GE Fanuc Automation

Computer Numerical Control Products

Handy Machine Operator's Panel

Connection Manual

GFZ-63753EN/01 *June 2002*

Warnings, Cautions, and Notes as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. GE Fanuc Automation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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SAFETY PRECAUTIONS

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

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

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

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

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

Table of Contents

I. SPECIFICATION

1 OUTLINE

Handy machine operator's panel is a small size machine operator's panel for controlling machine tool near machine. Handy machine operator's panel has a manual pulse generator, a small size LCD, input keys, an emergency stop button and an enabling switch (dead man switch). It is available with Series 16*i*/18*i*/21*i*-MODEL A/B, 15*i*, and Power Mate *i*-D/H.

The handy machine operator's panel is controlled with PMC ladder program. The input keys and the switches are read by PMC ladder program. The position and the message are displayed on the LCD by PMC ladder program.

The handy machine operator's panel is connected to CNC via the interface unit. The connection between the interface unit and the CNC is FANUC I/O Link. Detachable connection is possible at the connection panel on the cabinet.

Handy machine operator's panel is used for machine operation. Handy machine operator's panel is not available for maintenance of CNC. Other setting and display unit is necessary for maintenance.

2 SPECIFICATION

Manual pulse generator	Including
Display	LCD 16 characters × 2 lines
Input key	20 (with LED)
LED	User programmable LED × 2, system LED × 2
Key sheet	FANUC standard key sheet is provided. Customization of key sheet is possible with user's order. And it can be customized simply with putting their seals.
Operation ON/OFF switch	Including
Rotary switch	16 positions (for override)
Emergency stop button	2 contacts
Enabling switch	2 contacts , 3 positions
Interface	FANUC I/O Link via interface unit Additional circuit is provided to emergency stop system.
Cable length	Between handy machine operator's panel and interface unit is up to 50m.
Input power	24VDC±10% 0.4A (include a moment and ripple) <Sum of Handy machine operator's panel and interface unit>

	Handy machine operator's panel	**Interface unit**
External dimensions	130 (W)×255 (H) ×104 (D) mm	32 (W) ×122 (H) ×113 (D) mm
Weight	About 700g (not include the connection cable)	About 200g
Protect	IP54	-
Specification number	Unit : A02B-0259-C221#A (with FANUC standard key sheet A) Transparent key sheet : A02B-0259-K130	A02B-0259-C220

NOTE
1 Connecting cables are not included in the handy machine operator's panel.
2 Power supply unit and cables must be prepared by user.
3 When detachable connection, connector panel must be prepared by user.
4 In view of CE standard, there is a possibility that detachable connection by installing the connection panel in the cabinet is not permitted. (This is to bypass the emergency stop circuit.) Please confirm it to CE competent body. When detachable connection is not permitted, please use handy machine operator's panel by keeping always.

3 MAINLY FUNCTIONS

- Input keys, operation ON/OFF switch and override switch on the handy machine operator's panel are read by PMC ladder program.
- The position and messages with figures/alphabet/kana are displayed on the LCD by PMC ladder program.
- The LEDs near the input keys are turned on/off by PMC ladder program.
- The operation with manual pulse generator is possible.
- There is an emergency stop button to open emergency stop line in the system.
- There is a three positions enabling switch to open emergency stop line in the system. While the enabling switch is available, the emergency stop line is opened with releasing the switch or gripping it tightly.
- The enabling switch is enabled in automatically by the situation that the operator exposes himself to danger, example the observation working in the protection cover of cutting part, and the working in the fence for danger area. This switch is not used, when the operator is in a safety situation.
- The additional circuit of the emergency stop button and the enabling switch is provided for safety.
- The emergency stop button and the enabling switch on the handy machine operator's panel are parts of emergency stop circuit in this system. CNC and servo amplifier must be connected the emergency stop circuit.
- Detachable connection is possible by providing the connection panel on the cabinet.

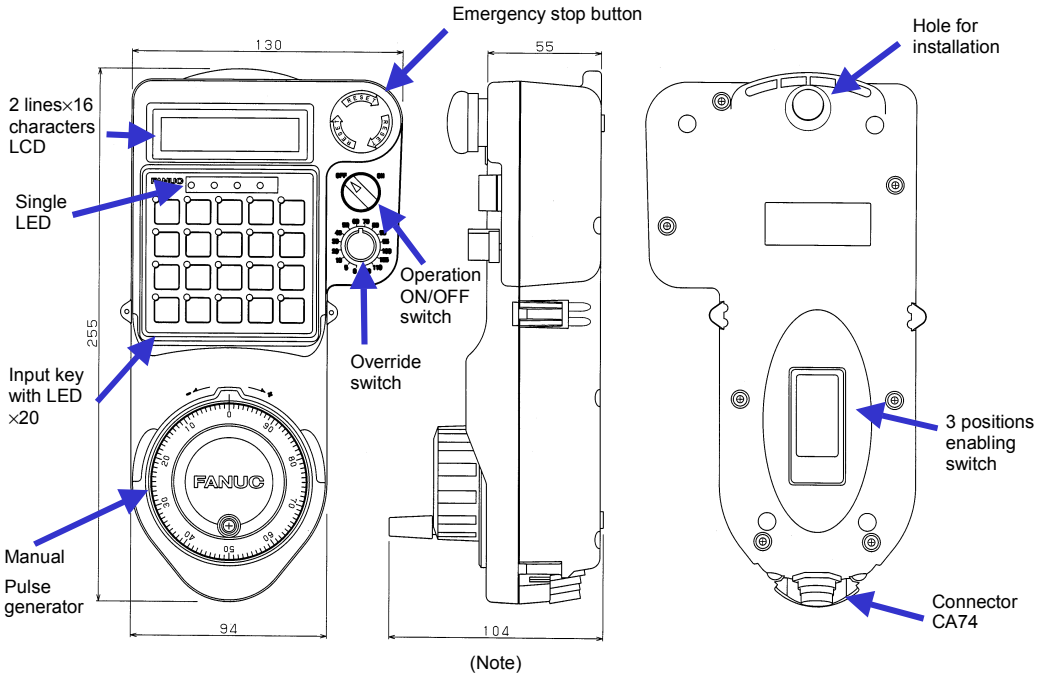
4 ENVIRONMENTAL REQUIREMENTS

Room temperature	In operation : 0°C to 45°C In store or transportation : –20°C to 60°C
Relative humidity	30% to 95% (no condensation)
Vibration	In operation : 0.5G or less In store or transportation : 1.0G or less
Pollutant	Please be careful not to expose to pollutants (dust, coolant, organic solvents, acid, corrosive gas, and salt) directly.
Radiation (ionizing or nonionizing)	Please be careful not to expose to radiation (microwave, ultraviolet rays, laser beams, X-rays) directly.
Height above sea level	In operation : up to 1,000m In store or transportation : up to 12,000m

NOTE
Please use in away place from noise and magnetism.

5 EXTERNAL FIGURE

5.1 HANDY MACHINE OPERATOR'S PANEL



Installation metal fitting is equivalent of A300-0001-0060. The strength is necessary to support the weight of handy machine operator's panel.

⚠ CAUTION

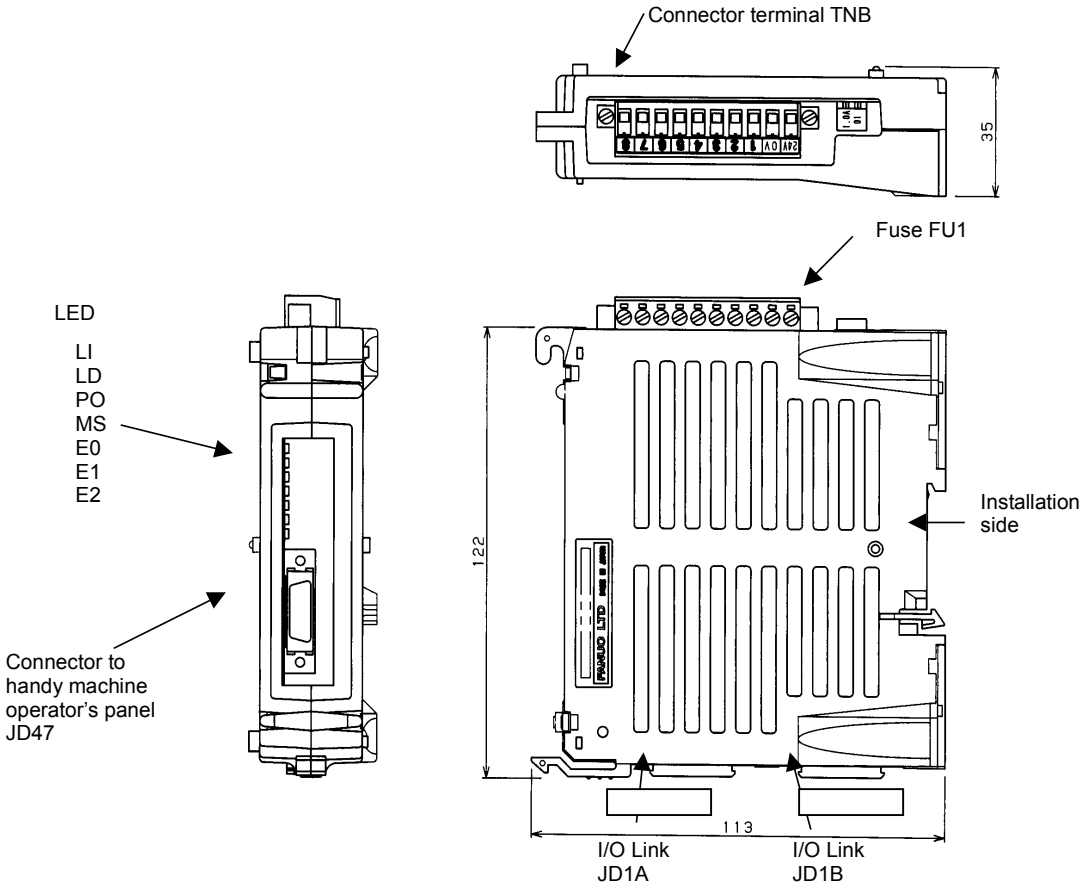
1 Please install the handy machine operator's panel seen head-on it.
2 Don't install the handy machine operator's panel by belt.
3 Please hold the handy machine operator's panel through belt. This unit has an enabling switch. When operator is surprised unexpected motion, he will release the enabling switch. When operator holds the handy machine operator's panel without using belt, the handy machine operator's panel may be dropped.

NOTE

For the new handy machine operator's panel which is shipped in around November 2001 and afterward, the height of the manual pulse generator is changed to 96 mm.

5.2 INTERFACE UNIT

The outline of interface unit is same as connector panel I/O (A03B-0815-C001).



Space of 70mm at front and under of this unit are necessary for cable connection.

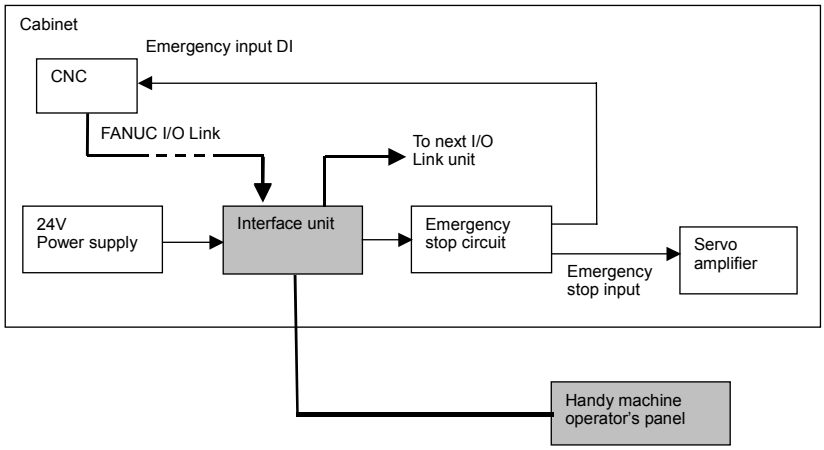
There is connector terminal TNB in the upper side. This connector terminal is possible to connect/disconnect with connecting wire. The space for minus driver (100mm or more) is necessary. In the case of the connector terminal is installed while the interface unit is not installed on the cabinet, space of 50mm or more is necessary at upper side of this unit.

This interface unit can be installed to the cabinet with DIN rail or screw. Please refer to the item of "connection of connector panel I/O module" of connection manual.

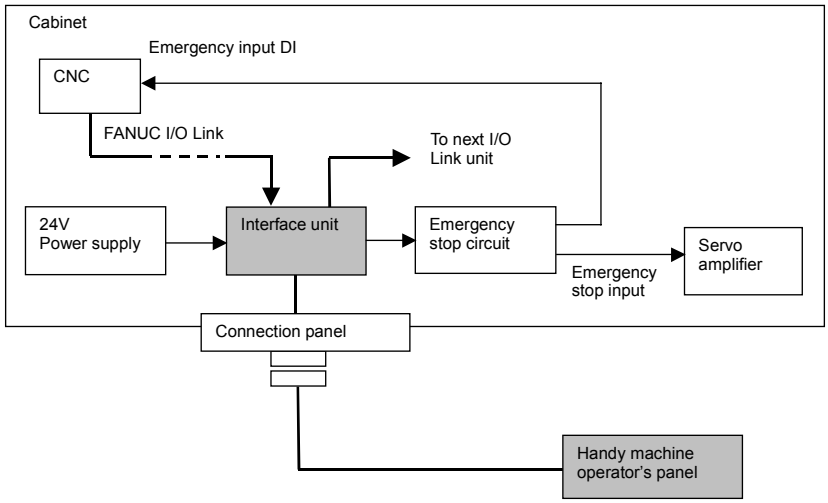
> ⚠ **CAUTION**
> Terminal block of connector TNB can be disconnected without disconnecting wire. When it is difficult to disconnect the terminal block, please remove the unit from DIN rail etc. The terminal block should not be disconnected with screwdriver while the unit is mounted to DIN rail, the case may be broken.

6 SYSTEM DIAGRAM

6.1 IN THE CASE OF KEEPING UNIT ALWAYS

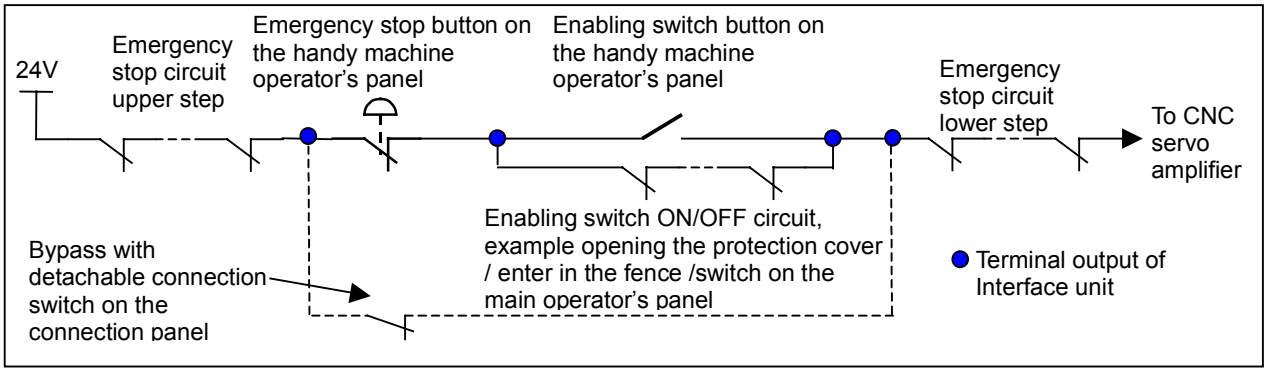


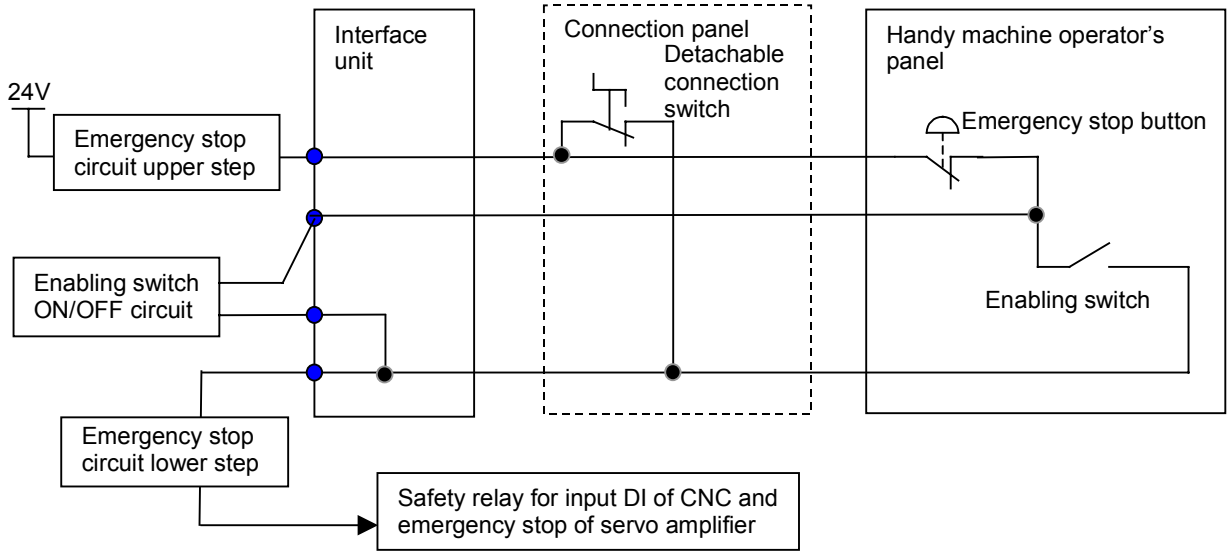
6.2 IN THE CASE OF DETACHABLE CONNECTING



7 EMERGENCY STOP CIRCUIT

The emergency stop button and the enabling switch on the handy machine operator's panel are parts of emergency stop circuit in this system. CNC and servo amplifier must be connected this emergency stop circuit. In the case of detachable connection, the emergency line is bypassed at the connection panel. The total connection diagram is as follows. Additional contact of the emergency stop button and the enabling switch are provided. So the function of emergency stop is not lost if one contact breaks down.





