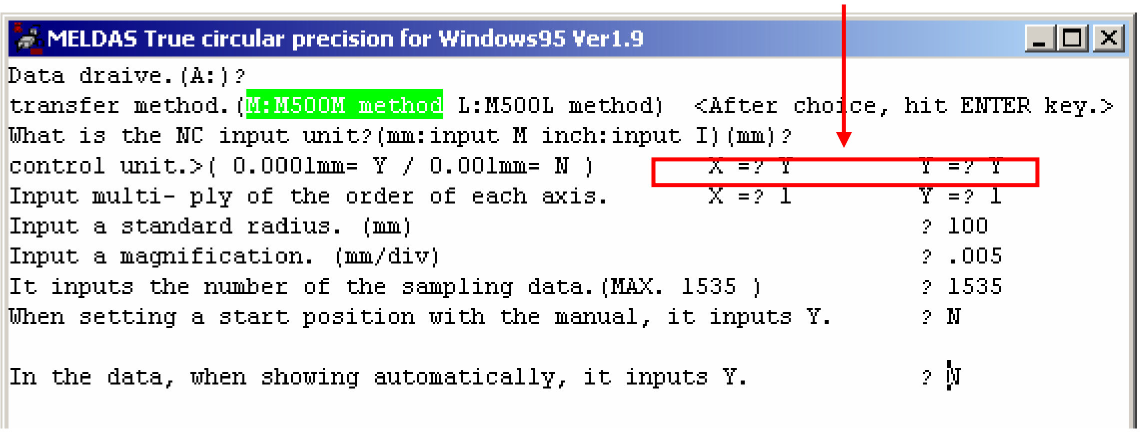
(d) The DBB test S/W has to save in storage device for USB or CF card. The division device of HD is C and D. The E device is for external. The test S/W can be found on E device for execution.



(8) Related setting and operation for ENGLISH version.

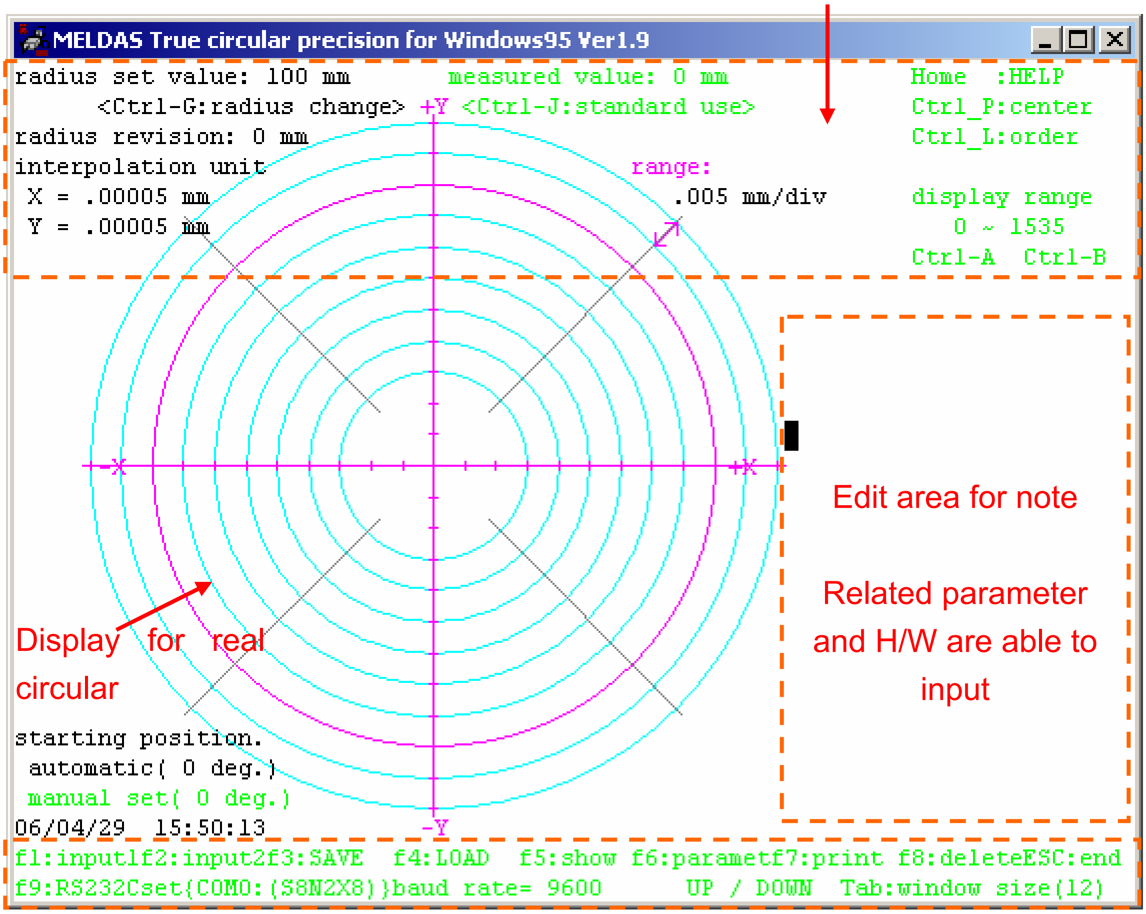
(a) Related setting for opening

The control unit of M700 is best precision than other NC type. This control unit is 0.1μ so modification to “Y” as enclosed.



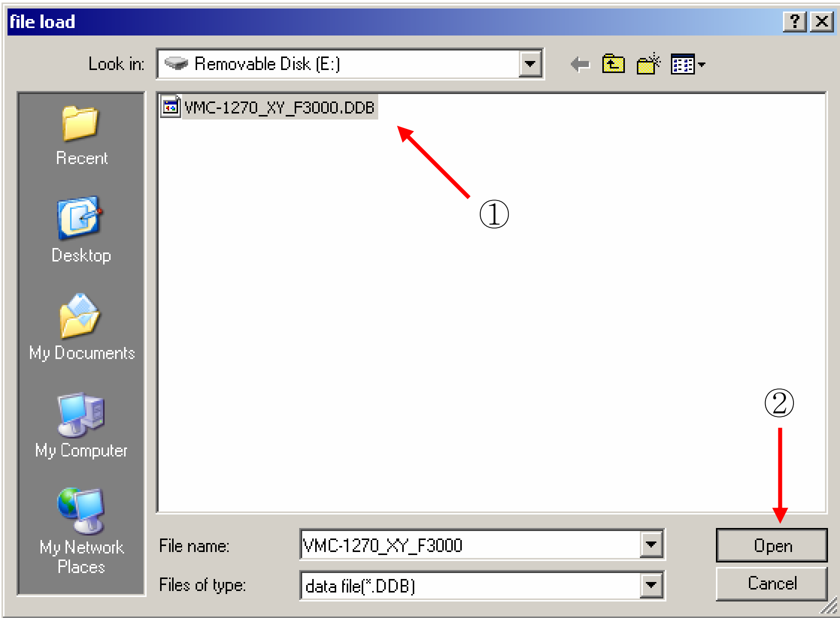
(b) Opening screen for initial setting after.

Display measurement setting area

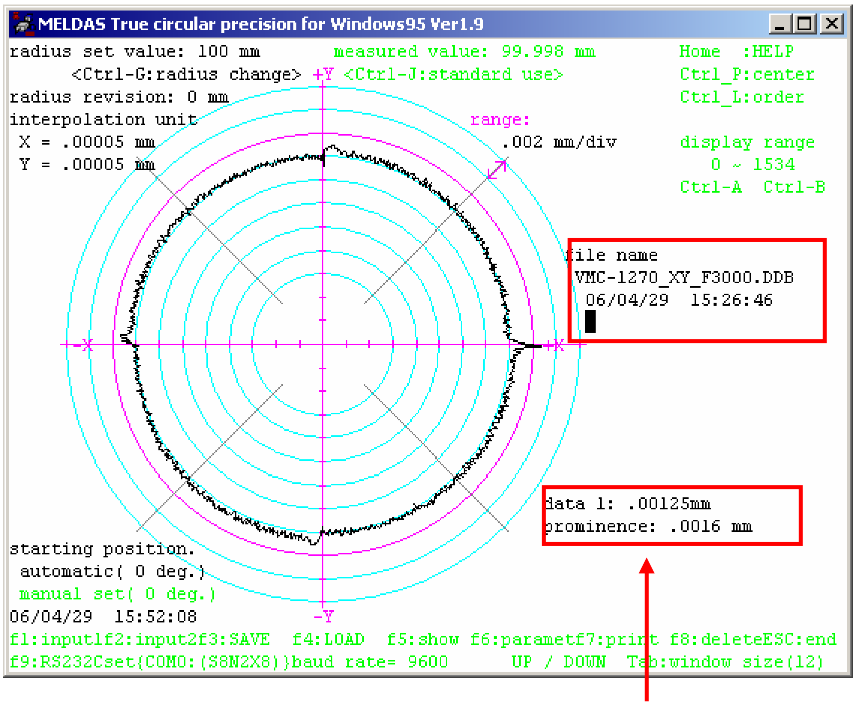


↑ Input/Output data and parameter area

(c) Press f4: LOAD to find out the file and select Open .

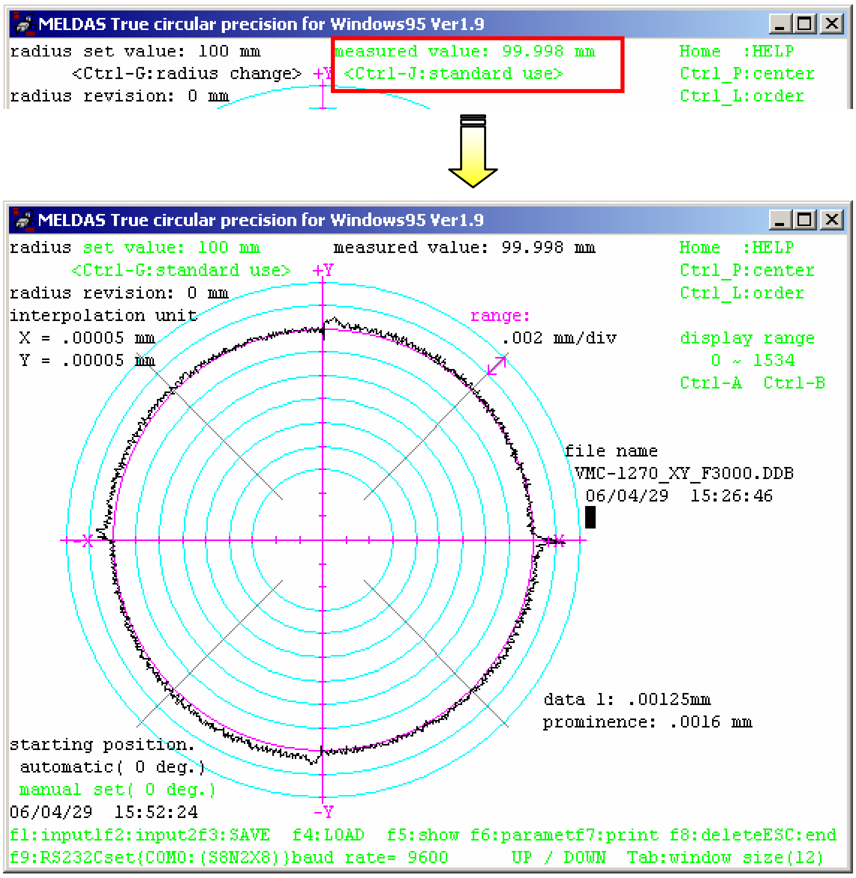


(d) The file name displayed on right side in the screen when data is opening. Select f5: show with mouse or press F5 key in the keyboard for opening waveform of circle as below.

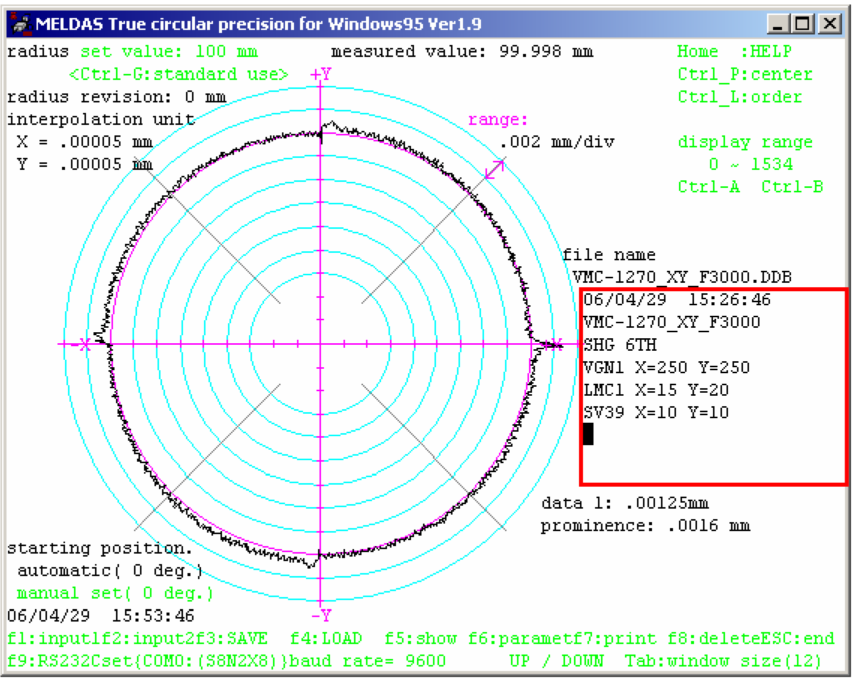


(e) The data1 is the precision of servo. The prominence data is changeover of quadrant on protruding sharp angle.

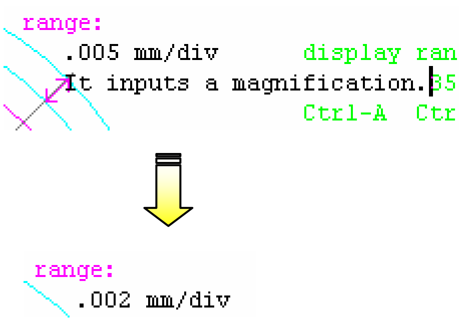
(f) Click upper center of screen with mouse or select Ctrl + J keys on keyboard can adjust the display range for circle automatically.



(g) In order to look up data, Input information and parameters on right side in screen.
Press F3 key on keyboard or click f3: SAVE with mouse for storage file.



(h) It can be display for range of precision used to parameter setting on initially screen , also can decide by below method. To click range: word by mouse to replace precision value between division.
Example: Replacement value to 0.002 and ENTER that display unit on division is 2 μ

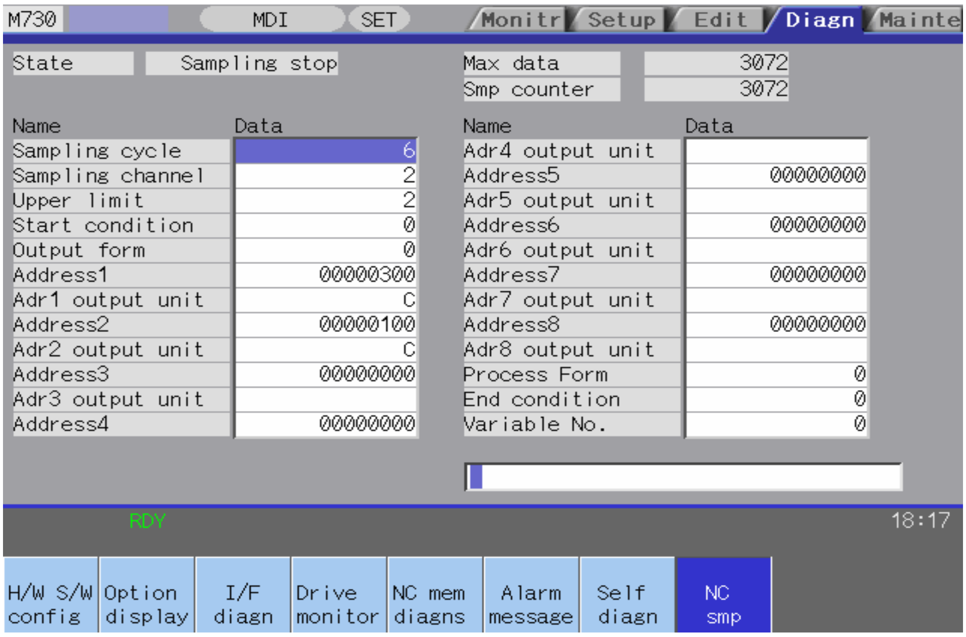


Caution	Windows XP system can execute true circular S/W on NC directly due to process speed is fast. Windows CE system must be copy sampling file to external device (USB,CF card) and execution data on personal PC. Also can connect with Ethernet function through sharing system.

20.7 ZX Plane

(1) [Radius:100mm，Feed rate :F3000]
Please reference item(2) on「13.4 sample testing program」

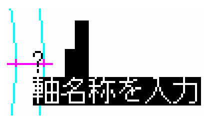
(2) Screen setting：



Address1：300　　（Sampling address1 set for Z axis）
Address2：100　　（Sampling address2 set for X axis）

(3) The original axis name defined X and Y axis. When Z and X plane test, used mouse to click in axis name exchanged for actual axis name.

for English version　　　　for Japanese version

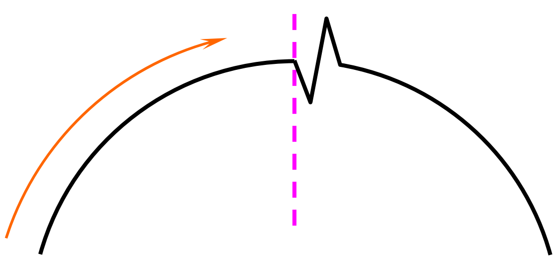


(4) Otherwise operation same as XY plane.

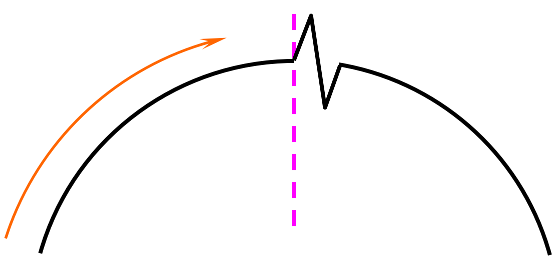
20.8 Compensation parameter

No.	Abbrev.	Name	Unit	Detail	Setting range
SV016	LMC1	Lost motion Compensation1	Stall current%	Set this when the protrusion(that occurs due to the non-sensitive band by friction torsion, backlash etc) at quadrant change is too large. Setting one unit is compensated 0.5 μ . The protrusion value set on LMC1 when the both direction of positive and negative are same. LMC2=0 LMC1 or LMC2 value is -1 for invalid.	-1～100
SV041	LMC2	Lost motion Compensation2	Stall current%	Set this with SV016(LMC1)only when you wish to set the lost motion compensation amount to be different depending on the command directions. Set to “0’ as a standard.	-1～100
SV039	LMCD	Lost motion Compensation timing	msec	Set this when the lost motion compensation timing does not match. Adjust by increasing the value by 10 at a time.	0～2000

(1) SV039 LOST MOTION TIMING Compensation：
This function is accordance with protrusion for both directions. The waveforms like as below. Setting range suggest 100 below.



SV039 too small



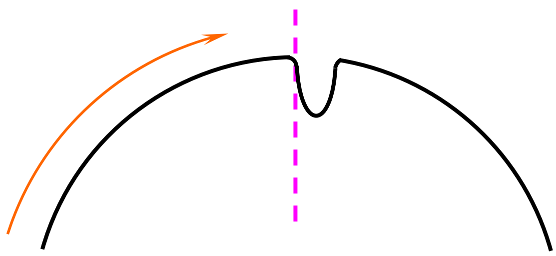
SV039 too high

(2) The SV039 setting valid under positive and negative value of protrusion must be same .
The SV016 value increases when the protrusion waveform rises.
The SV016 value decreases when the protrusion waveform concave.

(3) The protrusion of sharp angle value adjust below 5 μ recommended.

(4) When motor's inertia JL value is decided high than 300.It is not recommended used disturbance observer filter for SV043 SV044 and SHG command(smooth high gain)

(5) Disturbance observer compensation：
In order to improve precision in machining surface, if machine has not any vibration that disturbance observer parameter is cable to collocate using. These parameters can improve precision of protrusion in 45° 135° 225° 315° even Lost Motion function will decrease due to concave waveform. Please confirmation setting value for SV043, SV044.
If LMC1 and LMC2 value are "0" that the waveform still appear as illustration below. Finally check whether faulty on mechanical problem.



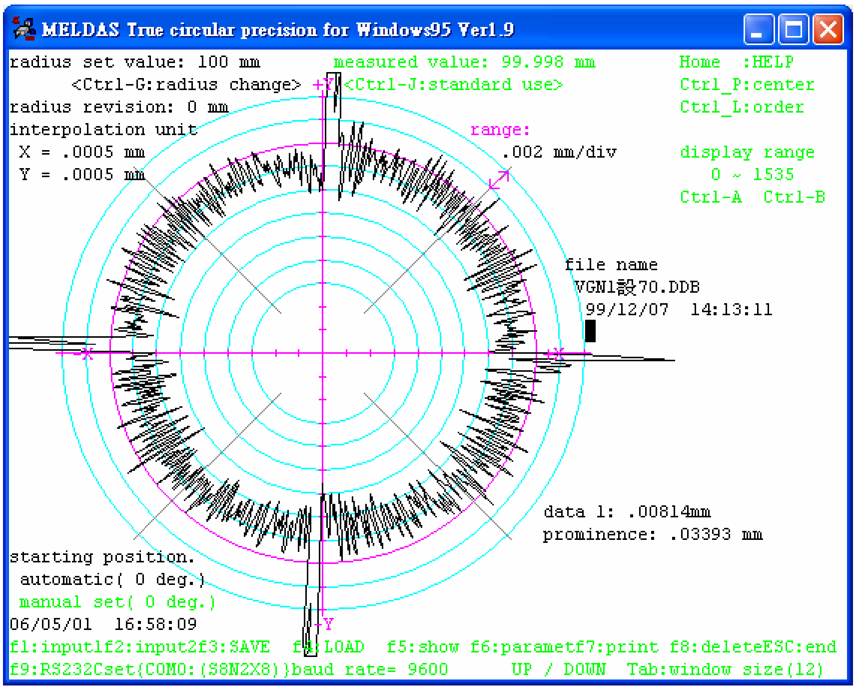
	D-V1／V2
SV43	100
SV44	100

20.9 Others

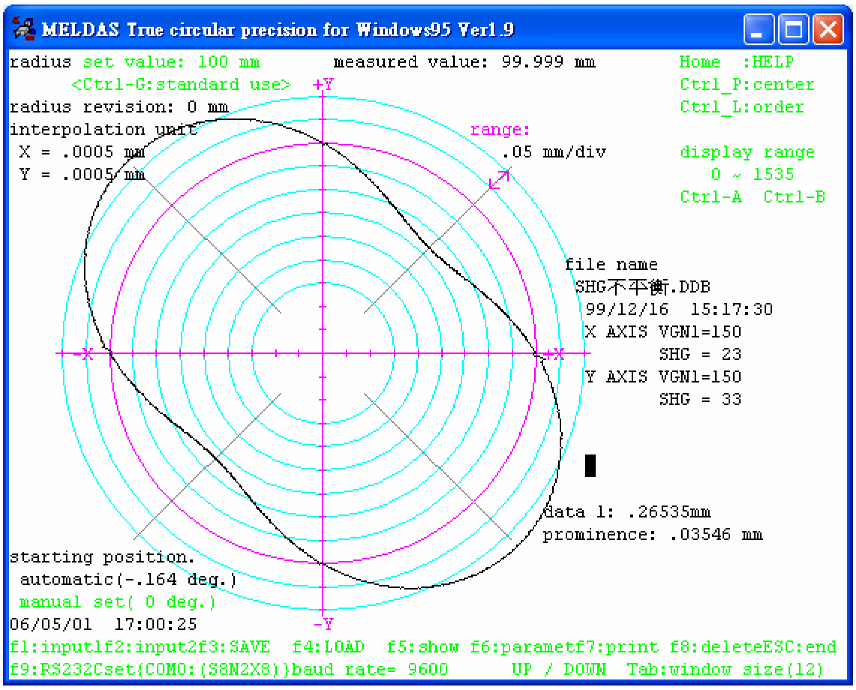
(a) These parameters for #2012 and #4006 have to restore original setting.
(b) Base parameter for #1224 BIT0 set “0” when testing is done.
(c) This S/W only provide electric signal on servo without content machine’s error. Laser instrument has to test in final assembly completed.
(d) This S/W can not offer measurement for inch ball screw.

20.10 Testing situation

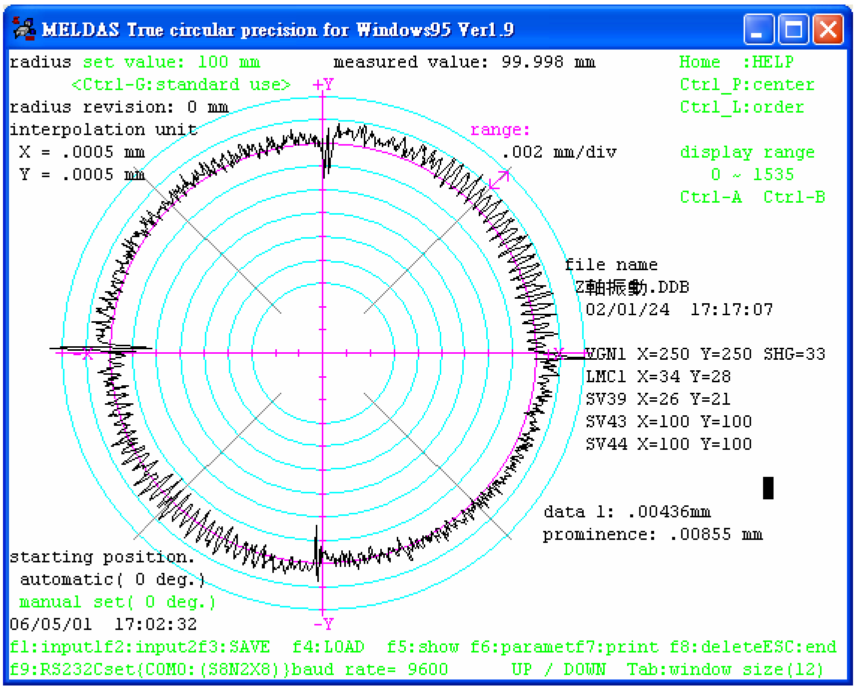
(1) A speed loop gain（VGN1）value too small or response of resonance on machine.



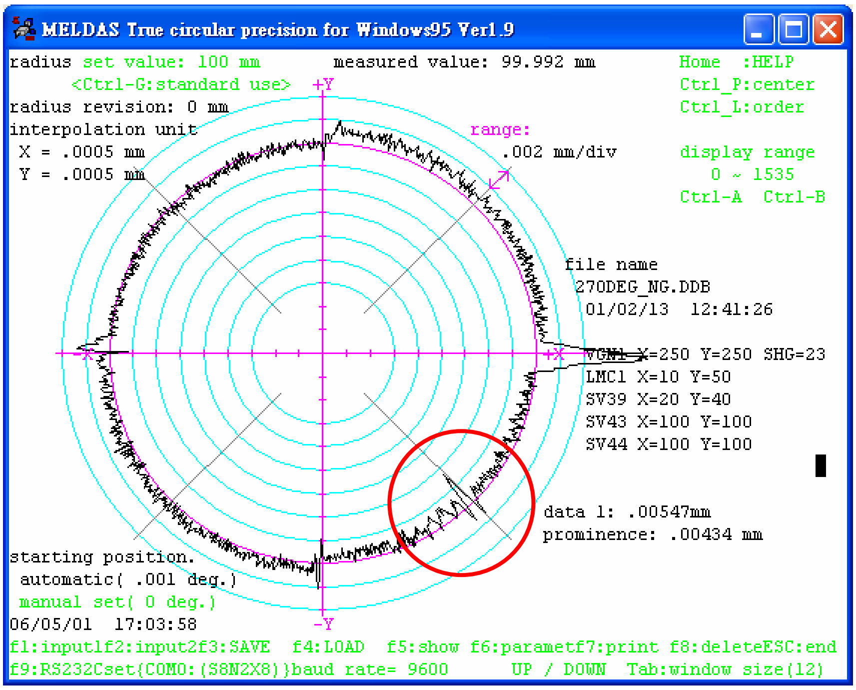
(2) On simultaneous axis set a difference value for position loop gain（PGN）.



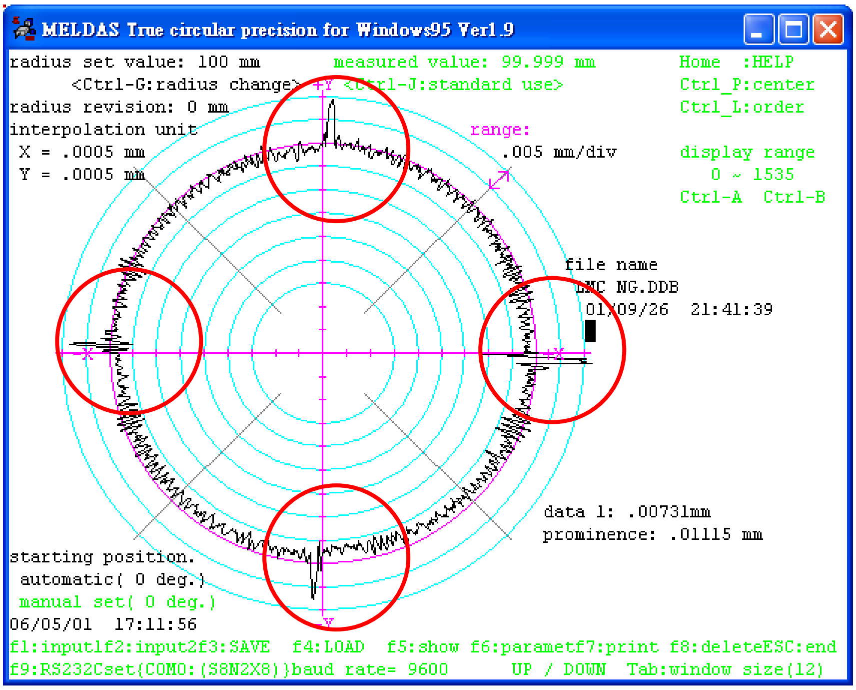
(3) Z axis has an obvious vibrating situation.



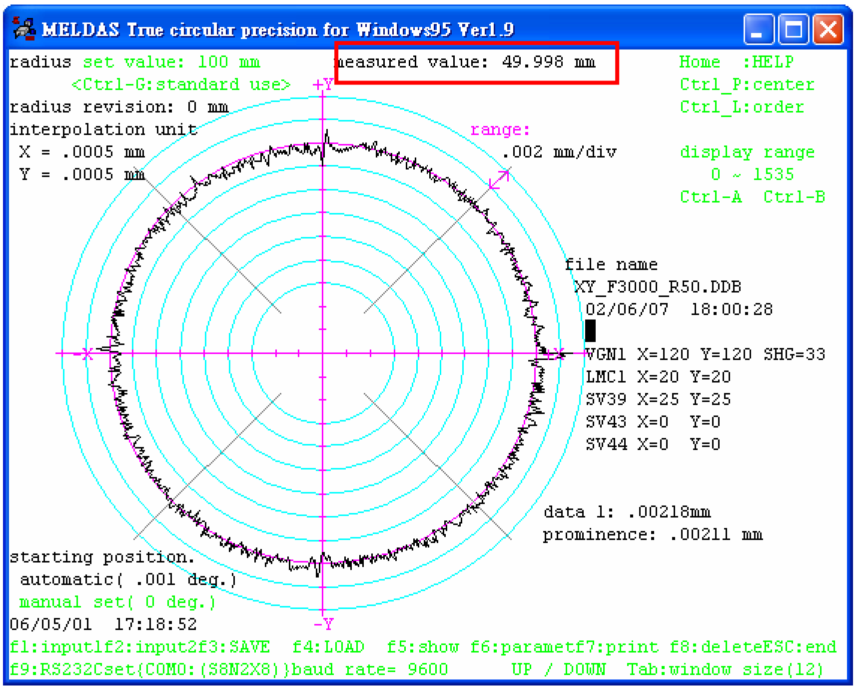
(4) The fix position on mechanical structure has an interference situation.



(5) The protrusion angle too big on forth quadrant for double column machine.



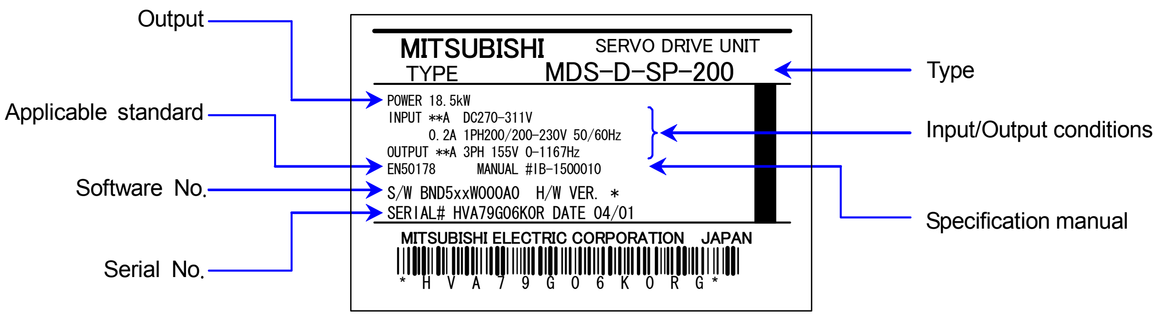
(6) The radius is 100mm for standard which depend on actual workpiece size can be adjusted for real radius. The method is click central of display with mouse or used keyboard select Ctrl + J keys for adjustment display range automatic.



3. SPINDLE UNIT INTRODUCTION

21. SPINDLE DIRVE SYSTEM

21.1 Spindle Drive Type

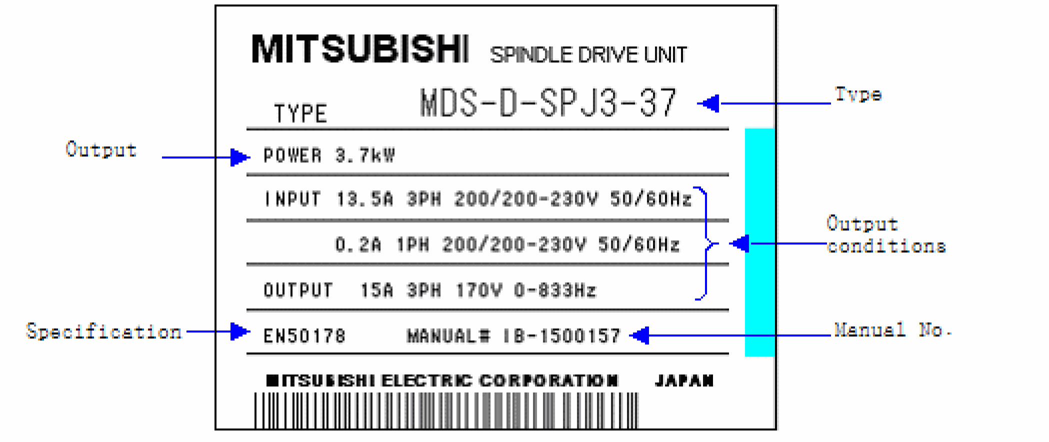


Rating nameplate

MDS – D – $\boxed{\quad}$

Symbol	Maximum current	Drive width
SP-20	20A	60mm
SP-40	40A	
SP-80	80A	
SP-160	160A	90mm
SP-200	200A	120mm
SP-240	240A	150mm
SP-320	320A	
SP-400	400A	Developing
SP-640	640A	Developing

21.1.1 MDS-D-SPJ3 series



Rating nameplate

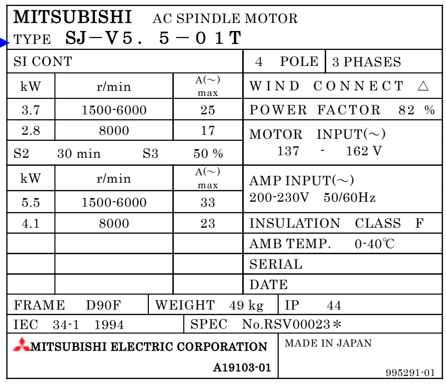
MDS-D-SPJ3 - ☐

Content

Symbol	Output	Drive width
075	0.75kW	60mm
22	2.2kW	90mm
37	3.7kW	
55	5.5kW	130mm
75	7.5kW	
110	11.0kW	172mm

21.2 Spindle Motor Type

Type



Rating nameplate

(1) Standard spindle motor series

SJ- ① ② − ③ ④ T

Symbol	Special specification
None	None
Z	High-Speed

③ The SJ-V series is indicated with a specification code (01~99)

④ Short time rated output

Symbol	Short time rated output
2.2	2.2kw
3.7	3.7kw
5.5	5.5kw
7.5	7.5kw
11	11 kw
15	15 kw
18.5	18.5kw
22	22 kw
26	26 kw
37	37 kw
45	45 kw
55	55 kw

① Motor series

Symbol	Motor series
V	Compact medium to large capacity
VS	Hollow shaft

(2) IPM Spindle Motor Series

SJ- PMF① ② T－ ③

③ Specification code (00)

Base speed

②

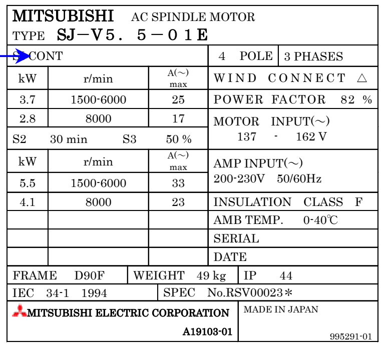
Symbol	Base speed
30	3000r/min

① 30-minute rated torque

Symbol	30-minute rated torque
018	17.5 N・m
035	35.0 N・m

21.2.1 MDS-D-SPJ3 series spindle motor type

Type



Rating nameplate

SJ-□□ - 01 E

E: MDS-D-SVJ3/SPJ3 series，MDS-D-SPJ3 motor

Short time output

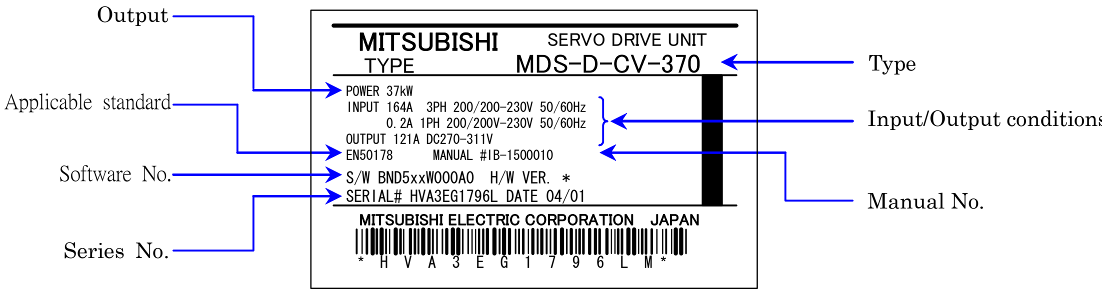
Symbol	Short time output
0.75	0.75kW
1.5	1.5kW
2.2	2.2kW
3.7	3.7kW
5.5	5.5kW
7.5	7.5kW
11	11kW

Motor series

Symbol	Motor series
VL	With FAN (0.75kW, 1.5kW)
V	With FAN (2.2kW～11kW)

(Note) special for internal spindle motor.

21.3 Power Supply Unit Type

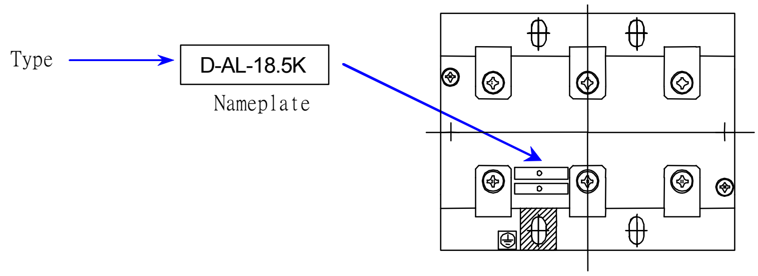


Rated nameplate

MDS – D –

Type MDS-D-	Rated output	Compatible AC reactor
CV-37	3.7 kw	D-AL-7.5K
CV-75	7.5 kw	
CV-110	11.0 kw	D-AL-11K
CV-185	18.5 kw	D-AL-18.5K
CV-300	30.0 kw	D-AL-30K
CV-370	37.0 kw	D-AL-37K
CV-450	45.0 kw	D-AL-45K
CV-550	55.0 kw	D-AL-55K

21.4 AC reactor type

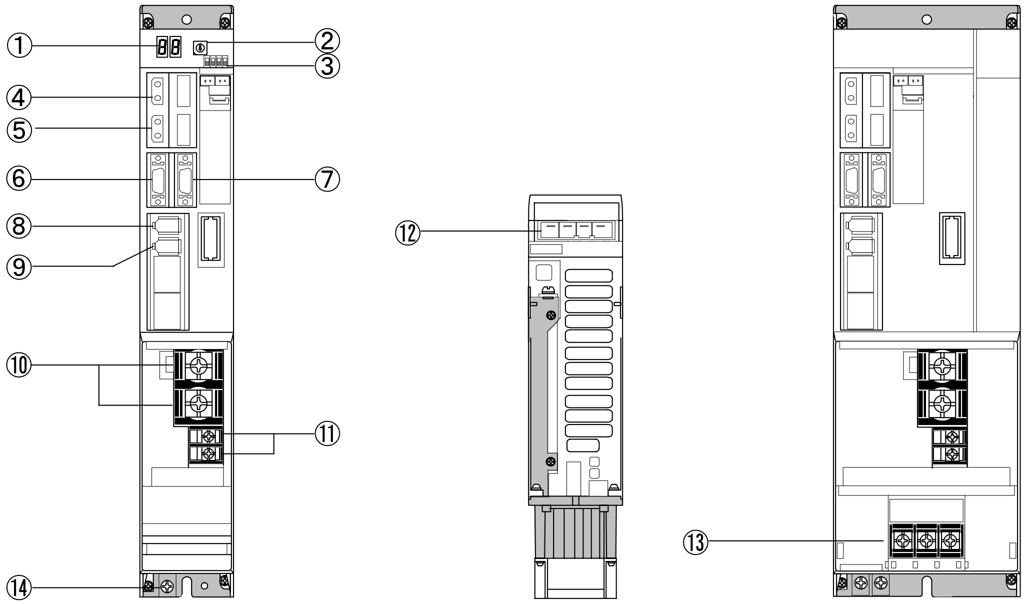


Top surface of AC reactor

D-AL- □

Type D-AL-	Capacity	Compatible power Supply unit
7.5 K	7.5 kw	MDS-D-CV-37
		MDS-D-CV-75
11 K	11.0 kw	MDS-D-CV-110
18.5 K	18.5 kw	MDS-D-CV-185
30 K	30.0 kw	MDS-D-CV-300
37 K	37.0 kw	MDS-D-CV-370
45 K	45.0 kw	MDS-D-CV-450
55 K	55.0 kw	MDS-D-CV-550

21.5 Explanation of each spindle drive unit part



MDS-D-SP
60mm width

Button view of
left diagram

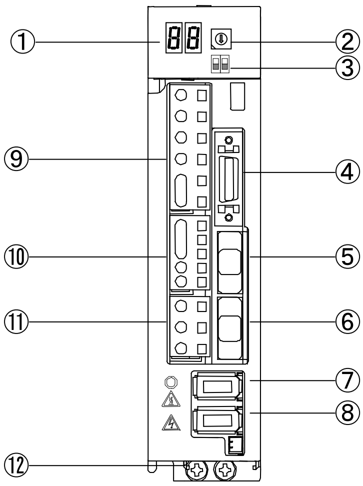
MDS-D-SP
90mm width or more

Each part name

		Name		Description
①	Control circuit	LED	—	Unit status indicated LED
②	Control circuit	SWL	—	Axis No. setting switch
③	Control circuit	SW1	—	Unused axis setting switch（L,M axis）
④	Control circuit	CN1A	—	NC or master axis optical communication connector
⑤	Control circuit	CN1B	—	Slave axis optical communication connector
⑥	Control circuit	CN9	—	Maintenance connector（Usually not used）
⑦	Control circuit	CN4	—	Power supply communication connector
⑧	Control circuit	CN2L	—	Built-in PLG detector connection connector
⑨	Control circuit	CN3L	—	Machine side detector connection connector
⑩	Main circuit	TE2	L+ L-	Converter voltage input terminal（DC input）
⑪	Main circuit	TE3	L11 L21	Control power input terminal（Single-phase AC input）
⑫	Main circuit	TE1	U, V, W,⏚	Motor power supply output connector（3 phase AC output）， Motor grounding terminal （for 60mm width）
⑬	Main circuit	TE1	U, V, W	Motor power supply output terminal（3 phase AC output） （for 90mm width or more）
⑭		PE	⏚	Grounding terminal Note that TE1 connector(above”⑫”) is used for the motor grounding of the 60mm width unit.

21.5.1 MDS-D-SPJ3 series explanation

Spindle drive （0.75KW~3.7KW）explanation



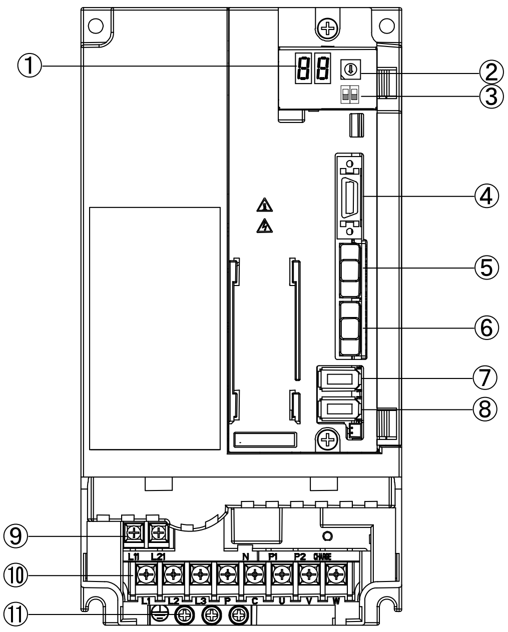
MDS-D-SPJ3-075/22/37

The connector and terminal block layout may differ according to the unit being used. Refer to each unit outline drawing for details.

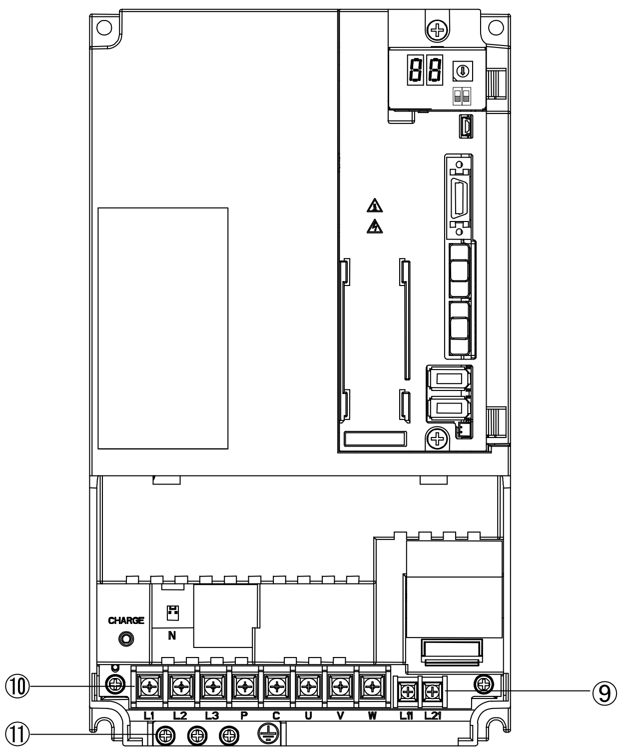
Each part name

		Name		Description	Screw size
(1)	Control circuit	LED	---	Unit status indication LED	---
(2)	Control circuit	SW1	---	Axis No. setting switch	---
(3)	Control circuit	SW2	---	For machine tool builder adjustment (always ON)	---
(4)	Control circuit	CN9	---	DI/O or maintenance connector	---
(5)	Control circuit	CN1A	---	NC or master axis optical communication connector	---
(6)	Control circuit	CN1B	---	Slave axis optical communication connector	---
(7)	Control circuit	CN2	---	Motor side detector connection connector	---
(8)	Control circuit	CN3	---	Machine side detector connection connector	---
(9)	Main circuit	CNP1	L1,L2,L3 N,P1,P2	L1,L2,L3: 3-phase AC power input N,P1,P2: Not used (short-circuit between the P1 and P2.)	---
(10)	Main circuit	CNP2	P,C,D L11,L21	Regenerative resistor connection terminal Control power input terminal (single-phase AC input)	---
(11)	Main circuit	CNP3	U, V, W	Motor power output terminal (3-phase AC output)	---
(12)		PE	⏚	Grounding terminal	M4 x 10

Spindle drive（5.5KW~11KW）explanation



MDS-D-SPJ3-55/75



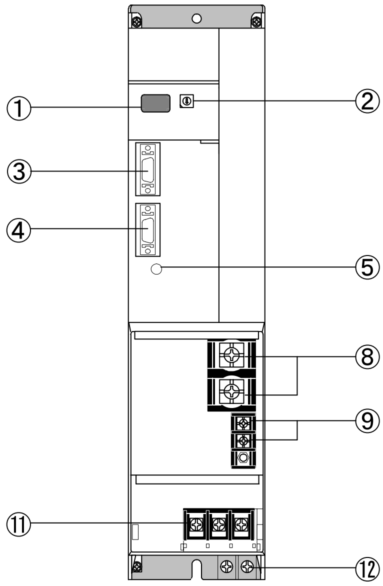
MDS-D-SPJ3-110

The connector and terminal block layout may differ according to the unit being used. Refer to each unit outline drawing for details.

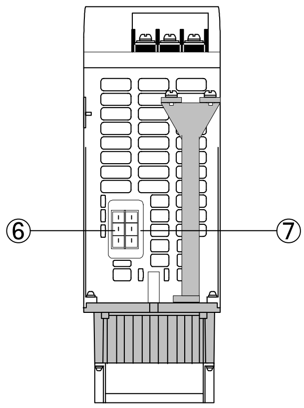
Each part name

		Name		Description	Screw size
(1)	Control circuit	LED	---	Unit status indication LED	---
(2)	Control circuit	SW1	---	Axis No. setting switch	---
(3)	Control circuit	SW2	---	For machine tool builder adjustment (always ON)	---
(4)	Control circuit	CN9	---	DI/O or maintenance connector	---
(5)	Control circuit	CN1A	---	NC or master axis optical communication connector	---
(6)	Control circuit	CN1B	---	Slave axis optical communication connector	---
(7)	Control circuit	CN2	---	Motor side detector connection connector	---
(8)	Control circuit	CN3	---	Machine side detector connection connector	---
(9)	Main circuit	TE2	L11,L21	Control power input terminal (single-phase AC input)	M3.5×6
(10)	Main circuit	TE1	L1,L2,L3 P,C U,V,W	L1,L2,L3: 3-phase AC power input P,C: Regenerative resistor connection terminal U,V,W: Motor power output terminal (3-phase AC output)	M4×10
(11)		PE	⏚	Grounding terminal	M4×10

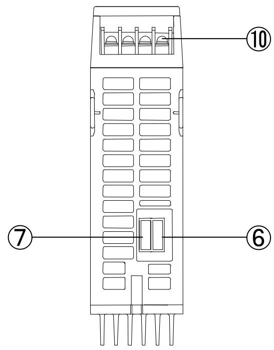
21.6 Explanation of each power supply unit part



MDS-D-CV



Bottom view
90mm width or more



Bottom view
60mm width

Each part name

		Name		Description
①	Control circuit	LED	─	Power supply status　indication LED
②		SW1	─	Power supply setting switch
③		CN4	─	Servo/spindle communication connector(master)
④		CN9	─	Servo/spindle communication connector(slave)
⑤		─	CHARGE LAMP	TE2 output charge/discharge circuit indication LED
⑥		CN23A	─	External emergency stop input connector
⑦		CN23B	MC1,MC2	External contactor control connector
⑧	Main circuit	TE2	L+ L-	Converter voltage output terminal(DC output)
⑨		TE3	L11 L21	Control power input terminal(single-phase AC input)
⑩		TE1	L1,L2,L3,⏚	Power input terminal（3 phase AC input）and Grounding terminal (for 60mm width)
⑪			L1, L2, L3	Power input terminal（3 phase AC input） (for 90mm width or more)
⑫		PE	⏚	Grounding terminal（for 90mm width or more）

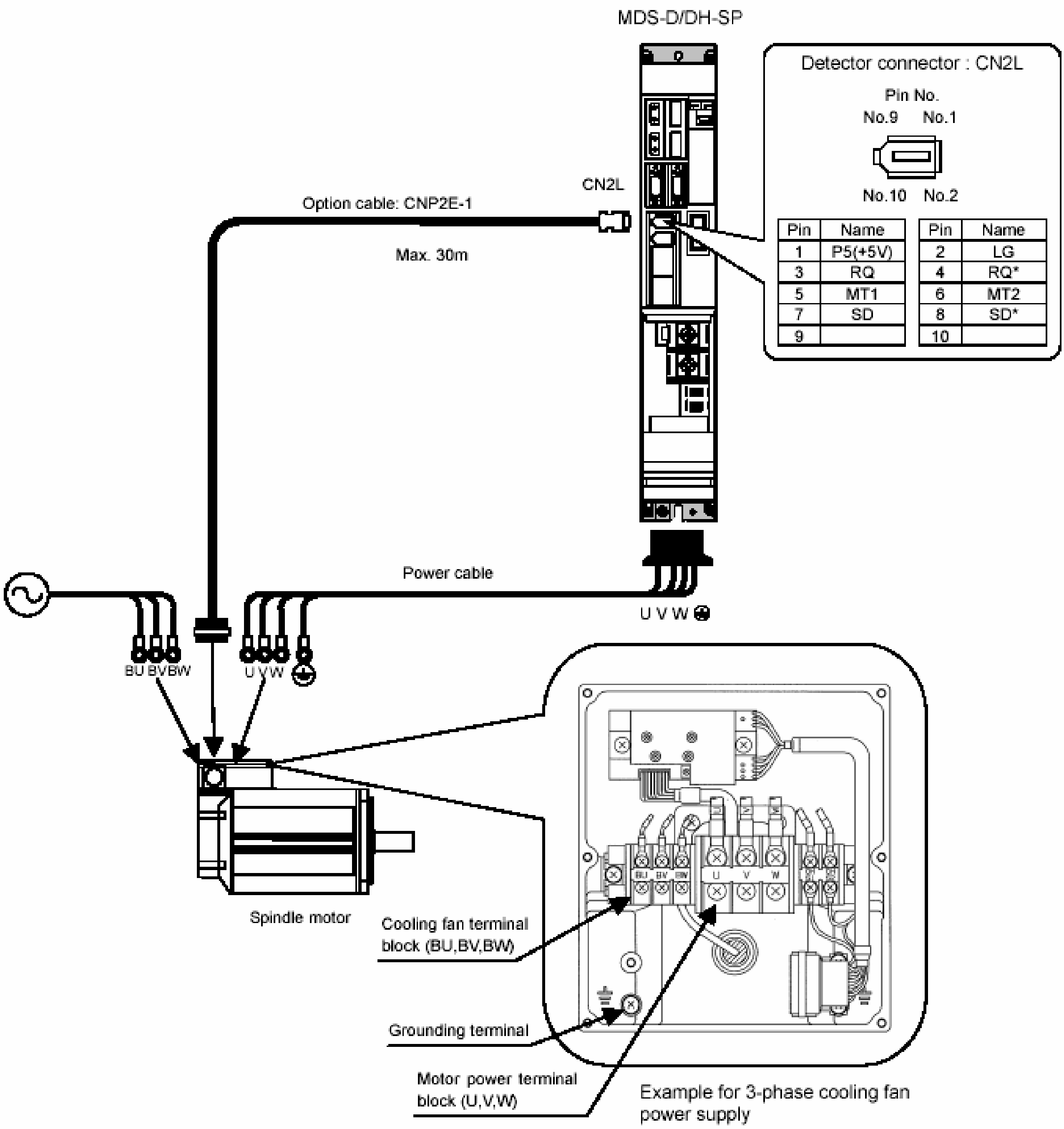
21.7 Spindle system configuration

The system configuration is same as chapter 2 Servo system so we don’t explain again.

21.8 Spindle motor connection

21.8.1 MDS-D-SP series

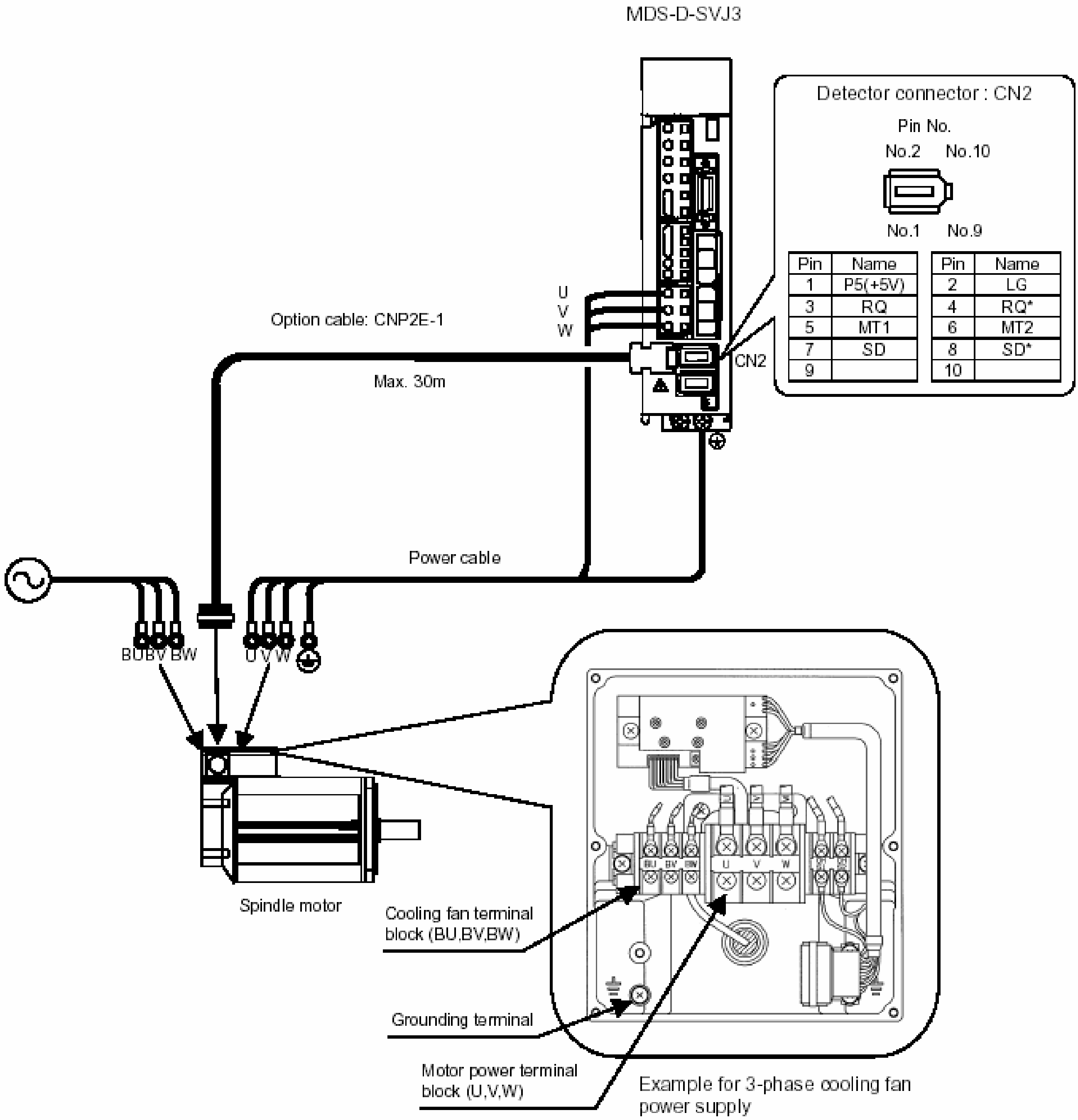
(1) Connecting the motor built-in PLG



(Note) Either a single-phase or 3-phase power supply is used for the cooling fan.
Refer to the Spindle Motor Specifications for details.

21.8.2 MDS-D-SPJ3 series

(1) Connecting the motor built-in PLG



Pin	Name	Pin	Name
1	P5(+5V)	2	LG
3	RQ	4	RQ*
5	MT1	6	MT2
7	SD	8	SD*
9		10	

(Note) Either a single-phase or 3-phase power supply is used for the cooling fan.
Refer to the Spindle Motor Specifications for details.

