GE Fanuc Automation

Computer Numerical Control Products

Operator Panels for i Series Controls

User's Manual

GFK-1478D *September 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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This manual provides the information required to connect a GE Fanuc North American Operator Panel to your machine tool whenever an *i* Series CNC is selected as the control unit. This manual provides information on mounting and connecting the Operator Panel to the machine tool and interfacing the I/O to the CNC. It may also be used to help you select the correct Operator Panel.

Applicable Controls

- Series 15*i* CNC.
- Series 16*i* / 18*i* CNCs.
- Series 21*i* CNC.
- Power Mate *i* – Models D and H.

Note

The Operator Panels included in this manual are those which are totally compatible with the *i* Series controls. While GE Fanuc does offer other Operator Panels, they do not provide the Manual Pulse Generator (MPG) interface for the *i* Series controls. Conversely, the MPG interface included with the Operator Panels for the *i* Series controls are not operable with other GE Fanuc computer numerical controls.

Operator Panels

The following Operator Panels are available. All units communicate with *i* Series CNCs via the I/O Link communication bus.

North American Operator Panel

- 520mm x 180mm x 90mm (or 50mm if the Connection Unit is not mounted).
- 400mm x 180mm x 90mm (or 50mm if the Connection Unit is not mounted).

Features

Features of the North American Operator Panel include :

- UL listed.
- Convenient Control ON / OFF pushbuttons, which may be used to cycle 24VDC power to the CNC and other elements of the machine tool.
- Bracket for mounting the Connection Unit A20B-2002-0470 (supports up to three MPGs).
- Optional 1 meter signal cable set for alternative mounting of the Connection Unit.
- Lighted pushbuttons with user-definable lens cap inserts.
- Choice of high-intensity LED or incandescent lamp for backlight.
- Optional configurations such as addition of MPG (see page 1-1)

Specification Part Numbers

See List of Covered Products on Page 1-1

Dispersion I/O Type Operator's Panel

Specification Part Numbers

- **A02B-0236-C141#MBR/MBS/TBR/TBS :** 400mm x 180mm x 60mm.
- **A02B-0236-C140#MBR/MBS/TBR/TBS :** 520mm x 180mm x 60mm.

- "M" version is used for machining center.
- "T" version is used for lathes.
- "R" indicates English language.
- "S" indicates symbolic icons on the keypads.

These two panels differ only in physical dimensions and number of keys.

Features

Features of the Dispersion I/O Type Operator's Panel include :

- CE Mark compliant.
- Built-in I/O Connection Unit which supports up to three MPGs.
- Membrane keyboard with embedded LEDs.
- These units are physically similar to the Series 0 style Operator Panels.

If you decide to interface your own Operator Panel to an *i* Series Control, you will probably need to use one of the Connection Units listed below. If you do not use either of the first two units, you will need to interface the MPG via an approved method. For more information, refer to the appropriate Hardware Connection Manual for your control.

Connection Units

The following Connection Units are available for the *i* Series CNCs. All units communicate with the *i* Series CNC via the I/O Link communication bus. (Refer to the appropriate Hardware Connection Manual for details.) Note that the MPG interface is operational only with *i* Series CNCs.

- **72/56 I/O**
  - 56 of the inputs are matrixed.
  - Outputs are sourced outputs, electronically fused.
  - Supports up to three MPGs.
  - Specification Number: **A20B-2002-0470**
- **48/32 I/O**
  - All inputs are non-matrixed.
  - Outputs are sourced outputs, electronically fused.
  - Supports up to three MPGs.
  - Specification Number: **A20B-2002-0520**
- **48/32 I/O**
  - All inputs are non-matrixed.
  - Outputs are sourced outputs, electronically fused.
  - Does not provide any MPG interface.
  - Specification Number: **A20B-2002-0521**

Related Publications

- **Series 15*i*-Model A**

GFZ-63322EN	*Descriptions Manual*
GFZ-63323EN	*Connection Manual (Hardware)*
GFZ-63323EN-1	*Connection Manual (Function)*
GFZ-63324EN	*Operator's Manual (Programming)*
GFZ-63324EN-1	*Operator's Manual (Operation)*
GFZ-63325EN	*Maintenance Manual*
GFZ-63330EN	*Parameter Manual*

- **Series 16*i*/18*i*-Model A**

GFZ-63002EN	*Descriptions Manual*
GFZ-63003EN	*Connection Manual (Hardware)*
GFZ-63003EN-1	*Connection Manual (Function)*
GFZ-63004EN	*Operator's Manual (for Lathe)*
GFZ-63005EN	*Maintenance Manual*
GFZ-63007EN	*Operation & Maintenance Handbook*
GFZ-63010EN	*Parameter Manual*
GFZ-63014EN	*Operator's Manual (for Machining Center)*

- **Series 21*i*-Model A**

GFZ-63002EN	*Descriptions Manual*
GFZ-63003EN	*Connection Manual (Hardware)*
GFZ-63003EN-1	*Connection Manual (Function)*
GFZ-63084EN	*Operator's Manual (for Lathe)*
GFZ-63085EN	*Maintenance Manual*
GFZ-63090EN	*Parameter Manual*
GFZ-63094EN	*Operator's Manual (for Machining Center)*

- **Power Mate *i*-Models D and H**

GFZ-63172EN	*Descriptions Manual*
GFZ-63173EN	*Connection Manual (Hardware)*
GFZ-63173EN-1	*Connection Manual (Function)*
GFZ-63174EN	*Operator's Manual*
GFZ-63175EN	*Maintenance Manual*
GFZ-63180EN	*Parameter Manual*

CONTENTS

The *Operator Panels for i Series Controls User's Manual*, GFK-1478D, contains the following sections:

SECTION 1:
NORTH AMERICAN OPERATOR PANEL
FOR *i* SERIES CNCS

This section contains: **Page**

North American Operator Panels for Machine Tools using *i* Series CNCs or Power Mate *i*

Table 1-1. Covered Products

Lamp Version		LED version	
Part Number	**Description**	**Part Number**	**Description**
44A739025-G01	Operator Panel Series i 520mm Lamp Standard	44A739025-G11	Operator Panel Series i 520 LEDS Standard
44A739025-G02	Operator Panel Series i 400mm Lamp Standard	44A739025-G12	Operator Panel Series i 400 LEDS Standard
44A739025-G03	Operator Panel Series i 520mm Lamp Chrysler	44A739025-G13	Operator Panel Series i 520 LEDs Chrysler
44A739025-G04	Operator Panel Series i 400 Lamp Chrysler	44A739025-G14	Operator Panel Series i 400 LEDS Chrysler
44A739026-G01	Operator Panel/Custom Series i Lamp	44A739026-G11	Operator Panel/Custom Series i LEDS
44A739026-G02	Operator Panel/Custom Series i Lamp	44A739026-G12	Operator Panel/Custom Series i LEDS
44A739026-G03	Operator Panel Series i 520 Lamp MPG+8PB	44A739026-G13	Operator Panel Series i 520 LEDS MPG+8PB
44A739026-G04	Operator Panel, Strippit 180i	NA	NA
44A739026-G05	Operator Panel, Fellows FS-400	NA	NA
44A739026-G06	Operator Panel, Fellows 10-4, Series I	NA	NA
44A739026-G07	Operator panel/Lamps, i Series, Strippit	44A739026-G17	Operator panel/LEDs, i Series, Strippit
44A739026-G08	Operator Panel Series i 520 Lamp 8PB Custom	44A739026-G18	Operator Panel Series i 520 LEDS 8PB Custom
44A739026-G09	Operator Panel Series i 520 Lamp MFO&SSO	44A739026-G19	Operator Panel Series i 520 LEDS MFO&SSO
44A739026-G10	Operator Panel Series i 520 Lamp MPG+8PB Chrysler	44A739026-G20	Operator Panel Series i 520 LEDS MPG+8PB Chrysler

The GE Fanuc North American Operator Panel has been adapted for use with the *i* Series Computer Numerical Controls (CNCs). As a result, its size is now more compact, and its wiring is simplified.

Table 1-2. Features and Benefits

Features	Benefits
Compatibility with GE Fanuc CNCs	The North American *i* Series Operator Panel attaches to the Connection Unit, which resides on the I/O Link, a universal GE Fanuc interface. The *i* Series compatible units provide Manual Pulse Generator (MPG) interface without requiring additional hardware.
Solid, attractive construction	All versions feature a galvanized steel faceplate with white silkscreen lettering on a durable gray background.
Discrete pushbuttons with back-lighting	GE Fanuc supplies both standard English legends and CE Mark-compliant symbolic legends. However, removable plastic caps allow end-users and machine tool builders to insert customized legends. Each pushbutton cap can be removed, and a new label can be inserted. Each pushbutton is backlit. You may choose either a high-intensity LED or a long-life incandescent lamp. Back-lighting displays the ON / OFF status of the pushbutton. You cannot mix LEDs and incandescent bulbs. Optional LED Upgrade Kits may be used to convert incandescent lamps to LEDs, if preferred. The kits include all necessary LEDs and tooling. Please see section on jumper setting.
E-STOP pushbutton and Spindle Speed %, Feedrate Override, and Traverse Override Rotary switches	All switches basic to machine tool operation may be selected.
Pre-wiring	When shipped from the factory, all wiring is provided for the Connection Unit to be mounted on the bracket attached to the back of the unit. Pre-wiring reduces engineering effort and testing.
Availability of ladder diagram segments	I/O assignments for the operator interface have been included in relay ladder diagram programs developed and tested by GE Fanuc engineers. These relay ladder diagram programs are available upon request from GE Fanuc's CNC Application Engineering team.
Flexibility	GE Fanuc offers versions of the North American Operator Panel with / without MPG and with / without extra pushbuttons. The North American Operator Panel can also be customized to better suit your specific applications. Please contact GE Fanuc's CNC Technical Marketing team.
Standards	UL listed, CE Mark compliant.

The dimensions of the North American *i* Series Operator Panel are either 520 mm or 400 mm wide by 180 mm high by 90 mm deep. If the Connection Unit bracket is removed, the depth is 50 mm. Panel devices project up to 25 mm from the front of the panel.

The Operator Panel is designed to be used with the 72 Data Input / 56 Data Output Connection Unit (see Section 3 of this manual). A convenient mounting bracket for the Connection Unit is provided on the back of the Operator Panel. The Connection Unit (A02B-2002-0470) is ordered separately. It attaches to the CNC via the high-speed I/O Link and provides a convenient attachment for up to three Manual Pulse Generators.

Note

For *i* Series controls, it may be possible to connect the MPGs to multiple locations within the machine tool. Select the location on the I/O Link closest to the CNC, and connect all MPGs to that unit. This will be the only active MPG circuit.

The pushbuttons on the Operator Panel use 44 of the 56 matrix-type inputs. The rotary switches use 12 of the 16 discrete-type 24V inputs. The remaining 12 outputs, 12 matrix inputs, and 4 discrete 24VDC inputs are available on connector PL2 for customer use.

Note

The Memory Protect Key Switch is included with the North American *i* Series Operator Panel, however, the protection must be defined in the ladder logic.

All supplied panel devices are wired, except for the Emergency Stop (E-STOP) pushbutton. It is the machine tool builder's responsibility to wire the E-STOP pushbutton in order to satisfy safety requirements for each application and location. For more information on E-STOP wiring and signals, refer to the Hardware and Function Connection Manuals for the CNC control to be used. The E-STOP pushbutton contacts are equipped with screw terminals to provide for easy termination of wiring by the machine tool builder. Use of crimp-on terminals or ferrules is recommended to protect stranded wire from being damaged by over-tightening the screw terminals.

The Operator Panel is connected to a 24VDC power supply fused for a maximum of 8 Amps. A Power Cable Set 44C742962-G01 may be ordered to connect the system. The Power Cable Set provides one meter of wire between the panel and the power supply, 250 mm from the panel to the Connection Unit (the length required when a mounting bracket is used), and one meter from the Connection Unit to the *i* Series Control. ON and OFF pushbuttons are provided to switch the 24VDC output for the CNC and other machine devices. (Refer to the wiring diagrams on Pages 1-13, 1-14, 1-15, and 1-18.)

CAUTION

The North American Operator Panel may be used with controls other than the *i* Series CNCs; however, the ON/OFF pushbuttons may require a different configuration.

In addition, the MPG interface circuits on the Connection Unit will not be functional with CNCs other than the *i* Series CNCs.

Ribbon cables are included to connect the Operator Panel to the Connection Unit when a mounting bracket is used. If the mounting bracket is not used, a one-meter set of Ribbon Cables 44C739032-G01 can be ordered.

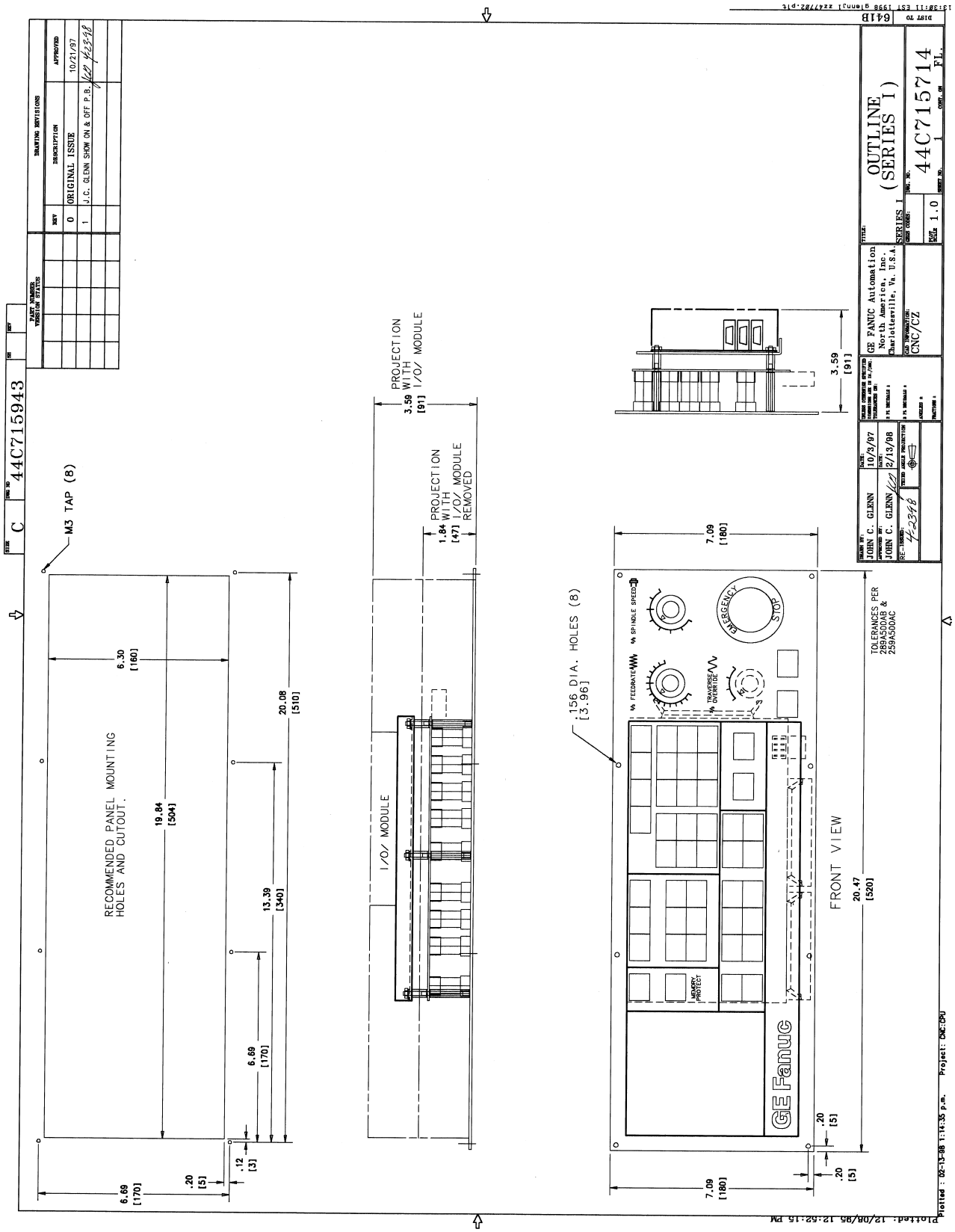


Figure 1-1. North American Operator Panel (520 mm wide)

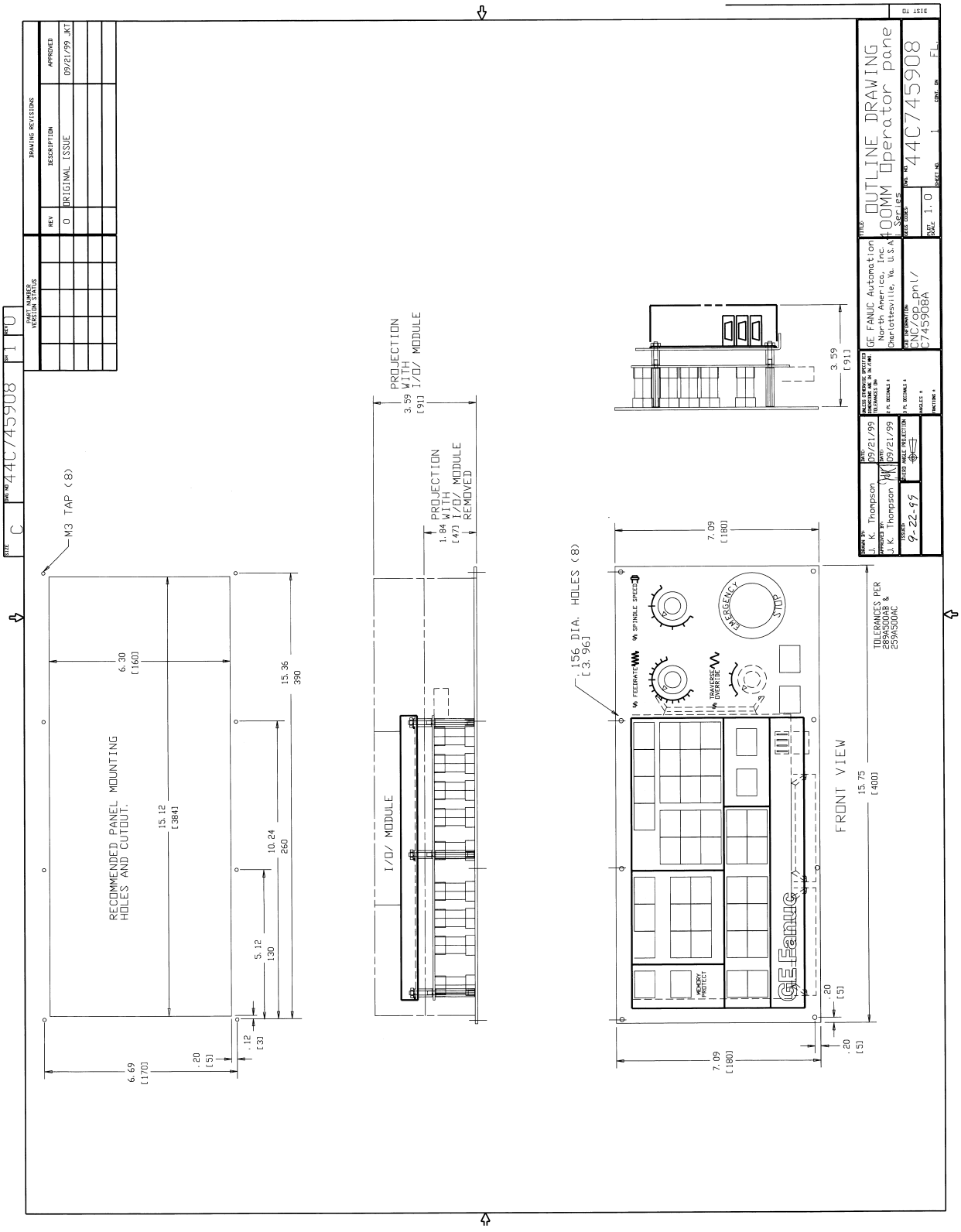


Figure 1-2. North American Operator Panel (400 mm wide)

Several variations of the North American Operator Panel are identified in Table 1-3. These variations include a width of 520 mm or 400 mm, with or without MPG, and various configurations of rotary switches and pushbuttons. If your specific application requires additional modification, please contact your local GE Fanuc sales or application engineer.