NOTE

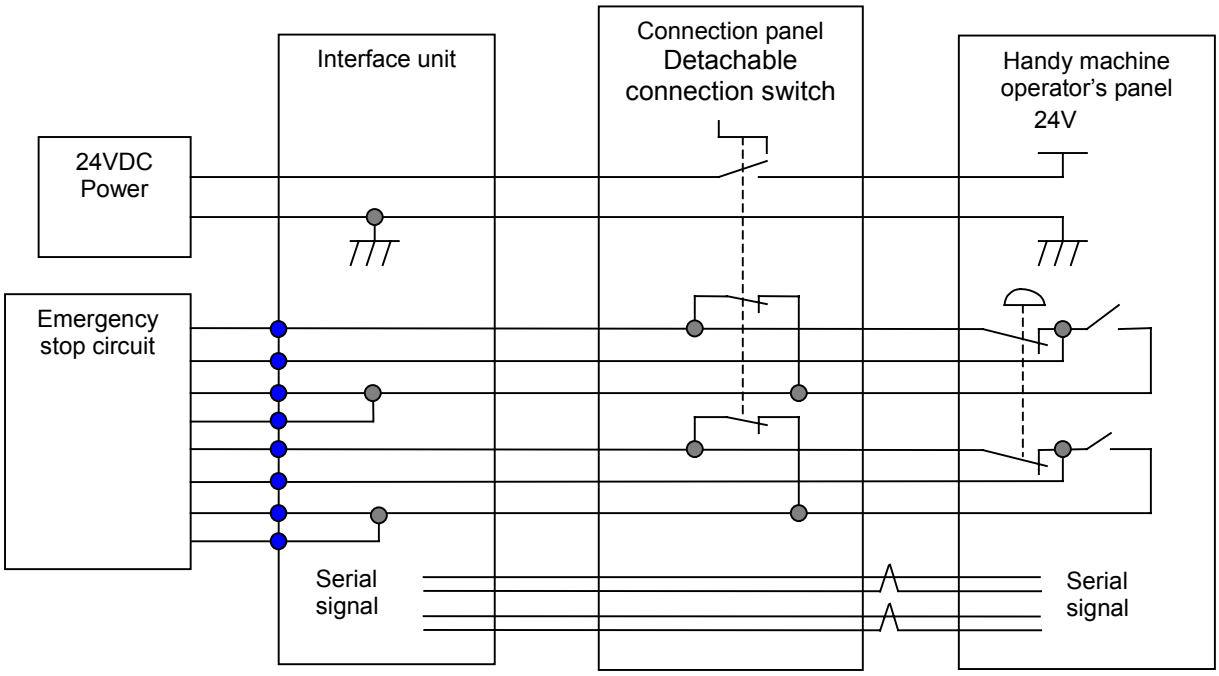
1 The state of the emergency stop button and the enabling switch on the handy machine operator's panel can be read by PMC ladder diagram. But emergency stop of CNC is not occurred with this signal on I/O Link. Emergency stop of CNC is occurred by DI of CNC.
2 Emergency stop line : 24VDC±10%
Maximum electric current : 200mA

⚠ CAUTION

1 When an operator controls machine tool with handy machine operator's panel, the operation must be done under the condition that CNC and servo amplifier can be stopped with the emergency stop button on the handy machine operator's panel.
2 When an operator controls machine tool with handy machine operator's panel and there is a possibility that the operator meet a dangerous situation, the operation must be done under the condition that CNC and servo amplifier can be stopped with the enabling switch on the handy machine operator's panel.
3 The contact and the additional contact of the emergency stop button and the enabling switch must be always used.
4 In the case of detachable connection, handy machine operator's panel must be removed from the connection panel and be put away, when machine tool is not operated with it. (This prevents the misunderstanding that the emergency stop button on the handy machine operator's panel can be used when the button is disabled.)

8 CONNECTION PANEL

In the case of detachable connection, connection panel is necessary for connection/disconnection to/from cabinet. Connection panel is prepared by MTB.
There are connector for connecting the handy machine operator's panel and detachable connection switch on the connection panel.



1) Detachable connection switch

One A contact and two B contacts are necessary for detachable connection switch. The switch must have a key. It is necessary that the switch position cannot be changed without this key.

When the switch is off position,

- 24VDC power is not supplied to handy machine operator's panel.(Operation is not possible.)
- Emergency stop circuit on handy machine operator's panel is not available, because emergency stop line is bypassed on the connection panel.

When the switch is on position,

- 24VDC power is supplied to handy machine operator's panel.(Operation is possible.)
- Emergency stop circuit on handy machine operator's panel is available, because emergency stop line is opened on the connection panel.

2) Connector for connect/disconnect the handy machine operator's panel

Please use a connector, which has 15 pins or more and doesn't fall out while operation.

Please use connector which the 0V of interface unit is connected to 0V of handy machine operator's panel at first, when the cable of handy machine operator's panel is connected.

⚠ CAUTION

Please keep the following notice, when detachable connection.

1 While operation, detachable connection switch must be ON, not OFF.
2 Detachable connection switch with key must be used. Operator must hold the key while operation. The other person must not hold the key or the copy key.
3 When emergency stop is occurred with switches on handy machine operator's panel, emergency stop state must not be released with turning off the detachable connection switch.

9 CONTROL & CONNECTION/ DISCONNECTION SEQUENCE

Starting operation with handy machine operator's panel

Operation ON/OFF switch of handy machine operator's panel is OFF.

1) The handy machine operator's panel is connected to the connection panel. (In the case of detachable connection)
2) The detachable connection switch on the connection panel is turned on. (In the case of detachable connection)
3) Set the position of the override switch on the handy machine operator's panel to the present setting value of override. (Caution 2)
4) Turn on the operation ON/OFF switch on the handy machine operator's panel.
3) The operation is possible with the handy machine operator's panel.

Finishing operation with handy machine operator's panel

1) Set the state of the alternate switch on the main operator's panel and touch panel switch to the state of the switch on the handy machine operator's panel. (Caution 2)
2) Turn off the operation ON/OFF switch on the handy machine operator's panel.
3) The detachable connection switch on the connection panel is turned off. (In the case of detachable connection)
4) The handy machine operator's panel is removed from the connection panel. (In the case of detachable connection)

⚠ CAUTION

1 In the case of existing of same purpose switches on the handy machine operator's panel and main operator's panel, and the switch is an alternate switch, there are possibility of damage to the machine when this sequence is not kept. Example, override is set to 120% with override switch on the handy machine operator's panel, but the override switch on the main operator's panel is 50%, override is changed from 120% to 50% by turning off the operation ON/OFF switch.

2 In the case of detachable connection, detachable connection switch must not be turned on with the state of turning on the operation switch. The override switch and the input key, which is pushed by accident, are valid after turning on the operation ON/OFF switch.

3 In the case of detachable connection, the Handy machine operator's panel should not be connected and disconnected while handle mode. The position of axes may be changed.

4 In the case of detachable connection, the Handy machine operator's panel should not be connected when the detachable connection switch on the connection panel is turned on. Because system alarm may be occurred.

10 CONSTRUCTION PARTS OF HANDY MACHINE OPERATOR'S PANEL

10.1 EMERGENCY STOP BUTTON

It is available in all operation modes. This switch has push-lock-turn-reset function and the direct opening action function. The state of this button can be read by PMC ladder program.

10.2 ENABLING SWITCH

This switch is used for keeping operator's safety when there is a possibility that the operator using the handy machine operator's panel exposes him to danger, example the observation working in the protection cover of cutting part, and the working in the fence for danger area. It is a 3-position switch. When operating machine tool, the switch is hold in the middle of 3 positions. The emergency stop line opens by releasing hand from this switch and gripping it tightly when operator exposes himself to danger. This switch is not used, when the operator is in a safety situation.
The information that can judge the state of this button is read by PMC ladder program.
This switch has a possibility of fusing and attaching, because the switch doesn't have the direct opening action. Operator must check the occurrence of fusing and attaching of this switch before using handy machine operator's panel with this switch. When the enabling switch is available and the operator is in non-dangerous place, emergency stop is occurred by operator with releasing the switch or griping it tightly. When fusing and attaching of the switch is occurred, the red LED ALM on the handy machine operator's panel is turned on. (Emergency stop is not occurred due to additional circuit.) When fusing and attaching of the switch is occurred, the red LED is turned on within 3 seconds after releasing the switch or griping it tightly.

⚠ CAUTION

1 The enabling switch has a possibility of fusing and attaching. Operator must check the occurrence of fusing and attaching of this switch before operating with handy machine operator's panel with this switch. Please check that the red LED ALM is not turned on while enabling switch is released. And check that the red LED ALM is not turned on while enabling switch is gripped tightly.
2 When fusing and attaching is occurred in the enabling switch, do not use the handy machine operator's panel with the enabling switch.
3 Do not cancel the state of emergency stop with the method except for keeping the enabling switch in the middle of three positions, when the enabling switch is available.

10.3 OPERATION ON/OFF SWITCH

This is an alternate switch. The state of this switch can be read by PMC ladder program. Please use this switch for the purpose of selecting the operation by handy machine operator's panel or the operation by main operator's panel. When this switch is on, the operation by handy machine operator's panel is permitted (the operation by main operator's panel is not permitted) by PMC ladder program. When this switch is off, the operation by main operator's panel is permitted (the operation by handy machine operator's panel is not permitted) by PMC ladder program.

⚠ CAUTION

When there are same purpose switches on the handy machine operator's panel and the main operator's panel

1 Please decide which switches are available by the state of the operation ON/OFF switch. When the both switches are available, the state can be changed from main operator's panel, though the operation with handy machine operator's panel is done. It is dangerous.
2 Please don't turn off the operation ON/OFF switch in the situation that operator expose himself to danger. When the operation ON/OFF switch is turned off, the operation from main operator's panel is possible. It is dangerous.

10.4 LCD

The display is 2 lines and 16 characters LCD.
The position and the messages with figures/alphabet/kana are displayed by PMC ladder program.

10.5 INPUT KEY

There are 20 input keys. The state of these keys can be read by PMC ladder program.

10.6 LED WITH INPUT KEY

LEDs are attached with each 20 input keys. These LEDs are turned on/off by PMC ladder program.

10.7 SINGLE LED

There are two LEDs, which is turned on/off by system of handy machine operator's panel.

1) EN (green); Power on state
2) ALM (red); Watchdog alarm of unit or fusing and attaching alarm of enabling switch
   - When this LED is turned on while normal operation, watchdog alarm(system alarm)is occurred.
   - When this LED is turned on while checking of fusing and attaching alarm of enabling switch, fusing and attaching alarm of enabling switch is occurred. In this case, this LED is turned off, when the enabling switch is hold in the middle position.

There are two LEDs, which is turned on/off by PMC ladder program for the following purpose mainly

1) Red LED (right side); The notation of FANUC standard key sheet is "CNC ALM".
   This LED shows the occurrence of Alarm of CNC.
   Please assign Alarm signal (AL) for this LED.
2) Green LED (second LED from right); The notation of FANUC standard key sheet is "SRDY".
   This LED shows possibility of axis motion.
   Please assign servo ready signal (SA) for this LED.

10.8 OVERRIDE SWITCH

16 positions override switch is provided. The divisions of this switch on the case are as follows.

→ **0,5,10**,20,30,40,50,60,70,80,90,**95,100,105**,110,120%

This switch is used for feedrate override in MEM operation mode, and manual feedrate override in JOG mode. When the operation ON/OFF switch is on, please set the value of override from judging the state of this switch by PMC program.

Before the operation ON/OFF switch is turned on, please confirm the present override setting value, and set the position of the override switch on handy machine operator's panel to the present override setting value. When this confirmation is not done, override is changed suddenly after turning on the operation ON/OFF switch. (When the present override setting value is different from the value of the override switch on the handy machine operator's panel after turning on the operation ON/OFF switch, the alarm of it can be displayed, and it is possible to stop the changing the value of override by PMC ladder program.)

10.9 MANUAL PULSE GENERATOR (MPG)

Counter information of MPG is transferred to CNC via FANUC I/O Link after power on the handy machine operator's panel and turning on the operation ON/OFF switch. (When mode is manual handle feed/step feed, the axis, which is selected by manual handle feed axis selection signals, is motioned.)
When the operation ON/OFF switch is turned off, the counter information of MPG is not transferred to CNC if MPG is rotated.

11 FANUC STANDARD KEY SHEET A

FANUC standard key sheet A is as follows. This key sheet is put on the standard unit.

XYZ 456	REF	SPINDL START	SPINDL STOP	RESET
HANDLE	JOG	SPINDL INC	SPINDL DEC	+
×n	MEM	F1 FUNC TION	MESSAG	RAPID
SINGLE BLOCK	DRY RUN	CYCLE START	FEED HOLD	-

When using this key sheet, memory operation "MEM", manual handle feed "HANDLE", manual continuous feed "JOG" and manual reference position return "REF" are possible. We suppose that the following operation and display is done by PMC ladder program.

1) Memory operation
The keys to use are shaded in the following figure.

XYZ 456	REF	SPINDL START	SPINDL STOP	RESET
HANDLE	JOG	SPINDL INC	SPINDL DEC	+
×n	MEM	FUNC TION	MESSAG	RAPID
SINGLE BLOCK	DRY RUN	CYCLE START	FEED HOLD	-

- When the "MEM" key is pushed, mode is changed to MEM operation mode.
- When the "CYCLE START" key is pushed, automatic operation is started.
- When the "FEED HOLD" key is pushed, automatic operation is stopped.

- When the “RESET” key is pushed, CNC is reset.
  Reset and rewind signal should be on for rewinding part program.
- Override can be applied to feedrate speed by the override switch on handy machine operator’s panel. Set feedrate override signal from 0% to 120% according to the override switch position.
- When the “×n” key is pushed, rapid traverse override is applied. Please rotate the setting value 100%→50%→25%→F0→100% by each pushing this key.
- For test operation, Dry run “DRY RUN” and single block “SINGLE BLOCK” are available.
- One axis position is displayed normally. When the “XYZ 456” key is pushed, next axis position is displayed.

<Display example>

	Program number					Block number						Present rapid override			
O	1	0	0	0		N	0	0	1	0		1	0	0	%
X	-	9	9	9	9	9	.	9	9	9		1	2	0	%
	Position display											Present feedrate override			

2) Manual handle feed

The keys to use are shaded in the following figure.

XYZ 456	REF	SPINDL START	SPINDL STOP	RESET
HANDLE	JOG	SPINDL INC	SPINDL DEC	+
×n	MEM	FUNC TION	MESSAG	RAPID
SINGLE BLOCK	DRY RUN	CYCLE START	FEED HOLD	-

- When the “HANDLE” key is pushed, mode is changed to manual handle feed mode.
- The axis, which is moved by MPG, is selected by pushing the “XYZ 456” key several times. And the selected axis is decided for pushing the “FUNCTION” key.
- When “×n” key is pushed, manual handle feed amount selection is applied. Please rotate ×1→×10→×m→×n by each pushing of this key.
- When the “RESET” key is pushed, the moving axis is stopped.

<Display example>

									Spindle speed							
									S	-	2	0	0	0	0	
X	-	9	9	9	9	9	.	9	9	9		*	1	2	7	
			Position display									manual handle feed amount selection				

3) Jog feed

The keys to use are shaded in the following figure.

XYZ 456	REF	SPINDL START	SPINDL STOP	RESET
HANDLE	JOG	SPINDL INC	SPINDL DEC	+
×n	MEM	FUNC TION	MESSAG	RAPID
SINGLE BLOCK	DRY RUN	CYCLE START	FEED HOLD	-

- When the "JOG" key is pushed, mode is changed to manual continuous feed mode.
- The axis, which is moved by the "JOG" key, is selected by pushing the "XYZ 456" key several times. And the selected axis is decided for pushing the "FUNCTION" key.
- When the "+" key is pushed, the desired axis moves to positive direction. When the "-" key is pushed, the desired axis moves to negative direction. When the "RAPID" key is pushed at the same time, rapid traverse is selected.
- Override can be applied to manual feedrate by the override switch on the handy machine operator's panel. Set manual feedrate override signal from 0% to 120% according to the override switch position.
- When the "RESET " key is pushed, the moving axis is stopped.

<Display example>

Spindle speed

									S	-	2	0	0	0	0
X	-	9	9	9	9	9	.	9	9	9		1	2	0	%

Position display manual feedrate override

4) Manual reference position return

The keys to use are shaded in the following figure.

XYZ 456	REF	SPINDL START	SPINDL STOP	RESET
HANDLE	JOG	SPINDL INC	SPINDL DEC	+
×n	MEM	FUNC TION	MESSAG	RAPID
SINGLE BLOCK	DRY RUN	CYCLE START	FEED HOLD	-

- When the "REF" key is pushed, mode is changed to manual continuous feed mode and manual reference position return selection signal "ZRN" is asserted.
- The axis, which is moved for manual reference position return, is selected by pushing the "XYZ 456" key several times. And the selected axis is decided for pushing the "FUNCTION" key.
- When the "+ " key or the "-" key is pushed, the axis moves to the direction of reference position.

<Display example>

X	-	9	9	9	9	9	.	9	9	9					

Position display

5) Spindle control
The keys to use are shaded in the following figure.

XYZ 456	REF	SPINDL START	SPINDL STOP	RESET
HANDLE	JOG	SPINDL INC	SPINDL DEC	+
×n	MEM	FUNC TION	MESSAG	RAPID
SINGLE BLOCK	DRY RUN	CYCLE START	FEED HOLD	-

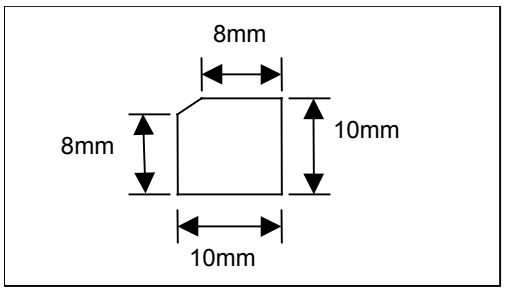
- When the “SPINDL START ” key is pushed, spindle motor is rotated to the direction, which is designed, with the speed at the decided override.
- When the “SPINDL STOP ” key is pushed, spindle motor is stopped.
- When the “SPINDL INC” key or the “SPINDL DEC” key is pushed, override of spindle speed is changed. The changing rate is decided by PMC ladder program.

6) User define key [FUNCTION]
We recommend that this key should be used for confirmation of axis selection in manual handle feed mode, manual continuous feed mode and manual reference position return. The position display should be space and the axis name should be turned on and off until pushing the confirmation key. When selected axis is changed by miss-operation, it is danger because different axis, which is not paid attention, is moved.
When user thinks that the confirmation of axis selection is not necessary or other mode, user can apply this key to other purpose at his own risk. (Example, this key may be used for clamp /unclamp at loader and coolant on/off at machining center.)

7) Message key [MESSAG]
When the “MESSAG” key is pushed, the screen is changed to user message screen. The next message screen is displayed after another pushing the “MESSAG” key. When the “XYZ 456” key is pushed, the screen is returned to the screen according to each mode.

12 CUSTOMIZATION OF KEY SHEET

1) Exclusive key sheet can be designed.
   The key sheet is put on the unit. Then the unit is shipped. The specification number of the exclusive unit is different from the specification number of standard unit.
2) Customization of key sheet by user
   When the above method is not be accepted, example the quantity is very small, or only one parts of standard key sheet would like to be changed, user can customize key sheet with the following method easily.
   - Please print out necessary keys on a seal.
   - Put the seal on the standard key sheet. LED must not be hidden.
   - Then transparent key sheet is put on it. Dust and air must not into the transparent key. The transparent key sheet is an option.
     Specification :
     A02B-0259-K130(transparent key sheet 3 sheets)
     Outline of seal



NOTE
When a handy machine operator's panel, which is customized by seal, is changed, the customization must be done by MTB. Please prepare the seal. Transparent key sheet, which is stripped off, can not be used again. Please use other transparent key sheet.

13 SUPPLEMENT

1) The following edition number or later of control software of CNC is necessary for Handy machine operator's panel.

16*i*-TA	18*i*-TA	21*i*-TA	16*i*-MA	18*i*-MA
Edition 01 of B1F4	Edition 01 of BEF4	Edition 01 of DEF4	Edition 02 of B0F4 02	Edition 02 of BDF4
21*i*-MA	16*i*-TB	18*i*-TB	21*i*-TB	16*i*-MB
Edition 02 of DDF4 02	Edition 03 of B1H1	Edition 03 of BEH1	Edition 03 of DEH1	Edition 02 of B0H1
18*i*-MB	21*i*-MB	15*i*-MA	15*i*-MA	PM *i*-D
Edition 02 of BDH1	Edition 02 of DDH1	Edition 01 of F008	Edition 01 of F608	Edition 15 of 88E0
PM *i*-H				
Edition 07 of 88F1				

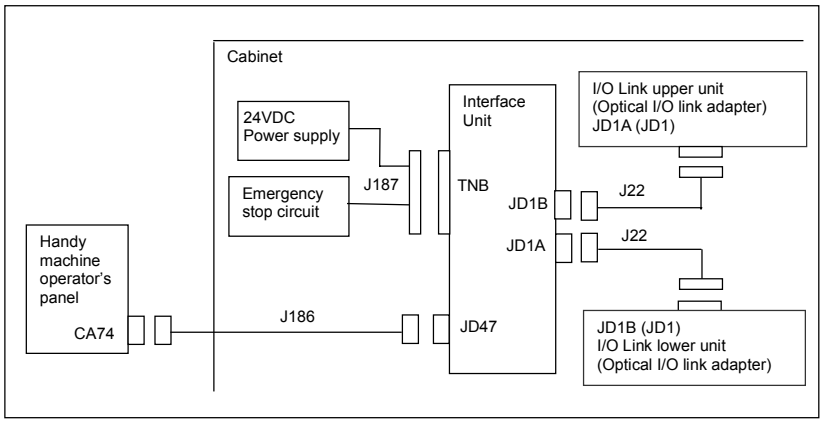
2) The following edition number or later of control software of PMC is necessary for Handy machine operator's panel.