21.9 SPJ3 series regenerative resistor list 機種適用回生電阻型式一覽表

The list

Corresponding spindle drive unit	Standard built-in regenerative resistor		External option regenerative resistor						
			FCUA-RB 04	FCUA-RB 075	FCUA-RB 15	FCUA-RB 22	FCUA-RB 37	FCUA-RB 55	FCUA -RB75/2 1 unit
	Regenerative capacity		60W	80W	120W	155W	185W	340W	340W
		Resistance value	200Ω	100Ω	60Ω	40Ω	25Ω	20Ω	30Ω
MDS-D-SPJ3-075	-	-	○	○	○	○			
MDS-D-SPJ3-22	-	-			○	○	○		○
MDS-D-SPJ3-37	-	-					○	○	○
MDS-D-SPJ3-55	-	-						○	
MDS-D-SPJ3-75	-	-							
MDS-D-SPJ3-110	-	-							

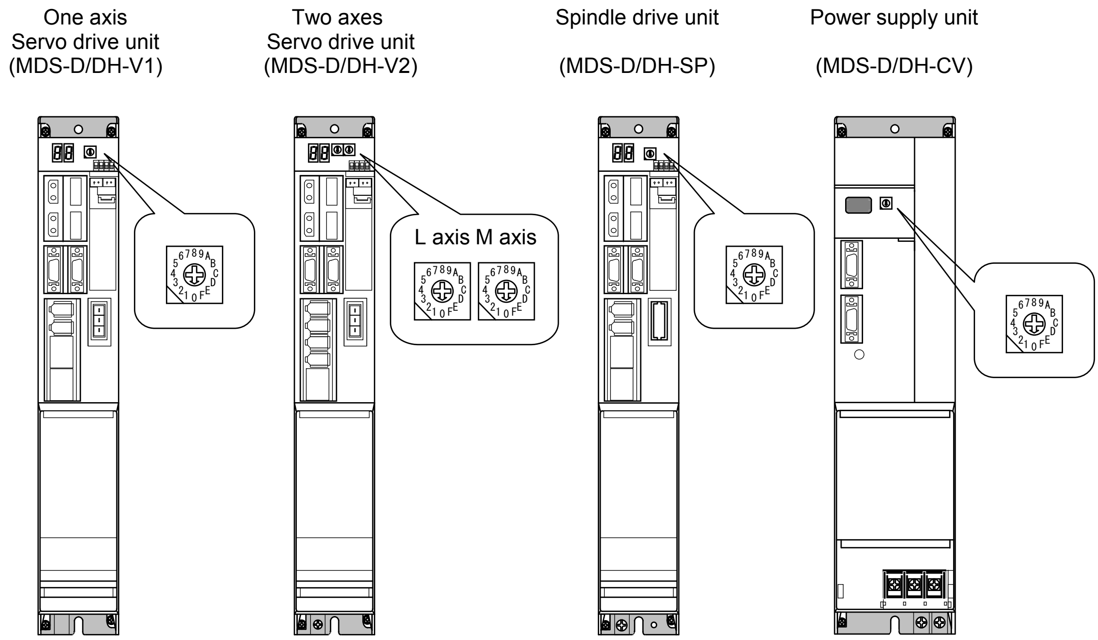
Corresponding spindle drive unit	Standard built-in regenerative resistor		External option regenerative resistor					
			R-UNIT1	R-UNIT2	R-UNIT3	R-UNIT4	R-UNIT5	FCUA -RB75/2 2 units
	Regenerative capacity		700W	700W	2100W	2100W	3100W	680W
		Resistance value	30Ω	15Ω	15Ω	10Ω	10Ω	15Ω
MDS-D-SPJ3-075	-	-						
MDS-D-SPJ3-22	-	-	○					
MDS-D-SPJ3-37	-	-	○					
MDS-D-SPJ3-55	-	-		○	○			○
MDS-D-SPJ3-75	-	-		○	○			○
MDS-D-SPJ3-110	-	-				○	○	

Corresponding spindle drive unit	Standard built-in regenerative resistor		External option regenerative resistor				
			MR-RB032	MR-RB12	MR-RB32	MR-RB30	MR-RB50
					GZG200W120 OHMK x 3 units	GZG200W39 OHMK x 3 units	GZG300W39 OHMK x 3 units
	Regenerative capacity		30W	100W	300W	300W	500W
		Resistance value	40Ω	40Ω	40Ω	13Ω	13Ω
MDS-D-SPJ3-075	-	-		○	○		
MDS-D-SPJ3-22	-	-				○	○
MDS-D-SPJ3-37	-	-				○	○
MDS-D-SPJ3-55	-	-				○	○
MDS-D-SPJ3-75	-	-					
MDS-D-SPJ3-110	-	-					

21.10 Initial setting drive and LED display status

(1) Rotary switch setting

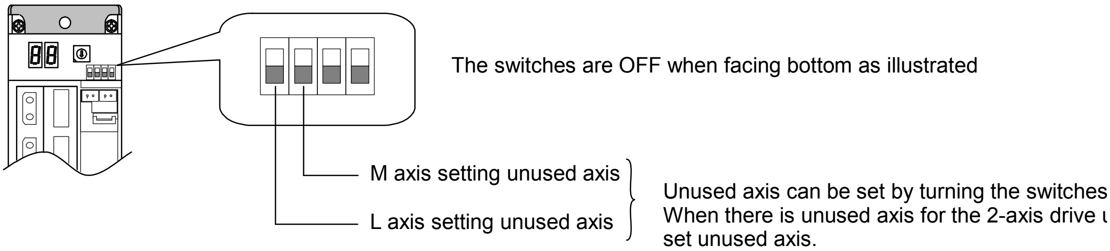
The rotary switch setting should be confirmed when power turn on before. The setting is valid during power turn on for rotary switch. Also setting position must be confirmed to avoid a message of Y03 AMP Unequipped occurring when drive is exchanged.



Rotary switch	Details	
	MDS-D/DH-V1/V2/SP□setting	MDS-D/DH-CVsetting
0	1st axis	Normal setting
1	2nd axis	Setting prohibited
2	3rd axis	
3	4th axis	
4	5th axis	External emergency stop valid （CN23 Used）
5	6th axis	Setting prohibited
6	7th axis	
7	8th axis	
8	9th axis	
9	10th axis	
A	11th axis	
B	12th axis	
C	13th axis	
D	14th axis	
E	15th axis	
F	16th axis	

(2) Dip switch setting

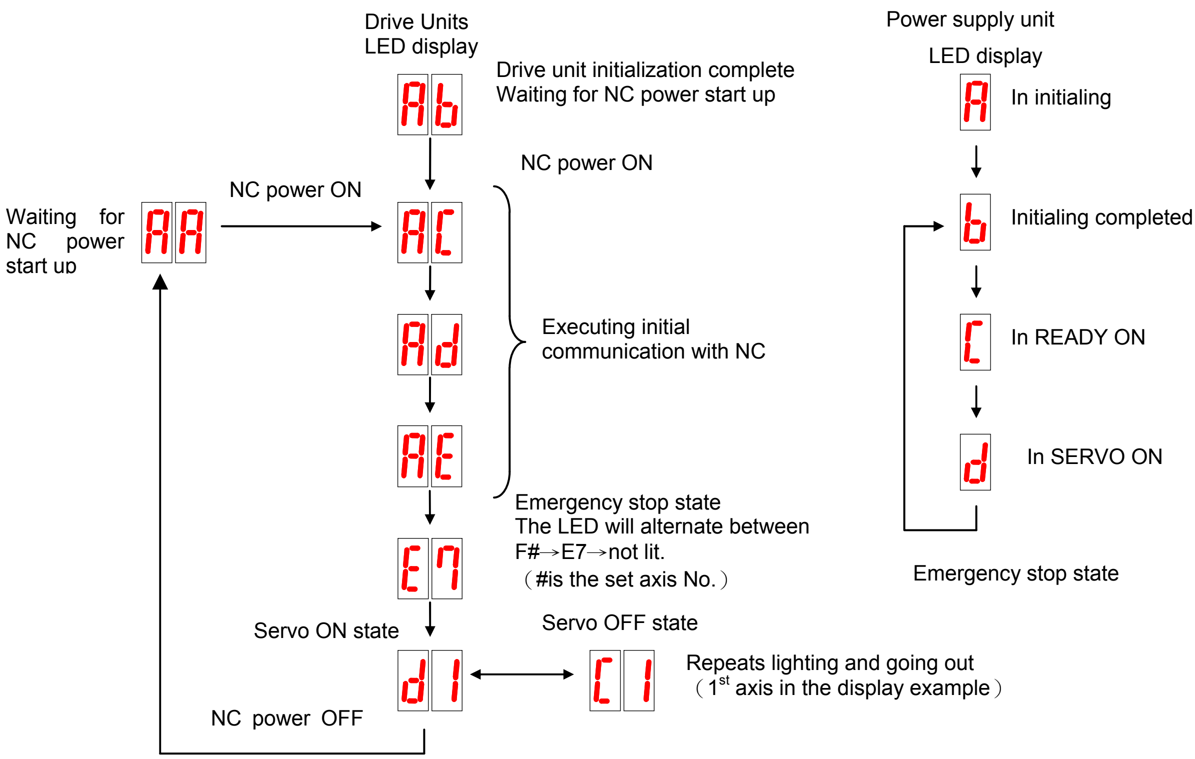
Setting the dip switches is necessary prior to turning ON the power. Setting of the dip switches at the time of turning ON the power is validated. The dip switches shall be as the standard setting.(all the switches OFF)



(3) Transition of LED display after power is turned ON

For CNC, each drive unit and the power supply unit power have been turned ON. Each unit will automatically execute self-diagnosis and initial settings for operation, etc. The LEDs on the front of the units will change as show below according to the progression of these processes.

If an alarm occurs,the alarm No. will appear on the LEDs.Refer to “LED display when alarm or warning occurs” for details on the alarm displays.



Caution	Always input emergency stop when starting the servo system.

(4) The display of seven segment indicate on servo drive.

Segment displays	NC display	State explanation
AA	(Non display)	Initiation，Waiting the NC power ON (When the NC power ON→OFF)
Ab		Initiation，Waiting the NC power ON (When the 220V voltage input without the NC power start up)
AC	(Non display)	Initiation，parameter requested transmission .
Ad		Initiation，parameter requested changeover.
AE		Initiation，Waiting servo IT start up
b #		Ready OFF
c #		Servo OFF
d #		Servo ON
F # → 9∗	9∗	Warning (∗ value is from 0 to F,E6 and E7 displayed only)
F # → E∗	E∗	
F # → ∗∗	∗∗	Alarm occurred

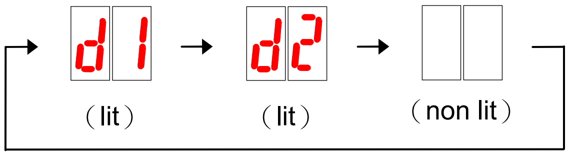
：Axis No.

∗：Warning number

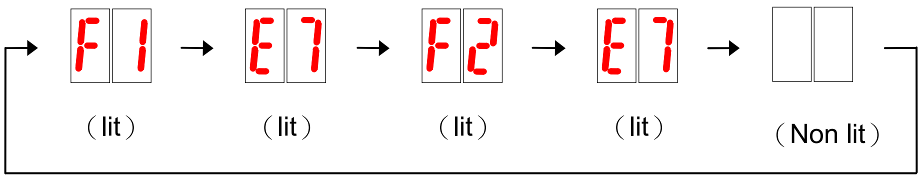
∗∗：Alarm number (Refer to <Servo alarm manual>)

Exemplification is MDS-A/B/C1/R-V2 series. The segment display set for L axis is 1st and M axis is 2nd.

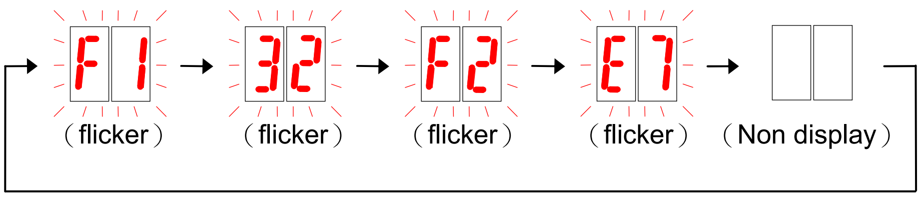
(Example 1) L axis and M axis are display on normal state.



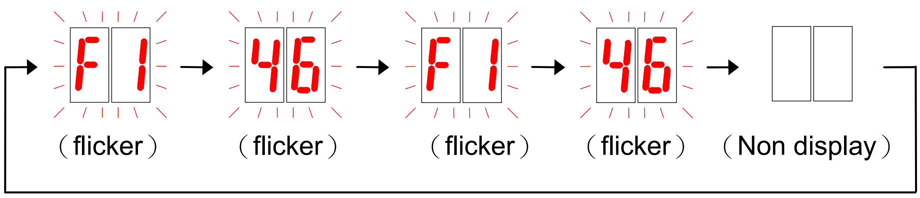
(Example 2) L axis and M axis are display on emergency state.



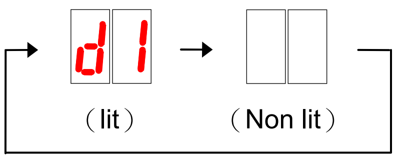
(Example 3) L axis occurred 32 alarm(over current) and M axis stay in emergency state.



(Example 4) The dip switches of M axis switch unused axis and L axis occurred overheat alarm (AL 46).



(Example 5) The dip switches of M axis switch unused axis and L axis display on normal state.



22. Spindle drive replacement procedure

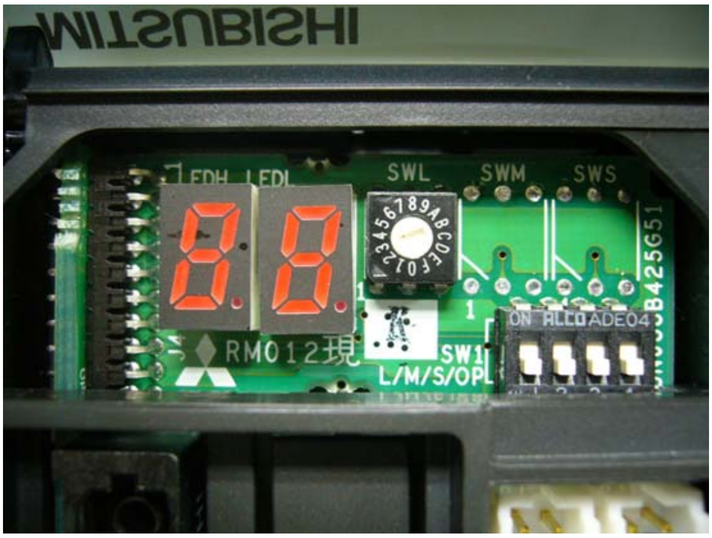
According to these procedures exchange drive

(1) Switch OFF the power and make sure again for LED of drive whether go out.
    (a) The drives can exchanged when the charge lamp of power supply go out .

(2) Take off connectors and cables on drivers.
    (a) To make a mark on connectors and cables when they take off before.
    (b) Opening drive's cover and take off cables by screw drivers.

(3) Take off screws connect with electric cabinet on drives.

(4) The rotary switch position has to same as old drive.



(5) These new drivers install back by reverse sequence according to old drives take off.

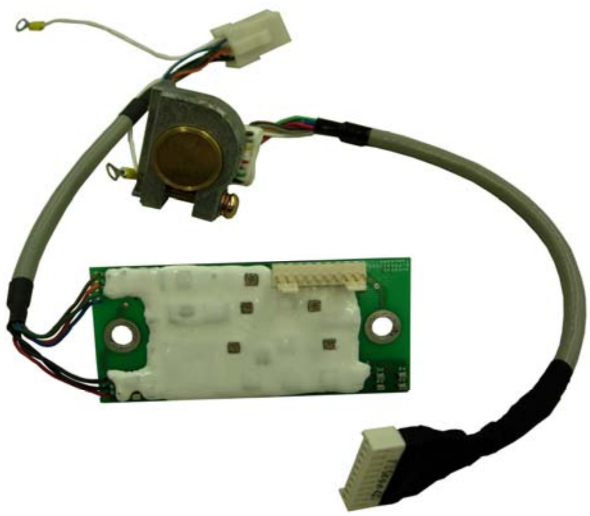
(6) Please make sure whether cables are fixed and faulty connection when the power turn ON before.

23. PLG adjustment procedure

The PLG is speed detector for spindle motor. In order to rotary speed is stable that the waveform must be confirmed due to first time to install or rotary speed unstable couple years ago. M700 controller could correspond with spindle detector as show below.

Spindle detector	Specialty explanation
TS5691	• Waveform adjust necessary • Model size exchange with before(connector difference) • The gap distance approach 0.15mm between Sensor and gear.
TS5690	• Non adjustment waveform • The gap distance approach 0.3mm between Sensor and gear.
ERM280 + APE391M （Heidenhain made）	• Non adjustment waveform • Order by MTB
External detctor + MDS-B-HR （European’s spindle motor）	• Connection with European model spindle motor • Mitsubishi must be recognize before shipment

TS5691 external photo

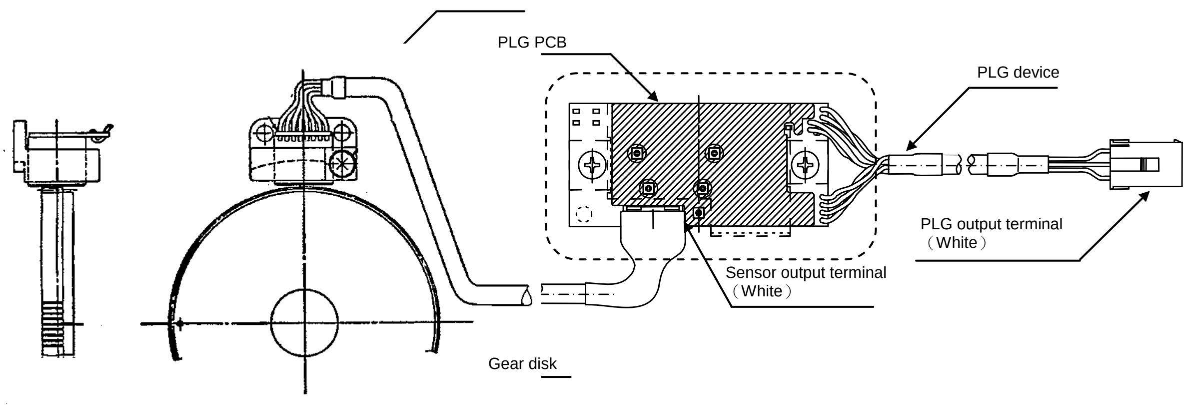


TS5690 external photo

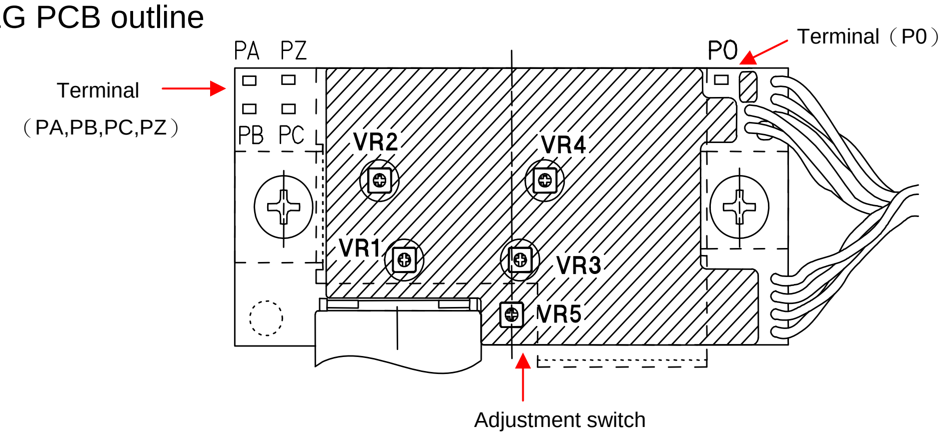
23.1 TS5691 detector construction

(1) The series detector of TS5691 is combine with sensor and pre-amplifier and gear. Including adjustment switch and connection terminals function following as below.

Detector Outline



PLG PCB outline



Adjustment switch function

Switch name	Function
VR1	A Phase zero voltage
VR2	A Phase Gain Adjust
VR3	B Phase zero position
VR4	B Phase Gain Adjust
VR5	Z Phase cycle（Pulse wave width）

← **Without adjustment**

Terminal function

Terminal name	Function	Terminal name	Function
PA	A Phase	PB	B Phase
PZ	Z Phase	PC	Middle Voltage
P0	GROUND（0V）		

(2) The analog signal is created three phase A ,B,Z from pre-amplifier between sensor part. The series signal output from pre-amplifier and driver (MDS-D/DH-SP)

(3) The sensor part and pre-amplifier are used same series number group.

(4) Be attention do not crash each part when they are installed.

23.2 Adjustment procedure

TS5691 output signal confirm and following adjustment procedure as below.

Start

↓

（Procedure1） 1.3.1 Sensor fixed base installation	The gap distance is 0.15mm between sensor face and gear disc.
（Procedure2） 1.3.2 Pre-amplifier PCB installation	The screws are tightly on motor base with protecting cover and PCB. Do not insert plastic isolation.
（Procedure3） 1.3.3 Signal cable connection	Please make sure cable direction when it is plugged in. The connector or terminal will be damaged with force possibly.
（Procedure5） 1.3.4 A、B phase signal adjustment	The output signal for A,B phase adjust with rotary switch peak voltage between 2000mV±10mV。
（Procedure6） 1.3.5 Z Phase signal adjustment	Confirmation basically waveform without adjust.

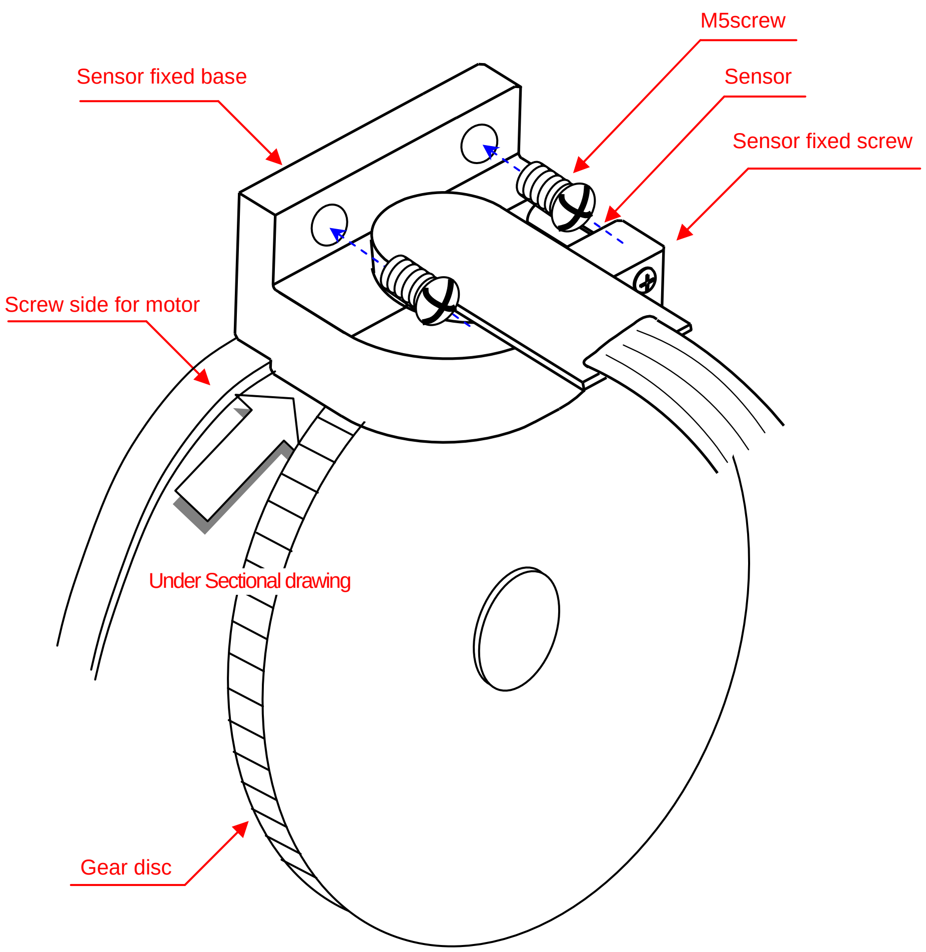
↓

End

23.3 Adjustment method

23.3.1 Sensor fixed base installation（Gap adjustment）

The screw side of motor and sensor fixed base board assemble on same line. The screw fixative spread in M5 screws to fix sensor.
The gap distance between sensor face and gear disc must be 0.15±0.01mm.How to adjust gap procedure as below:



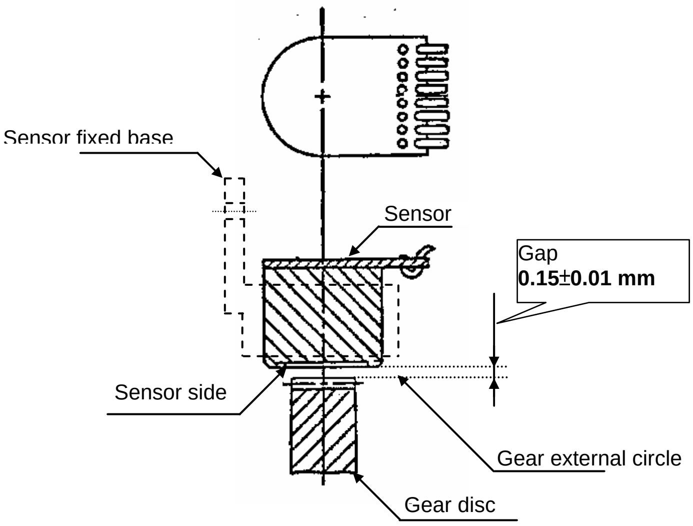
(1) Please make sure the gear is not run status. The sensor would be damaged when gear is running under gap adjustment.

(2) The sensor fixed base board could adjust with hand moving by up and down then M5 screw tighten lightly.

(3) The gap distance between sensor face and gear disc must be 0.15±0.01mm used gap ruler to adjust.

(4) The M5 screw make a spread with screw fixative when gap adjustment is finish.

Installation for sensor fixed



Gap distance adjustment（Section chart）

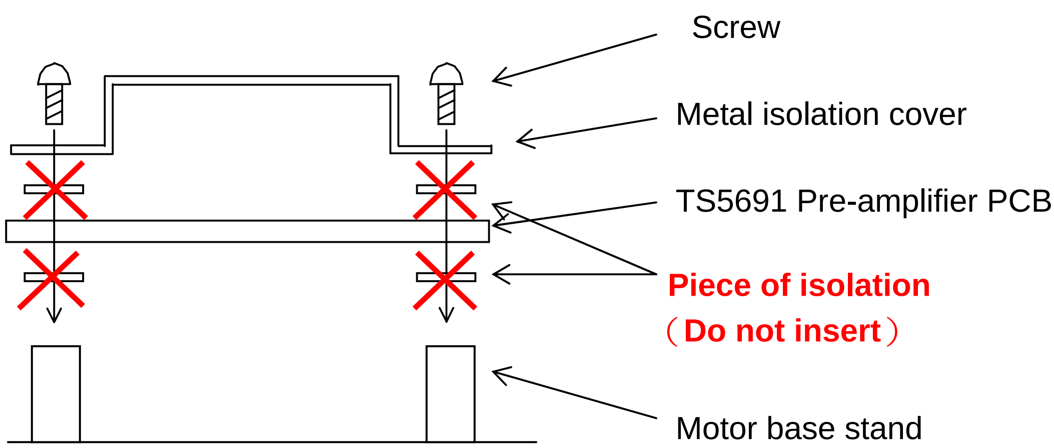
⚠ **Caution**	To avoid these situation for damage when sensor is installed and use. (a) Do not beat the sensor face side. (b) Do not drop down for sensor part. (c) Do not make a pressure for sensor.

23.3.2 Installation for Pre-amplifier PCB

The PCB of pre-amplifier install motor base without insert piece of isolation as below. (1) Installation screw. (2)Metal isolation cover. (3) TS5691 pre-amplifier base board.

The procedure step from (1) to (3) and tight lock on motor base stand.

However motor base stand must be metal material and connect with ground or extra cable to connect with ground for FG point of pre-amplifier base board.

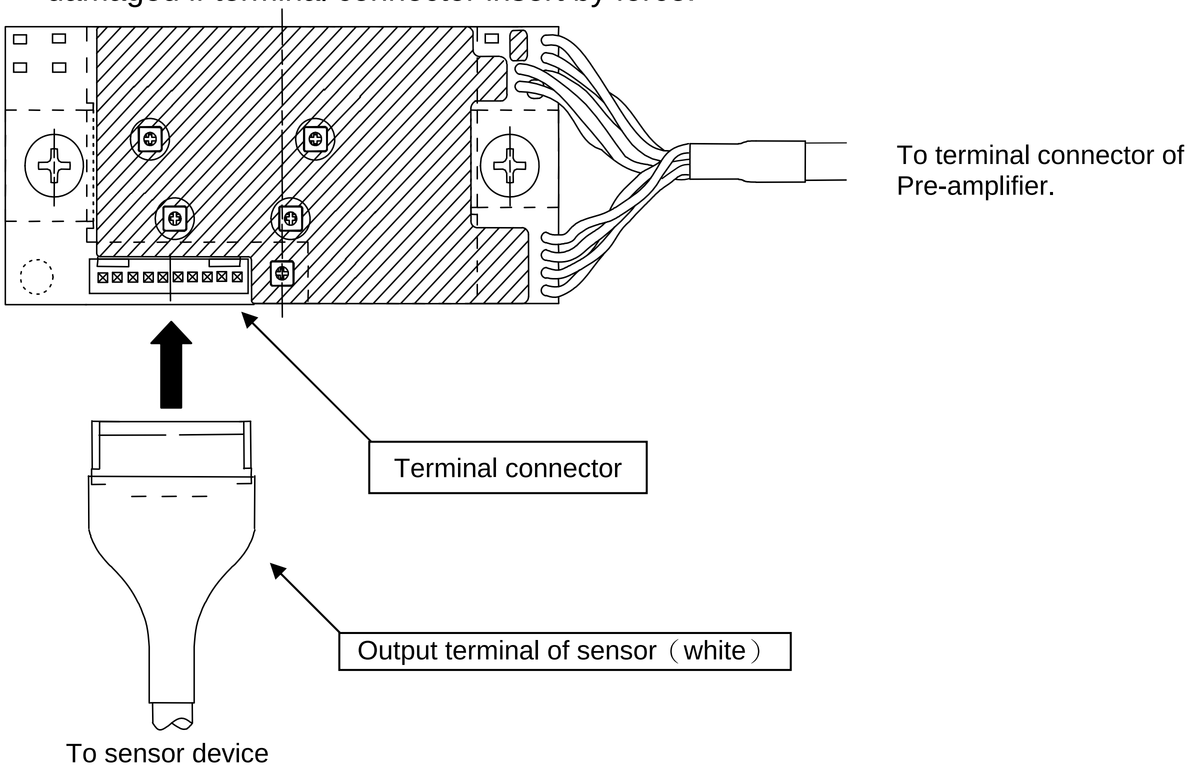


Installation for pre-amplifier set in motor base

23.3.3 Connection with signal cable

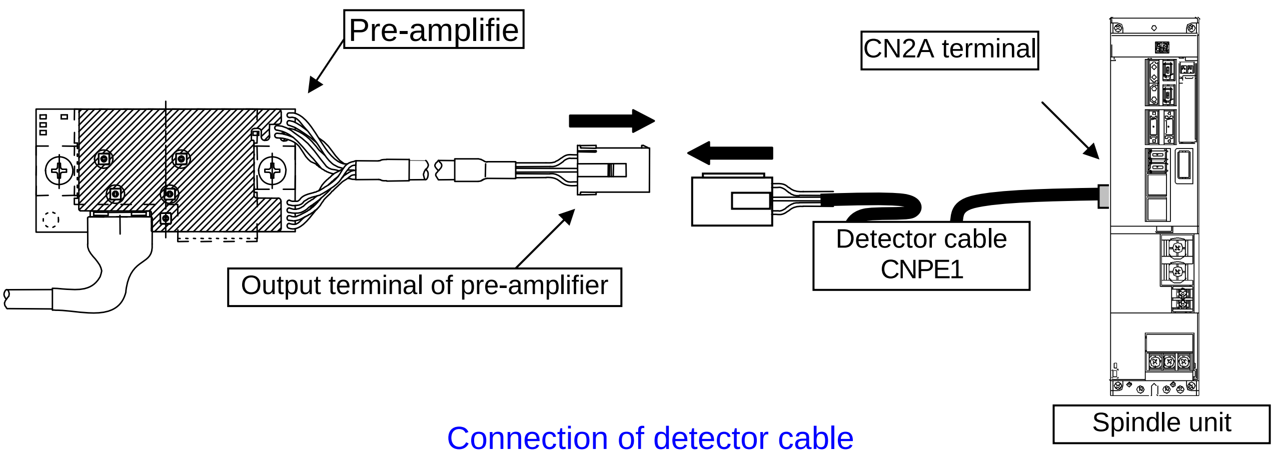
To connect signal cable when pre-amplifier is fixed in motor stand.

(1) The signal cable of sensor connects with pre-amplifier.
An output terminal of sensor (white) connects with terminal connector of pre-amplifier show as photo below. Be careful direction to connect. It will be damaged if terminal connector insert by force.



Connection between pre-amplifier and terminal of sensor

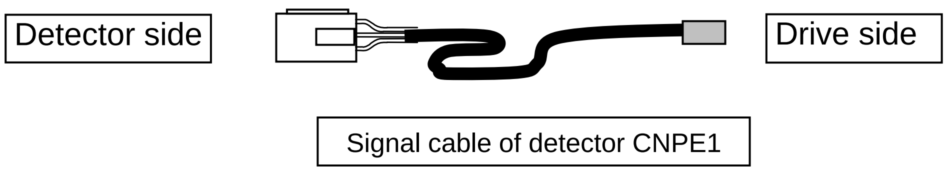
(2) Connect with signal cable of detector.
The CN2A terminal of spindle drive is connected by detector cable and output terminal of pre-amplifier. Be careful direction to connect. It will be damaged if terminal connector insert by force.



Connection of detector cable

※ Outline of detector cable

According to below figure to connect when signal cable is made. The maximum length is 30 meters.



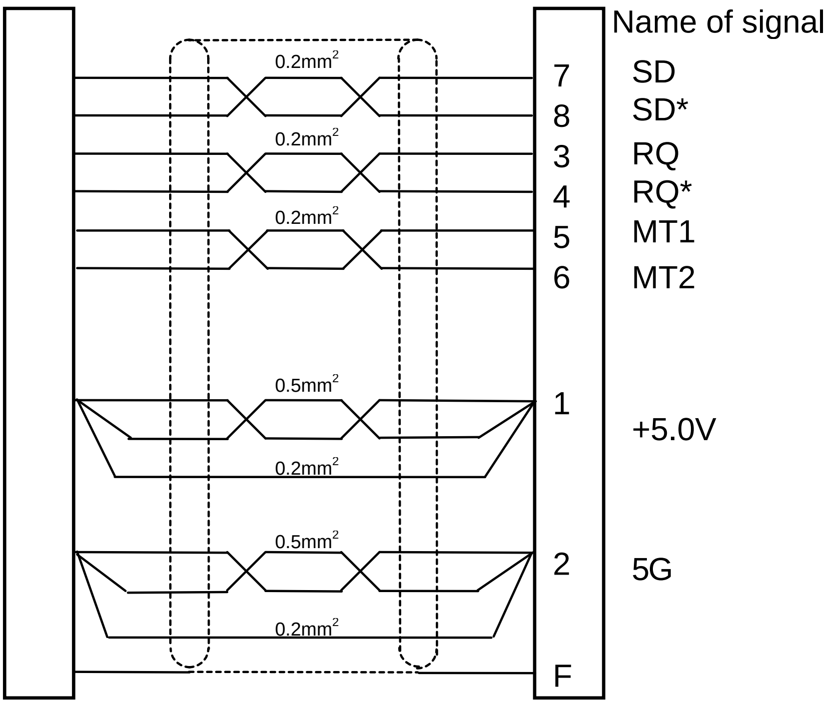


Figure of detector cable（CNPE1）

⚠ **Caution**	The cable of CNPE1 is exclusive detector cable for MDS-D/DH drive unit.

23.3.4 A,B phase adjustment

(1) Open loop setting

(a) For IM spindle motor (SP017= 0xxxx or 2xxxx) ⇨
The parameter of spindle set “1 “ for SP018 bit 1 (rotation with open loop) .The setting will be available when main power has to reboot again.

(b) For IPM spindle motor (SP017=1xxxx or 3xxxx) ⇨
The parameter of spindle set “1 “ for SP018 bit 1 and SP113 address set “10” (setting range between 10 to 20 for rotation speed). The setting will be available when main power has to reboot again.

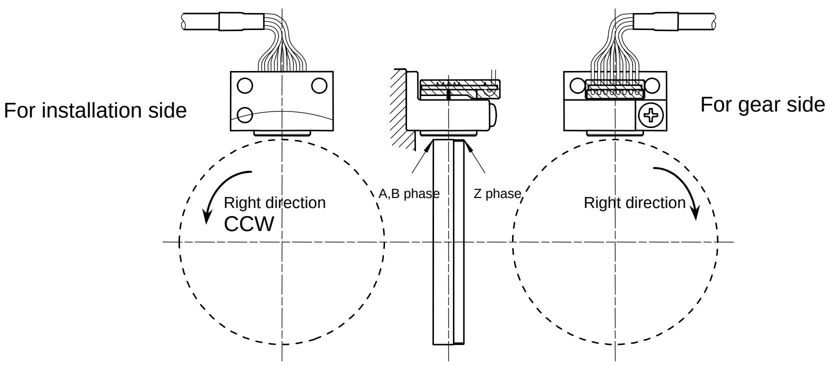
(2) The measurement range set DC 0.5V/div for oscilloscope on CH1 and CH2 (detector stick scale is 1:1).The P0 terminal of PLG circuit has to connect by each ground cable of detector stick and PC terminal connects by signal cable.

(3) In order to get an optimum 2.5V for each channel. The zero voltage level for CH1 and CH2 has to move middle. The stick is connected PA terminal for CH1 and PB terminal for CH2.

(4) Turn on the NC power and right rotation command run depend on basically rotation speed(refer to next subject for basically speed obtainable)

Rotational direction

For left figure, the rotation is defined clockwise (CW) that gear disc is anticlockwise (CCW).On this subject, CW means looks at on gear disc for right direction.

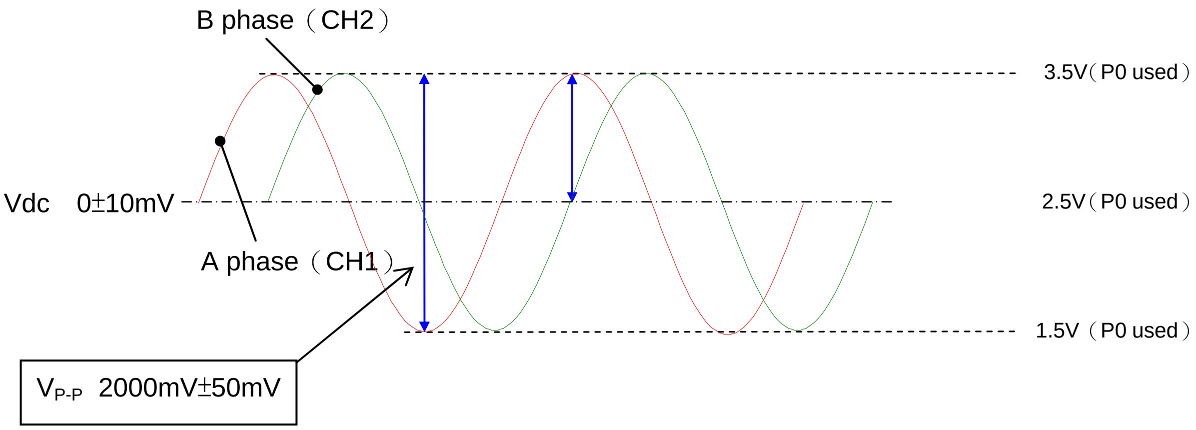


(6) For A phase adjustment , the waveform voltage is 2000mV±50mVP-P peak to peak value condition on basically speed rotation. $\boxed{\text{VR2}}$ is for amplitude and $\boxed{\text{VR1}}$ is for compensation of position. On half measurement from 0V is 1000mV±25mV.

(7) Using digital meter measures DC voltage that the waveform of CH1 is 0V±10mVDC base on DC voltage adjustment by $\boxed{\text{VR1}}$ .For AC voltage ,the measuring value is 707mV±4mV （=1000mV±5mV／$\sqrt{2}$） using $\boxed{\text{VR2}}$ to adjust.

(8) The procedure is same for B phase adjustment. The waveform of CH2 must be confirm related connection with PB terminal. Repeating procedure as (6) and (7) for adjustment VR4 (amplitude) and VR3(compensation of position).

Waveform takes by oscilloscope.



※ Basically speed figure out

Rotation speed figures out for spindle motor reference as below.

Basically speed（r/min）＝200（r/min）x（256/gear teeth amount using PLG gear disc）

ex：PLG gear teeth amount is 128 p/rev . Obtain :200x256/128＝400 r/min

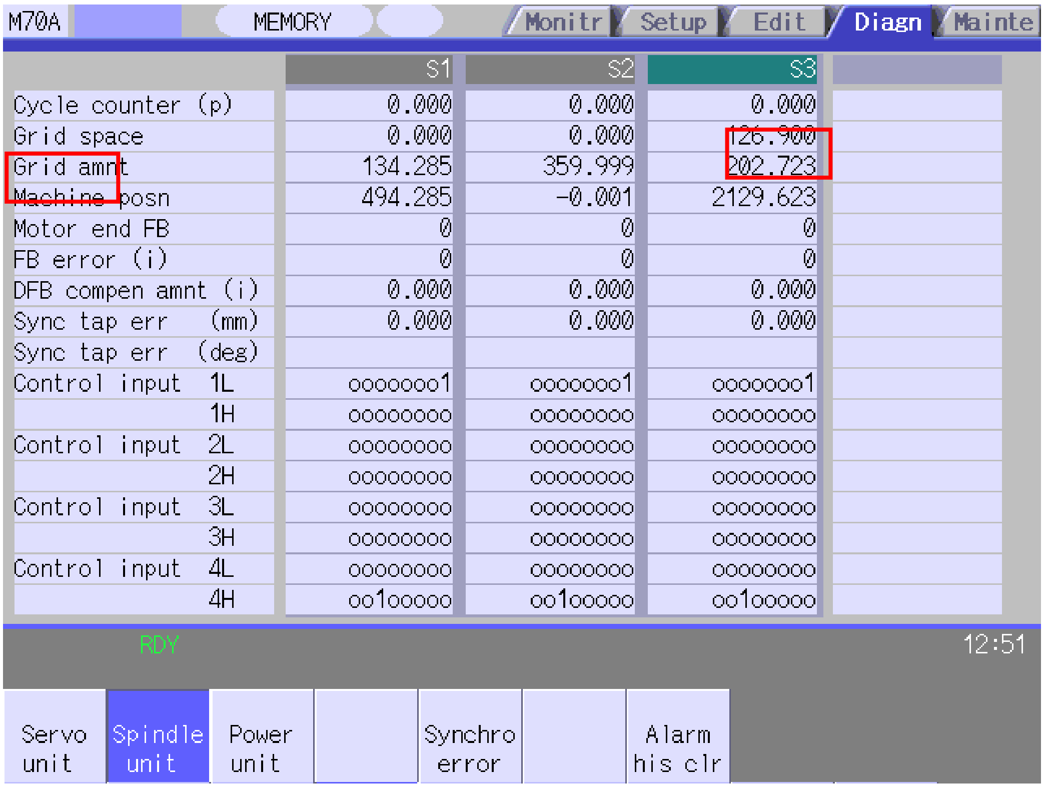
※ The spindle speed has to slowly increase(10~50r/min) for open loop mode. If don't do that, the speed will not reach expecting speed.

Refer：Related compare for PLG gear teeth and basically rotation amount.

SP020 setting	PLG gear amount	Basically speed	Z phase width（Next subject）
8000	512	100	0.7ms
6000	384	140	0.7ms
4000	256	200	0.7ms
2000	128	400	0.7ms

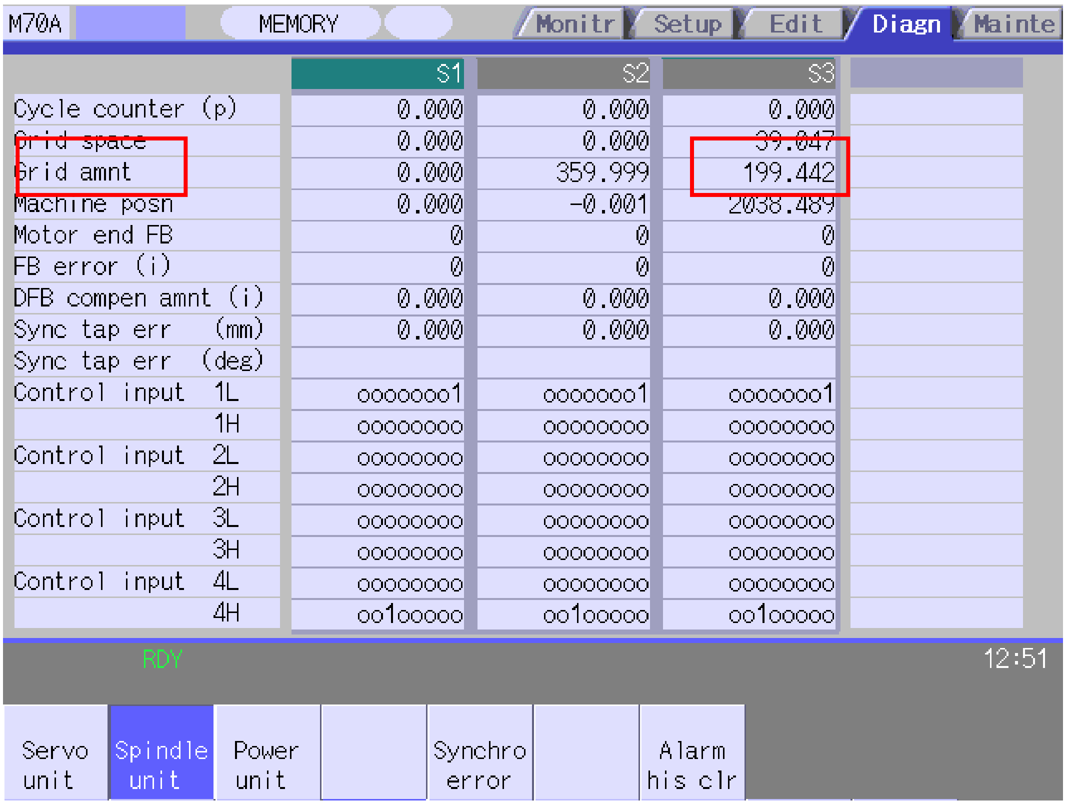
(9) After the first installation when it is unable to rotate the spindle motor. Except confirming whether relevant parameters are correct which also need to confirm it is correct that PLG gear is correct too. Can push EMG stop promptly and write down mechanical position of spindle. Then, turn around the spindle at this moment; confirm whether the mechanical position of the spindle is the same. This action can confirm spindle gear rate the relevant parameters is correct or not.

① Confirm the mechanical position of the spindle first, and draw marks in the mechanical structure.

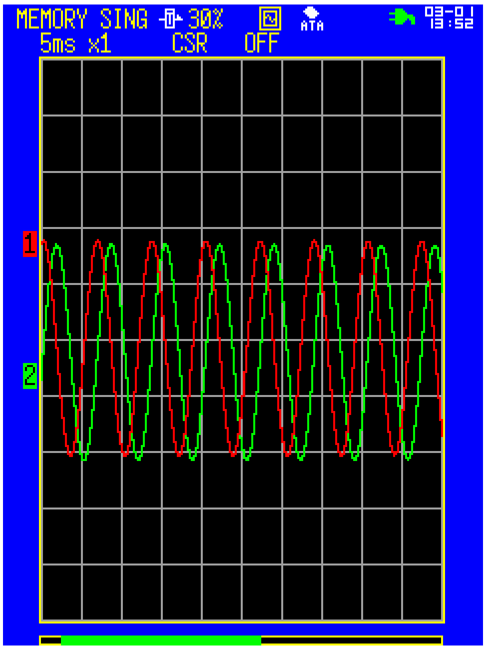


	S1	S2	S3
Cycle counter (p)	0.000	0.000	0.000
Grid space	0.000	0.000	126.900
Grid amnt	134.285	359.999	202.723
Machine posn	494.285	-0.001	2129.623
Motor end FB	0	0	0
FB error (i)	0	0	0
DFB compen amnt (i)	0.000	0.000	0.000
Sync tap err (mm)	0.000	0.000	0.000
Sync tap err (deg)			
Control input 1L	00000001	00000001	00000001
1H	00000000	00000000	00000000
Control input 2L	00000000	00000000	00000000
2H	00000000	00000000	00000000
Control input 3L	00000000	00000000	00000000
3H	00000000	00000000	00000000
Control input 4L	00000000	00000000	00000000
4H	00100000	00100000	00100000

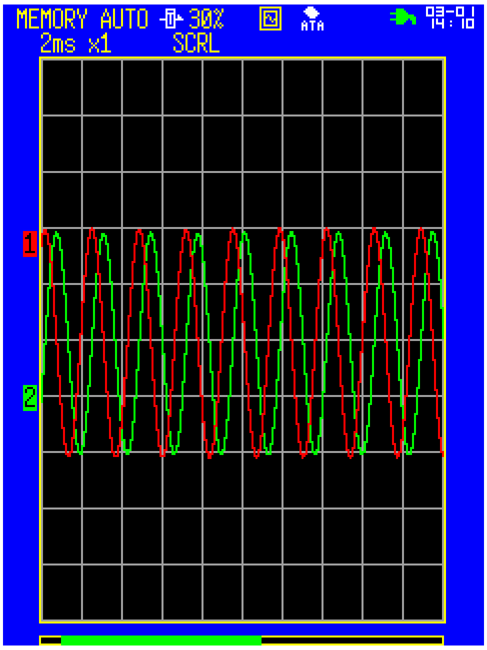
② Confirm after rotating one circle whether the mechanical position of the spindle is same.



(10) Actually example for PLG adjustment



PLG　A、B phase to slow



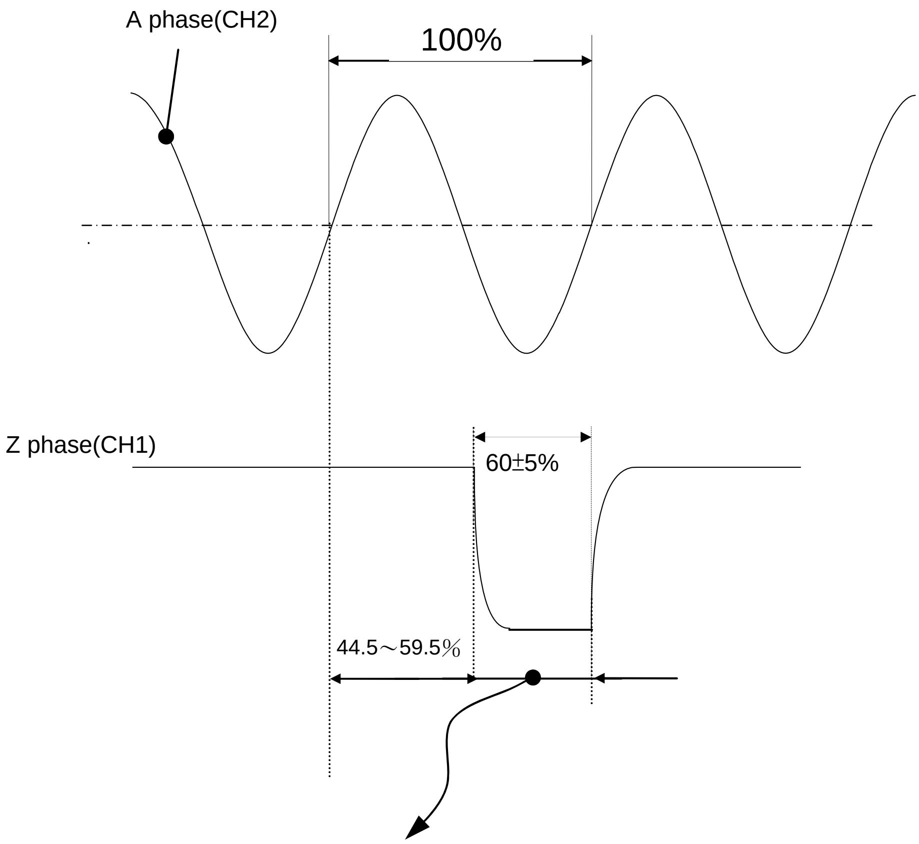
After adjusted wave

23.3.5 Z phase adjustment

(1) For Z phase width of pulse, the CH1 cable connect to PZ terminal on PLG PCB. The GND cables connect to P0 terminal. CH2 cable connects to PA terminal for PLG PCB.

(2) Confirmation the CH1 pulse width is one cycle for 60%±5 of CH2 base on CW direction of rotation speed.

※ Z phase adjustments just do confirmation on waveform. It is unnecessary modification for VR5 rotary switch if the width is under standard level for Z phase.



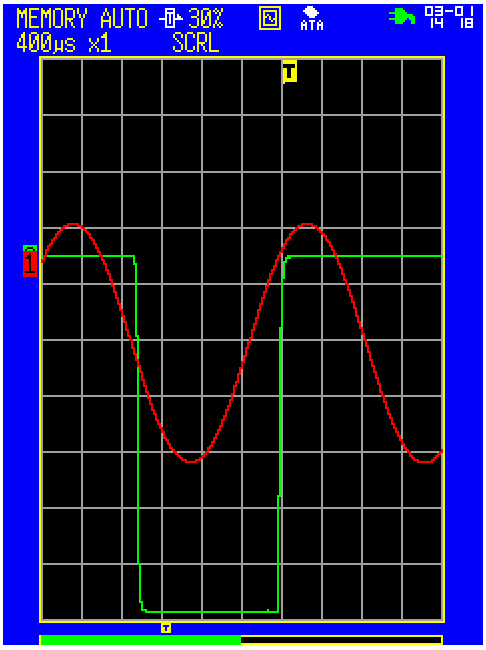
The Z phase width is approach 0.7ms to figure out by basically speed method under spindle speed.

When adjustment procedure is finish and spindle parameter has to recover.
SP018 (#3218) bit 1 restore to “0” (For IPM motor, SP113 (#3313) restore to “0”)
To switch off the main power and reboot again.

End of adjustment

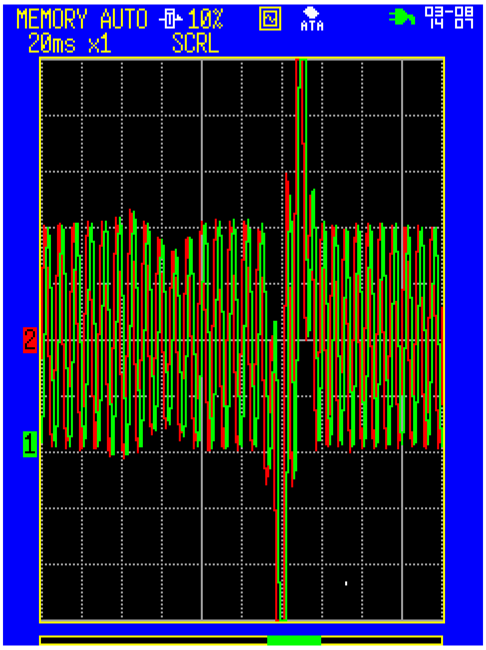
※ The automatic PLG adjustment function can installed on MDS-C1 drive for 220 voltage and MDS-CH drive for 400 voltage without parameter change on end of adjustment.
（This function can not used for MDS-D and MDS-DH drive. MDS-CH）.

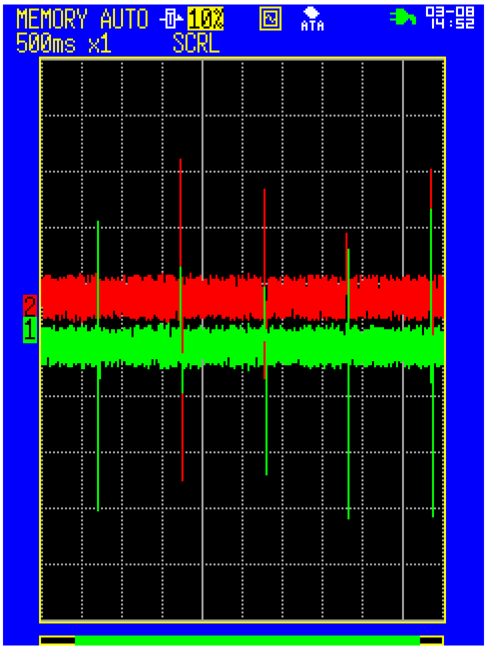
(3) Actually measure Z phase wave.



(4) PLG gear plate is wrong way.

Every time spindle motor cycle one time it will appear a unusual waveform（With Z phase signal）.





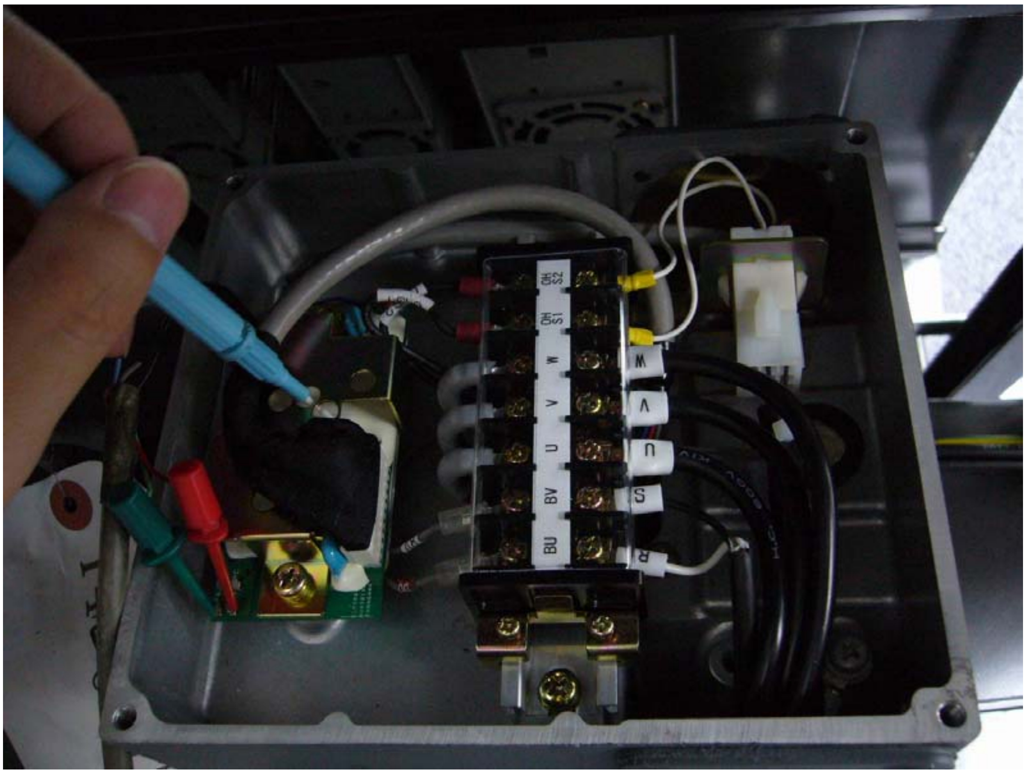
23.4 Simple explain for PLG adjustment

In this case, maybe somebody don't know where it is PLG in the spindle. Below is for example.

(1) Use screw driver to open motor cover.

(2) The right side is PCB for PLG, the centre is motor wire contactor.

(3) Use the CH1 and CH2 probe of oscilloscope to connect in A and B phase of PLG of PCB to start adjustment.