Table 1-3. Variations of the Operator Panel

Category	MPG	Pushbutton & Switch Variations	400 mm Width	520 mm Width	Comments
Connection Unit A02B-2002-0470 Source Type (CE) 72DI / 56DO Includes 3 MPG interfaces. Must be ordered separately.	Separate	Standard North American Operator Panel	44A739025-G02 (Lamps) 44A739025-G12 (LEDs)	44A739025-G01 (Lamps) 44A739025-G11 (LEDs)	E-STOP, 3 rotary switches (all with inhibit contacts), Memory Protect Key Switch, 45 pushbuttons, including Power ON/OFF.
	Separate	ON/OFF removed; 6 extra pushbuttons; 2 extra key switches.	N/A	44A739026-G01 (Lamps) 44A739026-G11 (LEDs)	Variations are all with respect to 44A739025-G01.
	Separate	1 rotary switch removed.	N/A	44A739026-G02 (Lamps) 44A739026-G12 (LEDs)	Variations are all with respect to 44A739025-G01.
	Built-in	8 extra pushbuttons located above MPG.	N/A	44A739026-G03 (Lamps) 44A739026-G13 (LEDs)	Variations are all with respect to 44A739025-G01.
Included Cables Note: I/O Link Cable must be ordered separately.	Includes 50 cm cable for Built-in MPG.		Connects Operator Panel to the Connection Unit, when mounted on brackets provided at rear of panel.	Connects Operator Panel to the Connection Unit, when mounted on brackets provided at rear of panel.	All internal cables are supplied with Operator Panel.
CE Mark Labels					One set is included with accessories shipped with Operator Panel.
Optional Cable Set			44C739032-G01	44C739032-G01	Optional 1 meter cable set available for remote mount.
Recommended Power Cable Set			44C742962-G01	44C742962-G01	Connects 24VDC to the CNC, Connection Unit and Operator Panel. Maximum cable length 1 meter.
Extra Contacts for E-STOP			44A724659-006 (Normally Open) 44A724659-007 (Normally Closed)	44A724659-006 (Normally Open) 44A724659-007 (Normally Closed)	For panels assembled after March 1999.
LED Upgrade Kit		44A736871-G02 (53 pushbuttons)	44A736871-G01 (45 pushbuttons)	44A736871-G01 (45 pushbuttons)	Standard panel has 45 pushbuttons.
Pushbutton Replacement Toolkit			44A739089-G01	44A739089-G01	One included with accessories shipped with Operator Panel.

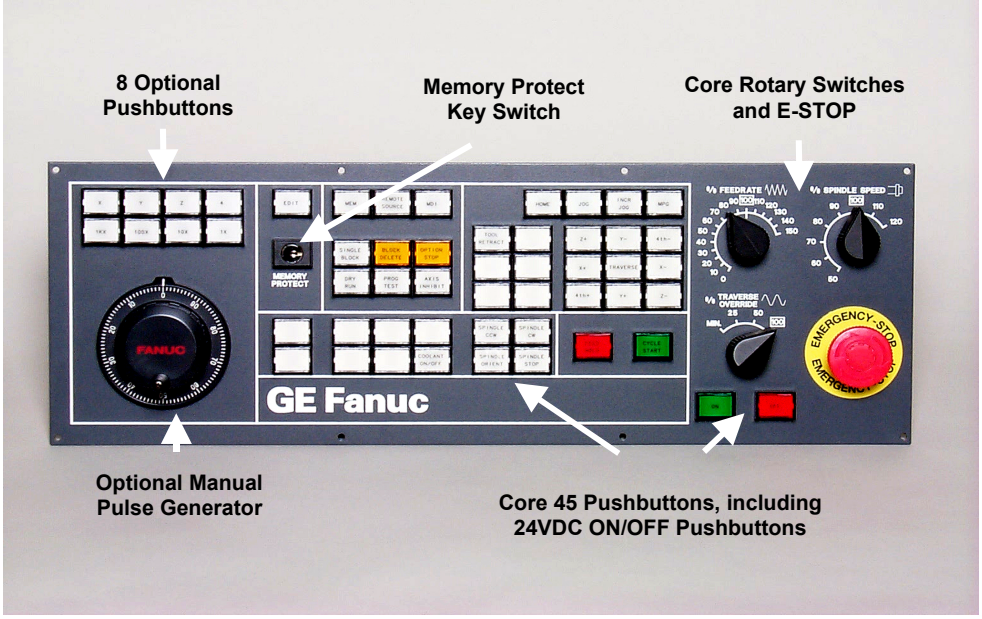


Figure 1-3. Front View of North American Operator Panel for *i* Series Controls

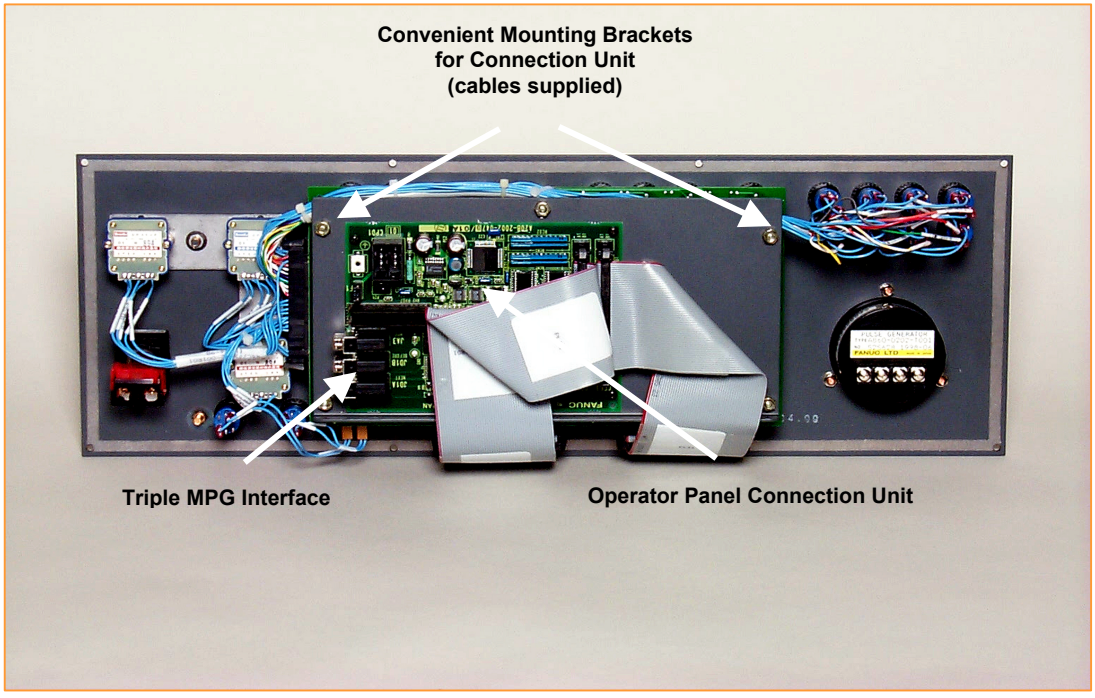


Figure 1-4. Back View of North American Operator Panel for *i* Series Controls

Optional Cables and Connectors

The cables identified in Table 1-4 are **not** automatically supplied with the North American Operator Panels for *i* Series CNCs. However, using pre-made cables will greatly speed up the installation of the Operator Panel. These cables and cable sets must be ordered separately by the part numbers listed below. Select the appropriate part numbers for your specific application.

Table 1-4. Cables

Part Number	Quantity	Description
44C742962-G01	1 set	Operator Panel Power Cable Set for the Series 16*i*/18*i* and 21*i* CNCs and Power Mate *i* Motion Controller. 44C742962-G01 includes: • 44C742962-005 PL1 to Connection Unit (250mm). • 44C742962-006 PL1 to Power Supply (1 meter). • 44C742974-001 CPD1 to CP1A (1 meter). **Note:** This Power Cable Set is **not** for the Series 15*i* CNC.
44A739097-G01	1 set	Operator Panel Power Cable Set for the Series 15*i* CNC. 44A739097-G01 includes: • 44C742962-010 +24VDC Cable PL1 to Connection Unit CPD1. • 44C742974-001 +24VDC Cable CPD1 to LCD Unit CP1B. • A02B-0120-K323 Connectors for +24VDC. Power Supply CP5 and LCD Unit CP1A (Qty 2). • A02B-0120-K322 Connectors for Power Supply CP4 (Qty 1). • 44A293713-101 Terminals for ON / OFF pushbuttons (Qty 4). **Note:** This Power Cable Set is **not** for the Series 16*i*/18*i* and 21*i* CNCs or Power Mate *i* Motion Controller.
44A739032-G01	1 set	Operator Panel Connection Unit Extended Length Ribbon Cables. Standard 180mm ribbon cables are provided for mounting the Connection Unit printed circuit board on the *i* Series Operator Panel chassis. Optional Extended Length Ribbon Cables can be used to mount the Connection Unit up to one meter from the Operator Panel. 44A739032-G01 includes: • 44C742961-002 PL54 to CE54 (1 meter). • 44C742960-002 PL53 to CE53 (1 meter).
A02B-0120-K841 A02B-0120-K848 A02B-0120-K847		Select the appropriate cable for your specific application: • 3 MPG Unit Cable to JA3 (7 meter). • 2 MPG Unit Cable to JA3 (7 meter). • 1 MPG Unit Cable to JA3 (7 meter).

The connectors listed in Table 1-5 are identified for reference use only. GE Fanuc recommends that connectors required for installation be specified and ordered with the CNC control hardware, as listed in the GE Fanuc ordering instructions. Separate connectors may be required for custom configurations or as renewal parts.

Note

In some cases, assembled cables can be provided in shorter lead times than separate connector components.

Table 1-5. Power Connectors and Connector Kits

Part Number	Quantity per	Description
GE Fanuc North American Operator Panel		
44A731497-002	1	Connector PL1 (+24VDC Switched).
44A717191-450	1	Connector PL2 (Rotary Switches and Additional I/O).
44A717191-901	50	Crimp Pins for PL2 Connector.
N/A - Replace Cable	2	Connector PL3 and PL4 (Control ON / Control OFF).
A02B-0120-K342	2	Connector PL53 and PL54 (50 Conductor Ribbon style).
A02B-0120-K342	2	Connector CE53 and CE54 (50 Conductor Ribbon style).
A02B-0120-K301	2	Kit for JD1A / JD1B , I/O Link (20 Pin Honda PCR solder type).
A02B-0120-K303	1	Kit JA3 MPG (15 Pin Honda PCR solder type).
A02B-0120-K324	2	Kit for CDP1 , +24VDC Power (Amp Type X 1-178288-3).
Series 16i/18i/21i LCD (Integrated) Units		
A02B-0120-K324	1	Kit for CP1A , +24VDC Power (Amp Type X 1-178288-3).
A02B-0120-K323	1	Kit for CP1B , +24VDC Power (Amp Type Y 2-178288-3).
A02B-0120-K301	1	Kit for JD1A , I/O Link (20 Pin Honda PCR solder type).
Series 16i/18i/21i Stand-Alone Units		
A02B-0120-K324	1	Kit for CP1A , +24VDC Power (Amp Type X 1-178288-3).
A02B-0120-K323	1	Kit for CP1B , +24VDC Power (Amp Type Y 2-178288-3).
A02B-0120-K301	1	Kit for JD1A , I/O Link (20 Pin Honda PCR solder type).
A02B-0120-K324	1	Kit for LCD CP1A , +24VDC Power (Amp Type X 1-178288-3).
A02B-0120-K323	1	Kit for LCD CP1B , +24VDC Power (Amp Type Y 2-178288-3).

(continued)

Table 1-6. Power Connectors and Connector Kits (continued)

Part Number	Quantity per	Description
		Power Mate i – Models D and H
A02B-0120-K324	1	Kit for LCD CP1 , +24VDC Power (Amp Type X 1-178288-3).
A02B-0120-K323	1	Kit for LCD CP2 , +24VDC Power (Amp Type Y 2-178288-3).
A02B-0120-K301	1	Kit for CP41 , Display (20 pin Honda PCR solder type).
A02B-0120-K324	1	Kit for CPD1 , CRT/MDI +24VDC Power (Amp Type X 1-178288-3).
A02B-0120-K324	1	Kit for CPD2 , CRT/MDI +24VDC Power (Amp Type X 1-178288-3).
A02B-0120-K301	1	Kit for JD13 , CRT/MDI (20 pin Honda PCR solder type).
A02B-0120-K301	1/2	Kit for JD1A / JD1B , I/O Link (20 Pin Honda PCR solder type).
		Series 15i CNC
A02B-0120-K321	1	Kit for CP1 , 200VAC Input (Amp 1-178128-3).
A02B-0120-K321	2	Kit for CP2 & CP3 , 200VAC Outputs (Amp 1-178128-3).
A02B-0120-K322	1	Kit for CP4 , Control On / Control Off (Amp 1-178129-6).
A02B-0120-K323	1	Kit for CP5 , +24VDC Power (Amp Type Y 2-178288-3).
A02B-0120-K324	1	Kit for CP6 , +24EVDC Power (Amp Type X 1-178288-3).
A02B-0120-K324	1	Kit for LCD CP1A , +24VDC Power (Amp Type X 1-178288-3).
A02B-0120-K323	1	Kit for LCD CP1B , +24VDC Power (Amp Type Y 2-178288-3).
A02B-0120-K301	1/2	Kit for JD1A / JD1B , I/O Link (20 Pin Honda PCR solder type).

Power Connection Considerations

The following questions and explanations will help you determine how to supply 24VDC power to the North American Operator Panel.

1. Is the CNC an "Open CNC System? That is, is it a system containing an integrated personal computer (PC) or an external PC with High-Speed Serial Bus (HSSB) hardware?

   If your answer is yes, the power-down sequence must include the time required to shut down the computer's Operating System before physically disconnecting power from the PC. A timing sequence run from the PMC ladder diagram can be used to accomplish this. Use the OFF pushbutton to start the sequence. For more information, refer to your Open System documentation.

2. Which CNC or motion control product is involved – Series 15*i*, Series 16*i*/18*i*, Series 21*i* CNC, or Power Mate *i* Models D and H?

   For Series 16*i*/18*i* and 21*i* power connections, refer to Pages 1-13 and 1-14. For Power Mate *i* Models D and H power connections, refer to Page 1-15. For Series 15*i* power connections, refer to Page 1-18.

3. Is the Series 16*i*/18*i*/21*i* CNC an LCD-Mount or Stand-Alone system?

   Separate wiring diagrams are provided on Pages 1-13 and 1-14 for these different configurations.

4. Is it desirable to isolate the 24VDC power supplied to the CNC from the 24VDC power supplied to the Machine I/O, including the North American Operator Panel?

   Due to resistive or inductive loading by 24VDC external machine devices, it may be beneficial to use a separate power supply to drive such loads. The machine tool builder must determine this and implement the appropriate wiring diagram to suit each application.

+24VDC Power Connections for Series 16*i*/18*i*/21*i* CNCs and Power Mate *i* Motion Controllers

Note

This information applies only to the Series 16*i*/18*i* and 21*i* CNCs and Power Mate *i* Motion Controllers. It does not apply to the Series 15*i* CNC. For information on the Series 15*i* CNC, please refer to Page 1-16.

The Series 16*i*/18*i* and 21*i* CNCs and Power Mate *i* Motion Controllers do not contain built-in power supplies. They must be powered by an external +24VDC power supply.

Most machine tools use an external +24VDC power supply for machine I/O devices. To save space and reduce electrical hardware, the same power supply could be sized to include the CNC hardware requirements. In other applications, it may be desirable to provide a separate +24VDC power supply to the CNC-related hardware. The separate +24VDC power supply would be isolated from the +24VDC power supply used for machine I/O devices.

CAUTION

Regardless of the method used to supply power, proper device mounting and grounding, good wiring practices, and recognized methods of noise suppression must always be observed. Failure to do so could result in incorrect operation or machine failures.

The North American Operator Panel for *i* Series CNCs contains built-in hardware to provide for switching the external +24VDC power supply. This will simplify installation for the machine tool builder. The switched +24VDC output is controlled by the Control ON and OFF pushbuttons provided on the Operator Panel. The switched +24VDC power supply should be used for all GE Fanuc devices required to be turned on in synchronization with the CNC control. This includes I/O Model A racks, I/O Link Connection Units, and Separate Feedback Detectors. Connector PL1 on OPND1 (the circuit board behind the pushbutton assembly) provides screw clamp terminal block type connections for the incoming +24VDC power supply, and +24VDC @ 8 Amps Maximum switched output (see 44C742964).

When used with the Series 16*i*/18*i*/21*i* controls, the Operator Panel may be ordered with Cable Kit 44C742962-G01. All cables in the kit are fully assembled. This kit contains the following items:

Table 1-7. Cable Kit 44C742962-G01

Item	Description
44C742962-006	+24VDC power supply to OPND1 Connector PL-1 for incoming +24VDC.
44C742962-005	Switched +24VDC from OPND1 PL-1 to the Connection Unit.
44C742974-001	Connection Unit to CNC or LCD Unit.