PMC-SB5/SB6	PMC-SA1	PMC-SB7	PMC-NB6
Edition 02 of 406A Edition 09 of 407B	Edition 18 of 406A or Edition 01 of 406H	Edition 01 of 406G	Edition 01 of 404A

3) When the time of one period of PMC ladder program is very long, key input is not accepted. The time of one period of PMC ladder program must be the time that key input is accepted certainly. The standard time is about 50ms.
4) The display routine of LCD should be run periodically. The standard time is about 200ms. Especially for position display, the changing of position is not smooth when the periodic time is exceeding the standard time.
5) When two input keys are pushed at the same time, PMC ladder program can read these input keys. But when three or more input keys are pushed at the same time, PMC ladder program can not read these input keys.
6) In the case of connecting a HMOP to FANUC I/O Link, that MPGs have been connected already, please refer to appendix A (for 16*i*/18*i*/21*i*-A/B and Power Mate *i*) . This method is possible with 15*i* from before.
7) In the case of 16*i*/18*i*/21*i*-A/B which are correspond to FANUC I/O Link 2 channels, please refer to appendix B for the connecting HNOP to channel No. 2 of FANUC I/O Link.
(The Series 15*i* and Power Mate *i* do not have the second channel of I/O Link.)

II. CONNECTION

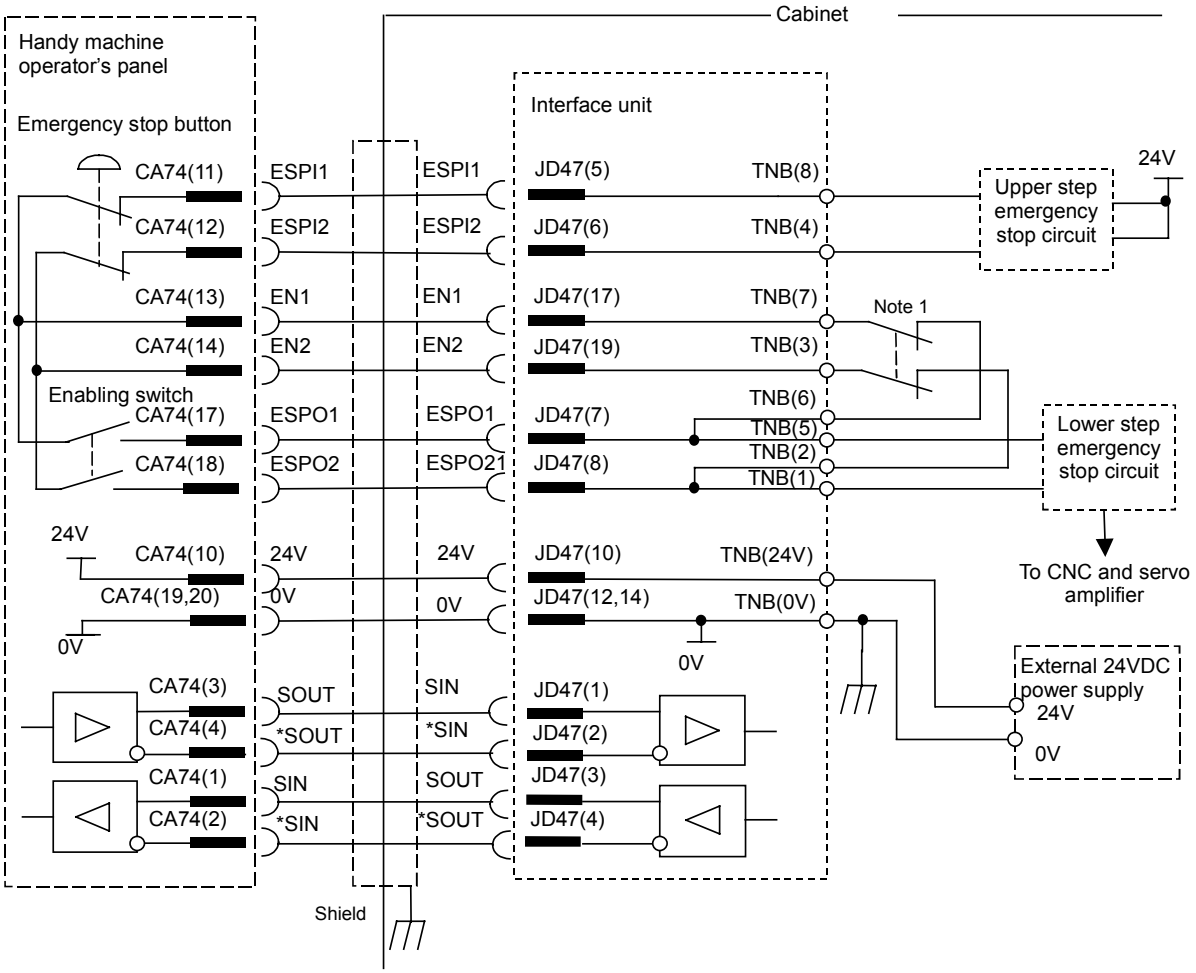
1 DETAILS CONNECTION (KEEPING AT ALL TIMES)



1) The total length of the cable J186 must not exceed 50m.
Please keep the following about 24VDC at connector CA74.
24VDC ±10% (including instantaneous changes and ripple)
(The 24VDC power is subject to a voltage drop corresponding to the total resistance of the 0V and 24V lines of cable J186 and J187.)

2) See Connection Manual of CNC for I/O Link cable J22.

1.1 TOTAL CONNECTION

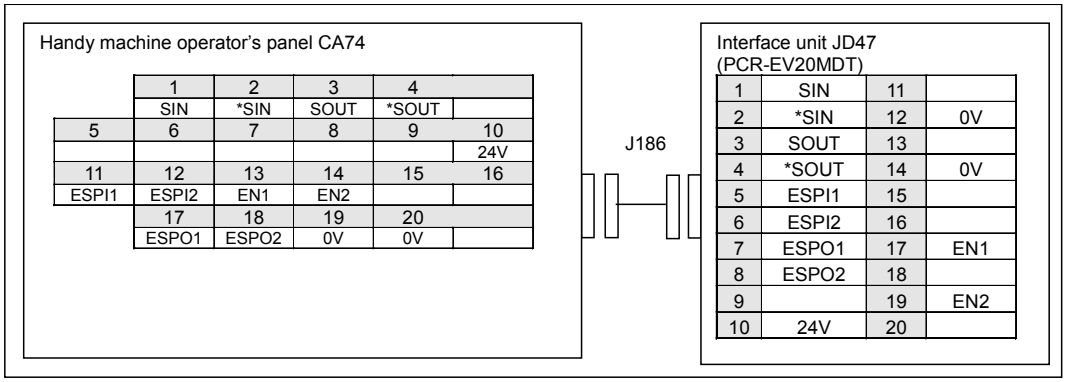


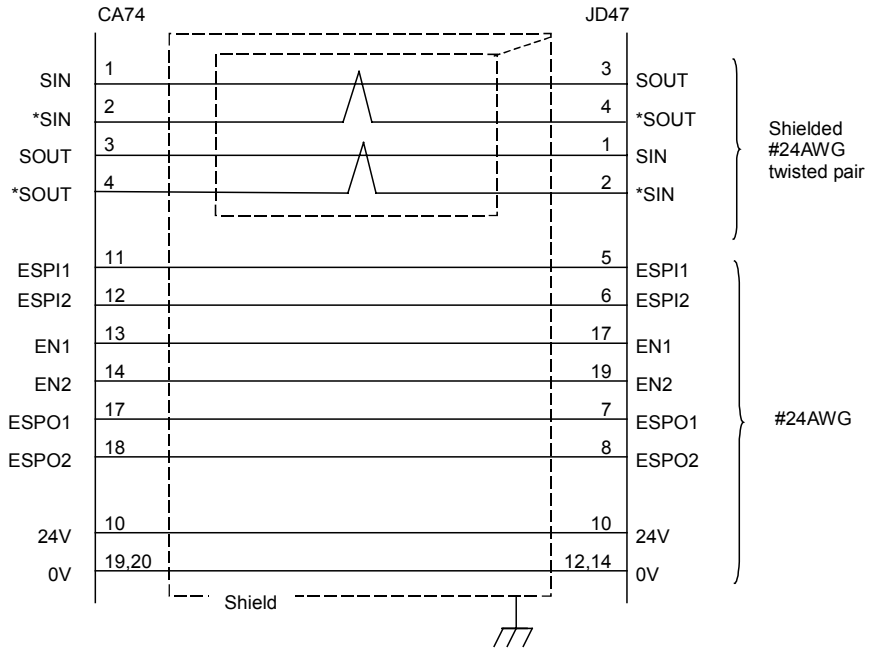
NOTE

1 This switch must be opened in automatically, when the operator exposes himself to danger, example the observation working in the protection cover of cutting part, and the working in the fence for danger area. So, the enable switch must be hold at the middle position avoiding the emergency stop. When the operator does not expose himself to danger, this switch is closed. So he does not have to hold the enable switch at the middle position.
And this switch may be the switch for the detection of fusing and attaching on the main operator's panel. When there is the switch, the protection cover and the fence does not have to open for the testing of fusing and attaching of enable switch.

2 The details connection of JD1A, JD1B (I/O Link) of interface unit is eliminated.

1.2 DETAILS OF HANDY MACHINE OPERATOR'S PANEL CABLE J186





Recommended wire A66L-0001-0298: Oki Electric Cable Co., Ltd.
Shielded #24AWG twisted pair×2, #24AWG×10, external diameter 8.5mm, Resistance 88.9Ω/km

Recommended connector CA74 side; Hirose Electric Co., Ltd.

1) Soldering type : HR22-12TPD-20S (housing and contact)
FANUC specification :
A02B-0211-K382 (HR22-12TPD-20S×1)
2) Crimp type :
HR22-12TPD-20SC(housing), HR22-SC-122(contact)
HR22-TA2428HC(Manual crimping tool)
FANUC specification: A02B-0211-K381
(HR22-12TPD-20SC×1, HR22-SC-122×20)

Expected cable external diameter: 8.5mm

Recommended connector JD47 side; Hirose Electric Co., Ltd.
FI40B-20S (Soldering type), case FI-20-CV5

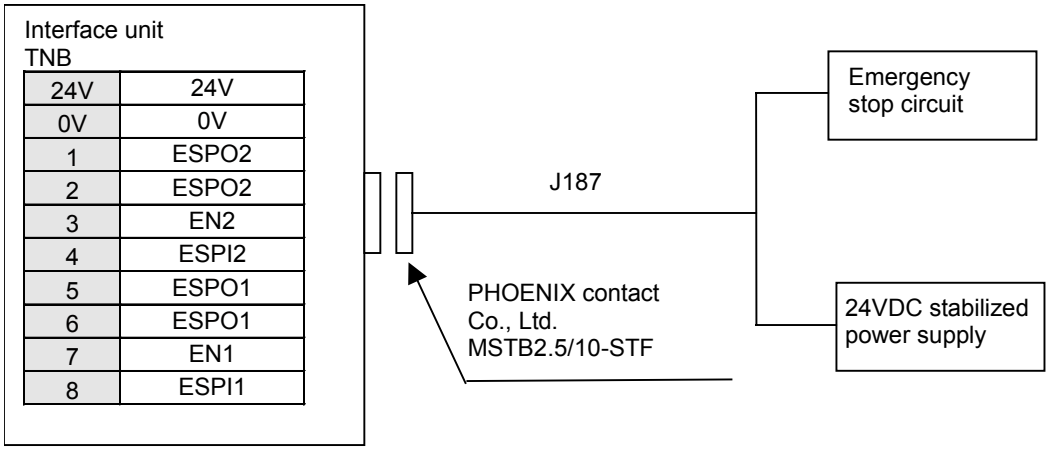
The notice of manufacture of cable J186

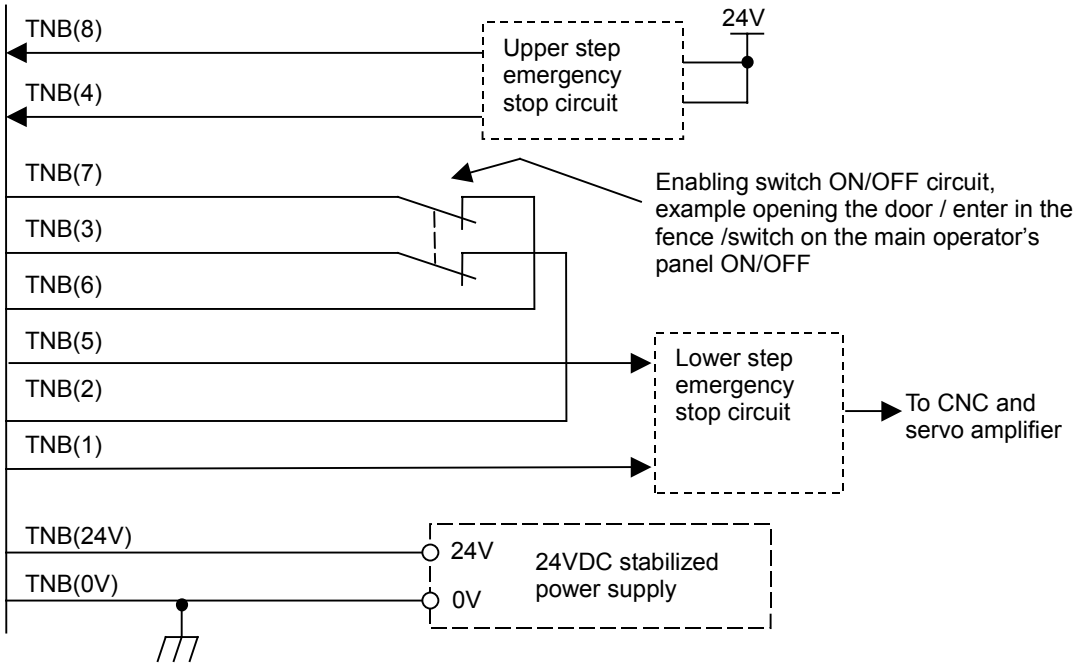
1) Shield treatment

Wire shield is turned up on the rubber of cable. Then put metal fitting on it. So connector main body is connected to shield with this method.

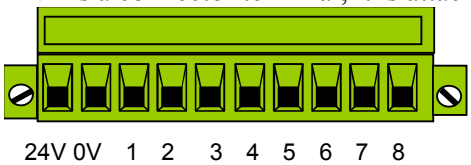
2) Open pins and pins with “() “must not be connected with wire.
3) Don’t change twisted pair of wires.

1.3 DETAILS OF EMERGENCY STOP LINE AND POWER LINE J187



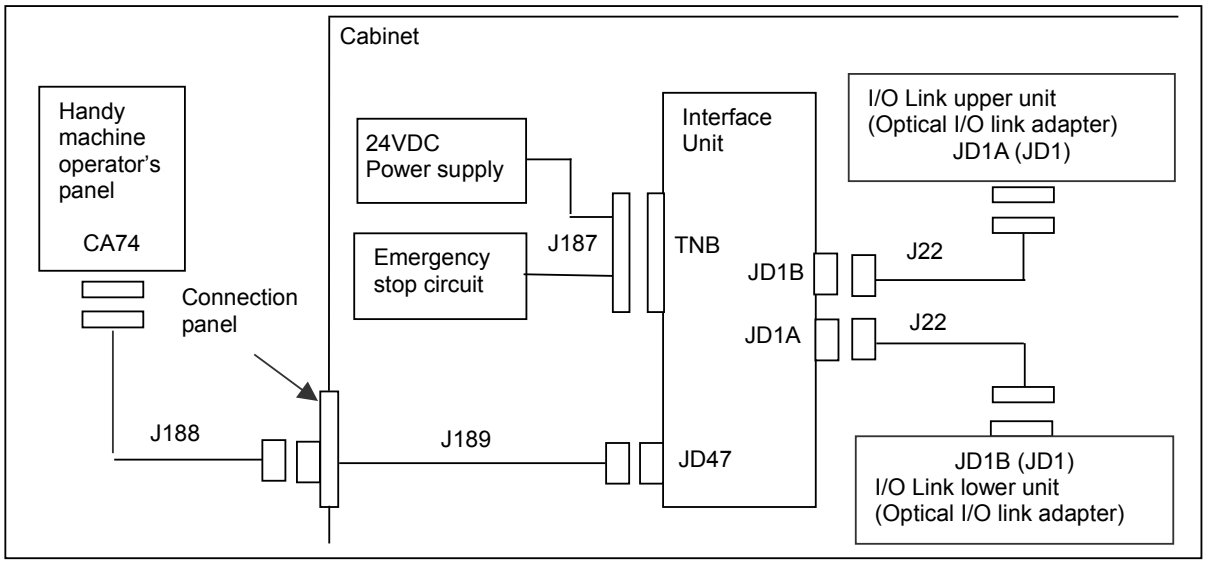


TNB is a connector terminal, it is attached to unit.