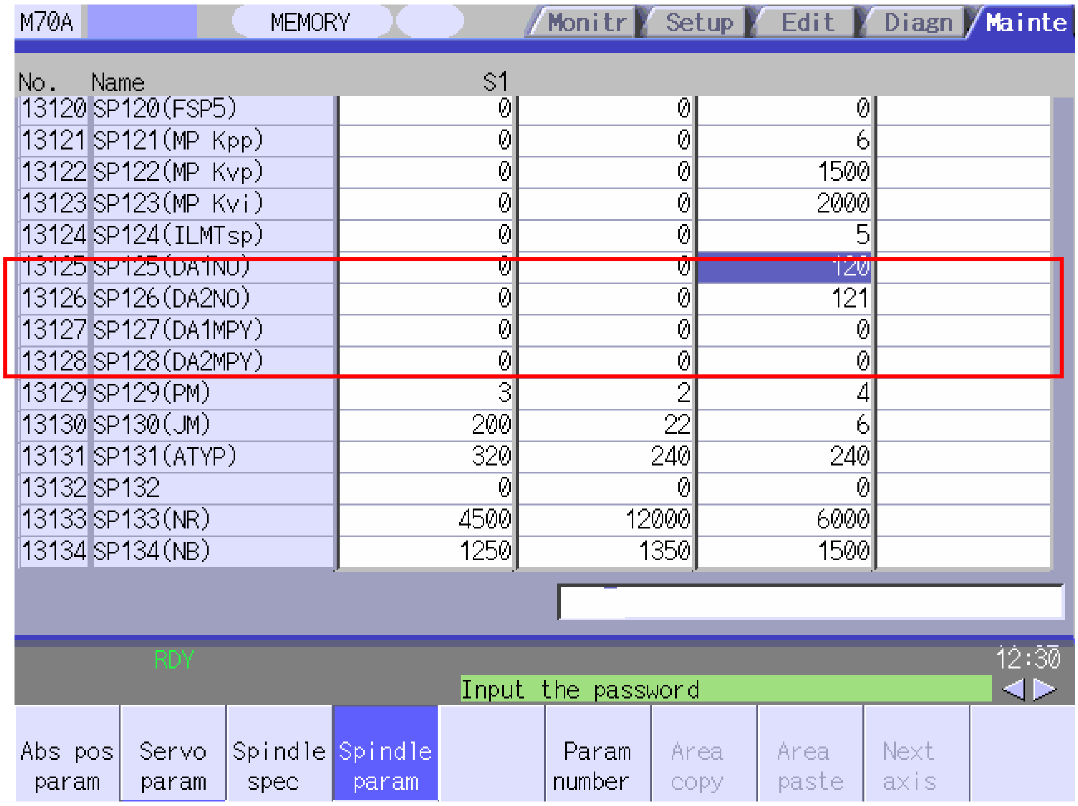


23.5 The TS5690 of detector setup procedure

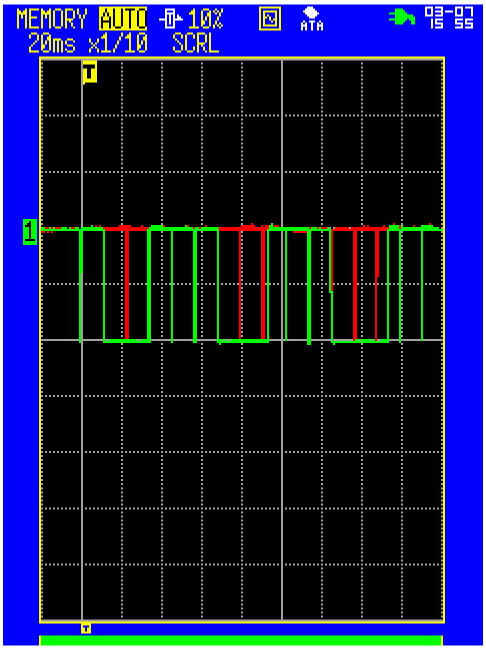
M700／M70 series uses PLG can be adjusted directly TS5691modal, otherwise another don't need adjust switch TS5690 modal. Though, this PLG does not have external adjustment switch but the extraordinary precision of demand installation while it is installing. This PLG has A, B phase gain and shift adjustment. PLG of TS5690 needs to adjust the interval and angle through the special instrument on installation, or match the oscillograph to adjust through D/A of the driver.

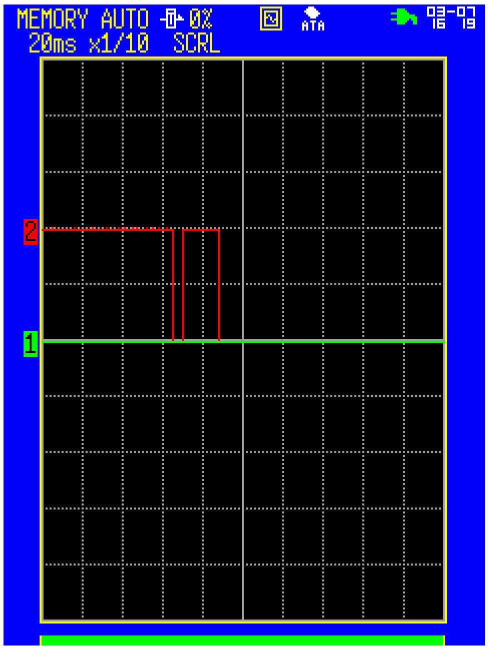
(1) Input below D/A parameters.

SP125 = 120　　H/W gap adjust（GAIN）　Standard is 0.3mm
SP126 = 121　　H/W angle adjust（SHIFT）trim Install angle or sensor position
SP127 = 0
SP128 = 0



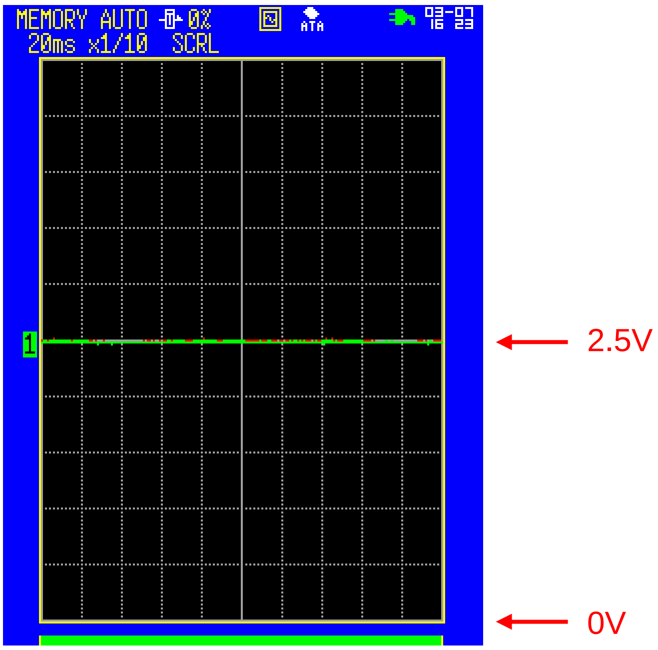
(2) Connect oscilloscope to test waveform（NG）.





GAIN and SHIFT are moved. GAIN is OK，SHIFT need trim adjust.

(3) After turn around spindle motor CH1（GAIN）and CH2（SHIFT） are fixed in 2.5V and states is OK. 。



! Caution	Though PLG signal of TS5690 does not need to adjust with the knob, but need installation precision of hardware. We suggest making a fixed guide to put the detector that can avoid adjusting the difficult problem in the future. When the signal of this unacknowledged chapter, rotating the main shaft will have situation unstable in rotational speed to take place.

23.6 Attention

(1) Please do not beat or drop down for gear disc and sensor (face of sensor) and PLG PCB that the function will be lost.

(2) Please taking care prevention rust for gear disc. Do not take disc body with hand without fingers. The oil of prevention rust smear on disc body for safekeeping.

(3) The sensor is magnetism equipment. A brush can take out when magnetic powder is cohered. Please avoid using and store on strong magnetic environment.

(4) Please do not touch body of gear disc when PLG sensor is assembly.

(5) The PLG sensor will be damage if gap between gear disc and sensor setting make a over pressure (1kg/cm^2 below） with gap ruler.

24 Spindle adjustment procedure

The spindle parameter adjustment is easier than servo section. If it is not tapping machine with low inertia spindle motor, normally only confirm spindle parameters and base waveform.

(1) Before operation confirms items（Low speed）

①Confirm spindle parameter setting.
（Please follow Mitsubishi standard parameter then change mechanical spec related parameters）.
②Confirm machine and motor connect.（Electric wire and machine structure）.
③Confirm speed command and actual speed is same. If they are not same please check spindle parameter again. The other way is confirm spindle is come back in same position after running.
（Specially confirm SP026、SP031、SP034、SP129～SP256）
④Confirm NC side parameter slimit1～4、smax1～4、smini setting.
⑤Check power cable connection or PLG waveform.
⑥The belt whether slippage.
⑦Whether occurred noise.
⑧Whether has stinking.
⑨Axis temperature whether extraordinary rise.

(2) After operation confirms items（High speed）

①Machine warmly operation（Regarding spindle motor character）.
②Every time add 1000 rpm to observe load and current whether extraordinary.
③If the load of motor is over 50% while running, please consider more big capacity motor.
④If the noise is loud, you can shot down power to test motor. And diagnosis whether need to adjust dynamic or electrical adjustment.
⑤Please test tool clip function during motor is high speed running.
⑥Please don't change parameter while spindle is running.

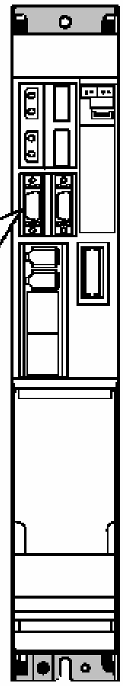
Caution	1. Please confirm machine status for safety. 2. The motor is dangerous while it is operation. 3. Please confirm setting after parameter had changed.

24.1 D/A output
24.1.1 MDS-D-SP D/A output specification

Item	Explanation
No. of channels	2ch
Output cycle	888μs (min. value)
Output precision	12bit
Output voltage range	0V to 2.5V (zero) to +5V
Output magnification setting	±32768
Output pin (CN9 connector)	MO1 = Pin 9 MO2 = Pin 19 LG = Pin 1, 11

CN9 connector

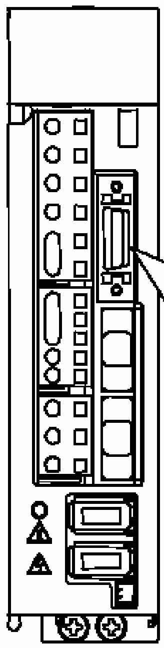
Pin	Name	Pin	Name
1	LG	11	LG
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9	MO1	19	MO2
10		20	



MDS-D/DH-SP

24.1.2 MDS-D-SPJ3 D/A output specification

Item	Explanation
No. of channels	2ch
Output cycle	0.8ms (min. value)
Output precision	10bit
Output voltage range	0V to 2.5V (zero) to +5V
Output magnification setting	±32768
Output pin (CN9 connector)	MO1 = Pin 4 MO2 = Pin 14 GND = Pins 1, 11



CN9 connector

Pin	Name	Pin	Name
1	LG	11	LG
2		12	
3		13	
4	MO1	14	MO2
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

MDS-D-SPJ3

24.1.3 Setting the output data

No.	Abbrev.	Parameter name	Explanation
SP125	DA1NO	D/A output channel 1 data No.	Input the No. of the data to be output to each D/A output channel.
SP126	DA2NO	D/A output channel 2 data No.	

No.	Output data	Output unit for standard setting	Output cycle
0	Commanded motor rotation speed	1000(r/min)/V	0.8ms
1	Motor rotation speed	1000(r/min)/V	0.8ms
2	Torque current command	100%/V	0.8ms
3	Torque current feedback	100%/V	0.8ms
50	Position droop	1/1000°/V	0.8ms
60	Position droop	1°/V	0.8ms
127	2.5V test data output	2.5V	0.8ms

24.1.4 Setting the output magnification

(1) Internal data output (Data No. -1 to 3, 50, 60, 127)

Set when outputting data other than in standard output increments. When "0" is set, the magnification will be the same as when "100" is set.

(Example 1)

When SP125=0, SP127=1000:

Commanded motor rotation speed is output to D/A output channel 1 in increments of 100r/min/V.

(Example 2)

When SP126=2, SP128=50:

q-axis current command is output to D/A output channel 1 in increments of 200%/V.

No.	Abbr.	Parameter name	Details	Setting range	Standard
SP127	DA1MPY	D/A output channel 1 output scale	Set the output scale with $\text{Output magnification} = \frac{100}{\text{SP127(SP128)}}$ (-fold) The same scale as "100" is applied when "0" is set.	-32768 to 32767 (1/100-fold)	100
SP128	DA2MPY	D/A output channel 2 output scale			100

24.1.5 Spindle D/A output setting

D/A	Phase current	Current feed back	Q axis integral	D axis integral	Orientation	C axis
SP125 CH1	1	1	1	1	2	60
SP126 CH2	31764	3	31778	31782	16492	2
SP127 CH1 magnification	25	25	25	25	0	0
SP128 CH2 magnification	2	100	4	4	0	0

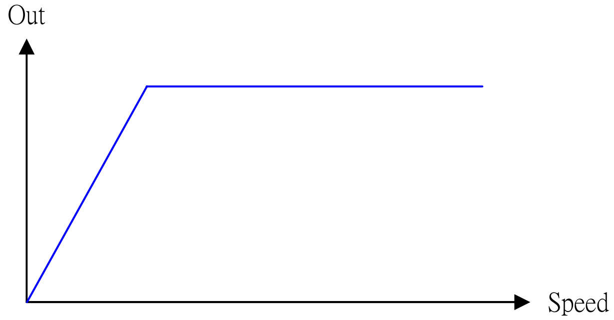
24.2 Confirm Acc/Dec waveform

	Acc/Dec or orientation	Tapping／C axis	Spindle sychronization
Position loop gain	SP001	SP002	SP003
Speed loop gain	SP005 SP006 SP007	SP008 SP009 SP010	
Current loop gain	SP077 SP078 SP079 SP080 } Hi Coil	SP081 SP082 SP083 SP084 } Low Coil	

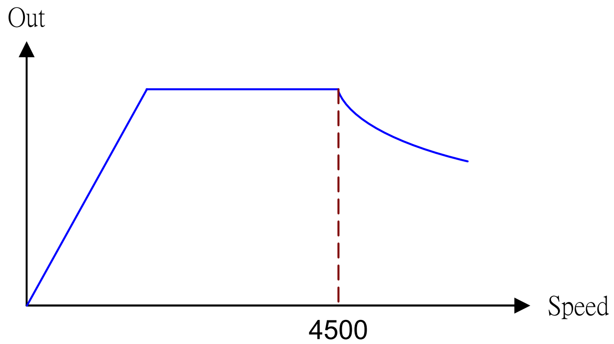
In motor Acc/Dec, if the current has a bad wave occurred. That can rise SP005(VGN1)setting to improve wave. But you will feel have over cut condition, so you can down SP006（VIA1）=1900→500 setting. The VIA2 is parameter for tapping used. The standard setting is 1900. To increase VGN = 150 → 250 → 300 and observe wave would become unmoral that down VIA1 but if not valid please down VGN1.

The character of INPUT and output are two items：

①High speed section line is no down（Don't need adjust）



②High speed section line is down



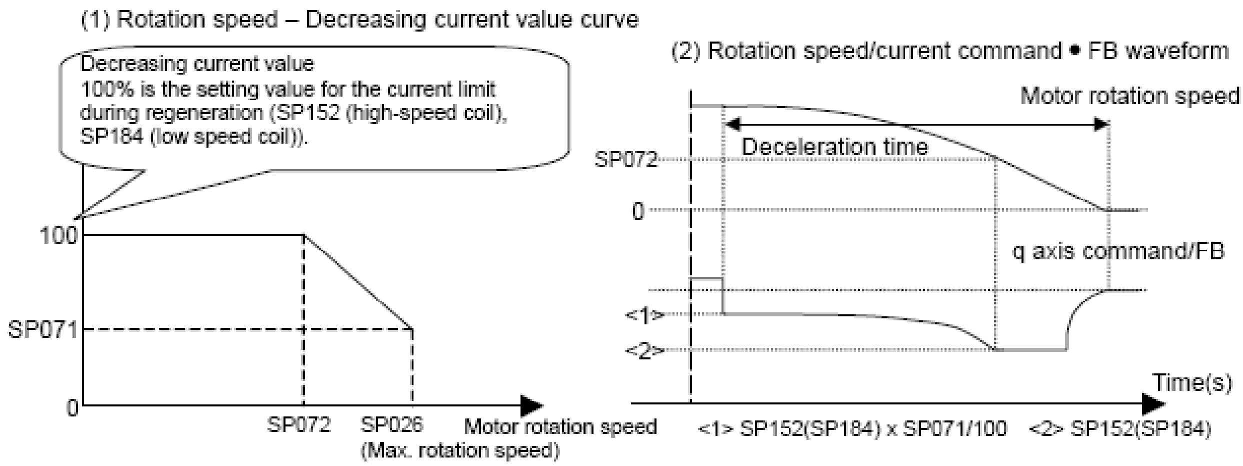
#3101 ～ #3104	Spindle running time setting
SP071 = 45～50（%）	This setting is SP152 percentage
SP072 = 4500 （RPM）	Deceleration change time
	It same as before parameter SP087 and SP088

SP152 = 90 （%） The current of deceleration

SP153 = 120 （%） The current of acceleration

Above two parameters don't need change

Relation between SP071 (variable current limit during deceleration, lower limit value) and SP072 (variable current limit during deceleration, break point speed)



Spindle adjustment must confirm current、current feed back、Q axis integral current（Stator current）、D axis integral current（Rotor current）four items of high speed. Below pictures are standard and unusual wave forms for your reference.

(1) Phase current

SP125 ＝ 1

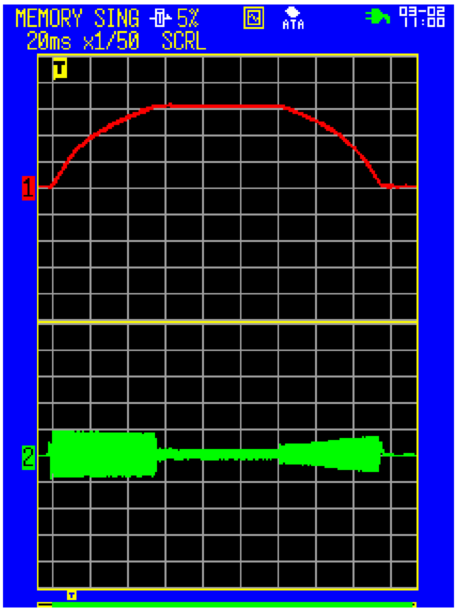
SP126 ＝ 31764

SP127 ＝ 25 The magnification will change by speed

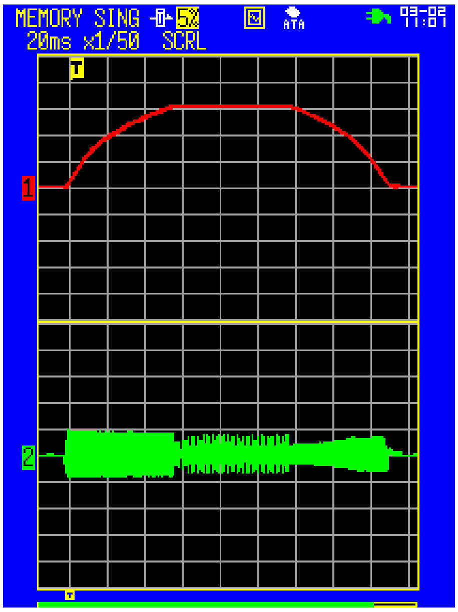
SP128 ＝ 2

$$SP026 \times \frac{1}{60 \times SP129} \geqq 200$$

Can use parameter setting, otherwise must use measurement.



Standard

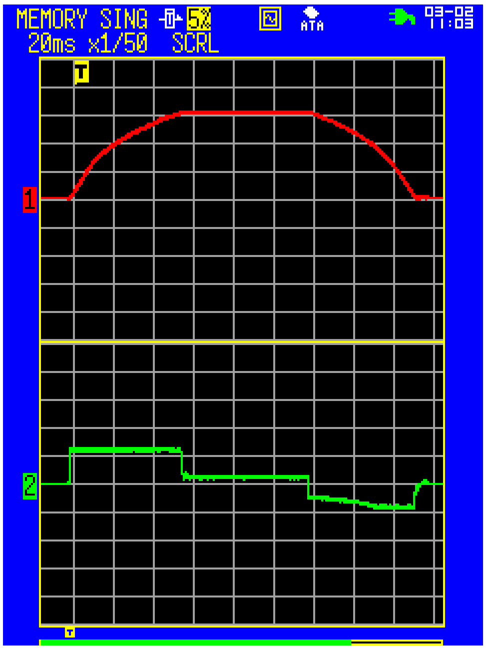


Unusual

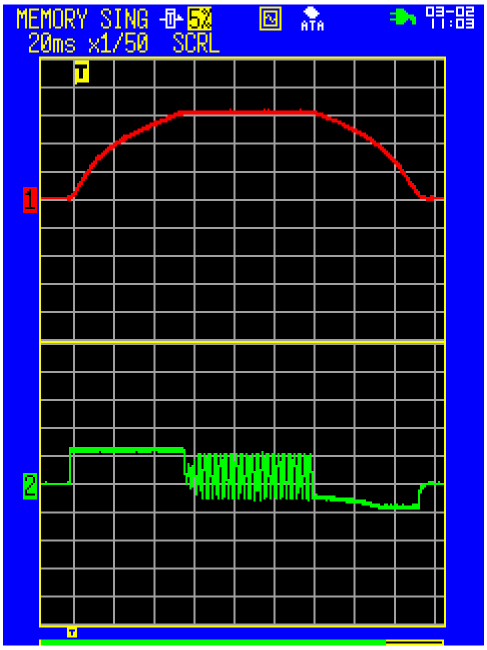
(2) Current feed back

SP125 ＝ 1　　SP127 ＝ 25

SP126 ＝ 3　　SP128 ＝ 100



Standard

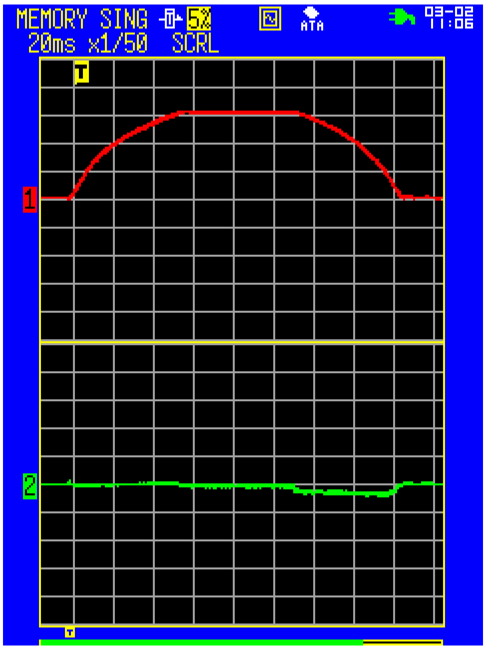


Unusual

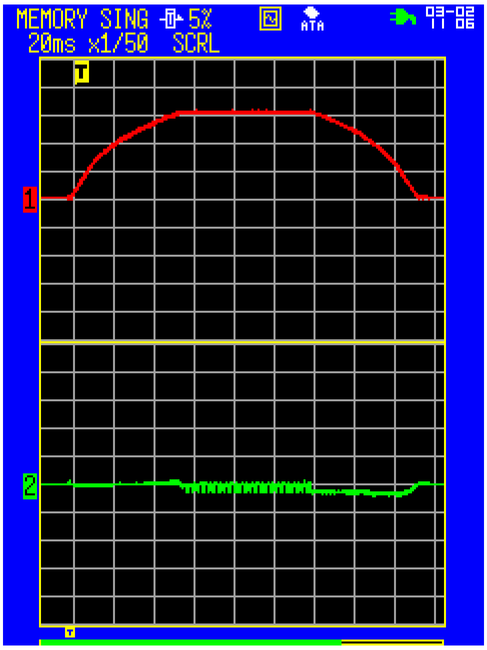
(3) Q axis integral current（The stator current）

SP125 ＝ 1　　SP127 ＝ 25

SP126 ＝ 31778　　SP128 ＝ 4



Standard

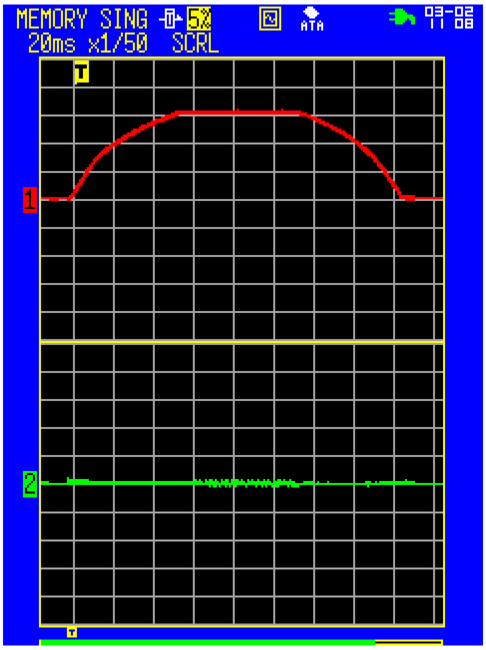


Unusual

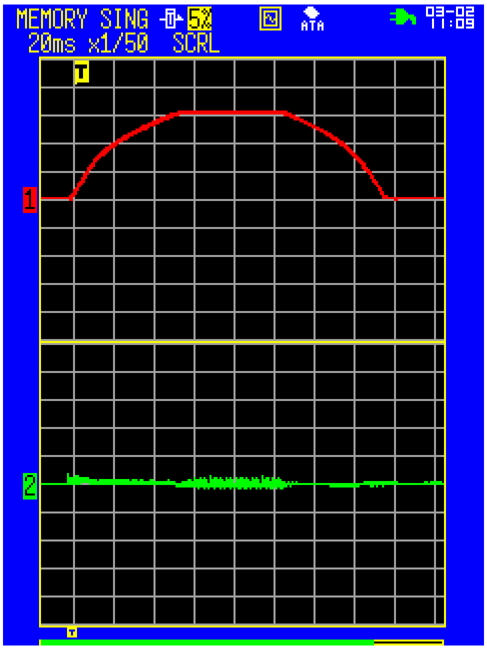
(4) D axis integral current（rotor current）

SP125 ＝ 1　　　SP127 ＝ 25

SP126 ＝ 31782　　　SP128 ＝ 4



Standard



Unusual

(5) The above mentioned four wave forms are zero to high speed related current wave form. If it is no any problem, that can separate some speed section.

Ex: The spindle of high speed is 10000rpm, which can 3000 rpm、5000 rpm、8000 rpm of wave form to confirm. And it is only confirm phase current and voltage feed back.

(6) IPM motor is used magnetic detector so without stator and rotator. It doesn't need measure Q axis and D axis integral current.

(7) When the load of spindle motor is big and can not adjustment that can reduce the related current feed back loop gain parameter SP077～SP080.

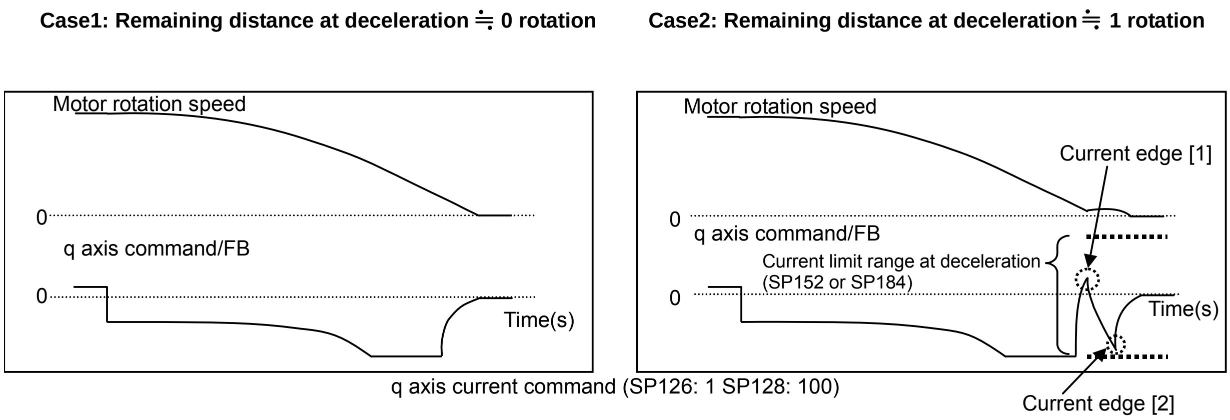
(8) When spindle has vibration, can set spindle vibration frequent parameter SP038. And input 500 or according machine really situation to modify.

24.3 Orientation adjustment

Adjusts orientation time by adjusting SP016.

Orientation characteristics for MDS-D/DH

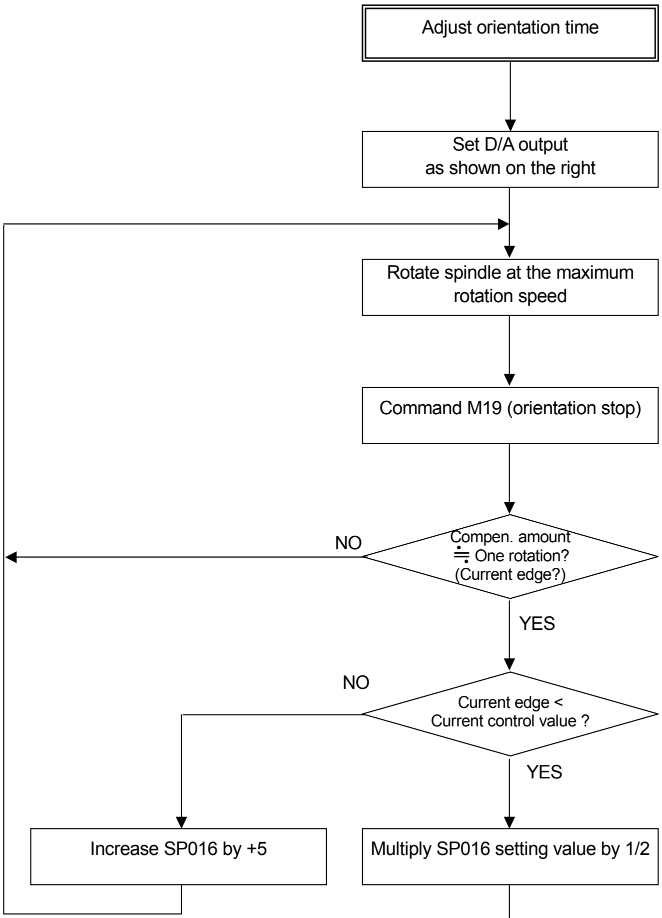
When decelerating to stop is executed with orientation, the remaining distance to the orientation stop position is compensated within one rotation. Thus, as shown in Case 1 below, when the remaining distance in deceleration is about "0", orientation time would be the shortest (time required to decelerate and stop + 0s), and as shown in Case 2 below, when the remaining distance in deceleration is about as much as one rotation amount, orientation time would be the longest.



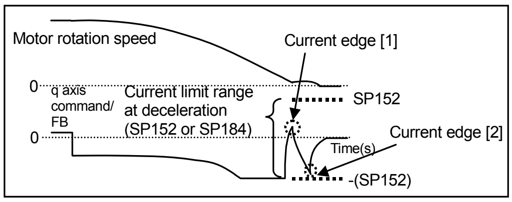
No.	Abbr.	Parameter name	Details	Setting range	Standard
SP016	DDT	Phase alignment deceleration rate	Set the single rotation position alignment deceleration rate for orientation stopping, phase alignment during rotation, and for changing the mode from non-interpolation during rotation to spindle synchronization. If the load inertia is large, decrease the setting. When the setting value is increased, the orient in-position and single rotation position alignment will end faster, but the impact applied on the machine will increase. To change the deceleration rate only during the rotation command (command FΔT $\neq$ 0), set this parameter together with SP070 (KDDT).	1 to 32767 (0.1 (r/mn)/ms)	30

24.3.1 Orientation time adjustment method

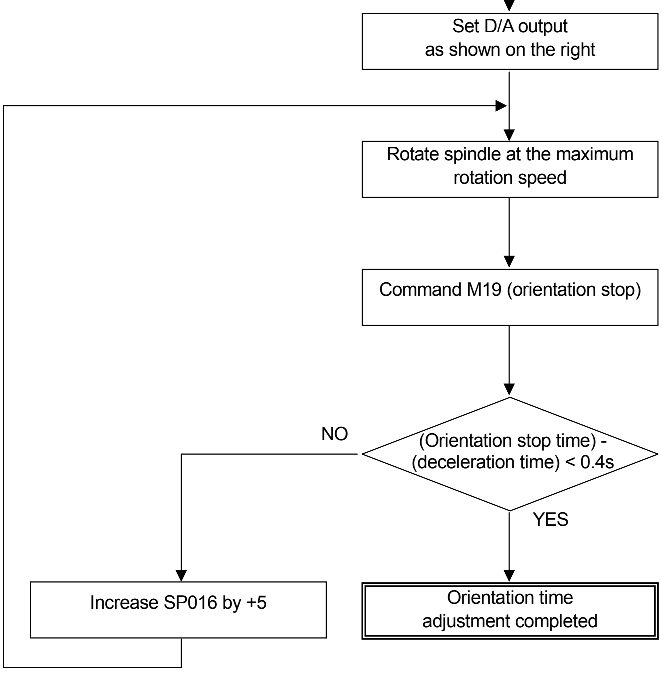
(1) Orientation adjustment from maximum rotation speed



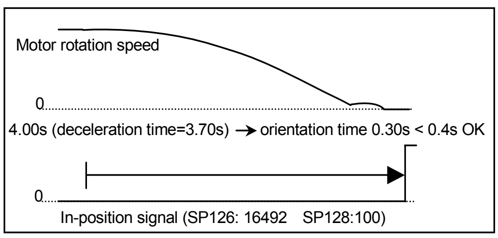
Ch1	Ouput waveform: Motor rotation speed	SP125:1	SP127: Set so that the maximum rotation speed is displayed.
Ch2	Ouput waveform: q axis current command	SP126:2	SP128:100(100%/V)



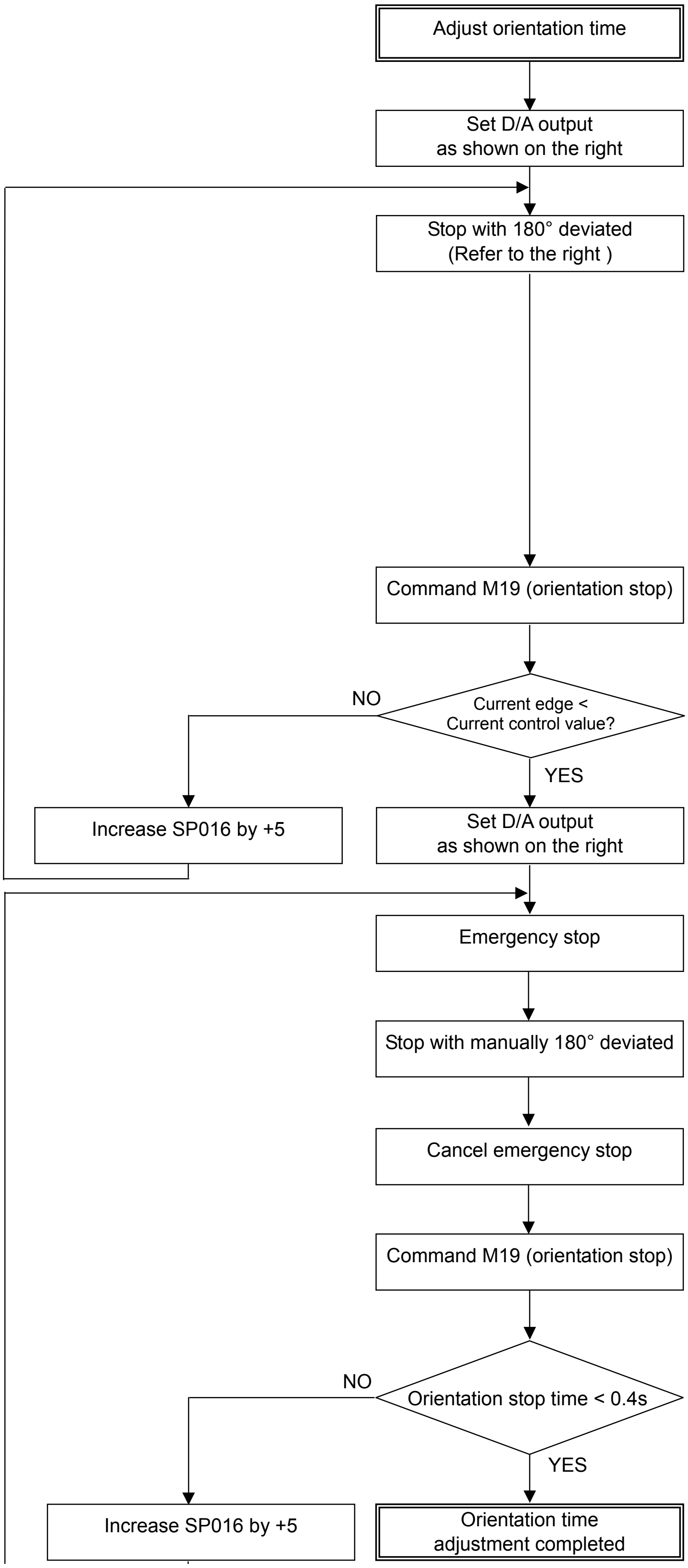
Set to SP016 as recovery time constant.



Ch1	Ouput waveform: Motor rotation speed	SP125:1	SP127: Set so that the maximum rotation speed is displayed.
Ch2	Ouput waveform: q axis current command	SP126:2	SP128:100(100%/V)

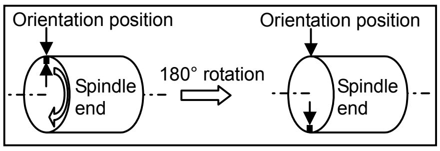


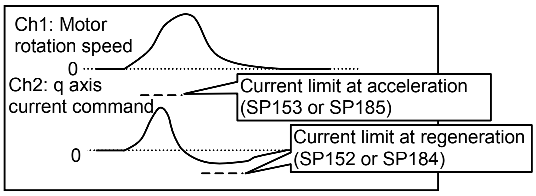
(2) Orientation adjustment from stop mode



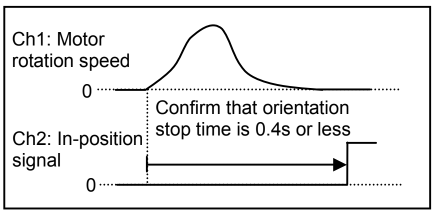
Ch1	Output waveform: Motor rotation speed	SP125 : 1	SP127: Set so that the maximum rotation speed is displayed.
Ch2	Output waveform: q axis current command	SP126 : 2	SP128: 100(100%/V)

Screen operation
[1] Press the NC function key DIAGN.
[2] Press the NC menu key I/F diagn.
[3] Press the NC menu key 1-shot output.
[4] Input “R7009/4650” with the NC key.
[5] Command M19 (orientation stop).
<-Stop at the side opposite to the orientation stop position (with 180° deviated).
[6] Press the NC menu key 1-shot output.
[7] Input “R7009/0”with the NC key.

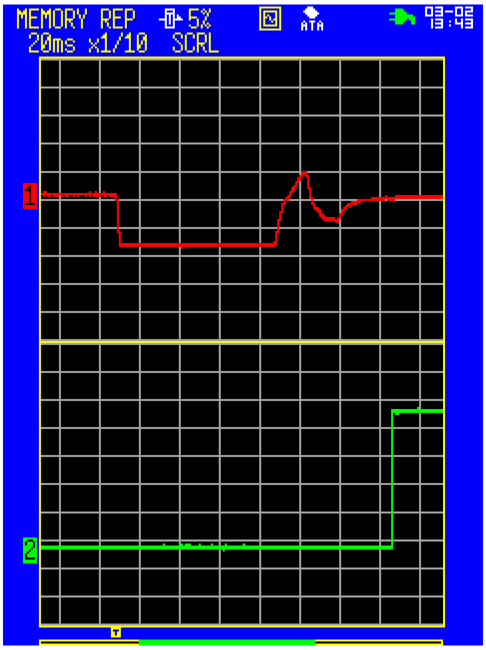




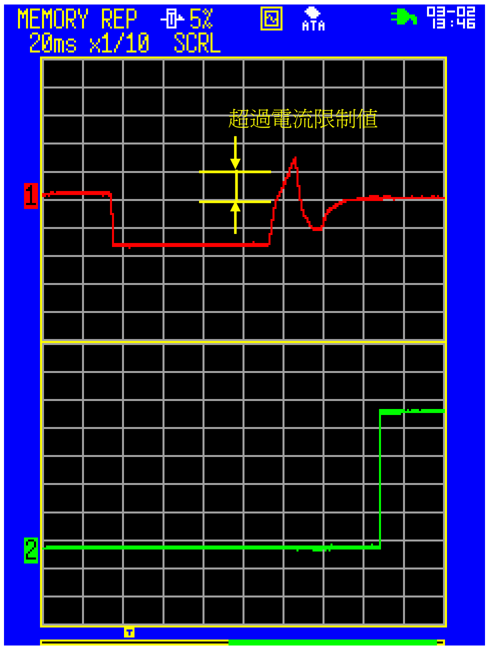
Ch1	Output waveform: Motor rotation speed	SP125: 1	SP127: 200(500r/min/V)
Ch2	Output waveform: In-position signal	SP126: 16492	SP128:100



(3) Orientation example waveform



Standard



Unusual

(4) Other experience

(a) After orientation, if has higher magnetic noise please down SP015 = 100 → 50.

(b) Because Z phase stop position is different, when far Z phase the current is big and close Z phase is small. So need test above 5 times, find out max current whether over limitation.

(c) Zero speed orientation adjust must manual move distance of spindle in far and close position

after the orientation.

（Example with parameter set clockwise orientation）

(d) Current command cannot over 1V range.

(e) Finished orientation signal cannot has dual pulse wave（up VGN and down VIA Setting) . If it is wrong please confirm PLC action.

(f) Lathe machine must has force the work piece.

(g) Milling machine must add the overweigh tool and highest speed tool. Also this tool can run highest speed and zero speed.

(h) Orientation command detects zero speed that use below parameters：

Stop speed is #3107

(i) The orientation speed of not zero speed uses below parameters：

Before stop the orientation change speed is #13016

(k) #13016 max setting is:

Lathe system：50 （Standard 5～10）

Milling system：70 （Standard 20～25）

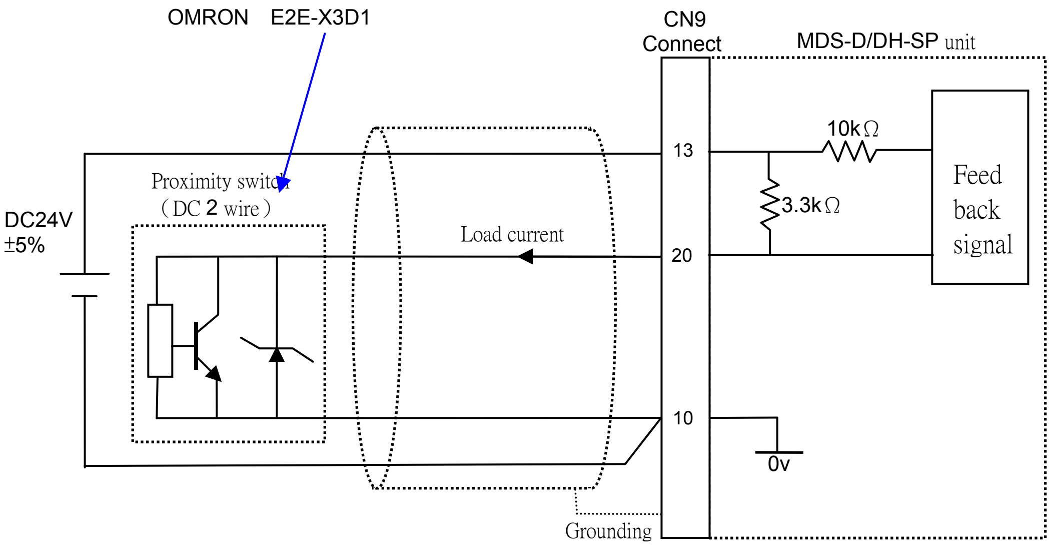
24.3.2 Proximity switch

(1) The proximity switch specification

Items	Specification
Output	DC 2 wire
Voltage	DC 24V
Frequent	400HZ above
Load current(Max)	14 mA above
Remain voltage	4V below
Leakage current	1 mA below

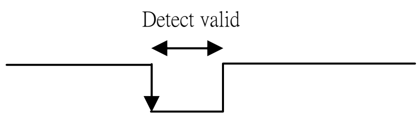
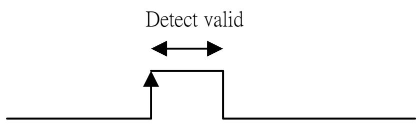
(2) The connection

Below picture is connection with servo unit. Please use DC 24V external power supply unit.



(3) Detector signal character

Below list is the detector signal character. Please refer spindle parameter （SP225/BIT5） signal edge selection.

SENSOR activity	Action	Drive input signal CN9 Connect 20pin	Edge sigle selection (sp225/bit5)
Normal OPEN	凸		Negative edge is valid
Normal CLOSE	凹		
Normal OPEN	凸		Positive edge is valid
Normal CLOSE	凹		

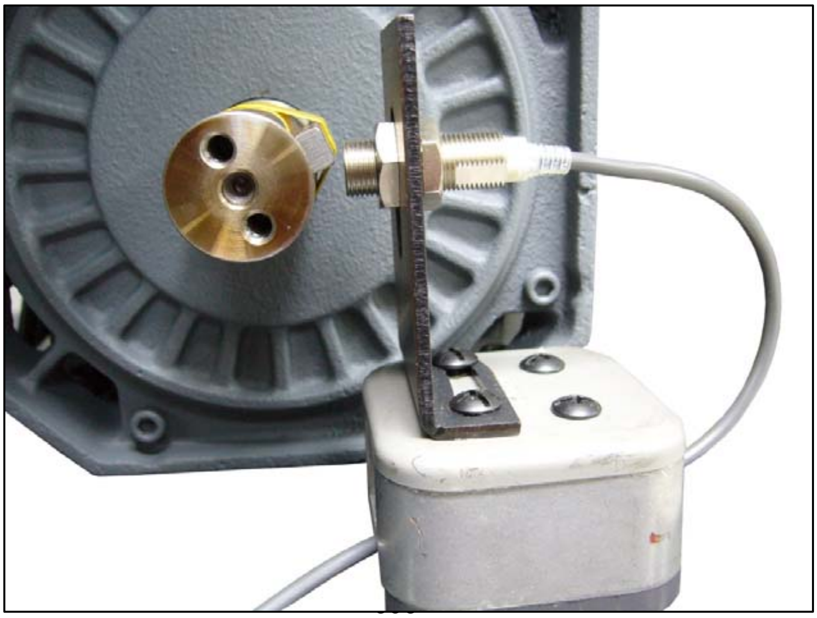
(6) Spindle motor related parameters for orientation

#3106 set 8＊＊＊
#3109 set 100～500
#13225 set 0020 （凸 set = 0020、凹 set = 0000）
#13227 set 4000 （If it has external magnetic switch setting x8xx will change to 48xx）
※H/W ：RM111Z-21must be RM111A-21（現B）or after.
※S/W ：MDS-D-SP must be A5A ver or after.

(5) Pictures.

Proximity switch（OMRON E2E-X3D1）

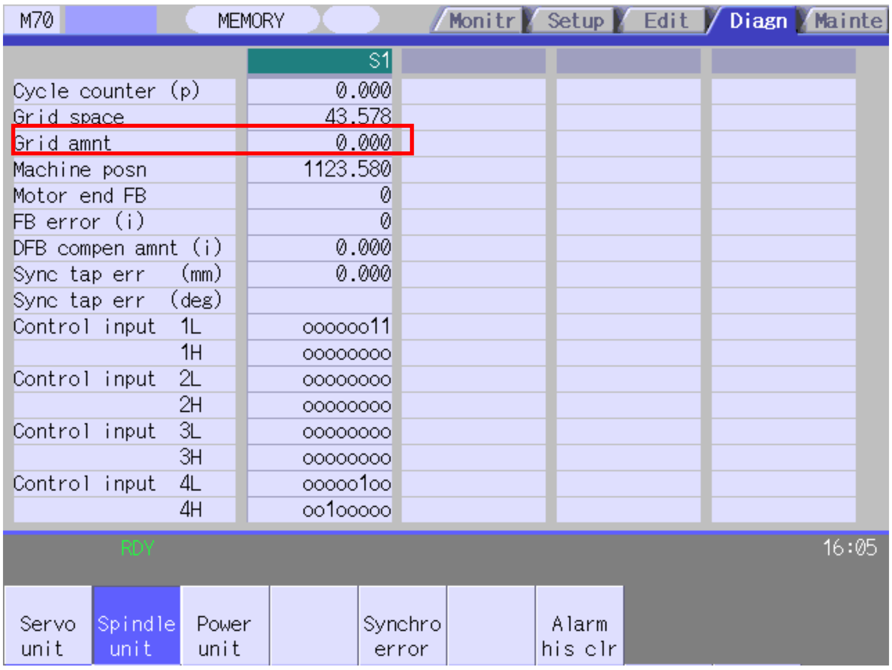
Proximity switch （OMRON E2E-X3D1）and spindle motor.



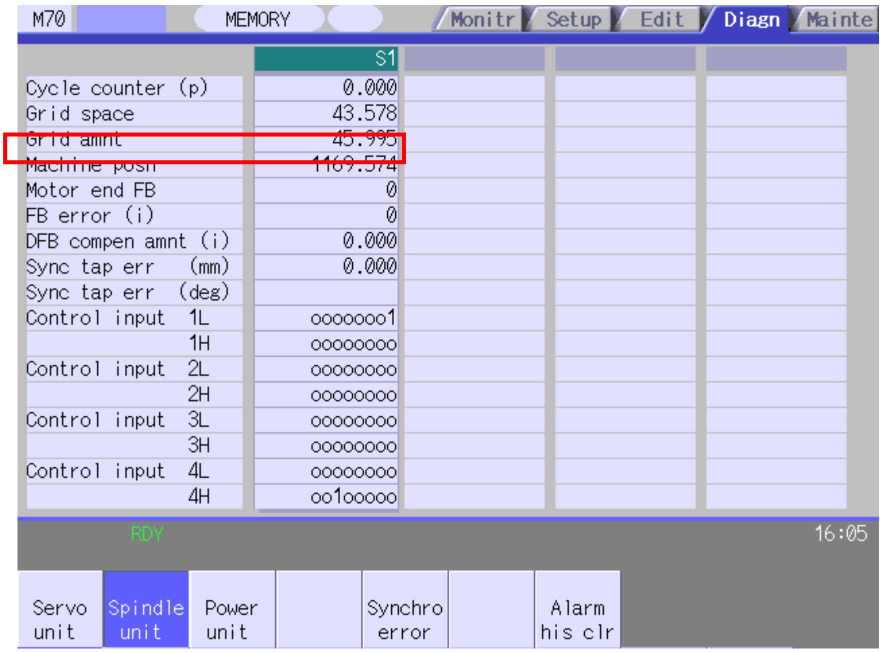
24.3.3 Orientation adjustment

M700／M70 series spindle monitor screen has one machine position column. It is only to demand machine position then directly input angle number that can get demanded orientation angle.

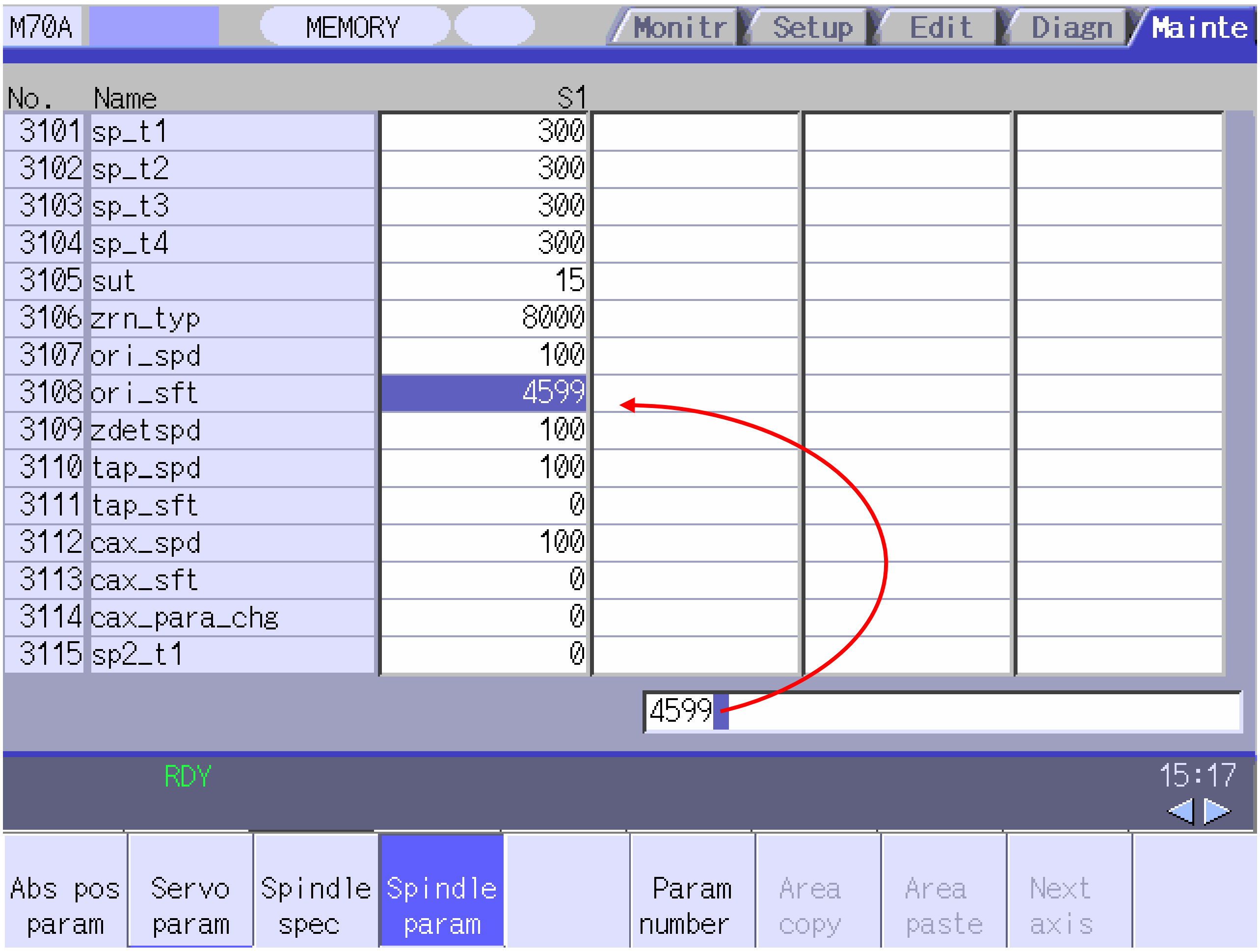
(1) Without shift angle of machine position.



(2) The orientation need to shift machine position.



(3) Input value of shift angle to spindle spec parameter #3108 ori_sft.



24.4 C axis adjustment

(1) Setting the gain

For spindle C axis speed loop gain, SP008 (speed loop gain 2), speed loop gain set 2, which consists of SP009 (speed loop lead compensation 2), and SP010 (speed loop delay compensation 2), is used. Thus, SP035 has to be set as follows. For position loop gain, set standard 33 to SP002 (position loop gain, interpolation mode).

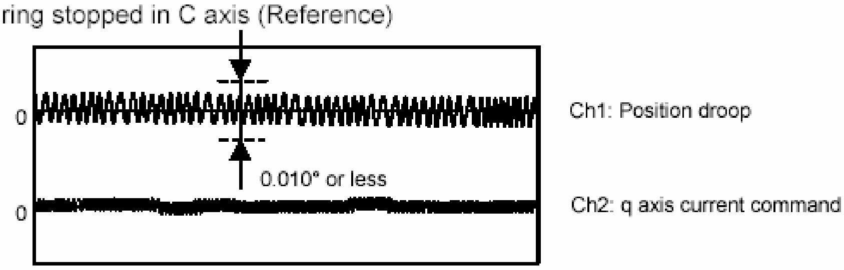
Parameter	Setting value
SP002	33
SP008	SP005 setting value set in "5-2-1" (Initial setting value: 150)
SP009	1900
SP010	0
SP035	0200: Speed loop gain set 2 selection (validate bit9)

(2) Gain adjustment and accuracy test during C axis operation

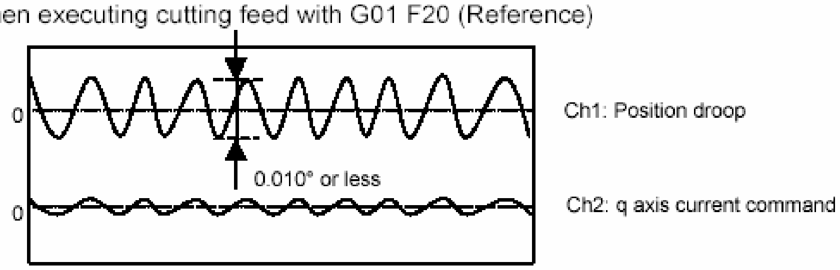
[1] Set the D/A output as follows during stopped in C axis mode (servo ON status) or when executing cutting feed with G01 F20. Then check the droop fluctuation is within 10°/1000.

CH1 output	Position droop: SP125=60	SP127 = 10000 (0.01°/V)
CH2 output	Current command: SP126=2	SP128 = 1000 (10%/V)

* Waveform during stopped in C axis (Reference)



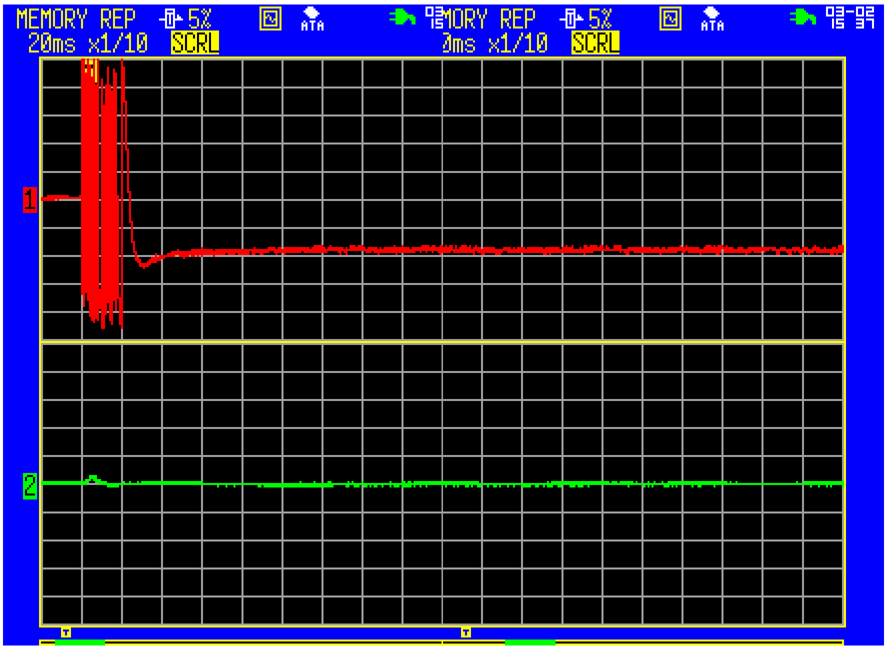
* Waveform when executing cutting feed with G01 F20 (Reference)



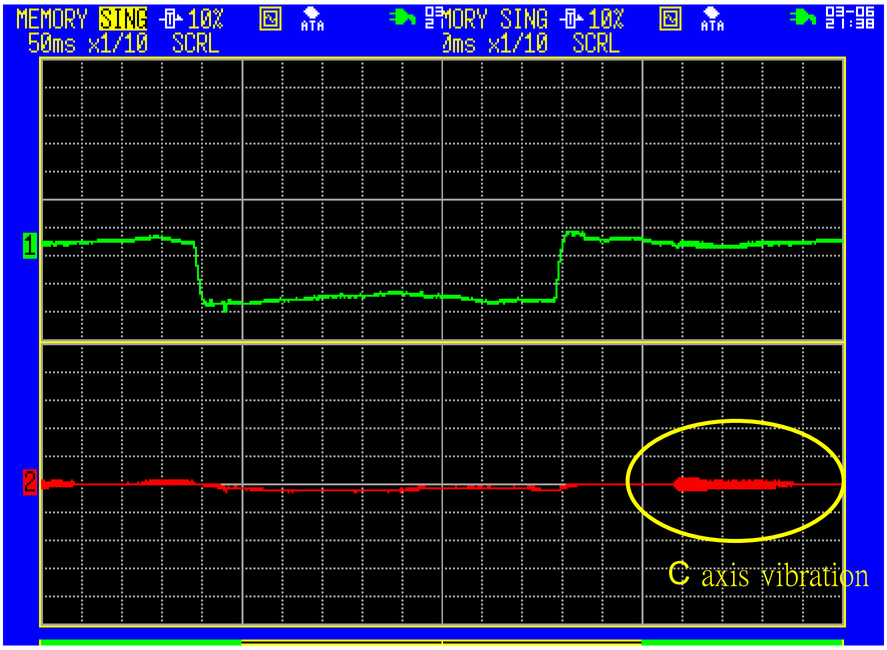
[2] When satisfactory accuracy is not secured, increase SP008 (VGN2) by 10 increments and adjust so that the accuracy level meets the standard. Note that the maximum setting value is 150 x [inertia ratio].