Note

The cables in the Cable Kit are sized for typical installations. Custom cable lengths may be required for special applications and would be provided by the machine tool builder.

Figures 1-5, 1-6, and 1-7 on Pages 1-13, 1-14, and 1-15, respectively, illustrate how to apply the +24VDC Cable Kit with either the LCD-Mount (Integrated) type or the Stand-Alone type *i* Series hardware. Power Mate Motion Controllers are only available in a Stand-Alone configuration.

The installation of Stand-Alone type *i* Series hardware will require a +24VDC cable from the LCD display to the CNC or PM logic rack. This cable length is determined by the machine tool design and cannot be included in a standard cable kit. Connectors required for custom cable lengths or for custom installations must be specified and ordered with the CNC control hardware.

The flexibility of Power Mate *i*-D & *i*-H motion controllers as used in their wide variety of applications makes it difficult to apply a "standardized" power cable kit. A "standard" cable kit may not best fit the specific requirements of cable types and lengths, required by specific hardware configurations and mounting distances. The machine tool builder must analyze the power cable requirements based on the application and installation dimensions. The *i*-Series Cable Kit 44C742962-G01 may be ordered separately for use in Power Mate *i* applications. However, it may not be suitable for the target application. In this case, please use the connectors supplied with the Operator Panel to create a custom cable set.

Notes :

1. Refer to the appropriate documentation for the +24VDC fusing requirements for your control.
2. Reversing +24VDC polarity to the CNC will damage the Inverter printed circuit board in the CNC. Check wiring and polarities before applying initial power.
3. North American Operator Panels are rated for 8 Amps maximum on the switched 24VDC circuit.

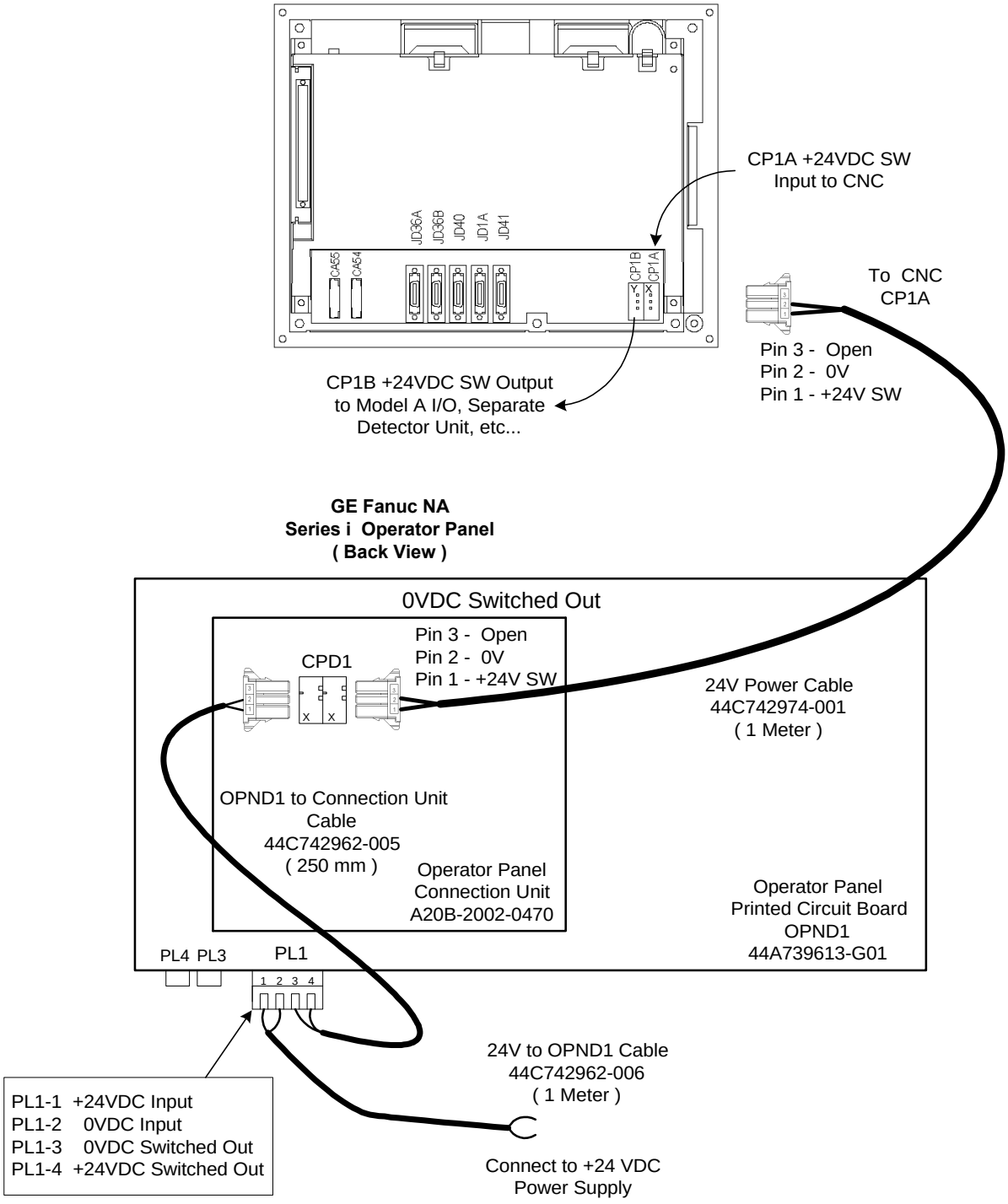
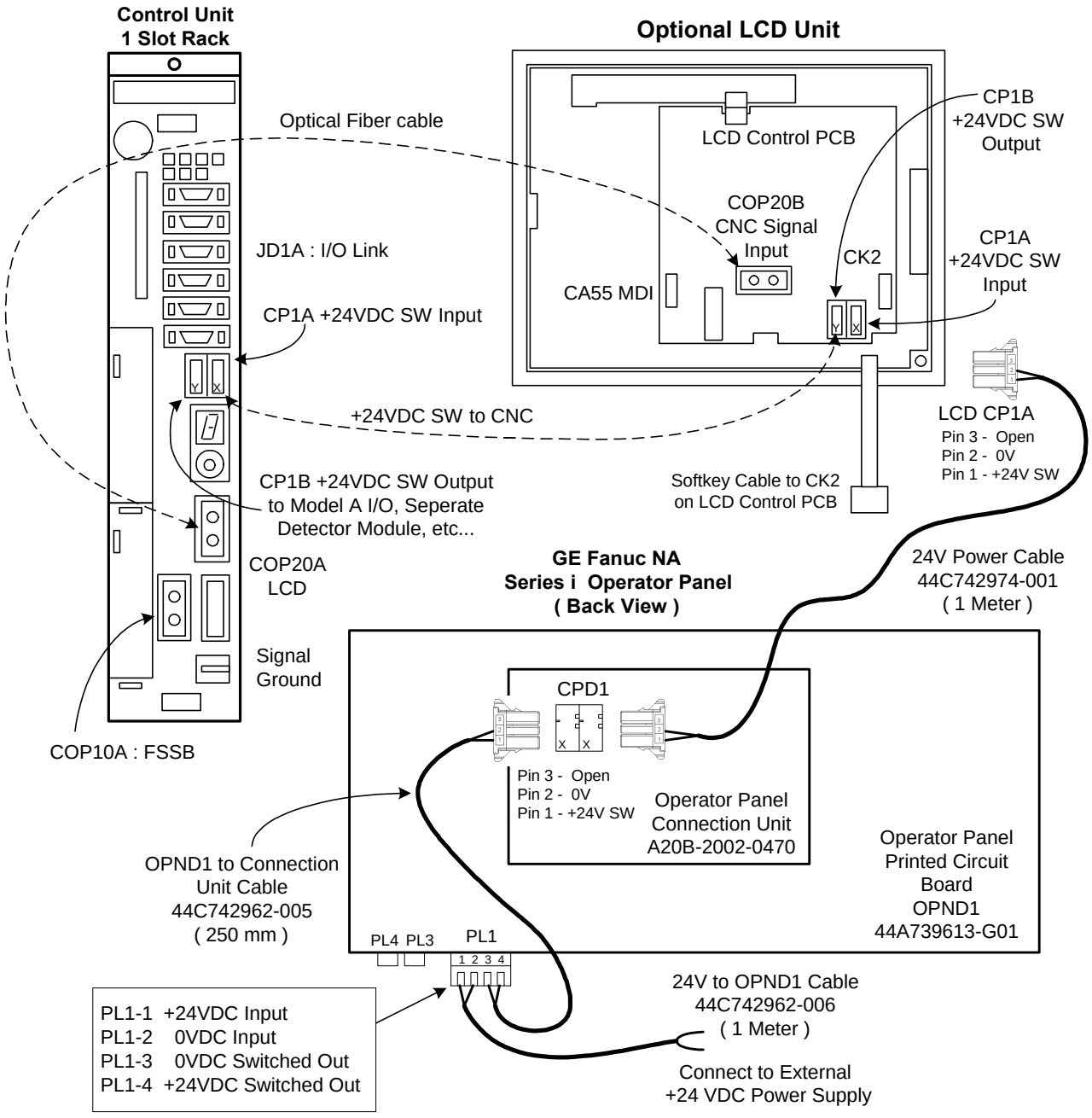


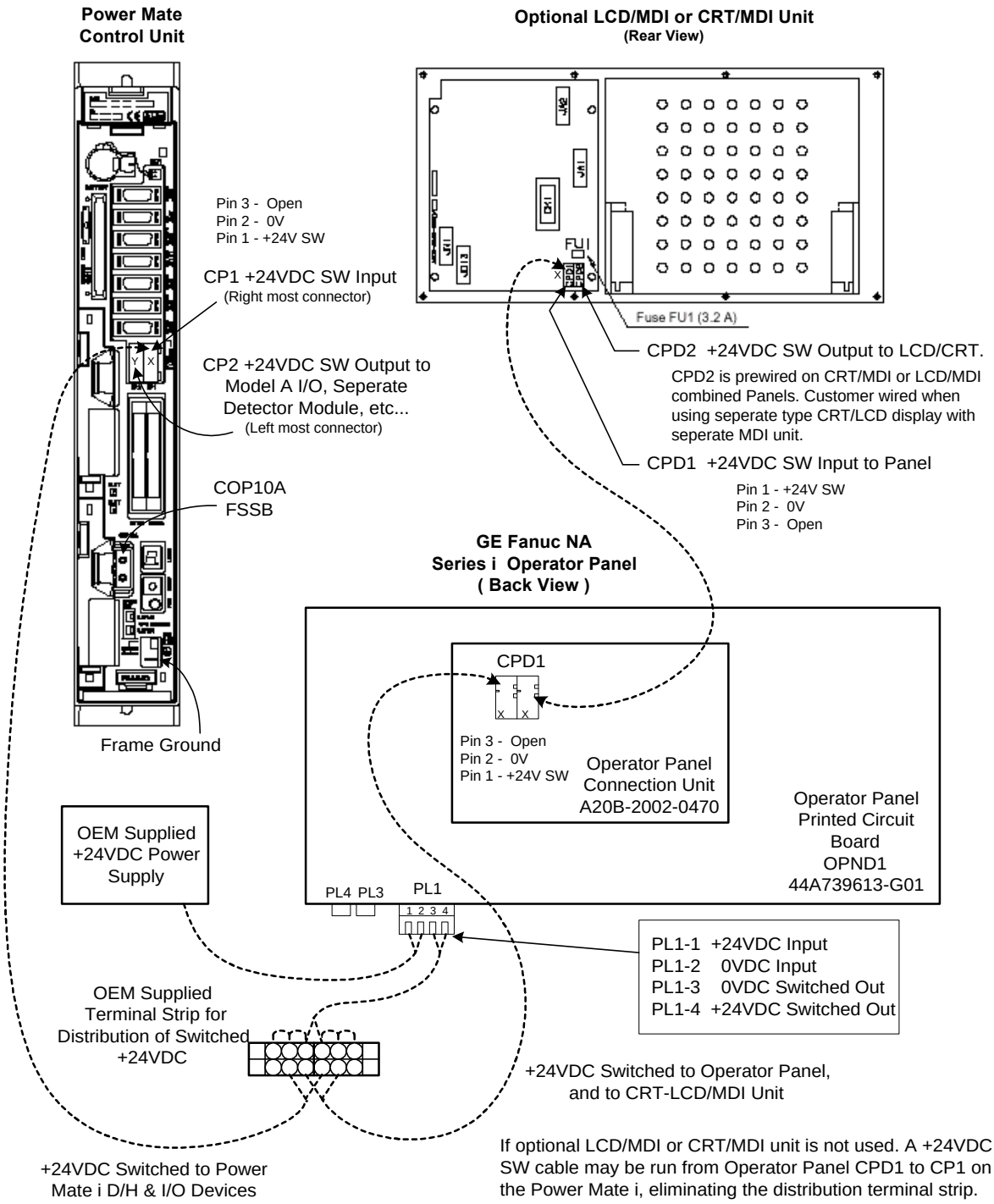
Figure 1-5. Series 16*i*/18*i*/21*i* LCD-Mount Type Control



Note

24VDC SW cable to be run from connector CP1B on the LCD Unit to connector CP1A on the Control Unit must be assembled and installed by the machine tool builder during the control installation. When used in an Open System configuration, the LCD Unit may not be present. In this case, the machine tool builder must assemble and install a switched +24VDC cable from CPD1 on the Operator Panel Connection Unit directly to CP1A on the Stand-Alone Type Control Unit.

Figure 1-6. Series 16*i*/18*i*/21*i* Stand-Alone Type Control



Note

Example of Power Mate *i*-D or *i*-H motion controller +24VDC power interconnections. When used with the PC based DPL/MDI Operation Package, Portable LCD/MDI Unit, or in Open System configuration. The optional LCD/MDI Unit or CRT/MDI Unit may not be present. Required +24VDC connectors to allow assembly of the above cables; by the machine tool builder, are included with Power Mate related hardware. *i*-Series Cable Kit may be ordered separately by the machine tool builder if cable lengths are determined to suit the application.

Figure 1-7. Power Mate *i* Models D and H Stand-Alone Type Control

+24VDC Power Connections for Series 15*i* Control

Note

This information applies only to the Series 15*i* CNC. It does not apply to the Series 16*i*/18*i* and 21*i* CNCs or Power Mate *i* Motion Controllers. For information on the Series 16*i*/18*i* and 21*i* CNCs or Power Mate *i* Motion Controllers, please refer to Pages 1-11 through 1-15.

The Series 15*i* CNC uses its own power supply which operates from 200 volts ac. The power supply is similar in style to previous generations of Series 15 controls. The power supply mounts in the CNC logic rack and provides power to the Series 15*i* circuit boards mounted in the rack. The power supply also provides a switched +24VDC that can be used to power the LCD unit, Operator Panel, and other GE Fanuc devices requiring a switched +24VDC. The power supply contains connections to be wired directly to the Control ON and OFF pushbuttons mounted on the Operator Panel.

The North American Operator Panel includes circuitry to provide a switched +24VDC to be used with the Series 16*i*/18*i* and 21*i* CNCs. This circuitry does not apply when the Operator Panel is used with the Series 15*i* control. Instead, the Operator Panel mounted Control ON and OFF pushbuttons will be wired directly to the Series 15*i* power supply. The +24VDC required by the Operator Panel may be sourced from the Series 15*i* power supply.

When used with the Series 15*i* control, the Operator Panel may be ordered with Cable Kit 44A739097-G01. This kit contains the following items:

Table 1-7. Cable Kit 44A739097-G01

Item	Description
44C742962-010	+24VDC Cable PL1 to Connection Unit CPD1.
44C742974-001	+24VDC Cable CPD1 to LCD Unit CP1B.
A02B-0120-K323	Connectors for +24VDC. Power Supply CP5 and LCD Unit CP1A (Qty 2).
A02B-0120-K322	Connectors for Power Supply CP4 (Qty 1).
44A293713-101	Terminals for ON and OFF pushbuttons (Qty 4).

Note

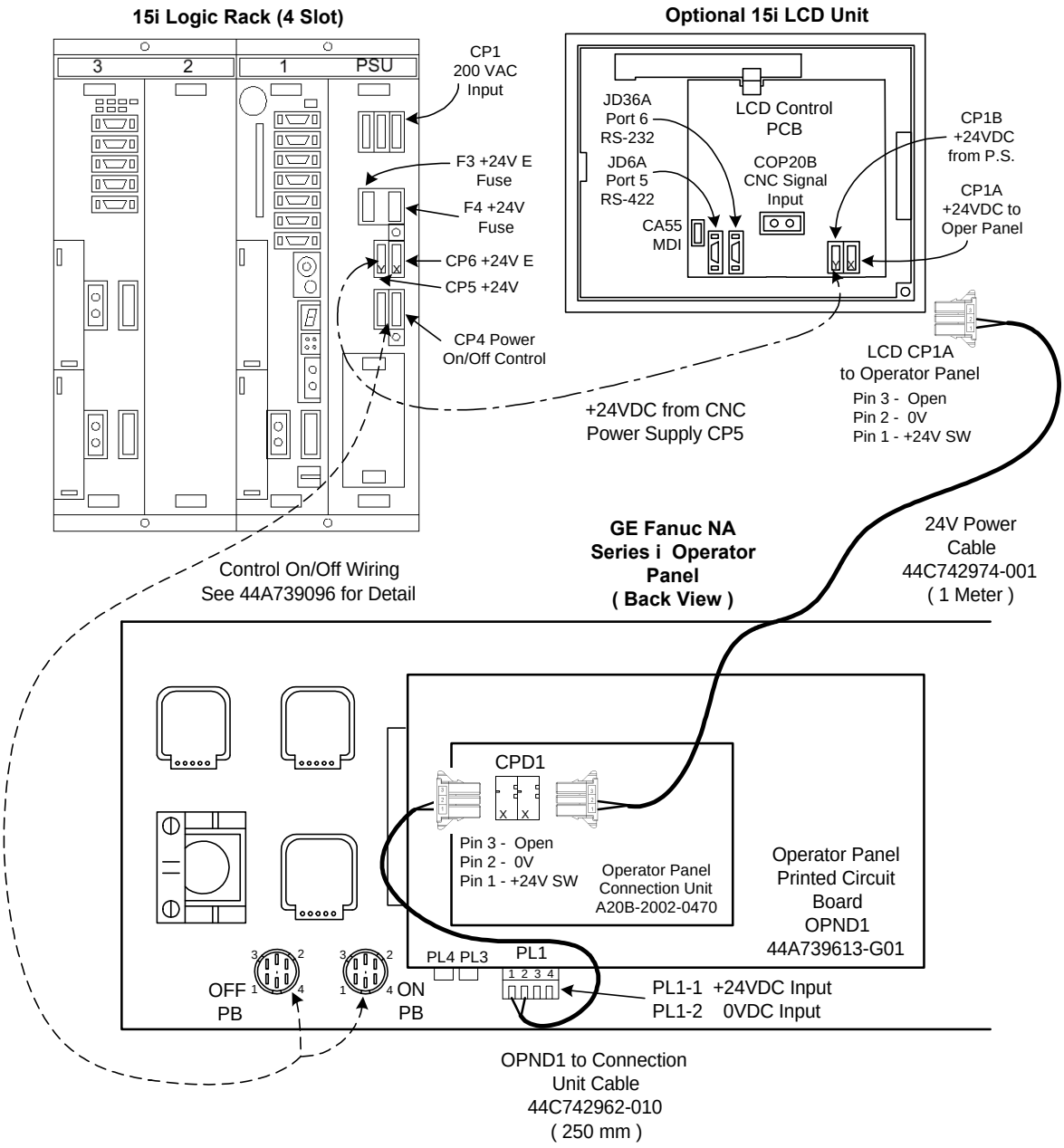
Materials in the Cable Kit are sized for typical installations. Other cabling configurations are possible to accommodate specific machine requirements and would be provided by the machine tool builder.