PHOENIX contact Co., Ltd.
MSTB2.5/10-STF
Suitable wire AWG24-12

2 DETAILS CONNECTION (DETACHABLE CONNECTION)

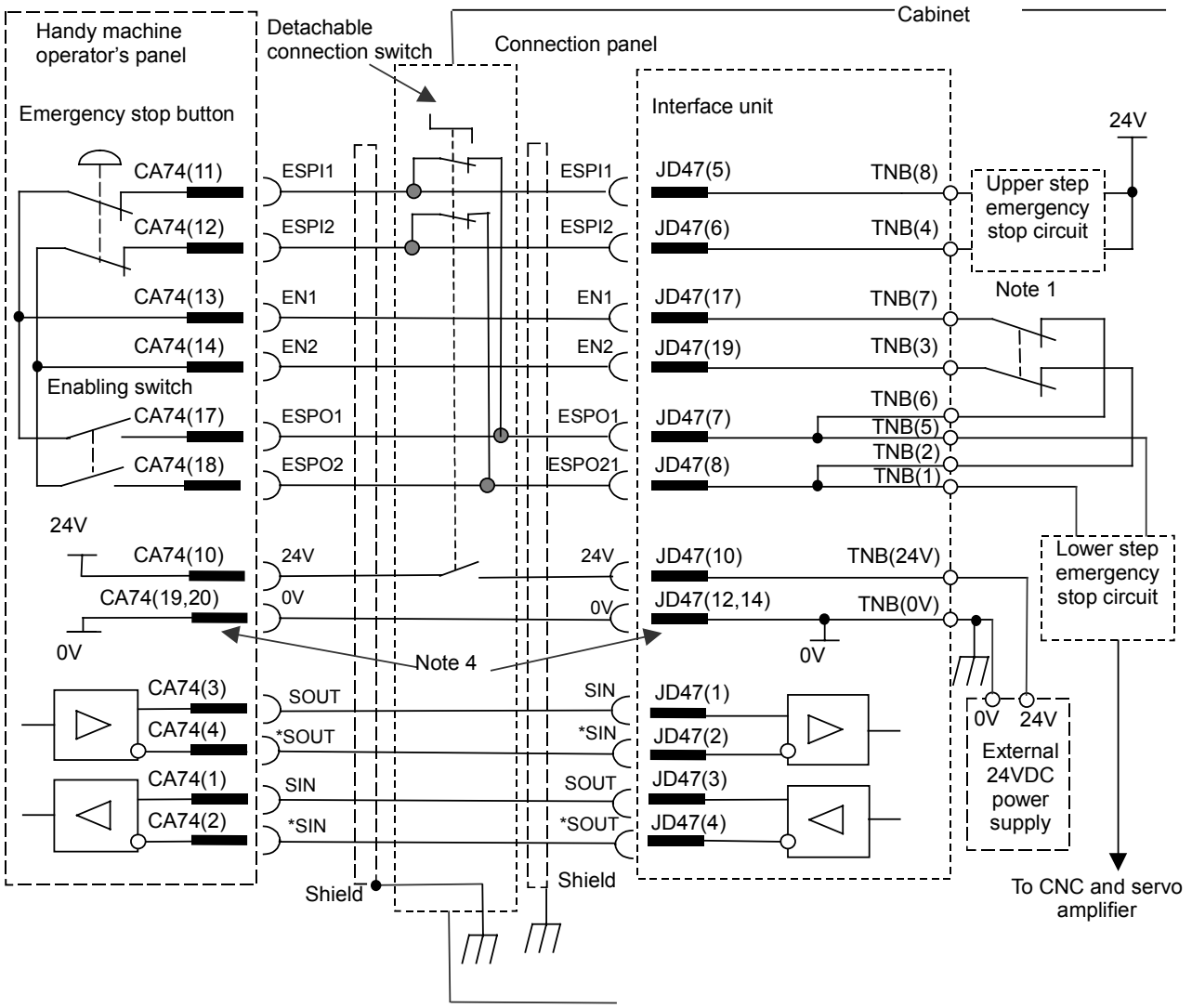


1) The total length of the cable J188 and J189 must not exceed 50m.
   Keep the following about 24VDC at connector CA74.
   24VDC±10% (including instantaneous changes and ripple)
   (The 24VDC power is subject to a voltage drop corresponding to the total resistance of the 0V and 24V lines of cable J187, J188 and J189.)
2) See Connection Manual of CNC for I/O Link cable J22.
3) See the Section 1.3 for emergency stop line and power line cable J187.
4) See the Chapter 8 of the specification about the connection panel. And keep notice of the chapter 8.

> ⚠ **WARNING**
> In the case of detachable connection, the emergency stop button and the enabling switch is not available under the condition of the detachable connection switch is OFF on the connection panel.

5) In view of CE standard, there is a possibility that detachable connection by installing the connection panel in the cabinet is not permitted. (See the above warning.) Confirm it to CE competent body. When detachable connection is not permitted, please use the handy machine operator's panel by keeping always.

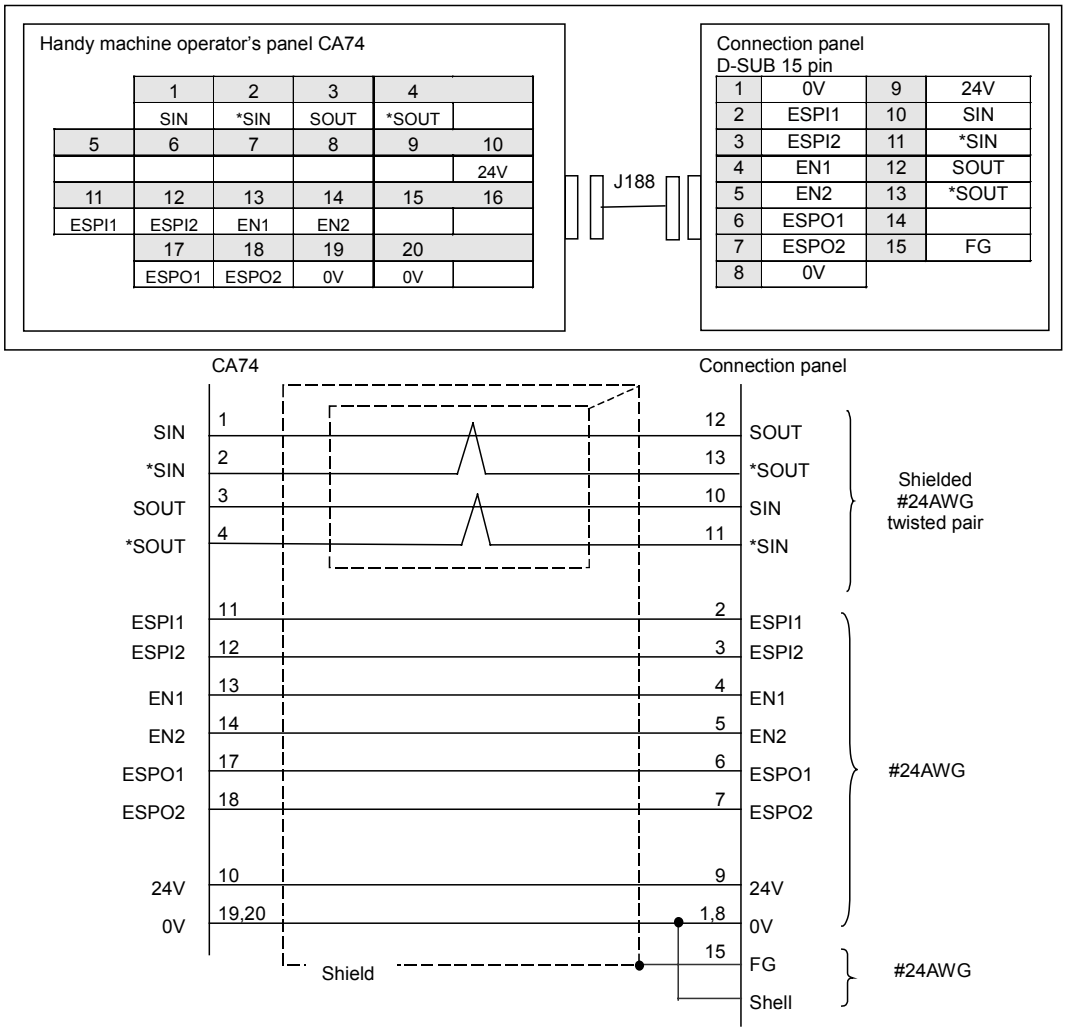
2.1 TOTAL CONNECTION



NOTE

1 See Note 1) of Section 1.1.
2 The details connection of JD1A, JD1B (I/O Link) of interface unit is eliminated.
3 The pin connection at the connection panel is eliminated.
4 To attach a handy machine operator's panel while the interface unit, 0V of interface unit must be connected to 0V of the handy machine operator's panel before any other line.
5 When 24 VDC is supplied to the handy machine operator's panel, the interface unit must be connected between the power supply and the operator's panel.

2.2 DETAILS OF HANDY MACHINE OPERATOR'S PANEL CABLE J188



Recommended wire A66L-0001-0298: Oki Electric Cable Co., Ltd.
Shielded #24AWG twisted pair×2, #24AWG×10, external diameter 8.5mm, Resistance 88.9Ω/km

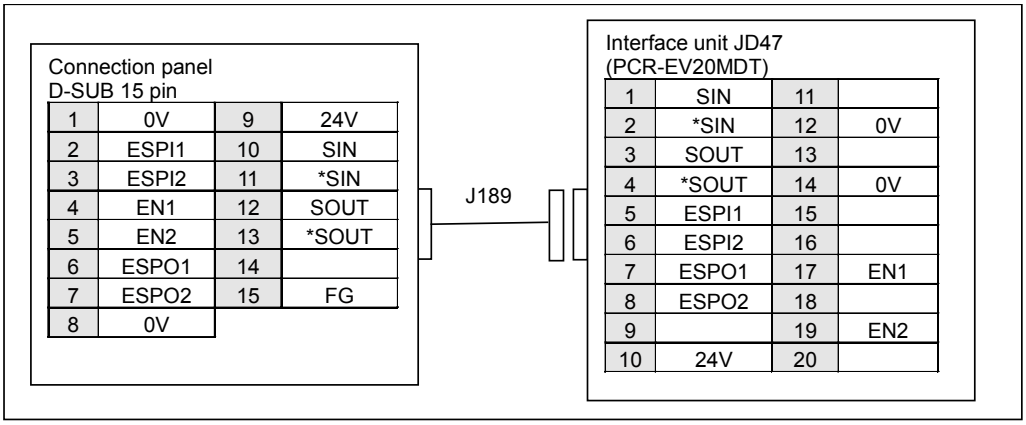
Recommended connector CA74 side; Hirose Electric Co., Ltd.

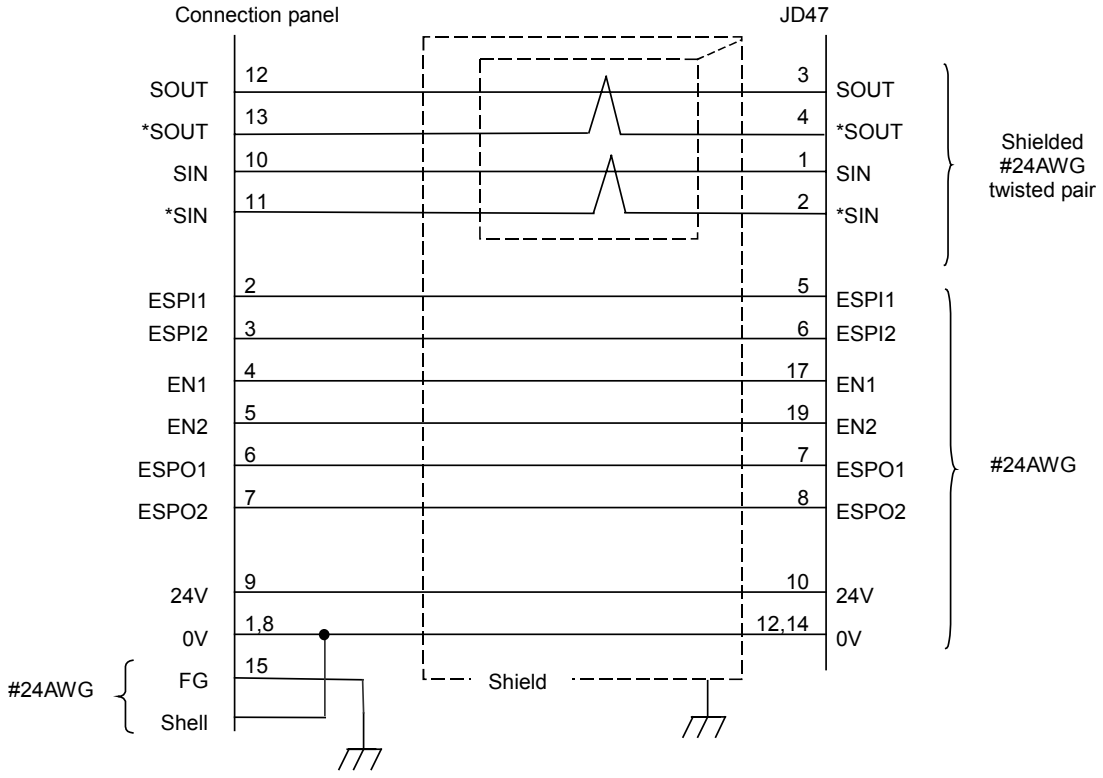
1) Soldering type : HR22-12TPD-20S (housing and contact)
   FANUC specification :
   A02B-0211-K382 (HR22-12TPD-20S×1)
2) Crimp type :
   HR22-12TPD-20SC(housing), HR22-SC-122(contact)
   HR22-TA2428HC(Manual crimping tool)
   FANUC specification:
   A02B-0211-K381
   (HR22-12TPD-20SC×1, HR22-SC-122×20)

Expected cable external diameter: 8.5mm

Recommended connector of connection panel side :
D-SUB 15 pin connector etc.

2.3 DETAILS OF HANDY MACHINE OPERATOR'S PANEL CABLE J189





Recommended wire A66L-0001-0298: Oki Electric Cable Co., Ltd.
Shielded #24AWG twisted pair×2, #24AWG×10, external diameter 8.5mm, Resistance 88.9Ω/km
Recommended connector JD47 side; Hirose Electric Co., Ltd.
FI40B-20S (Soldering type), case FI-20-CV5

2.4 THE NOTICE OF MANUFACTURE OF CABLE J188 AND J189

1) Keep the notice of manufacture of cable at Section 1.2.
2) The connector of the connection panel is not always D-sub 15 pin connector. Please use connector that 0V of interface unit is connected to 0V of the handy machine operator's panel before any other line. And the connector must not detach easily.
   Above connection, shell of connector, which is connected to 0V, is used for above purpose.

III. MAINTENANCE

1 FUSE

Interface unit has a fuse FU1 for the input of 24VDC power supply. This fuse is for the protection of the input of 24VDC power supply of Handy machine operator's panel (HMOP) and Interface unit. It has the possibility that the fuse of FU1 blows when the Single LED "EN" of HMOP isn't turned on and the LED "PO" of Interface unit isn't turned on after a 24VDC power supply is supplied. In this case, pull out the fuse from the socket, and examine continuity with a tester (or visual observation). When the fuse blows, investigate the cause, and do proper treatment, and exchange it. The capacity and the specification of the fuse are as the next. Refer to the Section 5.2 of the specification material for the mounting position of the fuse.

Name	Capacity	Specification
FU1	1.0A	A03B-0815-K002

2 INDICATION OF LED

See the Section 10.7 of the specification material for the Single LED "EN" and "ALM" of HMOP.

The following seven LEDs are mounted on Interface unit, and the condition of the unit is indicated. As for the mounting position, see the Section 5.2 of the specification material.

Name	Lighting color	Description
LI	Green	It is turned on with the master of I/O Link during the communication.
LD	Green	It is turned on with the Handy machine operator's panel during the communication.
PO	Green	It is turned on during power supply on.
MS	Red	It is turned on by the error occurrence. See the next table for the details.
E0	Red	
E1	Red	
E2	Red	

The details of LEDs turned on by the error occurrence

MS	E0	E1	E2	Error's name	Description	Countermeasure
Lit	Lit	Off	Off	Peripheral error of Interface unit	Interface unit is wrong.	Replace Interface unit.
Lit	Off	Lit	Off	RAM parity error of Interface unit	Interface unit is wrong.	Replace Interface unit.
Lit	Off	Off	Lit	Receiving error of I/O Link	The other equipment connected with I/O Link is wrong.	Confirm the other equipment connected with I/O Link.
Lit	Lit	Off	Lit	Framing error of I/O Link	The communication end signal of I/O Link is incorrect.	
Lit	Off	Lit	Lit	CRC error of I/O Link	The communication data of I/O Link is incorrect.	
Lit	Lit	Lit	Lit	Watch-dog error of Interface unit	Communication from the master of I/O Link was interrupted.	The master is wrong, or the master's power is turned off.
Off	Lit	Off	Off	Peripheral error of HMOP	HMOP is wrong.	Replace HMOP.
Off	Lit	Lit	Lit	Watch-dog error of HMOP	Communication with Interface unit was interrupted.	

The above errors have the possibility that it occurs by the contact defect of the cable, the breakage or the manufacture defect, too. And, the errors have the possibility that they occur by the noise, too. In this case, confirm the connection of the cable, the treatment of shielding and grounding according to the connection material. And, see the "Countermeasures against noise" of the manual of NC, too.

3 ERROR MESSAGE

Following error message is displayed on LCD of HMOP when error occurs.

Message	Description	Countermeasure
SYSTEM ERROR:001 (CPU WATCHDOG)	The firmware of HMOP terminated by the malfunction	Replace HMOP.
SYSTEM ERROR:002 (ROM ERROR)	The firmware of HMOP is broken.	Replace HMOP.
SYSTEM ERROR:003 (PCB VER. ERROR)	The combination of the PCB and the firmware is not correct.	Replace HMOP.
COMM. ERROR: 001 (PERIPH. ERROR)	HMOP is wrong.	Replace HMOP.
COMM. ERROR: 011 (WATCHDOG ERROR)	The communication with the interface unit got the suspension.	
COMM. ERROR: 100 (CRC ERROR)	The communication data is incorrect.	
COMM. ERROR: 101 (DMI ERROR)	The communication ripple has fallen into disorder.	
COMM. ERROR: 110 (FRAMING ERROR)	The communication end signal is incorrect.	
COMM. ERROR: 111 (DATA NUM. ERR.)	The number of communication bytes exceeds four bytes.	

The above errors have the possibility that it occurs by the contact defect of the cable, the breakage or the manufacture defect, too. And, the errors have the possibility that they occur by the noise, too. In this case, confirm the connection of the cable, the treatment of shielding and grounding according to the connection material. And, see the "Noise against action" of the connection manual of CNC, too.

IV. PMC PROGRAMMING

1 PREFACE

Part IV “PMC Programming,” describes the necessary information to perform following operations :

- Reading of information of input keys, operation ON/OFF switch and override switch on the handy machine operator’s panel by PMC ladder program.
- Displaying of information of the position and messages with figures/alphabet/kana on the LCD by PMC ladder program.

2 APPLIED SOFTWARE

The information contained in this document is applicable to the following software.

2.1 PMC CONTROL SOFTWARE

CNC	PMC	PMC Series / Edition
Series 15*i*	PMC-NB6	404A / 01 or later
Series 16*i* /18*i* /21*i* –A	PMC-SA5/SB5/SB6	406A / 09 or later
Series 21*i* -A	PMC-SA1	406A / 18 or later
Series 16*i* /18*i* /21*i* –B	PMC-SB7	406G / 01 or later
Series 21*i* -B	PMC-SA1	406H / 01 or later
Power Mate *i*	PMC-SB5/SB6	407B / 02 or later

2.2 OFF-LINE PROGRAMMER

Software	Specification
FAPT LADDER-II	A08B-9201-J503
Ladder Editing Package	A08B-9201-J510
FAPT LADDER-III (for Windows)	A08B-9201-J505
Ladder Editing Package (for Windows)	A08B-9201-J511

3 PREPARATIONS FOR USING

3.1 ASSIGNMENT OF ADDRESS

Assignment of I/O Link address is needed for LADDER program because the handy machine operator's panel is connected to CNC by I/O link. Handy machine operator's panel uses continuous 16 bytes for X and continuous 32 bytes for Y on I/O Link. Please make the number and the name of specified [Base no], [Slot no], and [assigned name] strictly the same as the following. Though HMOP occupies 16 bytes of inputs, the occupied input point for this group is recognized as 32 bytes as same as outputs.

NOTE
The occupied input/output point for Handy machine operator's panel is 32 bytes/32 bytes.

(1) Assignment of PMC X address

X Address	Group No.	Base No.	Slot No.	Assigned name	Occupied address
X+0	n	0	0	##	4bytes
X+4	n	0	1	#2	2bytes
X+6	n	0	2	#2	2bytes
X+8	n	0	3	#2	2bytes
X+10	n	0	4	#2	2bytes
X+12	n	0	5	#2	2bytes
X+14	n	0	6	#2	2bytes
				Total bytes	16bytes

(Note) $0 \leq n \leq 15$

(2) Assignment of PMC Y address

Y Address	Group No.	Base No.	Slot No.	Assigned name	Occupied address
Y+0	n	0	7	#2	2bytes
Y+2	n	0	8	#2	2bytes
Y+4	n	0	9	#2	2bytes
Y+6	n	0	10	#2	2bytes
Y+8	n	0	11	#2	2bytes
Y+10	n	0	12	#2	2bytes
Y+12	n	0	13	#2	2bytes
Y+14	n	0	14	#2	2bytes
Y+16	n	0	15	#2	2bytes
Y+18	n	0	16	#2	2bytes
Y+20	n	0	17	#2	2bytes
Y+22	n	0	18	#2	2bytes
Y+24	n	0	19	#2	2bytes
Y+26	n	0	20	#2	2bytes
Y+28	n	0	21	#2	2bytes
Y+30	n	0	22	#2	2bytes
				Total bytes	32bytes

(Note) $0 \leq n \leq 15$

3.2 DI/DO MAP ON I/O Link

Assigned address is used as follows.