(3) Actual testing waveform

Standard wave form（Build-in spindle）



Unusual waveform（Belt type spindle）



25. IPM spindle motor initial adjustment

MDS-C1/CH spindle drive matches IPM motor. It need implement the magnetic pole position to amalgamate while putting in the new machine（Z phase auto adjustment）. Z phase auto adjustment function in after adjust result（Magnetic shaft value）is wrote in spindle drive's memory, so must be adjusted automatically again after spindle driver exchanges.

Magnetic pole position is it examines Z phase encoder and motor magnetic position corresponding position memory. IPM spindle motor is a permanent magnet motor it must hold the magnetic pole position of the motor when being often. Amalgamate with the magnetic pole position, examine appearing device Z and examine and happen to consult the motor magnetic pole position of memory in advance, so can hold the correct motor magnetic pole position.

MDS-D/DH spindle drive is parameter above adjust result. So even if spindle drive changed it doesn't need implement magnetic pole position adjustment. But adjust the result with turning into a parameter, it is explained for everybody for the difference with MDS-C1/CH spindle drive.

25.1 Magnetic pole position combine compare with old type

The following table compares DH and MDS-C1/CH regarding the major items in magnetic pole positioning.

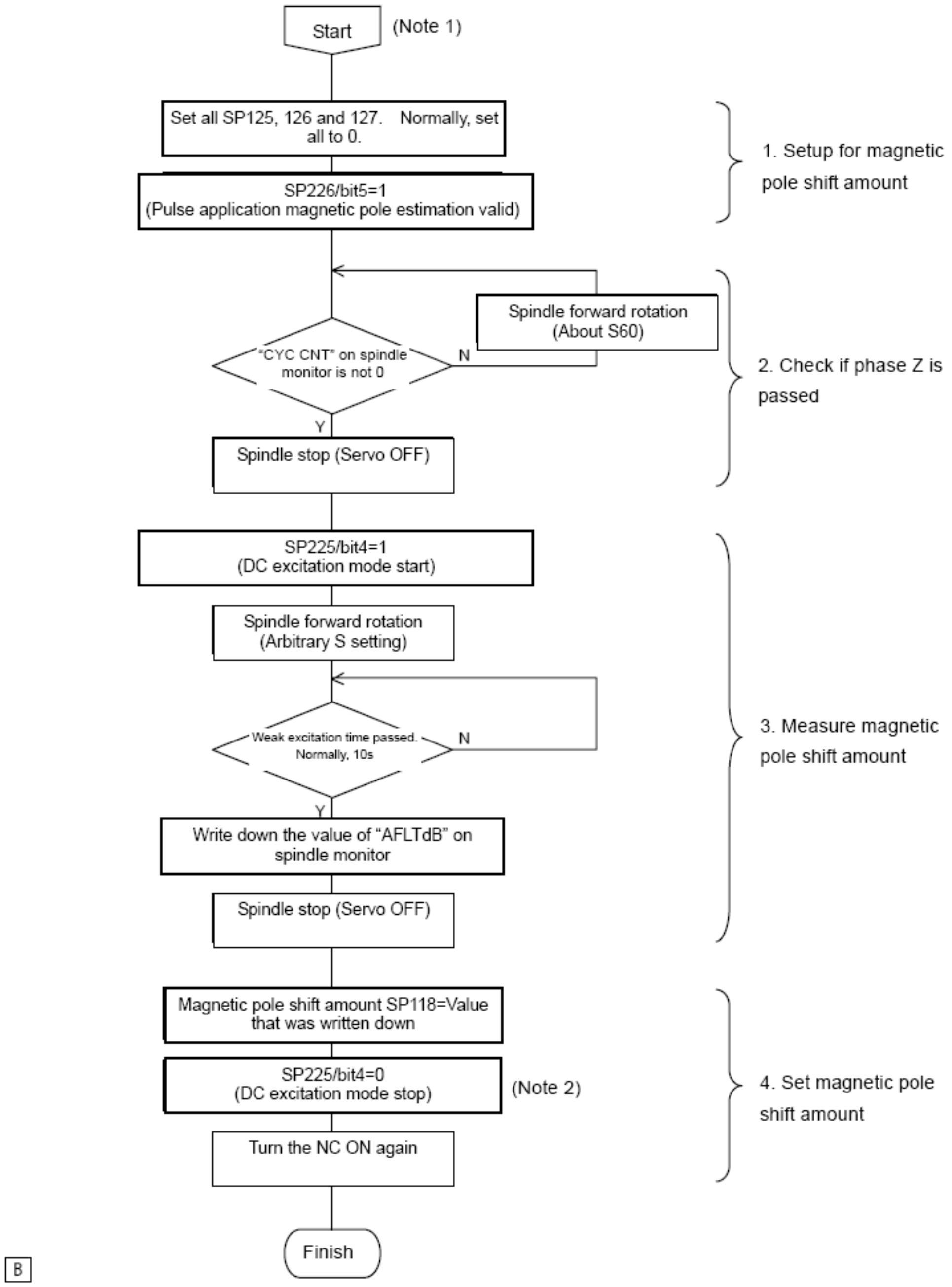
Major item	Current MDS-C1/CH	MDS-DH spindle drive unit	What is different from the current model
When to perform the positioning	-Machine setup -Motor exchange (Including detection gears) -Drive unit exchange	-Machine setup -Motor exchange (Including detection gears)	Not necessary in replacing drive units.
Procedure and necessary time	(1) Set the spindle parameter SP205=0→1, and turn the spindle ON. (2) Positioning complete in up to 90 seconds. (3) Turn the NC ON again.	(1) Let the motor detector's phase Z pass. (2) Set spindle parameter SP225/bit4 to 1, and turn the spindle ON. (3) After 10s, write down the value on the spindle monitor screen. (4) Turn OFF the spindle , and set the value in (3) in the spindle parameter SP118. (5) Turn the NC ON again.	Even though the procedure steps increase, necessary time will be reduced.
Others	Result of positioning (magnetic pole shift amount) cannot be checked.	The magnetic pole shift amount can be checked on the spindle monitor screen or by the setting value of the parameter SP118.	Magnetic pole position result can be checked.

※ Magnetic pole positioning (magnetic shift amount measurement) by MDS-D/DH drive unit is supported from the software version A4 (high-speed synchronous tapping will be supported from A4E)

25.2 MDS-D/DH IPM spindle magnetic shift measurement procedure

SP142=0, confirm below setting before NC power on. Otherwise spindle start running the ALARM 3A will appear.

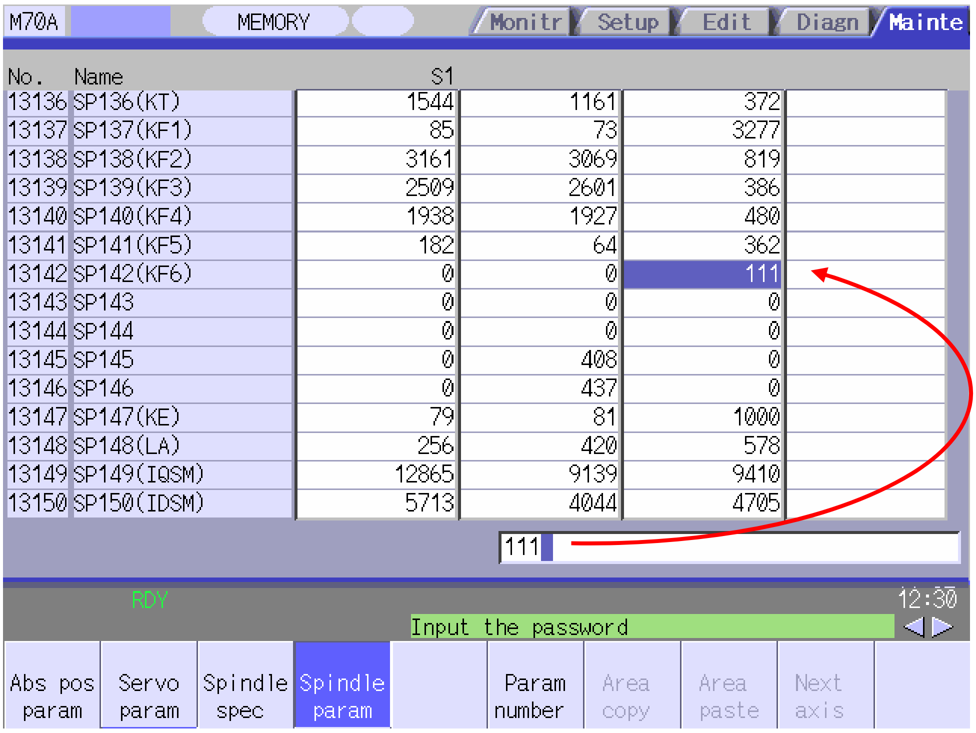
MAZAK	INTE200/300Ⅲ upper Milling spindle	：SP142=1333
MAZAK	MPT/INTE lower Milling spindle、QTN250MS（Y）Sub-spindle	：SP142=111
Good way	GS-2600MSY up tool MILL spindle	：SP142=111



[Notes]
1. Perform magnetic pole shift amount measurement without workpieces and tools. With workpiece and tool, the measurement result may be incorrect.
2. When the measurement is complete, make sure to perform DC excitation mode stop (SP225/bit4=0). Otherwise, after turning the NC ON again, the initial parameter error alarm 37 will occur.
3. Magnetic pole shift amount is different depending on each machine. When importing the parameter from another machine (SRAM data), make sure to change the SP118 value to the one suitable for the machine.

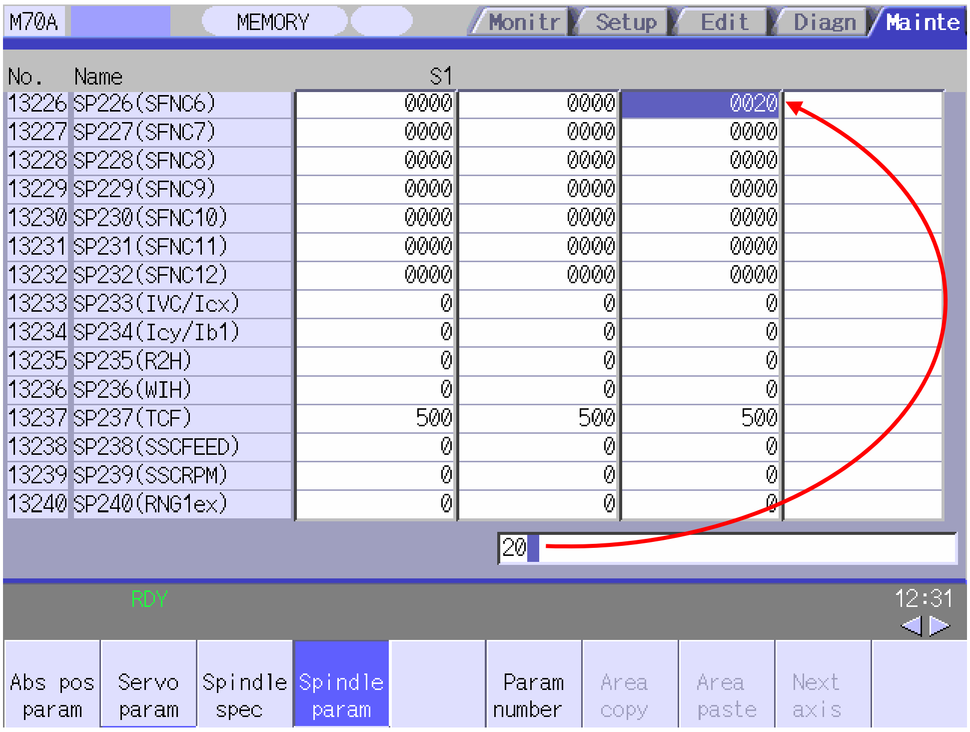
(1) Confirm spindle D/A output related setting SP125～SP128 to set「0」. Then, set SP142=111

(2) If setting is incorrect the "ALARM 3A" will appear after motor start running.



No.	Name	S1		
13136	SP136(KT)	1544	1161	372
13137	SP137(KF1)	85	73	3277
13138	SP138(KF2)	3161	3069	819
13139	SP139(KF3)	2509	2601	386
13140	SP140(KF4)	1938	1927	480
13141	SP141(KF5)	182	64	362
13142	SP142(KF6)	0	0	111
13143	SP143	0	0	0
13144	SP144	0	0	0
13145	SP145	0	408	0
13146	SP146	0	437	0
13147	SP147(KE)	79	81	1000
13148	SP148(LA)	256	420	578
13149	SP149(IQSM)	12865	9139	9410
13150	SP150(IDSM)	5713	4044	4705

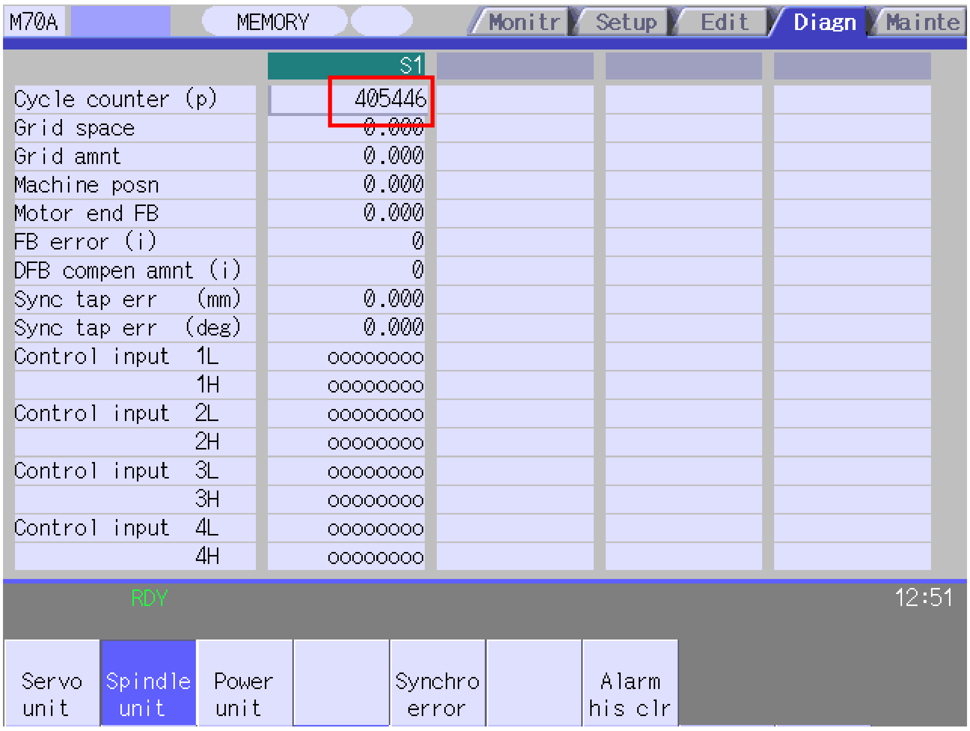
(3) Set SP226 bit5 = 1 it means 0020



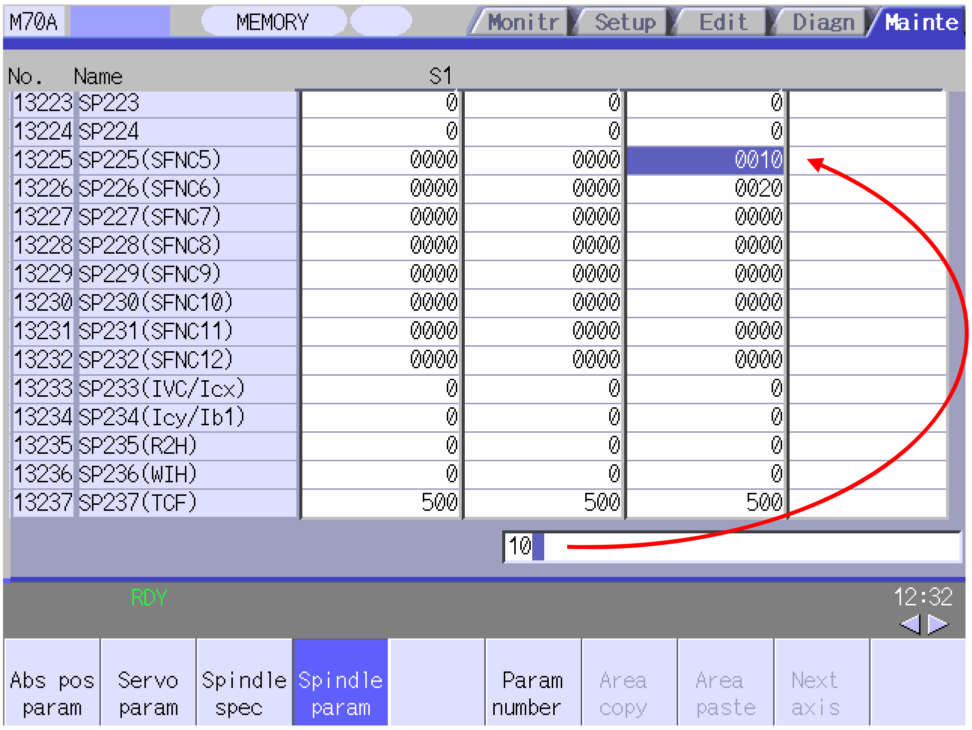
No.	Name	S1		
13226	SP226(SFNC6)	0000	0000	0020
13227	SP227(SFNC7)	0000	0000	0000
13228	SP228(SFNC8)	0000	0000	0000
13229	SP229(SFNC9)	0000	0000	0000
13230	SP230(SFNC10)	0000	0000	0000
13231	SP231(SFNC11)	0000	0000	0000
13232	SP232(SFNC12)	0000	0000	0000
13233	SP233(IVC/Icx)	0	0	0
13234	SP234(Icy/Ib1)	0	0	0
13235	SP235(R2H)	0	0	0
13236	SP236(WIH)	0	0	0
13237	SP237(TCF)	500	500	500
13238	SP238(SSCFEED)	0	0	0
13239	SP239(SSCRPM)	0	0	0
13240	SP240(RNG1ex)	0	0	0

(4) Use low speed to rotate spindle and let the number of Cycle counter（p）is not「0」 then stop spindle.

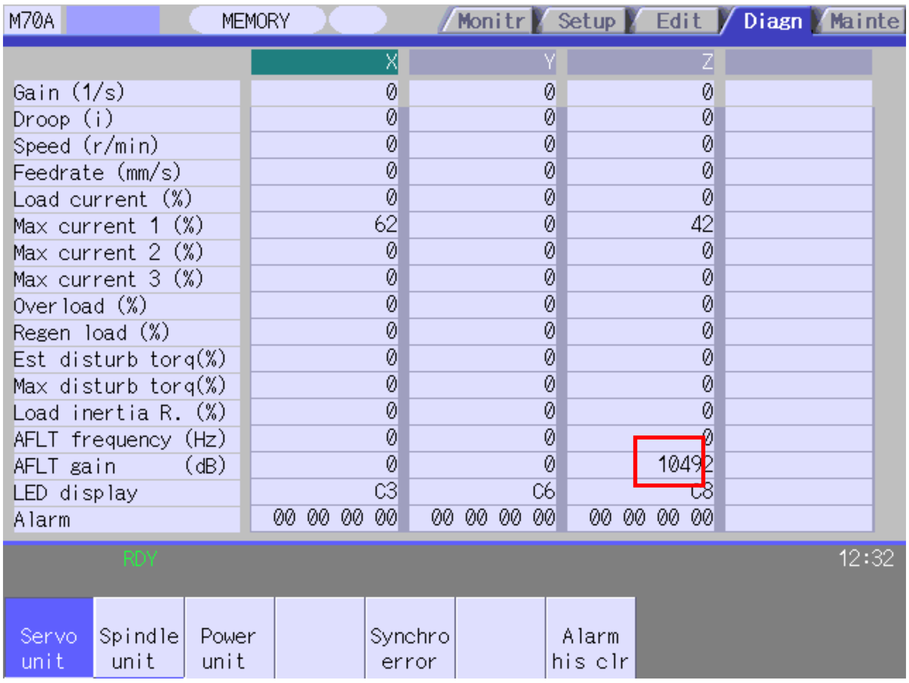
(5) The first setting if U,V,W wires connected incorrect the “ALARM 50” will appear.



(6) Set SP225 bit4 = 1 it means 0010

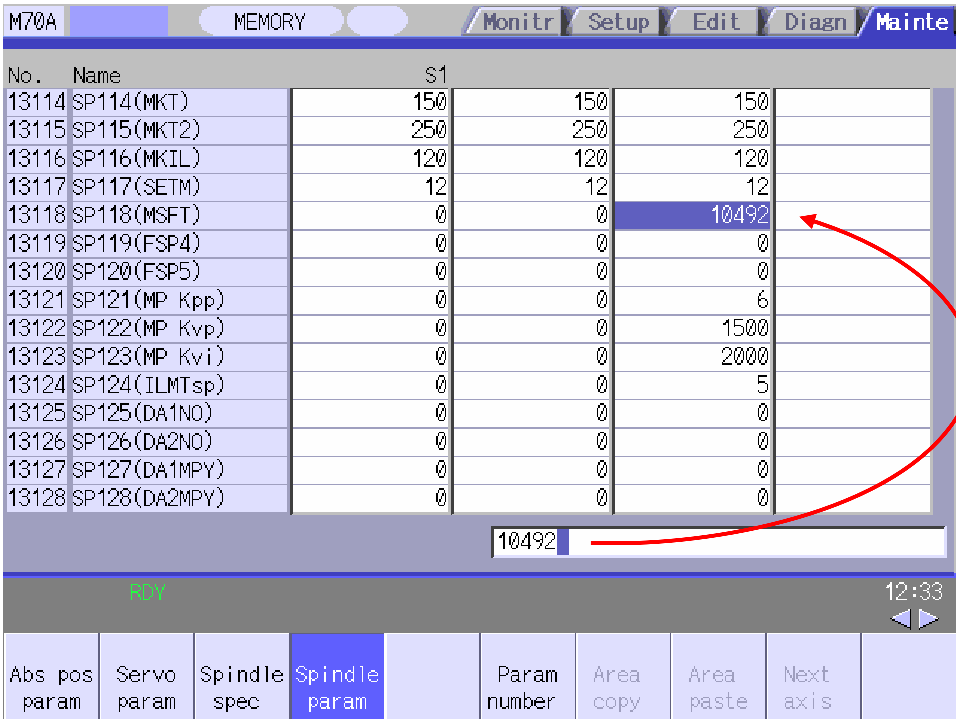


(7) Use lower speed to rotate spindle motor again, observe the number of AFLT gain（dB）is stable or not.



	X	Y	Z	
Gain (1/s)	0	0	0	
Droop (i)	0	0	0	
Speed (r/min)	0	0	0	
Feedrate (mm/s)	0	0	0	
Load current (%)	0	0	0	
Max current 1 (%)	62	0	42	
Max current 2 (%)	0	0	0	
Max current 3 (%)	0	0	0	
Over load (%)	0	0	0	
Regen load (%)	0	0	0	
Est disturb torq(%)	0	0	0	
Max disturb torq(%)	0	0	0	
Load inertia R. (%)	0	0	0	
AFLT frequency (Hz)	0	0	0	
AFLT gain (dB)	0	0	10492	
LED display	C3	C6	C8	
Alarm	00 00 00 00	00 00 00 00	00 00 00 00	

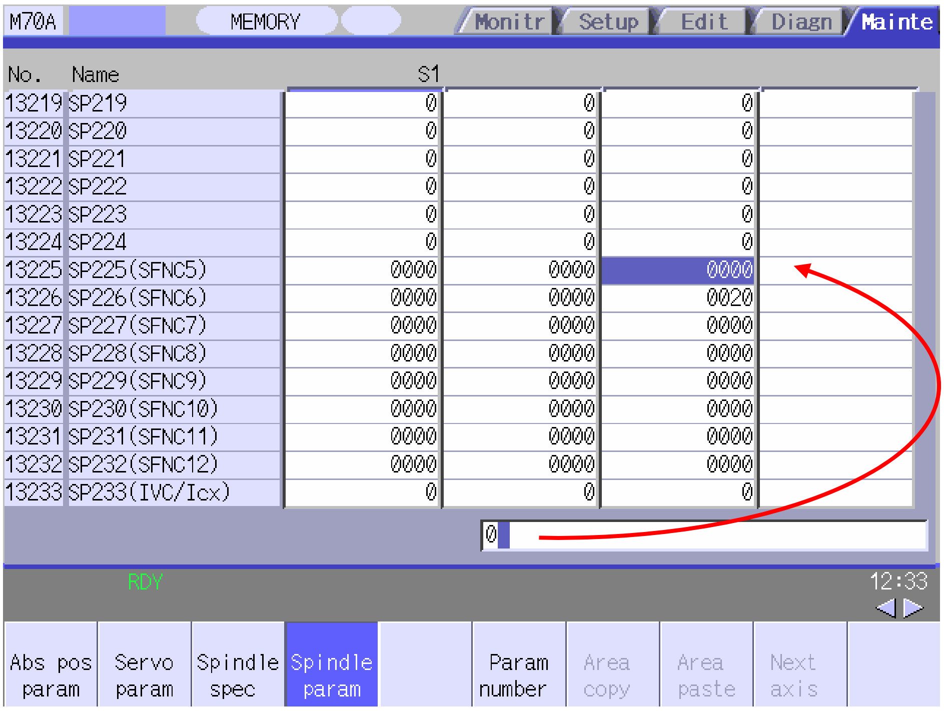
(8) The number of AFLT gain（dB）input to SP118。



No.	Name	S1			
13114	SP114(MKT)	150	150	150	
13115	SP115(MKT2)	250	250	250	
13116	SP116(MKIL)	120	120	120	
13117	SP117(SETM)	12	12	12	
13118	SP118(MSFT)	0	0	10492	
13119	SP119(FSP4)	0	0	0	
13120	SP120(FSP5)	0	0	0	
13121	SP121(MP Kpp)	0	0	6	
13122	SP122(MP Kvp)	0	0	1500	
13123	SP123(MP Kvi)	0	0	2000	
13124	SP124(ILMTsp)	0	0	5	
13125	SP125(DA1NO)	0	0	0	
13126	SP126(DA2NO)	0	0	0	
13127	SP127(DA1MPY)	0	0	0	
13128	SP128(DA2MPY)	0	0	0	

(9) Set SP225 bit4 = 0 it means 0000

(10) After above setting completed, please must setting back this parameter.
Otherwise, the ALARM 37 will show on screen after restart NC.



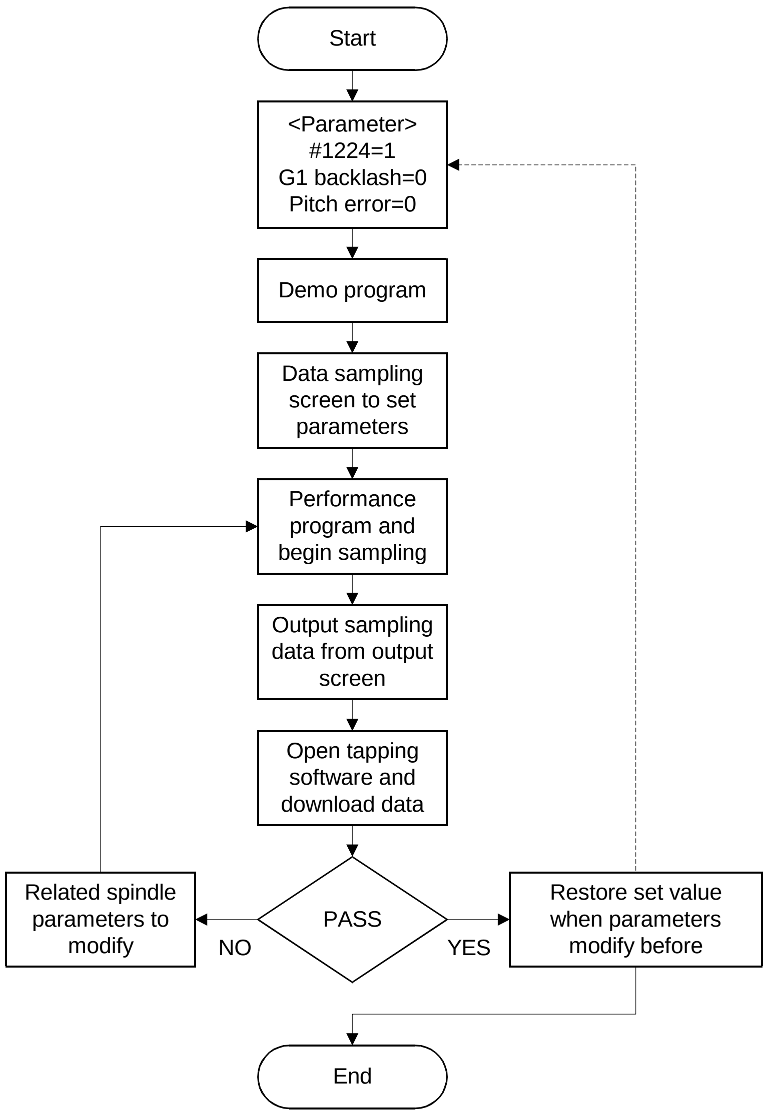
(11) Turn off power and restart, IPM motor initial step completed. If the spindle speed is not stable please check parameters again or PLG wave whether normal.

26. Spindle tapping adjustment

26.1 Preparing

Previously action prepares same as servo true circular performance. The value set 0 for backlash of Z axis and compensation scale factor of pitch error. The address 1 of sampling input data for Z axis and address 2 input spindle data and sampling cycle set 1(The sampling Cycle is actually related tapping time to increase or decrease).The sampling cycle can be performed with simple program. Refer set procedure 【1.3 The proper screen is for rig tapping to sampling data. 】

It will bring a backlash and protrusion situation when Z axis move reverse for tapping action. So performance of true circular for servo must be done before. Finally to get a proper protrusion Compensation after that this tapping software is able to do.



26.2 Simple test program

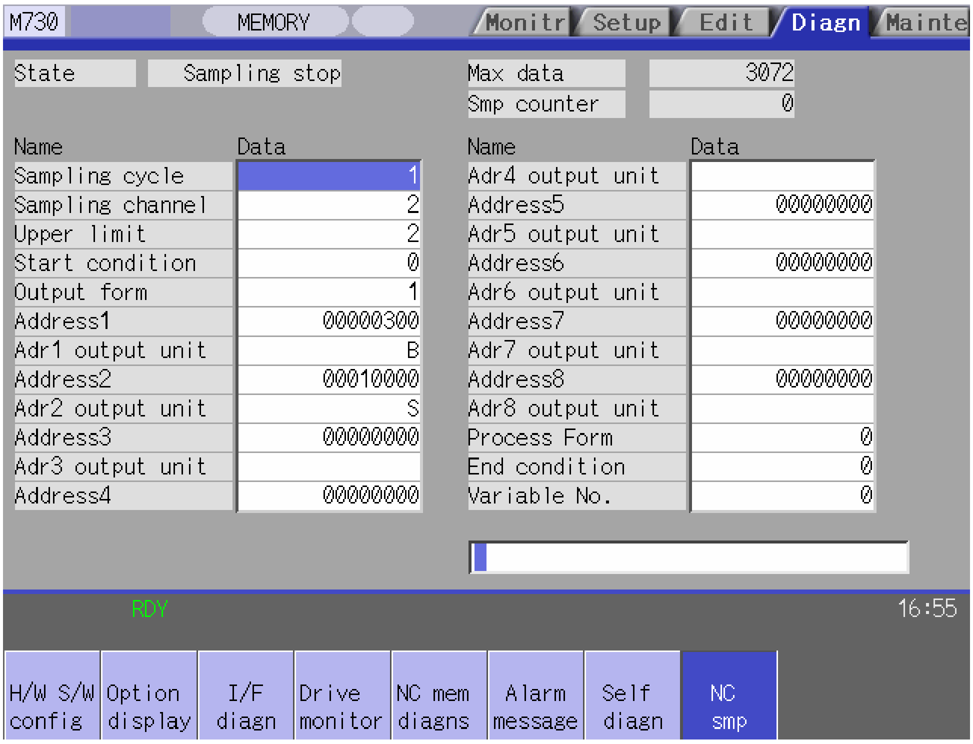
26.2.1 Simple test program

G91 G28 Z ；	← Zero return for Z axis
S3000 M3 ；	← spindle rotary 3000 RPM
G84 Z-20. F1.0，R1 ；	← Tapping action
G80 ；	← cancel tapping command
M30 ；	← finish

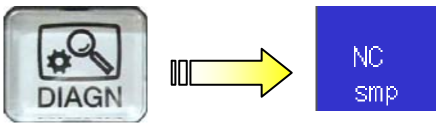
【Note】 Please confirmation without any overrun with stroke end to avoid crash when the program perform before.

26.3 The proper screen for rig tapping

(1) NC sampling screen：



★ Position：



(a) Sampling cycle： 2 （Depth:20mm，Spindle speed =S3000）

※ According to actual cycle for tapping performance setting value if depth of tapping and spindle speed vary.

(b) Sampling channel： 2

(c) Upper limit： 2

(d) Output form： 1

(e) Address1： 300 （Sampling address1 set for Z axis）

(f) Adr1 output unit： B

(g) Address2： 10000 （Sampling address 2 set for spindle）

(h) Adr2 output unit： S

(2) The program performs by single block and hold in this position as below.
G84 Z-20. F1.0，R1；

(3) Press [Smp start] （Sampling trigger start）and then press CYCLE START immediately. In up left of screen show a status for sampling.

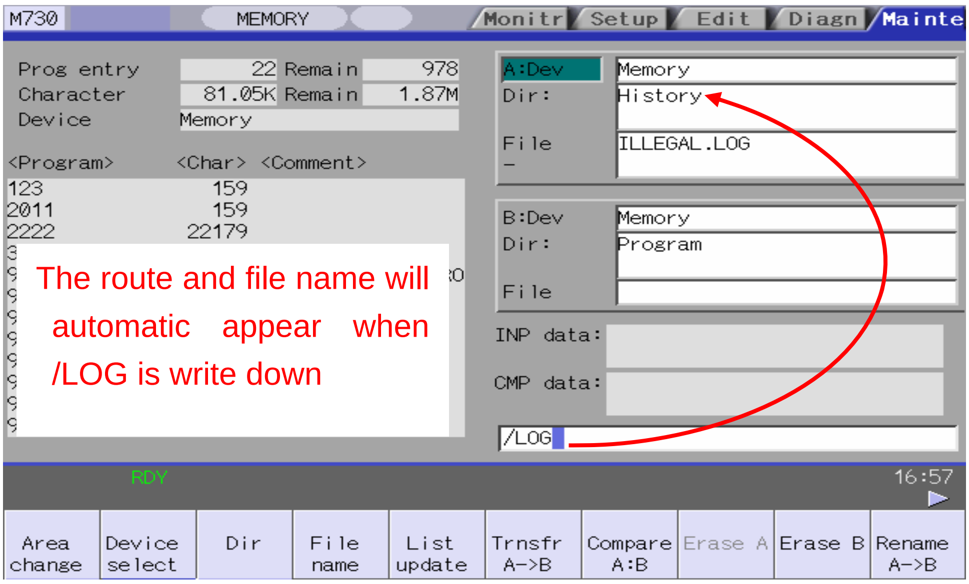
(4) When tapping procedure is done whether data sampling stop status is recovered in up left of screen. Data sampling become to "**data sampling stop "**message time is too quick or slow that trigger time must be adjusted.

State　Sampling stop

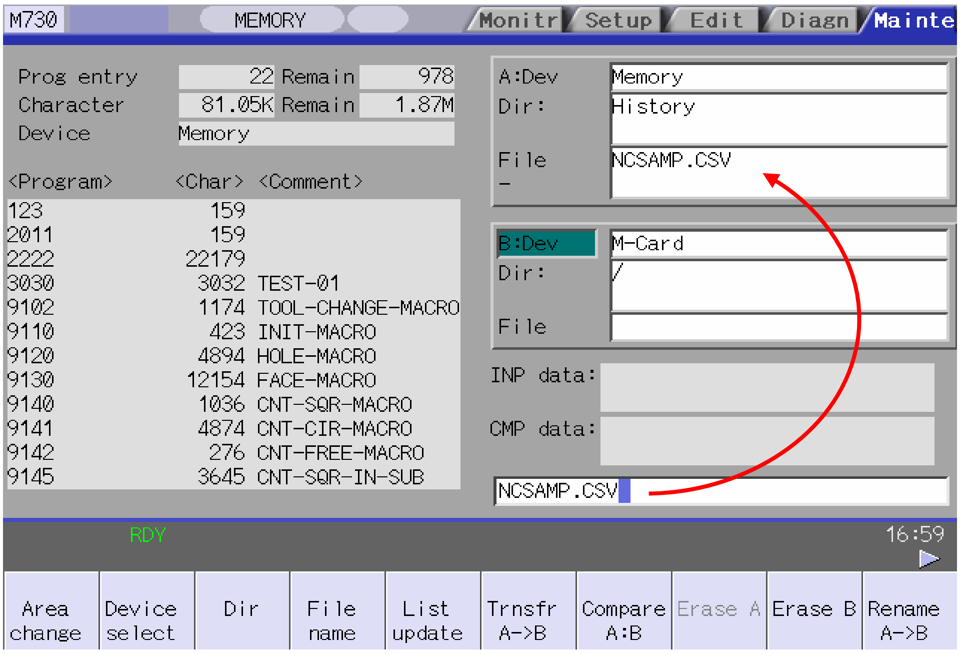
(5) Related communication set under Input/Output screen.(The setting status be able to memorize automatic if there is not any address to renew.

(a) Press Area change key exchange into「A：Dev」then Device select key select「Memory」.

(b) Press Dir key write a character for「/LOG」and screen in Dir show out「History」.



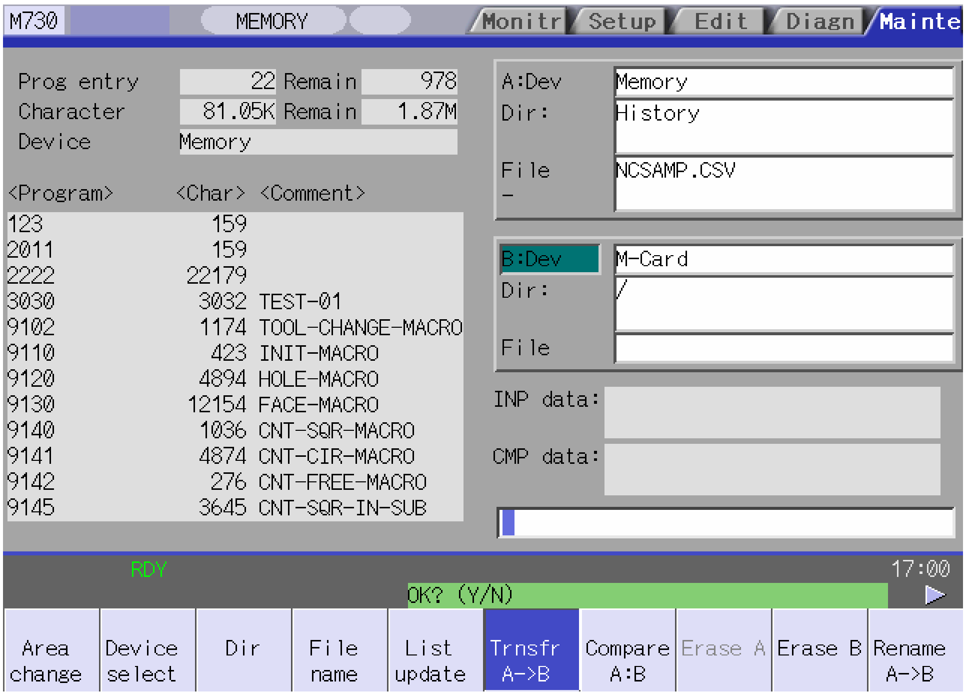
(c) The file name is fix to write「NCSAMP.CSV」



(d) Press Area change key exchange into「B：Dev」then Device select key choice「Memory card」.

The destination of storage does not installed in memory card of front panel also H/D can save in.

(e) The screen will bring a confirmation message when Trnsfr A→B key is pressed. The data be going to transmit when INPUT key press again.

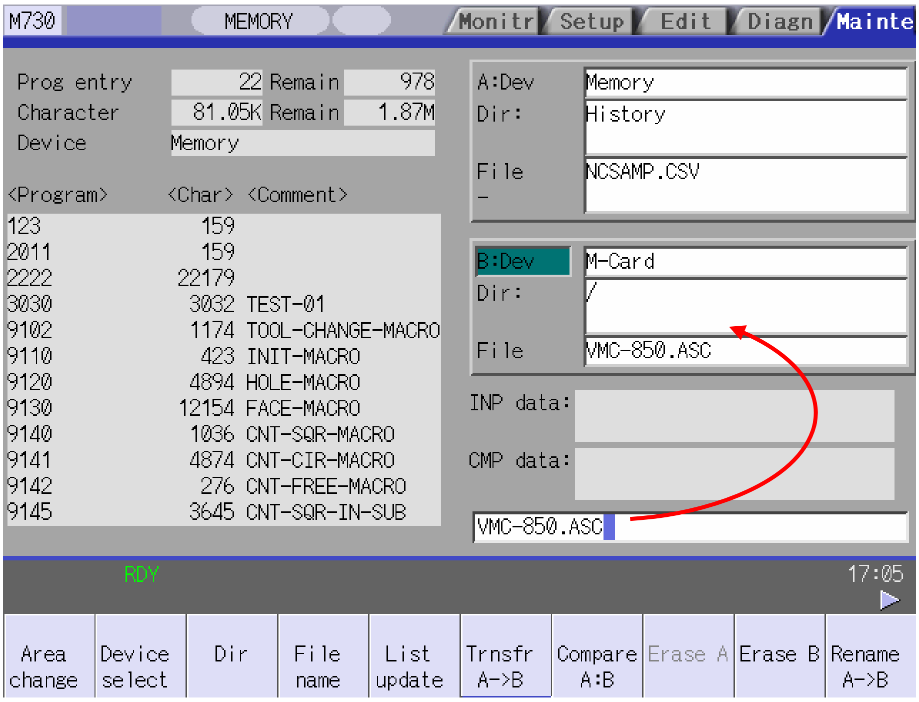


(f) If the file name is same as other one on destination area. The message show Overwrite this file?(Y/N) on screen and data will cover over when INPUT key is pressed.

(g) The message of is appear Transfer complete when transmission is done.

(h) In order to manage file for easy that on 「B：Dev」 device can input file name for easy recognition character. The sub file name of tapping software is defined with ASC.

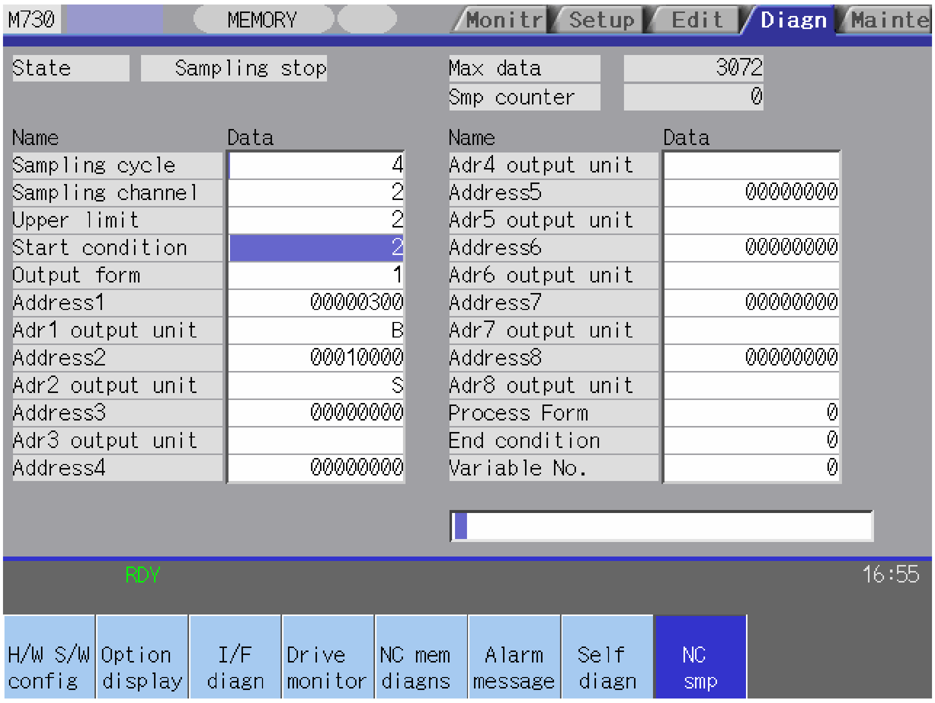
For example as below:



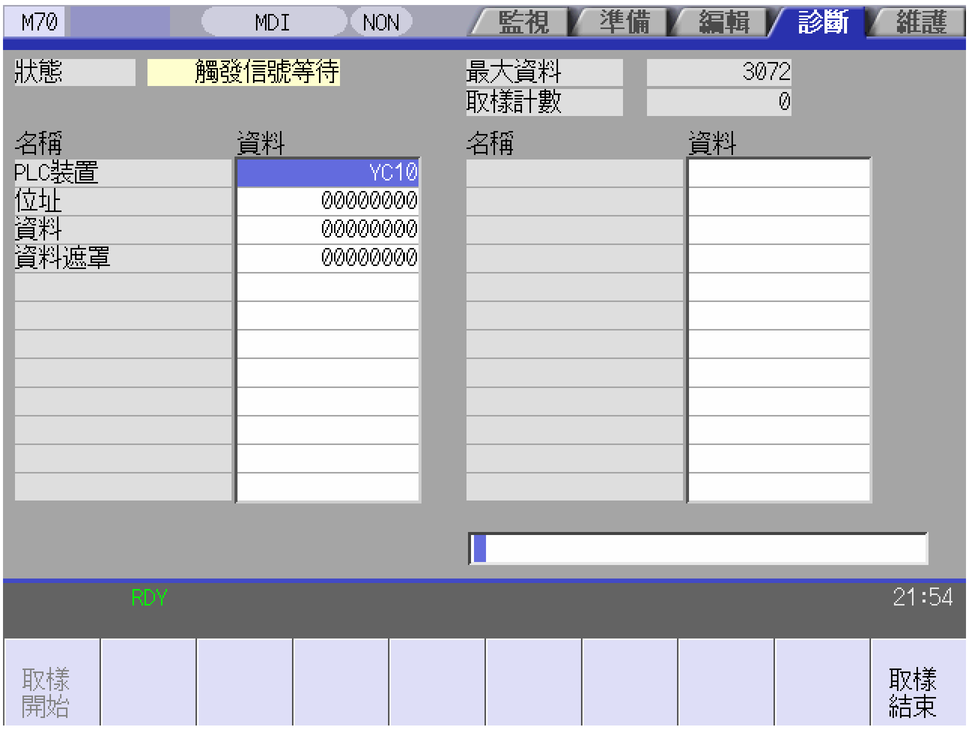
(6) NC data sampling advanced application

Carry out the true circular or spindle tapping sampling data, you can add data sampling conditions. It can easy take data.

(1) In column of “Start condition” sets to「2」, use PLC device start.



(2) In PLC device to set「YC10」. Use “Single block” key come to next execute block to carry out rig tapping. First press down left Sampling start menu key. After this press “CYCLE START” to start take sampling data.



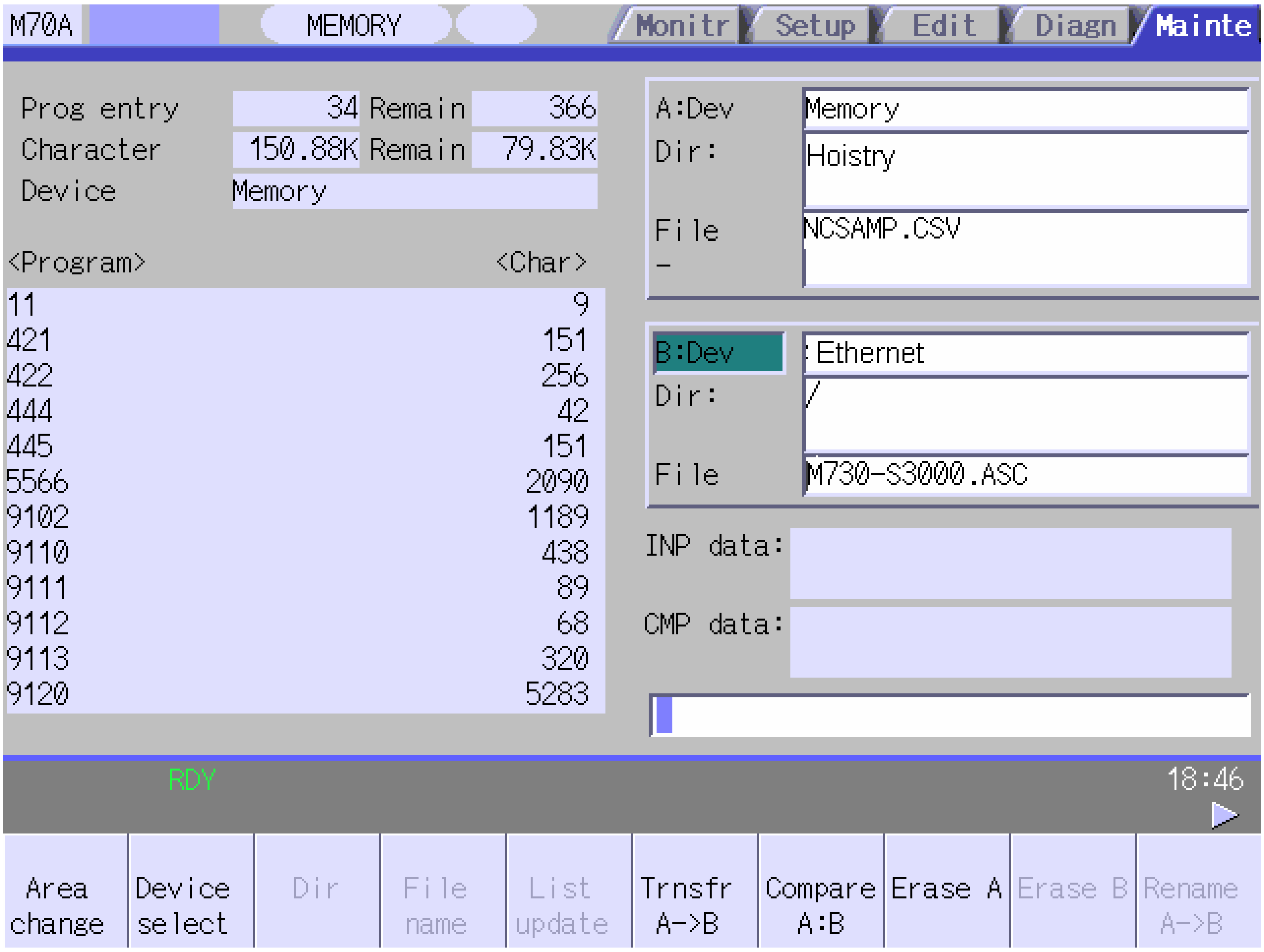
(7) NC data sampling output application

Now this function is only for M700 series with WinXP and CE and M70 series. WinXP has HD device, so can copy software to HD and enter it. Then open NC memory output sampling data to HD. It is very easy.

But M700 with CE and M70 takes sampling data that must through CF card、ETHERNET、RS-232C just can output data to PC. If use CF card, every time you must take out CF card. It is very easy to damage CF card. RS-232C is transmit speed too slow, so the best way is ETHERNET function.

(1) FTP network

In B：DEV set to Ethernet. Then input the file name, press Transf A→B to take sampling data to PC.

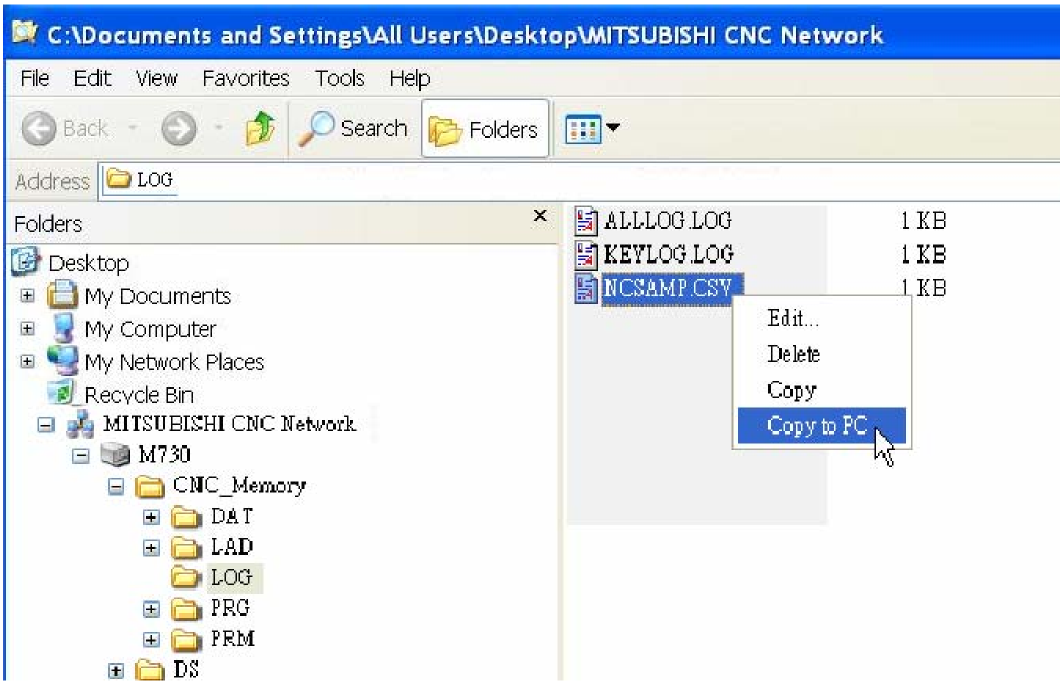


【NOTE】Ethernet function connects please CH 1 related explanation.

(2) Use MITSUBISHI CNC Network

Carry out MITSUBISHI CNC Network. And selection" \CNC_Memory\LOG" this folder. In "NCSAMP.CSV" use mouse to Copy to PC move NCSAMP.CSV file to "C:\CNC CopyFiles" this folder.

Change "NCSAMP.CSV" file sub-name to .DDB（DDB software used）or .ASC（Tapping software used）.

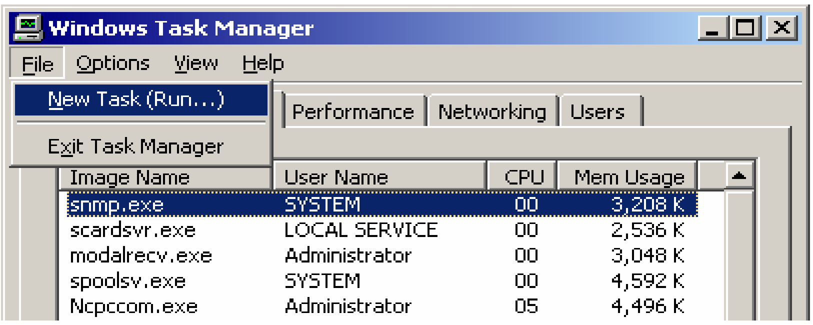


【NOTE】MITSUBISHI CNC Network operation please refer chapter 1 related explanation.

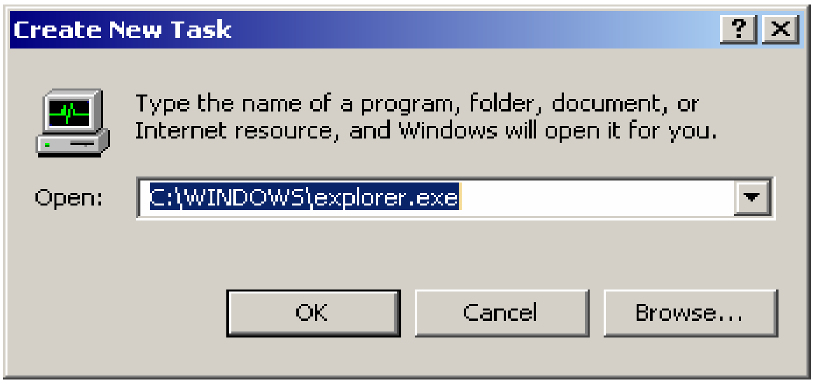
26.4 Open tapping program (In Windows XPe)

(1) Press the key of keyboard for call out management of Windows
ALTER → CTRL → DELETE

(2) Press the key of keyboard ALT → F and select New Task (Run…)

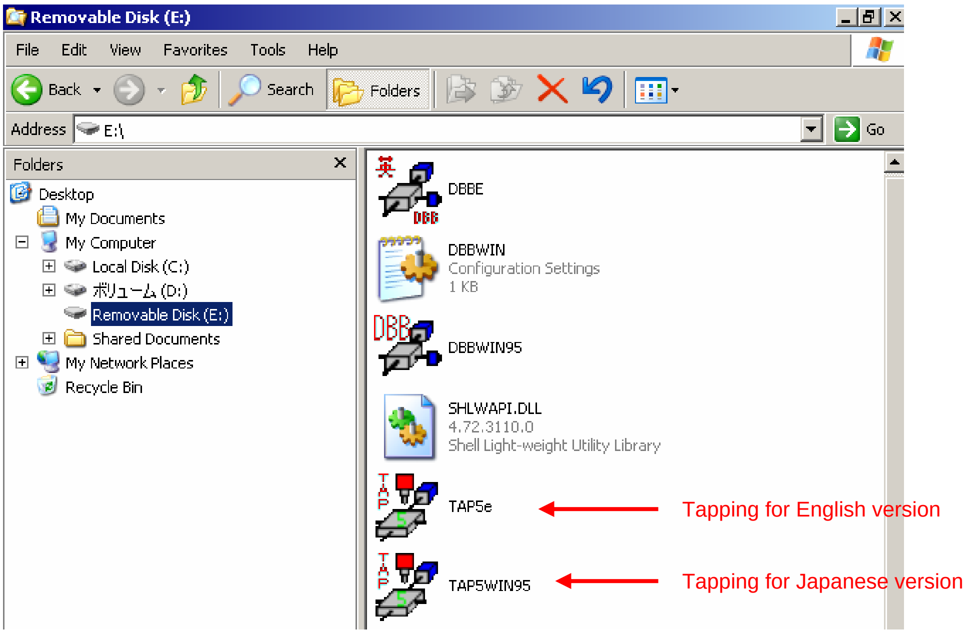


(3) Input "EXPLORER" or "C:\WINDOWS\EXPLORER" to perform explorer file.

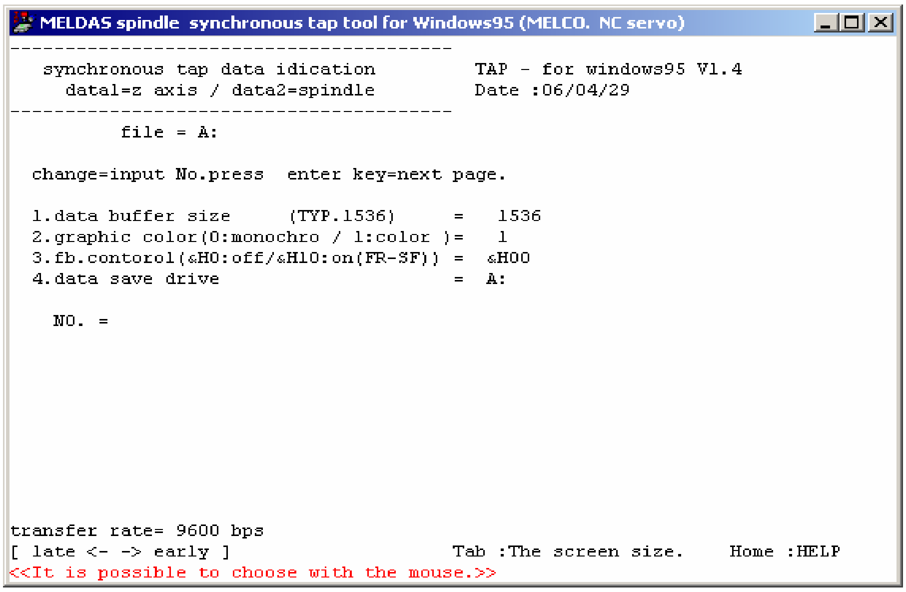


26. Spindle tapping adjustment

(4) The update software has to save in USB disc or CF card and device port is on E disk.
The tapping software can be performed and find out immediate in E disk.



(5) These versions of English and Japanese do not difference. Hence here is a example for English .Click $\boxed{\text{ENTER}}$ key to entrance next step.