Figure 1-8 illustrates the recommended cabling using this Cable Kit for +24VDC power and wiring diagrams for Control ON and OFF pushbuttons.

The installation of the Series 15*i* control requires a +24VDC cable from the Series 15*i* power supply to the LCD unit and a Control ON/OFF pushbutton cable to the control's power supply. As these cable lengths are determined by the machine design, they cannot be included in a standard cable kit. Required connectors are provided to allow the machine tool builder to construct cables to the required length.

Notes :

1. Refer to the appropriate documentation for the +24VDC fusing requirements for your control.
2. Check all wiring and polarities before applying initial power.
3. External devices and machine I/O requiring +24VDC power may require the use of an external +24VDC power supply.
4. +24E on Power Supply Connector CP6 may be used for external devices. Do not exceed the 2 Amp rating. (Please refer to the following notes regarding the use of 24E from CP6.)
5. When using CP5 as +24VDC source for the Series 15*i* LCD Unit and North American Operator Panel, as illustrated, current draw of the two devices during normal operation will total approximately 1.5 Amps. Assignment of spare outputs from the Operator Panel to OEM devices, or use of the Operator Panel in special applications requiring the simultaneous illumination of most available pushbuttons, will increase current draw. Current draw from CP5 up to 2 Amps is permitted. However, when driving loads larger than 1 Amp from CP5, the load capacity of CP6 should be de-rated so that the combined 24VDC load supported by CP5 and CP6 does not exceed 3 Amps in total.
6. In certain applications, an alternative method would be to supply 24VDC to the LCD Unit exclusively from connector CP5. CP6 (24E) could then be used for the Operator Panel and external Operator Panel devices, not to exceed 2 Amps.
7. Many applications will generally require an external +24VDC power supply to be used for Machine I/O. It may often be more convenient to supply 24VDC to the Operator Panel and associated Operator Panel devices from the external 24VDC supply.



Note

Series 15*i* Power Cable Kit for the 44A739097-G01 Operator Panel includes the cables identified above with GE Fanuc part numbers. The kit also includes connector and terminal hardware for making cables to the ON / OFF pushbuttons and a +24VDC cable from the Power Supply to the LCD. Additional GE Fanuc devices requiring switched +24VDC, such as Model A I/O or a Separate Detector Module, may be run from CP6 +24E VDC. (See Notes 5, 6, and 7 regarding current ratings on previous page.) When used in an Open System configuration, the LCD Unit may not be present. In this case, the machine tool builder must assemble and install a switched +24VDC cable from CP5 on the Series 15*i* PSU directly to CPD1 on the Operator Panel Connection Unit.

Figure 1-8. Connection Diagram for the Series 15*i* CNC

Series 15*i* Power Supply Connection Installation

The North American Operator Panel includes circuitry for switching 24VDC power for a CNC using the Control ON and OFF pushbuttons on that panel. By following the steps listed below, you can modify the Operator Panel for use with the Series 15*i* CNC, which uses 200VAC power and includes its own switching logic.

1. Remove the cable from the OFF pushbutton to Connector PL4 on the back of the Operator Panel. Also, remove the cable from the ON pushbutton to Connector PL3. You can dispose of these cables. They are not used with the Series 15*i* control.
2. Using the stab-on terminals provided, construct an ON/OFF cable of the proper length from Connector CP4 on the Series 15*i* CNC to the ON and OFF pushbuttons on the Operator Panel. For more detailed wiring information, refer to Figure 1-9 below and the Hardware Connection Manual for the Series 15*i* CNC.
3. Remove any power cable from PL1, Pins 3 and 4, to CPD1 on the Operator Panel Connection Unit. Install the power cable provided, 44C742962-010, from CPD1 to PL1, Pins 1 and 2.

Note

If your system includes an LCD, install Cable 44C742962-010 from CPD1 on the Operator Panel Connection to CP1 on the LCD.

4. Construct a power cable of the proper length from CP5 on the Series 15*i* to CP1 on the LCD or to CPD1 on the Operator Panel Connection Unit, if an LCD is not being used.

The recommended cabling for the 24VDC power and for the ON/OFF circuitry is illustrated in Figure 1-9 on the following page. However, other configurations are possible. For help with other configurations, please contact your local GE Fanuc sales or applications engineer.

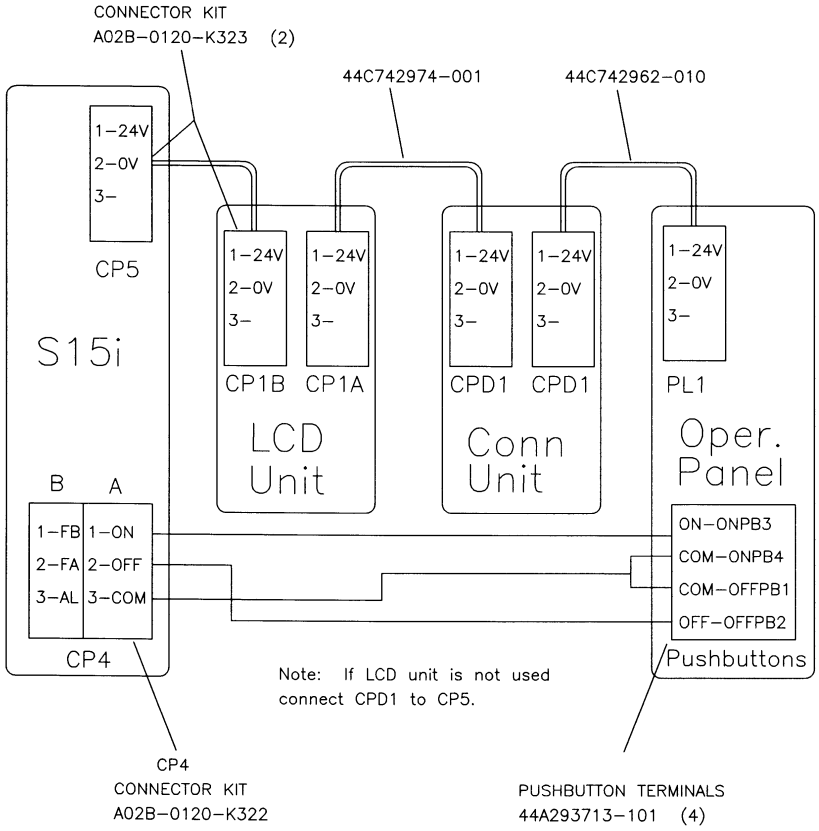


Figure 1-9. Power Supply Connection Installation for Series 15*i* Control

Sample Operator Panel Ladder Logic

To integrate the North American Operator Panel with the *i* Series CNC, Programmable Machine Control (PMC) ladder logic must be developed. GE Fanuc Automation can provide examples of the ladder logic to the machine tool builder or system integrator to assist in this development effort.

Examples are available to illustrate common ladder interface methodology and help reduce the overall design effort. GE Fanuc Automation makes no representation that these examples will provide full functionality for every application. It is the machine tool builder's responsibility to properly develop and test the machine tool's ladder interface for the desired application.

For more information, please contact your local GE Fanuc Automation sales or application engineer.

Renewal Parts

The North American Operator Panels (see page 1-1 for list of covered products) contain the following renewable parts. The part numbers are listed in Table 1-8 for Renewal Parts ordering convenience only. You do **not** need to order these parts separately when ordering a new Operator Panel.

Table 1-8. Renewal Parts

Part Number	Quantity per	Description
44A717186-042	Varies	28V 40ma T-1 3/4 Lamp.
44A717186-014	Varies	Pushbutton Switch (Lens Cap not included).
44A717186-016	2	ON / OFF Snap Action Pushbutton Switch (Lens Cap not included).
44A717186-005	2	Lens Cap and Holder (Red).
44A717186-006	2	Lens Cap and Holder (Yellow).
44A717186-007	2	Lens Cap and Holder (Green).
44A717186-008	Varies	Lens Cap and Holder (Clear).
44A717186-028	1	Keylock Switch.
44A717186-027	1	Replacement keys only for Keylock switch (two keys included)
44A724658-002	1	Rotary Switch (Feedrate Override).
44A724658-004	2	Rotary Switch (Spindle Speed / Traverse Override).
44B235867-106	3	Knob (Rotary Switch).
44C715943-003	1	Overlay for Rotary Switch Silkscreen (for all 3 switches).
44C715943-004	1	Overlay for Rotary Switch Silkscreen (for Spindle Speed and Feedrate Override switches only).
44A739613-G01	1	OPND1 Printed Circuit Board.
44C742960-001	1	180mm Ribbon Cable (PL53 I/O).
44C742961-001	1	180mm Ribbon Cable (PL54 I/O).
44C742962-001	1	Cable (Rotary Switch).
44C742962-003	1	Cable (PL3 ON Pushbutton).
44C742962-004	1	Cable (PL4 OFF Pushbutton).

(continued)

Table 1-8. Renewal Parts (continued)

Part Number	Quantity per	Description
44A736871-G01	1	LED Conversion Kit (45-pushbutton panel).
44A736871-G02	1	LED Conversion Kit (53-pushbutton panel).
44A739089-G01	1	Lamp Extractor Kit.
44A724659-003	1	E-STOP Pushbutton.
44A724659-006	1	Extra Normally Open Contact for E-STOP.
44A724659-007	3	Extra Normally Closed Contact for E-STOP.
44C742962-G01	1	Operator Panel Power Cable Set for the Series 16*i*/18*i*/21*i* CNCs and Power Mate *i* Motion Controller.
44A739097-G01	1	Operator Panel Power Cable Set for the Series 15*i* CNC.
44A739032-G01	1	Operator Panel Connection Unit Extended Length Ribbon Cable Set. Suitable for mounting the Connection Unit up to one meter from the Operator Panel.
44A717186-051	Varies	LED Red 24V 6CHIP T1 3/4
44A717186-052	Varies	LED Green 24V 6CHIP T1 3/4
44A717186-053	Varies	LED Yellow 24V 6CHIP T1 3/4

In addition, the North American Operator Panels with MPG (44A739026-G03 & 44A739026-G13) add the unique items listed in Table 1-9 below.

Table 1-9. Renewal Parts Unique to North American Operator Panels with MPG 44A739026-G03 or 44A739026-G13

Part Number	Quantity per	Description
A860-0202-T001	1	Manual Pulse Generator (MPG) Device.
44C741873-007	1	MPG Cable (0.5m).
44C742962-008	1	Pushbutton Cable Harness for PL2.

Instructions for Using Incandescent Lamps or LEDs

All North American Operator Panels may be operated with either incandescent lamps or with LEDs. Table 1-8 lists LED conversion kits for Operator Panels that have incandescent lamps.

Note:

- Jumper JP1 must be in the standard position if lamps are installed, and in the alternate position if LEDs are installed. (See "JP1 Setting", below.)
- Do not mix lamps and LEDs.
- Each LED should be mounted behind a lens cap of the same color, otherwise the emitted light may not pass through.

JP1 Setting

All North American Operators Panels have a jumper (JP1) that must be set up differently depending on whether incandescent lamps are used, or LEDs are used. On the Series i compatible units, JP1 is located on circuit board OPND1, behind and below the Cycle Start Pushbutton.

- For use with incandescent lamps, place the jumper JP1inside the silk-screened rectangle marking. This will result in the jumper being located across the two pins furthest from the nearby corner of the circuit board OPND1. When the jumper is set this way, the lamp filaments are pre-heated when off, and will result in longer lamp life.
- For use with LEDs, place the jumper JP1 in its alternate setting (i.e. not inside the rectangle). This will result in the jumper being located across the two pins closest to the nearby corner of the circuit board OPND1.

Verifying Correct Setting of JP1

There are simple tests that can be performed to verify that the jumper JP1 is set correctly.

- If incandescent lamps are installed, remove the lens cap of a couple of the unlit pushbuttons. A dim glow will be visible in the filament of each unlit lamp when the jumper JP1 is correctly positioned. If the ambient light is low, this effect is visible even with the lens caps in place, so this effect can also be used to check for blown lamps. If none of the "off" lamps is glowing dimly, it is likely that JP1 is in the wrong position.
- If LEDs are installed, they will glow dimly if the jumper JP1 is positioned incorrectly. And, as additional pushbuttons are activated, the LEDs that are supposed to be off will glow a little more brightly each time. No damage will result to the LEDs, but the operator could become confused. So, if LEDs that are supposed to be off are in fact glowing, the setting of jumper JP1 should be changed. It is possible to remove a few lens caps to get a better view of the LEDs underneath while conducting this test.

WARNING!

The +24VDC power supplied to the Operator Panel is typically NOT removed from the operator panel by CNC's Control Off logic. Please refer to the electrical schematics provided by the Machine Tool Builder for specifics.

CAUTION

When removing the incandescent lamps, take care use the extractor tool 44A739089-G01. If the specified extractor tool is not available, use only a non-metallic/non-conductive device to remove the incandescent lamps. Damage to circuitry may result when attempting to remove lamps with conductive tooling such as needle-nose pliers while +24VDC is applied to the operator panel. Even if no circuit damage results, shorting out the lamp circuit will lead to an I/O error which will disrupt operation of the machine tool.

C	44C742964	1	1

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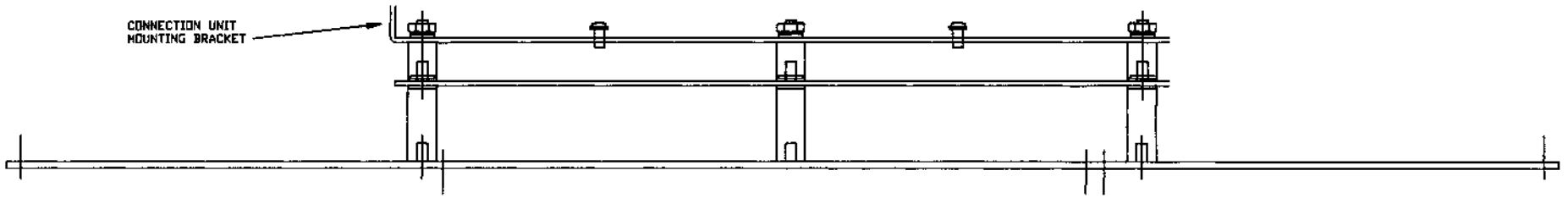

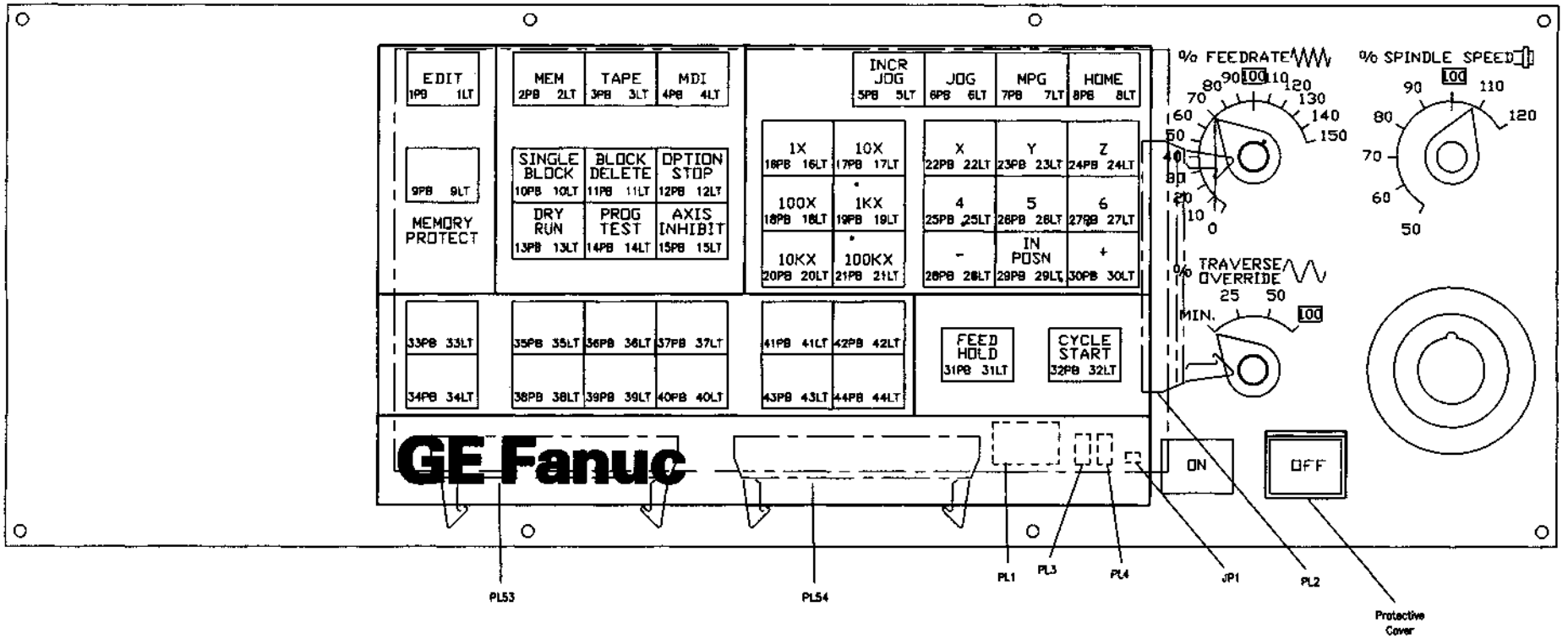

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JK THOMPSON	07/26/99	CNC\OP-PNL\C742964A	44C742964
		1.00	1 OF 1A