X	Bits 0 to 7
+0	Power-on/off information
+1	
+2	
+3	
+4	Status of Handy machine operator's panel
+5	
+6	
+7	Input key bit image
+8	
+9	
+10	
+11	Reserved
+12	Manual pulse generator
+13	Reserved
+14	
+15	

Y	Bits 0 to 7
+0	LED bit image
+1	
+2	
+3	
+4	LCD line control
+5	1st (left) character of selected line
+6	2nd character of selected line
+7	3rd character of selected line
+8	4th character of selected line
+9	5th character of selected line
+10	6th character of selected line
+11	7th character of selected line
+12	8th character of selected line
+13	9th character of selected line
+14	10th character of selected line
+15	11th character of selected line
+16	12th character of selected line
+17	13th character of selected line
+18	14th character of selected line
+19	15th character of selected line
+20	16th(right) character of selected line
+21	Numeric variable data information
+22	
+23	
+24	Numeric variable data
+25	
+26	
+27	
+28	
+29	
+30	
+31	

4 OUTLINE OF HANDY MACHINE OPERATOR'S PANEL FUNCTIONS

Function that can be executed by PMC LADDER program is described.

4.1 COMMUNICATION ERROR AND POWER-ON/OFF INFORMATION

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X+0	PWR08	PWR07	PWR06	PWR05	PWR04	PWR03	PWR02	PWR01
X+1	PWR16	PWR15	PWR14	PWR13	PWR12	PWR11	PWR10	PWR09
X+2	-	-	PWR22	PWR21	PWR20	PWR19	PWR18	PWR17
X+3	ERINF	-	-	-	-	-	-	-

1) Communication error
When HMOP is not communicating correctly, "ERINF" becomes "1". So, the message on the display unit of CNC can be displayed.

2) Power-on/off information
After HMOP and CNC once communicated, Power-on/off information PWR01 becomes "1". When the HMOP is disconnected or the power supply is OFF, the signal becomes "0". By using this input signal, PMC LADDER can detect whether the HMOP is connected or disconnected (The power is turned on or off.) So, the message on the display unit of CNC can be displayed. There are 22 Power-on/off information (PWR01 to PWR22), but please use PWR01.
Turning off the power supply could be detected by only PWR01 signal though there are 22 signals.
When "ERINF" is "1", Power-on/off information is not valid. Please judge the Power-on/off information under the condition of ERINF is “0”.

NOTE
When the HMOP is disconnected or the power is off or communication alarm is occurred, the input signals from the HMOP will be all “0”. The timing that the input signals are “0” are not defined compared with the timing that ”ERINF” is ”1” and the timing that ”PWR01” is “0” .

4.2 OPERATING INFORMATION OF HANDY MACHINE OPERATOR'S PANEL

State of override switch, emergency stop button, operation on/off switch, 3 position enabling switch, input keys and manual pulse generator can be read. The information mentioned above are transferred as input signals assigned on the I/O Link.

4.2.1 Override Switch

By using these input signals, position of override switch (position 0-15) can be read.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X+4	(reserved)	(reserved)	(reserved)	OVREN	OVR3	OVR2	OVR1	OVR0

Bits 0 to 3: Override switch

Bit 3	Bit 2	Bit 1	Bit 0	Description
OVR3	OVR2	OVR1	OVR0	
0	0	0	0	Position 0 of the override switch (0%)
			1	Position 1 of the override switch (5%)
		1	0	Position 2 of the override switch (10%)
			1	Position 3 of the override switch (20%)
	1	0	0	Position 4 of the override switch (30%)
			1	Position 5 of the override switch (40%)
		1	0	Position 6 of the override switch (50%)
			1	Position 7 of the override switch (60%)
1	0	0	0	Position 8 of the override switch (70%)
			1	Position 9 of the override switch (80%)
		1	0	Position 10 of the override switch (90%)
			1	Position 11 of the override switch (95%)
	1	0	0	Position 12 of the override switch (100%)
			1	Position 13 of the override switch (105%)
		1	0	Position 14 of the override switch (110%)
			1	Position 15 of the override switch (120%)

NOTE

1 Please check OVREN (Valid override switch signal) is "1" before referring to OVR0 -OVR3.
When the HMOP is disconnected or the power is off or communication alarm is occurred, the above signals will be “0”. It can be distinguished the situation that the override switch is set to position 0 (0%), so the machine can be avoid the shock.

2 When the Handy machine operator’s panel is used with detachable connection and is disconnected, the override value is hold by the ladder program with the turning off the operation ON/OFF switch. But if the Handy machine operator’s panel is disconnected without turning off the operation ON/OFF switch, the machine can be avoid the shock with the judging of the OVREN bit.

Bit 4: Valid override switch signal

Bit 4 OVREN	Description
0	OVR0 to 3 signal is invalid
1	OVR0 to 3 signal is valid

4.2.2 Emergency Stop Button, 3 Position Enabling Switch, Operation On/Off Switch

ON/OFF state of Operation on/off switch can be read. So, it can be decided that the signals from the HMOP can be used. And the states of Emergency stop button, 3 position enabling switch and Operation on/off switch can be confirmed by CNC diagnoses screen.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X+5	(Reserved)	(Reserved)	(Reserved)	OPSW	EQDSW	DSW2	DSW1	ESP

Bit 0: Emergency stop

Bit 0 ESP	Description
0	Emergency stop button is not pushed.
1	Emergency stop button is pushed. Or 24VDC is not supplied to emergency stop circuit.

Bit 1: Enabling switch (first path)

Bit 1 DSW1	Description
0	Contacts of pass1 of enabling switch or emergency stop button are opened. Or 24VDC is not supplied to emergency stop circuit.
1	Contacts of pass1 of enabling switch and emergency stop button are closed.

Bit 2: Enabling switch (second path)

Bit 2 DSW2	Description
0	Contacts of pass2 of enabling switch or emergency stop button are opened. Or 24VDC is not supplied to emergency stop circuit.
1	Contacts of pass2 of enabling switch and emergency stop button are closed.

Bit 3: Comparison of DSW1 and DSW2

Bit 3 EQDSW	Description
0	DSW1 and DSW2 are same state (Fusing and attaching of enabling switch is not occurred.)
1	DSW1 and DSW2 are not same state(Fusing and attaching of enabling switch is occurred.)

Bit 4: Operation on/off switch

Bit 4 OPSW	The state of **Operation on/off switch**
0	Off position (The input signal from HMOP are not used.)
1	On position (The input signal from HMOP are used.)

4.2.3 Input Keys

By using these input signals, state of 20 input keys can be read. When the HMOP is disconnected or the power is off or communication alarm is occurred, the signals will be all "0".

Address	Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X+7	(Reserved)	(Reserved)	(Reserved)	KEY15	KEY14	KEY13	KEY12	KEY11
X+8	(Reserved)	(Reserved)	(Reserved)	KEY25	KEY24	KEY23	KEY22	KEY21
X+9	(Reserved)	(Reserved)	(Reserved)	KEY35	KEY34	KEY33	KEY32	KEY31
X+10	(Reserved)	(Reserved)	(Reserved)	KEY45	KEY44	KEY43	KEY42	KEY41

KEY11 to KEY45: Input keys

KEY11 to KEY45	Description
0	Input key is not pressed.
1	Input key is pressed.

When HMOP is viewed from the front, key array is as follows.

KEY11	KEY 12	KEY 13	KEY 14	KEY 15
KEY 21	KEY 22	KEY 23	KEY 24	KEY 25
KEY 31	KEY 32	KEY 33	KEY 34	KEY 35
KEY 41	KEY 42	KEY 43	KEY 44	KEY 45

4.2.4 Manual Pulse Generator (MPG)

By using these input signals, pulses from MPG can be read.
PMC need not handle these signals because CNC handles these directly.

Address	Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X+12	MPG7	MPG6	MPG5	MPG4	MPG3	MPG2	MPG1	MPG0

Bits 0 to 7 : Pulses from MPG

Bits 0 to 7	Description
MPG0 to MPG7	Count of pulses from MPG

This value changes only when OPSW(Operation on/off switch) is 1(enable).

4.3 TURNING LED ON/OFF

By using these output signals, PMC LADDER can control LED.
To turn an LED on/off, turn on/off an output signal corresponds to the LED.

Address	Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Y+0	LED2	LED1	(Reserved)	LED15	LED14	LED13	LED12	LED11
Y+1	(Reserved)	(Reserved)	(Reserved)	LED25	LED24	LED23	LED22	LED21
Y+2	(Reserved)	(Reserved)	(Reserved)	LED35	LED34	LED33	LED32	LED31
Y+3	(Reserved)	(Reserved)	(Reserved)	LED45	LED44	LED43	LED42	LED41

LED1, LED2, and LED11 to LED45: LED

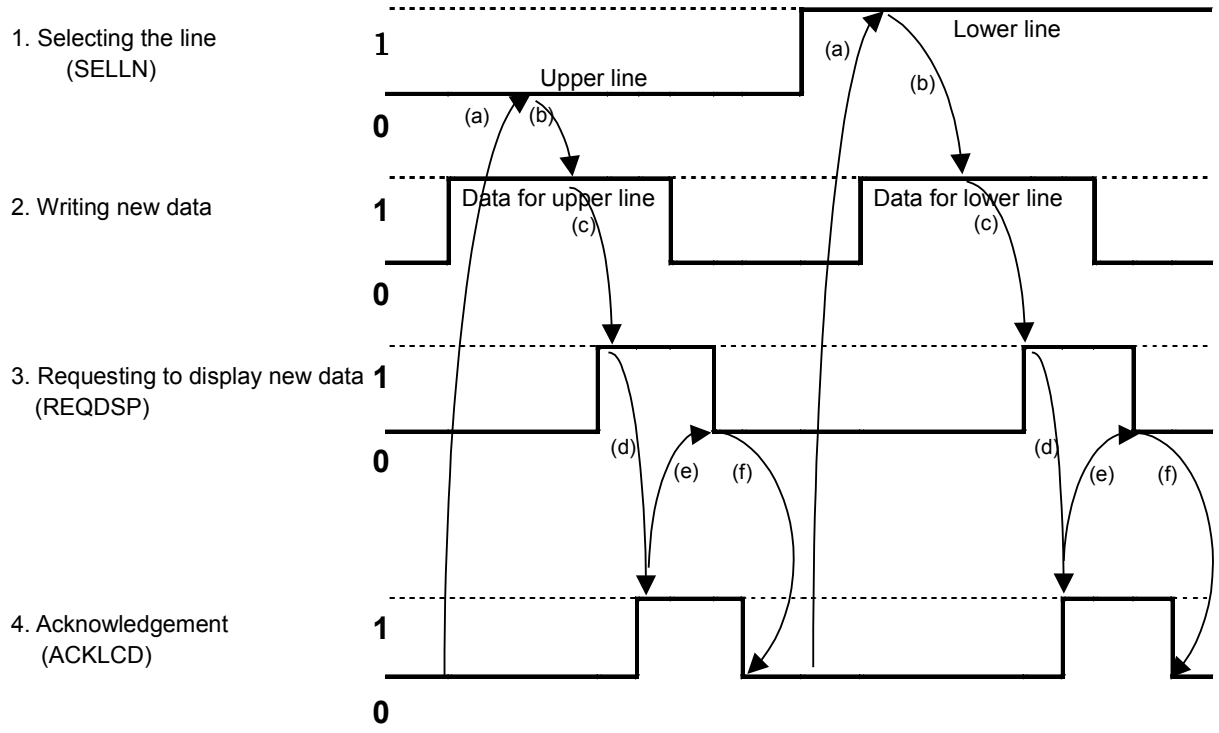
LED1, LED2 LED11 to LED45	Description
0	LED lights down
1	LED lights up

When HMOP is viewed from the front, LED array is as follows.

		LED1	LED2	
LED 11	LED 12	LED 13	LED 14	LED 15
LED 21	LED 22	LED 23	LED 24	LED 25
LED 31	LED 32	LED 33	LED 34	LED 35
LED 41	LED 42	LED 43	LED 44	LED 45

4.4 CHARACTER DISPLAY ON LCD

2 lines of 16 characters data can be displayed on LCD by PMC ladder program.
Not only fixed strings data but also a data containing a binary data can be displayed. (Numeric variable display - Displaying after converting binary value to strings data)
Procedure of LCD display is shown as follows.



(a) PMC confirms display acknowledgement (ACKLCD) is reset.
(b) PMC selects the line(SELLN) and writes new data for selected line.
(c) PMC sets display request (REQDSP) and waits for acknowledgement (ACKLCD).
(d) HMOP sets display acknowledgement (ACKLCD). Moreover, when the LCD display error occurs, the cause is set in LCDER0-2.
(e) PMC resets display request (REQDSP) and can clear data for selected line.
(f) HMOP resets display acknowledgement (ACKLCD)

4.4.1 LCD Display Control 1

These are input signals from HMOP for using LCD display control.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X+6	(Reserved)	(Reserved)	(Reserved)	(Reserved)	LCDER2	LCDER1	LCDER0	ACKLCD

Bit 0: LCD display acknowledgement

Bit 0	Description
ACKLCD	
0	Waiting for the LCD display request.
1	acknowledging the LCD display request

Bits 1 to 3: Error status of the LCD display

Bit 3	Bit 2	Bit 1	Description
LCDER2	LCDER1	LCDER0	
0	0	0	No error occurred.
		1	Specified figure number to display the numeric variable on LCD is illegal. - The number of characters to the right of the display position is less than the specified number. - The specified number of characters is 0 or equal to or greater than 17.
	1	0	Specified length(byte number) of numeric variable data is invalid. - Over 9 or 0. - When the numeric type is 3(Custom macro variable), the length is not 6.
		1	Number of the characters which is needed to express numeric variable including a sign and a decimal point was over the number of specified figure to display on the LCD.
1	0	0	Binary data is illegal
		1	BCD data is illegal. Except for 0 to 9
	1	0	Custom macro variable data (Mantissa 4bytes+exponent 2bytes) is illegal.
		1	System error occurred.

4.4.2 LCD Display Control 2

These are output signals to HMOP for using LCD display control.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Y+4	(Reserved)	(Reserved)	(Reserved)	(Reserved)	(Reserved)	(Reserved)	REQDSP	SELLN

Bit 0: Selecting the line to display characters on LCD

Bit 0 SELLN	Description
0	1st(upper) line is selected.
1	2nd(lower) line is selected.

Bit 1: Request to display characters on LCD

Bit 1 REQDSP	Description
0	Reset request.
1	Set request.

4.4.3 Displayed Character of Selected Line

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Y+5	CDATA1 : 1st (left) character							
Y+6	CDATA2 : 2nd character							
Y+7	CDATA3 : 3rd character							
Y+8	CDATA4 : 4th character							
Y+9	CDATA5 : 5th character							
Y+10	CDATA6 : 6th character							
Y+11	CDATA7 : 7th character							
Y+12	CDATA8 : 8th character							
Y+13	CDATA9 : 9th character							
Y+14	CDATA10 : 10th character							
Y+15	CDATA11 : 11th character							
Y+16	CDATA12 : 12th character							
Y+17	CDATA13 : 13th character							
Y+18	CDATA14 : 14th character							
Y+19	CDATA15 : 15th character							
Y+20	CDATA16 : 16th (right) character							

- The leftmost digit on the LCD indicates the first character, the next leftmost digit the second, ---, and rightmost digit the 16th.

			LCD one line		
1st line	1st char.	2nd char.	to	15th char.	16th char.
2nd line	1st char.	2nd char.	to	15th char.	16th char.

- See Subsection “4.4.8 LCD character-code table" for the character-code which can be set.

- The location where numeric variable code (16) was specified is substituted for the character strings which displays numeric variable (X+21 to X+31). When the numeric variable is shown by two or more digits, the characters following the numeric variable code are also substituted. When a numeric variable is illegal, the location where numeric variable code was specified becomes blank (32).

(Example) The value of numeric variable is -12.3

Address	Y+5	Y+6	Y+7	Y+8	Y+9	Y+10	Y+11	Y+12	--	Y+20
Char.-code	88	61	16	32	32	32	32	32	--	32
Displayed char.	X	=	(Space)	(Space)	(Space)	(Space)	(Space)	(Space)		(Space)

↓

LCD column	1	2	3	4	5	6	7	8	--	16
LCD displays	X	=	-	1	2	.	3	(Space)		(Space)

NOTE
In this case, the number of digits to display numeric variable data is 5, and the number of decimal digits is 1.

- The location where the transparent character-code (31) was specified leaves the last character

(Example)

LCD column	1	2	3	4	5	6	-	16
Current LCD displays	Y	=	6	A	B	C		P

+

Address	Y+5	Y+6	Y+7	Y+8	Y+9	Y+10	-	Y+20
Char.-code	31	31	31	90	61	52	-	32
Displayed char.	(trans.)	(trans.)	(trans.)	Z	=	4		(space)

↓

LCD column	1	2	3	4	5	6	-	16
Next LCD displays	Y	=	6	Z	=	4		(space)

- Only one numeric variable can be specified by one display request. When two or more numeric variables are specified for one line, it is necessary to overwrite selected line two or more times by using the transparent character-code (31).

4.4.4 Numeric Variable Format Specification1 (Data Type, Data Length)

These are output signals to specify the type and length of numeric variable data.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Y+21	VDTLN3	VDTLN2	VDTLN1	VDTLN0	(Reserved)	(Reserved)	VTYPE0	VTYPE0

Bits 0 and 1: Numeric type

Bit 1	Bit 0	Description
VTYPE1	VTYPE0	
0	0	Unsigned binary form
	1	Signed binary form (Negative value is expressed by the sub number 2.)
1	0	BCD (Binary Code Decimal) form
	1	Custom macro variable data (Mantissa 4bytes+exponent 2bytes)

(a) The binary form and the BCD form
The binary form and the BCD form can be specified for a size of data within the range from 1 to 8 bytes. The following table shows the range of the numerical value data that can be expressed by each size.

	Unsigned binary	Binary	BCD
1 byte	0 to 255	-128 to 127	0 to 99
2bytes	0 to 65535	-32768 to 32767	0 to 9999
3bytes	0 to 16777215	-8388608 to 8388607	0 to 999999
4bytes	0 to 4294967295	-2147483648 to 2147483647	0 to 99999999
5bytes	0 to 1099511627775	-549755813888 to 549755813887	0 to 9999999999
6bytes	0 to 281474976710655	-140737488355328 to 140737488355327	0 to 999999999999
7bytes	0 to 72057594037927935	-36028797018963968 to 36028797018963967	0 to 99999999999999
8bytes	0 to 18446744073709551615	-9223372036854775808 to 9223372036854775807	0 to 9999999999999999

(b) Custom macro variable data (Mantissa 4bytes+exponent 2bytes)
This data type is useful for when the custom macro variable of CNC is read by PMC window function. Mantissa 4bytes and exponent 2bytes, 6 bytes in total specified to this data type.