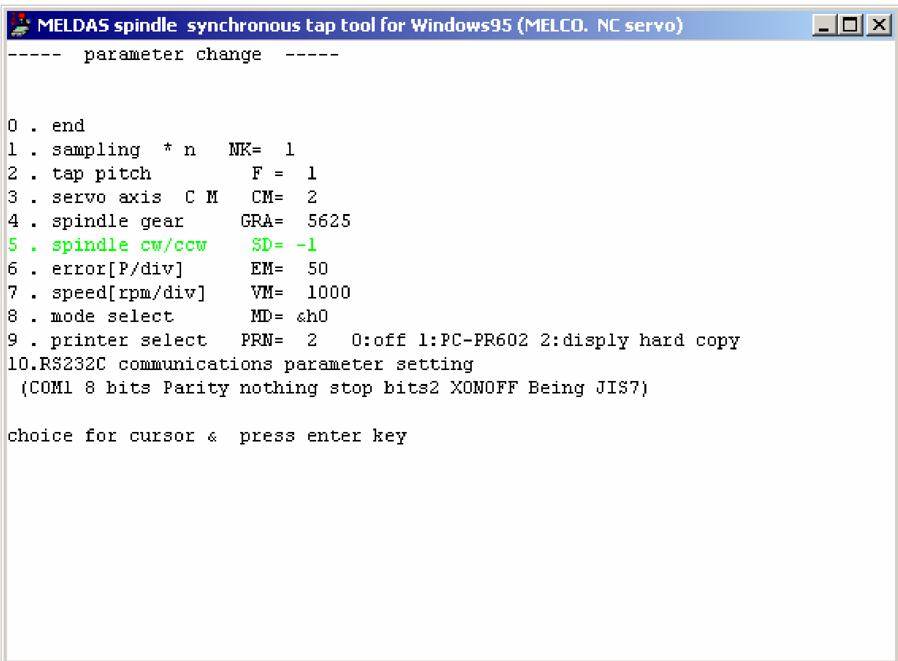
(6) Enter parameter screen to modify as below：

(a) Item「2. tap pitch」 The value of "1" is initial definition. Depending actual pitch range set a value.

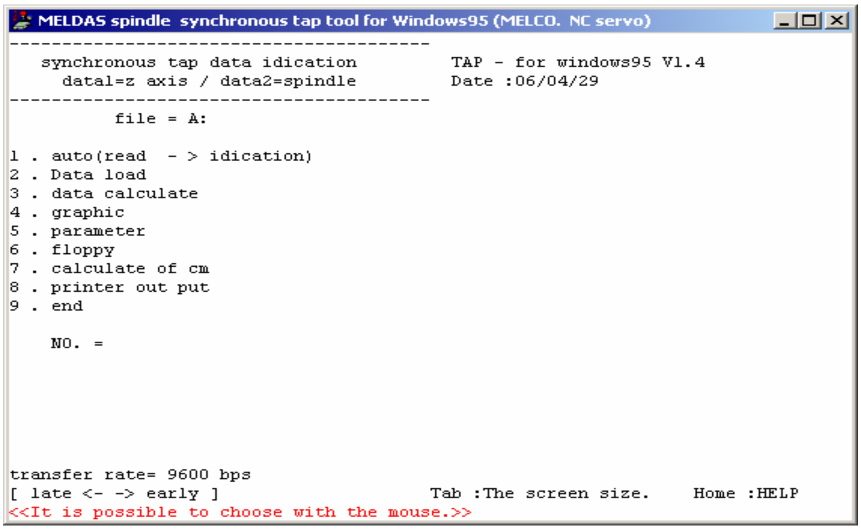
(b) Item「5. spindle cw/ccw」set value of "-1" .

(c) Item「7. speed [rpm/div]」set value of "1000" .

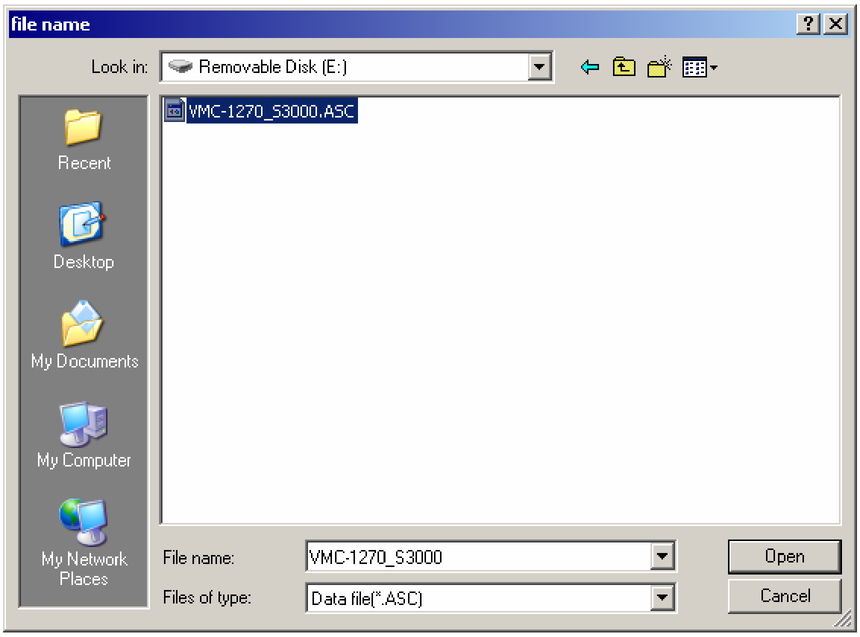
(d) To select 「0. end」item finish parameter setting when setting process done.



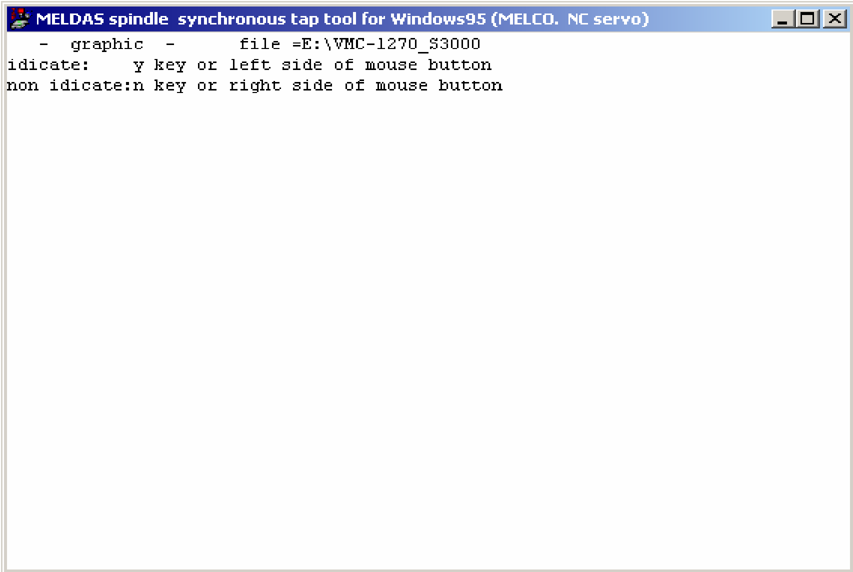
(7) To select 「2. Data load」 item download sampling data .



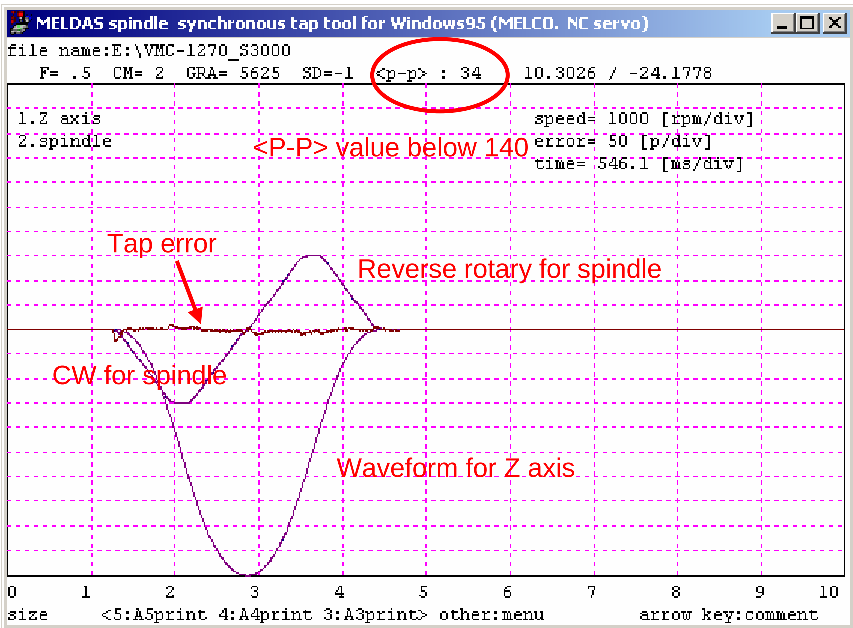
(8) Find out the file of storage position then selection 



(9) Showing as screen below and a diagram of tapping analysis is able to display when key in $\boxed{Y}$.



(10) The <P-P> value must under 140 for standard ,furthermore lost motion compensation of Z axis have to measure when tapping process perform before. The diagram is able to write notes on beside waveform and saving.



26.5 Parameters

Parameter No.			Refer value	Explanation
Spindle Specification parameter	3013	stap1	3000	Maximum spindle speed during a tapping cycle with gear1
	3017	stapt1	500	Set time constants for constant inclination synchronous tap cycles for gear1
	3037	taps21	6000	Set the spindle rotation speed at which the step-2 acceleration/deceleration time constant is to be switch
	3041	tapt21	1250	Set the time constant to reach synchronous tap switching spindle rotation speed 2
	3045	tapt31	2500	Set the time constant to reach the maximum rotation speed
	3106	zrn_typ	0000	Synchronous tap and orientate specification
Spindle parameter	13002	PGN	33	Set the value must be same
Axis specification	2017	tap_g	33	

【Note】 These parameters is recommended value hence according to change by real situation.

Please refer set up manual of M700 series 【IB(NA)1500124(TWN)】for more parameters explanation.

26.6 Attention points

(1) The PGN of spindle and tap_g of axis parameters set same value ,otherwise the cutting tool will be broken when machine is machining.

(2) The diagram of synchronous tap of <P-P> set 140 values below.

(3) If the value of <P-P> exceeds 140 that these items be confirmed as below.

(a) The value of PGN and tap_g whether are same.

(b) The gear ratio of spindle whether set correct.

(c) The value of <P-P> still exceed 140 even parameters are correct .The time of #3013 stapt1 set raising.

(d) The LOST MOTION compensation value set already and the backlash parameter set"0".

(e) The value of SV050 for servo parameter set "0" for standard setting.

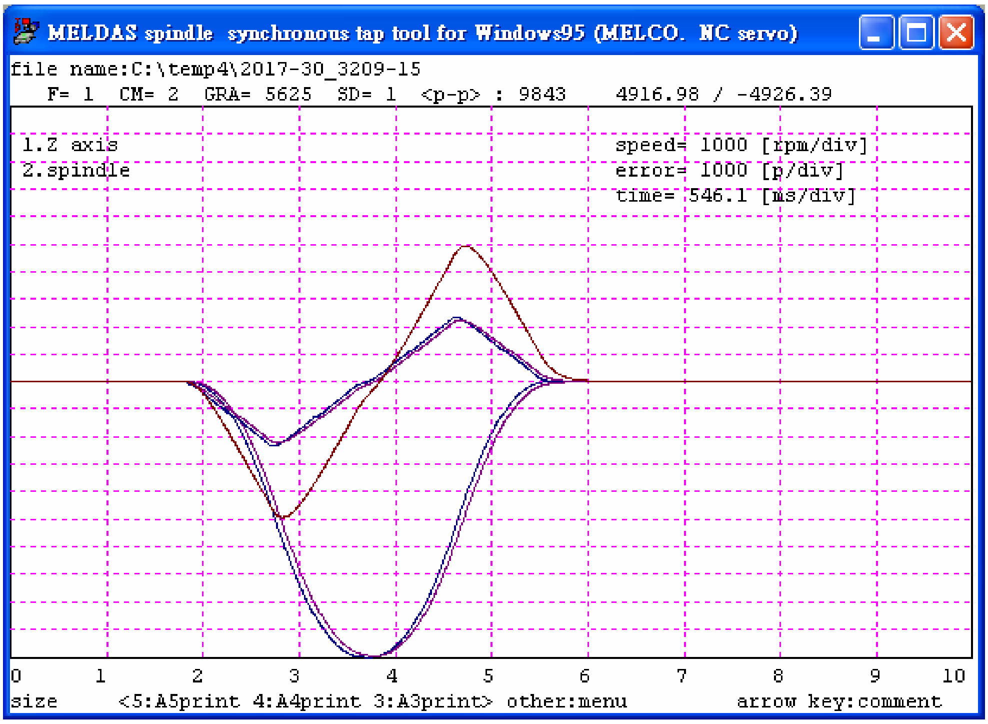
The value of <P-P> will be greatly by faulty setting.

(4) A inch ball screw does not suit this tapping software.

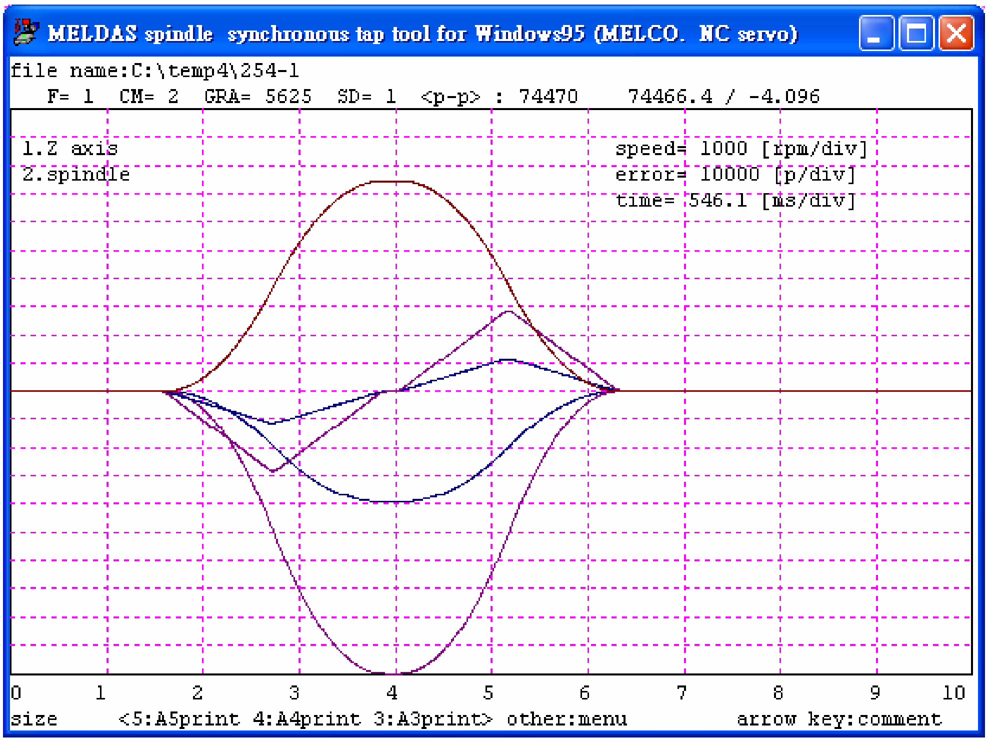
(5) A pecking tap does not suit this tapping software.

26.7 Example tapping situation

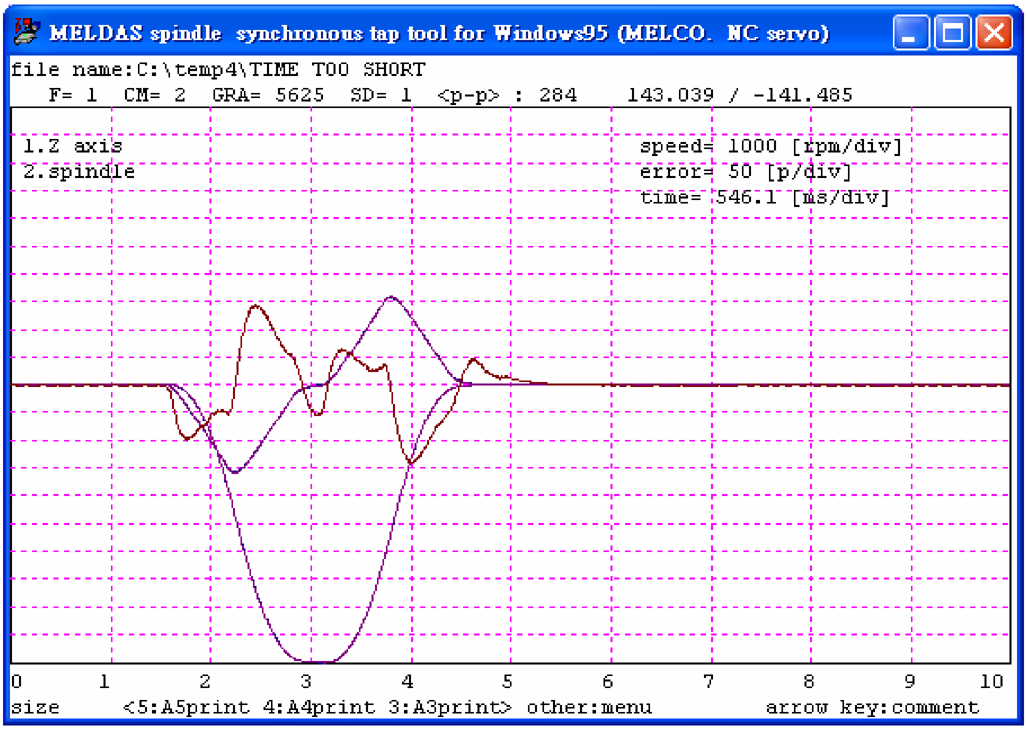
(1) Difference value for spindle and axis tapping gain :



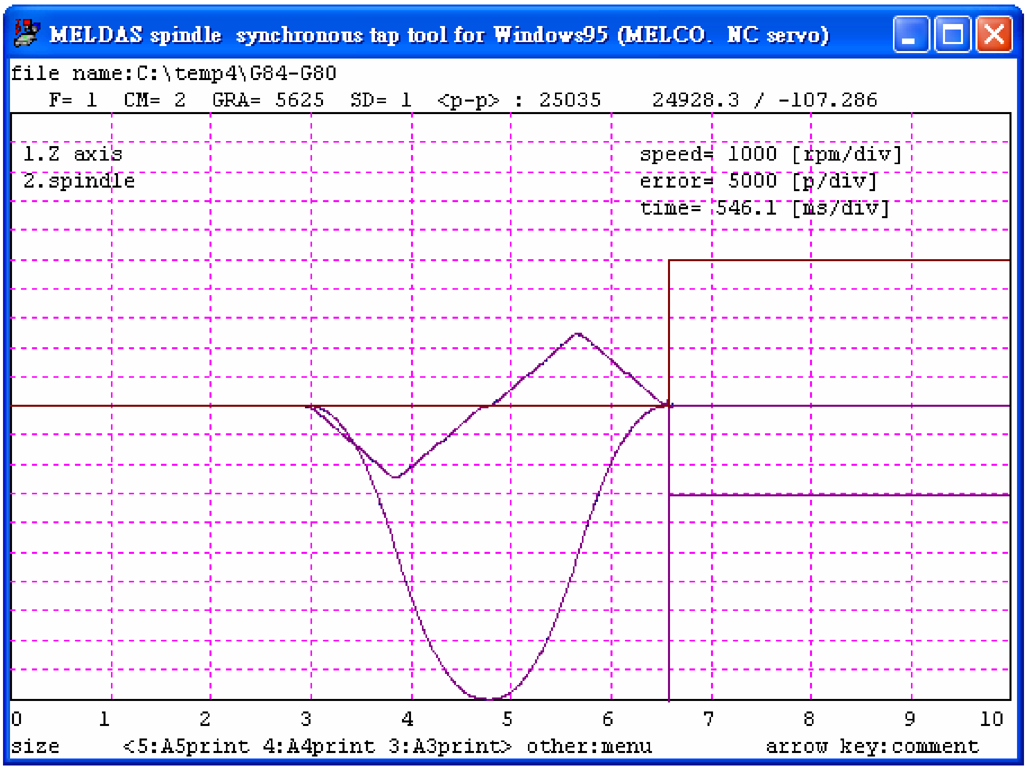
(2) Inch ball screw :



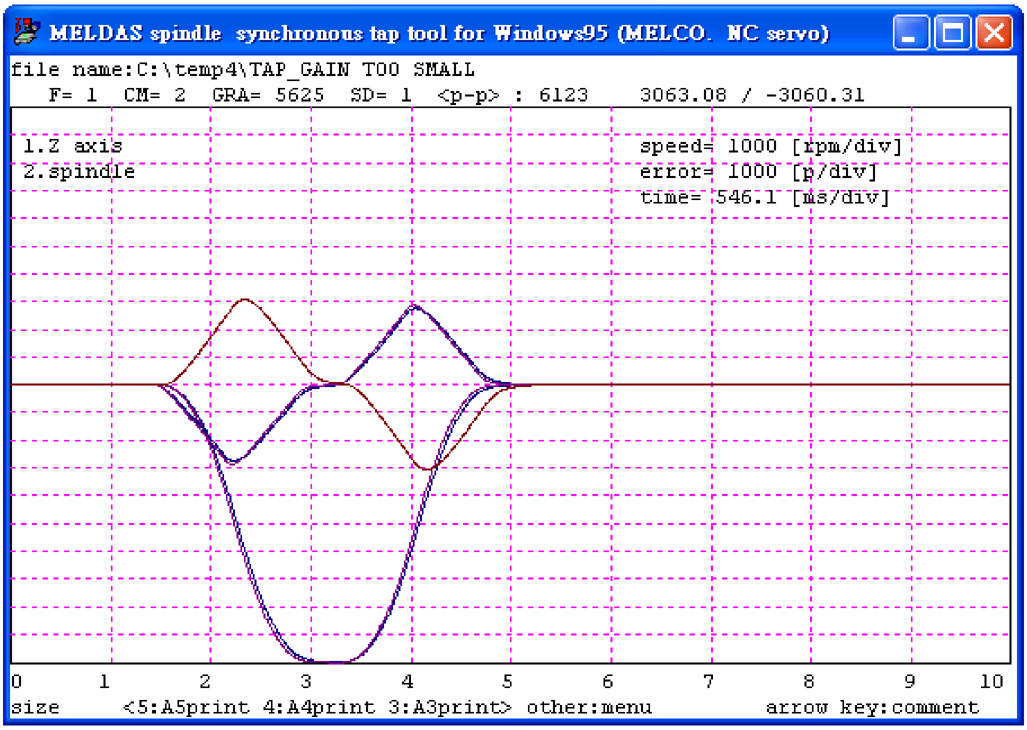
(3) Synchronous tap time too short :



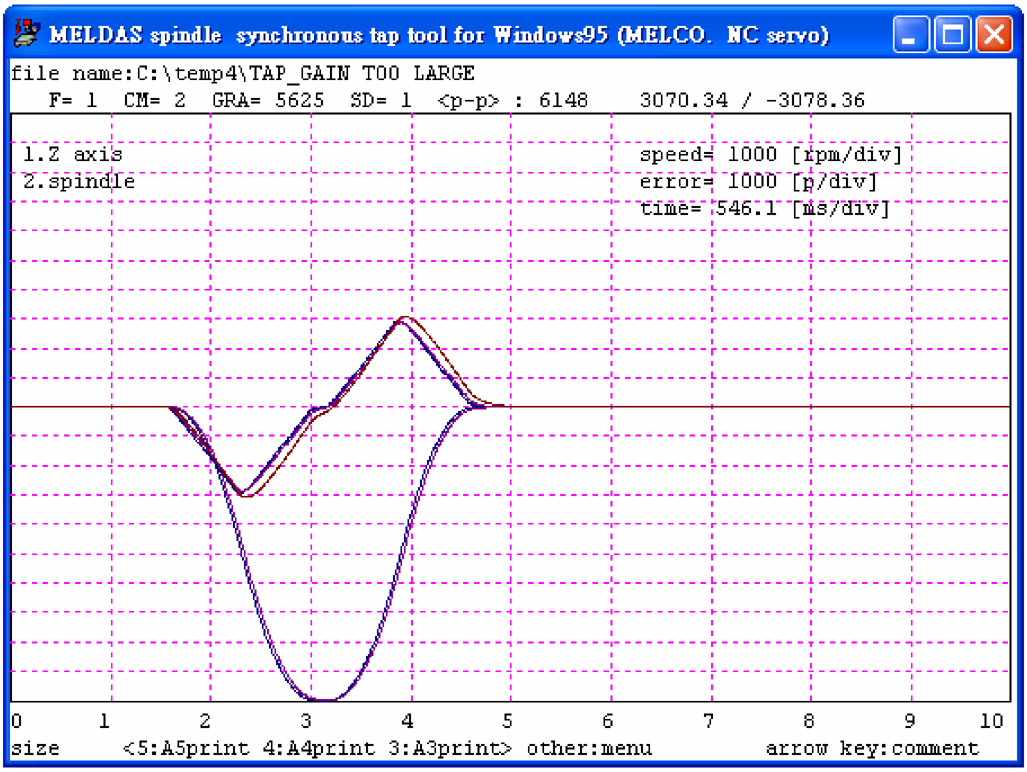
(4) The single block does not use on full procedure.



(5) Tapping gain value set too small.



(6) Tapping gain value set too big.



26.8 Spindle monitor screen for tapping error display

In order to convenient user to carry out the adjustment of parameter and confirm that can save time in tapping software. It can on monitor screen to observe synchronous value of tapping error.

Press $\boxed{\text{DIAGN}}$ → $\boxed{\text{Drive monitor}}$ → $\boxed{\text{Spindle Unit}}$ → $\boxed{\text{Next page}}$ that can observe synchronous tapping error and error angle display. If it was testing software error <P-P> value, you must use below formula to account.

$$\frac{\text{<P-P>}}{4096} = \frac{\text{Sync tap err (mm)}}{1\ \text{mm}}$$

$$\frac{\text{<P-P>}}{4096} = \frac{\text{Sync tap err (deg)}}{360\ \text{deg}}$$

Sync tap err (mm)	0.009
Sync tap err (deg)	3.240

(1) Example for tapping error to calculate <P-P>：

$$\frac{\text{<P-P>}}{4096} = \frac{0.009}{1\ \text{mm}}$$

$$\therefore\ \text{<P-P>} = 0.009 \times 4096 \fallingdotseq 37$$

(2) Example for tapping error angle to calculate <P-P>：

$$\frac{\text{<P-P>}}{4096} = \frac{3.24}{360\ \text{degree}}$$

$$\therefore\ \text{<P-P>} = 3.24 \times 4096 \div 360 \fallingdotseq 37$$

27 Spindle noise diagnosis

When generally if the different sound of spindle takes a noise, please make use of following method to check whether it is a mechanical side problem or not. Spindle motor is it invite rotational speed high than noise to turn round, then turn off the main power (NFB) . The motor will inertia stop slowly (Free-Run) at this moment, please check whether there is noise sound in the part of the spindle motor. If it may be spindle head, dynamic equilibrium or motor bearing to have at the same time. Please separate from motor and the spindle head again, test Free-Run once in order to confirm the question, too. If when motor the Free-Run stills have noise sound, bank up the forest with earth problematically for the dynamic equilibrium or the bearing probably. If it does not have noise at all after Free-Run is tested, and generally operate and have strange sound, judge whether it is the questions of parameter or PLG.

Spindle happens a noise or cannot run after this occurred the alarm of ALARM 23. It can use spindle Open-Loop to test the alarm from AMP or PLC circuit problem. Because in spindle Open-Loop, it doesn’t check feedback signal only spindle motor.

(1) Into Spindle Parameter screen.

(2) In NC and spindle drive connection cable, the spindle parameter SP018 bit1 to set ″1″（that can start open loop testing）.

Caution	After Open loop function test please recover original parameter set. SP018 bit1＝0 to avoid error operation.

(3) Please run spindle motor again, Because in Open-Loop status speed will become slow and load will fix in 50％. The Open-Loop max test speed is 1800rpm。

(4) If the speed one time accelerates to highest will need long time. So please every time add 500rmp test and until demanded speed. That confirms whether has any noise if no it is meaning spindle drive is ok.

(5) If the noise still happen, maybe is PLG feed back circuit problem please change feed back cable or observe PLG A、B、Z phase signal.（Refer spindle PLG adjustment section）

(6) If the machine structure and PLG is ok please attention motor's power cable UVW connection is correct.

(1) If the new machine was assembled in the factory, this problem probably happens is relatively great. Or if it is in user's factory may be cable or the other reasons to cause this problem.

(2) While changing SENSOR of motor PLG of spindle, smudgy UVW mark causes the wiring connection mistake.

(3) If it is not able to differentiate correct wiring at the position immediately to have two more above-mentioned, please rotate at probably speed of 50 rpm. if a arrival has sound that stops promptly at once, this way needs wiring six times at most when luck is the worst.

Motor	U	V	W
Drives	①	②	③
	①	③	②
	②	③	①
	②	①	③
	③	①	②
	③	②	①

APPENDIX 1

M700/M70 Troubleshooting

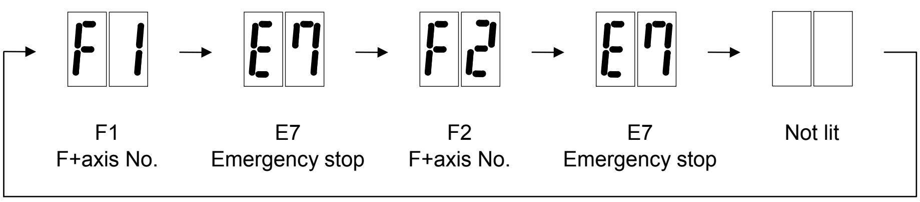
Appendix 1. Troubleshooting

Appendix 1.1 Troubleshooting at Power ON

If the NC system does not start up correctly and a system error occurs when the NC power is turned ON, the drive unit may not have been started up properly. Check the LED display on the drive unit, and take measures according to this section.

LED display	Symptom	Cause of occurrence	Investigation method	Remedy
AA	Initial communication with the CNC was not completed correctly.	The drive unit axis No. setting is incorrect.	Is there any other drive unit that has the same axis No. set?	Set correctly.
		The CNC setting is incorrect.	Is the No. of CNC controlled axes correct?	Set correctly.
		Communication with CNC is incorrect.	Is the connector (CN1A, CN1B) connected?	Connect correctly.
			Is the cable broken?	Replace the cable.
Ab	Initial communication with the CNC was not carried out.	The axis is not used, the setting is for use inhibiting.	Is the DIP switch set correctly?	Set correctly.
		Communication with CNC is incorrect.	Is the connector (CN1A, CN1B) connected?	Connect correctly.
			Is the cable broken?	Replace the cable.
12	An error was detected in the unit's memory and IC during the self-diagnosis at power ON.	The CPU peripheral circuit is abnormal.	Check the repeatability.	Replace the unit.
			Check whether there is any abnormality with the unit's surrounding environment, etc.	Improve the surrounding environment.

The drive unit has started up normally if the following type of emergency stop (E7) is displayed on the display unit's LED display.



Normal drive unit LED display at NC power ON (for 1st axis)

Appendix 1.2 Troubleshooting for each alarm No.

Alarm No. 11	**Axis selection error** Setting of the axis No. selection switch is incorrect.

	Investigation details	Investigation results	Remedies	SV	SP
1	Check the setting of the axis selection switch (rotary switch) on the top of the unit.	The same axis No. is set for the L and M axes.	Correctly set the axis No. 0 = No. 1 axis, 1 = No. 2 axis, ...	○	○
		The value is duplicated with other axis.	Correctly set the axis No. 0 = No. 1 axis, 1 = No. 2 axis, ...		
		No abnormality is found in particular.	Replace the drive unit.		

Alarm No. 12	**Memory error 1** A CPU error or an internal memory error was detected during the power ON self-check.

	Investigation details	Investigation results	Remedies	SV	SP
1	Check whether the servo or spindle software version was changed recently.	The version was changed.	There is a possibility that the spindle software was downloaded into servo, or the servo software was downloaded into spindle. Download servo/spindle software again.	○	○
		The version was not changed.	Check the investigation item No. 2.		
2	Check the repeatability.	The error is always repeated.	Replace the drive unit.	○	○
		The state returns to normal once, but occurs sometimes thereafter.	Check the investigation item No. 3.		
3	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 13	**Software processing error 1** Software processing has not finished within the specified time.

	Investigation details	Investigation results	Remedies	SV	SP
1	Check whether the servo or spindle software version was changed recently.	The version was changed.	Change software version back to the original.	○	○
		The version was not changed.	Check the investigation item No. 2.		
2	Check the repeatability.	The error is always repeated.	Replace the drive unit.	○	○
		The state returns to normal once, but occurs sometimes thereafter.	Check the investigation item No. 3.		
3	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 16	**Magnetic pole position detection error** An error was detected in the magnetic pole detection for controlling the motor.

	Investigation details	Investigation results	Remedies	SV	SP
1	Check the parameters.	The parameters specified with the adjustment are not set.	Replace the drive unit.		○
		Correct parameters are set.	Check the investigation item No. 2.		
2	Check the repeatability.	The error is always repeated.	Replace the drive unit.		○
		The state returns to normal once, but occurs sometimes thereafter.	Check the investigation item No. 3.		
3	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.			○

Alarm No. 17	**A/D converter error** An error was detected in the A/D converter for detecting current FB.

	Investigation details	Investigation results	Remedies	SV	SP
1	Check the repeatability.	The error is always repeated.	Replace the drive unit.	○	○
		The state returns to normal once, but occurs sometimes thereafter.	Check the investigation item No. 2.		
2	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 18	**Motor side detector: Initial communication error** Initial communication with the motor end detector failed.

	Investigation details	Investigation results	Remedies	SV	SP
1	Check the servo parameter (SV025.ent) setting value. OSE104: 0, OSA104: 1 Are all others set to 2? (Excluding slave axis for synchronous control)	The value is not set correctly.	Correctly set SV025.		○
		The value is set correctly.	Check the investigation item No. 2.		
2	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	○
		The connector is not disconnected.	Check the investigation item No. 3.		
3	Turn the power OFF, and check the detector cable connection with a tester.	The connection is faulty.	Replace the detector cable.	○	○
		The connection is normal.	Check the investigation item No. 4.		
4	Replace with another unit, and check whether the fault is on the unit side or detector side.	The alarm is on the drive unit side.	Replace the drive unit.	○	○
		The alarm is on the detector side.	Check the investigation item No. 5.		
5	Check if there is any abnormality in the detector's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 1A	**Machine side detector: Initial communication error** Initial communication with the linear scale or the ball screw end detector failed.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the servo parameter (SV025.pen) setting value. Are the serial communication type detector parameters set for the pulse type detector?	The value is not set correctly.	Correctly set SV025.	○	
		The value is set correctly.	Check the investigation item No. 2.		
2	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	
		The connector is not disconnected.	Check the investigation item No. 3.		
3	Turn the power OFF, and check the detector cable connection with a tester.	The connection is faulty.	Replace the detector cable.	○	
		The connection is normal.	Check the investigation item No. 4.		
4	Replace with another unit, and check whether the fault is on the unit side or detector side.	The alarm is on the drive unit side.	Replace the drive unit.	○	
		The alarm is on the detector side.	Check the investigation item No. 5.		
5	Check if there is any abnormality in the detector's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	

Alarm No. 1B	**Machine side detector: Error 1** The machine side detector detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check whether the servo axis has moved and the spindle has rotated when an alarm occurred.	The axis has operated.	Check the investigation item No. 3.	○	○
		The axis has not operated.	Check the investigation item No. 2.		
2	Check whether the operation at low speed is normal.	The operation is normal.	Check the investigation item No. 3.	○	○
		The operation is not normal.	Check the cautions at power ON. • Wiring check • Parameter check		
3	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	○
		The connector is not disconnected.	Check the investigation item No. 4.		
4	Turn the power OFF, and check the detector cable connection with a tester.	The connection is faulty.	Replace the detector cable.	○	○
		The connection is normal.	Check the investigation item No. 5.		
5	Replace with another unit, and check whether the fault is on the unit side or detector side.	The alarm is on the drive unit side.	Replace the drive unit.	○	○
		The alarm is on the detector side.	Check the investigation item No. 6.		
6	Check if there is any abnormality in the detector's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 1C	**Machine side detector: Error 2** The machine side detector detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	

Alarm No. 1D	**Machine side detector: Error 3** The machine side detector detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	

Alarm No. 1E	**Machine side detector: Error 4** The machine side detector detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	

Alarm No. 1F	**Machine side detector: Communication error** An error was detected in communication data with the linear scale or the ball screw end detector. Or the communication was interrupted.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	
		The connector is not disconnected.	Check the investigation item No. 2.		
2	Is the detector cable wired in the same conduit as the motor's power cable, or are the two cables laid in parallel near each other?	The cables are wired near each other. (Noise is entering from the power cable.)	Improve the cable wiring.	○	
		The wires are sufficiently separated.	Check the investigation item No. 3.		
3	Is the motor FG wire connected only to the drive unit which drives it? (Is the motor grounded to one point?)	The motor FG wire is grounded on the motor side.	Ground the motor to one point, connecting the wires together on the drive unit side.	○	
		The motor is grounded to one point.	Check the investigation item No. 4.		
4	Turn the power OFF, and check the detector cable connection with a tester. (Is the cable shielded?)	The connection is faulty.	Replace the detector cable.	○	
		The connection is normal.	Check the investigation item No. 5.		
5	Replace with another unit, and check whether the fault is on the unit side or detector side.	The alarm is on the drive unit side.	Replace the drive unit.	○	
		The alarm is on the detector side.	Check the investigation item No. 6.		
6	Check if there is any abnormality in the detector's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	

Alarm No. 21	**Machine side detector: No signal** When an excessive error alarm occurred, no signal from the machine side detector was detected.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the servo parameter (SV025. pen) setting value. Are the pulse type detector parameters set for a serial communication type detector?	The value is not set correctly.	Correctly set SV025.	○	
		The value is set correctly.	Check the investigation item No. 3.		
2	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	
		The connector is not disconnected.	Check the investigation item No. 4.		
3	Turn the power OFF, and check the detector cable connection with a tester.	The connection is faulty.	Replace the detector cable.	○	
		The connection is normal.	Check the investigation item No. 5.		
4	Replace with another unit, and check whether the fault is on the unit side or detector side.	The alarm is on the drive unit side.	Replace the drive unit.	○	
		The alarm is on the detector side.	Check the investigation item No. 6.		
5	Check if there is any abnormality in the detector's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	

Alarm No. 23	**Excessive speed error** A difference between the speed command and speed feedback was continuously exceeding 50 r/min for longer than the setting time.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the U, V and W wiring between the spindle drive unit and spindle motor.	The wires are not correctly connected.	Correctly connect.		○
		The wires are correctly connected.	Check the investigation item No. 2.		
2	Check the spindle parameter (SP017, SP018, SP019, SP020, SP117 and SP129 or later) setting value.	The correct values are not set.	Correctly set.		○
		The correct values are set.	Check the investigation item No. 3.		
3	Measure the acceleration/ deceleration time up to the point where the spindle speed reaches its maximum. If the alarm occurs when forward run is changed to reverse run, measure the acceleration/ deceleration time from the forward run's maximum speed to reverse run's maximum speed.	12sec or more.	Increase the spindle acceleration/deceleration time constant setting value.		○
		Less than 12sec.	Check the investigation item No. 4.		
4	Check the load amount when the alarm occurred during cutting.	Load amount is 120% or more.	Reduce the load.		○
		Load amount is less than 120%.	Check the investigation item No. 5.		
5	Check the fluctuation of the input voltage into the power supply unit.	Voltage drop during acceleration does not satisfy the motor voltage.	Review the power supply capacity.		○
		Voltage drop during acceleration satisfies the motor voltage.	Check the investigation item No.6.		
6	Check the capacity of the drive unit.	The capacity does not satisfy the motor output.	Increase the capacity.		○
		The capacity satisfies the motor output.	Replace the unit.		

Alarm No. 24	**Grounding** The motor power cable is in contact with FG (Frame Ground).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Measure the insulation across the power cables (U,V,W) for connected motors and the ground. (Carry out a megger test.)	Less than 100kΩ.	The motor or power cable may be ground faulted.	○	○
		100kΩ or more.	Check the investigation item No. 2.		
2	Has oil come in contact with the motor or power cable?	Oil has come in contact.	Take measures so that oil does not come in contact. Check the motor's cannon connector and the inside of the terminal box, and clean as necessary.	○	○
		Oil has not come in contact.	Check the investigation item No. 3.		
3	Measure the insulation again.	Less than 1MΩ.	Replace the motor or cable.	○	○
		1MΩ or more.	Check the investigation item No. 2.		
4	Measure the resistance across the U, V, W phase terminals of the servo/spindle drive unit and the ground. (Do not measure the insulation as the unit could be damaged.)	Less than 100kΩ.	Replace the drive unit.	○	○
		100kΩ or more.	Replace the power supply unit.		

Alarm No. 25	**Absolute position data lost** The absolute position was lost, as the backup battery voltage dropped in the absolute position detector.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Is warning 9F occurring at the same time?	The warning is occurring.	Check the investigation item No. 2.	○	
		The warning is not occurring.	Check the investigation item No. 3.		
2	Measure the battery voltage with a tester.	Less than 3V.	Replace the battery, and establish the zero point.	○	
		3V or more.	Check the NC bus cable connection.		
3	Did alarm No.18 occur when the power was turned ON the last time?	Alarm No.18 occurred.	Turn the drive unit control power ON again, and establish the zero point.	○	
		Alarm No.18 did not occur.	Check the investigation item No. 4.		
4	Was the detector cable or battery cable left disconnected from the unit for a long time?	The unit was left disconnected for a long time. Guide at delivery : 20 hours or more After 5 years : 10 hours or more	Turn the drive unit control power ON again, and establish the zero point.	○	
		The cables were not left disconnected.	Check the investigation item No. 5.		
5	Check the detector cable or battery cable connection with a tester.	The connection is faulty.	Replace the cable.	○	
		The connection is normal.	Replace the drive unit.		

Alarm No. 26	**Unused axis error** A power module error occurred in the axis whose axis No. selection switch was set to "F"(free axis).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the repeatability.	The error is always repeated.	Replace the drive unit.	○	○
		The state returns to normal once, but occurs sometimes thereafter.	Check the investigation item No. 2.		
2	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 27	**Machine side detector: Error 5** The machine side detector detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	

Alarm No. 28	**Machine side detector: Error 6** The machine side detector detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	

Alarm No. 29	**Machine side detector: Error 7** The machine side detector detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	

Alarm No. 2A	**Machine side detector: Error 8** The machine side detector detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	

Alarm No. 2B	Motor side detector: Error 1 The motor side detector (linear scale in the case of linear motor) detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	○

Alarm No. 2C	Motor side detector: Error 2 The motor side detector (linear scale in the case of linear motor) detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	○

Alarm No. 2D	Motor side detector: Error 3 The motor side detector (linear scale in the case of linear motor) detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	○

Alarm No. 2E	Motor side detector: Error 4 The motor side detector (linear scale in the case of linear motor) detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "1B" items.			○	○

Alarm No. 2F	Motor side detector: Communication error An error was detected in communication data with the motor end detector or with the linear scale of a linear servo system. Or the communication was interrupted.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	○
		The connector is not disconnected.	Check the investigation item No. 2.		
2	Is the detector cable wired in the same conduit as the motor's power cable, or are the two cables laid in parallel near each other?	The cables are wired near each other. (Noise is entering from the power cable.)	Improve the cable wiring.	○	○
		The wires are sufficiently separated.	Check the investigation item No. 3.		
3	Is the motor FG wire connected only to the drive unit which drives it? (Is the motor grounded to one point?)	The motor FG wire is grounded on the motor side.	Ground the motor to one point, connecting the wires together on the drive unit side.	○	○
		The motor is grounded to one point.	Check the investigation item No. 4.		
4	Turn the power OFF, and check the detector cable connection with a tester. (Is the cable shielded?)	The connection is faulty.	Replace the detector cable.	○	○
		The connection is normal.	Check the investigation item No. 5.		
5	Replace with another unit, and check whether the fault is on the unit side or detector side.	The alarm is on the drive unit side.	Replace the drive unit.	○	○
		The alarm is on the detector side.	Check the investigation item No. 6.		
6	Check if there is any abnormality in the detector's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 31	**Overspeed** The motor was detected to rotate at a speed exceeding the allowable speed. (In the case of linear motor, it was detected to move at a speed exceeding the allowable speed.)				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check if the unit in which the alarm was detected is servo or spindle.	The alarm was detected in servo.	Check the investigation item No. 2.	○	○
		The alarm was detected in spindle.	Check the investigation item No. 3.		
2	Check the servo parameters SV001 (PC1), SV002 (PC2), SV018 (PIT) and SV025 (MTYP) settings.	The settings are incorrect.	Correctly set.	○	
		Correctly set.	Check the investigation item No. 5.		
3	Check the spindle parameter SP017 (TSP) setting.	The setting is incorrect. The alarm is detected at 115% of SP017.	Correctly set.		○
		Correctly set.	Check the investigation item No. 4.		
4	Check the PLG output waveform.	There is a problem.	Adjust the PLG output waveform.	○	○
		Normal.	Check the investigation item No. 5.		
5	Check whether the speed waveform is overshooting.	The waveform is overshooting.	Increase the acceleration/ deceleration time constant.	○	○
		The waveform is not overshooting.	Check if there is any abnormality in the unit's ambient environment. (Ex.: Ambient temperature, noise, grounding)		
			Check the investigation item No. 6.		
6	Check the repeatability.	The alarm occurs when the motor is stopped.	Replace the detector or detector cable.	○	○
		The alarm occurs at all time.	Check the investigation item No. 7.		

Alarm No. 32	**Power module overcurrent** Overcurrent protection function in the power module has started its operation.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Disconnect the power cable (U, V, W) from the unit's terminal block and motor, and check whether a short-circuit between the power cable or whether conduction at both end of wiring occurs with a tester.	Short-circuited or not conducted.	Replace the power cables (U, V, W).	○	○
		There is no problem.	Check the investigation item No. 2.		
2	Check the motor insulation with a (megger) tester under the condition of the investigation item No. 1. (between motor power and ground earth)	Less than 1MΩ. (Grounding)	Replace the motor.	○	○
		1MΩ or more. (Normal)	Check the investigation item No. 3.		
3	Check the parameter setting values. • Refer to the adjustment procedure.	The value is not set correctly.	Correctly set.	○	○
		The value is set correctly.	Check the investigation item No. 4.		
4	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	○
		The connector is not disconnected.	Check the investigation item No. 5.		
5	Turn the power OFF, and check the detector cable connection with a tester.	Connection is faulty.	Replace the detector cable.	○	○
		Connection is normal.	Check the investigation item No. 6.		
6	Check the repeatability.	The state returns to normal once, but occurs sometimes thereafter.	Check the investigation item No. 8.	○	○
		The error is always repeated.	Check the investigation item No. 7.		
7	Replace with another unit, and check whether the fault is on the drive unit side or detector side.	The alarm is on the drive unit side.	Replace the drive unit.	○	○
		The alarm is on the detector side.	Replace the detector.		
8	Check for any abnormalities in the unit's ambient environment. (Ex.: Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 34	NC-DRV communication: CRC error An error was detected in the data received from the CNC.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Manually shake the connection connectors between NC and drive unit, battery unit and drive unit, or among multiple drive units to check if they are disconnected. Also, check if an excessive force is not applied on them.	The connector is disconnected (or loose).	Correctly install.	○	○
		The connector is not disconnected.	Check the investigation item No. 2.		
2	Turn the power OFF, and check the connection of the communication cables indicated in item 1 with a tester. Or, replace with a correct cable.	The connection is faulty.	Replace the communication cable.	○	○
		The connection is normal.	Check the investigation item No. 3.		
3	Check whether the NC or drive unit software version was changed recently.	The version was changed.	Change software version back to the original.	○	○
		The version was not changed.	Check the investigation item No. 4.		
4	Replace with another drive unit, and check whether the fault is on the NC side or drive unit side.	The alarm is on the drive unit side.	Replace the drive unit.	○	○
		The alarm is on the unit connections.	Check the investigation item No. 5.		
5	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 35	NC command error The travel command data that was received from the CNC was excessive.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "34" items.			○	○

Alarm No. 36	NC-DRV communication: Communication error The communication with the CNC was interrupted.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "34" items.			○	○

Alarm No. 37	Initial parameter error An incorrect parameter was detected among the parameters received from the CNC at the power ON.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check if the unit in which the alarm was detected is servo or spindle.	The alarm was detected in servo.	Check the investigation item No. 2.	○	○
		The alarm was detected in spindle.	Check the investigation item No. 3.		
2	An error parameter No. is displayed on the NC diagnosis screen. Check the servo parameter with the parameter adjustment procedure.	Wrong parameters were set. SV001 to SV005	Correct the parameter. Set the value within the designated setting range.	○	
		-1 The electronic gears are overflowing.	Check SV001, SV002 and SV018.		
		-2 The absolute position detection parameter is valid when OSE104 and OSE105 are connected. (Absolute position control cannot be used.)	In order to use the absolute position control function, an absolute position option is required.		
		Correct parameters were set.	Check the investigation item No. 4.		
3	An error parameter No. is displayed on the NC diagnosis screen. Check the servo parameter with the parameter adjustment procedure.	SP001 to SP384	Set the value within the designated setting range.		○
4	Check the alarm No. "34" items.			○	○

Alarm No. 38	NC-DRV communication: Protocol error 1 An error was detected in the communication frames received from the CNC.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "34" items.			○	○

Alarm No. 39	NC-DRV communication: Protocol error 2 An error was detected in the axis information data received from the CNC.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "34" items.			○	○

Alarm No. 3A	Overcurrent Excessive current was detected in the motor drive current.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check whether vibration is occurring.	Vibration is occurring.	• Set a filter. • Lower the speed loop gain (SV005/SP005).	○	○
		There is no vibration.	Check the investigation item No. 2.		
2	The speed loop gain setting is larger than the standard value. Servo: SV005 / Spindle: SP005	The setting is too large.	Set an appropriate value.	○	○
		The setting is approximately the same as the standard value.	Check the investigation item No. 3.		
3	Check the current loop gain. Servo: SV009,SV010,SV011,SV012 Spindle: SP081,SP082,SP083,SP084	The setting is incorrect.	Set the standard value.	○	○
		The standard value is set.	Check the investigation item No. 4.		
4	Disconnect the power cable (U,V,W) from the terminal block and the cannon plug from the motor. Check the insulation with a tester.	The power cable is short-circuited.	Replace the motor power cable.	○	○
		There is no problem.	Check the investigation item No. 5.		
5	Check the insulation between the motor power cable and FG.	There is a ground fault at the power cable.	Replace the motor power cable.	○	○
		There is no problem.	Check the investigation item No. 6.		
6	Connect the cannon plug, and check the insulation between the power cable and FG.	There is a ground fault in the motor.	Replace the motor. (With the absolute position system, the zero point must be established.)	○	○
		There is no problem.	Check the investigation item No. 7.		
7	Check if there is any abnormality in the motor's ambient environment. (Ex. Ambient temperature, cutting water)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 3B	Power module overheat Thermal protection function in the power module has started its operation.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check that the fan is rotating correctly.	Large amounts of cutting oil or cutting chips, etc., are adhered, or the rotation is slow.	Clean or replace the fan.	○	○
		The fan is rotating properly.	Check the investigation item No. 2.		
2	Check whether the heat dissipating fins are dirty.	Cutting oil or cutting chips, etc., are adhered, and the fins are clogged.	Clean the fins.	○	○
		The fins are normal.	Check the investigation item No. 3.		
3	Measure the drive unit's ambient temperature.	55°C or more.	Improve the ventilation and cooling for the power distribution panel.	○	○
		Less than 55°C.	Check the investigation item No. 4.		
4	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 42	**Feedback error 1** An error was detected in the feedback signals of the position detector in a servo system, or in PLG's feedback signals in a spindle system.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check SP019 and SP020.	Parameter is set incorrectly.	Correctly set.		○
		Parameter is set correctly.	Check the investigation item No. 2.		
2	Check the alarm No. "2C" items.				○

Alarm No. 43	**Feedback error 2** Excessive difference was detected in position data between the motor end detector and the machine end detector in a servo system. In a spindle system, an error was detected in the encoder feedback signals.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	
		The connector is not disconnected.	Check the investigation item No. 2.		
2	Is the detector cable wired in the same conduit as the motor's power cable, or are the two cables laid in parallel near each other?	The cables are wired near each other. (Noise is entering from the power cable.)	Improve the cable wiring.	○	
		The wires are sufficiently separated.	Check the investigation item No. 3.		
3	Is the motor FG wire connected only to the drive unit which drives it? (Is the motor grounded to one point?)	The motor FG wire is grounded on the motor side.	Ground the motor to one point, connecting the wires together on the drive unit side.	○	
		The motor is grounded to one point.	Check the investigation item No. 4.		
4	Turn the power OFF, and check the detector cable connection with a tester. (Is the cable shielded?)	The connection is faulty.	Replace the detector cable.	○	
		The connection is normal.	Check the investigation item No. 5.		
5	Replace with another unit, and check whether the fault is on the unit side or detector side.	The alarm is on the drive unit side.	Replace the drive unit.	○	
		The alarm is on the detector side.	Check the investigation item No. 6.		
6	Check if there is any abnormality in the detector's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	
7	Check SP019 and SP020.	Parameter is set incorrectly.	Correctly set.	○	
		Parameter is set correctly.	Check the investigation item No. 8.		
8	Check the alarm No. "1B" items.			○	

Alarm No. 45	**Fan stop** A cooling fan built in the drive unit stopped, and the loads on the unit exceeded the specified value.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check if the connector connected to a fan is disconnected.	The connector is disconnected.	Correctly connect the connector.	○	○
		The connector is not disconnected.	Check the investigation item No. 2.		
2	Check if oil or cutting chips are adhered to the fan.	Oil or cutting chips are adhered.	Improve the use environment and replace the drive unit.	○	○
		Oil or cutting chips are not adhered. The cable may be broken.	Replace the drive unit.		

Alarm No. 46	**Motor overheat** Thermal protection function of the motor or in the detector, has started its operation.

	Investigation details	Investigation results	Remedies	SV	SP
1	Check the repeatability.	The alarm occurs before operation.	Check the investigation item No. 2.	○	○
		The alarm occurs occasionally after operation is started.	Check the investigation item No. 5.		
2	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly install.	○	○
		The connector is not disconnected.	Check the investigation item No. 3.		
3	Turn the power OFF, and check the detector cable connection with a tester. (Is the cable shielded?)	The connection is faulty.	Replace the cable.	○	○
		The connection is normal.	Check the investigation item No. 4.		
4	When using MDS-B-HR, check if the motor is validated even if a motor thermal is not provided?	SV034/bit2 = 0	Set SP034/bit2 to 1.	○	
		SV034/bit2 = 1	Check the investigation item No. 5.		
5	Check the overload % (servo) or load meter (spindle).	The load is large.	Servo : Check the investigation item No. 6. Spindle : Check the investigation item No. 8.	○	○
		The load is not large.	Check the investigation item No. 9.		
6	Is the unbalance torque high?	The constant load torque (friction + unbalance) is 60% or more.	Select the motor so that the constant load torque is 60% or less.	○	
		The constant load torque is less than 60%.	Check the investigation item No. 7.		
7	Was the overload alarm (50) forcibly reset by turning the drive unit power OFF?	The alarm was forcibly reset.	Do not turn the drive unit's power OFF when an overload alarm occurs. (The NC power can be turned OFF.)	○	○
		The alarm was not forcibly reset.	Check the investigation item No. 9.		
8	Check the parameter settings.	The parameter is not set correctly.	Correctly set.		○
		The parameter is set correctly.	Check the investigation item No. 9.		
9	Measure the motor temperature when the alarm occurs.	The motor is hot.	Check the investigation item No. 10.	○	○
		The motor is not hot.	Check the investigation item No. 12.		
10	When using a motor with fan, check whether the fan is stopped, or it is clogged with dust, etc.	The motor fan was stopped.	Check the investigation item No. 11.	○	○
		The motor fan wind flow is poor.	Clean the fan.		
11	Check the fan wiring.	There is no problem.	Check the investigation item No. 12.	○	○
		The cable is broken.	Replace the cable.		
		The cable is not broken.	Replace the fan.		
12	Replace the drive unit or motor with another drive unit or motor, and check whether the fault is on the drive unit side or motor side	The alarm is on the drive unit side.	Replace the drive unit.	○	○
		The alarm is on the motor side.	Replace the motor.		
13	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Alarm No. 48	**Motor side detector: Error 5** The motor side detector (linear scale in the case of linear motor) detected an error. As details defer from detector to detector, refer to the separate table (1).

	Investigation details	Investigation results	Remedies	SV	SP
1	Check the alarm No. "1B" items.			○	○

Alarm No. 49	**Motor side detector: Error 6** The motor side detector (linear scale in the case of linear motor) detected an error. As details defer from detector to detector, refer to the separate table (1).

	Investigation details	Investigation results	Remedies	SV	SP
1	Check the alarm No. "1B" items.			○	

Alarm No. 4A	Motor side detector: Error 7 The motor side detector (linear scale in the case of linear motor) detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	Investigation results	Remedies	SV	SP
1	Check the alarm No. "1B" items.			○	○

Alarm No. 4B	Motor side detector: Error 8 The motor side detector (linear scale in the case of linear motor) detected an error. As details defer from detector to detector, refer to the separate table (1).				
	Investigation details	Investigation results	Remedies	SV	SP
1	Check the alarm No. "1B" items.			○	○

Alarm No. 4E	NC command mode error The mode outside the specification was input in spindle control mode selection.				
	Investigation details	Investigation results	Remedies	SV	SP
1	Check the wiring and setting environment. 1) Correctly grounded? 2) Any noise generating devices around the unit? 3) Are the speed/position detector cables correctly shielded?	1) The grounding is incomplete.	Correctly ground.		○
		2) The alarm occurs easily when a specific device operates.	Use noise measures on the device described on the left.		
		3) The cable is not correctly shielded.	Correctly shield the cable.		
		No abnormality is found in particular.	Replace the drive unit.		

Alarm No. 50	Overload 1 Overload detection level became over 100%. The motor or the drive unit is overloaded.				
	Investigation details	Investigation results	Remedies	SV	SP
1	Check the overload parameters. Servo : SV021, SV022 Spindle : SP063, SP064	The standard values (below) are not set. Servo : SV021 = 60, SV022 = 150 Spindle : SV063 = 60, SP064 = 110	Set the standard values.	○	○
		The standard values are set.	Investigate item 2.		
2	Check the overload % (servo) or load meter (spindle).	The load is large.	Servo : Investigate item 3. Spindle : Investigate item 7.	○	○
		The load is not large.	Investigate item 9.		
3	Check whether machine resonance is occurring.	Resonance is occurring.	Adjust the parameters. • Set the notch filter. • Lower VGN1 (SV005).	○	
		Resonance is not occurring.	Investigate item 4.		
4	Check whether the shaft sways when the motor is stopped. (Hunting)	The motor is hunting.	Adjust the parameters. • Increase VGN1 (SV005). • Lower VIA (SV008).	○	
		The motor is not hunting.	Investigate item 5.		
5	Check the brake operation. • Check the brake relay. • Check the connector (CN20) connection.	The motor brakes are not released.	Correct the faulty section.	○	
		The motor brake operation is normal.	Investigate item 6.		
6	Check the load current with the NC Servo Monitor, and investigate the machine load.	The cutting load is large.	Lower the cutting load.	○	
		There is interference with the positioning pin.	When using the positioning pin, turn the servo OFF when stopped.		
		An excessive force is applied from the machine.	Check whether the ball screw is bent, or whether there is a fault in the guide.		
		The machine load is not large.	Investigate item 8.		
7	Check the PLG output waveform.	There is a problem.	Adjust the PLG output waveform.		○
		Normal	Investigate item 8.		
8	Confirm the motor capacity selection again.	The motor performance is insufficient.	Lower the acceleration/deceleration rate or cutting load.	○	○
		The motor performance is sufficient.	Investigate item 9.		
9	Try replacing the drive unit.	Improved.	Replace the drive unit.	○	○
		Not improved.	Replace the motor.		

(Note) NR and PR resetting are not possible when the overload level is 50% or more. Do not forcibly reset (AR) by turning the unit power OFF. If AR resetting is used at 50% or higher, the level is set to 80% when the power is turned ON next. (Servo)

Alarm No. 51	Overload 2 Current command of more than 95% of the unit's max. current was being continuously given for longer than 1 second in a servo system. In a spindle system, current command of more than 95% of the motor's max. current was being continuously given for longer than 1 second.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Did the alarm occur immediately after READY ON?	The alarm occurred after ready ON before operation starts.	Investigate item 2.	○	
		The alarm occurred after normal operation.	Investigate item 5.		
2	Check that the PN voltage is supplied to the drive unit. • Is the CHARGE lamp ON?	The voltage is not supplied.	Correctly supply the PN voltage.	○	
		Approx. 300V is correctly supplied.	Investigate item 3.		
3	Check the motor power cable (U, V, W phases). • The power cable is not connected. • Is the cable connected to the motor for another axis?	The connections are incorrect.	Connect correctly.	○	
		The connections are correct.	Investigate item 4.		
4	Check the detector cable connection. • Is the cable connected to the motor for another axis?	The connections are incorrect.	Connect correctly.	○	
		The connections are correct.	Investigate item 5.		
5	Check whether the machine has collided.	The machine has collided.	Check the machining program and soft limit settings.	○	
		The machine has not collided.	Investigate item 6.		
6	Check whether the current value on the NC Servo Monitor screen is saturated during acceleration/deceleration.	The current is saturated during acceleration/deceleration.	Increase the acceleration/ deceleration time constant.	○	
		The current value during acceleration/deceleration is appropriate.	Investigate item 7.		
7	Check the detector FB.	The FB signal is abnormal.	Replace the detector. (With the absolute position system, the zero point must be established.)	○	
		The FB signal is normal.	Replace the drive unit.		
8	Check the load meter value.	The load is large.	Lower the load.		○
		The load is not large.	Investigate item 9.		
9	Check the PLG output waveform.	There is a problem.	Adjust the PLG output waveform.		○
		Normal	Replace the drive unit.		