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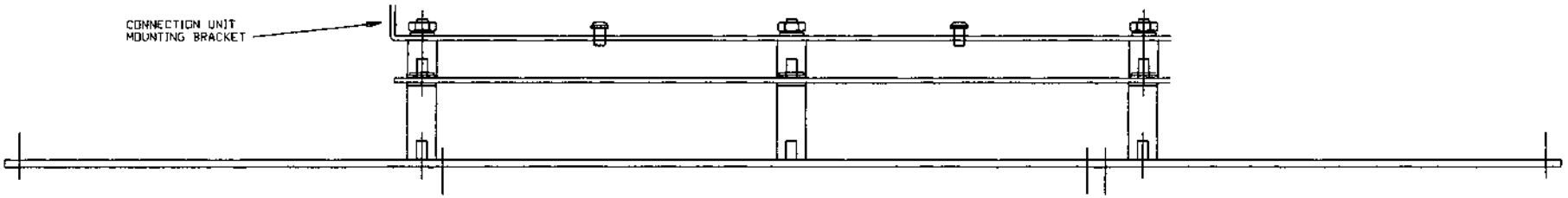

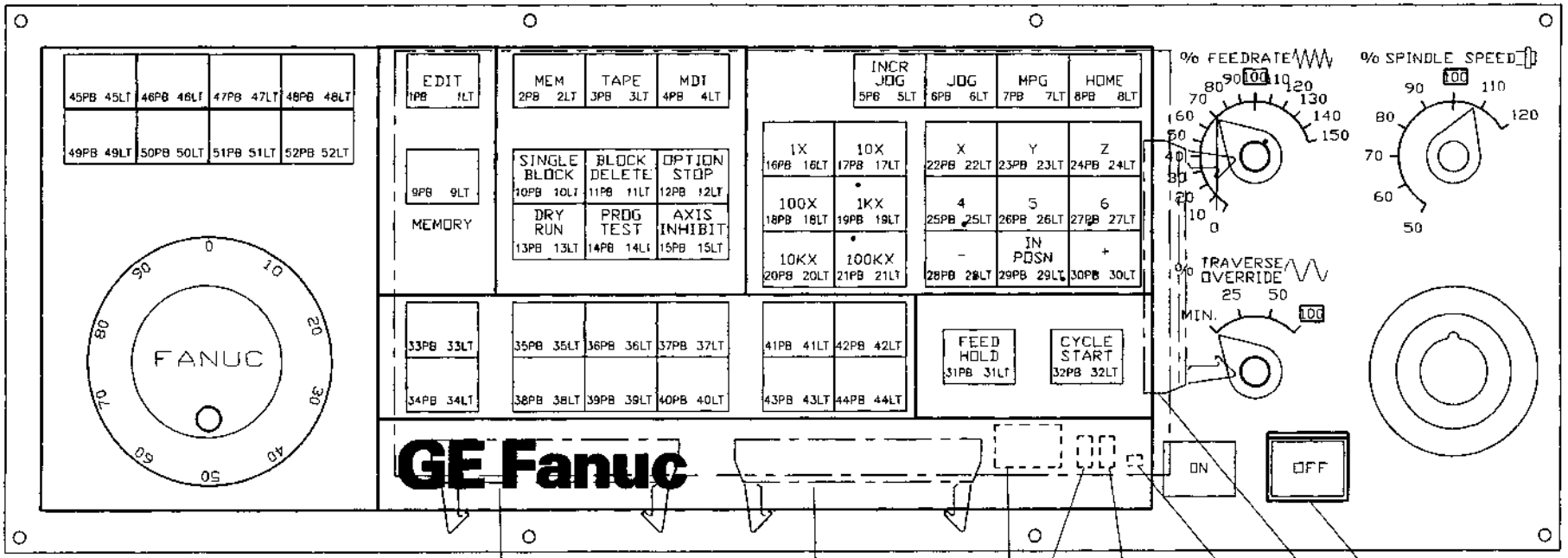

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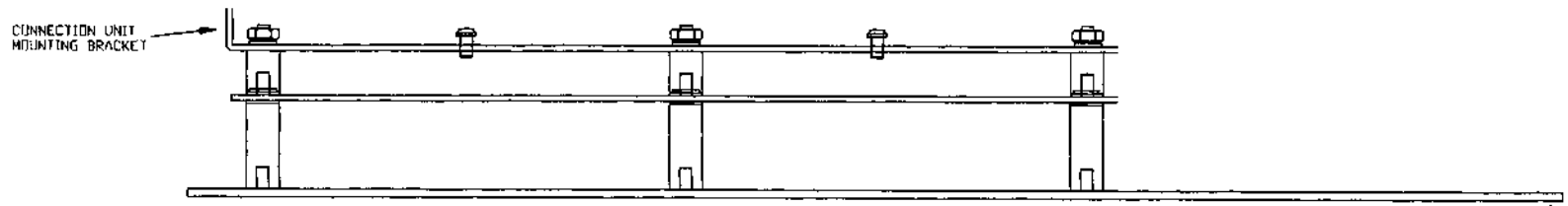

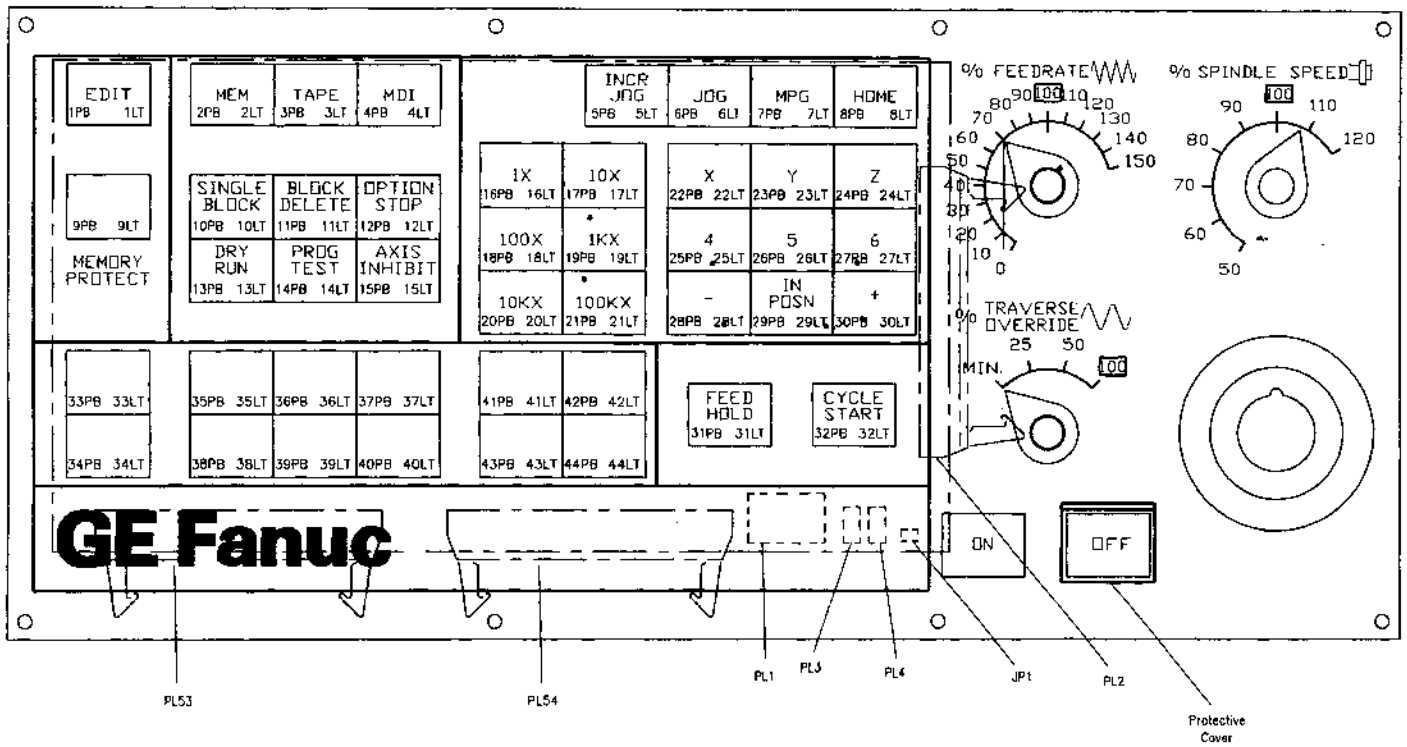

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		CAD INFORMATION: CNC\OP-PNL\ C742964A2	SIZE C SCALE 1.00 DWG NO. 44C742964 SHEET NO. 18 CONT. ON 2

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					2	ADD RESISTOR NOTE	04/22/99 jkt
					3	Change E-STOP Note.	07/26/99 jkt

BLOCK DIAGRAM

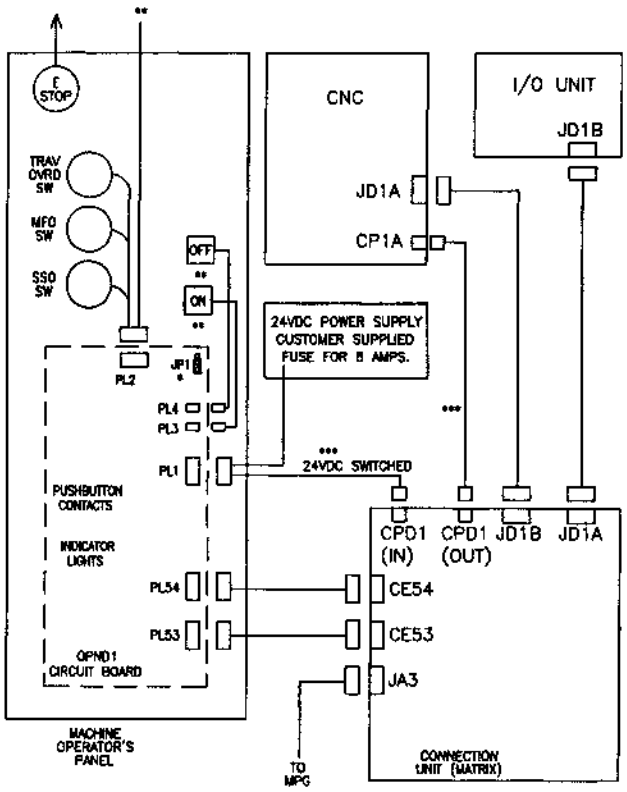
E STOP PUSHBUTTONS

ON PANELS BUILT BEFORE APRIL 1999 INSTALL CONTACT BLOCK PROVIDED IN LEFT POSITION OF E-STOP SWITCH. AN ADDITIONAL CONTACT BLOCK MAY BE ADDED IN THE RIGHT POSITION.

DO NOT INSTALL ANY BLOCK IN THE CENTER POSITION

ON PANELS BUILT AFTER APRIL 1999 ONE CONTACT BLOCK IS PROVIDED. UP TO 3 ADDITIONAL BLOCKS MAY BE ADDED. ONE NEXT TO THE PROVIDED BLOCK THEN ONE BEHIND EACH OF THE FIRST TWO BLOCKS.

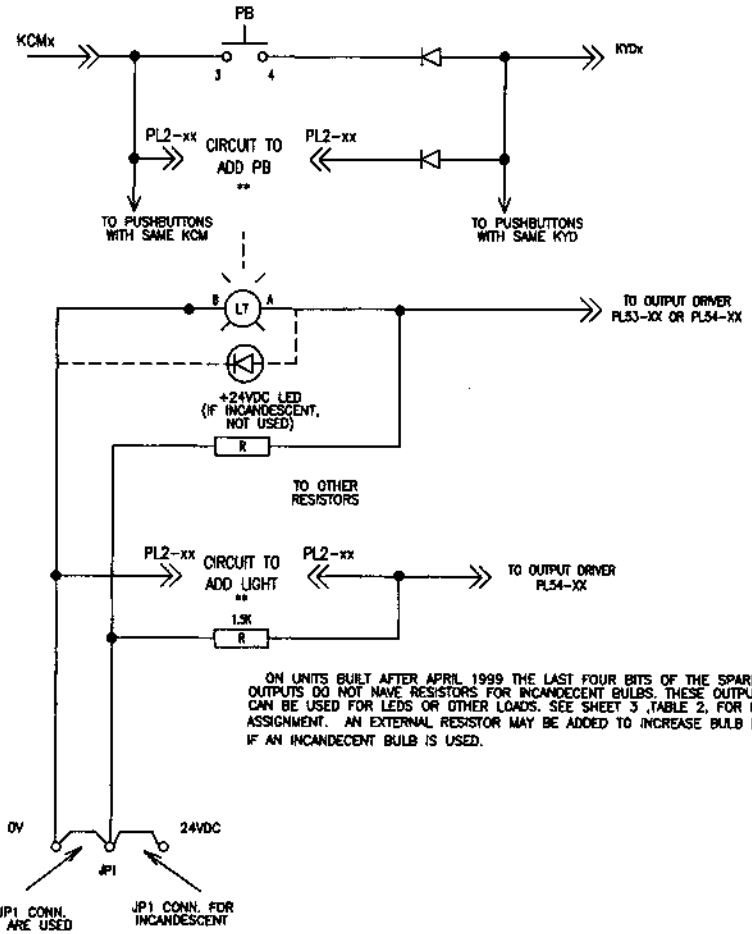
E STOP CONNECTIONS ARE DEPENDANT ON SYSTEM CONFIGURATION. REFER TO CONNECTION MANUAL.



** I/O NOT USED BY PANEL IS AVAILABLE AT UNUSED PINS OF PL2. SEE SHEET 3 FOR WIRING DETAILS.

*** 24VDC FROM CUSTOMER SUPPLY IS SWITCHED FOR CNC WHEN THE ON PUSHBUTTON IS ACTIVATED. SWITCHING CONTACT IS RATED AT 8 AMPS. SEE SHEET 5 FOR CIRCUIT DETAILS.

TYPICAL PUSHBUTTON CONNECTION.



ON UNITS BUILT AFTER APRIL 1999 THE LAST FOUR BITS OF THE SPARE OUTPUTS DO NOT HAVE RESISTORS FOR INCANDESCENT BULBS. THESE OUTPUTS CAN BE USED FOR LEDS OR OTHER LOADS. SEE SHEET 3 ,TABLE 2, FOR BIT. ASSIGNMENT. AN EXTERNAL RESISTOR MAY BE ADDED TO INCREASE BULB LIFE IF AN INCANDECENT BULB IS USED.

* JUMPER CENTER PIN OF JP1 TO PIN FARTHER FROM CORNER OF BOARD FOR INCANDESCENT LIGHTS. JUMPER CENTER PIN TO PIN CLOSEST TO CORNER OF CIRCUIT BOARD FOR LEDS.

DRAWN BY: JK THOMPSON	DATE: 09/26/97	GE FANUC Automation North America, Inc. Charlottesville, Va. U.S.A.	TITLE: ELEMENTRY DIAGRAM CNC OPERATOR PANELS
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						2	ADD RESISTOR NOTE	04/22/99 jkt

WIRING DETAILS FOR PUSHBUTTONS

TABLE 1

DEVICE	FUNCTION	CONTACTS: CONTACT ADDRESS	CONTACTS: CE/PL CONNECTIONS	CONTACTS: MATRIX REFERENCE	LAMPS: LAMP ADDRESS	LAMPS: CE/PL CONNECTIONS
SW1	EDIT	Xn+4.0	53-A23/53-A19	KCM1/KYD0	Yn+0.0	53-A07
SW2	MEMORY	Xn+4.1	53-A23/53-B19	KCM1/KYD1	Yn+0.1	53-B07
SW3	TAPE	Xn+4.2	53-A23/53-A20	KCM1/KYD2	Yn+0.2	53-A08
SW4	MDI	Xn+4.3	53-A23/53-B20	KCM1/KYD3	Yn+0.3	53-B08
SW5	INCR JOG	Xn+4.4	53-A23/53-A21	KCM1/KYD4	Yn+0.4	53-A09
SW6	JOG	Xn+4.5	53-A23/53-B21	KCM1/KYD5	Yn+0.5	53-B09
SW7	HPG	Xn+4.6	53-A23/53-A22	KCM1/KYD6	Yn+0.6	53-A10
SW8	HOME	Xn+4.7	53-A23/53-B22	KCM1/KYD7	Yn+0.7	53-B10
SW16	1X	Xn+5.0	53-B23/53-A19	KCM2/KYD0	Yn+1.0	53-A11
SW17	10X	Xn+5.1	53-B23/53-B19	KCM2/KYD1	Yn+1.1	53-B11
SW18	100X	Xn+5.2	53-B23/53-A20	KCM2/KYD2	Yn+1.2	53-A12
SW19	1KX	Xn+5.3	53-B23/53-B20	KCM2/KYD3	Yn+1.3	53-B12
SW20	10KX	Xn+5.4	53-B23/53-A21	KCM2/KYD4	Yn+1.4	53-A13
SW21	100KX	Xn+5.5	53-B23/53-B21	KCM2/KYD5	Yn+1.5	53-B13
SW31	FDHOLD	Xn+5.6	53-B23/53-A22	KCM2/KYD6	Yn+1.6	53-A14
SW32	CYCSTRT	Xn+5.7	53-B23/53-B22	KCM2/KYD7	Yn+1.7	53-B14
SW22	X	Xn+6.0	53-A24/53-A19	KCM3/KYD0	Yn+2.0	53-A15
SW23	Y	Xn+6.1	53-A24/53-B19	KCM3KY/D1	Yn+2.1	53-B15
SW24	Z	Xn+6.2	53-A24/53-A20	KCM3/KYD2	Yn+2.2	53-A16
SW25	4	Xn+6.3	53-A24/53-B20	KCM3/KYD3	Yn+2.3	53-B16
SW26	5	Xn+6.4	53-A24/53-A21	KCM3/KYD4	Yn+2.4	53-A17
SW27	6	Xn+6.5	53-A24/53-B21	KCM3/KYD5	Yn+2.5	53-B17
SW28	-	Xn+6.6	53-A24/53-A22	KCM3/KYD6	Yn+2.6	53-A18
SW30	+	Xn+6.7	53-A24/53-B22	KCM3/KYD7	Yn+2.7	53-B18
SW9	MEMPROT	Xn+7.0	53-B24/53-A19	KCM4/KYD0	Yn+3.0	54-A07
SW10	SINGLE	Xn+7.1	53-B24/53-B19	KCM4/KYD1	Yn+3.1	54-B07
SW11	BLK DEL	Xn+7.2	53-B24/53-A20	KCM4/KYD2	Yn+3.2	54-A08
SW12	OPT STOP	Xn+7.3	53-B24/53-B20	KCM4/KYD3	Yn+3.3	54-B08
SW13	DRY RUN	Xn+7.4	53-B24/53-A21	KCM4/KYD4	Yn+3.4	54-A09
SW14	PROG TEST	Xn+7.5	53-B24/53-B21	KCM4/KYD5	Yn+3.5	54-B09
SW15	AXIS INH	Xn+7.6	53-B24/53-A22	KCM4/KYD6	Yn+3.6	54-A10
SW29	IN POSN	Xn+7.7	53-B24/53-B22	KCM4/KYD7	Yn+3.7	54-B10
SW33	SPARE 01	Xn+8.0	54-A23/53-A19	KCM5/KYD0	Yn+4.0	54-A11
SW34	SPARE 02	Xn+8.1	54-A23/53-B19	KCM5/KYD1	Yn+4.1	54-B11
SW35	SPARE 03	Xn+8.2	54-A23/53-A20	KCM5/KYD2	Yn+4.2	54-A12
SW36	SPARE 04	Xn+8.3	54-A23/53-B20	KCM5/KYD3	Yn+4.3	54-B12
SW37	SPARE 05	Xn+9.0	54-B23/53-A19	KCM6/KYD0	Yn+4.4	54-A13
SW38	SPARE 06	Xn+9.1	54-B23/53-B19	KCM6/KYD1	Yn+4.5	54-B13
SW39	SPARE 07	Xn+9.2	54-B23/53-A20	KCM6/KYD2	Yn+4.6	54-A14
SW40	SPARE 08	Xn+9.3	54-B23/53-B20	KCM6/KYD3	Yn+4.7	54-B14
SW41	SPARE 09	Xn+10.0	54-A24/53-A19	KCM7/KYD0	Yn+5.0	54-A15
SW42	SPARE 10	Xn+10.1	54-A24/53-B19	KCM7/KYD1	Yn+5.1	54-B15
SW43	SPARE 11	Xn+10.2	54-A24/53-A20	KCM7/KYD2	Yn+5.2	54-A16
SW44	SPARE 12	Xn+10.3	54-A24/53-B20	KCM7KY/D3	Yn+5.3	54-B16