Bits 4 to 7: Length (bytes) of numeric variable data

Bit 7	Bit 6	Bit 5	Bit 4	Description
VDTLN3	VDTLN2	VDTLN1	VDTLN0	
0	0	0	0	The numeric variable is not used.
			1	Length of numeric variable data is 1 byte.
		1	0	Length of numeric variable data is 2 bytes.
			1	Length of numeric variable data is 3 bytes.
	1	0	0	Length of numeric variable data is 4 byte.
			1	Length of numeric variable data is 5 byte.
		1	0	Length of numeric variable data is 6 byte.
			1	Length of numeric variable data is 7 byte.
1	0	0	0	Length of numeric variable data is 8 byte.
			1	Not specify.
		1	0	Not specify.
			1	Not specify.
	1	0	0	Not specify.
			1	Not specify.
		1	0	Not specify.
			1	Not specify.

4.4.5 Numeric Variable Format Specification 2 (Decimals)

These are output signals to specify the digits, accuracy and display position of decimals of numeric variable data.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Y+22	(Reserved)	(Reserved)	LZERO	DSPPOS	DSPPRC	DECCL2	DECCL1	DECCL0

Bits 0 to 2: Number of decimal digits of numeric variable data

Bit 2	Bit 1	Bit 0	Description
DECCL2	DECCL1	DECCL0	
0	0	0	No decimal digits.(Integer)
		1	Number of decimal digits is 1.
	1	0	Number of decimal digits is 2.
		1	Number of decimal digits is 3.
1	0	0	Number of decimal digits is 4.
		1	Number of decimal digits is 5.
	1	0	Number of decimal digits is 6.
		1	Number of decimal digits is 7.

NOTE
This setting is invalid when numeric type is custom macro variable form.

- This specification is invalid when "Custom macro variable data" is specified to numeric type (VTYPE0 to 1)
  (Example) To display the output data of the PMC window instruction (binary form), the decimal position is specified according to a unit as follows.
  "Numeric variable data (binary form) = 123456" Situation.

Unit	The decimal position	Value of numeric variable
1	0	123456
0.001	3	123.456
0.00001	5	1.23456

Bit 3: Accuracy of displayed numeric variable data

Bit 3	Description
DSPPRC	
0	Round down. Last figure might be truncated.
1	Half-adjust. Round up numbers of five and above and round down anything under five

- Rounding are done according to this setting when effective number of digits below the decimal point of numeric variable is larger than the number of digits specified with DSPDE0-2 (Number of display columns below decimal point).
  (Example) "Value of numeric variable=13.45,
  Number of display columns below decimal point=1,
  Number of display columns = 4 " Situation.

DSPPRC	Display of four digits			
0: Round-down	1	3	.	4
1: Half-adjust	1	3	.	5

Bit 4: Display location

Bit 4 DSPPOS	Description
0	Numeric variable is displayed in right justify in the display column number specified with DSPCL 0-4.
1	Numeric variable is displayed in left justify in the display column number specified with DSPCL 0-4

- When "Right justify" is specified, the character specified with LZERO is displayed on vacant of the left side.
- When "Left justify" is specified, vacant of the right side becomes blank.

Bit 5: Character stuffed at the left of displayed numerical value

Bit 5 LZERO	Description
0	The space character is stuffed with.
1	The '0' character is stuffed with. When numeric variable is a negative number, this item cannot be specified.

- When the digits of data is less than the number of display columns which specifies with DSPCL0-4, and specifies "Right justify" with DSPPOS, this setting is effective.
  (Example) "Value of numeric variable=1234, Number of display columns = 4 " Situation

DSPPOS	LZERO	Display of six digit					
0: right justify	0: Space			1	2	3	4
0: right justify	1: '0'.	0	0	1	2	3	4
1: left justify	0: Space	1	2	3	4		
1: left justify	1: '0'	1	2	3	4		

4.4.6 Numeric Variable Format Specification 3 (Number of Display Columns)

These are output signals to specify the number of display columns of whole data and decimals.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Y+23	DSPDE2	DSPDE1	DSPDE0	DSPCL4	DSPCL3	DSPCL2	DSPCL1	DSPCL0

Bits 0 to 4: Number of display columns of whole data

Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
DSPCL4	DSPCL3	DSPCL2	DSPCL1	DSPCL0	
1 to 16 is effective					Number of display columns, which includes the sign and decimal point.

- A value of 0 or equal to or greater than 17 indicates an error.

Bits 5 to 7: Number of display columns below decimal point

Bit 7	Bit 6	Bit 5	Description
DSPDE2	DSPDE1	DSPDE0	
0	0	0	Do not display below the decimal point.
		1	Decimal point number of digits is 1.
	1	0	Decimal point number of digits is 2.
		1	Decimal point number of digits is 3
1	0	0	Decimal point number of digits is 4.
		1	Decimal point number of digits is 5.
	1	0	Decimal point number of digits is 6.
		1	Decimal point number of digits is 7.

- When the value of this setting is bigger than the effective decimal position of numeric variable data, 0 is supplied to the end.
- When the value of this setting is smaller than the effective decimal position of numeric variable, the digit is rounded by the method of specification with DSPPRC.

  (Example) "Value of the numeric variable=13.45, Number of display columns = 6,
  DSPPOS =Left justify, DSPPRC=Half-adjust" Situation

Number of display columns below decimal point	Display of six characters
0	1 3
1	1 3 . 5
2	1 3 . 4 5
3	1 3 . 4 5 0

4.4.7 Numeric Variable Data

These are output signals to specify numeric variable data.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Y+24	VDATA0: The first byte of the numeric variable data							
Y+25	VDATA1: The 2nd byte of the numeric variable data							
Y+26	VDATA2: The 3rd byte of the numeric variable data							
Y+27	VDATA3: The 4th byte of the numeric variable data							
Y+28	VDATA4: The 5th byte of the numeric variable data							
Y+29	VDATA5: The 6th byte of the numeric variable data							
Y+30	VDATA6: The 7th byte of the numeric variable data							
Y+31	VDATA7: The 8th byte of the numeric variable data							

- The numeric variable data is continuously stored from VDATA0. The number of bytes used is specified with VDTLN0-4.
- The numeric variable data is a Little endian form (Intel form). The numerical value is sequentially stored from the digit below.
  (Example) Numeric type = Unsigned binary form, The length(bytes) of numeric variable data = 4,
  Numeric variable data = 123456 (Decimal)
  = 1E240 (Hexadecimal)

	Value(Hexadecimal)
VDATA0	40
VDATA1	E2
VDATA2	01
VDATA3	00

Numeric type = BCD form, The length(bytes) of numeric variable data = 4,
Numeric variable data = 123456 (BCD)

	Value(Hexadecimal)
VDATA0	56
VDATA1	34
VDATA2	12
VDATA3	00

- When numeric type (VTYPE0-1) is "Custom macro variable", Mantissa is stored in VDATA0-3(four bytes), exponent is stored in VDATA4-5(two bytes).

4.4.8 LCD Character-Code Table

High 4bits / Low 4bits	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		*1)		0	@	P	`	p				-*3)	ﾀ	ﾐ		
1			!	1	A	Q	a	q			。	ｱ	ﾁ	ﾑ		
2			"	2	B	R	b	r			「	ｲ	ﾂ	ﾒ		
3			#	3	C	S	c	s			」	ｳ	ﾃ	ﾓ		
4			$	4	D	T	d	t			、	ｴ	ﾄ	ﾔ		
5			%	5	E	U	e	u			・	ｵ	ﾅ	ﾕ		
6			&	6	F	V	f	v			ｦ	ｶ	ﾆ	ﾖ		
7			'	7	G	W	g	w			ｧ	ｷ	ﾇ	ﾗ		
8			(	8	H	X	h	x			ｨ	ｸ	ﾈ	ﾘ		
9			)	9	I	Y	i	y			ｩ	ｹ	ﾉ	ﾙ		
A			*	:	J	Z	j	z			ｪ	ｺ	ﾊ	ﾚ		
B			+	;	K	[	k	{			ｫ	ｻ	ﾋ	ﾛ		
C			,	<	L	¥	l	|			ｬ	ｼ	ﾌ	ﾜ		
D			-*3)	=	M	]	m	}			ｭ	ｽ	ﾍ	ﾝ		
E			.	>	N	^	n	→			ｮ	ｾ	ﾎ	ﾞ		
F		*2)	/	?	O	_*4)	o	←			ｯ	ｿ	ﾏ	°		

*1) Numeric bariable code
*2) Transparent code
*3) Minus
*4) Under bar

5 DI/DO INFORMATION TABLE

5.1 INPUT SIGNALS

address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X+0	PWR08	PWR07	PWR06	PWR05	PWR04	PWR03	PWR02	PWR01
X+1	PWR16	PWR15	PWR14	PWR13	PWR12	PWR11	PWR10	PWR09
X+2	-	-	PWR22	PWR21	PWR20	PWR19	PWR18	PWR17
X+3	ERINF	-	-	-	-	-	-	-
X+4	-	-	-	OVREN	OVR3	OVR2	OVR1	OVR0
X+5	-	-	-	OPSW	EQDSW	DSW2	DSW1	ESP
X+6	-	-	-	-	LCDER2	LCDER1	LCDER0	ACKLCD
X+7	-	-	-	KEY15	KEY14	KEY13	KEY12	KEY11
X+8	-	-	-	KEY25	KEY24	KEY23	KEY22	KEY21
X+9	-	-	-	KEY35	KEY34	KEY33	KEY32	KEY31
X+10	-	-	-	KEY45	KEY44	KEY43	KEY42	KEY41
X+11	-	-	-	-	-	-	-	-
X+12	MPG7	MPG6	MPG5	MPG4	MPG3	MPG2	MPG1	MPG0
X+13	-	-	-	-	-	-	-	-
X+14	-	-	-	-	-	-	-	-
X+15	-	-	-	-	-	-	-	-

5.2 OUTPUT SIGNALS

address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Y+0	LED2	LED1	-	LED15	LED14	LED13	LED12	LED11
Y+1	-	-	-	LED25	LED24	LED23	LED22	LED21
Y+2	-	-	-	LED35	LED34	LED33	LED32	LED31
Y+3	-	-	-	LED45	LED44	LED43	LED42	LED41
Y+4	-	-	-	-	-	-	REQDSP	SELLN
Y+5	CDATA1							
Y+6	CDATA2							
Y+7	CDATA3							
Y+8	CDATA4							
Y+9	CDATA5							
Y+10	CDATA6							
Y+11	CDATA7							
Y+12	CDATA8							
Y+13	CDATA9							
Y+14	CDATA10							
Y+15	CDATA11							
Y+16	CDATA12							
Y+17	CDATA13							
Y+18	CDATA14							
Y+19	CDATA15							
Y+20	CDATA16							
Y+21	VDTLN3	VDTLN2	VDTLN1	VDTLN0	-	-	VTYPE1	VTYPE0
Y+22	-	-	LZERO	DSPPOS	DSPPRC	DECCL2	DECCL1	DECCL0
Y+23	DSPDE2	DSPDE1	DSPDE0	DSPCL4	DSPCL3	DSPCL2	DSPCL1	DSPCL0
Y+24	VDATA1							
Y+25	VDATA2							
Y+26	VDATA3							
Y+27	VDATA4							
Y+28	VDATA5							
Y+29	VDATA6							
Y+30	VDATA7							
Y+31	VDATA8							

6 EXAMPLE OF LADDER DIAGRAM

6.1 EMERGENCY STOP USING ENABLE SWITCH ON HMOP

Judgement of various emergency conditions according to operation on/off switch, emergency stop button and 3 position enable switch on HMOP.

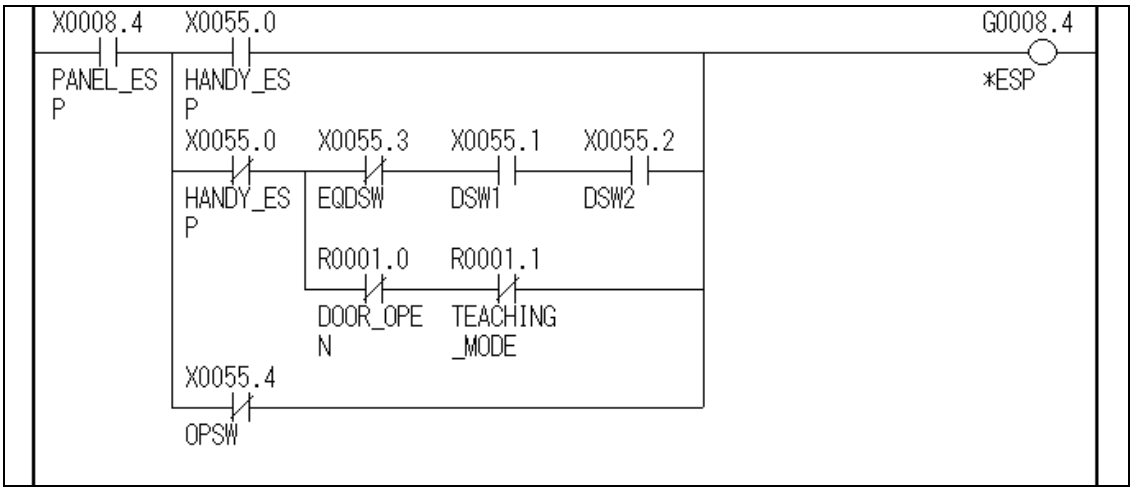
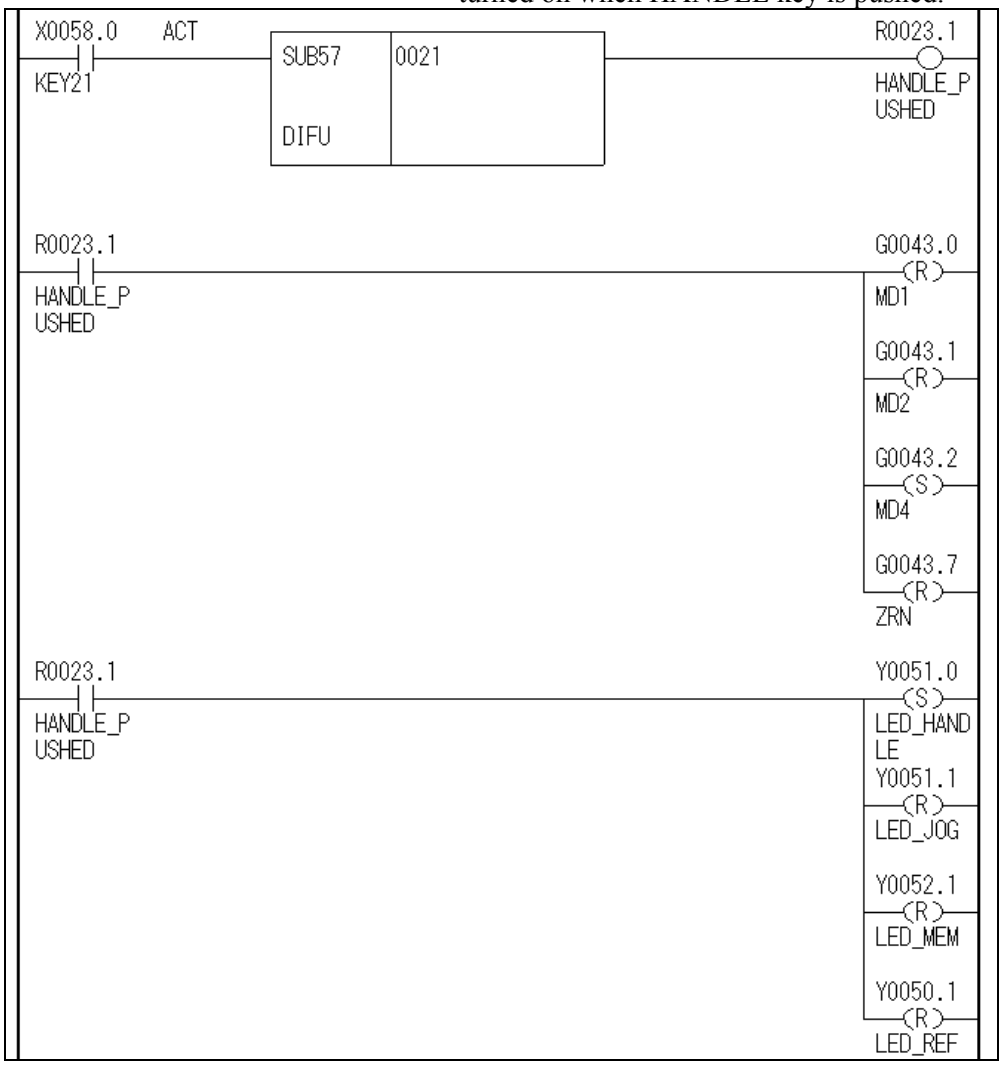


Fig.6.1 Emergency stop

6.2 CHANGING CNC MODE BY HANDLE KEY

Changing CNC mode to HANDLE and LED besides HANDLE key turned on when HANDLE key is pushed.



Detect turning on of key signal to execute following procedure once when key is pushed.

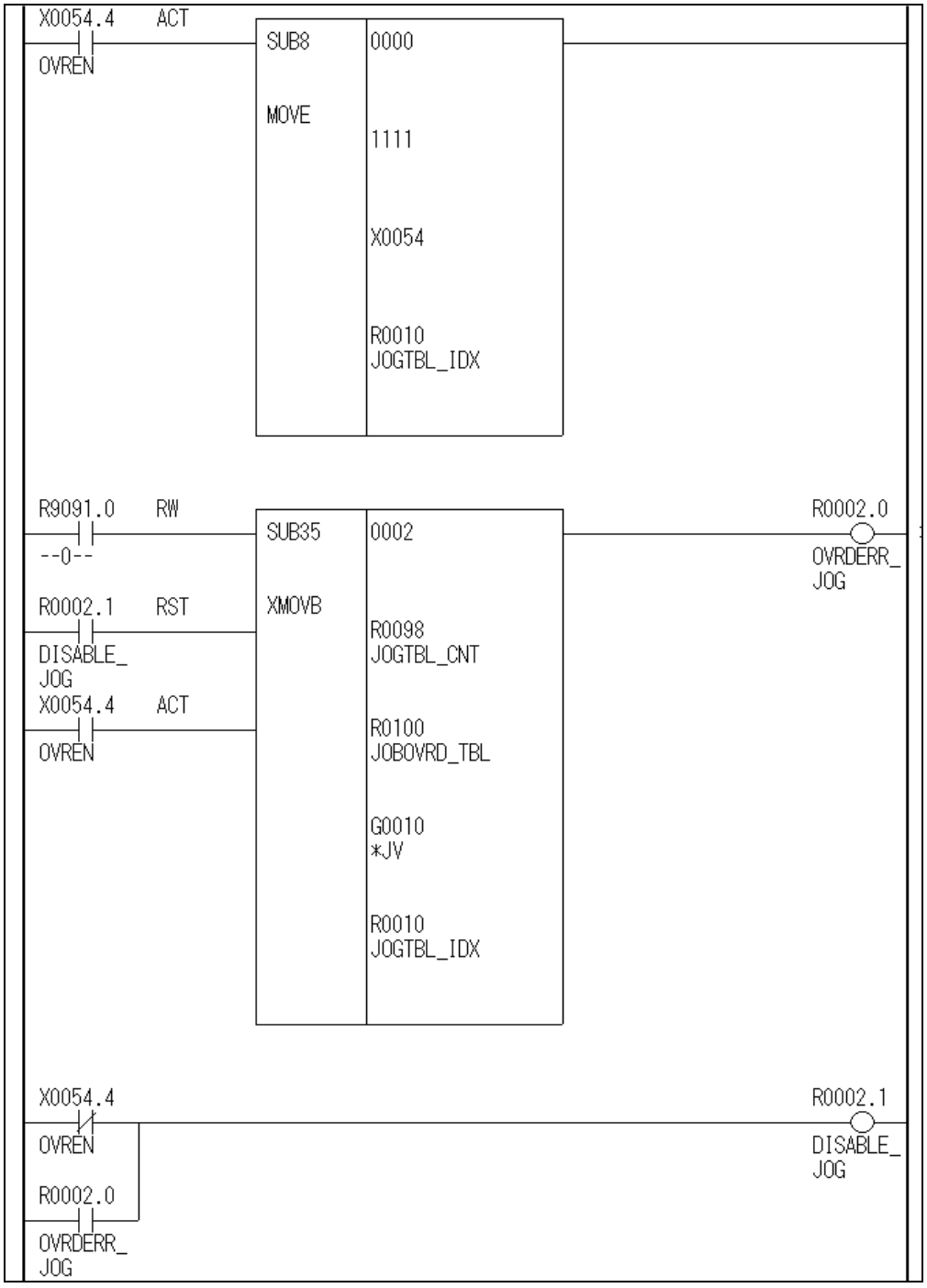
Set CNC mode signal.