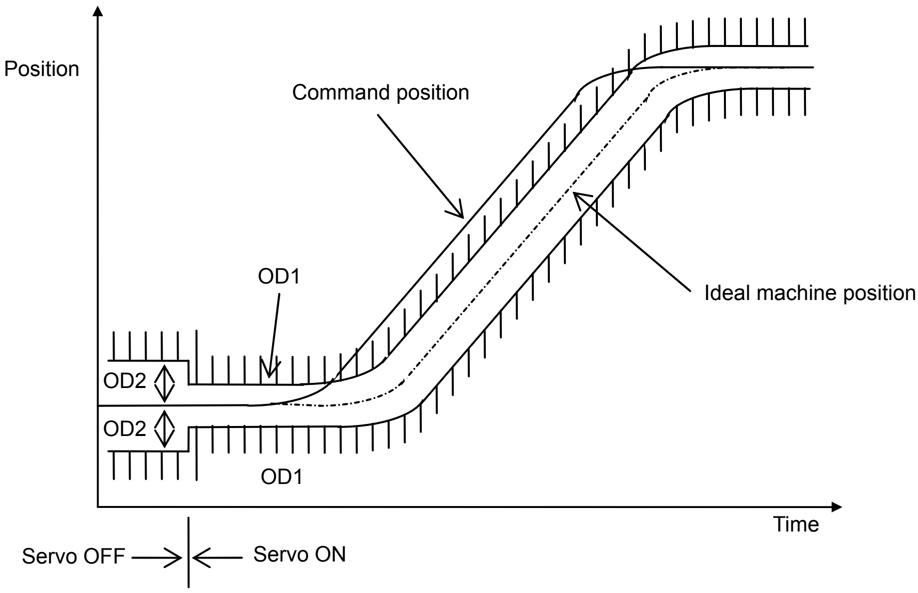
Alarm No. 52	Excessive error 1 A difference between the actual and theoretical motor positions during servo ON exceeded the setting value.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the excessive error detection width. SV023 (Servo) SP102 (Orientation control) SP154, SP155 (C-axis control) SP177/bitD, SP186 (Spindle synchronous control) SP193/bitD, SP218 (Synchronous tap)	The excessive error detection width is too small. Servo standard value: $SV023 = \frac{RAPID}{60 \times PGN1} \div 2$ For the spindle, a value larger than the droop amount: Droop amount = $\frac{\text{Spindle rotation speed} \times \text{No. of pulses}}{60 \times \text{position loop gain}}$	Set appropriate values.	○	○
		Appropriate values are set.	Investigate item 2.		
2	Check the position detector polarity. SV017/bit4 (Servo) SP097/bit5 (Orientation control) SP129/bit5 (C-axis control) SP177/bit5 (Spindle synchronous control) SP193/bit5 (Synchronous tap control)	The polarity is reversed.	Correctly set the parameters.	○	○
		Normal.	Investigate item 3.		
3	Check the alarm No. "51" items.			○	○

Alarm No. 53	Excessive error 2 A difference between the actual and theoretical motor positions during servo OFF exceeded the setting value.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the follow-up function while the NC is in the servo OFF state.	The axis detachment function (NC parameter) is invalid. (Note) For the axis detachment function, refer to the NC manual.	Check the investigation item No. 2.	○	
		The axis detachment function (NC parameter) is valid. (Note) For the axis detachment function, refer to the NC manual.	Check the investigation item No. 3.		
2	Check whether the axis has moved during servo OFF, and check the motor brake operation.	The axis has moved.	Adjust the brakes, etc. so that the axis does not move.	○	
		The axis has not moved.	Check the investigation item No. 3.		
3	Check the excessive error detection width. SV026 (Servo)	The excessive error detection width is too small. $SV026 = \frac{RAPID}{60 \times PGN1} \div 2$	Set an appropriate value.	○	
		An appropriate value is set.	Check for problems on the NC side, such as the position FB follow-up control.		

Alarm No. 54	Excessive error 3 When an excessive error 1 occurred, detection of the motor current failed.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check that the PN voltage is supplied to the drive unit. • Is the CHARGE lamp ON?	The voltage is not supplied.	Correctly supply the PN voltage.	○	
		Approx. 300V is correctly supplied.	Investigate item 2.		
2	Check the motor power cable (U, V, W phases). • The power cable is not connected. • Is the cable connected to the motor for another axis?	The connections are incorrect.	Connect correctly.	○	
		The connections are correct.	Replace the drive unit.		

Supplement (servo)

Depending on the ideal machine position in respect to the command position, the actual machine position could enter the actual shaded section shown below, which is separated more than the distance set in OD1.



Alarm No. 58	Collision detection 1: G0 When collision detection function was valid, the disturbance torque in rapid traverse (G0) exceeded the collision detection level.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check whether the machine has collided.	The machine has collided.	Check the machining program and soft limit settings.	○	
		The machine has not collided.	Increase the detection level (SV060). (The detection level should be set as 1.5-times the maximum torque or more.)		

Alarm No. 59	Collision detection 1: G1 When collision detection function was valid, the disturbance torque in cutting feed (G1) exceeded the collision detection level.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check whether the machine has collided.	The machine has collided.	Check the machining program and soft limit settings.	○	
		The machine has not collided.	Increase the detection level (SV035. clG1). (Set the detection level larger than the maximum cutting load.)		

Alarm No. 5A	Collision detection 2 When collision detection function was valid, the command torque reached the max. motor torque.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check whether the machine has collided.	The machine has collided.	Check the machining program and soft limit settings.	○	
		The machine has not collided.	Check the investigation item No. 2.		
2	Check whether the current value on the NC Servo Monitor screen is saturated during acceleration/deceleration.	The current is saturated during acceleration/deceleration.	Check the investigation item No. 3.	○	
		The current value during acceleration/deceleration is appropriate.	Investigate the cause of the load fluctuation.		
3	Can the acceleration/deceleration time constant be changed?	The constant can be changed.	Increase the acceleration/ deceleration time constant.	○	
		The constant cannot be changed.	Set to ignore collision detection method 2.		

Alarm No. 5B	Safety observation: Commanded speed error In safety monitoring mode, the commanded speed was detected to exceed the safe speed.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the commanded speed on the NC side.	The commanded speed and safe speed limit value are the same.	Reduce the commanded speed on the NC side or increase the safe speed limit value.	○	○
		The commanded speed is slower than the safe speed.	Replace the drive unit.		

Alarm No. 5D	Safety observation: Door state error In safety monitoring mode, the door state signal from the NC and the same signal from the drive unit don't match. Otherwise, door open state was detected in normal mode.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the DI input timing.	Both NC side and drive unit side input timings match one another within 500ms.	Review the DI input sequence. Check if the cable for the DI input signal is broken.	○	○
		NC side and drive unit side inputs do not match one another within 500ms.	Investigate the wiring and connection environment.		

Alarm No. 5E	**Safety observation: Feedback speed error** In safety monitoring mode, the motor speed was detected to exceed the safe speed.			
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the DI input timing.	The feedback speed and safe speed limit value are the same.	Reduce the commanded speed on the NC side or increase the safe speed limit value.	○	○
		The feedback speed is slower than the safe speed.	Replace the drive unit.		
2	Check the wiring and setting environment. 1) Correctly grounded? 2) Any noise generating devices around the unit? 3) Are the speed/position detector cables correctly shielded?	1) The grounding is incomplete.	Correctly ground.	○	○
		2) The alarm occurs easily when a specific device operates.	Use noise measures on the device described on the left.		
		3) The cable is not correctly shielded.	Correctly shield the cable.		
		No abnormality is found in particular.	Replace the drive unit.		

Alarm No. 61	**Power supply: Power module overcurrent** Overcurrent protection function in the power module has started its operation.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the state of the operation when the alarm occurs, and check the repeatability.	The alarm occurs each time immediately after 200VAC is supplied or after READY is turned ON.	Replace the unit.	○
		The alarm occurs frequently during READY ON.	Check the investigation item No. 3.	
		The alarm occurs after continuous operation for a long time. The unit is hot.	Check the investigation item No. 2.	
2	Check the load state of all motors, and the starting/stopping frequency.	The total load of all motors exceeds the rated capacity of the power supply unit.	Lower the motor load and operation frequency.	○
		The total does not exceed the capacity.	Check the investigation item No. 3.	
3	Check the power capacity.	The power capacity is insufficient.	Increase the power capacity.	○
		The specified power capacity is secured.	Check the investigation item No. 4.	
4	Measure the voltage across wires. • Is the voltage 170V or more even when the motor is accelerating?	The voltage drops to 170V or less occasionally.	Increase the power capacity.	○
		The difference of the voltage across wires is 10V or more.	Improve the power phase balance.	
		The difference of the voltage across wires is less than 10V.	Check the investigation item No. 5.	
5	Measure the power voltage with a synchroscope, and check whether there is any distortion. • Are there any other devices causing the power distortion?	The power voltage is distorted.	Improve the source of the distortion. Install an AC reactor.	○
		The power voltage waveform is not abnormal.	Check the investigation item No. 6.	
6	Check if there is any abnormality in the unit's ambient environment. (Ex. Noise, grounding, etc.)	Take remedies according to the causes of the abnormality in the ambient environment.		○

Alarm No. 62	Power supply: Frequency error The input power supply frequency increased above the specification range.			
	Investigation details	Investigation results	Remedies	CV
1	Check the state of the operation when the alarm occurs, and check the repeatability.	The alarm occurs each time immediately after the power is turned ON. Or, the alarm occurs occasionally regardless of the operation state.	Check the investigation item No. 2.	○
		The alarm occurs only while the motor is accelerating/decelerating.	Check the investigation item No. 3.	
2	Measure the power voltage waveform during normal operation.	The frequency is deviated from 50Hz±3% or 60Hz±3%.	Review the power facilities.	○
		The voltage waveform dips at some sections.	Improve the source of the distortion. Install an AC reactor.	
		There is no problem.	Check the investigation item No. 4.	
3	Measure the power voltage when the motor is accelerating/decelerating.	The frequency greatly fluctuates during acceleration/deceleration.	Review the power facilities.	○
		The voltage waveform during deceleration dips in some sections.	Improve the source of the distortion. Install an AC reactor.	
		There is no problem.	Check the investigation item No. 4.	
4	Check if there is any abnormality in the unit's ambient environment. (Ex. Noise, grounding, etc.)	Take remedies according to the causes of the abnormality in the ambient environment.		○

Alarm No. 67	Power supply: Phase interruption An open-phase condition was detected in input power supply circuit.			
	Investigation details	Investigation results	Remedies	CV
1	Check the voltage for each input phase.	There are phases with no voltage.	Correct the power supply.	○
		There is no problem.	Check the investigation item No. 2.	
2	Check the alarm No. "71" items.			○

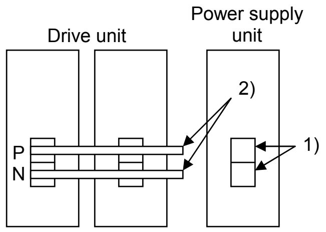
Alarm No. 68	Power supply: Watchdog The system does not operate correctly.			
	Investigation details	Investigation results	Remedies	CV
1	Check the repeatability.	The alarm occurs each time READY is turned ON.	Replace the unit.	○
		The alarm occurs occasionally.	Check the investigation item No. 2.	
2	Check if there is any abnormality in the unit's ambient environment. (Ex. Noise, grounding, etc.)	Take remedies according to the causes of the abnormality in the ambient environment.		○

Alarm No. 69	Power supply: Grounding The motor power cable is in contact with FG (Frame Ground).				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Measure the insulation across the power cables (U,V,W) for all motors and the ground. (Carry out a megger test.)	Less than 100kΩ. (Grounding)	The motor or power cable may be ground faulted.	○	○
		100kΩ or more. (Normal)	Check the investigation item No. 2.		
2	Has oil come in contact with the motor or power cable?	Oil has come in contact.	Take measures so that oil does not come in contact. Check the motor's cannon connector and the inside of the terminal box, and clean as necessary.	○	○
		Oil has not come in contact.	Check the investigation item No. 3.		
3	Measure the insulation again.	Less than 1MΩ. (Grounding)	Replace the motor or cable.	○	○
		1MΩ or more. (Normal)	Check the investigation item No. 2.		
4	Measure the resistance across the U, V, W phase terminals of the servo/spindle drive unit and the ground. (Do not measure the insulation as the unit could be damaged.)	Less than 100kΩ.	Replace the drive unit.	○	○
		100kΩ or more.	Replace the power supply unit.		
5	Check whether there is any axis in which alarm has occurred.	There is an axis in which alarm has occurred.	Check the alarm No. "24" items.	○	○
		There is no axis in which alarm has occurred.	Check the investigation item No. 2.		

Alarm No. 6A	Power supply: External contactor welding A contact of the external contactor is welding.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check whether any alarm has occurred on the drive unit side.	An alarm has occurred.	Remove the cause of the alarm on the drive side, and check the investigation item No. 2.	○
		An alarm has not occurred.	Check the investigation item No. 2.	
2	Check whether the contactor's contact has melted.	The contactor has melted.	Replace the contactor.	○
		The contactor has not melted.	Check the investigation item No. 3.	
3	Check that the contactor excitation wiring is correctly connected from the power supply unit's MC1 terminal.	The connection is correct.	Correctly connect.	○
		The connection is incorrect.	Replace the power supply unit.	

Alarm No. 6B	Power supply: Rush relay welding A resistor relay for rush short circuit fails to be OFF.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check whether any alarm has occurred on the drive unit side.	An alarm has occurred.	Remove the cause of the alarm on the drive side, and then carry out the investigation details 2.	○
		An alarm has not occurred.	Check the investigation item No. 2.	
2	Check the repeatability.	The alarm occurs each time READY is turned ON.	Replace the unit.	○
		The alarm occurs occasionally.	Check the investigation item No. 3.	
3	Check if there is any abnormality in the unit's ambient environment. (Ex. Noise, grounding, etc.)	Take remedies according to the causes of the abnormality in the ambient environment.		○

Alarm No. 6C	Power supply: Main circuit error An error was detected in charging operation of the main circuit capacitor.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the CHARGE lamp state when the alarm occurs.	The CHARGE lamp remains ON for some time.	Replace the power supply unit.	○
		The lamp turns ON instantly, but when the alarm occurs and the contactor turns OFF, the lamp turns OFF immediately.	Check the investigation item No. 2.	
		The lamp never turns ON.	Check the investigation item No. 2. Then replace the unit.	
2	Disconnect the power supply unit's PN terminal block wiring, and measure the resistance value at 1) and 2) shown below.	1) The power supply unit side is abnormal.	Replace the power supply unit.	○
		2) The drive unit side is abnormal.	Disconnect the PN wiring, and then check the drive unit side.	
		1) and 2) are both normal.	Replace the power supply unit.	



Tester measure-ment point	Polarity +	Polarity -	Normal	Abnormal
1)	P	N	Several 100Ω	Short-circuit/∞Ω
	N	P	∞Ω	Several 100Ω
2)	P	N	Several 100Ω	Short-circuit/∞Ω
	N	P	∞Ω	Several 100Ω

Alarm No. 6E	Power supply: Memory error/AD error An error was detected in the internal memory or A/D converter.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the repeatability.	The alarm occurs each time READY is turned ON.	Replace the unit.	○
		The alarm occurs occasionally.	Check the investigation item No. 2.	
2	Check if there is any abnormality in the unit's ambient environment. (Ex. Noise, grounding, etc.)	Take remedies according to the causes of the abnormality in the ambient environment.		○

Alarm No. 6F	Power supply error No power supply is connected to the drive unit, or a communication error was detected.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the LED display on the power supply unit.	"F" is flickering.	An A/D converter error has occurred. Check the alarm No. "6E" items.	○
		Another alarm code is flickering.	Check items of each alarm No.	
		"0" is displayed.	Check the investigation item No. 2.	
		"F" is displayed.	Check the investigation item No. 2.	
		"8" is displayed.	Check the alarm No. "68" items.	
		"b", "C", "d" is displayed.	Check the investigation item No. 3.	
		Something else is displayed.	Check the alarm No. "68" items.	
2	Check the rotary switch setting.	0 or 4 is set.	Check the investigation item No. 3.	○
		A value other than the above is set.	Correctly set the rotary switch.	
3	Check the communication cable (CN4) connected with the drive unit.	There is a problem with the wiring or shield.	Replace the cable.	○
		There is no problem.	Replace the unit.	

(Note) Alarm 6F is detected at the same time other power supply alarms occur.

Alarm No. 70	**Power supply: External emergency stop error** A mismatch of the external emergency stop input and CNC emergency stop input continued for 30 seconds.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the connection between external emergency stop and NC emergency stop.	Not wired.	Correctly wire the external emergency stop and NC emergency stop.	○
2	Check if there is any abnormality in the unit's ambient environment.	No abnormality is found in particular.	Replace the drive unit.	○
		The grounding is incomplete.	Take remedies according to the causes of the abnormality. Additionally ground and review.	

Alarm No. 71	**Power supply: Instantaneous power interruption** The power was momentarily interrupted.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Investigate the sequence to check whether the contactor has been turned OFF with an emergency stop button, etc.	The contactor has been turned OFF externally.	Review the machine sequence. When turning the contactor OFF with external means, such as an emergency stop button, this alarm can be avoided by inputting NC emergency stop at the same time.	○
		The contactor has not been turned OFF.	Check the investigation item No. 2.	
2	Check the repeatability.	The alarm occurs each time READY is turned ON.	Check the investigation item No. 3.	○
		The alarm occurs at a certain operation.	Check the investigation item No. 1. If there is no problem, check the investigation item No. 3.	
		The alarm occurs occasionally during operation.	Check the investigation item No. 4.	
3	Check whether the power input wire and contactor are correctly wired.	The wiring is incorrect.	Correctly connect.	○
		There is no problem.	Check the investigation item No. 4.	
4	Check the power voltage waveform with a synchroscope.	An instantaneous power failure or voltage drop occurs frequently.	Correct the power facility.	○
		There is no problem.	Replace the unit.	

Alarm No. 72	**Power supply: Fan stop** A cooling fan built in the power supply unit stopped, and overheat occurred in the power module.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check if the connector connected to a fan is disconnected.	The connector is disconnected.	Correctly connect the connector.	○
		The connector is not disconnected.	Check the investigation item No. 2.	
2	Check if oil or cutting chips are adhered to the fan.	Oil or cutting chips are adhered.	Improve the use environment and replace the drive unit.	○
		Oil or cutting chips are not adhered. The cable may be broken.	Replace the drive unit.	

Alarm No. 73

Power supply: Over regeneration

Over-regeneration detection level became over 100%. The regenerative resistor is overloaded. This alarm cannot be reset for 15 min from the occurrence. Leave the drive system energized for more than 15 min, then turn the power ON to reset the alarm.

	Investigation details	Investigation results	Remedies	CV
1	Check the alarm occurrence state and regenerative load displayed on the NC Monitor screen while changing the operation mode.	The regenerative load value increases when the power is turned ON and the motor is not rotated.	Check whether the state is affected by power fluctuation, grounding or noise. If there is no problem, replace the unit.	○
		The regenerative load value increases each time the motor decelerates, and the alarm occurs.	A-CR : Check the investigation item No. 2. C1-CV : Check the investigation item No. 4.	
		The regenerative load value increases each time the motor decelerates, but the alarm does not occur when the operation mode is eased.	A-CR : Check the investigation item No. 2. C1-CV : Ease the operation mode.	
2	Check whether the parameter (regenerative resistor type) of the drive unit controlling the power supply unit is correct.	The setting is incorrect.	Correctly set. (Check the alarm No. "6D" items.)	○
		The setting is correct.	Check the investigation item No. 3.	
3	Check the regenerative resistor's state. • Is oil adhered? • Measure the resistance value.	The regenerative resistor is abnormal.	Replace the regenerative resistor.	○
		There is no problem.	Check the investigation item No. 4.	
4	Check the alarm No. "75" items.			○

Alarm No. 75

Power supply: Overvoltage

L+ and L- bus voltage in main circuit exceeded the allowable value. As the voltage between L+ and L- is high immediately after this alarm, another alarm may occur if this alarm is reset in a short time. Wait more than 5 min before resetting so that the voltage drops.

	Investigation details	Investigation results	Remedies	CV
1	Check the repeatability.	The alarm occurs each time the motor decelerates.	Check the investigation item No. 3.	○
		The alarm occurs occasionally.	Check the investigation item No. 2.	
2	Check the power supply's alarm history.	Auxiliary regeneration frequency over (E8) occurs just before the over-voltage occurs.	Limit the occurrence of the excessive instantaneous regeneration by not decelerating multiple axes at the same time.	○
		Others.	Check the investigation item No. 3.	
3	Check the power capacity.	The power capacity is insufficient.	Increase the power capacity.	○
		The specified power capacity is secured.	Check the investigation item No. 4.	
4	Measure the voltage across wires. • Is the voltage 170V or more even when the motor is accelerating?	The voltage drops to 170V or less occasionally.	Increase the power capacity.	○
		The difference of the voltage across wires is 10V or more.	Improve the power phase balance.	
		The difference of the voltage across wires is less than 10V.	Check the investigation item No. 5.	
5	Measure the power voltage with a synchroscope, and check whether there is any distortion. • Are there any other devices causing the power distortion?	The power voltage is distorted.	Improve the source of the distortion. Install an AC reactor.	○
		The power voltage waveform is not abnormal.	Check the investigation item No. 6.	
6	Check if there is any abnormality in the unit's ambient environment. (Ex. Noise, grounding, etc.)	Take remedies according to the causes of the abnormality in the ambient environment.		○

Alarm No. 76	Power supply: External emergency stop setting error The rotary switch setting of external emergency stop is not correct, or a wrong external emergency stop signal is input.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the rotary switch setting.	When using external emergency stop, rotary switch is not set to "4".	Set the rotary switch to "4".	○
2	Check if there is any abnormality in the unit's ambient environment.	No abnormality is found in particular.	Replace the drive unit.	○
		The grounding is incomplete.	Take remedies according to the causes of the abnormality. Additionally ground and review.	

Alarm No. 77	Power supply: Power module overheat Thermal protection function in the power module has started its operation.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Confirm that the fan is properly rotating.	Large amounts of cutting oil or cutting chips, etc., are adhered, or the rotation is slow.	Clean or replace the fan.	○
		The fan is properly rotating.	Check the investigation item No. 2.	
2	Check whether the heat dissipating fins are dirty.	Cutting oil or cutting chips, etc., are adhered, and the fins are clogged.	Clean the fins.	○
		The fins are normal.	Check the investigation item No. 3.	
3	Measure the power supply unit's ambient temperature.	55°C or more	Improve the ventilation and cooling for the power distribution panel.	○
		Less than 55°C.	Check the investigation item No. 4.	
4	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○

Alarm No. 88	Watchdog The system does not operate correctly.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check whether the servo or spindle software version was changed recently.	The version was changed.	Change software version back to the original.	○	○
		The version was not changed.	Check the investigation item No. 2.		
2	Check the repeatability.	The error is always repeated.	Replace the drive unit.	○	○
		The state returns to normal once, but occurs sometimes thereafter.	Check the investigation item No. 3.		
3	Check if there is any abnormality in the unit's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	○

Appendix 1.3 Troubleshooting for each warning No.

Warning No. 9E	**Absolute position detector: Revolution counter error** An error was detected in the revolution counter of the absolute position detector. The absolute position data cannot be compensated.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check if there is any abnormality in the detector's ambient environment. (Ex. Ambient temperature, noise, grounding)	Take remedies according to the causes of the abnormality in the ambient environment.		○	
2	Check the repeatability.	Occurs frequently.	Replace the detector.	○	○
		Is not repeated.	Check the investigation item No. 1.		

Warning No. 9F	**Battery voltage drop** The battery voltage that is supplied to the absolute position detector dropped. The absolute position data is retained.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Measure the battery (MDS-A-BT) voltage.	Less than 3V.	Replace the battery unit.	○	
		3V or more.	Check the investigation item No. 2.		
2	Check whether the NC bus cable is disconnected.	The cable is disconnected.	Correctly connect.	○	
		The cable is not disconnected.	Check the investigation item No. 3.		
3	Check whether the battery wire in the detector cable is broken.	The cable is broken.	Replace the cable.	○	
		The cable is not broken.	Check the investigation item No. 4.		
4	Replace the drive unit.	Improved.	Replace the drive unit.	○	
		Not improved.	Replace the detector. (With the absolute position system, the zero point must be established.)		

(Note) When warning 9F occurs, do not turn the drive unit power OFF to ensure that the absolute position data is held. Replace the battery with the drive unit power ON.

Warning No. A6	**Fan stop warning** A cooling fan built in the drive unit stopped.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the alarm No. "45" items.			○	○

Warning No. E1	**Overload warning** Overload detection level exceeded 80%.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check if the motor is hot.	Motor is hot.	Check the alarm No. "50" items.		○
		Motor is not hot.	Check the investigation item No. 2.		
2	Check if an error occurs when executing acceleration/deceleration operation.	Error is not found in operation. Thus, operation is possible.	Ease the operation patter, if possible. If no alarm occurs, operation can be continued as it is.		○
		Error is found in operation.	Check the investigation item 3 or later of Alarm No. 50.		
3	Check the alarm No. "50" items.			○	○

Warning No. E4	**Set parameter warning** An incorrect parameter was detected among the parameters received from the CNC.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check the error parameter No.	SV001 to SV256 SP001 to SP256	Set the value within the designated setting range.	○	○
2	Check the spindle control input 4/bit 0 to 2.	Selected other than 000, 001, 010 and 100 when the alarm occurred.	Correctly select.		○

Warning No. E6	**Control axis detachment warning** Control axis detachment was commanded.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	The status in which removal of the control axis was commanded from the NC is indicated.			○	

Warning No. E7	In NC emergency stop state Emergency stop was input from the CNC.				
	Investigation details	**Investigation results**	**Remedies**	**SV**	**SP**
1	Check if the emergency stop is applied on the NC side.	The emergency stop is applied.	Check the investigation item No. 2.	○	○
		The emergency stop is cancelled.	Check the investigation item No. 3.		
2	Cancel the emergency stop.	Normally starts up.	Normal.	○	○
		"E7" remains displayed.	Check the investigation item No. 3.		
3	Check whether an alarm is occurring in another drive unit.	An alarm is occurring in another drive unit.	Reset the alarm in the other drive unit.	○	○
		An alarm is not occurring.	Check the investigation item No. 4.		
4	Turn the power of NC and 200VAC (400V) ON again			○	○

Warning No. E9	Instantaneous power interruption warning The power was momentarily interrupted.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the alarm No. "71" items.			○

Warning No. EA	In external emergency stop state External emergency stop signal was input.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check whether the specifications allow use of the external emergency stop.	Use is not allowed.	Invalidate the external emergency stop.	○
		Use is allowed.	Check the investigation item No. 2.	
2	Measure the input voltage of the CN23 connector. (While emergency stop is cancelled.)	24V is input.	Replace the power supply unit.	○
		24V is not input.	Check whether the external emergency stop cable is broken, or check the external contact operation.	

Warning No. EB	Power supply: Over regeneration warning Over-regeneration detection level exceeded 80%.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the alarm No. "73" items.			○

Warning No. EE	Power supply: Fan stop warning A cooling fan built in the power supply unit stopped.			
	Investigation details	**Investigation results**	**Remedies**	**CV**
1	Check the alarm No. "72" items.			○

Appendix 1.4 Parameter numbers during initial parameter error

If an initial parameter error (alarm 37) occurs, the alarm and the No. of the parameter set exceeding the setting range will appear on the NC Diagnosis screen as shown below.

S02 Initial parameter error ○○○○ □

○○○○ : Error parameter No.
□ : Axis name

If an error No. larger than the servo parameter No. is displayed for the servo drive unit (MDS-D/DH-V1/V2), the alarm is occurring for several related parameters. Refer to the following table, and correctly set the parameters.

Error parameter No.	Details	Related parameters
2301	The following settings are overflowing. • Electronic gears • Position loop gain • Speed feedback	SV001, SV002 SV003, SV018 SV019, SV020 SV049
2302	The absolute position parameter is valid when OSE104 and OSE105 are connected.	SV017, SV025

Appendix 1.5 Troubleshooting the spindle system when there is no alarm or warning

If an abnormality is observed in the spindle system but no alarm or warning has occurred, refer to the following table and check the state.

[1] The rotation speed command and actual rotation speed do not match.

	Investigation item	Investigation results	Remedies
1	Check the speed command.	The speed command is not input correctly.	Input the correct speed command.
		The speed command is correct.	Check the investigation item No. 2.
2	Check whether there is slipping between the motor and spindle. (When connected with a belt or clutch.)	There is slipping.	Repair the machine side.
		No particular problems found.	Check the investigation item No. 3.
3	Check the spindle parameters (SP026, SP129 and following).	The correct values are not set.	Set the correct values.
		The correct values are set.	Replace the spindle drive unit.

[2] The starting time is long or has increased in length.

	Investigation item	Investigation results	Remedies
1	Check whether the friction torque has increased.	The friction torque has increased.	Repair the machine side.
		No particular problems found.	Check the investigation item No. 2.
2	Manually rotate the motor bearings and check the movement.	The bearings do not rotate smoothly.	Replace the spindle motor.
		The bearings rotate smoothly.	Check the investigation item No. 3.
3	Check whether the torque limit signal has been input.	The signal has been input.	Do not input this signal.
		The signal is not input.	Replace the drive unit.

[3] The motor stops during cutting.

	Investigation item	Investigation results	Remedies
1	Check the load rate during cutting.	The load meter sways over 120% during cutting.	Reduce the load.
		No particular problems found.	Check the investigation item No. 2.
2	Carry out the same investigations and remedies as section (4).		

[4] The vibration and noise (gear noise), etc., are large.

	Investigation item	Investigation results	Remedies
1	Check the machine's dynamic balance. (Coast from the maximum speed.)	The same noise is heard during coasting.	Repair the machine side.
		No particular problems found.	Check the investigation item No. 2.
2	Check whether there is a resonance point in the machine. (Coast from the maximum speed.)	Vibration and noise increase at a set rotation speed during coasting.	Repair the machine side.
		No particular problems found.	Check the investigation item No. 3.
3	Check the machine's backlash.	The backlash is great.	Repair the machine side.
		No particular problems found.	Check the investigation item No. 4.
4	Check the spindle parameter settings. (SP005:VGN1, SP006:VIA1, SP007:VIL1, SP008:VGN2, SP009:VIA2, SP010:VIL2, SP014:PY1)	The vibration and noise levels will increase when the setting value is set to approx. half.	Change the setting value. Note that the impact response will drop.
		The symptoms do not change even if the above value is set.	Return the setting values to the original values. Check the investigation item No. 5.
5	Jiggle the detector connectors (drive unit side and detector side) and check if they are disconnected.	The connector is disconnected (or loose).	Correctly connect the connector.
		The connector is not disconnected (or loose).	Check the investigation item No. 6.
6	Turn the power OFF, and check the connection of the speed detector cable with a tester.	The connection is faulty or disconnected.	Replace the detector cable. Correct the connection.
		The connection is normal.	Replace the drive unit.

[5] The spindle coasts during deceleration.

	Investigation item	Investigation results	Remedies
1	Check whether there is slipping between the motor and spindle. (When connected with a belt or clutch.)	There is slipping.	Repair the machine side.
		No particular problems found.	Replace the drive unit.

[6] The rotation does not stabilize.

	Investigation item	Investigation results	Remedies
1	Check the spindle parameter SP005 (SP008) settings.	The rotation stabilizes when the settings values are both set to approx. double.	Change the setting value. Note that the gear noise may increase.
		The symptoms do not change even when the above value is set.	Return the setting values to the original values. Check the investigation item No. 2.
2	Manually shake the speed detector connectors (spindle drive unit side and speed detector side) to check if they are disconnected.	The connector is disconnected (or loose).	Correctly connect the connector.
		The connector is not disconnected (or loose).	Check the investigation item No. 3.
3	Turn the power OFF, and check the connection of the speed detector cable with a tester. (Especially check the shield wiring.)	The connection is faulty or disconnected.	Replace the detector cable. Correct the connection.
		The connection is normal.	Check the investigation item No. 4.
4	Investigate the wiring and installation environment. 1) Is the ground correctly connected? 2) Are there any noise-generating devices near the drive unit?	1) The grounding is incomplete.	Correctly ground.
		2) The alarm occurs easily when a specific device operates.	Use noise measures on the device described on the left.
		No particular problems found.	Replace the spindle drive unit.

[7] The speed does not rise above a set level.

	Investigation item	Investigation results	Remedies
1	Check the speed command. Check whether the override input is input from the machine operation panel.	The speed command is not input correctly.	Input the correct speed command.
		The speed command is input correctly.	Check the investigation item No. 2.
2	Check whether the load has suddenly become heavier.	The load has become heavier.	Repair the machine side.
		No particular problems found.	Check the investigation item No. 3.
3	Manually rotate the motor bearings and check the movement.	The bearings do not rotate smoothly.	Replace the spindle motor.
		The bearings rotate smoothly.	Check the investigation item No. 4.
4	Manually shake the speed detector connectors (spindle drive unit side and speed detector side) to check if they are disconnected.	The connector is disconnected (or loose).	Correctly connect the connector.
		The connector is not disconnected (or loose).	Check the investigation item No. 5.
5	Turn the power OFF, and check the connection of the speed detector cable with a tester. (Especially check the shield wiring.)	The connection is faulty or disconnected.	Replace the detector cable. Correct the connection.
		The waveform is normal.	Replace the spindle drive unit.

APPENDIX 2

M60S $\rightarrow$ M700/M70 signal list

Appendix 2.1 PLC device table

M60S・M625（PLC4B mode）			
Device		Signal number	Detail
X		1216	PLC Machine input（1st system）
Y		1344	PLC Machine output（1st system）
U	※1	384	PLC Machine input（2nd system）
W	※3	512	PLC Machine output（2nd system）
I	※1	1024	PLC Machine input
J	※1	1600	PLC Machine output
S	※1	320	PLC Machine input/output
M		5120	Temporary memory
G	※1	3072	Temporary memory
F		128	Temporary memory
L		256	Latch relay
E	※1	128	Special relay
T		104	Timer
Q	※1	152	Fixed timer
C		24	Counter
B	※3	104	Fixed counter
D		1024	Data register
R		8192	File register
A	※1	2	Accumulator
Z		1	Index register
V	※3	1	Index register
N		8	Master control
P		256	Jump, call label
K		-	Decimal constant
H		-	Hexdecimal constant

M700（GPPW mode）			
Device		Signal number	Detail
X		8192	PLC Machine input
Y		8192	PLC Machine output
M		10240	Temporary memory
L		512	Latch relay
F		1024	Temporary memory
SB	※2	512	Linked special relay
B	※3	8192	Link relay
SM	※2	128	Special relay
V	※3	256	Edge relay
SW	※2	512	Linked special relay
SD	※2	128	Special register
T		720	Timer
ST	※2	48	Integrated timer
C		256	Counter
D		2048	Data register
R		13312	File register
W	※3	8192	Link register
Z		14	Index register
N		8	Master control
P		2048	Jump, call label
K		-	Decimal constant
H		-	Hexdecimal constant

※1：deleted device.
※2：new add device.
※3：different using method device.

Appendix 2.2 M700/M70 series XY device and R register table

(1) X device

Device	Detail
X0000 ～ X00FF	RIO1 input
X0100 ～ X01FF	RIO2 input
X0200 ～ X02FF	RIO3 input
X0300 ～ X05FF	RIO(Spare）
X0600 ～ X067F	Spare
X0680 ～ X06BF	PLC switch(1～32、Spare 33～64)
X06C0 ～ X06EF	Spare
X06F0 ～ X06FF	Manual skip finish output・skip output(8)
X0700 ～ X077F	NC to PLC input (system common)
X0780 ～ X0BFF	NC to PLC input(axis)
X0C00 ～ X0D3F	NC to PLC input(1st system)
X0D40 ～ X0E7F	NC to PLC input(2nd system)
X0E80 ～ X0FBF	NC to PLC input(3rd system)
X0FC0 ～ X10FF	NC to PLC input(4th system)
X1100 ～ X187F	Spare
X1880 ～ X18DF	NC to PLC input(1st spindle)
X18E0 ～ X193F	NC to PLC input(2nd spindle)
X1940 ～ X199F	NC to PLC input(3rd spindle)
X19A0 ～ X19FF	NC to PLC input(4th spindle)
X1A00 ～ X1CFF	Spare
X1D00 ～ X1DFF	NC to PLC input(position switch)
X1E00 ～ X1FFF	Spare

(2) Y device

Device			Detail
Y0000	～	Y00FF	RIO1 input
Y0100	～	Y01FF	RIO2 input
Y0200	～	Y02FF	RIO3 input//
Y0300	～	Y067F	RIO(Spare）/
Y0680	～	Y06BF	PLC switch(1～32、Spare 33～64) display
Y06C0	～	Y06FF	PLC switch(1～32、Spare 33～64) signal
Y0700	～	Y077F	From PLC to NC output signal(system common signal)
Y0780	～	Y0BFF	PLC to NC output(axie)
Y0C00	～	Y0D3F	PLC to NC output(1st system)
Y0D40	～	Y0E7F	PLC to NC output(2nd system)
Y0E80	～	Y0FBF	PLC to NC output(3rd system)
Y0FC0	～	Y10FF	PLC to NC output(4th system)
Y1100	～	Y187F	Spare
Y1880	～	Y18DF	NC to PLC output(1st spindle)
Y18E0	～	Y193F	NC to PLC output(2nd spindle)
Y1940	～	Y199F	NC to PLC output(3rd spindle)
Y19A0	～	Y19FF	NC to PLC output(4th spindle)
Y1A00	～	Y1CFF	Spare
Y1D00	～	Y1DFF	PLC to NC output(position switch)
Y1E00	～	Y1EFF	For area bus link（Spare）
Y1F00	～	Y1FFF	For area bus link（Spare）

(3) R register

Device			Detail
R00000	~	R00199	System common data(NC→PLC)
R00200	~	R00499	System common data(PLC→NC)
R00500	~	R00699	1st system data(NC→PLC)
R00700	~	R00899	2nd system data(NC→PLC)
R00900	~	R01099	3rd system data(NC→PLC)
R01100	~	R01299	4th system data(NC→PLC)
R01300	~	R02499	Spare
R02500	~	R02699	1st system data(PLC→NC)
R02700	~	R02899	2nd system data(PLC→NC)
R02900	~	R03099	3rd system data(PLC→NC)
R03100	~	R03299	4th system data(PLC→NC)
R03300	~	R04499	Spare
R04500	~	R05683	Axis data（NC→PLC)
R05684	~	R05699	Spare
R05700	~	R06371	Axis data（PLC→NC)
R06372	~	R06499	User macro program (NC→PLC：64 point、PLC→NC：64 point)
R06500	~	R06549	1st spindle data(NC→PLC)
R06550	~	R06599	2nd spindle data(NC→PLC)
R06600	~	R06649	3rd spindle data(NC→PLC)
R06650	~	R06699	4th spindle data(NC→PLC)
R06700	~	R06999	Spare
R07000	~	R07049	1st spindle data(PLC→NC)
R07050	~	R07099	2nd spindle data(PLC→NC)
R07100	~	R07149	3rd spindle data(PLC→NC)
R07150	~	R07199	4th spindle data(PLC→NC)
R07200	~	R07499	Spare
R07500	~	R07949	PLC constant
R07950	~	R07999	（Empty）
R08000	~	R08299	Spare
R08300	~	R09799	User store area
R09800	~	R09899	User work area
R09900	~	R09999	J2CT(8 axes)
R10000	~	R10099	Remote IO error data
R10100	~	R13311	Spare

(4) T register、ST register、C register

Device			Detail
T000	～	T703	Timer（Variable/fixed for parameter setting）
ST00	～	ST63	Intrgrated timer（100ms unit）
C000	～	C255	Counter（Variable/fixed for parameter setting）

Appendix 2.3 X device

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System common	NC reset（key input）	X2F0	—	—	—	X108	—	—	—
	PLC switch #1	X680	—	—	—	X140	—	—	—
	PLC switch #2	X681	—	—	—	X141	—	—	—
	PLC switch #3	X682	—	—	—	X142	—	—	—
	PLC switch #4	X683	—	—	—	X143	—	—	—
	PLC switch #5	X684	—	—	—	X144	—	—	—
	PLC switch #6	X685	—	—	—	X145	—	—	—
	PLC switch #7	X686	—	—	—	X146	—	—	—
	PLC switch #8	X687	—	—	—	X147	—	—	—
	PLC switch #9	X688	—	—	—	X148	—	—	—
	PLC switch #10	X689	—	—	—	X149	—	—	—
	PLC switch #11	X68A	—	—	—	X14A	—	—	—
	PLC switch #12	X68B	—	—	—	X14B	—	—	—
	PLC switch #13	X68C	—	—	—	X14C	—	—	—
	PLC switch #14	X68D	—	—	—	X14D	—	—	—
	PLC switch #15	X68E	—	—	—	X14E	—	—	—
	PLC switch #16	X68F	—	—	—	X14F	—	—	—
	PLC switch #17	X690	—	—	—	X150	—	—	—
	PLC switch #18	X691	—	—	—	X151	—	—	—
	PLC switch #19	X692	—	—	—	X152	—	—	—
	PLC switch #20	X693	—	—	—	X153	—	—	—
	PLC switch #21	X694	—	—	—	X154	—	—	—
	PLC switch #22	X695	—	—	—	X155	—	—	—
	PLC switch #23	X696	—	—	—	X156	—	—	—
	PLC switch #24	X697	—	—	—	X157	—	—	—
	PLC switch #27	X69A	—	—	—	X15A	—	—	—
	PLC switch #28	X69B	—	—	—	X15B	—	—	—
	PLC switch #29	X69C	—	—	—	X15C	—	—	—
	PLC switch #30	X69D	—	—	—	X15D	—	—	—
	PLC switch #31	X69E	—	—	—	X15E	—	—	—
	PLC switch #32	X69F	—	—	—	X15F	—	—	—
	Battery alarm	X70F	—	—	—	X20F	—	—	—
	MELDASNET diagnosis output	X722	—	—	—	X302	—	—	—

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System common	MELDASNET sampling signal	X723	–	–	–	X303	–	–	–
	Remote program input executing	X724	–	–	–	X304	–	–	–
	Remote program input finishing	X725	–	–	–	X305	–	–	–
	Remote program input error finishing	X726	–	–	–	X306	–	–	–
	TOOL ID communicating	X727	–	–	–	X307	–	–	–
	P－OFF asked finish notice	X72C	–	–	–	X30C	–	–	–
	P－OFF asked cancel	X72D	–	–	–	X30D	–	–	–
	P-OFF PARA change	X72F	–	–	–	X30F	–	–	–
	Power output 1	X730	–	–	–	X310	–	–	–
	Power output 2	X731	–	–	–	X311	–	–	–
	Power output 3	X732	–	–	–	X312	–	–	–
	Power output 4	X733	–	–	–	X313	–	–	–
	Power output 5	X734	–	–	–	X314	–	–	–
	Power output 6	X735	–	–	–	X315	–	–	–
	Power output 7	X736	–	–	–	X316	–	–	–
	Power output 8	X737	–	–	–	X317	–	–	–
Axis data	SERVO READY 1st axis	X780	X788	X790	X798	X180	X4C0	–	–
	SERVO READY 2nd axis	X781	X789	X791	X799	X181	X4C1	–	–
	SERVO READY 3rd axis	X782	X78A	X792	X79A	X182	X4C2	–	–
	SERVO READY 4th axis	X783	X78B	X793	X79B	X183	X4C3	–	–
	SERVO READY 5th axis	X784	X78C	X794	X79C	X184	X4C4	–	–
	SERVO READY 6th axis	X785	X78D	X795	X79D	X185	X4C5	–	–
	SERVO READY 7th axis	X786	X78E	X796	X79E	X186	X4C6	–	–
	SERVO READY 8th axis	X787	X78F	X797	X79F	X187	X4C7	–	–
	Axis select output 1st axis	X7A0	X7A8	X7B0	X7B8	X188	X4C8	–	–
	Axis select output 2nd axis	X7A1	X7A9	X7B1	X7B9	X189	X4C9	–	–
	Axis select output 3rd axis	X7A2	X7AA	X7B2	X7BA	X18A	X4CA	–	–
	Axis select output 4th axis	X7A3	X7AB	X7B3	X7BB	X18B	X4CB	–	–
	Axis select output 5th axis	X7A4	X7AC	X7B4	X7BC	X18C	X4CC	–	–
	Axis select output 6th axis	X7A5	X7AD	X7B5	X7BD	X18D	X4CD	–	–
	Axis select output 7th axis	X7A6	X7AE	X7B6	X7BE	X18E	X4CE	–	–
	Axis select output 8th axis	X7A7	X7AF	X7B7	X7BF	X18F	X4CF	–	–
	Axis moving signal+ 1st axis	X7C0	X7C8	X7D0	X7D8	X190	X4D0	–	–
	Axis moving signal+ 2nd axis	X7C1	X7C9	X7D1	X7D9	X191	X4D1	–	–
	Axis moving signal+ 3rd axis	X7C2	X7CA	X7D2	X7DA	X192	X4D2	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	Axis moving signal+ 4th axis	X7C3	X7CB	X7D3	X7DB	X193	X4D3	–	–
	Axis moving signal+ 5th axis	X7C4	X7CC	X7D4	X7DC	X194	X4D4	–	–
	Axis moving signal+ 6th axis	X7C5	X7CD	X7D5	X7DD	X195	X4D5	–	–
	Axis moving signal+ 7th axis	X7C6	X7CE	X7D6	X7DE	X196	X4D6	–	–
	Axis moving signal+ 8th axis	X7C7	X7CF	X7D7	X7DF	X197	X4D7	–	–
	Axis moving signal- 1st axis	X7E0	X7E8	X7F0	X7F8	X198	X4D8	–	–
	Axis moving signal- 2nd axis	X7E1	X7E9	X7F1	X7F9	X199	X4D9	–	–
	Axis moving signal- 3rd axis	X7E2	X7EA	X7F2	X7FA	X19A	X4DA	–	–
	Axis moving signal- 4th axis	X7E3	X7EB	X7F3	X7FB	X19B	X4DB	–	–
	Axis moving signal- 5th axis	X7E4	X7EC	X7F4	X7FC	X19C	X4DC	–	–
	Axis moving signal- 6th axis	X7E5	X7ED	X7F5	X7FD	X19D	X4DD	–	–
	Axis moving signal- 7th axis	X7E6	X7EE	X7F6	X7FE	X19E	X4DE	–	–
	Axis moving signal- 8th axis	X7E7	X7EF	X7F7	X7FF	X19F	X4DF	–	–
	Reach 1st reference position 1st axis	X800	X808	X810	X818	X1A0	X4E0	–	–
	Reach 1st reference position 2nd axis	X801	X809	X811	X819	X1A1	X4E1	–	–
	Reach 1st reference position 3rd axis	X802	X80A	X812	X81A	X1A2	X4E2	–	–
	Reach 1st reference position 4th axis	X803	X80B	X813	X81B	X1A3	X4E3	–	–
	Reach 1st reference position 5th axis	X804	X80C	X814	X81C	X1A4	X4E4	–	–
	Reach 1st reference position 6th axis	X805	X80D	X815	X81D	X1A5	X4E5	–	–
	Reach 1st reference position 7th axis	X806	X80E	X816	X81E	X1A6	X4E6	–	–
	Reach 1st reference position 8th axis	X807	X80F	X817	X81F	X1A7	X4E7	–	–
	Reach 2nd reference position 1st axis	X820	X828	X830	X838	X1A8	X4E8	–	–
	Reach 2nd reference position 2nd axis	X821	X829	X831	X839	X1A9	X4E9	–	–
	Reach 2nd reference position 3rd axis	X822	X82A	X832	X83A	X1AA	X4EA	–	–
	Reach 2nd reference position 4th axis	X823	X82B	X833	X83B	X1AB	X4EB	–	–
	Reach 2nd reference position 5th axis	X824	X82C	X834	X83C	X1AC	X4EC	–	–
	Reach 2nd reference position 6th axis	X825	X82D	X835	X83D	X1AD	X4ED	–	–
	Reach 2nd reference position 7th axis	X826	X82E	X836	X83E	X1AE	X4EE	–	–
	Reach 2nd reference position 8th axis	X827	X82F	X837	X83F	X1AF	X4EF	–	–
	Reach 3rd reference position 1st axis	X840	X848	X850	X858	X1B0	X4F0	–	–
	Reach 3rd reference position 2nd axis	X841	X849	X851	X859	X1B1	X4F1	–	–
	Reach 3rd reference position 3rd axis	X842	X84A	X852	X85A	X1B2	X4F2	–	–
	Reach 3rd reference position 4th axis	X843	X84B	X853	X85B	X1B3	X4F3	–	–
	Reach 3rd reference position 5th axis	X844	X84C	X854	X85C	X1B4	X4F4	–	–
	Reach 3rd reference position 6th axis	X845	X84D	X855	X85D	X1B5	X4F5	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	Reach 3rd reference position 7th axis	X846	X84E	X856	X85E	X1B6	X4F6	–	–
	Reach 3rd reference position 8th axis	X847	X84F	X857	X85F	X1B7	X4F7	–	–
	Reach 4th reference position 1st axis	X860	X868	X870	X878	X1B8	X4F8	–	–
	Reach 4th reference position 2nd axis	X861	X869	X871	X879	X1B9	X4F9	–	–
	Reach 4th reference position 3rd axis	X862	X86A	X872	X87A	X1BA	X4FA	–	–
	Reach 4th reference position 4th axis	X863	X86B	X873	X87B	X1BB	X4FB	–	–
	Reach 4th reference position 5th axis	X864	X86C	X874	X87C	X1BC	X4FC	–	–
	Reach 4th reference position 6th axis	X865	X86D	X875	X87D	X1BD	X4FD	–	–
	Reach 4th reference position 7th axis	X866	X86E	X876	X87E	X1BE	X4FE	–	–
	Reach 4th reference position 8th axis	X867	X86F	X877	X87F	X1BF	X4FF	–	–
	Near reference position 1st axis	X880	X888	X890	X898	X1D8	X518	–	–
	Near reference position 2nd axis	X881	X889	X891	X899	X1D9	X519	–	–
	Near reference position 3rd axis	X882	X88A	X892	X89A	X1DA	X51A	–	–
	Near reference position 4th axis	X883	X88B	X893	X89B	X1DB	X51B	–	–
	Near reference position 5th axis	X884	X88C	X894	X89C	X1DC	X51C	–	–
Axis data	Near reference position 6th axis	X885	X88D	X895	X89D	X1DD	X51D	–	–
	Near reference position 7th axis	X886	X88E	X896	X89E	X1DE	X51E	–	–
	Near reference position 8th axis	X887	X88F	X897	X89F	X1DF	X51F	–	–
	One-touch initializing completed 1st axis	X8C0	X8C8	X8D0	X8D8	X280	X5C0	–	–
	One-touch initializing completed 2nd axis	X8C1	X8C9	X8D1	X8D9	X281	X5C1	–	–
	One-touch initializing completed 3rd axis	X8C2	X8CA	X8D2	X8DA	X282	X5C2	–	–
	One-touch initializing completed 4th axis	X8C3	X8CB	X8D3	X8DB	X283	X5C3	–	–
	One-touch initializing completed 5th axis	X8C4	X8CC	X8D4	X8DC	X284	X5C4	–	–
	One-touch initializing completed 6th axis	X8C5	X8CD	X8D5	X8DD	X285	X5C5	–	–
	One-touch initializing completed 7th axis	X8C6	X8CE	X8D6	X8DE	X286	X5C6	–	–
	One-touch initializing completed 8th axis	X8C7	X8CF	X8D7	X8DF	X287	X5C7	–	–
	One-touch initializing error completed 1st axis	X8E0	X8E8	X8F0	X8F8	X288	X5C8	–	–
	One-touch initializing error completed 2nd axis	X8E1	X8E9	X8F1	X8F9	X289	X5C9	–	–
	One-touch initializing error completed 3rd axis	X8E2	X8EA	X8F2	X8FA	X28A	X5CA	–	–
	One-touch initializing error completed 4th axis	X8E3	X8EB	X8F3	X8FB	X28B	X5CB	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	One-touch initializing error completed 5th axis	X8E4	X8EC	X8F4	X8FC	X28C	X5CC	–	–
	One-touch initializing error completed 6th axis	X8E5	X8ED	X8F5	X8FD	X28D	X5CD	–	–
	One-touch initializing error completed 7th axis	X8E6	X8EE	X8F6	X8FE	X28E	X5CE	–	–
	One-touch initializing error completed 8th axis	X8E7	X8EF	X8F7	X8FF	X28F	X5CF	–	–
	In current limit 1st axis	X900	X908	X910	X918	X290	X5D0	–	–
	In current limit 2nd axis	X901	X909	X911	X919	X291	X5D1	–	–
	In current limit 3rd axis	X902	X90A	X912	X91A	X292	X5D2	–	–
	In current limit 4th axis	X903	X90B	X913	X91B	X293	X5D3	–	–
	In current limit 5th axis	X904	X90C	X914	X91C	X294	X5D4	–	–
	In current limit 6th axis	X905	X90D	X915	X91D	X295	X5D5	–	–
	In current limit 7th axis	X906	X90E	X916	X91E	X296	X5D6	–	–
	In current limit 8th axis	X907	X90F	X917	X91F	X297	X5D7	–	–
	Current limit reached 1st axis	X920	X928	X930	X938	X298	X5D8	–	–
	Current limit reached 2nd axis	X921	X929	X931	X939	X299	X5D9	–	–
	Current limit reached 3rd axis	X922	X92A	X932	X93A	X29A	X5DA	–	–
	Current limit reached 4th axis	X923	X92B	X933	X93B	X29B	X5DB	–	–
	Current limit reached 5th axis	X924	X92C	X934	X93C	X29C	X5DC	–	–
	Current limit reached 6th axis	X925	X92D	X935	X93D	X29D	X5DD	–	–
	Current limit reached 7th axis	X926	X92E	X936	X93E	X29E	X5DE	–	–
	Current limit reached 8th axis	X927	X92F	X937	X93F	X29F	X5DF	–	–
	Up-to speed 1st axis	X940	X948	X950	X958	X2B0	X5F0	–	–
	Up-to speed 2nd axis	X941	X949	X951	X959	X2B1	X5F1	–	–
	Up-to speed 3rd axis	X942	X94A	X952	X95A	X2B2	X5F2	–	–
	Up-to speed 4th axis	X943	X94B	X953	X95B	X2B3	X5F3	–	–
	Up-to speed 5th axis	X944	X94C	X954	X95C	X2B4	X5F4	–	–
	Up-to speed 6th axis	X945	X94D	X955	X95D	X2B5	X5F5	–	–
	Up-to speed 7th axis	X946	X94E	X956	X95E	X2B6	X5F6	–	–
	Up-to speed 8th axis	X947	X94F	X957	X95F	X2B7	X5F7	–	–
	Un-clamp command 1st axis	X960	X968	X970	X978	X2B8	X5F8	–	–
	Un-clamp command 2nd axis	X961	X969	X971	X979	X2B9	X5F9	–	–
	Un-clamp command 3rd axis	X962	X96A	X972	X97A	X2BA	X5FA	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	Un-clamp command 4th axis	X963	X96B	X973	X97B	X2BB	X5FB	–	–
	Un-clamp command 5th axis	X964	X96C	X974	X97C	X2BC	X5FC	–	–
	Un-clamp command 6th axis	X965	X96D	X975	X97D	X2BD	X5FD	–	–
	Un-clamp command 7th axis	X966	X96E	X976	X97E	X2BE	X5FE	–	–
	Un-clamp command 8th axis	X967	X96F	X977	X97F	X2BF	X5FF	–	–
	In cross machining control (1st axis)	X980	X988	X990	X998	X2E0	X620	–	–
	In cross machining control (2nd axis)	X981	X989	X991	X999	X2E1	X621	–	–
	In cross machining control (3rd axis)	X982	X98A	X992	X99A	X2E2	X622	–	–
	In cross machining control (4th axis)	X983	X98B	X993	X99B	X2E3	X623	–	–
	In cross machining control (5th axis)	X984	X98C	X994	X99C	X2E4	X624	–	–
	In cross machining control (6th axis)	X985	X98D	X995	X99D	X2E5	X625	–	–
	In cross machining control (7th axis)	X986	X98E	X996	X99E	X2E6	X626	–	–
	In cross machining control (8th axis)	X987	X98F	X997	X99F	X2E7	X627	–	–
	In synchronous/superimposition control(1st axis)	X9A0	X9A8	X9B0	X9B8	X2E8	X628	–	–
	In synchronous/superimposition contro(2nd axis)	X9A1	X9A9	X9B1	X9B9	X2E9	X629	–	–
	In synchronous/superimposition contro(3rd axis)	X9A2	X9AA	X9B2	X9BA	X2EA	X62A	–	–
	In synchronous/superimposition contro(4th axis)	X9A3	X9AB	X9B3	X9BB	X2EB	X62B	–	–
	In synchronous/superimposition contro(5th axis)	X9A4	X9AC	X9B4	X9BC	X2EC	X62C	–	–
	In synchronous/superimposition contro(6th axis)	X9A5	X9AD	X9B5	X9BD	X2ED	X62D	–	–
	In synchronous/superimposition contro(7th axis)	X9A6	X9AE	X9B6	X9BE	X2EE	X62E	–	–
	In synchronous/superimposition contro(8th axis)	X9A7	X9AF	X9B7	X9BF	X2EF	X62F	–	–
System data	In JOG mode	XC00	XD40	XE80	XFC0	X1E0	X520	–	–
	In handle mode	XC01	XD41	XE81	XFC1	X1E1	X521	–	–
	In incremental mode	XC02	XD42	XE82	XFC2	X1E2	X522	–	–
	In manual random feed mode	XC03	XD43	XE83	XFC3	X1E3	X523	–	–
	In reference position return mode	XC04	XD44	XE84	XFC4	X1E4	X524	–	–
	In automatic initial set mode	XC05	XD45	XE85	XFC5	X1E5	X525	–	–
	In JOG－handle simultaneous mode	XC06	XD46	XE86	XFC6	X1E6	X526	–	–
	In memory mode	XC08	XD48	XE88	XFC8	X1E8	X528	–	–
	In Tape mode	XC09	XD49	XE89	XFC9	X1E9	X529	–	–
	Online operation	XC0A	XD4A	XE8A	XFCA	X1EA	X52A	–	–
	In MDI mode	XC0B	XD4B	XE8B	XFCB	X1EB	X52B	–	–
	In PC operation	XC0C	XD4C	XE8C	XFCC	X1EC	X52C	–	–
	In Direct operation	XC0D	XD4D	XE8D	XFCD	X1ED	X52D	–	–
	Controller ready complete	XC10	XD50	XE90	XFD0	X1F0	X530	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data	SERVO READY complete	XC11	XD51	XE91	XFD1	X1F1	X531	–	–
	In auto operation “run”	XC12	XD52	XE92	XFD2	X1F2	X532	–	–
	In auto operation “start”	XC13	XD53	XE93	XFD3	X1F3	X533	–	–
	In auto operation “pause”	XC14	XD54	XE94	XFD4	X1F4	X534	–	–
	In “reset”	XC15	XD55	XE95	XFD5	X1F5	X535	–	–
	In manual random feed	XC16	XD56	XE96	XFD6	X1F6	X536	–	–
	In Rewind	XC17	XD57	XE97	XFD7	X1F7	X537	–	–
	Motion command complete	XC18	XD58	XE98	XFD8	X1F8	X538	–	–
	All axes In-position	XC19	XD59	XE99	XFD9	X1F9	X539	–	–
	All axes Smoothing Zero	XC1A	XD5A	XE9A	XFDA	X1FA	X53A	–	–
	Manual random feed complete	XC1C	XD5C	XE9C	XFDC	X1FC	X53C	–	–
	In high-speed mode	XC1F	XD5F	XE9F	XFDF	X1FF	X53F	–	–
	In rapid traverse	XC20	XD60	XEA0	XFE0	X200	X540	–	–
	In cutting feed	XC21	XD61	XEA1	XFE1	X201	X541	–	–
	In tapping	XC22	XD62	XEA2	XFE2	X202	X542	–	–
	In thread cutting	XC23	XD63	XEA3	XFE3	X203	X543	–	–
	In constant surface speed	XC24	XD64	XEA4	XFE4	X204	X544	–	–
	In constant surface speed	XC25	XD65	XEA5	XFE5	X205	X545	–	–
	In skip	XC26	XD66	XEA6	XFE6	X206	X546	–	–
	In reference position return	XC27	XD67	XEA7	XFE7	X207	X547	–	–
	In inch unit select	XC28	XD68	XEA8	XFE8	X208	X548	–	–
	In display lock	XC29	XD69	XEA9	XFE9	X209	X549	–	–
	F1－digit command	XC2A	XD6A	XEAA	XFEA	X20A	X54A	–	–
	In tool lift management	XC2B	XD6B	XEAB	XFEB	X20B	X54B	–	–
	Tool lift over	XC2E	XD6E	XEAE	XFEE	X20E	X54E	–	–
	F1－digit No.1	XC30	XD70	XEB0	XFF0	X218	X558	–	–
	F1－digit No.2	XC31	XD71	XEB1	XFF1	X219	X559	–	–
	F1－digit No.4	XC32	XD72	XEB2	XFF2	X21A	X55A	–	–
	F1－digit No.8	XC33	XD73	XEB3	XFF3	X21B	X55B	–	–
	Waiting between part systems	XC34	XD74	XEB4	XFF4	X21C	X55C	–	–
	Illegal axis selected	XC37	XD77	XEB7	XFF7	X217	X557	–	–
	M code independent output M00	XC40	XD80	XEC0	X1000	X220	X560	–	–
	M code independent output M01	XC41	XD81	XEC1	X1001	X221	X561	–	–
	M code independent output M02	XC42	XD82	XEC2	X1002	X222	X562	–	–
	M code independent output M30	XC43	XD83	XEC3	X1003	X223	X563	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data	Manual numerical command	XC49	XD89	XEC9	X1009	X229	X569	–	–
	M function strobe 1	XC60	XDA0	XEE0	X1020	X230	X570	–	–
	M function strobe 2	XC61	XDA1	XEE1	X1021	X231	X571	–	–
	M function strobe 3	XC62	XDA2	XEE2	X1022	X232	X572	–	–
	M function strobe 4	XC63	XDA3	XEE3	X1023	X233	X573	–	–
	S function strobe 1	XC64	XDA4	XEE4	X1024	X234	X574	–	–
	S function strobe 2	XC65	XDA5	XEE5	X1025	X235	X575	–	–
	S function strobe 3	XC66	XDA6	XEE6	X1026	X236	X576	–	–
	S function strobe 4	XC67	XDA7	XEE7	X1027	X237	X577	–	–
	T function strobe 1	XC68	XDA8	XEE8	X1028	X238	X578	–	–
	T function strobe 2	XC69	XDA9	XEE9	X1029	X239	X579	–	–
	T function strobe 3	XC6A	XDAA	XEEA	X102A	X23A	X57A	–	–
	T function strobe 4	XC6B	XDAB	XEEB	X102B	X23B	X57B	–	–
	2nd M function strobe 1	XC6C	XDAC	XEEC	X102C	X23C	X57C	–	–
	2nd M function strobe 2	XC6D	XDAD	XEED	X102D	X23D	X57D	–	–
	2nd M function strobe 3	XC6E	XDAE	XEEE	X102E	X23E	X57E	–	–
	2nd M function strobe 4	XC6F	XDAF	XEEF	X102F	X23F	X57F	–	–
	In Chopping start	XC80	XDC0	XF00	X1040	X260	X5A0	–	–
	Basic position- upper dead center point	XC81	XDC1	XF01	X1041	X261	X5A1	–	–
	Upper dead center point-bottom point	XC82	XDC2	XF02	X1042	X262	X5A2	–	–
	Bottom dead center point- upper point	XC83	XDC3	XF03	X1043	X263	X5A3	–	–
	Upper dead center point- basic position	XC84	XDC4	XF04	X1044	X264	X5A4	–	–
	In Chopping mode	XC85	XDC5	XF05	X1045	X265	X5A5	–	–
	Search & start (error)	XC8A	XDCA	XF0A	X104A	X1C2	X502	–	–
	Search & star (search)	XC8B	XDCB	XF0B	X104B	X1C3	X503	–	–
	Power OFF request (SP regeneration circuit err)	XC8C	XDCC	XF0C	X104C	X1C4	X504	–	–
		XC92	XDD2	XF12	X1052	X22A	X56A	–	–
	Tool change position return complete	XC93	XDD3	XF13	X1053	X22B	X56B	–	–
	New tool change	XC94	XDD4	XF14	X1054	X22C	X57C	–	–
		XC95	XDD5	XF15	X1055	X22D	X58D	–	–
		XC96	XDD6	XF16	X1056	X22E	X59E	–	–
	NC alarm 1	XC98	XDD8	XF18	X1058	X210	X550	–	–
	NC alarm 2	XC99	XDD9	XF19	X1059	X211	X551	–	–
	NC alarm 3	XC9A	XDDA	XF1A	X105A	X212	X552	–	–
	NC alarm 4	XC9B	XDDB	XF1B	X105B	X213	X553	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data		XC9E	XDDE	XF1E	X105E	X266	X5A6	–	–
	Load monitor Teaching, monitor execution output ▲	XCA0	XDE0	XF20	X1060	X268	X5A8	–	–
	Teaching mode valid ▲	XCA1	XDE1	XF21	X1061	X269	X5A9	–	–
	Monitor mode valid ▲	XCA2	XDE2	XF22	X1062	X26A	X5AA	–	–
	In optimum control execution ▲	XCA3	XDE3	XF23	X1063	X26B	X5AB	–	–
	Tap retract possible	XCA5	XDE5	XF25	X1065	X26D	X5AD	–	–
	No. of work machining over	XCA6	XDE6	XF26	X1066	X26E	X5AE	–	–
	Absolute position warning	XCA7	XDE7	XF27	X1067	X26F	X5AF	–	–
	In polygon mode (Spindle-NC axis)	XCB0	XDF0	XF30	X1070	X2A0	X5E0	–	–
	NC alarm 5	XCB1	XDF1	XF31	X1071	X2A1	X5E1	–	–
	In polygon mode (Spindle-Spindle)	XCB2	XDF2	XF32	X1072	X2A2	X5E2	–	–
	Spindle-spindle polygon synchronization complete	XCB3	XDF3	XF33	X1073	X2A3	X5E3	–	–
		XCB8	XDF8	XF38	X1078	X2A8	X5E8	–	–
	For HVS control（position err detect）▲	XCBF	XDFF	XF3F	X107F	X2AF	X5EF	–	–
	In synchronized tapping selection (M command)	XCC0	XE00	XF40	X1080	X2C0	X600	–	–
	In small diameter deep hole cycle	XCC1	XE01	XF41	X1081	X2C1	X601	–	–
	High-speed retract function valid state ▲	XCC2	XE02	XF42	X1082	X2C2	X602	–	–
	In high-speed retract function operation ▲	XCC3	XE03	XF43	X1083	X2C3	X603	–	–
	Optimum pecking function valid state ▲	XCC4	XE04	XF44	X1084	X2C4	X604	–	–
	In optimum pecking function operation ▲	XCC5	XE05	XF45	X1085	X2C5	X605	–	–
	Load monitor function valid state ▲	XCC6	XE06	XF46	X1086	X2C6	X606	–	–
	In load monitor function operation ▲	XCC7	XE07	XF47	X1087	X2C7	X607	–	–
	In barrier valid (left)	XCC8	XE08	XF48	X1088	X2D0	X610	–	–
	In barrier valid (right)	XCC9	XE09	XF49	X1089	X2D1	X611	–	–
	Door open enable	XCD8	XE18	XF58	X1098	X300	X9C0	–	–
	Door open enable 1-2	XCE8	XE28	XF68	X10A8	X320	X9E0	–	–
	Door open enable 1-3	XCE9	XE29	XF69	X10A9	X321	X9E1	–	–
Spindle data	Spindle speed upper limit over	X1880	X18E0	X1940	X19A0	X20C	X54C	XA40	XA60
	Spindle speed lower limit over	X1881	X18E1	X1941	X19A1	X20D	X54D	XA41	XA61
	S-anlog gear No. illegal	X1882	X18E2	X1942	X19A2	X214	X554	XA42	XA62
	S-analog max./min. Command value over	X1883	X18E3	X1943	X19A3	X215	X555	XA43	XA63
	S-analog no gear selected	X1884	X18E4	X1944	X19A4	X216	X556	XA44	XA64
	Spindle gear shift 1	X1885	X18E5	X1945	X19A5	X225	X565	XA45	XA65
	Spindle gear shift 2	X1886	X18E6	X1946	X19A6	X226	X566	XA46	XA66