DETAILS TO ADD MATRIX DEVICES.
CONTACTS TO BE 5V, LAMPS TO BE 24V

TABLE 2

ADDITIONAL DEVICE	CONTACTS: CONTACT ADDRESS	CONTACTS: 2PL CONNECTIONS	CONTACTS: MATRIX REFERENCE	LAMPS: LAMP ADDRESS	LAMPS: 2PL CONNECTIONS: SIGNAL	LAMPS: 2PL CONNECTIONS: 0 VOLTS	
SW45	Xn+8.4	PL2-B01/B04	KCM5/KYD4	Yn+5.4	PL2-A01	PL2-A07	
SW46	Xn+8.5	PL2-B01/B05	KCM5/KYD5	Yn+5.5	PL2-A08	PL2-A07	
SW47	Xn+8.6	PL2-B01/B06	KCM5/KYD6	Yn+5.6	PL2-A09	PL2-A07	
SW48	Xn+8.7	PL2-B01/B07	KCM5/KYD7	Yn+5.7	PL2-A05	PL2-A07	
SW49	Xn+9.4	PL2-B02/B08	KCM6/KYD4	Yn+6.0	PL2-A02	PL2-A04	
SW50	Xn+9.5	PL2-B02/B09	KCM6/KYD5	Yn+6.1	PL2-A06	PL2-A04	
SW51	Xn+9.6	PL2-B02/B10	KCM6/KYD6	Yn+6.2	PL2-A10	PL2-A04	
SW52	Xn+9.7	PL2-B02/B11	KCM6/KYD7	Yn+6.3	PL2-A11	PL2-A04	
SW53	Xn+10.4	PL2-B03/B12	KCM7/KYD4	Yn+6.4	PL2-A12	PL2-A03	*
SW54	Xn+10.5	PL2-B03/B13	KCM7/KYD5	Yn+6.5	PL2-A13	PL2-A03	*
SW55	Xn+10.6	PL2-B03/B14	KCM7/KYD6	Yn+6.6	PL2-A14	PL2-A03	*
SW56	Xn+10.7	PL2-B03/B15	KCM7/KYD7	Yn+6.7	PL2-A15	PL2-A03	*

* SPARE OUTPUTS WITHOUT RESISTORS SEE SHEET 2 FOR DETAILS.

WIRING DETAILS FOR ROTARY SWITCHES AND AVAILABLE 24VDC INPUTS.

TABLE 3

DEVICE	FUNCTION	CONTACT ADDRESS	CE/PL CONNECTIONS	2PL CONNECTIONS: SIGNAL	2PL CONNECTIONS: 24 VOLTS
FDSW 1	FD OVR 1	Xn+0.0	CE/PL53-A03	PL2-A16	PL2-B24
FDSW 2	FD OVR 2	Xn+0.1	CE/PL53-B03	PL2-B16	PL2-B24
FDSW 4	FD OVR 4	Xn+0.2	CE/PL53-A04	PL2-A17	PL2-B24
FDSW 8	FD OVR 8	Xn+0.3	CE/PL53-B04	PL2-B17	PL2-B24
FDSW I	FD OV INH	Xn+0.4	CE/PL53-A05	PL2-A18	PL2-B24
TRSW 1	TRAV OV 1	Xn+0.5	CE/PL53-B05	PL2-B18	PL2-A25
TRSW 2	TRAV OV 2	Xn+0.6	CE/PL53-A06	PL2-A19	PL2-A25
TRSW I	TRAV O INH	Xn+0.7	CE/PL53-B06	PL2-B19	PL2-A25
SPSW 1	SPDL OV 1	Xn+1.0	CE/PL54-A03	PL2-A20	PL2-B25
SPSW 2	SPDL OV 2	Xn+1.1	CE/PL54-B03	PL2-B20	PL2-B25
SPSW 4	SPDL OV 4	Xn+1.2	CE/PL54-A04	PL2-A21	PL2-B25
SPSW I	SPDL O INH	Xn+1.3	CE/PL54-B04	PL2-B21	PL2-B25
AVAILABLE INPUTS	FUNCTION	CONTACT ADDRESS	CE/PL CONNECTIONS	2PL CONNECTIONS: SIGNAL	2PL CONNECTIONS: 24 VOLTS
SPARE IN 1	ADDL. IN 1	Xn+1.4	CE/PL54-A05	PL2-A22	PL2-A24
SPARE IN 2	ADDL. IN 2	Xn+1.5	CE/PL54-B05	PL2-B22	PL2-A24
SPARE IN 3	ADDL. IN 3	Xn+1.6	CE/PL54-A06	PL2-A23	PL2-A24
SPARE IN 4	ADDL. IN 4	Xn+1.7	CE/PL54-B06	PL2-B23	PL2-A24

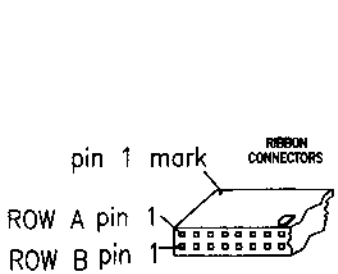
DRAWN BY: JB SPELLER	DATE: 09/23/97	GE FANUC Automation North America, Inc. Charlottesville, Va. U.S.A.	TITLE: CONNECTION DIAGRAM GEF OPERATORS PANEL SERIES I
APPROVED BY: JK THOMPSON	DATE: 04/22/99	[.CNC.OP-PNL] C742964C	SIZE: C / DWG NO: 44C742964
			SCALE: 1.00 / SHEET NO. 3 / CONT. ON 4

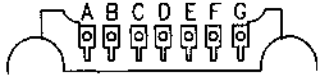
620B

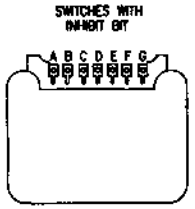
C	44C742964	4	1

ENGINE NUMBER VERSION STATUS					

DRAWING REVISIONS		
REV	DESCRIPTION	APPROVED
0	ORIGINAL ISSUE	09/26/97 jkt
1	ENLARGE DWG	02/04/98 jkt

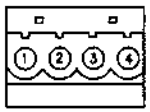




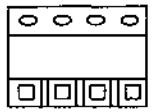


PL1

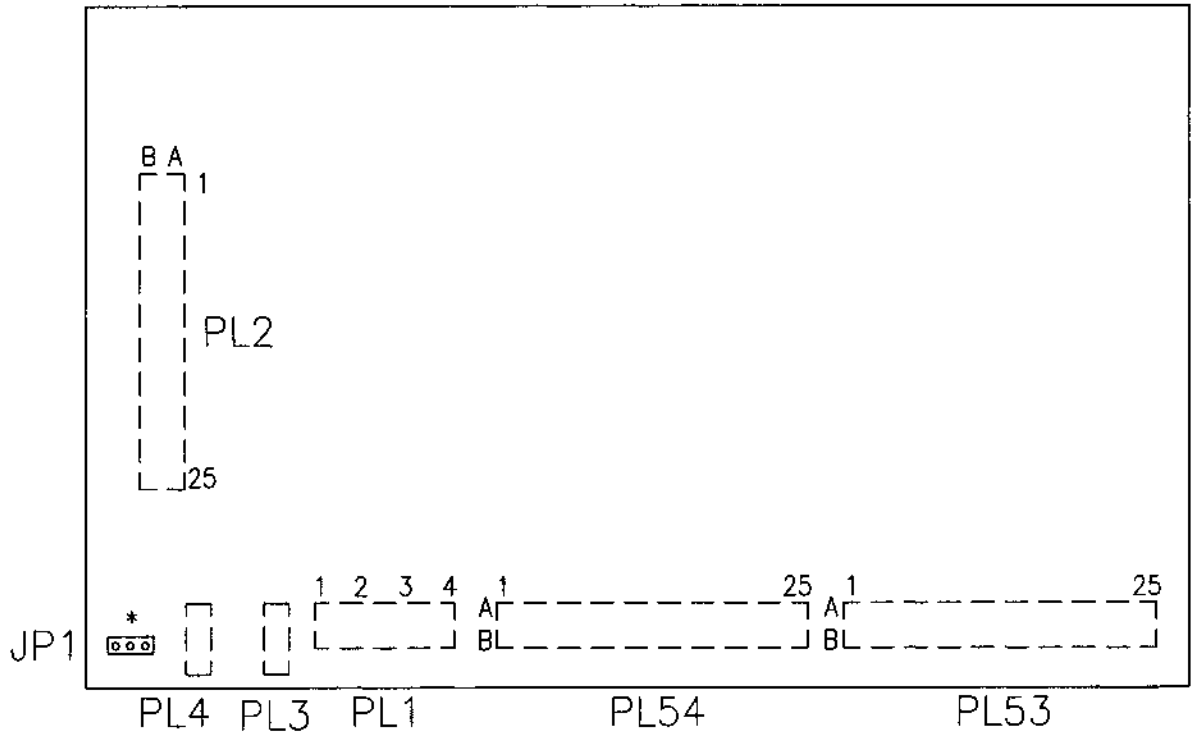
PIN VIEW



WIRING VIEW



BACK VIEW (OPND1)



* JUMPER CENTER PIN OF JP1 TO PIN FARTHER FROM CORNER OF BOARD FOR INCANDESCENT LIGHTS. JUMPER CENTER PIN TO PIN CLOSEST TO CORNER OF CIRCUIT BOARD FOR LEDS.

DRAWN BY: JB SPELLER	DATE: 09/23/97		GE FANUC Automation North America, Inc. Charlottesville, Va. U.S.A.	TITLE: CONNECTION DIAGRAM GEF OPERATORS PANEL SERIES I
APPROVED BY: JK THOMPSON	DATE: 02/04/97			
	THIRD ANGLE PROJECTION		[.CNC.OP-PNL] C742964D	1.00
				44C742964 SHEET NO. 4 OF 5

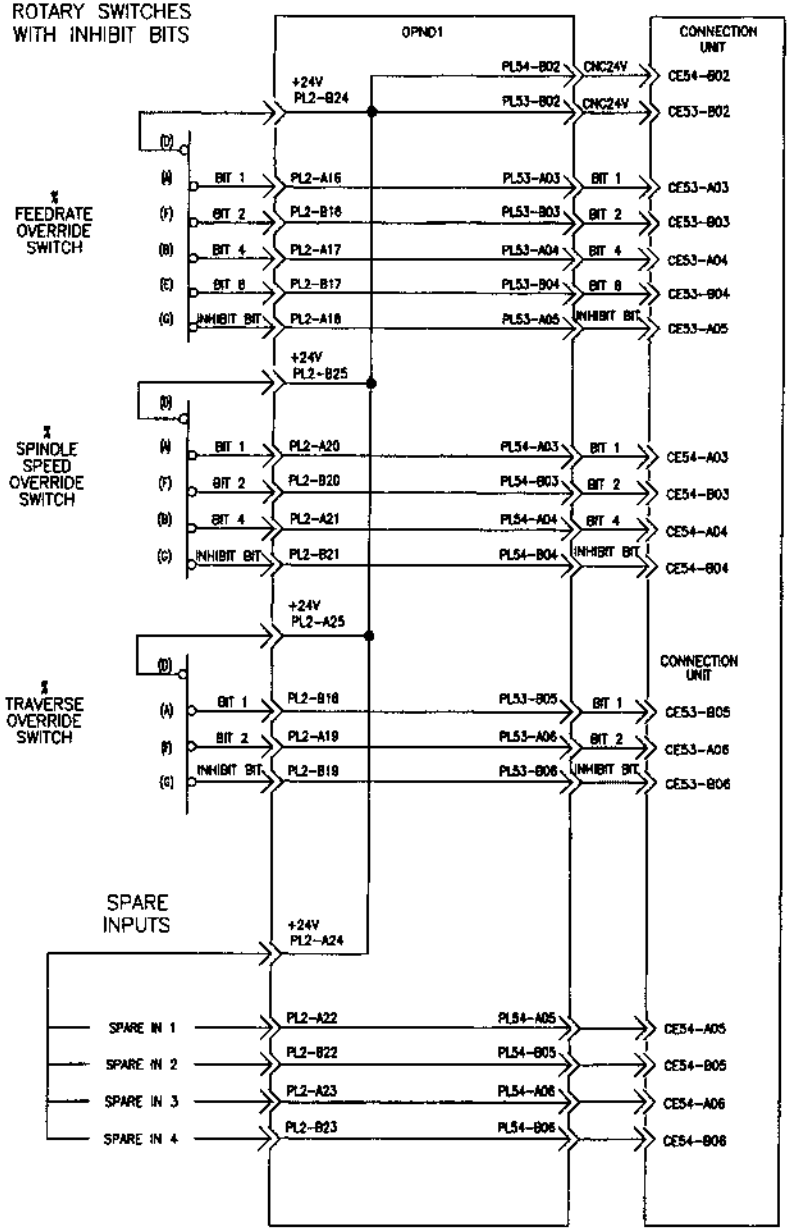
620B

SIZE	DWG NO	SH	REV
C	44C742964	5	4

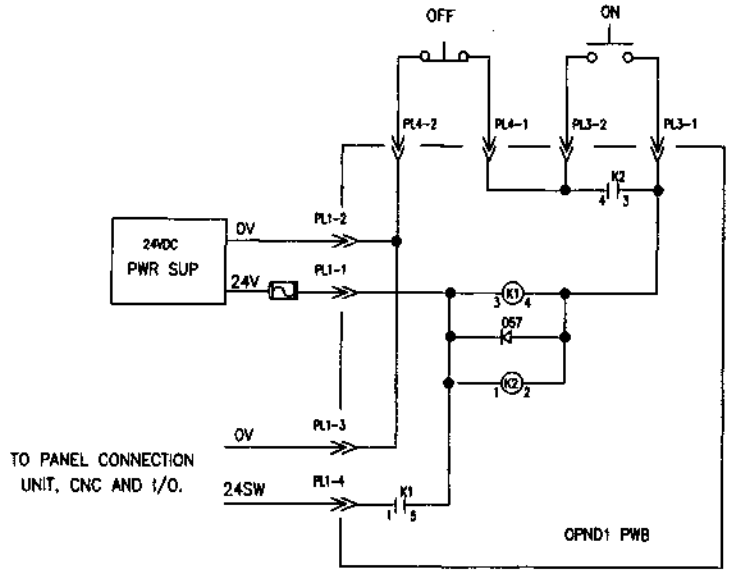
PART NUMBER VERSION STATUS					

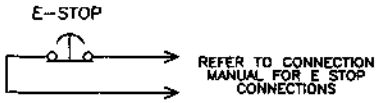
DRAWING REVISIONS		
REV	DESCRIPTION	APPROVED
1	CHG 24SW NOTE	02/04/98 jkt
2	ESTOP CONTACT NOTE	09/28/98 jkt
3	Change E-STOP Note	07/28/99 jkt
4	Show spare inputs	05/18/00 jkt

ROTARY SWITCHES WITH INHIBIT BITS



ON & OFF CONNECTION





E-STOP CONNECTION

E STOP PUSHBUTTONS

ON PANELS BUILT BEFORE APRIL 1999 INSTALL CONTACT BLOCK PROVIDED IN LEFT POSITION OF E-STOP SWITCH. AN ADDITIONAL CONTACT BLOCK MAY BE ADDED IN THE RIGHT POSITION.

ON PANELS BUILT AFTER APRIL 1999 ONE CONTACT BLOCK IS PROVIDED. UP TO 3 ADDITIONAL BLOCKS MAY BE ADDED. ONE NEXT TO THE PROVIDED BLOCK THEN ONE BEHIND EACH OF THE FIRST TWO BLOCKS.