Turn on LED beside HANDLE key and turn off LED for the other mode key.

For other keys to change mode like REF, JOG and MEM, similar operation could be done.

Fig.6.2 Changing to HANDLE mode

6.3 SETTING OF JOG OVERRIDE



Pick up OVR0 – OVR3 from the Status of HMOP signal when OVREN is 1.

Get override value from table and set to *JV0 - *JV15 according to override switch position.

This is an error handling procedure for above XMOVB.

Fig.6.3(a) Setting of JOG override

Override value (complement value of % unit) must be prepared previously to R100 – R132.
And, data number of table(=16) must be set to R98 too.

Address	R98	R100	R102	R104	R106	R108	R110	R112	R114
Contents (decimal)	16	-1	-501	-1001	-2001	-3001	-4001	-5001	-6001

Address	R116	R118	R120	R122	R124	R126	R128	R130
Contents (decimal)	-7001	-8001	-9001	-9501	-10001	-10501	-11001	-12001

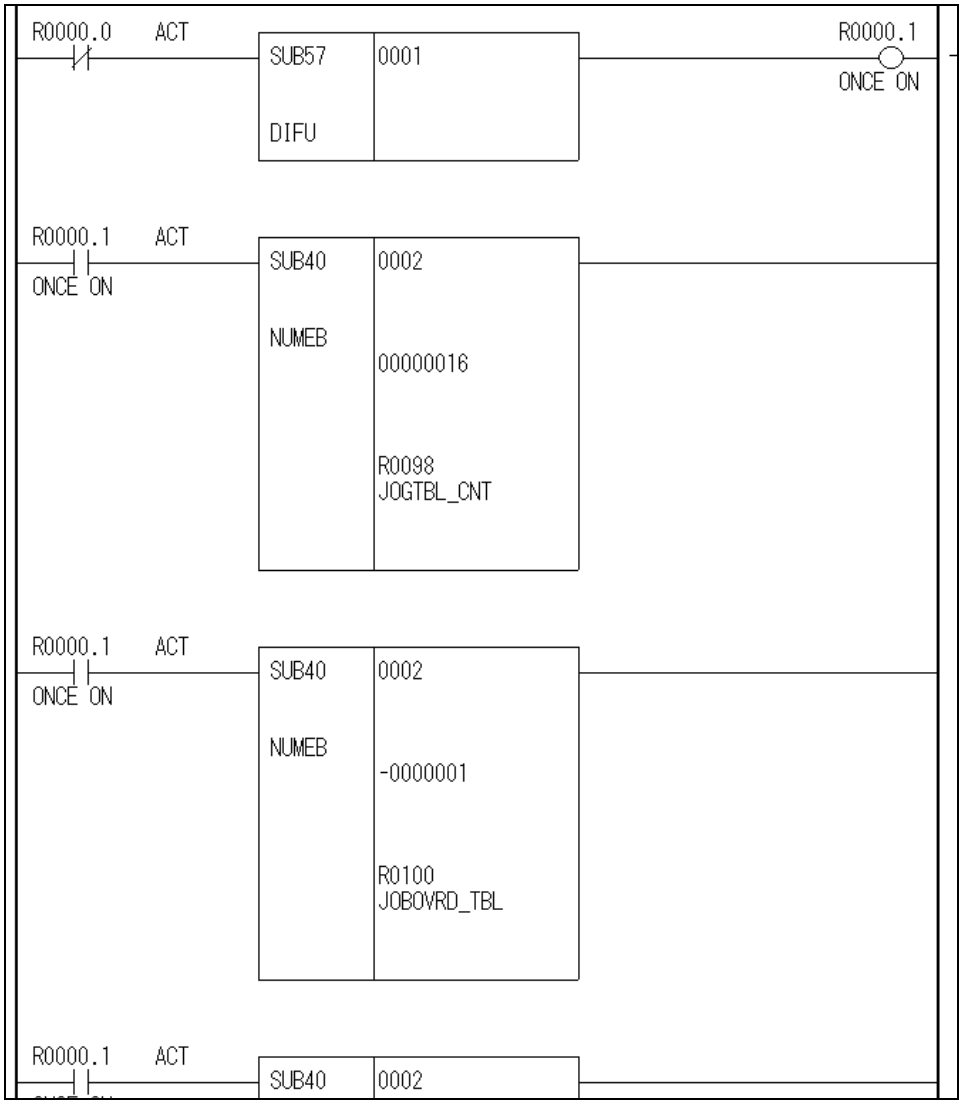
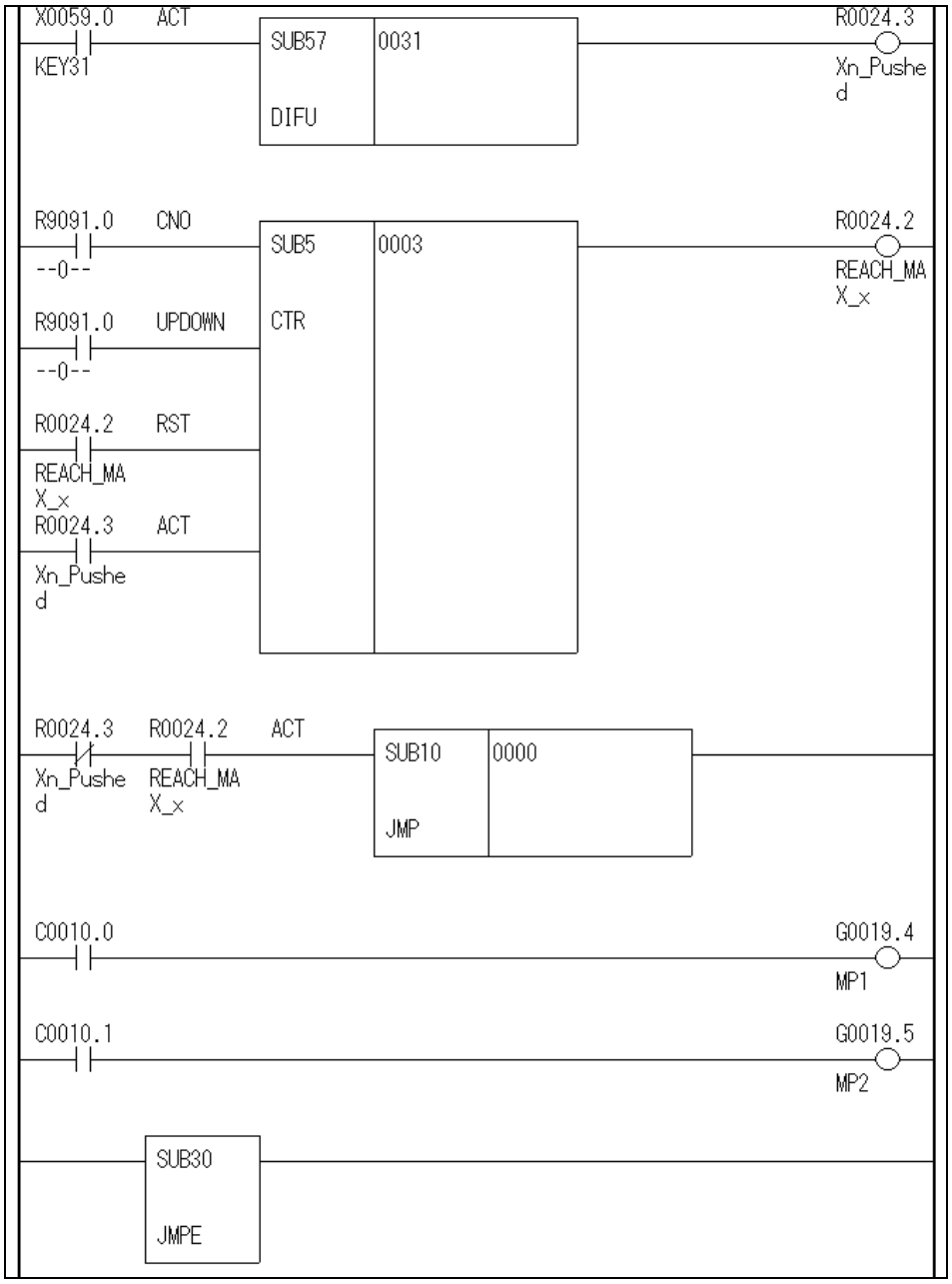


Fig.6.3(b) Making of strings table

6.4 SETTING OF MANUAL HANDLE FEED AMOUNT SELECTION SIGNAL BY XN KEY



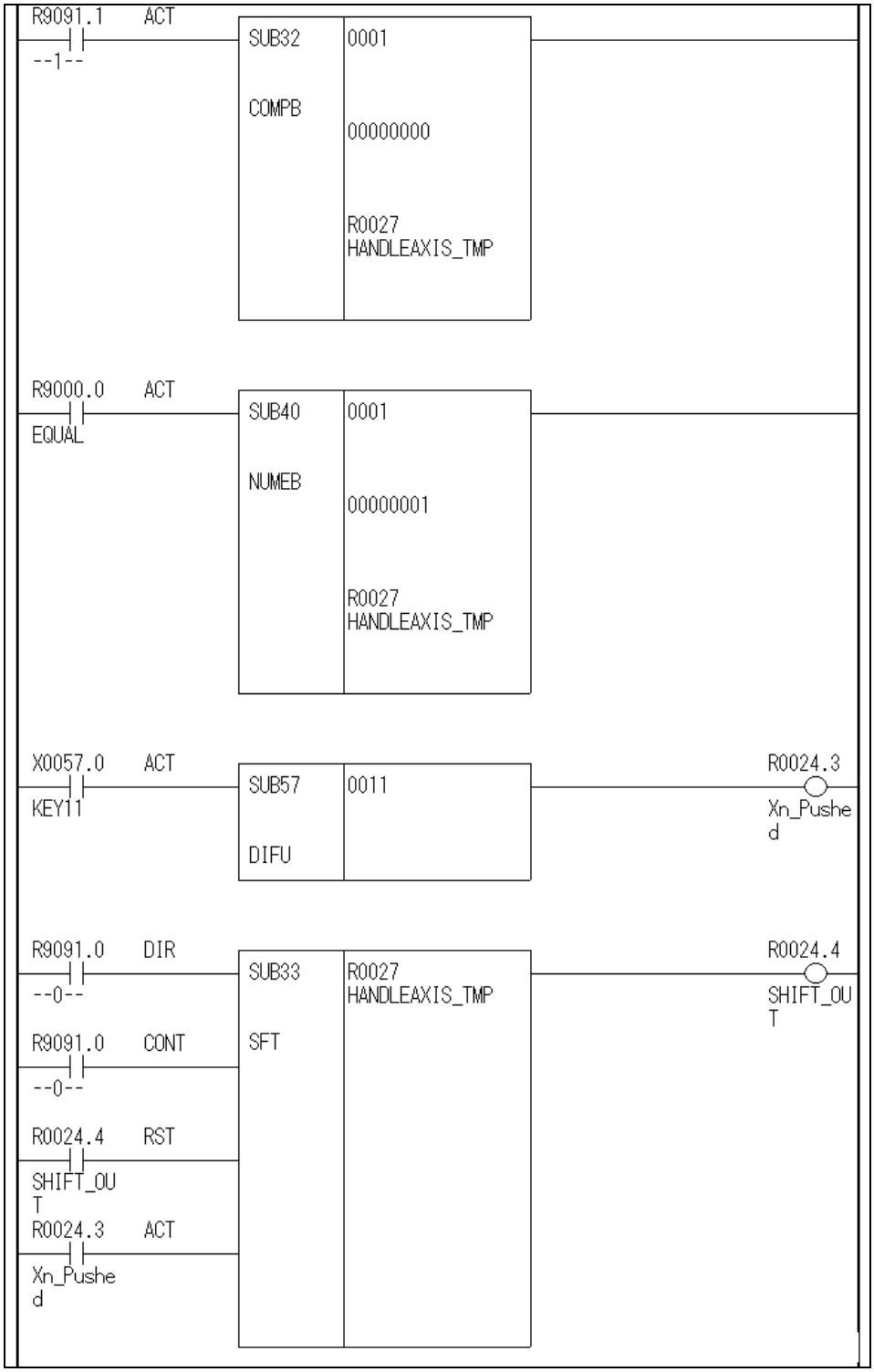
Detect turning on of Xn key signal.

Counts up by using CTR instruction.
(C6 must be set 4 beforehand)

Copy content of counter value to MP1 and MP2 when Xn key is pushed or reset procedure of CTR is done.

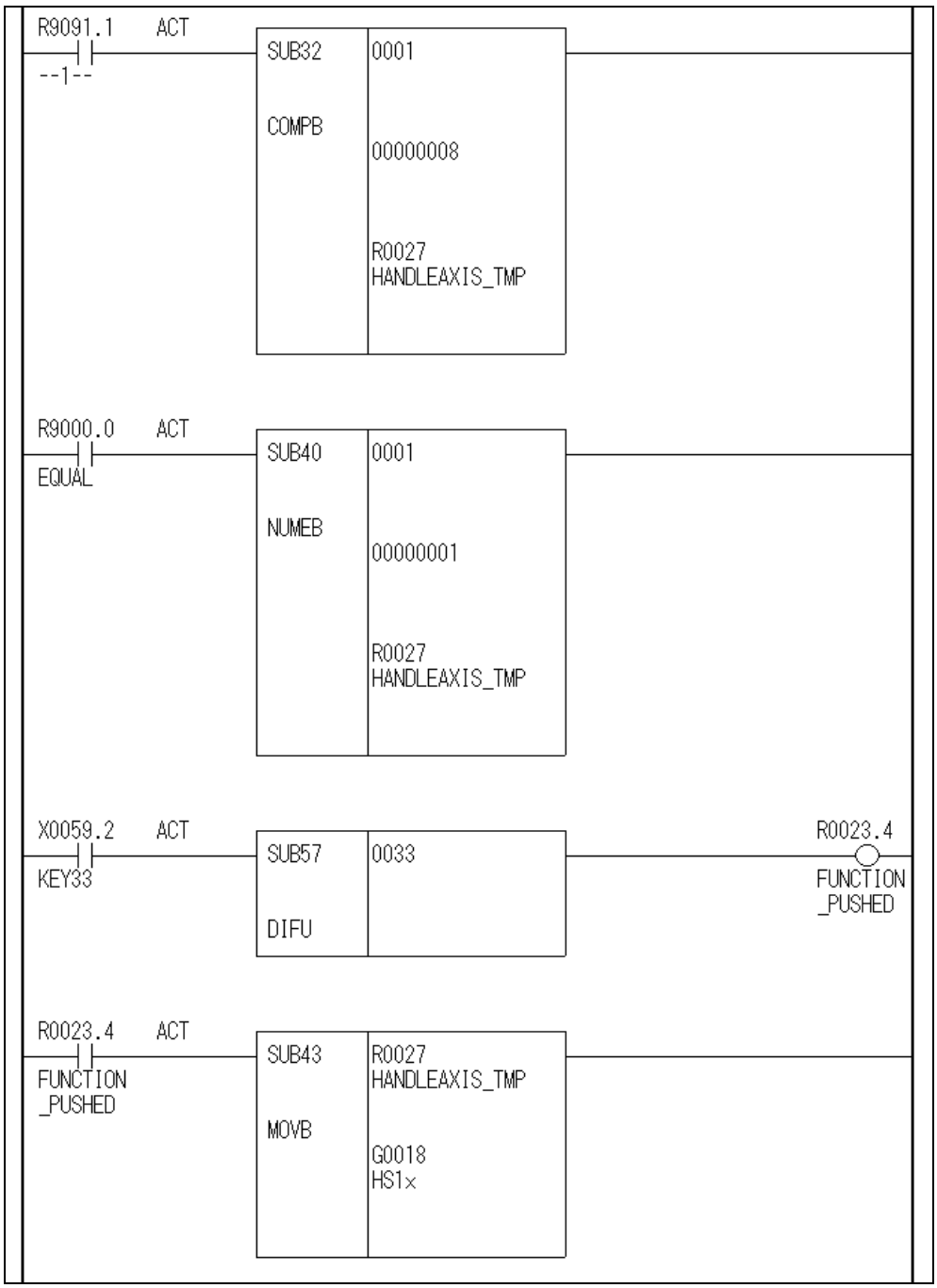
Fig.6.4 Setting of Manual Handle Feed amount

6.5 SELECTION OF AXIS BY XYZ456 KEY



Set 1 to HANDLEAXIS_TMP when it is 0. It is the procedure when power turned on.

Shift HANDLEAXIS_TMP to left when XYZ456 key is pushed.



Set 1 to HANDLEAXIS_TMP when it is over the axis number. Axis number is 3 in this sample LADDER.(8 is equal to 2^3)

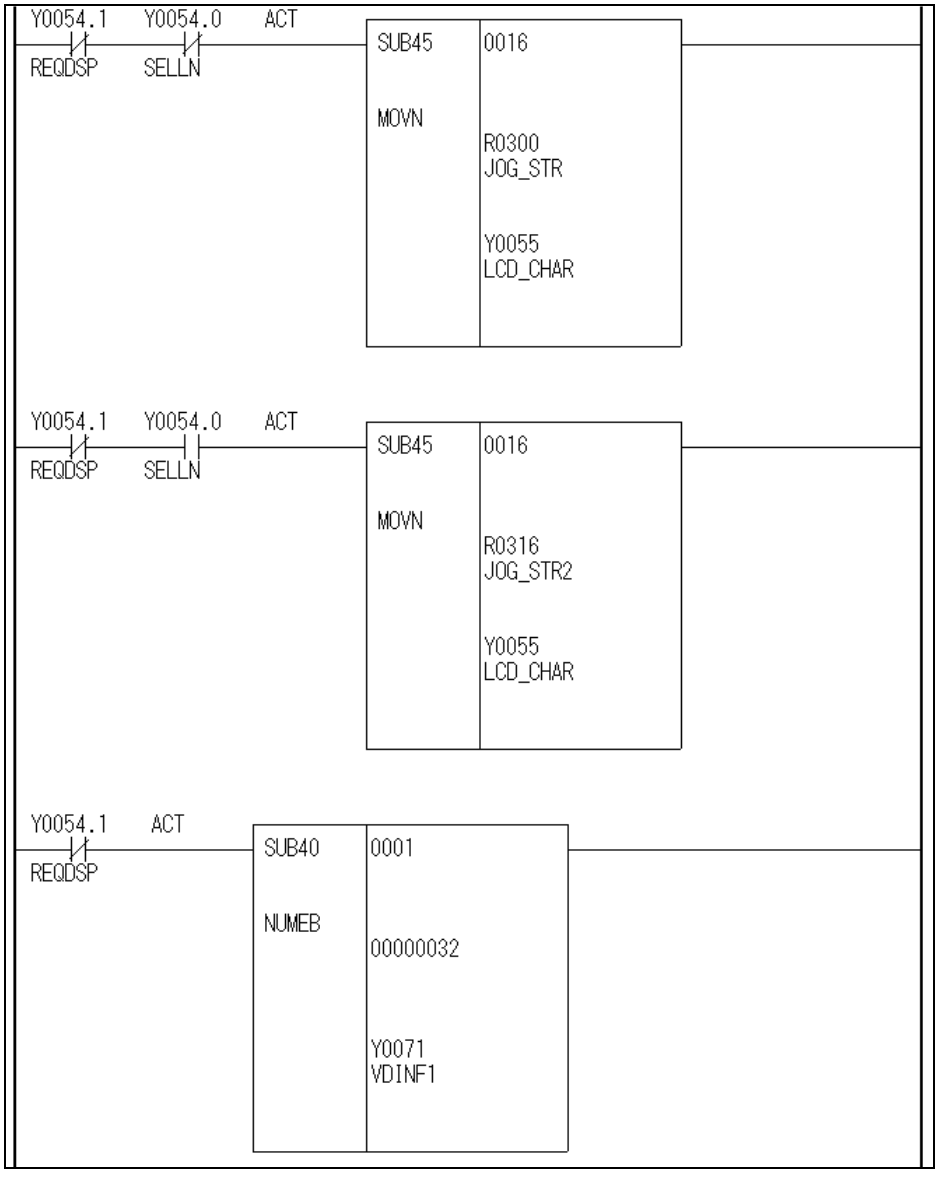
Copy HANDLEAXIS_TMP to HS1A-HS1D when FUNCTION key is pushed.