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Spindle data	(Always "0")	X1887	X18E7	X1947	X19A7	X227	X567	XA47	XA67
	2nd In-position	X1888	X18E8	X1948	X19A8	X240	X580	XA50	XA70
	Current detect	X1889	X18E9	X1949	X19A9	X241	X581	XA51	XA71
	Speed detect	X188A	X18EA	X194A	X19AA	X242	X582	XA52	XA72
	In spindle alarm	X188B	X18EB	X194B	X19AB	X243	X583	XA53	XA73
	Zero speed	X188C	X18EC	X194C	X19AC	X244	X584	XA54	XA74
	Up-to-speed	X188D	X18ED	X194D	X19AD	X245	X585	XA55	XA75
	Spindle in-position	X188E	X18EE	X194E	X19AE	X246	X586	XA56	XA76
	In L coil selected	X188F	X18EF	X194F	X19AF	X247	X587	XA57	XA77
	Spindle ready-ON	X1890	X18F0	X1950	X19B0	X248	X588	XA58	XA78
	Spindle servo-ON	X1891	X18F1	X1951	X19B1	X249	X589	XA59	XA79
	Spindle emergency stop	X1892	X18F2	X1952	X19B2	X24A	X58A	XA5A	XA7A
	Spindle normal rotating	X1893	X18F3	X1953	X19B3	X24B	X58B	XA5B	XA7B
	Spindle reverse rotating	X1894	X18F4	X1954	X19B4	X24C	X58C	XA5C	XA7C
	Z-phase passed	X1895	X18F5	X1955	X19B5	X24D	X58D	XA5D	XA7D
	Position loop in-position	X1896	X18F6	X1956	X19B6	X24E	X58E	XA5E	XA7E
	Torque limit	X1897	X18F7	X1957	X19B7	X24F	X58F	XA5F	XA7F
		X1898	X18F8	X1958	X19B8	X1D0	X510	XA48	XA68
		X1899	X18F9	X1959	X19B9	X1D1	X511	XA49	XA69
		X189C	X18FC	X195C	X19BC	–	–	–	–
	Speed detect 2	X189D	X18FD	X195D	X19BD	X1D5	X515	XA4D	XA6D
	In M coil srlected	X189E	X18FE	X195E	X19BE	X1D6	X516	XA4E	XA6E
	Index positioning complete	X189F	X18FF	X195F	X19BF	X1D7	X517	XA4F	XA6F
	Spindle enable	X18A0	X1900	X1960	X19C0	X2C8	X608	X940	X950
	In spindle synchronous control	X18A8	X1908	X1968	X19C8	X308	–	–	–
	Spindle rotation speed synchronization complete	X18A9	X1909	X1969	X19C9	X309	–	–	–
	Spindle phase synchronization complete	X18AA	X190A	X196A	X19CA	X30A	–	–	–
	In spindle synchronous control mode 2(D)	X18AB	X190B	X196B	X19CB	X30B	–	–	–
	Chuck close confirmation	X18AC	X190C	X196C	X19CC	X30E	–	–	–
	In magnetic bearing ready ON	X18B8	X1918	X1978	X19D8	X318	X9D8	--	--
	In magnetic bearing servo ON	X18B9	X1919	X1979	X19D9	X319	X9D9	--	--
		X18BA	X191A	X197A	X19DA	X31A	X9DA	--	--
		X18BB	X191B	X197B	X19DB	X31B	X9DB	--	--
	In magnetic bearing warning	X18BC	X191C	X197C	X19DC	X31C	X9DC	--	--

Appendix 2. M60S・M625 → M700/M70 signal list

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Spindle data		X18BD	X191D	X197D	X19DD	X31D	X9DD	--	--
		X18BE	X191E	X197E	X19DE	X31E	X9DE	--	--
	In magnetic bearing alarm	X18BF	X191F	X197F	X19DF	X31F	X9DF	--	--
PSW	Position switch 1	X1D00	X1D20	X1D40	X1D60	X270	X5B0	−	−
	Position switch 2	X1D01	X1D21	X1D41	X1D61	X271	X5B1	−	−
	Position switch 3	X1D02	X1D22	X1D42	X1D62	X272	X5B2	−	−
	Position switch 4	X1D03	X1D23	X1D43	X1D63	X273	X5B3	−	−
	Position switch 5	X1D04	X1D24	X1D44	X1D64	X274	X5B4	−	−
	Position switch 6	X1D05	X1D25	X1D45	X1D65	X275	X5B5	−	−
	Position switch 7	X1D06	X1D26	X1D46	X1D66	X276	X5B6	−	−
	Position switch 8	X1D07	X1D27	X1D47	X1D67	X277	X5B7	−	−
	Position switch 9	X1D08	X1D28	X1D48	X1D68	X328	X9E8	−	−
	Position switch 10	X1D09	X1D29	X1D49	X1D69	X329	X9E9	−	−
	Position switch 11	X1D0A	X1D2A	X1D4A	X1D6A	X32A	X9EA	−	−
	Position switch 12	X1D0B	X1D2B	X1D4B	X1D6B	X32B	X9EB	−	−
	Position switch 13	X1D0C	X1D2C	X1D4C	X1D6C	X32C	X9EC	−	−
	Position switch 14	X1D0D	X1D2D	X1D4D	X1D6D	X32D	X9ED	−	−
	Position switch 15	X1D0E	X1D2E	X1D4E	X1D6E	X32E	X9EE	−	−
	Position switch 16	X1D0F	X1D2F	X1D4F	X1D6F	X32F	X9EF	−	−
	Position switch 17	X1D10	X1D30	X1D50	X1D70	X330	X9F0	−	−
	Position switch 18	X1D11	X1D31	X1D51	X1D71	X331	X9F1	−	−
	Position switch 19	X1D12	X1D32	X1D52	X1D72	X332	X9F2	−	−
	Position switch 20	X1D13	X1D33	X1D53	X1D73	X333	X9F3	−	−
	Position switch 21	X1D14	X1D34	X1D54	X1D74	X334	X9F4	−	−
	Position switch 22	X1D15	X1D35	X1D55	X1D75	X335	X9F5	−	−
	Position switch 23	X1D16	X1D36	X1D56	X1D76	X336	X9F6	−	−
	Position switch 24	X1D17	X1D37	X1D57	X1D77	X337	X9F7	−	−
	Position switch 25	X1D18	X1D38	X1D58	X1D78	X338	X9F8	−	−
	Position switch 26	X1D19	X1D39	X1D59	X1D79	X339	X9F9	−	−
	Position switch 27	X1D1A	X1D3A	X1D5A	X1D7A	X33A	X9FA	−	−
	Position switch 28	X1D1B	X1D3B	X1D5B	X1D7B	X33B	X9FB	−	−
	Position switch 29	X1D1C	X1D3C	X1D5C	X1D7C	X33C	X9FC	−	−
	Position switch 30	X1D1D	X1D3D	X1D5D	X1D7D	X33D	X9FD	−	−
	Position switch 31	X1D1E	X1D3E	X1D5E	X1D7E	X33E	X9FE	−	−
	Position switch 32	X1D1F	X1D3F	X1D5F	X1D7F	X33F	X9FF	−	−

Appendix 2.4 Y device

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System common	PLC switch light display output #1	Y680	–	–	–	Y180	–	–	–
	PLC switch light display output #2	Y681	–	–	–	Y181	–	–	–
	PLC switch light display output #3	Y682	–	–	–	Y182	–	–	–
	PLC switch light display output #4	Y683	–	–	–	Y183	–	–	–
	PLC switch light display output #5	Y684	–	–	–	Y184	–	–	–
	PLC switch light display output #6	Y685	–	–	–	Y185	–	–	–
	PLC switch light display output #7	Y686	–	–	–	Y186	–	–	–
	PLC switch light display output #8	Y687	–	–	–	Y187	–	–	–
	PLC switch light display output #9	Y688	–	–	–	Y188	–	–	–
	PLC switch light display output #10	Y689	–	–	–	Y189	–	–	–
	PLC switch light display output #11	Y68A	–	–	–	Y18A	–	–	–
	PLC switch light display output #12	Y68B	–	–	–	Y18B	–	–	–
	PLC switch light display output #13	Y68C	–	–	–	Y18C	–	–	–
	PLC switch light display output #14	Y68D	–	–	–	Y18D	–	–	–
	PLC switch light display output #15	Y68E	–	–	–	Y18E	–	–	–
	PLC switch light display output #16	Y68F	–	–	–	Y18F	–	–	–
	PLC switch light display output #17	Y690	–	–	–	Y190	–	–	–
	PLC switch light display output #18	Y691	–	–	–	Y191	–	–	–
	PLC switch light display output #19	Y692	–	–	–	Y192	–	–	–
	PLC switch light display output #20	Y693	–	–	–	Y193	–	–	–
	PLC switch light display output #21	Y694	–	–	–	Y194	–	–	–
	PLC switch light display output #22	Y695	–	–	–	Y195	–	–	–
	PLC switch light display output #23	Y696	–	–	–	Y196	–	–	–
	PLC switch light display output #24	Y697	–	–	–	Y197	–	–	–
	PLC switch light display output #25	Y698	–	–	–	Y198	–	–	–
	PLC switch light display output #26	Y699	–	–	–	Y199	–	–	–
	PLC switch light display output #27	Y69A	–	–	–	Y19A	–	–	–
	PLC switch light display output #28	Y69B	–	–	–	Y19B	–	–	–
	PLC switch light display output #29	Y69C	–	–	–	Y19C	–	–	–
	PLC switch light display output #30	Y69D	–	–	–	Y19D	–	–	–
	PLC switch light display output #31	Y69E	–	–	–	Y19E	–	–	–
	PLC switch light display output #32	Y69F	–	–	–	Y19F	–	–	–
	S function strobe 1	Y704	–	–	–	Y234	–	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System common	S function strobe 2	Y705	—	—	—	Y235	—	—	—
	Data protect 1	Y708	—	—	—	Y238	—	—	—
	Data protect 2	Y709	—	—	—	Y239	—	—	—
	Data protect 3	Y70A	—	—	—	Y23A	—	—	—
	Data protect 4	Y70B	—	—	—	Y23B	—	—	—
	Program display duning operation	Y70C	—	—	—	Y23C	—	—	—
	PLC axis near point detect 1st axis	Y718	—	—	—	Y2E0	—	—	—
	PLC axis near point detect 2nd axis	Y719	—	—	—	Y2E1	—	—	—
	PLC axis near point detect 3rd axis	Y71A	—	—	—	Y2E2	—	—	—
	PLC axis near point detect 4th axis	Y71B	—	—	—	Y2E3	—	—	—
	PLC axis 1st handle valid	Y720	—	—	—	Y2E4	—	—	—
	PLC axis 2st handle valid	Y721	—	—	—	Y2E5	—	—	—
	PLC axis 3st handle valid	Y722	—	—	—	Y2E6	—	—	—
	CRT change ok	Y728	—	—	—	Y2F8	—	—	—
	Screen display request	Y729	—	—	—	Y2F9	—	—	—
		Y72B	—	—	—	Y2FB	—	—	—
	Data sampling trigger	Y72C	—	—	—	Y2FC	—	—	—
	Display changeover $1	Y730	—	—	—	Y2FE	—	—	—
	Display changeover $2	Y731	—	—	—	Y2FF	—	—	—
	TOOL IC new read ▲	Y740	—	—	—	Y390	—	—	—
	TOOL IC exchange read ▲	Y741	—	—	—	Y391	—	—	—
		Y745	—	—	—	Y395	—	—	—
		Y747	—	—	—	Y397	—	—	—
	PLC jump 1	Y748	—	—	—	Y3A0	—	—	—
	PLC jump 2	Y749	—	—	—	Y3A1	—	—	—
	PLC jump 3	Y74A	—	—	—	Y3A2	—	—	—
	PLC jump 4	Y74B	—	—	—	Y3A3	—	—	—
	PLC jump 5	Y74C	—	—	—	Y3A4	—	—	—
	PLC jump 6	Y74D	—	—	—	Y3A5	—	—	—
	PLC jump 7	Y74E	—	—	—	Y3A6	—	—	—
	PLC jump 8	Y74F	—	—	—	Y3A7	—	—	—
	Door open	Y768	—	—	—	Y380	—	—	—
	Remote program input start	Y76C	—	—	—	Y384	—	—	—
	TOOL ID data read	Y76D	—	—	—	Y385	—	—	—
	TOOL ID data write	Y76E	—	—	—	Y386	—	—	—

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System common	TOOL ID data erase	Y76F	–	–	–	Y387	–	–	–
Axis data	Control axis detach 1st axis	Y780	Y788	Y790	Y798	Y180	Y540	–	–
	Control axis detach 2nd axis	Y781	Y789	Y791	Y799	Y181	Y541	–	–
	Control axis detach 3rd axis	Y782	Y78A	Y792	Y79A	Y182	Y542	–	–
	Control axis detach 4th axis	Y783	Y78B	Y793	Y79B	Y183	Y543	–	–
	Control axis detach 5th axis	Y784	Y78C	Y794	Y79C	Y184	Y544	–	–
	Control axis detach 6th axis	Y785	Y78D	Y795	Y79D	Y185	Y545	–	–
	Control axis detach 7th axis	Y786	Y78E	Y796	Y79E	Y186	Y546	–	–
	Control axis detach 8th axis	Y787	Y78F	Y797	Y79F	Y187	Y547	–	–
	SERVO OFF 1st axis	Y7A0	Y7A8	Y7B0	Y7B8	Y188	Y548	–	–
	SERVO OFF 2nd axis	Y7A1	Y7A9	Y7B1	Y7B9	Y189	Y549	–	–
	SERVO OFF 3rd axis	Y7A2	Y7AA	Y7B2	Y7BA	Y18A	Y54A	–	–
	SERVO OFF 4th axis	Y7A3	Y7AB	Y7B3	Y7BB	Y18B	Y54B	–	–
	SERVO OFF 5th axis	Y7A4	Y7AC	Y7B4	Y7BC	Y18C	Y54C	–	–
	SERVO OFF 6th axis	Y7A5	Y7AD	Y7B5	Y7BD	Y18D	Y54D	–	–
	SERVO OFF 7th axis	Y7A6	Y7AE	Y7B6	Y7BE	Y18E	Y54E	–	–
	SERVO OFF 8th axis	Y7A7	Y7AF	Y7B7	Y7BF	Y18F	Y54F	–	–
	Mirror image 1st axis	Y7C0	Y7C8	Y7D0	Y7D8	Y190	Y550	–	–
	Mirror image 2nd axis	Y7C1	Y7C9	Y7D1	Y7D9	Y191	Y551	–	–
	Mirror image 3rd axis	Y7C2	Y7CA	Y7D2	Y7DA	Y192	Y552	–	–
	Mirror image 4th axis	Y7C3	Y7CB	Y7D3	Y7DB	Y193	Y553	–	–
	Mirror image 5th axis	Y7C4	Y7CC	Y7D4	Y7DC	Y194	Y554	–	–
	Mirror image 6th axis	Y7C5	Y7CD	Y7D5	Y7DD	Y195	Y555	–	–
	Mirror image 7th axis	Y7C6	Y7CE	Y7D6	Y7DE	Y196	Y556	–	–
	Mirror image 8th axis	Y7C7	Y7CF	Y7D7	Y7DF	Y197	Y557	–	–
	External deceleration ＋ 1st axis	Y7E0	Y7E8	Y7F0	Y7F8	Y198	Y558	–	–
	External deceleration ＋ 2nd axis	Y7E1	Y7E9	Y7F1	Y7F9	Y199	Y559	–	–
	External deceleration ＋ 3rd axis	Y7E2	Y7EA	Y7F2	Y7FA	Y19A	Y55A	–	–
	External deceleration ＋ 4th axis	Y7E3	Y7EB	Y7F3	Y7FB	Y19B	Y55B	–	–
	External deceleration ＋ 5th axis	Y7E4	Y7EC	Y7F4	Y7FC	Y19C	Y55C	–	–
	External deceleration ＋ 6th axis	Y7E5	Y7ED	Y7F5	Y7FD	Y19D	Y55D	–	–
	External deceleration ＋ 7th axis	Y7E6	Y7EE	Y7F6	Y7FE	Y19E	Y55E	–	–
	External deceleration ＋ 8th axis	Y7E7	Y7EF	Y7F7	Y7FF	Y19F	Y55F	–	–
	External deceleration － 1st axis	Y800	Y808	Y810	Y818	Y1A0	Y560	–	–
	External deceleration － 2nd axis	Y801	Y809	Y811	Y819	Y1A1	Y561	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	External deceleration − 3rd axis	Y802	Y80A	Y812	Y81A	Y1A2	Y562	−	−
	External deceleration − 4th axis	Y803	Y80B	Y813	Y81B	Y1A3	Y563	−	−
	External deceleration − 5th axis	Y804	Y80C	Y814	Y81C	Y1A4	Y564	−	−
	External deceleration − 6th axis	Y805	Y80D	Y815	Y81D	Y1A5	Y565	−	−
	External deceleration − 7th axis	Y806	Y80E	Y816	Y81E	Y1A6	Y566	−	−
	External deceleration − 8th axis	Y807	Y80F	Y817	Y81F	Y1A7	Y567	−	−
	Auto interlock + 1st axis	Y820	Y828	Y830	Y838	Y1A8	Y568	−	−
	Auto interlock + 2nd axis	Y821	Y829	Y831	Y839	Y1A9	Y569	−	−
	Auto interlock + 3rd axis	Y822	Y82A	Y832	Y83A	Y1AA	Y56A	−	−
	Auto interlock + 4th axis	Y823	Y82B	Y833	Y83B	Y1AB	Y56B	−	−
	Auto interlock + 5th axis	Y824	Y82C	Y834	Y83C	Y1AC	Y56C	−	−
	Auto interlock + 6th axis	Y825	Y82D	Y835	Y83D	Y1AD	Y56D	−	−
	Auto interlock + 7th axis	Y826	Y82E	Y836	Y83E	Y1AE	Y56E	−	−
	Auto interlock + 8th axis	Y827	Y82F	Y837	Y83F	Y1AF	Y56F	−	−
	Auto interlock − 1st axis	Y840	Y848	Y850	Y858	Y1B0	Y570	−	−
	Auto interlock − 2nd axis	Y841	Y849	Y851	Y859	Y1B1	Y571	−	−
	Auto interlock − 3rd axis	Y842	Y84A	Y852	Y85A	Y1B2	Y572	−	−
	Auto interlock − 4th axis	Y843	Y84B	Y853	Y85B	Y1B3	Y573	−	−
	Auto interlock − 5th axis	Y844	Y84C	Y854	Y85C	Y1B4	Y574	−	−
	Auto interlock − 6th axis	Y845	Y84D	Y855	Y85D	Y1B5	Y575	−	−
	Auto interlock − 7th axis	Y846	Y84E	Y856	Y85E	Y1B6	Y576	−	−
	Auto interlock − 8th axis	Y847	Y84F	Y857	Y85F	Y1B7	Y577	−	−
	Manual interlock + 1st axis	Y860	Y868	Y870	Y878	Y1B8	Y578	−	−
	Manual interlock + 2nd axis	Y861	Y869	Y871	Y879	Y1B9	Y579	−	−
	Manual interlock + 3rd axis	Y862	Y86A	Y872	Y87A	Y1BA	Y57A	−	−
	Manual interlock + 4th axis	Y863	Y86B	Y873	Y87B	Y1BB	Y57B	−	−
	Manual interlock + 5th axis	Y864	Y86C	Y874	Y87C	Y1BC	Y57C	−	−
	Manual interlock + 6th axis	Y865	Y86D	Y875	Y87D	Y1BD	Y57D	−	−
	Manual interlock + 7th axis	Y866	Y86E	Y876	Y87E	Y1BE	Y57E	−	−
	Manual interlock + 8th axis	Y867	Y86F	Y877	Y87F	Y1BF	Y57F	−	−
	Manual interlock − 1st axis	Y880	Y888	Y890	Y898	Y1C0	Y580	−	−
	Manual interlock − 2nd axis	Y881	Y889	Y891	Y899	Y1C1	Y581	−	−
	Manual interlock − 3rd axis	Y882	Y88A	Y892	Y89A	Y1C2	Y582	−	−
	Manual interlock − 4th axis	Y883	Y88B	Y893	Y89B	Y1C3	Y583	−	−
	Manual interlock − 5th axis	Y884	Y88C	Y894	Y89C	Y1C4	Y584	−	−

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	Manual interlock － 6th axis	Y885	Y88D	Y895	Y89D	Y1C5	Y585	－	－
	Manual interlock － 7th axis	Y886	Y88E	Y896	Y89E	Y1C6	Y586	－	－
	Manual interlock － 8th axis	Y887	Y88F	Y897	Y89F	Y1C7	Y587	－	－
	Auto machine lock 1st axis	Y8A0	Y8A8	Y8B0	Y8B8	Y1C8	Y588	－	－
	Auto machine lock 2nd axis	Y8A1	Y8A9	Y8B1	Y8B9	Y1C9	Y589	－	－
	Auto machine lock 3rd axis	Y8A2	Y8AA	Y8B2	Y8BA	Y1CA	Y58A	－	－
	Auto machine lock 4th axis	Y8A3	Y8AB	Y8B3	Y8BB	Y1CB	Y58B	－	－
	Auto machine lock 5th axis	Y8A4	Y8AC	Y8B4	Y8BC	Y1CC	Y58C	－	－
	Auto machine lock 6th axis	Y8A5	Y8AD	Y8B5	Y8BD	Y1CD	Y58D	－	－
	Auto machine lock 7th axis	Y8A6	Y8AE	Y8B6	Y8BE	Y1CE	Y58E	－	－
	Auto machine lock 8th axis	Y8A7	Y8AF	Y8B7	Y8BF	Y1CF	Y58F	－	－
	Manual machine lock 1st axis	Y8C0	Y8C8	Y8D0	Y8D8	Y1D0	Y590	－	－
	Manual machine lock 2nd axis	Y8C1	Y8C9	Y8D1	Y8D9	Y1D1	Y591	－	－
	Manual machine lock 3rd axis	Y8C2	Y8CA	Y8D2	Y8DA	Y1D2	Y592	－	－
	Manual machine lock 4th axis	Y8C3	Y8CB	Y8D3	Y8DB	Y1D3	Y593	－	－
	Manual machine lock 5th axis	Y8C4	Y8CC	Y8D4	Y8DC	Y1D4	Y594	－	－
	Manual machine lock 6th axis	Y8C5	Y8CD	Y8D5	Y8DD	Y1D5	Y595	－	－
	Manual machine lock 7th axis	Y8C6	Y8CE	Y8D6	Y8DE	Y1D6	Y596	－	－
	Manual machine lock 8th axis	Y8C7	Y8CF	Y8D7	Y8DF	Y1D7	Y597	－	－
	Feed axis select ＋ 1st axis	Y8E0	Y8E8	Y8F0	Y8F8	Y1D8	Y598	－	－
	Feed axis select ＋ 2nd axis	Y8E1	Y8E9	Y8F1	Y8F9	Y1D9	Y599	－	－
	Feed axis select ＋ 3rd axis	Y8E2	Y8EA	Y8F2	Y8FA	Y1DA	Y59A	－	－
	Feed axis select ＋4th axis	Y8E3	Y8EB	Y8F3	Y8FB	Y1DB	Y59B	－	－
	Feed axis select ＋ 5th axis	Y8E4	Y8EC	Y8F4	Y8FC	Y1DC	Y59C	－	－
	Feed axis select ＋ 6th axis	Y8E5	Y8ED	Y8F5	Y8FD	Y1DD	Y59D	－	－
	Feed axis select ＋ 7th axis	Y8E6	Y8EE	Y8F6	Y8FE	Y1DE	Y59E	－	－
	Feed axis select ＋ 8th axis	Y8E7	Y8EF	Y8F7	Y8FF	Y1DF	Y59F	－	－
	Feed axis select － 1st axis	Y900	Y908	Y910	Y918	Y1E0	Y5A0	－	－
	Feed axis select － 2nd axis	Y901	Y909	Y911	Y919	Y1E1	Y5A1	－	－
	Feed axis select － 3rd axis	Y902	Y90A	Y912	Y91A	Y1E2	Y5A2	－	－
	Feed axis select － 4th axis	Y903	Y90B	Y913	Y91B	Y1E3	Y5A3	－	－
	Feed axis select － 5th axis	Y904	Y90C	Y914	Y91C	Y1E4	Y5A4	－	－
	Feed axis select － 6th axis	Y905	Y90D	Y915	Y91D	Y1E5	Y5A5	－	－
	Feed axis select － 7th axis	Y906	Y90E	Y916	Y91E	Y1E6	Y5A6	－	－
	Feed axis select － 8th axis	Y907	Y90F	Y917	Y91F	Y1E7	Y5A7	－	－

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	Manual/Auto simultaneous valid 1st axis	Y920	Y928	Y930	Y938	Y1F0	Y5B0	–	–
	Manual/Auto simultaneous valid 2nd axis	Y921	Y929	Y931	Y939	Y1F1	Y5B1	–	–
	Manual/Auto simultaneous valid 3rd axis	Y922	Y92A	Y932	Y93A	Y1F2	Y5B2	–	–
	Manual/Auto simultaneous valid 4th axis	Y923	Y92B	Y933	Y93B	Y1F3	Y5B3	–	–
	Manual/Auto simultaneous valid 5th axis	Y924	Y92C	Y934	Y93C	Y1F4	Y5B4	–	–
	Manual/Auto simultaneous valid 6th axis	Y925	Y92D	Y935	Y93D	Y1F5	Y5B5	–	–
	Manual/Auto simultaneous valid 7th axis	Y926	Y92E	Y936	Y93E	Y1F6	Y5B6	–	–
	Manual/Auto simultaneous valid 8th axis	Y927	Y92F	Y937	Y93F	Y1F7	Y5B7	–	–
	Manual federate B valid 1st axis	Y940	Y948	Y950	Y958	Y260	Y620	–	–
	Manual federate B valid 2nd axis	Y941	Y949	Y951	Y959	Y261	Y621	–	–
	Manual federate B valid 3rd axis	Y942	Y94A	Y952	Y95A	Y262	Y622	–	–
	Manual federate B valid 4th axis	Y943	Y94B	Y953	Y95B	Y263	Y623	–	–
	Manual federate B valid 5th axis	Y944	Y94C	Y954	Y95C	Y264	Y624	–	–
	Manual federate B valid 6th axis	Y945	Y94D	Y955	Y95D	Y265	Y625	–	–
	Manual federate B valid 7th axis	Y946	Y94E	Y956	Y95E	Y266	Y626	–	–
	Manual federate B valid 8th axis	Y947	Y94F	Y957	Y95F	Y267	Y627	–	–
	Reference position initializing mode 1st axis	Y960	Y968	Y970	Y978	Y300	Y6C0	–	–
	Reference position initializing mode 2nd axis	Y961	Y969	Y971	Y979	Y301	Y6C1	–	–
	Reference position initializing mode 3rd axis	Y962	Y96A	Y972	Y97A	Y302	Y6C2	–	–
	Reference position initializing mode 4th axis	Y963	Y96B	Y973	Y97B	Y303	Y6C3	–	–
	Reference position initializing mode 5th axis	Y964	Y96C	Y974	Y97C	Y304	Y6C4	–	–
	Reference position initializing mode 6th axis	Y965	Y96D	Y975	Y97D	Y305	Y6C5	–	–
	Reference position initializing mode 7th axis	Y966	Y96E	Y976	Y97E	Y306	Y6C6	–	–
	Reference position initializing mode 8th axis	Y967	Y96F	Y977	Y97F	Y307	Y6C7	–	–
	Reference position initializing start 1st axis	Y980	Y988	Y990	Y998	Y308	Y6C8	–	–
	Reference position initializing star 2nd axis	Y981	Y989	Y991	Y999	Y309	Y6C9	–	–
	Reference position initializing star 3rd axis	Y982	Y98A	Y992	Y99A	Y30A	Y6CA	–	–
	Reference position initializing star 4th axis	Y983	Y98B	Y993	Y99B	Y30B	Y6CB	–	–
	Reference position initializing star 5th axis	Y984	Y98C	Y994	Y99C	Y30C	Y6CC	–	–
	Reference position initializing star 6th axis	Y985	Y98D	Y995	Y99D	Y30D	Y6CD	–	–
	Reference position initializing star 7th axis	Y986	Y98E	Y996	Y99E	Y30E	Y6CE	–	–
	Reference position initializing star 8th axis	Y987	Y98F	Y997	Y99F	Y30F	Y6CF	–	–
	Current limit changeover 1st axis	Y9A0	Y9A8	Y9B0	Y9B8	Y318	Y6D8	–	–
	Current limit changeover 2nd axis	Y9A1	Y9A9	Y9B1	Y9B9	Y319	Y6D9	–	–
	Current limit changeover 3rd axis	Y9A2	Y9AA	Y9B2	Y9BA	Y31A	Y6DA	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	Current limit changeover 4th axis	Y9A3	Y9AB	Y9B3	Y9BB	Y31B	Y6DB	–	–
	Current limit changeover 5th axis	Y9A4	Y9AC	Y9B4	Y9BC	Y31C	Y6DC	–	–
	Current limit changeover 6th axis	Y9A5	Y9AD	Y9B5	Y9BD	Y31D	Y6DD	–	–
	Current limit changeover 7th axis	Y9A6	Y9AE	Y9B6	Y9BE	Y31E	Y6DE	–	–
	Current limit changeover 8th axis	Y9A7	Y9AF	Y9B7	Y9BF	Y31F	Y6DF	–	–
	Droop release request 1st axis	Y9C0	Y9C8	Y9D0	Y9D8	Y320	Y6E0	–	–
	Droop release request 2nd axis	Y9C1	Y9C9	Y9D1	Y9D9	Y321	Y6E1	–	–
	Droop release request 3rd axis	Y9C2	Y9CA	Y9D2	Y9DA	Y322	Y6E2	–	–
	Droop release request 4th axis	Y9C3	Y9CB	Y9D3	Y9DB	Y323	Y6E3	–	–
	Droop release request 5th axis	Y9C4	Y9CC	Y9D4	Y9DC	Y324	Y6E4	–	–
	Droop release request 6th axis	Y9C5	Y9CD	Y9D5	Y9DD	Y325	Y6E5	–	–
	Droop release request 7th axis	Y9C6	Y9CE	Y9D6	Y9DE	Y326	Y6E6	–	–
	Droop release request 8th axis	Y9C7	Y9CF	Y9D7	Y9DF	Y327	Y6E7	–	–
	TLM 1st axis（spare）	Y9E0	Y9E8	Y9F0	Y9F8	Y328	Y6E8	–	–
	TLM 2nd axis （spare）	Y9E1	Y9E9	Y9F1	Y9F9	Y329	Y6E9	–	–
	TLM 3rd axis （spare）	Y9E2	Y9EA	Y9F2	Y9FA	Y32A	Y6EA	–	–
	TLM 4th axis （spare）	Y9E3	Y9EB	Y9F3	Y9FB	Y32B	Y6EB	–	–
	TLM 5th axis （spare）	Y9E4	Y9EC	Y9F4	Y9FC	Y32C	Y6EC	–	–
	TLM 6th axis （spare）	Y9E5	Y9ED	Y9F5	Y9FD	Y32D	Y6ED	–	–
	TLM 7th axis （spare）	Y9E6	Y9EE	Y9F6	Y9FE	Y32E	Y6EE	–	–
	TLM 8th axis （spare）	Y9E7	Y9EF	Y9F7	Y9FF	Y32F	Y6EF	–	–
	Control axis detach Ⅱ 1st axis	YA00	YA08	YA10	YA18	Y330	Y6F0	–	–
	Control axis detach Ⅱ 2nd axis	YA01	YA09	YA11	YA19	Y331	Y6F1	–	–
	Control axis detach Ⅱ 3rd axis	YA02	YA0A	YA12	YA1A	Y332	Y6F2	–	–
	Control axis detach Ⅱ 4th axis	YA03	YA0B	YA13	YA1B	Y333	Y6F3	–	–
	Control axis detach Ⅱ 5th axis	YA04	YA0C	YA14	YA1C	Y334	Y6F4	–	–
	Control axis detach Ⅱ 6th axis	YA05	YA0D	YA15	YA1D	Y335	Y6F5	–	–
	Control axis detach Ⅱ 7th axis	YA06	YA0E	YA16	YA1E	Y336	Y6F6	–	–
	Control axis detach Ⅱ 8th axis	YA07	YA0F	YA17	YA1F	Y337	Y6F7	–	–
	Un-clamp finish 1st axis	YA20	YA28	YA30	YA38	Y338	Y6F8	–	–
	Un-clamp finish 2nd axis	YA21	YA29	YA31	YA39	Y339	Y6F9	–	–
	Un-clamp finish 3rd axis	YA22	YA2A	YA32	YA3A	Y33A	Y6FA	–	–
	Un-clamp finish 4th axis	YA23	YA2B	YA33	YA3B	Y33B	Y6FB	–	–
	Un-clamp finish 5th axis	YA24	YA2C	YA34	YA3C	Y33C	Y6FC	–	–
	Un-clamp finish 6th axis	YA25	YA2D	YA35	YA3D	Y33D	Y6FD	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Axis data	Un-clamp finish 7th axis	YA26	YA2E	YA36	YA3E	Y33E	Y6FE	–	–
	Un-clamp finish 8th axis	YA27	YA2F	YA37	YA3F	Y33F	Y6FF	–	–
	Each axis reference position return 1st axis	YA40	YA48	YA50	YA58	Y340	Y700	–	–
	Each axis reference position return 2nd axis	YA41	YA49	YA51	YA59	Y341	Y701	–	–
	Each axis reference position return 3rd axis	YA42	YA4A	YA52	YA5A	Y342	Y702	–	–
	Each axis reference position return 4th axis	YA43	YA4B	YA53	YA5B	Y343	Y703	–	–
	Each axis reference position return 5th axis	YA44	YA4C	YA54	YA5C	Y344	Y704	–	–
	Each axis reference position return 6th axis	YA45	YA4D	YA55	YA5D	Y345	Y705	–	–
	Each axis reference position return 7th axis	YA46	YA4E	YA56	YA5E	Y346	Y706	–	–
	Each axis reference position return 8th axis	YA47	YA4F	YA57	YA5F	Y347	Y707	–	–
	Cross machining control request (1st axis)	YA60	YA68	YA70	YA78	Y360	Y720	–	–
	Cross machining control reques (2nd axis)	YA61	YA69	YA71	YA79	Y361	Y721	–	–
	Cross machining control reques (3rd axis)	YA62	YA6A	YA72	YA7A	Y362	Y722	–	–
	Cross machining control reques (4th axis)	YA63	YA6B	YA73	YA7B	Y363	Y723	–	–
	Cross machining control reques (5th axis)	YA64	YA6C	YA74	YA7C	Y364	Y724	–	–
	Cross machining control reques (6th axis)	YA65	YA6D	YA75	YA7D	Y365	Y725	–	–
	Cross machining control reques (7th axis)	YA66	YA6E	YA76	YA7E	Y366	Y726	–	–
	Cross machining control reques (8th axis)	YA67	YA6F	YA77	YA7F	Y367	Y727	–	–
	Synchronous control request 1st axis	YA80	YA88	YA90	YA98	Y3A8	YCE8	–	–
	Synchronous control request 2nd axis	YA81	YA89	YA91	YA99	Y3A9	YCE9	–	–
	Synchronous control request 3rd axis	YA82	YA8A	YA92	YA9A	Y3AA	YCEA	–	–
	Synchronous control request 4th axis	YA83	YA8B	YA93	YA9B	Y3AB	YCEB	–	–
	Synchronous control request 5th axis	YA84	YA8C	YA94	YA9C	Y3AC	YCEC	–	–
	Synchronous control request 6th axis	YA85	YA8D	YA95	YA9D	Y3AD	YCED	–	–
	Synchronous control request 7th axis	YA86	YA8E	YA96	YA9E	Y3AE	YCEE	–	–
	Synchronous control request 8th axis	YA87	YA8F	YA97	YA9F	Y3AF	YCEF	–	–
	Superimposition control request 1st axis	YAA0	YAA8	YAB0	YAB8	Y3B0	YCF0	–	–
	Superimposition control reques 2nd axis	YAA1	YAA9	YAB1	YAB9	Y3B1	YCF1	–	–
	Superimposition control reques 3rd axis	YAA2	YAAA	YAB2	YABA	Y3B2	YCF2	–	–
	Superimposition control reques 4th axis	YAA3	YAAB	YAB3	YABB	Y3B3	YCF3	–	–
	Superimposition control reques 5th axis	YAA4	YAAC	YAB4	YABC	Y3B4	YCF4	–	–
	Superimposition control reques 6th axis	YAA5	YAAD	YAB5	YABD	Y3B5	YCF5	–	–
	Superimposition control reques 7th axis	YAA6	YAAE	YAB6	YABE	Y3B6	YCF6	–	–
	Superimposition control reques 8th axis	YAA7	YAAF	YAB7	YABF	Y3B7	YCF7	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data	JOG mode	YC00	YD40	YE80	YFC0	Y208	Y5C8	–	–
	Handle mode	YC01	YD41	YE81	YFC1	Y209	Y5C9	–	–
	Increament mode	YC02	YD42	YE82	YFC2	Y20A	Y5CA	–	–
	Manual random feed	YC03	YD43	YE83	YFC3	Y20B	Y5CB	–	–
	Reference position return mode	YC04	YD44	YE84	YFC4	Y20C	Y5CC	–	–
	Auto initialization mode	YC05	YD45	YE85	YFC5	Y20D	Y5CD	–	–
		YC06	YD46	YE86	YFC6	Y20E	Y5CE	–	–
	Memory mode	YC08	YD48	YE88	YFC8	Y210	Y5D0	–	–
	Tape mode	YC09	YD49	YE89	YFC9	Y211	Y5D1	–	–
	Online operation（Comp link B)	YC0A	YD4A	YE8A	YFCA	Y212	Y5D2	–	–
	MDI mode	YC0B	YD4B	YE8B	YFCB	Y213	Y5D3	–	–
	PC operation	YC0C	YD4C	YE8C	YFCC	Y214	Y5D4	–	–
	Direct operation	YC0D	YD4D	YE8D	YFCD	Y215	Y5D5	–	–
	Auto operation “start” command	YC10	YD50	YE90	YFD0	Y218	Y5D8	–	–
	Auto operation “pause” command	YC11	YD51	YE91	YFD1	Y219	Y5D9	–	–
	Singal block	YC12	YD52	YE92	YFD2	Y21A	Y5DA	–	–
	Block start interlock	YC13	YD53	YE93	YFD3	Y21B	Y5DB	–	–
	Cutting block start interlock	YC14	YD54	YE94	YFD4	Y21C	Y5DC	–	–
	Dry run	YC15	YD55	YE95	YFD5	Y21D	Y5DD	–	–
	Error detect	YC17	YD57	YE97	YFD7	Y21F	Y5DF	–	–
	NC reset 1	YC18	YD58	YE98	YFD8	Y220	Y5E0	–	–
	NC reset 2	YC19	YD59	YE99	YFD9	Y221	Y5E1	–	–
	Reset＆Rewind	YC1A	YD5A	YE9A	YFDA	Y222	Y5E2	–	–
	Chamfering	YC1B	YD5B	YE9B	YFDB	Y223	Y5E3	–	–
	Auto restart	YC1C	YD5C	YE9C	YFDC	Y224	Y5E4	–	–
	M function finish 1	YC1E	YD5E	YE9E	YFDE	Y226	Y5E6	–	–
	M function finish 2	YC1F	YD5F	YE9F	YFDF	Y227	Y5E7	–	–
	Tool length measurement 1	YC20	YD60	YEA0	YFE0	Y228	Y5E8	–	–
	Tool length measurement 2	YC21	YD61	YEA1	YFE1	Y229	Y5E9	–	–
	Synchronization correction mode	YC22	YD62	YEA2	YFE2	Y22A	Y5EA	–	–
	Program restart	YC23	YD63	YEA3	YFE3	Y22B	Y5EB	–	–
	Playback	YC24	YD64	YEA4	YFE4	Y22C	Y5EC	–	–
	Macro interrupt	YC25	YD65	YEA5	YFE5	Y22D	Y5ED	–	–
	Rapid traverse	YC26	YD66	YEA6	YFE6	Y22E	Y5EE	–	–
		YC27	YD67	YEA7	YFE7	Y22F	Y5EF	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data	Manual absolute	YC28	YD68	YEA8	YFE8	Y230	Y5F0	—	—
	Display lock	YC29	YD69	YEA9	YFE9	Y231	Y5F1	—	—
	F1－digit speed chang valid	YC2A	YD6A	YEAA	YFEA	Y232	Y5F2	—	—
	Recalculation request	YC2B	YD6B	YEAB	YFEB	Y233	Y5F3	—	—
	PLC emergency stop	YC2C	YD6C	YEAC	YFEC	Y29F	Y65F	—	—
	Reference position retract	YC2D	YD6D	YEAD	YFED	Y29D	Y65D	—	—
	Chopping signal	YC30	YD70	YEB0	YFF0	Y1E8	Y5A8	—	—
	Call & status	YC31	YD71	YEB1	YFF1	Y1FA	Y5BA	—	—
	Magazine index check valid（ATC high speed）	YC32	YD72	YEB2	YFF2	Y1FB	Y5BB	—	—
	Spindle orientation complete standby valid (ATC high speed）	YC33	YD73	YEB3	YFF3	Y1FC	Y5BC	—	—
	Inclined axis control valid	YC35	YD75	YEB5	YFF5	Y23D	Y5FD	—	—
	Inclined axis control：No Zaxis compensation	YC36	YD76	YEB6	YFF6	Y23E	Y5FE	—	—
	Optional block skip 1	YC37	YD77	YEB7	YFF7	Y23F	Y5FF	—	—
	Optional block skip 2	YC38	YD78	YEB8	YFF8	Y240	Y600	—	—
	Optional block skip 3	YC39	YD79	YEB9	YFF9	Y241	Y601	—	—
	Optional block skip 4	YC3A	YD7A	YEBA	YFFA	Y242	Y602	—	—
	Optional block skip 5	YC3B	YD7B	YEBB	YFFB	Y243	Y603	—	—
	Optional block skip 6	YC3C	YD7C	YEBC	YFFC	Y244	Y604	—	—
	Optional block skip 7	YC3D	YD7D	YEBD	YFFD	Y245	Y605	—	—
	Optional block skip 8	YC3E	YD7E	YEBE	YFFE	Y246	Y606	—	—
	Optional block skip 9	YC3F	YD7F	YEBF	YFFF	Y247	Y607	—	—
	1st handle axis No 1	YC40	YD80	YEC0	Y1000	Y248	Y608	—	—
	1st handle axis No 2	YC41	YD81	YEC1	Y1001	Y249	Y609	—	—
	1st handle axis No 4	YC42	YD82	YEC2	Y1002	Y24A	Y60A	—	—
	1st handle axis No 8	YC43	YD83	YEC3	Y1003	Y24B	Y60B	—	—
	1st handle axis No 16	YC44	YD84	YEC4	Y1004	Y24C	Y60C	—	—
	1st handle valid	YC47	YD87	YEC7	Y1007	Y24F	Y60F	—	—
	2nd handle axis No 1	YC48	YD88	YEC8	Y1008	Y250	Y610	—	—
	2nd handle axis No 2	YC49	YD89	YEC9	Y1009	Y251	Y611	—	—
	2nd handle axis No 4	YC4A	YD8A	YECA	Y100A	Y252	Y612	—	—
	2nd handle axis No 8	YC4B	YD8B	YECB	Y100B	Y253	Y613	—	—
	2nd handle axis No 16	YC4C	YD8C	YECC	Y100C	Y254	Y614	—	—
	2nd handle axis selection	YC4E	YD8E	YECE	Y100E	Y256	Y616	—	—
	2nd handle valid	YC4F	YD8F	YECF	Y100F	Y257	Y617	—	—