DO NOT INSTALL ANY BLOCK IN THE CENTER POSITION

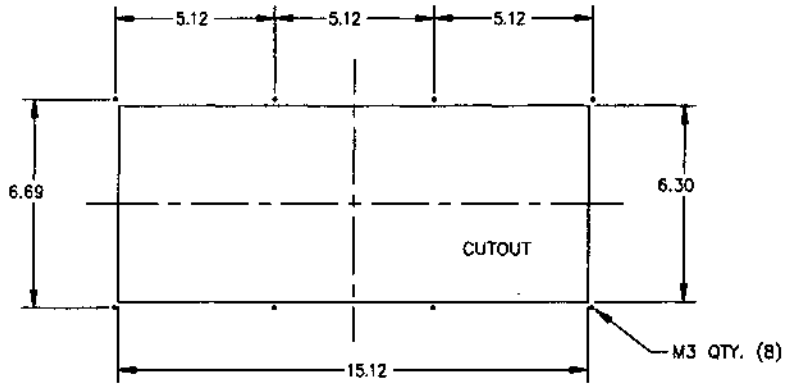
DRAWN BY: J8 SPELLER	DATE: 09/25/97	GE FANUC Automation North America, Inc. Charlottesville, Va. U.S.A.	TITLE: ELEMENTRY DIAGRAM PANEL DEVICES SERIES 1
APPROVED BY: JK THOMPSON	DATE: 05/18/00		
THIRD ANGLE PROJECTION		DWG DESCRIPTION: [CNC.OP-PNL] C742964E	SIZE: C / DWG NO: 44C742964
		PLOT SCALE: 1.00	SHEET NO: 5 / SHEET QTY: 6

620B

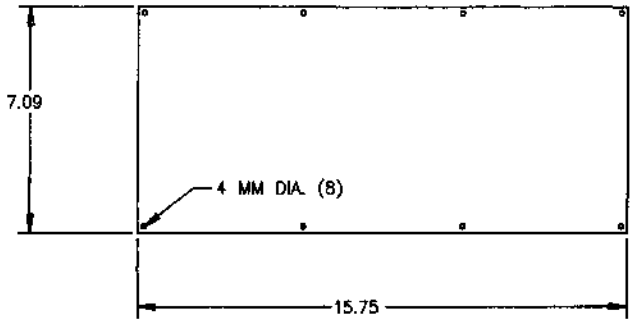
C	44C742964	6	3

REV	DESCRIPTION	APPROVED
0	ORIGINAL ISSUE	09/26/97 jkt
1	ADD 6.69 DIM	10/22/97 jkt
2	CHG CONT ON SH.	02/04/98 jkt
3	Add 400MM panel data	07/28/99 jkt

CUTOUT SIZE AND
MOUNTING HOLE PATTERN FOR
400 MM OPERATOR PANEL

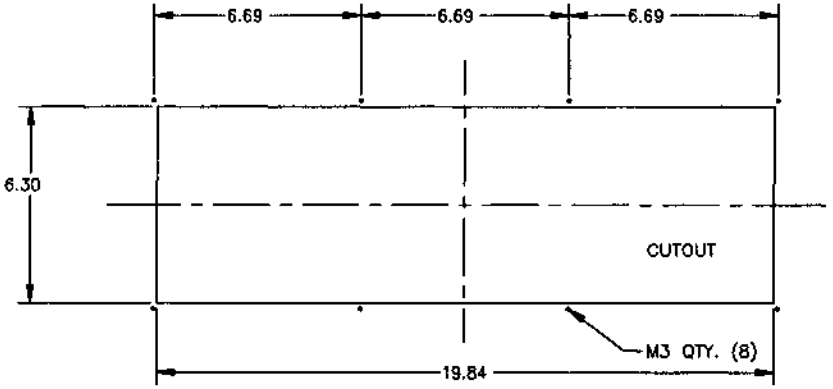


DEVICES PROJECT 50 MM FROM BACK SURFACE OF
PANEL, 90 MM IF CONNECTION UNIT IS MOUNTED.
DEVICES PROJECT 25 MM FROM FRONT SURFACE.

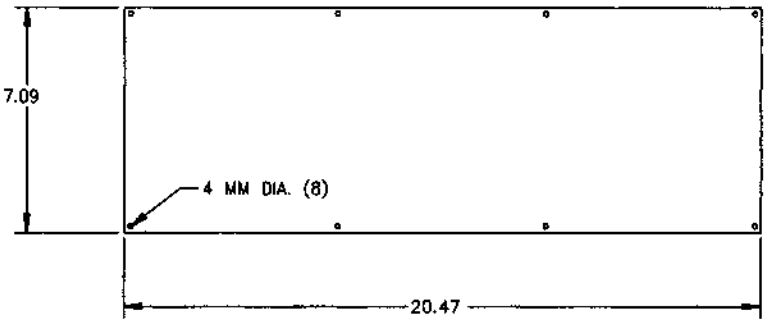


OVERALL DIMENSIONS OF
400 MM OPERATOR PANEL

CUTOUT SIZE AND
MOUNTING HOLE PATTERN FOR
520 MM OPERATOR PANEL



DEVICES PROJECT 50 MM FROM BACK SURFACE OF
PANEL, 90 MM IF CONNECTION UNIT IS MOUNTED.
DEVICES PROJECT 25 MM FROM FRONT SURFACE.
MPG UNIT PROJECTS 50MM WHEN PROVIDED

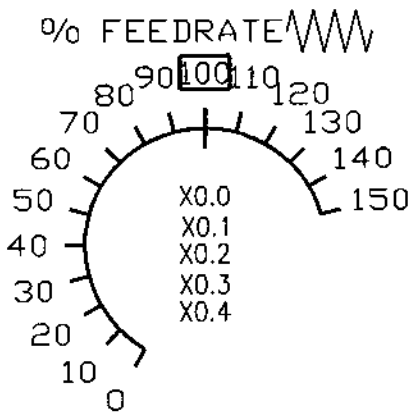


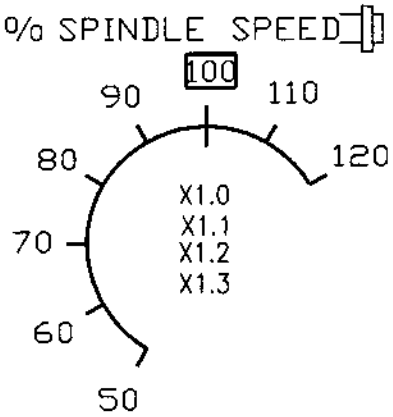
OVERALL DIMENSIONS OF
520 MM OPERATOR PANEL

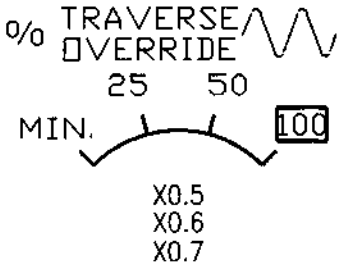
JK THOMPSON	09/26/98	GE FANUC Automation North America, Inc. Charlottesville, Va. U.S.A.	PANEL MOUNTING SIZE AND HOLE PATTERN
JK THOMPSON	07/26/99	[CNC.OP-PNL] C742964F	44C742964
		1.00	SHEET NO. 6 OF 7

C | 44C742964 | 7 | 0

REV	DESCRIPTION	APPROVED
0	ORIGINAL ISSUE 2/04/98	jkt







NOTE.

ADDRESS SHOWN IS THE INCREMENTAL VALUE ABOVE THE I/O LINK ASSIGNED BASE ADDRESS.

X4.0 Y0.0 EDIT 1PB 1LT	X4.1 Y0.1 MEM 2PB 2LT	X4.2 Y0.2 TAPE 3PB 3LT	X4.3 Y0.3 MDI 4PB 4LT	X4.4 Y0.4 INC JOG 5PB 5LT	X4.5 Y0.5 JOG 6PB 6LT	X4.6 Y0.6 MPG 7PB 7LT	X4.7 Y0.7 HOME 8PB 8LT
X7.0 (Y3.0) 9PB 9LT	X7.1 Y3.1 SINGLE 10PB 10LT	X7.2 Y3.2 BLK DEL 11PB 11LT	X7.3 Y3.3 OPT STP 12PB 12LT	X5.0 Y1.0 1X 16PB 16LT	X5.1 Y1.1 10X 17PB 17LT	X6.0 Y2.0 X 22PB 22LT	X6.1 Y2.1 Y 23PB 23LT	X6.2 Y2.2 Z 24PB 24LT
MEMORY PROTECT	X7.4 Y3.4 DRY RUN 13PB 13LT	X7.5 Y3.5 PRG TST 14PB 14LT	X7.6 Y3.6 AX INH 15PB 15LT	X5.2 Y1.2 100X 18PB 18LT	X5.3 Y1.3 1KX 19PB 19LT	X6.3 Y2.3 4 25PB 25LT	X6.4 Y2.4 5 26PB 26LT	X6.5 Y2.5 6 27PB 27LT
				X5.4 Y1.4 10KX 20PB 20LT	X5.5 Y1.5 100KX 21PB 21LT	X6.6 Y2.6 — 28PB 28LT	X7.7 Y3.7 IN PSN 29PB 29LT	X6.7 Y2.7 + 30PB 30LT

X8.0 Y4.0 33PB 33LT	X8.2 Y4.2 35PB 35LT	X8.3 Y4.3 36PB 36LT	X9.0 Y4.4 37PB 37LT	X10.0 Y5.0 41PB 41LT	X10.1 Y5.1 42PB 42LT	X5.6 Y1.6 FD HOLD 31PB 31LT	X5.7 Y1.7 CYC STR 32PB 32LT
X8.1 Y4.1 34PB 34LT	X9.1 Y4.5 38PB 38LT	X9.2 Y4.6 39PB 39LT	X9.3 Y4.7 40PB 40LT	X10.2 Y5.2 43PB 43LT	X10.3 Y5.3 44PB 44LT		

(Y3.0) NOT USED ON STANDARD PANEL. AVAILABLE FOR LAMP IF KEYSWITCH IS CHANGED TO A PUSHBUTTON.

JK THOMPSON 02/04/98	GE FANUC Automation North America, Inc. Charlottesville, Va. U.S.A.	SERIES I OPERATOR PANEL PANEL LAYOUT	
JK THOMPSON 02/04/98	CNC\OP-PNL\C7429840	SIZE A	44C742964
		SCALE 1.00	SHEET NO. 7 OF 7 FNL

SECTION 2:
DISPERSION I/O TYPE OPERATOR PANEL

This section contains:

- **Drawing No. A-73167E/02 for Dispersion I/O Type Operator Panels:**
  - **A02B-0236-C140 (Full Keyboard).**
  - **A02B-0236-C141 (Small Keyboard).**

Dispersion I/O Type Operator's Panel Connection Manual

-Item-

EDIT.	DATE	DESIG.	DESCRIPTION
02	97.07.22	Kojima	Fullkey type addition and others Jinnai
01	97.02.18	Kojima	Jinnai

TITLE: Dispersion I/O Type Operator's Panel Connection Manual

DRAW. NO. A-73167E/02 | CUST.

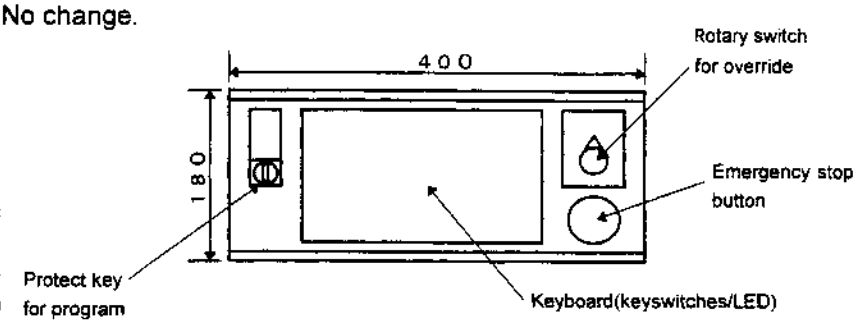
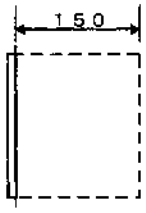
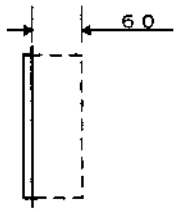
FANUC LTD | SHEET 001/24

1. Summary

Dispersion I/O type operator's panel has the panel design of the FS0 standard operator's panel corresponding, and This operator's panel is connected with CNC by I/O Link.

Dispersion I/O type operator's panel has the following differences and common points for FS0 standard operator's panel.

(In case of small type operator's panel)

Item	FS0 type Operator's panel	Dispersion I/O type operator's panel
Panel design	No change. 	
Depth		
Override	Max. 150%, binary code outputs	Max. 200%, Gray code outputs
Keysheet	Because the keysheet is compatible, the keysheet of customer designed for FS0 standard operator's panel can be used for dispersion I/O type operator's panel as it is. However, when FANUC ships dispersion I/O type operator's panel mounting the custom keysheet, a new design is necessary.	
Connection with CNC	DI/DO connection	I/O Link connection
Emergency stop	Wired.	No wiring.Refer to **3.4 Emergency stop signal connection**.
MPG interface	Non-correspondence	Max. 3 units. i series CNC is only possible to use.

				TITLE Dispersion I/O Type Operator's Panel Connection Manual	
				DRAW. NO. A−73167E／02	CUST.
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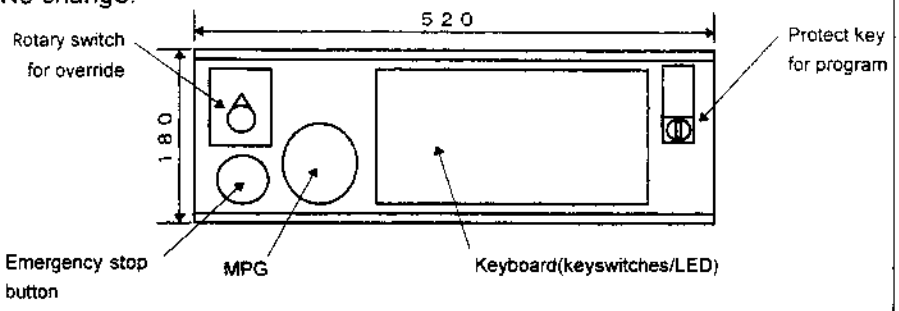
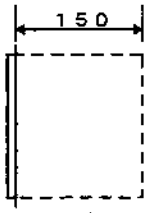
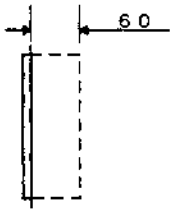
(In case of fullkey type operator's panel)

Item	FS0 type Operator's panel	Dispersion I/O type operator's panel
Panel design	No change. 	
Depth		
Override	Max. 150%, binary code outputs	Max. 200%, Gray code outputs
Keysheet	Because the keysheet is compatible, the keysheet of customer designed for FS0 standard operator's panel can be used for dispersion I/O type operator's panel as it is. However, when FANUC ships dispersion I/O type operator's panel mounting the custom keysheet, a new design is necessary.	
Connection with CNC	DI/DO connection	I/O Link connection
MPG	Mounted (1 unit). No wiring.	Mounted (1 unit). No wiring.
Emergency stop	Wired.	No wiring.Refer to **3.4 Emergency stop signal connection**.
MPG interface	Non-correspondence	Max. 3 units. i series CNC is only possible to use.

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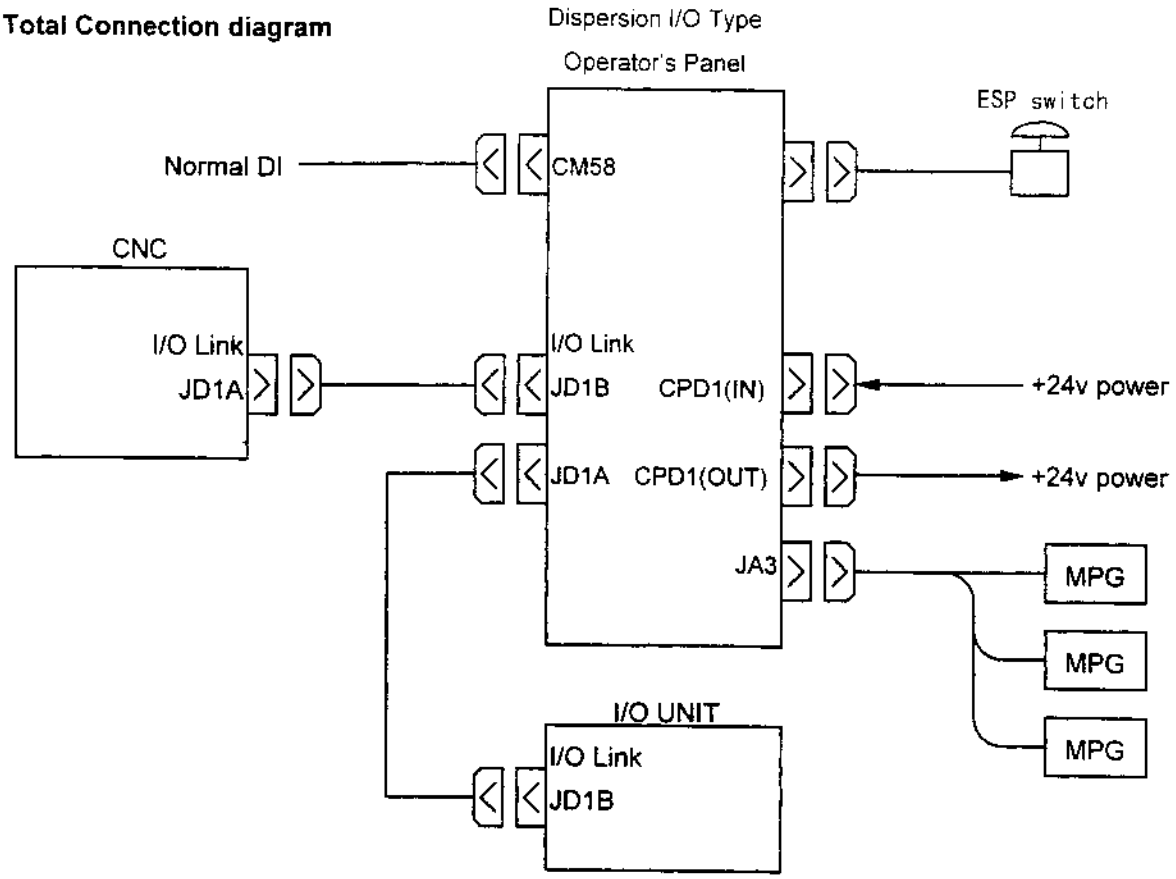
2. Total Connection diagram



Note) i series CNC is only possible to use the MPG interface on this operator's panel. If i series CNC uses some I/O unit having MPG interface (ex. Dispersion type I/O module for panel) and this operator's panel, the MPG interface nearest the CNC is only available on the I/O Link connection.