Fig.6.5 Selection axis

6.6 INFORMATION DISPLAY TO LCD

Fig. 6.6.1 shows the strings on LCD.
The most left character of second line shows the selected axis by XYZ456 key, and ???% shows the JOG override value.

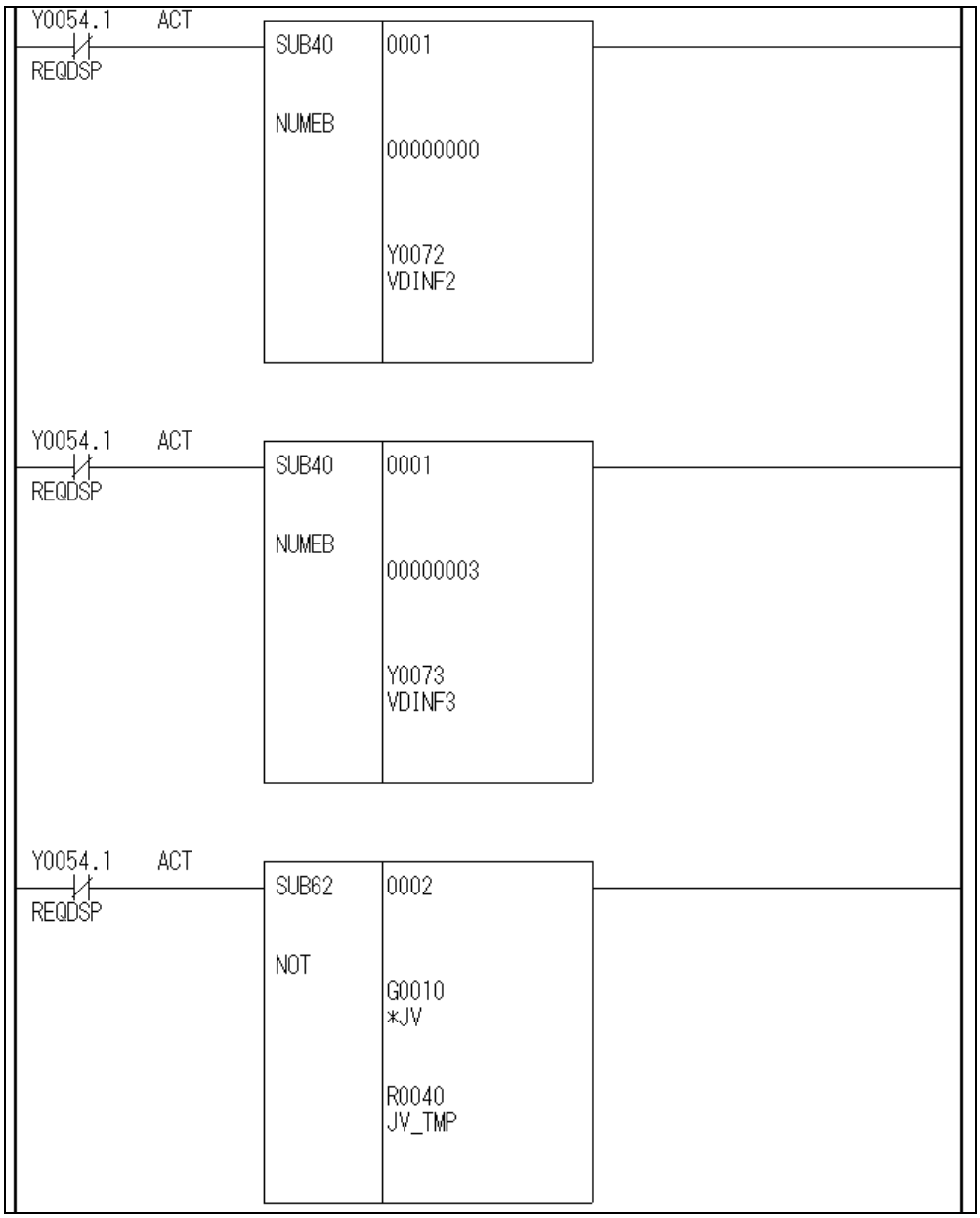
column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LCD upper line	[	J	O	G	]											
LCD lower line	X												?	?	?	%



Set strings data when REQDSP=0. Upper line data is set if SELLN=0, lower line data is set if SELLN=1.

Set unsigned binary form and 2byte length to Variable format 1 because numeric variable data is used for lower line display.

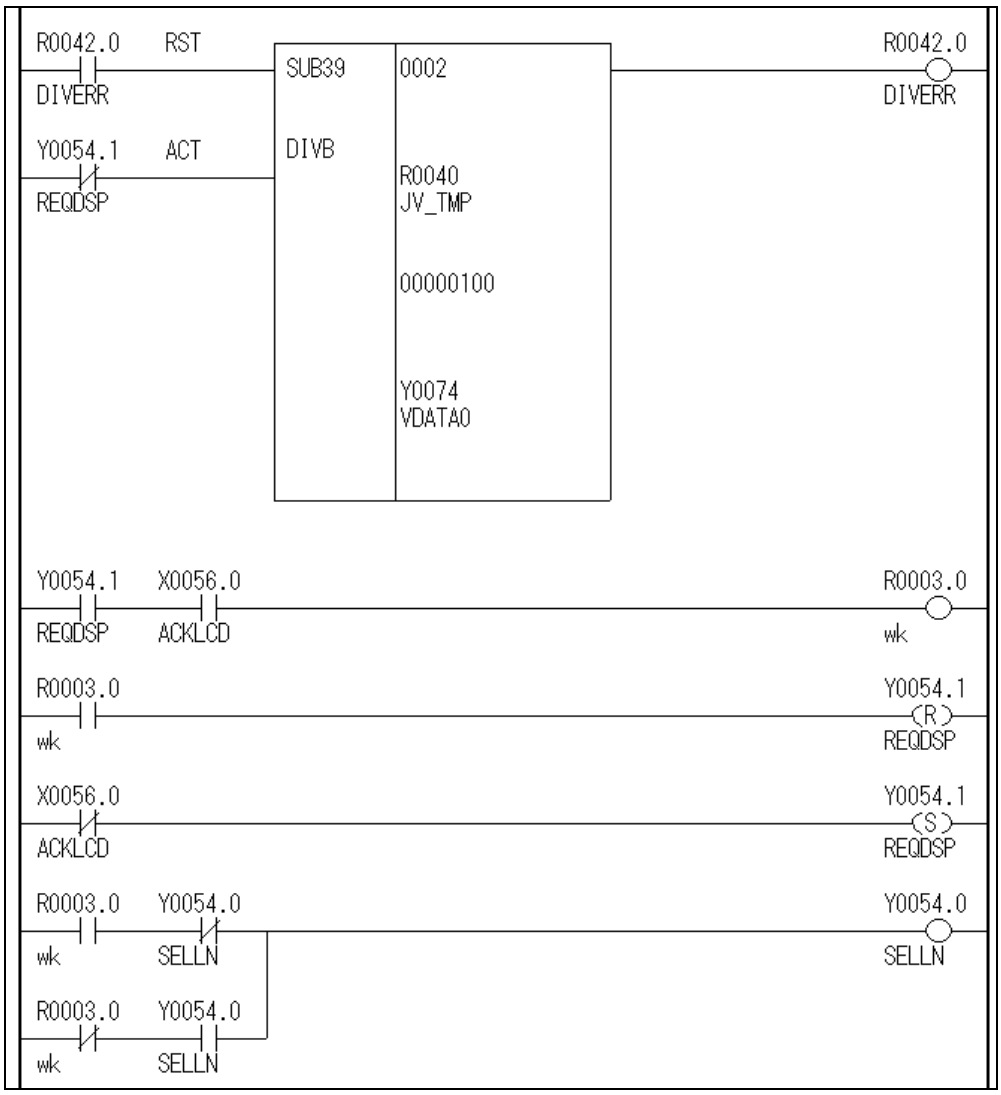
Fig.6.6(a) Example of LCD display



Set No decimal digits, right justified and stuff space character to Variable format 2.

Set 3 to the number of display column of Variable format 3.

Complement the value of JOG override for LCD display.



Divide the complement JOG override value by 100 (to convert 0.01% unit to 1% unit) and set to numeric variable data area.

Following from here is a sequence for LCD display.

If immediately after the LCD display, wk=1. Besides, wk=0.

If immediately after the LCD display, REQDSP=0.

If ACKLCD=0 (display demand is not accepted), REQDSP=1.

If immediately after the LCD display, change selected line.

Fig.6.6(b) LCD Display

- About display character data of the first line.
  LCD display character data of the following content is stored in R0300-R0315 beforehand. See Fig.6.3(b) for the sequence.

Address	Character-code (decimal)	displayed character	Transferring by MOVN at RUN time	Destination address
R0300	91	[	→	LCD_CHAR
R0301	74	J	→	LCD_CHAR+1
R0302	79	O	→	LCD_CHAR+2
R0303	71	G	→	LCD_CHAR+3
R0304	93	]	→	LCD_CHAR+4
R0305	32	(Space)	→	LCD_CHAR+5
R0306	32	(Space)	→	LCD_CHAR+6
R0307	32	(Space)	→	LCD_CHAR+7
R0308	32	(Space)	→	LCD_CHAR+8
R0309	32	(Space)	→	LCD_CHAR+9
R0310	32	(Space)	→	LCD_CHAR+10
R0311	32	(Space)	→	LCD_CHAR+11
R0312	32	(Space)	→	LCD_CHAR+12
R0313	32	(Space)	→	LCD_CHAR+13
R0314	32	(Space)	→	LCD_CHAR+14
R0315	32	(Space)	→	LCD_CHAR+15

- About fixed display character of the 2nd line.
  LCD display character data of the following content is stored in R0316-R0331 beforehand. See Fig.6.3(b) for the sequence.

Address	Character-code (decimal)	displayed character	Transferring by MOVN at RUN time	Destination address
R0316	32	(Space)	→	LCD_CHAR
R0317	32	(Space)	→	LCD_CHAR+1
R0318	32	(Space)	→	LCD_CHAR+2
R0319	32	(Space)	→	LCD_CHAR+3
R0320	32	(Space)	→	LCD_CHAR+4
R0321	32	(Space)	→	LCD_CHAR+5
R0322	32	(Space)	→	LCD_CHAR+6
R0323	32	(Space)	→	LCD_CHAR+7
R0324	32	(Space)	→	LCD_CHAR+8
R0325	32	(Space)	→	LCD_CHAR+9
R0326	32	(Space)	→	LCD_CHAR+10
R0327	32	(Space)	→	LCD_CHAR+11
R0328	16	(variable)	→	LCD_CHAR+12
R0329	16	(variable)	→	LCD_CHAR+13
R0330	16	(variable)	→	LCD_CHAR+14
R0331	37	%	→	LCD_CHAR+15

- About variable data of the 2nd line
  Sequence of displaying JOG override value is included in Fig. 6.6(b).
  Getting the selected axis name to display is done in the procedure of axis selection which is executed when XYZ456 key is pushed. That is, reading CNC parameter 1020 by PMC window function and move the result of it to R316.

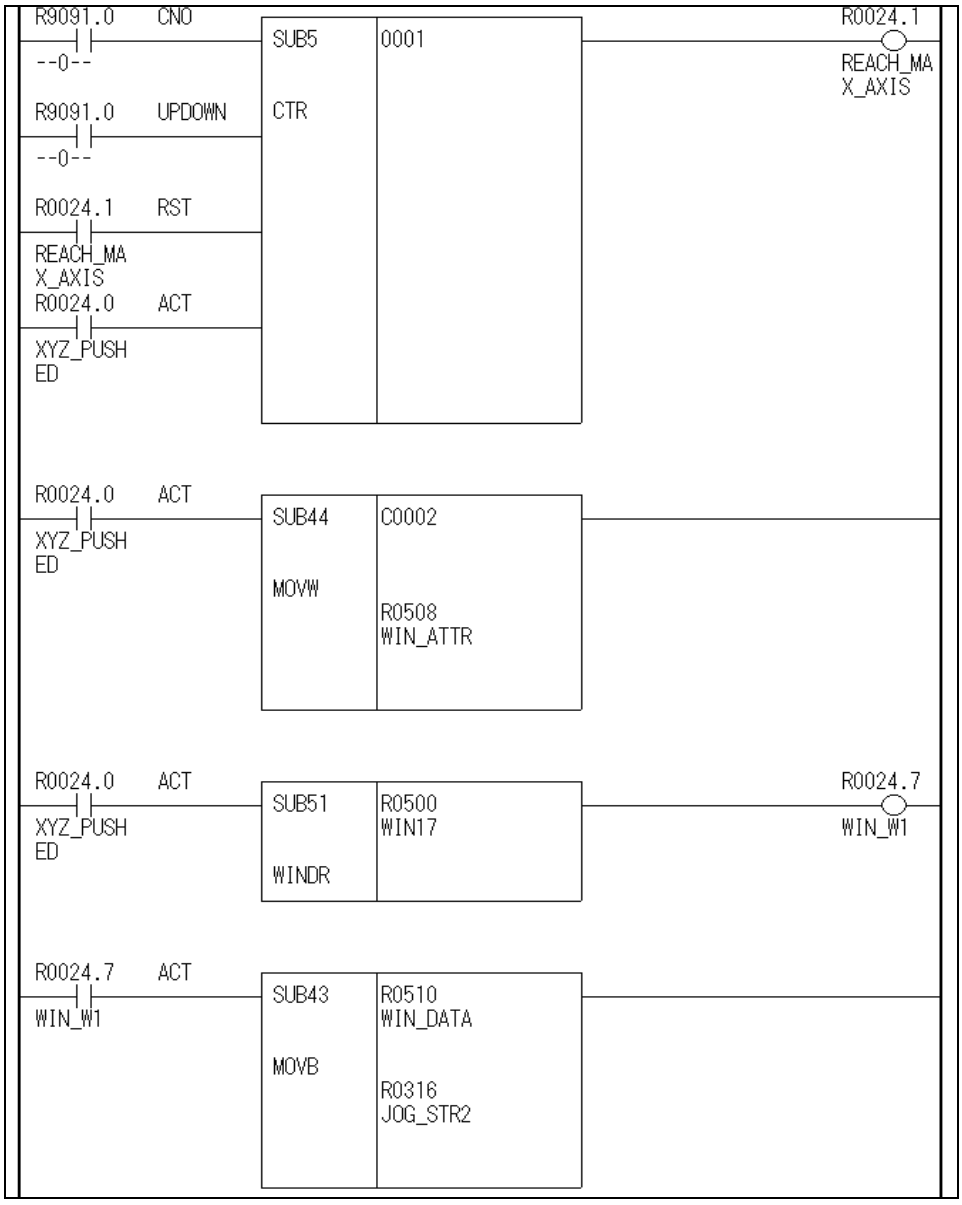
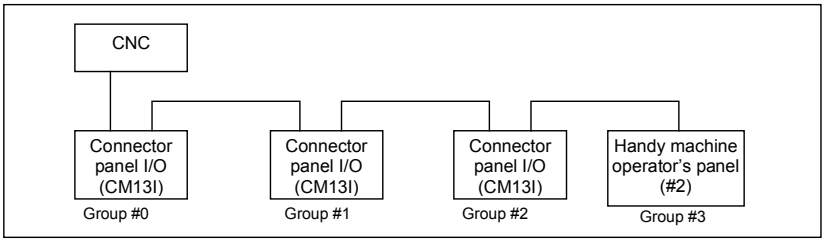


Fig.6.6(c) Reading axis name of CNC

APPENDIX

A CONNECTING A MANUAL PULSE GENERATOR FOR 16*i*/18*i*/21*i*-A/B, AND Power Mate *i*

When connecting a manual pulse generator to I/O Link, use a module that can be connected to the manual pulse generator (connector panel I/O module, operator's panel I/O module, machine operator's panel, etc.).
The number of manual pulse generators that can be connected depends on the module name and module-specific ID used in allocation.



For instance, up to three manual pulse generators can be connected to a single connector panel I/O module. However, with the allocation name CM13I (allocation name for connecting a single manual pulse generator) used in the example shown above, just one manual pulse generator can be connected. In addition, a single manual pulse generator can be connected to the handy machine operator's panel. (For details of allocation, refer to Section 3, "Assigning Addresses" in " FANUC PMC Ladder Language Programming Manual" (B-61863E).)

Accordingly, in the example using three connector panel I/O modules and one handy machine operator's panel, as shown above, four manual pulse generators can be connected in total. However, up to three manual pulse generators can be used actually.

In such cases, the modules to which manual pulse generators are connected can be selectively enabled by two methods, which can be selected by a parameter.

1. Conventional method
   This method has been adopted by the Series 16*i*/18*i*/21*i* and Power Mate *i*-D/H.
   On the I/O Link line, the manual pulse generators are automatically allocated to the modules to which manual pulse generators can be connected, in ascending order of group number.

In the example illustrated above, the manual pulse generators connected to groups #0, #1, and #2 are enabled, and the manual pulse generator connected to the handy machine operator's panel of group #3 cannot be used.

2. New method (This method can be used with Power Mate i-D/H only.)
   Any X addresses to which manual pulse generators can be connected can be used.
   The manual pulse generators connected to any groups specified by parameters can be used.

Parameter
Power Mate *i*-D/H

	#7	#6	#5	#4	#3	#2	#1	#1
7105							HXS	

HXS The manual pulse generators are allocated to I/O Link by:

0 : The conventional method.
Up to three manual pulse generators related to smallest group numbers used for the connection of I/O Link can be used automatically.

1 : The new method. (Parameters 7120 to 7122 are referenced.)
Up to three manual pulse generators related to specified group numbers can be used, irrespective of the order of connection.

7120	X address to which the first manual pulse generator is allocated
7121	X address to which the second manual pulse generator is allocated
7122	X address to which the third manual pulse generator is allocated

[Data type] Byte
[Valid data range] 0 to 128

NOTE
If an address to which a manual pulse generator cannot be allocated is specified in the parameter, the change in the value is ignored, resulting in no axial operation.

B CONNECTING THE SECOND CHANNEL OF I/O Link FOR Series 16*i*/18*i*/21*i*-A/B

No handy machine operator's panel can be connected to the second channel of I/O Link of the Series 16*i*/18*i*/21*i*.

(The Series 15*i* and Power Mate *i* do not have the second channel of I/O Link.)

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Revision Record

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