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data	3rd handle axis No 1	YC50	YD90	YED0	Y1010	Y258	Y618	–	–
	3rd handle axis No 2	YC51	YD91	YED1	Y1011	Y259	Y619	–	–
	3rd handle axis No 4	YC52	YD92	YED2	Y1012	Y25A	Y61A	–	–
	3rd handle axis No 8	YC53	YD93	YED3	Y1013	Y25B	Y61B	–	–
	3rd handle axis No 16	YC54	YD94	YED4	Y1014	Y25C	Y61C	–	–
	3rd handle axis selection	YC56	YD96	YED6	Y1016	Y25E	T61E	–	–
	3rd handle valid	YC57	YD97	YED7	Y1017	Y25F	Y61F	–	–
	Override cancel	YC58	YD98	YED8	Y1018	Y298	Y658	–	–
	Manual override valid	YC59	YD99	YED9	Y1019	Y299	Y659	–	–
	Miscellaneous function lock	YC5A	YD9A	YEDA	Y101A	Y29A	Y65A	–	–
	Tap retract	YC5C	YD9C	YEDC	Y101C	Y29C	Y65C	–	–
	Cutting federate override 1	YC60	YDA0	YEE0	Y1020	Y2A0	Y660	–	–
	Cutting federate override 2	YC61	YDA1	YEE1	Y1021	Y2A1	Y661	–	–
	Cutting federate override 4	YC62	YDA2	YEE2	Y1022	Y2A2	Y662	–	–
	Cutting federate override 8	YC63	YDA3	YEE3	Y1023	Y2A3	Y663	–	–
	Cutting federate override 16	YC64	YDA4	YEE4	Y1024	Y2A4	Y664	–	–
	2nd cutting federate override valid	YC66	YDA6	YEE6	Y1026	Y2A6	Y666	–	–
	Cutting feedrade override method select	YC67	YDA7	YEE7	Y1027	Y2A7	Y667	–	–
	Rapid traverse speed override 1	YC68	YDA8	YEE8	Y1028	Y2A8	Y668	–	–
	Rapid traverse speed override 2	YC69	YDA9	YEE9	Y1029	Y2A9	Y669	–	–
	Rapid traverse speed overridemethod select	YC6F	YDAF	YEEF	Y102F	Y2AF	Y66F	–	–
	Manual federate 1	YC70	YDB0	YEF0	Y1030	Y2B0	F670	–	–
	Manual federate 2	YC71	YDB1	YEF1	Y1031	Y2B1	F671	–	–
	Manual federate 4	YC72	YDB2	YEF2	Y1032	Y2B2	F672	–	–
	Manual federate 8	YC73	YDB3	YEF3	Y1033	Y2B3	F673	–	–
	Manual federate 16	YC74	YDB4	YEF4	Y1034	Y2B4	F674	–	–
	Manual federate method select	YC77	YDB7	YEF7	Y1037	Y2B7	F677	–	–
	Feedrate least increment 1	YC78	YDB8	YEF8	Y1038	Y2B8	F678	–	–
	Feedrate least increment 2	YC79	YDB9	YEF9	Y1039	Y2B9	F679	–	–
	Jog synchronous feed valid	YC7A	YDBA	YEFA	Y103A	Y2BA	Y67A	–	–
	Jog・handle synchronous	YC7B	YDBB	YEFB	Y103B	Y2BB	Y67B	–	–
	Handle／Incremental feed multiplication 1	YC80	YDC0	YF00	Y1040	Y2C0	Y680	–	–
	Handle／Incremental feed multiplication 2	YC81	YDC1	YF01	Y1041	Y2C1	Y681	–	–
	Handle／Incremental feed multiplication 4	YC82	YDC2	YF02	Y1042	Y2C2	Y682	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data	Handle multiplication valid	YC86	YDC6	YF06	Y1046	Y2C6	Y686	–	–
	Handle/Incremental feed multiplication method select	YC87	YDC7	YF07	Y1047	Y2C7	Y687	–	–
	Tool alarm 1	YC88	YDC8	YF08	Y1048	Y2C8	Y688	–	–
	Tool alarm 2	YC89	YDC9	YF09	Y1049	Y2C9	Y689	–	–
	Data count valid	YC8A	YDCA	YF0A	Y104A	Y2CA	Y68A	–	–
	Tool life management input	YC8B	YDCB	YF0B	Y104B	Y2CB	Y68B	–	–
	Tool change reset	YC8C	YDCC	YF0C	Y104C	Y2CC	Y68C	–	–
	Seference position select 1	YC90	YDD0	YF10	Y1050	Y200	Y5C0	–	–
	Seference position select 2	YC91	YDD1	YF11	Y1051	Y201	Y5C1	–	–
	Seference position select method	YC97	YDD7	YF17	Y1057	Y207	Y5C7	–	–
	Manual random feed 1st axis 1	YCA0	YDE0	YF20	Y1060	Y268	Y628	–	–
	Manual random feed 1st axis 2	YCA1	YDE1	YF21	Y1061	Y269	Y629	–	–
	Manual random feed 1st axis 4	YCA2	YDE2	YF22	Y1062	Y26A	Y62A	–	–
	Manual random feed 1st axis 8	YCA3	YDE3	YF23	Y1063	Y26B	Y62B	–	–
	Manual random feed 1st axis 16	YCA4	YDE4	YF24	Y1064	Y26C	Y62C	–	–
	Manual random feed 1st axis valid	YCA7	YDE7	YF27	Y1067	Y26F	Y62F	–	–
	Manual random feed 2nd axis 1	YCA8	YDE8	YF28	Y1068	Y270	Y630	–	–
	Manual random feed 2nd axis 2	YCA9	YDE9	YF29	Y1069	Y271	Y631	–	–
	Manual random feed 2nd axis 4	YCAA	YDEA	YF2A	Y106A	Y272	Y632	–	–
	Manual random feed 2nd axis 8	YCAB	YDEB	YF2B	Y106B	Y273	Y633	–	–
	Manual random feed 2nd axis 16	YCAC	YDEC	YF2C	Y106C	Y274	Y634	–	–
	Manual random feed 2nd axis valid	YCAF	YDEF	YF2F	Y106F	Y277	Y637	–	–
	Manual random feed 3rd axis 1	YCB0	YDF0	YF30	Y1070	Y278	Y638	–	–
	Manual random feed 3rd axis 2	YCB1	YDF1	YF31	Y1071	Y279	Y639	–	–
	Manual random feed 3rd axis 4	YCB2	YDF2	YF32	Y1072	Y27A	Y63A	–	–
	Manual random feed 3rd axis 8	YCB3	YDF3	YF33	Y1073	Y27B	Y63B	–	–
	Manual random feed 3rd axis 16	YCB4	YDF4	YF34	Y1074	Y27C	Y63C	–	–
	Manual random feed 3rd axis valid	YCB7	YDF7	YF37	Y1077	Y27F	Y63F	–	–
	Smoothing off	YCB8	YDF8	YF38	Y1078	Y280	Y640	–	–
	Axis independent	YCB9	YDF9	YF39	Y1079	Y281	Y641	–	–
	EX.F/MODAL.F	YCBA	YDFA	YF3A	Y107A	Y282	Y642	–	–
	G0/G1	YCBB	YDFB	YF3B	Y107B	Y283	Y643	–	–
	MC/WK	YCBC	YDFC	YF3C	Y107C	Y284	Y644	–	–
	ABS/INC	YCBD	YDFD	YF3D	Y107D	Y285	Y645	–	–
	Stop	YCBE	YDFE	YF3E	Y107E	Y286	Y646	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data	Strobe	YCBF	YDFF	YF3F	Y107F	Y287	Y647	–	–
	Current limit mode 1	YCC0	YE00	YF40	Y1080	Y310	Y6D0	–	–
	Current limit mode 2	YCC1	YE01	YF41	Y1081	Y311	Y6D1	–	–
	Current limit mode 3（spare）	YCC2	YE02	YF42	Y1082	Y312	Y6D2	–	–
	Load monitor Teaching/ monitorexecution	YCC3	YE03	YF43	Y1083	Y313	Y6D3	–	–
	Load monitor Teaching mode select	YCC4	YE04	YF44	Y1084	Y314	Y6D4	–	–
	Load monitor Monitor mode select	YCC5	YE05	YF45	Y1085	Y315	Y6D5	–	–
	Load monitor Alarm reset	YCC6	YE06	YF46	Y1086	Y316	Y6D6	–	–
	Load monitor Waming reset	YCC7	YE07	YF47	Y1087	Y317	Y6D7	–	–
	All axes reference position return interlock	YCC8	YE08	YF48	Y1088	Y348	Y708	–	–
	Optimum control execution	YCC9	YE09	YF49	Y1089	Y349	Y709	–	–
	Small diameter deep hole drillingcycle	YCCA	YE0A	YF4A	Y108A	Y34A	Y70A	–	–
	Clipper ON	YCCB	YE0B	YF4B	Y108B	Y34B	Y70B	–	–
	High-sped retract function valid	YCCC	YE0C	YF4C	Y108C	Y34C	Y70C	–	–
	Optimum pecking function valid	YCCD	YE0D	YF4D	Y108D	Y34D	Y70D	–	–
	Load monitor function valid	YCCE	YE0E	YF4E	Y108E	Y34E	Y70E	–	–
	Waitiog ignore	YCD0	YE10	YF50	Y1090	Y358	Y718	–	–
	Spindle-spindle polygon cancel	YCD1	YE11	YF51	Y1091	Y359	Y719	–	–
	Synchronous tapping command polarity reversal	YCD2	YE12	YF52	Y1092	Y35A	Y71A	–	–
	Spindle OFF mode	YCD3	YE13	YF53	Y1093	Y35B	Y71B	–	–
	Deep tapping axis selection signal	YCD4	YE14	YF54	Y1094	Y35C	Y71C	–	–
	Barrier valid (left)	YCD8	YE18	YF58	Y1098	Y378	Y738	–	–
	Barrier valid (right)	YCD9	YE19	YF59	Y1099	Y379	Y739	–	–
	Sub tool measure function valid	YCDA	YE1A	YF5A	Y109A	Y37A	Y73A	–	–
	Move area force	YCDB	YE1B	YF5B	Y109B	Y37B	Y73B	–	–
	Door interlock Ⅱ	YCE1	YE21	YF61	Y10A1	Y381	YCC1	–	–
	Door open signal input (spindlespeed monitor)	YCE2	YE22	YF62	Y10A2	Y382	YCC2	–	–
	Door interlock spindle speed clamp	YCE3	YE23	YF63	Y10A3	Y383	YCC3	–	–
	Door open Ⅱ 1−2 (1 system 2 channel)	YCE8	YE28	YF68	Y10A8	Y3B8	YCF8	–	–
	Door open Ⅱ 1−3 (1 system 3 channel) spare	YCE9	YE29	YF69	Y10A9	Y3B9	YCF9	–	–
	Door open signal input spindle speed monitor signal 1−2 (1 system 2 channel)	YCEA	YE2A	YF6A	Y10AA	Y3BA	YCFA	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
System data	Door open signal input spindle speed monitor signal 1−3 (1 system 3 channel) spare	YCEB	YE2B	YF6B	Y10AB	Y3BB	YCFB	–	–
	SSC door open (1 channel)	YCEC	YE2C	YF6C	Y10AC	Y3BC	YCFC	–	–
	SSC door open (2 channel)	YCED	YE2D	YF6D	Y10AD	Y3BD	YCFD	–	–
	SSC door open(3 channel) spare	YCEE	YE2E	YF6E	Y10AE	Y3BE	YCFE	–	–
Spindle data	Gear shift complete	Y1885	Y18E5	Y1945	Y19A5	Y225	Y5E5	YD48	YD58
	Spindle OVERRIDE 1	Y1888	Y18E8	Y1948	Y19A8	Y288	Y648	YD80	YDA0
	Spindle OVERRIDE 2	Y1889	Y18E9	Y1949	Y19A9	Y289	Y649	YD81	YDA1
	Spindle OVERRIDE 4	Y188A	Y18EA	Y194A	Y19AA	Y28A	Y64A	YD82	YDA2
	Spindle override method select	Y188F	Y18EF	Y194F	Y19AF	Y28F	Y64F	YD87	YDA7
	Spindle gear select 1	Y1890	Y18F0	Y1950	Y19B0	Y290	Y650	YD88	YDA8
	Spindle gear select 2	Y1891	Y18F1	Y1951	Y19B1	Y291	Y651	YD89	YDA9
	Spindle stop	Y1894	Y18F4	Y1954	Y19B4	Y294	Y654	YD8C	YDAC
	Spindle gear shift	Y1895	Y18F5	Y1955	Y19B5	Y295	Y655	YD8D	YDAD
	Oriented spindle speed command	Y1896	Y18F6	Y1956	Y19B6	Y296	Y656	YD8E	YDAE
	Spindle command invalid	Y1897	Y18F7	Y1957	Y19B7	Y297	Y657	YD8F	YDAF
	Spindle forward run start	Y1898	Y18F8	Y1958	Y19B8	Y2D0	Y690	YD90	YDB0
	Spindle reverse run start	Y1899	Y18F9	Y1959	Y19B9	Y2D1	Y691	YD91	YDB1
	Torque limit L	Y189A	Y18FA	Y195A	Y19BA	Y2D2	Y692	YD92	YDB2
	Torque limit H	Y189B	Y18FB	Y195B	Y19BB	Y2D3	Y693	YD93	YDB3
	Spindle forward run index	Y189C	Y18FC	Y195C	Y19BC	Y2D4	Y694	YD94	YDB4
	Spindle reverse run index	Y189D	Y18FD	Y195D	Y19BD	Y2D5	Y695	YD95	YDB5
	Spindle orient command	Y189E	Y18FE	Y195E	Y19BE	Y2D6	Y696	YD96	YDB6
	L coil selection	Y189F	Y18FF	Y195F	Y19BF	Y2D7	Y697	YD97	YDB7
	C axis gain L	Y18A2	Y1902	Y1962	Y19C2	Y2DA	Y69A	YD9A	YDBA
	C axis gain H	Y18A3	Y1903	Y1963	Y19C3	Y2DB	Y69B	YD9B	YDBB
	C axis reference position retum	Y18A4	Y1904	Y1964	Y19C4	Y2DC	Y69C	YD9C	YDBC
	M coil selection	Y18A6	Y1906	Y1966	Y19C6	Y2DE	Y69E	YD9E	YDBE
	Spindle select	Y18A8	Y1908	Y1968	Y19C8	Y350	Y710	YD40	YD50
	Spindle output control signal (01-03-28 now no use)	Y18A9	Y1909	Y1969	Y19C9	Y351	Y711	YD41	YD51
	PLC coil changeover	Y18AF	Y190F	Y196F	Y19CF	Y357	–	–	–
	Spindle synchronous control	Y18B0	Y1910	Y1970	Y19D0	Y398	–	–	–
	Spindle phase synchronous control	Y18B1	Y1911	Y1971	Y19D1	Y399	–	–	–
	Spindle synchronous rotation direction	Y18B2	Y1912	Y1972	Y19D2	Y39A	–	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Spindle data	Phase shife calculation request	Y18B3	Y1913	Y1973	Y19D3	Y39B	–	–	–
	Phase offset erquest	Y18B4	Y1914	Y1974	Y19D4	Y39C	–	–	–
	Error temporary cancel	Y18B5	Y1915	Y1975	Y19D5	Y39D	–	–	–
	Spindle synchronization cancel	Y18B8	Y1918	Y1978	Y19D8	Y2E8	–	–	–
	Chuck close	Y18B9	Y1919	Y1979	Y19D9	Y2E9	–	–	–
	Magnetic bearing servo ON command	Y18C0	Y1920	Y1980	Y19E0	Y388	YCC8	–	–
	Mangnetic bearing tool clamp	Y18C1	Y1921	Y1981	Y19E1	Y389	YCC9	–	–
	Mangnetic spindle prepare	Y18C2	Y1922	Y1982	Y19E2	Y38A	YCCA	–	–
	↑	Y18C3	Y1923	Y1983	Y19E3	Y38B	YCCB	–	–
	↑	Y18C4	Y1924	Y1984	Y19E4	Y38C	YCCC	–	–
	↑	Y18C5	Y1925	Y1985	Y19E5	Y38D	YCCD	–	–
	↑	Y18C6	Y1926	Y1986	Y19E6	Y38E	YCCE	–	–
	↑	Y18C7	Y1927	Y1987	Y19E7	Y38F	YCCF	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
PSW	Position switch 1 interlock	Y1D00	Y1D20	Y1D40	Y1D60	Y370	Y730	–	–
	Position switch 2 interlock	Y1D01	Y1D21	Y1D41	Y1D61	Y371	Y731	–	–
	Position switch 3 interlock	Y1D02	Y1D22	Y1D42	Y1D62	Y372	Y732	–	–
	Position switch 4 interlock	Y1D03	Y1D23	Y1D43	Y1D63	Y373	Y733	–	–
	Position switch 5 interlock	Y1D04	Y1D24	Y1D44	Y1D64	Y374	Y734	–	–
	Position switch 6 interlock	Y1D05	Y1D25	Y1D45	Y1D65	Y375	Y735	–	–
	Position switch 7 interlock	Y1D06	Y1D26	Y1D46	Y1D66	Y376	Y736	–	–
	Position switch 8 interlock	Y1D07	Y1D27	Y1D47	Y1D67	Y377	Y737	–	–
	Position switch 9 interlock	Y1D08	Y1D28	Y1D48	Y1D68	Y3C0	YD00	–	–
	Position switch 10 interlock	Y1D09	Y1D29	Y1D49	Y1D69	Y3C1	YD01	–	–
	Position switch 11 interlock	Y1D0A	Y1D2A	Y1D4A	Y1D6A	Y3C2	YD02	–	–
	Position switch 12 interlock	Y1D0B	Y1D2B	Y1D4B	Y1D6B	Y3C3	YD03	–	–
	Position switch 13 interlock	Y1D0C	Y1D2C	Y1D4C	Y1D6C	Y3C4	YD04	–	–
	Position switch 14 interlock	Y1D0D	Y1D2D	Y1D4D	Y1D6D	Y3C5	YD05	–	–
	Position switch 15 interlock	Y1D0E	Y1D2E	Y1D4E	Y1D6E	Y3C6	YD06	–	–
	Position switch 16 interlock	Y1D0F	Y1D2F	Y1D4F	Y1D6F	Y3C7	YD07	–	–
	Position switch 17 interlock	Y1D10	Y1D30	Y1D50	Y1D70	Y3C8	YD08	–	–
	Position switch 18 interlock	Y1D11	Y1D31	Y1D51	Y1D71	Y3C9	YD09	–	–
	Position switch 19 interlock	Y1D12	Y1D32	Y1D52	Y1D72	Y3CA	YD0A	–	–
	Position switch 20 interlock	Y1D13	Y1D33	Y1D53	Y1D73	Y3CB	YD0B	–	–
	Position switch 21 interlock	Y1D14	Y1D34	Y1D54	Y1D74	Y3CC	YD0C	–	–
	Position switch 22 interlock	Y1D15	Y1D35	Y1D55	Y1D75	Y3CD	YD0D	–	–
	Position switch 23 interlock	Y1D16	Y1D36	Y1D56	Y1D76	Y3CE	YD0E	–	–
	Position switch 24 interlock	Y1D17	Y1D37	Y1D57	Y1D77	Y3CF	YD0F	–	–

Appendix 2.5 R register

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
System commom	NC→PLC	Analogy input	R0	—	—	—	R0	—	—	—
			～	—	—	—	～	—	—	—
			R7	—	—	—	R7	—	—	—
		KEY IN 1	R8	—	—	—	R16	—	—	—
		FULL KEY IN	R9	—	—	—	R17	—	—	—
		Date yy (yy・mm)	R11	—	—	—	R460	—	—	—
		Date mm・dd(day・time)	R12	—	—	—	R461	—	—	—
		Date hh・min(min・second)	R13	—	—	—	R462	—	—	—
		CNC software version number	R16	—	—	—	R96	—	—	—
			R17	—	—	—	R97	—	—	—
			R18	—	—	—	R98	—	—	—
			R19	—	—	—	R99	—	—	—
			R20	—	—	—	—	—	—	—
			R21	—	—	—	—	—	—	—
			R22	—	—	—	—	—	—	—
			R23	—	—	—	—	—	—	—
		M-NET OT check	R24	—	—	—	R84	—	—	—
		PC high process time	R25	—	—	—	R86	—	—	—
		Tool tower interfere check	R26	—	—	—	R472	—	—	—
		Interfere alarm information	R27	—	—	—	R473	—	—	—
		High speed mode PCB sets unfinished	R28	—	—	—	R645	—	—	—
		High speed mode PCB sets unfinished(debug)	R29	—	—	—	R690	—	—	—
		Remote program input error	R30	—	—	—	R1502	—	—	—
		MELDAS-NET output	R31	—	—	—	R1503	—	—	—
		Battery low factor	R56	—	—	—	R56	—	—	—
		Temperature up factor	R57	—	—	—	R57	—	—	—
		5V/24V error factor	R58	—	—	—	R58	—	—	—
		Control nuit internal temperature	R60	—	—	—	R458	—	—	—
		Contactor temperature	R61	—	—	—	R459	—	—	—
		TOOL ID communication error	R62	—	—	—	R488	—	—	—
		MELDASNET diagnosis output factor	R63	—	—	—	R489	—	—	—

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
System commom	NC→PLC	CRT screen control inform	R64	–	–	–	R64	–	–	–
			R65	–	–	–	R65	–	–	–
			R66	–	–	–	R66	–	–	–
			R67	–	–	–	R67	–	–	–
		PLC scan time	R68	–	–	–	R68	–	–	–
		Emergency stop factor	R69	–	–	–	R69	–	–	–
		DIO interface inform	R70	–	–	–	R70	–	–	–
	PLC→NC	Analogy output	R200	–	–	–	R100	–	–	–
			~	–	–	–	~	–	–	–
			R207	–	–	–	R107	–	–	–
		KEY OUT 1	R212	–	–	–	R112	–	–	–
		FULL KEY OUT	R213	–	–	–	R113	–	–	–
		KEY OUT (user no open)	R214	–	–	–	R114	–	–	–
		PW OFF note Y device No.	R215	–	–	–	R4701	–	–	–
		User PLC version number	R224	–	–	–	R196	–	–	–
			R225	–	–	–	R197	–	–	–
			R226	–	–	–	R198	–	–	–
			R227	–	–	–	R199	–	–	–
			R228	–	–	–	–	–	–	–
			R229	–	–	–	–	–	–	–
			R230	–	–	–	–	–	–	–
			R231	–	–	–	–	–	–	–
		User PLC version numbe 2	R232	–	–	–	R4732	–	–	–
			R233	–	–	–	R4733	–	–	–
			R234	–	–	–	R4734	–	–	–
			R235	–	–	–	R4735	–	–	–
			R236	–	–	–	R4736	–	–	–
			R237	–	–	–	R4737	–	–	–
			R238	–	–	–	R4738	–	–	–
			R239	–	–	–	R4739	–	–	–
		APLC version	R240	–	–	–	R656	–	–	–
			R241	–	–	–	R657	–	–	–
			R242	–	–	–	R658	–	–	–
			R243	–	–	–	R659	–	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
System commom	PLC→NC	OT ignored (1~16 axis or 1,2 system 1~8 axis)	R248	—	—	—	R156	R356	—	—
		OT ignored (17~32 axis or 3,4 system 1~8 axis)	R249	—	—	—	—	—	—	—
		OT ignored (5,6 system 1~8 axis)	R250	—	—	—	—	—	—	—
		OT ignored (7,8 system 1~8 axis)	R251	—	—	—	—	—	—	—
		OT ignored divide valid (bit0:1~4 axis、bit1:5~8 axis)	R252	—	—	—	—	—	—	—
		Near point ignored (1~16 axis or 1,2 system 1~8 axis)	R272	—	—	—	R157	R357	—	—
		Near point ignored (17~32 axis or 3,4 system 1~8 axis)	R273	—	—	—	—	—	—	—
		Near point ignored (5,6 system 1~8 axis)	R274	—	—	—	—	—	—	—
		Near point ignored (7,8 system 1~8 axis)	R275	—	—	—	—	—	—	—
		Near point ignored divide valid (bit0:1~4 axis、bit1:5~8 axis)	R276	—	—	—	—	—	—	—
		TOOL ID R/W port No. designateion	R336	—	—	—	R438	—	—	—
		Large diameter tool information	R337	—	—	—	R439	—	—	—
		Tool weight (spindle tool)	R338	—	—	—	R440	—	—	—
		Tool weight(stad-by tool)	R339	—	—	—	R441	—	—	—
		Unset tool information	R340	—	—	—	R442	—	—	—
		TOOL IC communication process results	R341	—	—	—	R443	—	—	—
		Fixed shape workpiece No.designation	R342	—	—	—	R444	—	—	—
		Fixed shape workpiece No.designation (spare)	R343	—	—	—	R445	—	—	—
		All macro screen change restrict(restrict end)	R344	—	—	—	R300	—	—	—
		Monitor communication information	R345	—	—	—	R363	—	—	—
		Special monitor display asked signal	R346	—	—	—	R304	—	—	—
		Jump back axis valid	R347	—	—	—	R627	—	—	—
		Jump back value	R348	—	—	—	R628	—	—	—
		Jump back value	R349	—	—	—	R629	—	—	—

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
System commom	PLC→NC	Jamp speed	R350	–	–	–	R630	–	–	–
			R351	–	–	–	R631	–	–	–
		Remote program input number	R352	–	–	–	R1400	–	–	–
			R353	–	–	–	R1401	–	–	–
		Machine maker macro password	R354	–	–	–	R1402	–	–	–
			R355	–	–	–	R1403	–	–	–
		Direct screen selection	R356	–	–	–	R650	–	–	–
			R357	–	–	–	R651	–	–	–
			R358	–	–	–	R652	–	–	–
			R359	–	–	–	R653	–	–	–
		Cutting force I/F	R360	–	–	–	R669	–	–	–
		PLC password	R362	–	–	–	R1890	–	–	–
			R363	–	–	–	R1891	–	–	–
		Setting parameter lock I/F	R364	–	–	–	R1896	–	–	–
		Tool set vibration movement	R365	–	–	–	R1897	–	–	–
		Computer P－OFF waiting timer	R366	–	–	–	R4700	–	–	–
		MELDAS-NET input	R367	–	–	–	R1404	–	–	–
		User PLC information （ladder type information）	R396	–	–	–	R454	–	–	–
System data	NC→PLC	M code data 1	R504	R704	R904	R1104	R20	R220	–	–
			R505	R705	R905	R1105	R21	R221	–	–
		M code data 2	R506	R706	R906	R1106	R22	R222	–	–
			R507	R707	R907	R1107	R23	R223	–	–
		M code data 3	R508	R708	R908	R1108	R24	R224	–	–
			R509	R709	R909	R1109	R25	R225	–	–
		M code data 4	R510	R710	R910	R1110	R26	R226	–	–
			R511	R711	R911	R1111	R27	R227	–	–
		S code data 1	R512	R712	R912	R1112	R28	R228	–	–
			R513	R713	R913	R1113	R29	R229	–	–
		S code data 2	R514	R714	R914	R1114	R30	R230	–	–
			R515	R715	R915	R1115	R31	R231	–	–
		S code data 3	R516	R716	R916	R1116	R32	R232	–	–
			R517	R717	R917	R1117	R33	R233	–	–
		S code data 4	R518	R718	R918	R1118	R34	R234	–	–
			R519	R719	R919	R1119	R35	R235	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
System data	NC→PLC	T code data 1	R536	R736	R936	R1136	R36	R236	－	－
			R537	R737	R937	R1137	R37	R237	－	－
		T code data 2	R538	R738	R938	R1138	R38	R238	－	－
			R539	R739	R939	R1139	R39	R239	－	－
		T code data 3	R540	R740	R940	R1140	R40	R240	－	－
			R541	R741	R941	R1141	R41	R241	－	－
		T code data 4	R542	R742	R942	R1142	R42	R242	－	－
			R543	R743	R943	R1143	R43	R243	－	－
		2nd compensention function data 1	R544	R744	R944	R1144	R44	R244	－	－
			R545	R745	R945	R1145	R45	R245	－	－
		2nd compensention function data 2	R546	R746	R946	R1146	R46	R246	－	－
			R547	R747	R947	R1147	R47	R247	－	－
		2nd compensention function data 3	R548	R748	R948	R1148	R48	R248	－	－
			R549	R749	R949	R1149	R49	R249	－	－
		2nd compensention function data 4	R550	R750	R950	R1150	R50	R250	－	－
			R551	R751	R951	R1151	R51	R251	－	－
		Load monitor warning output	R564	R764	R964	R1164	R52	R252	－	－
		Load monitor warning output	R565	R765	R965	R1165	R53	R253	－	－
		Laod monitor data alarm	R566	R766	R966	R1166	R54	R254	－	－
		Life management group output	R567	R767	R967	R1167	R55	R255	－	－
		Suitable control OVERRIDE output	R571	R771	R971	R1171	R59	R259	－	－
		CNC finish waiting state output	R572	R772	R972	R1172	R60	R260	－	－
		(space)	R573	R773	R973	R1173	R61	R261	－	－
		Initial setting	R574	R774	R974	R1174	R62	R262	－	－
		Initial setting unfinished	R575	R775	R975	R1175	R63	R263	－	－
		Program process state（edit relation）	R579	R779	R979	R1179	R71	R271	－	－
		Near zero point signal output（zero point）	R580	R780	R980	R1180	R88	R288	－	－
			R581	R781	R981	R1181	R89	R289	－	－
		Tool length measurement contactor output	R582	R782	R982	R1182	R90	R290	－	－
		Tool length measurement interlock output	R583	R783	R983	R1183	R91	R291	－	－
		Area signal X ON／OFF	R584	R784	R984	R1184	R464	R468	－	－
		Area signal Z ON／OFF	R585	R785	R985	R1185	R465	R469	－	－
		Area signaldirection X ON／OFF	R586	R786	R986	R1186	R466	R470	－	－

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
System data	NC→PLC	Area signal direction Z ON／OFF	R587	R787	R987	R1187	R467	R471	—	—
		TAKT time（msec unit）（Low）	R588	R788	R988	R1188	R480	R484	—	—
		TAKT time（msec unit）（High)	R589	R789	R989	R1189	R481	R485	—	—
		TAKT time（min unit）（Low)	R590	R790	R990	R1190	R482	R486	—	—
		TAKT time（min unit）（High)	R591	R791	R991	R1191	R483	R487	—	—
		Position error check	R592	R792	R992	R1192	R498	R499	—	—
		Load monitor state output (1)	R596	R796	R996	R1196	R670	R680	—	—
		Load monitor state output (2)	R597	R797	R997	R1197	R671	R681	—	—
		Load monitor state output (3)	R598	R798	R998	R1198	R672	R682	—	—
		Load monitor state output (4)	R599	R799	R999	R1199	R673	R683	—	—
		Load monitor state output (5)	R600	R800	R1000	R1200	R674	R684	—	—
		Load monitor state output (6)	R601	R801	R1001	R1201	R675	R685	—	—
		Load monitor state output (7)	R602	R802	R1002	R1202	R676	R686	—	—
		Load monitor state output (8)	R603	R803	R1003	R1203	R677	R687	—	—
		Load monitor state output (9)	R604	R804	R1004	R1204	R678	R688	—	—
		Load monitor state output (10)	R605	R805	R1005	R1205	R679	R689	—	—
		Workpiece count current No.	R606	R806	R1006	R1206	R2896	R1892	—	—
			R607	R807	R1007	R1207	R2897	R1893	—	—
		Max workpiece count No.	R608	R808	R1008	R1208	R2898	R1894	—	—
			R609	R809	R1009	R1209	R2899	R1895	—	—
		Tool file used data	R628	R828	R1028	R1228	R614	R616	—	—
			R629	R829	R1029	R1229	R615	R617	—	—
		Tool life management registerd No.	R630	R830	R1030	R1230	R5461	R5471	—	—
	PLC→NC	1st cutting OVERRIDE	R2500	R2700	R2900	R3100	R132	R332	—	—
		2nd cutting OVERRIDE	R2501	R2701	R2901	R3101	R133	R333	—	—
		Jog OVERRIDE	R2502	R2702	R2902	R3102	R134	R334	—	—
		Chopping OVERRIDE	R2503	R2703	R2903	R3103	R135	R335	—	—
		Jog speed	R2504	R2704	R2904	R3104	R136	R336	—	—
			R2505	R2705	R2905	R3105	R137	R337	—	—

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
System data	PLC→NC	Jog speed B	R2506	R2706	R2906	R3106	R138	R338	–	–
			R2507	R2707	R2907	R3107	R139	R339	–	–
		Hand wheel /incremete multiple	R2508	R2708	R2908	R3108	R140	R340	–	–
			R2509	R2709	R2909	R3109	R141	R341	–	–
		2nd hand wheel feed rate multiple	R2510	R2710	R2910	R3110	R142	R342	–	–
			R2511	R2711	R2911	R3111	R143	R343	–	–
		3rd hand wheel feed rate multiple	R2512	R2712	R2912	R3112	R144	R344	–	–
			R2513	R2713	R2913	R3113	R145	R345	–	–
		Load meter interface 1	R2520	R2720	R2920	R3120	R152	–	–	–
			R2521	R2721	R2921	R3121	R153	–	–	–
		Load meter interface 2	R2522	R2722	R2922	R3122	R154	–	–	–
			R2523	R2723	R2923	R3123	R155	–	–	–
		Manual random feed 1st axis movement data	R2544	R2744	R2944	R3144	R142	R342	–	–
			R2545	R2745	R2945	R3145	R143	R343	–	–
		Manual random feed 2nd axis movement data	R2548	R2748	R2948	R3148	R144	R344	–	–
			R2549	R2749	R2949	R3149	R145	R345	–	–
		Manual random feed 3rd axis movement data	R2552	R2752	R2952	R3152	R146	R346	–	–
			R2553	R2753	R2953	R3153	R147	R347	–	–
		Alarm message interface 1	R2556	R2756	R2956	R3156	R158	R358	–	–
		Alarm message interface 2	R2557	R2757	R2957	R3157	R159	R359	–	–
		Alarm message interface 3	R2558	R2758	R2958	R3158	R160	R360	–	–
		Alarm message interface 4	R2559	R2759	R2959	R3159	R161	R361	–	–
		Operation message interface	R2560	R2760	R2960	R3160	R162	R362	–	–
		Search & start program No.	R2562	R2762	R2962	R3162	R170	R370	–	–
			R2563	R2763	R2963	R3163	R171	R371	–	–
		Manual jump I/F 1	R2564	R2764	R2964	R3164	R164	R364	–	–
		Manual jump I/F 2	R2565	R2765	R2965	R3165	R165	R365	–	–
		Manual jump I/F 3	R2566	R2766	R2966	R3166	R166	R366	–	–
		Encoder selection	R2567	R2767	R2967	R3167	R124	R324	–	–
		C axis selection signal	R2568	R2768	R2968	R3168	R125	R325	–	–
		No use	R2569	R2769	R2969	R3169	R126	R326	–	–
		Load monitor axis selection	R2580	R2780	R2980	R3180	R116	R316	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
System data	PLC→NC	Load monitor load change rate detection axis	R2581	R2781	R2981	R3181	R117	R317	–	–
		Load monitor teaching data Sub-No.	R2582	R2782	R2982	R3182	R118	R318	–	–
		Optimum control basic axis selection	R2583	R2783	R2983	R3183	R119	R319	–	–
		Each axis reference position select	R2584	R2784	R2984	R3184	R120	R320	–	–
		Each axis reference position return interlock（ATC time reduction）	R2585	R2785	R2985	R3185	R121	R321	–	–
		Editing state input (GOPⅢ)	R2586	R2786	R2986	R3186	R122	R322	–	–
		Tool life management data sort	R2588	R2788	R2988	R3188	R5460	R5470	–	–
		Synchronous operation mode select	R2589	R2789	R2989	R3189	R435	R436	–	–
		Tool group No. designated	R2590	R2790	R2990	R3190	R150	R350	–	–
			R2591	R2791	R2991	R3191	R151	R351	–	–
		Current limit changeover	R2593	R2793	R2993	R3193	R185	R385	–	–
		Wear compensastion No.（tool length measurement）	R2594	R2794	R2994	R3194	R186	R386	–	–
		Spare	R2595	R2795	R2995	R3195	R187	R387	–	–
		Tool tower interfered tool No. designated	R2596	R2796	R2996	R3196	R188	R388	–	–
		Tool tower interfered tool No. designated(spare)	R2597	R2797	R2997	R3197	R189	R389	–	–
		Workpiece coordinate compensation No.	R2600	R2800	R3000	R3200	R192	R392	–	–
			R2601	R2801	R3001	R3201	R193	R393	–	–
		Selection tools number	R2602	R2802	R3002	R3202	R194	R394	–	–
			R2603	R2803	R3003	R3203	R195	R395	–	–
		Selected tool compensation No.	R2604	R2804	R3004	R3204	R1000	R1050	–	–
			R2605	R2805	R3005	R3205	R1001	R1051	–	–
		Selected tool compensation No.(sub)	R2606	R2806	R3006	R3206	R1002	R1052	–	–
			R2607	R2807	R3007	R3207	R1003	R1053	–	–
		Tool munting information (1-16)	R2608	R2808	R3008	R3208	R1004	R1054	–	–
		Tool munting information (17-32)	R2609	R2809	R3009	R3209	R1005	R1055	–	–
		Tool munting information (33-48)	R2610	R2810	R3010	R3210	R1006	R1056	–	–
		Tool munting information (49-64)	R2611	R2811	R3011	R3211	R1007	R1057	–	–
		Tool munting information (65-80)	R2612	R2812	R3012	R3212	R1008	R1058	–	–
		Tool No.(tool length mearsure2)	R2618	R2818	R3018	R3218	R2970	R2971	–	–
Axis data	NC→PLC	Servo DROOP 1st axis	R4756	R4772	R4788	R4804	R1100	R1116	–	–
			R4757	R4773	R4789	R4805	R1101	R1117	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
Axis data	NC→PLC	Servo DROOP 2nd axis	R4758	R4774	R4790	R4806	R1102	R1118	–	–
			R4759	R4775	R4791	R4807	R1103	R1119	–	–
		Servo DROOP 3rd axis	R4760	R4776	R4792	R4808	R1104	R1120	–	–
			R4761	R4777	R4793	R4809	R1105	R1121	–	–
		Servo DROOP 4th axis	R4762	R4778	R4794	R4810	R1106	R1122	–	–
			R4763	R4779	R4795	R4811	R1107	R1123	–	–
		Servo DROOP 5th axis	R4764	R4780	R4796	R4812	R1108	R1124	–	–
			R4765	R4781	R4797	R4813	R1109	R1125	–	–
		Servo DROOP 6th axis	R4766	R4782	R4798	R4814	R1110	R1126	–	–
			R4767	R4783	R4799	R4815	R1111	R1127	–	–
		Servo DROOP 7th axis	R4768	R4784	R4800	R4816	R1112	R1128	–	–
			R4769	R4785	R4801	R4817	R1113	R1129	–	–
		Servo DROOP 8th axis	R4770	R4786	R4802	R4818	R1114	R1130	–	–
			R4771	R4787	R4803	R4819	R1115	R1131	–	–
		Synchronous error value 1,9,17,25 axis	R5076	R5092	R5108	R5124	R1350	R1366	–	–
			R5077	R5093	R5109	R5125	R1351	R1367	–	–
		Synchronous error value 2,10,18,26 axis	R5078	R5094	R5110	R5126	R1352	R1368	–	–
			R5079	R5095	R5111	R5127	R1353	R1369	–	–
		Synchronous error value 3,11,19,27 axis	R5080	R5096	R5112	R5128	R1354	R1370	–	–
			R5081	R5097	R5113	R5129	R1355	R1371	–	–
		Synchronous error value 4,12,20,28 axis	R5082	R5098	R5114	R5130	R1356	R1372	–	–
			R5083	R5099	R5115	R5131	R1357	R1373	–	–
		Synchronous error value 5,13,21,29 axis	R5084	R5100	R5116	R5132	R1358	R1374	–	–
			R5085	R5101	R5117	R5133	R1359	R1375	–	–
		Synchronous error value 6,14,22,30 axis	R5086	R5102	R5118	R5134	R1360	R1376	–	–
			R5087	R5103	R5119	R5135	R1361	R1377	–	–
		Synchronous error value 7,15,23,31 axis	R5088	R5104	R5120	R5136	R1362	–	–	–
			R5089	R5105	R5121	R5137	R1363	–	–	–
		Synchronous error value 8,16,24,32 axis	R5090	R5106	R5122	R5138	R1364	–	–	–
			R5091	R5107	R5123	R5139	R1365	–	–	–
		Cutting feed movement 1st axis	R5172	R5204	R5236	R5268	R576	–	–	–
			R5173	R5205	R5237	R5269	R577	–	–	–
		Cutting feed movement 2nd axis	R5176	R5208	R5240	R5272	R578	–	–	–
			R5177	R5209	R5241	R5273	R579	–	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
Axis data	NC→PLC	Cutting feed movement 3rd axis	R5180	R5212	R5244	R5276	R580	–	–	–
			R5181	R5213	R5245	R5277	R581	–	–	–
		Cutting feed movement 4th axis	R5184	R5216	R5248	R5280	R582	–	–	–
			R5185	R5217	R5249	R5281	R583	–	–	–
		Cutting feed movement 5th axis	R5188	R5220	R5252	R5284	R584	–	–	–
			R5189	R5221	R5253	R5285	R585	–	–	–
		Cutting feed movement 6th axis	R5192	R5224	R5256	R5288	R586	–	–	–
			R5193	R5225	R5257	R5289	R587	–	–	–
		Cutting feed movement 7th axis	R5196	R5228	R5260	R5292	R588	–	–	–
			R5197	R5229	R5261	R5293	R589	–	–	–
		Cutting feed movement 8thaxis	R5200	R5232	R5264	R5296	R590	–	–	–
			R5201	R5233	R5265	R5297	R591	–	–	–
	PLC→NC	Ext.machine coordinate system compensateion data 1st axis	R5700	R5716	R5732	R5748	R560	R568	–	–
			R5701	R5717	R5733	R5749	–	–	–	–
		Ext.machine coordinate system compensateion data 2st axis	R5702	R5718	R5734	R5750	R561	R569	–	–
			R5703	R5719	R5735	R5751	–	–	–	–
		Ext.machine coordinate system compensateion data 3st axis	R5704	R5720	R5736	R5752	R562	R570	–	–
			R5705	R5721	R5737	R5753	–	–	–	–
		Ext.machine coordinate system compensateion data 4st axis	R5706	R5722	R5738	R5754	R563	R571	–	–
			R5707	R5723	R5739	R5755	–	–	–	–
		Ext.machine coordinate system compensateion data 5st axis	R5708	R5724	R5740	R5756	R564	R572	–	–
			R5709	R5725	R5741	R5757	–	–	–	–
		Ext.machine coordinate system compensateion data 6st axis	R5710	R5726	R5742	R5758	R565	R573	–	–
			R5711	R5727	R5743	R5759	–	–	–	–
		Ext.machine coordinate system compensateion data 7st axis	R5712	R5728	R5744	R5760	R566	R574	–	–
			R5713	R5729	R5745	R5761	–	–	–	–
		Ext.machine coordinate system compensateion data 8st axis	R5714	R5730	R5746	R5762	R567	R575	–	–
			R5715	R5731	R5747	R5763	–	–	–	–
User macro program	NC→PLC	Macro，interface output #1132	R6372	R6380	R6388	R6396	R172	R372	–	–
			R6373	R6381	R6389	R6397	R173	R373	–	–
		Macro，interface output #1133	R6374	R6382	R6390	R6398	R174	R374	–	–
			R6375	R6383	R6391	R6399	R175	R375	–	–
		Macro，interface output #1134	R6376	R6384	R6392	R6400	R176	R376	–	–
			R6377	R6385	R6393	R6401	R177	R377	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
User macro program	NC→PLC	Macro，interface output #1135	R6378	R6386	R6394	R6402	R178	R378	–	–
			R6379	R6387	R6395	R6403	R179	R379	–	–
	PLC→NC	Macro，interface output #1032	R6436	R6444	R6452	R6460	R72	R272	–	–
			R6437	R6445	R6453	R6461	R73	R273	–	–
		Macro，interface output #1033	R6438	R6446	R6454	R6462	R74	R274	–	–
			R6439	R6447	R6455	R6463	R75	R275	–	–
		Macro，interface output #1034	R6440	R6448	R6456	R6464	R76	R276	–	–
			R6441	R6449	R6457	R6465	R77	R277	–	–
		Macro，interface output #1035	R6442	R6450	R6458	R6466	R78	R278	–	–
			R6443	R6451	R6459	R6467	R79	R279	–	–
Spindle data	NC→PLC	Spindle command rotate	R6500	R6550	R6600	R6650	R8	R208	R4500	R4520
			R6501	R6551	R6601	R6651	R9	R209	R4501	R4521
		Spindle command last data	R6502	R6552	R6602	R6652	R10	R210	R4502	R4522
			R6503	R6553	R6603	R6653	R11	R211	R4503	R4523
		Spindle last data （12 bit）	R6504	R6554	R6604	R6654	–	–	–	–
			R6505	R6555	R6605	R6655	–	–	–	–
		Spindle real rotate	R6506	R6556	R6606	R6656	R18	R218	R4506	R4526
			R6507	R6557	R6607	R6657	R19	R219	R4507	R4527
		Spindle synchronous position error phase/gear delay angle	R6516	R6566	R6616	R6666	R474	–	–	–
		Spindle synchronous phase compensation data	R6518	R6568	R6618	R6668	R490	–	–	–
		Spindle synchronous phase error monitor	R6519	R6569	R6619	R6669	R477	–	–	–
		Spindle synchronous phase error monitor（down）	R6520	R6570	R6620	R6670	R478	–	–	–
		Spindle synchronous phase error monitor（up）	R6521	R6571	R6621	R6671	R479	–	–	–
		Spindle synchronous phase error 1 (degree)	R6522	R6572	R6622	R6672	R475	–	–	–
		Spindle synchronous phase error 2 (degree)	R6523	R6573	R6623	R6673	R476	–	–	–
	PLC→NC	Spindle command rotate output	R7000	R7050	R7100	R7150	R108	R308	R4600	4620
			R7001	R7051	R7101	R7151	R109	R309	R4601	4621
		Spindle selection signal	R7002	R7052	R7102	R7152	R110	R310	R4606	R4626
		S analog OVERRIDE	R7008	R7058	R7108	R7158	R148	R348	R4604	R4624
		Multi-point position data	R7009	R7059	R7109	R7159	R149	R349	R4605	R4625
		Spindle synchronous basic spindle	R7016	R7066	R7116	R7166	R446	–	–	–
		Spindle synchronous selection	R7017	R7067	R7117	R7167	R447	–	–	–
		Spindle synchronous phase shift set	R7018	R7068	R7118	R7168	R448	–	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
PLC constant	PLC constant＃1	R7500	–	–	–	R2800	–	–	–
		R7501	–	–	–	R2801	–	–	–
	～	～	–	–	–	～	–	–	–
	PLC constant＃48	R7594	–	–	–	R2894	–	–	–
		R7595	–	–	–	R2895	–	–	–
	PLC constant＃49	R7596	–	–	–	R4900	–	–	–
		R7597	–	–	–	R4901	–	–	–
	～	～	–	–	–	～	–	–	–
	PLC constant＃96	R7690	–	–	–	R4994	–	–	–
		R7691	–	–	–	R4995	–	–	–
Bit selection parameter	Bit selection parameter #1,#2	R7800	–	–	–	R2900	–	–	–
	～	～	–	–	–	～	–	–	–
	Bit selection parameter #95,#96	R7847	–	–	–	R2947	–	–	–
	Bit selection parameter #97,#98	R7848	–	–	–	R4400	–	–	–
	～	～	–	–	–	～	–	–	–
	Bit selection parameter #195,#196	R7897	–	–	–	R4449	–	–	–
User backup area		R8300	–	–	–	R1900	–	–	–
		～	–	–	–	～	–	–	–
		R9799	–	–	–	R2799	–	–	–
User workpiece area		R9800	–	–	–	R500	–	–	–
		～	–	–	–	～	–	–	–
		R9899	–	–	–	R549	–	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
J2-CT data	NC→PLC	J2-CT 1st axis state 4	R9900	–	–	–	R1600	–	–	–
		J2-CT 1st axis state 3	R9901	–	–	–	R1601	–	–	–
		J2-CT 1st axis state 2	R9902	–	–	–	R1602	–	–	–
		J2-CT 1st axis state 1	R9903	–	–	–	R1603	–	–	–
		J2-CT 1st axis machine position	R9904	–	–	–	R1736	–	–	–
			R9905	–	–	–	R1737	–	–	–
		J2-CT 2nd axis state 4	R9906	–	–	–	R1604	–	–	–
		J2-CT 2nd axis state 3	R9907	–	–	–	R1605	–	–	–
		J2-CT 2nd axis state 2	R9908	–	–	–	R1606	–	–	–
		J2-CT 2nd axis state 1	R9909	–	–	–	R1607	–	–	–
		J2-CT 2nd axis machine position	R9910	–	–	–	R1738	–	–	–
			R9911	–	–	–	R1739	–	–	–
		J2-CT 3rd axis state 4	R9912	–	–	–	R1608	–	–	–
		J2-CT 3rd axis state 3	R9913	–	–	–	R1609	–	–	–
		J2-CT 3rd axis state 2	R9914	–	–	–	R1610	–	–	–
		J2-CT 3rd axis state 1	R9915	–	–	–	R1611	–	–	–
		J2-CT 3rd axis machine position	R9916	–	–	–	R1740	–	–	–
			R9917	–	–	–	R1741	–	–	–
		J2-CT 4th axis state 4	R9918	–	–	–	R1612	–	–	–
		J2-CT 4th axis state 3	R9919	–	–	–	R1613	–	–	–
		J2-CT 4th axis state 2	R9920	–	–	–	R1614	–	–	–
		J2-CT 4th axis state 1	R9921	–	–	–	R1615	–	–	–
		J2-CT 4th axis machine position	R9922	–	–	–	R1742	–	–	–
			R9923	–	–	–	R1743	–	–	–
		J2-CT 5th axis state 4	R9924	–	–	–	R1616	–	–	–
		J2-CT 5th axis state 3	R9925	–	–	–	R1617	–	–	–
		J2-CT 5th axis state 2	R9926	–	–	–	R1618	–	–	–
		J2-CT 5th axis state 1	R9927	–	–	–	R1619	–	–	–
		J2-CT 5th axis machine position	R9928	–	–	–	R1744	–	–	–
			R9929	–	–	–	R1745	–	–	–
		J2-CT 6th state 4	R9930	–	–	–	R1620	–	–	–
		J2-CT 6th state 3	R9931	–	–	–	R1621	–	–	–
		J2-CT 6th state 2	R9932	–	–	–	R1622	–	–	–
		J2-CT 6th state 1	R9933	–	–	–	R1623	–	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
J2-CT data	NC→PLC	J2-CT 6th machine position	R9934	–	–	–	R1746	–	–	–
			R9935	–	–	–	R1747	–	–	–
		J2-CT running adjust mode（axis bit）	R9948	–	–	–	R1656	–	–	–
	PLC→NC	J2-CT 1st axis command 4	R9950	–	–	–	R1700	–	–	–
		J2-CT 1st axis command 3	R9951	–	–	–	R1701	–	–	–
		J2-CT 1st axis command 2	R9952	–	–	–	R1702	–	–	–
		J2-CT 1st axis command 1	R9953	–	–	–	R1703	–	–	–
		J2-CT 1st axis command position	R9954	–	–	–	R1704	–	–	–
			R9955	–	–	–	R1705	–	–	–
		J2-CT 2nd axis command 4	R9956	–	–	–	R1706	–	–	–
		J2-CT 2nd axis command 3	R9957	–	–	–	R1707	–	–	–
		J2-CT 2nd axis command 2	R9958	–	–	–	R1708	–	–	–
		J2-CT 2nd axis command 1	R9959	–	–	–	R1709	–	–	–
		J2-CT 2nd axis command position	R9960	–	–	–	R1710	–	–	–
			R9961	–	–	–	R1711	–	–	–
		J2-CT 3rd axis command 4	R9962	–	–	–	R1712	–	–	–
		J2-CT 3rd axis command 3	R9963	–	–	–	R1713	–	–	–
		J2-CT 3rd axis command 2	R9964	–	–	–	R1714	–	–	–
		J2-CT 3rd axis command 1	R9965	–	–	–	R1715	–	–	–
		J2-CT 3rd axis command position	R9966	–	–	–	R1716	–	–	–
			R9967	–	–	–	R1717	–	–	–
		J2-CT 4th axis command 4	R9968	–	–	–	R1718	–	–	–
		J2-CT 4th axis command 3	R9969	–	–	–	R1719	–	–	–
		J2-CT 4th axis command 2	R9970	–	–	–	R1720	–	–	–
		J2-CT 4th axis command 1	R9971	–	–	–	R1721	–	–	–
		J2-CT 4th axis command position	R9972	–	–	–	R1722	–	–	–
			R9973	–	–	–	R1723	–	–	–
		J2-CT 5th axis command 4	R9974	–	–	–	R1724	–	–	–
		J2-CT 5th axis command 3	R9975	–	–	–	R1725	–	–	–
		J2-CT 5th axis command 2	R9976	–	–	–	R1726	–	–	–
		J2-CT 5th axis command 1	R9977	–	–	–	R1727	–	–	–
		J2-CT 5th axis command position	R9978	–	–	–	R1728	–	–	–
			R9979	–	–	–	R1729	–	–	–
		Runnig adjust mode (J2CT)	R9998	–	–	–	R1784	–	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
I/O link	I/O link input	R10100	–	–	–	R1560	–	–	–
		～	–	–	–	～	–	–	–
		R10139	–	–	–	R1599	–	–	–
	I/O link output	R10140	–	–	–	R1460	–	–	–
		～	–	–	–	～	–	–	–
		R10179	–	–	–	R1499	–	–	–
	I/O link communication	R10180	–	–	–	R1559	–	–	–
Basic PLC equip check	Basic PLC equip check	R10188	–	–	–	R640	–	–	–
		R10189	–	–	–	R641	–	–	–
MELSEC link Ⅱ	MELSEC link Ⅱ diagnosis I/F	R10190	–	–	–	R1880	–	–	–
		～	–	–	–	～	–	–	–
		R10199	–	–	–	R1889	–	–	–
	MELSEC connection Ⅱ data buffer (machine input)	R10200	–	–	–	R4000	–	–	–
		～	–	–	–	～	–	–	–
		R10399	–	–	–	R4095	–	–	–
	MELSEC connection Ⅱ data buffer (machine output)	R10400	–	–	–	R4200	–	–	–
		～	–	–	–	～	–	–	–
		R10599	–	–	–	R4327	–	–	–
ATC（M system）	ATC control parameter	R10600	–	–	–	R2950	–	–	–
	ATC control parameter	R10601	–	–	–	R2951	–	–	–
	ATC control parameter	R10602	–	–	–	R2952	–	–	–
	AUX data	R10604	–	–	–	R2998	–	–	–
	1st tool magazine parameter	R10610	–	–	–	R2960	–	–	–
	2nd tool magazine parameter	R10611	–	–	–	R2961	–	–	–
	3rd tool magazine parameter	R10612	–	–	–	R2962	–	–	–
	1st tool magazine index	R10615	–	–	–	R2965	–	–	–
	2nd tool magazine index	R10616	–	–	–	R2966	–	–	–
	3rd tool magazine index	R10617	–	–	–	R2967	–	–	–
	1st tool magazine T8 spindle tool	R10620	–	–	–	R2970	–	–	–
		R10621	–	–	–	R2971	–	–	–
	1st magazine T8 stand-by No.1 tool	R10622	–	–	–	R2972	–	–	–
		R10623	–	–	–	R2973	–	–	–
	1st magazine T8 stand-by No.2 tool	R10624	–	–	–	R2974	–	–	–
		R10625	–	–	–	R2975	–	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
ATC（M system）	1st magazine T8 stand-by No.3 tool	R10626	—	—	—	R2976	—	—	—
		R10627	—	—	—	R2977	—	—	—
	1st magazine T8 stand-by No.4 tool	R10628	—	—	—	R2978	—	—	—
		R10629	—	—	—	R2979	—	—	—
	2nd magazine T8 stand-by tool	R10630	—	—	—	R2980	—	—	—
		R10631	—	—	—	R2981	—	—	—
	2nd magazine T8 stand-by 1st tool	R10632	—	—	—	R2982	—	—	—
		R10633	—	—	—	R2983	—	—	—
	2nd magazine T8 stand-by 2nd tool	R10634	—	—	—	R2984	—	—	—
		R10635	—	—	—	R2985	—	—	—
	2nd magazine T8 stand-by 3rd tool	R10636	—	—	—	R2986	—	—	—
		R10637	—	—	—	R2987	—	—	—
	2nd magazine T8 stand-by 4th tool	R10638	—	—	—	R2988	—	—	—
		R10639	—	—	—	R2989	—	—	—
	3rd magazine T8 stand-by tool	R10640	—	—	—	R3750	—	—	—
		R10641	—	—	—	R3751	—	—	—
	3rd magazine T8 stand-by 1st tool	R10642	—	—	—	R3752	—	—	—
		R10643	—	—	—	R3753	—	—	—
	3rd magazine T8 stand-by 2nd tool	R10644	—	—	—	R3754	—	—	—
		R10645	—	—	—	R3755	—	—	—
	3rd magazine T8 stand-by 3rd tool	R10646	—	—	—	R3756	—	—	—
		R10647	—	—	—	R3757	—	—	—
	3rd magazine T8 stand-by 4th tool	R10648	—	—	—	R3758	—	—	—
		R10649	—	—	—	R3759	—	—	—
	1st magazine spindle tool D	R10670	—	—	—	R3760	—	—	—
	1st magazine stand-by 1 tool D	R10671	—	—	—	R3761	—	—	—
	1st magazine stand-by 2 tool D	R10672	—	—	—	R3762	—	—	—
	1st magazine stand-by 3 tool D	R10673	—	—	—	R3763	—	—	—
	1st magazine stand-by 4 tool D	R10674	—	—	—	R3764	—	—	—
	2nd magazine spindle tool D	R10675	—	—	—	R3770	—	—	—
	2nd magazine stand-by 1 tool D	R10676	—	—	—	R3771	—	—	—
	2nd magazine stand-by 2 tool D	R10677	—	—	—	R3772	—	—	—
	2nd magazine stand-by 3 tool D	R10678	—	—	—	R3773	—	—	—
	2nd magazine stand-by 4 tool D	R10679	—	—	—	R3774	—	—	—
	3rd magazine spindle tool D	R10680	—	—	—	R3780	—	—	—

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
ATC（M system）		3rd magazine stand-by 1 tool D	R10681	–	–	–	R3781	–	–	–
		3rd magazine stand-by 2 tool D	R10682	–	–	–	R3782	–	–	–
		3rd magazine stand-by 3 tool D	R10683	–	–	–	R3783	–	–	–
		3rd magazine stand-by 4 tool D	R10684	–	–	–	R3784	–	–	–
		1st magazine first No.	R10695	–	–	–	R2990	–	–	–
		2nd magazine first No.	R10696	–	–	–	R2991	–	–	–
		3rd magazine first No.	R10697	–	–	–	R2992	–	–	–
		4th magazine first No.	R10698	–	–	–	R2993	–	–	–
		5th magazine first No.	R10699	–	–	–	R2994	–	–	–
		1st magazine tool data（120 sets）	R10700	–	–	–	R3000	–	–	–
			～	–	–	–	～	–	–	–
			R11059	–	–	–	R3239	–	–	–
		2nd magazine tool data（120 sets）	R11060	–	–	–	R3240	–	–	–
			～	–	–	–	～	–	–	–
			R11419	–	–	–	R3479	–	–	–
		3rd magazine tool data（120 sets）	R11420	–	–	–	R3480	–	–	–
			～	–	–	–	～	–	–	–
			R11779	–	–	–	R3719	–	–	–
Tool life management（M system）	NC→PLC	Tool lift management stand-by tool group No.	R11800	R11850	R11900	R11950	–	–	–	–
			R11801	R11851	R11901	R11951	–	–	–	–
		Tool lift management stand-by tool group No.	R11802	R11852	R11902	R11952	–	–	–	–
			R11803	R11853	R11903	R11953	–	–	–	–
		Tool lift management stand-by tool flag/state	R11804	R11854	R11904	R11954	–	–	–	–
		Tool lift management stand-by tool auxiliary data	R11805	R11855	R11905	R11955	–	–	–	–
		Tool lift management stand-by tool accumulate data	R11806	R11856	R11906	R11956	–	–	–	–
			R11807	R11857	R11907	R11957	–	–	–	–
		Tool lift management stand-by tool set time data	R11808	R11858	R11908	R11958	–	–	–	–
			R11809	R11859	R11909	R11959	–	–	–	–
		Tool lift management stand-by tool accumulate counter data	R11810	R11860	R11910	R11960	–	–	–	–
		Tool lift management stand-by tool set count data	R11811	R11861	R11911	R11961	–	–	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
Tool life management (M system)	NC→PLC	Tool lift management stand-by tool accumulate wear data	R11812	R11862	R11912	R11962	–	–	–	–
			R11813	R11863	R11913	R11963	–	–	–	–
		Tool lift management stand-by tool set wear data	R11814	R11864	R11914	R11964	–	–	–	–
			R11815	R11865	R11915	R11965	–	–	–	–
		Tool lift management stand-by tool compensation data	R11816	R11866	R11916	R11966	–	–	–	–
			R11817	R11867	R11917	R11967	–	–	–	–
		Tool lift management stand-by tool diameter offset data	R11818	R11868	R11918	R11968	–	–	–	–
			R11819	R11869	R11919	R11969	–	–	–	–
		Tool lift management stand-by tool length wear data	R11820	R11870	R11920	R11970	–	–	–	–
			R11821	R11871	R11921	R11971	–	–	–	–
		Tool lift management stand-by tool diameter wear data	R11822	R11872	R11922	R11972	–	–	–	–
			R11823	R11873	R11923	R11973	–	–	–	–
		Tool lift management tool group No.	R11824	R11874	R11924	R11974	R3724	–	–	–
			R11825	R11875	R11925	R11975	R3725	–	–	–
		Tool lift management tool group No.	R11826	R11876	R11926	R11976	R3726	–	–	–
			R11827	R11877	R11927	R11977	R3727	–	–	–
		Tool lift management used data flag/state	R11828	R11878	R11928	R11978	R3728	–	–	–
		Tool lift management used data auxiliary data	R11829	R11879	R11929	R11979	R3729	–	–	–
		Tool lift management used data set counter data（life data）	R11830	R11880	R11930	R11980	R3730	–	–	–
		Tool lift management used data accumulate counter data（using data）	R11831	R11881	R11931	R11981	R3731	–	–	–
		Tool lift management used data length compensation data	R11832	R11882	R11932	R11982	R3732	–	–	–
			R11833	R11883	R11933	R11983	R3733	–	–	–
		Tool lift management used data diameter compensation data	R11834	R11884	R11934	R11984	R3734	–	–	–
			R11835	R11885	R11935	R11985	R3735	–	–	–
		Tool lift management used data timer data	R11836	R11886	R11936	R11986	–	–	–	–
			R11837	R11887	R11937	R11987	–	–	–	–
		Tool lift management used data setting timer data	R11838	R11888	R11938	R11988	–	–	–	–
			R11839	R11889	R11939	R11989	–	–	–	–
		Tool lift management used data accumulate wear data	R11840	R11890	R11940	R11990	–	–	–	–
			R11841	R11891	R11941	R11991	–	–	–	–

Sort		Item	M700				M60S・M625			
			$1	$2	$3	$4	$1	$2	$3	$4
Tool life management （M system）	NC→PLC	Tool lift management used data setting wear data	R11842	R11892	R11942	R11992	–	–	–	–
			R11843	R11893	R11943	R11993	–	–	–	–
		Tool lift management used data length wear data	R11844	R11894	R11944	R11994	–	–	–	–
			R11845	R11895	R11945	R11995	–	–	–	–
		Tool lift management used data diameter wear data	R11846	R11896	R11946	R11996	–	–	–	–
			R11847	R11897	R11947	R11997	–	–	–	–
	PLC→NC	Tool life management used spindle tool No.	R12200	R12210	R12220	R12230	R3720	–	–	–
			R12201	R12211	R12221	R12231	R3721	–	–	–
		Tool life management stand-by tool No.	R12202	R12212	R12222	R12232	R3722	–	–	–
			R12203	R12213	R12223	R12233	R3723	–	–	–
Other		Computer link A I/F	R12800	–	–	–	R700	–	–	–
			～	–	–	–	～	–	–	–
			R13099	–	–	–	R999	–	–	–
		C axis position monitor	R13150	–	–	–	R1830	–	–	–
			～	–	–	–	～	–	–	–
			R13169	–	–	–	R1849	–	–	–
		Maintenance diagnosis area (CRC counter servo #1)	R13170	–	–	–	R1850	–	–	–
		↑ (CRC counter servo #2)	R13171	–	–	–	R1851	–	–	–
		↑ (address error servo #1)	R13172	–	–	–	R1852	–	–	–
		↑ (address error servo #2)	R13173	–	–	–	R1853	–	–	–
		↑ (CRC count：monitor)	R13174	–	–	–	R1854	–	–	–
		↑ (address error：monitor)	R13175	–	–	–	R1855	–	–	–
		↑ (Same as above servo#3 spare 1)	R13176	–	–	–	R1856	–	–	–
		↑ Same as above servo#3 spare 2)	R13177	–	–	–	R1857	–	–	–
		↑	R13178	–	–	–	R1858	–	–	–
		↑ (position shift factor diagnosis)	R13179	–	–	–	R1859	–	–	–

Sort	Item	M700				M60S・M625			
		$1	$2	$3	$4	$1	$2	$3	$4
Other	↑ (position shift confirm X)	R13180	–	–	–	R1860	–	–	–
	↑ (↑)	R13181	–	–	–	R1861	–	–	–
	↑ (position shift confirm Y)	R13182	–	–	–	R1862	–	–	–
	↑ (↑)	R13183	–	–	–	R1863	–	–	–
	↑ (position shift confirm Z)	R13184	–	–	–	R1864	–	–	–
	↑ (↑)	R13185	–	–	–	R1865	–	–	–
	↑ workpiece compensention measure state	R13186	–	–	–	R1866	–	–	–
	↑ workpiece compensention measure unfinished factor	R13187	–	–	–	R1867	–	–	–
	↑	R13188	–	–	–	R1868	–	–	–
	↑	R13189	–	–	–	R1869	–	–	–
	↑	R13190	–	–	–	R1870	–	–	–
	↑	R13191	–	–	–	R1871	–	–	–
	↑	R13192	–	–	–	R1872	–	–	–
	↑	R13193	–	–	–	R1873	–	–	–
	↑	R13194	–	–	–	R1874	–	–	–
	↑	R13195	–	–	–	R1875	–	–	–
	↑	R13196	–	–	–	R1876	–	–	–
	↑	R13197	–	–	–	R1877	–	–	–
	↑	R13198	–	–	–	R1878	–	–	–
	Maintenance diagnosis area	R13199	–	–	–	R1879	–	–	–
	NSK million torgue motor I/F	R13200	–	–	–	R5000	–	–	–
		~	–	–	–	~	–	–	–
		R13299	–	–	–	R5099	–	–	–

Appendix 2.6 T device・C device

Contant	Sort	M60S・M625		M700			Remarks
		Device	Parameter	Device	Parameter	Command	
10ms variable unit timer	Timer	T0～T15	#6000～#6015	T0～T399	#16000～#16399	OUTH	
100ms variable unit timer	Timer	T16～T95	#6016～#6095	T400～T499	#16400～#1649	OUT	
10ms fixed unit timer	Timer	Q0～Q39	—	T500～T599	—	OUTH	Parameter #6454 BIT0～3 selected No.
100ms fixed unit timer	Timer	Q40～Q135	—	T600～T703	—	OUT	
100ms valiable accumulation timer	Timer	T96～T103	#6096～#6103	ST0～ST39	#17000～#17039	OUT	
100ms fixed fixed accumulation timer	Timer	Q136～Q151	—	ST40～ST63	—	OUT	Parameter #6455 BIT5～7 start selected No.
Variable timer	Timer	C0～C23	#6200～#6223	C0～C119	#17200～#17319	OUT	
Fixed counter	Timer	B0～B103	—	C120～C255	—	OUT	Parameter #6454 BIT4～7 start selected No.

※ For Bit selection parameter and timer・counter of variable area

	Variable area		Bit selection #6454（R7826_H）								#6453(R7826_L)		
	Point	Range	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	bit7	bit6	bit5
Timer	0						0	0	0	0			
	100	0～99					0	0	0	1			
	200	0～199					0	0	1	0			
	300	0～299					0	0	1	1			
	400	0～399					0	1	0	0			
	500	**0～499**					**0**	**1**	**0**	**1**			
	600	0～599					0	1	1	0			
	All	0～703					0	1	1	1			
Counter	0		0	0	0	0							
	40	0～39	0	0	0	1							
	80	0～79	0	0	1	0							
	120	**0～119**	**0**	**0**	**1**	**1**							
	160	0～159	0	1	0	0							
	200	0～199	0	1	0	1							
	240	0～239	0	1	1	0							
	All	0～255	0	1	1	1							
Accumulate timer	0										0	0	0
	20	0～19									0	0	1
	40	**0～39**									**0**	**1**	**0**
	All	0～63									0	1	1

Appendix 2.7 Other device

Content	M60S・M625	M700	Remarks
Jump・sub-program	P250	P4000	
	P251	P4001	PLC high speed state symbol
	P252	P4002	PLC main（ladder）state symbol
	P253	P4003	
	P254	P4004	
	P255	P4005	END symbol
Temporal memory	G0～G3071	M5120～M8191	
Special relay	E0～E79	SM0～SM79	
	E80～E112	Y6C0～Y6E0	PLC switch state display
	E113～E128	SM113～SM128	
Index register	Z	Z0	
	V	Z1	
Accumulator	A0	D1022	
	A1	D1023	

Revision History

Date of revision	Manual No.	Revision details
Oct. 2006	MTF-T06Q008-001A(ENG)	First edition created.
Jun.2007	MTF-T07Q003-001*(TWN)	Second edition created.

Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible.
Please contact your Mitsubishi Electric dealer with any questions or comments regarding the use of this product.

Duplication Prohibited