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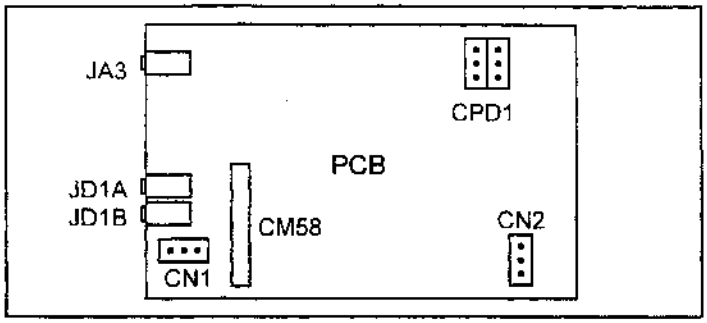
3. Each connections

3.1 Connector position

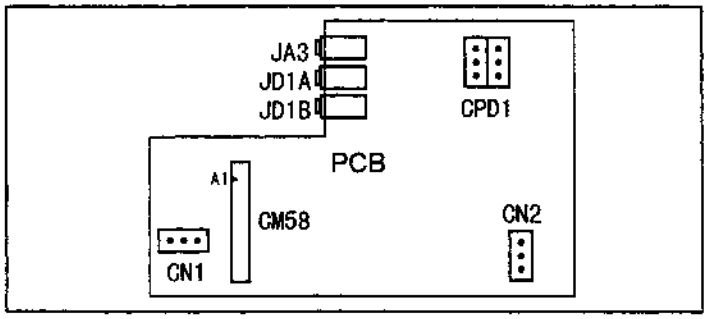
Rear view



Small type operator's panel shipped at the between Feb. 1997. and Sep. 1997.

PCB specification : A16B-2300-0210

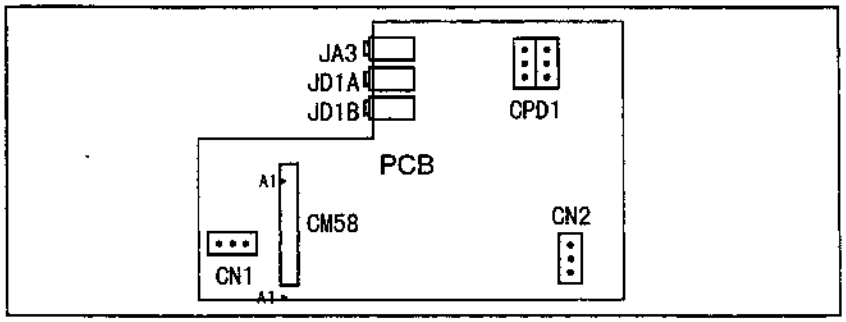
Rear view



Small type operator's panel shipped at Sep. 1997 or later.

PCB specification : A20B-8001-0720

Rear view



Fullkey type operator's panel.

PCB specification : A20B-8001-0720

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3.2 I/O Link Connection

Refer to each CNC connection Manual, all I/O Link connection methods are in common.

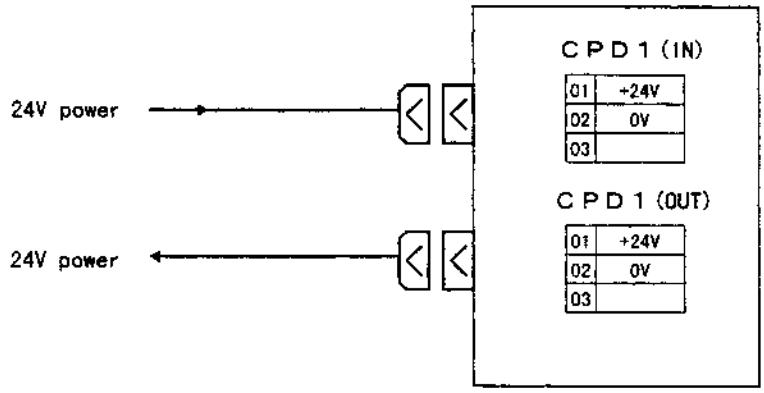
But it is not possible to use the below connectors which will be used for the main board of the i Series.

Not available connectors for the dispersion I/O type operator's panel

	Specification	Maker
Connector Housing	FI-20-CV7	HIROSE
Connector Housing and Connector	FI30-20S-CV7	HIROSE

3.3 Power supply connection

Supply a power for this operator's panel activity and all DI power from the connector CPD1(IN). And the operator's panel has connector CPD1(OUT). It will be usefu for branching off the power. The power supplied from CPD1(IN) is through the operator's panel and output for CPD1(OUT).



Recommended connector for cable : A02B-0120-K324
(Including below connector and case)
(Housing : AMP 1-178288-3)
(Contact : AMP 1-175218-5)

Note) Both connectors CPD1(IN) and CPD1(OUT) are same specification. And there is not indication of (IN) and (OUT) on the PCB.

Note) Power supply for the operator's panel must not turn off at operation. If +24V is turned off at operation, CNC happen to get system alarm(Communication alarm between CNC and operator's panel). +24V for operator's panel must be supplied before or same time CNC power on.

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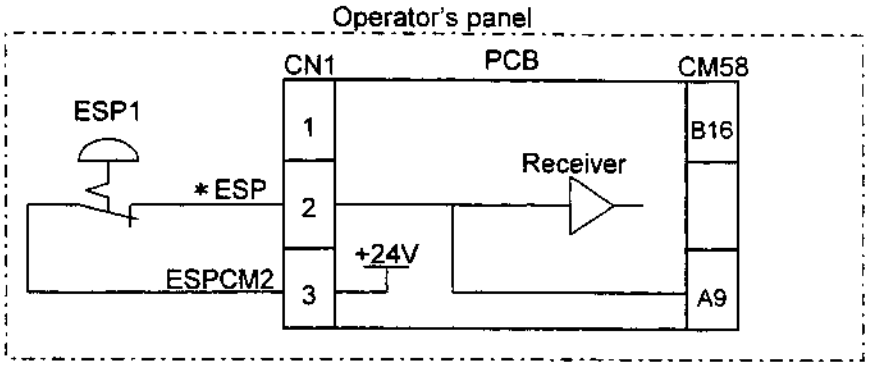
3.4 Emergency stop signal connection

The wiring of the emergency stop (ESP) switch is not given on this operator's panel. It is necessary to wire according to the customer's systems.

In this operator's panel, the common terminal and the ESP signal terminal is prepared in connector CN1 and CM58. The following wiring is recommended.

(1) When ESP switch is not used on the machine side and only the emergency stop switch of the operator's panel is used.

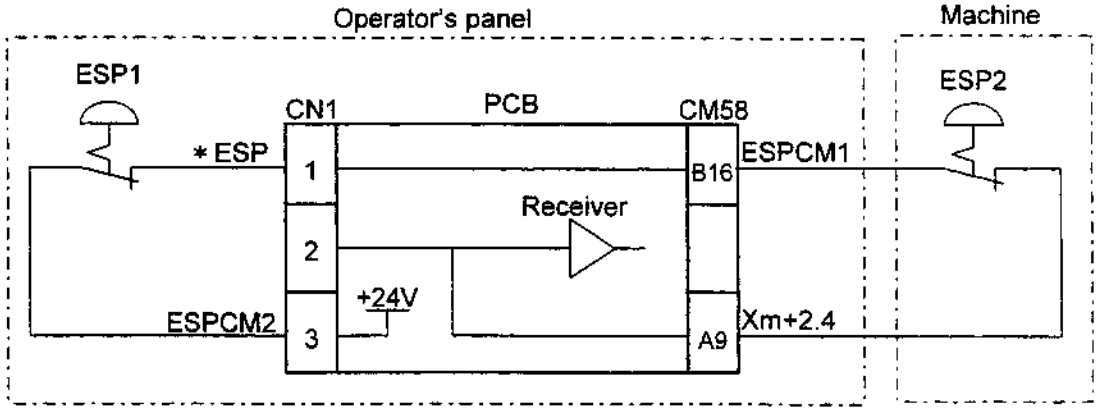
Connect ESP switch with connector CN1(No.2 pin and No.3pin)



Recommended connector CN1 for cable Housing : AMP 2-178288-3
Contact : AMP 1-175218-5

(2) When ESP switches on the operator's panel side and machine side are used.

Connect ESP switch with connector CN1(No.1 pin and No.3 pin) and connector CM58(No.A9 pin and No.B16 pin).



Recommended connector CN1 for cable Housing : AMP 2-178288-3
Contact : AMP 1-175218-5
Recommended connector CM58 for cable HIROSE HIF3BA-34DA-2.54R

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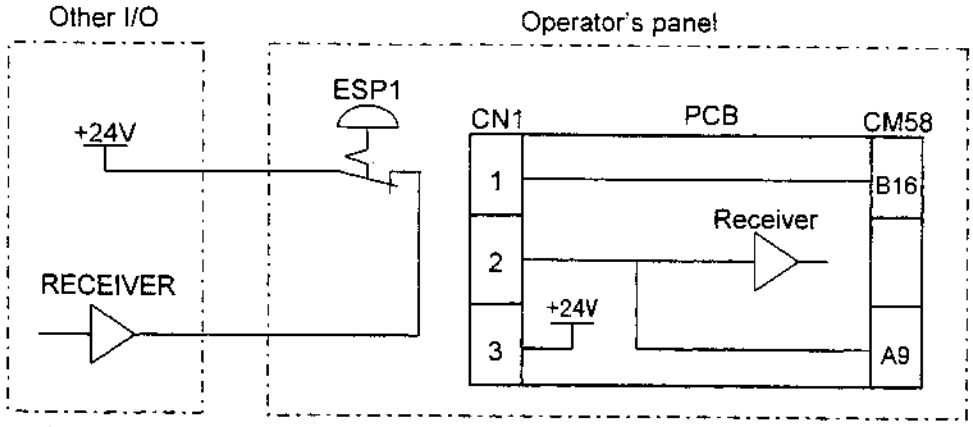
(3) When ESP switch on the operator's panel is connected with other I/O.



Note) In example (1) and (2) , ESP signal is received at +24V common fixed DI address(Xm+2.4). So, as refer to **5. DI/DO mapping**, assign the DI mapping.
When ESP signal are received at another address excepting Xm+2.4,refer to **3.5 Normal DI signal connection** and **5. DI/DO mapping**.
In example(3), Xm+2.4 can be used as normal DI.

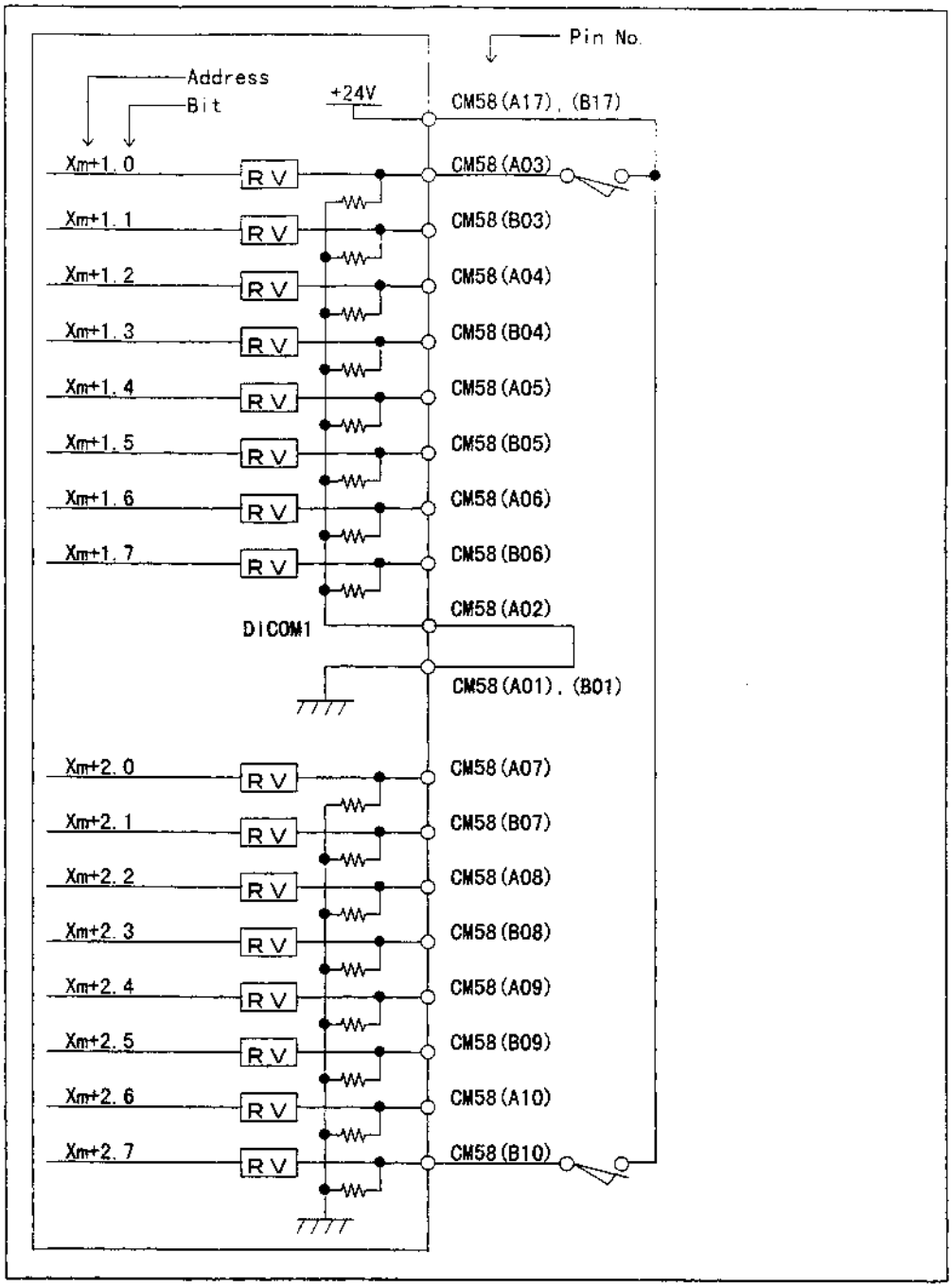
3.5 Normal DI signal connection

This operator's panel have 24 points normal DI. The interface is as follows.

CM58

	A	B
01	0V	0V
02	DICOM1	DICOM3
03	Xm+1.0	Xm+1.1
04	Xm+1.2	Xm+1.3
05	Xm+1.4	Xm+1.5
06	Xm+1.6	Xm+1.7
07	Xm+2.0	Xm+2.1
08	Xm+2.2	Xm+2.3
09	Xm+2.4	Xm+2.5
10	Xm+2.6	Xm+2.7
11	Xm+3.0	Xm+3.1
12	Xm+3.2	Xm+3.3
13	Xm+3.4	Xm+3.5
14	Xm+3.6	Xm+3.7
15	TR1	TR2
16	TR3	ESPCM1
17	+24V	+24V

Recommended connector CM58 for cable HIROSE HIF3BA-34DA-2.54R



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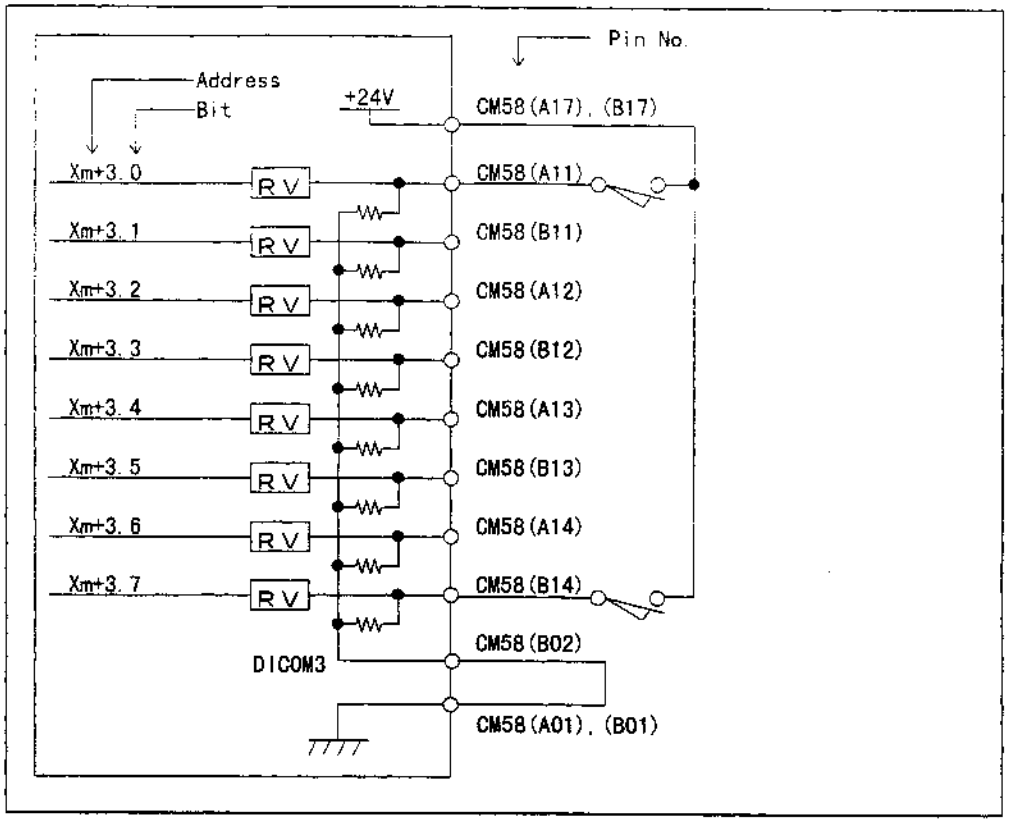


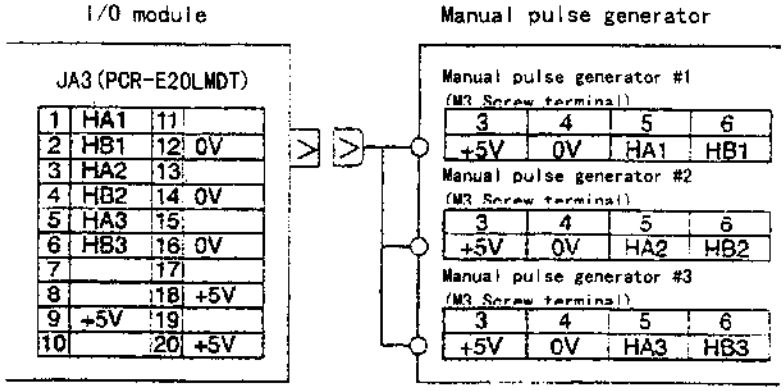
Note) Xm+1.0～Xm+1.7 and Xm+3.0～Xm+3.7 have a common line which is possible to select the source/sink type. If DICOM1(CM58-A02pin) and DICOM3(CM58-B02pin) are connected to +24V, the DI signal logic is negative.
But in this connection, if the DI signal wires happen to drop the ground level, the status of the DI signal is same as the DI signal is "ON". From the safety viewpoint, DICOM1 and DICOM3 should be connected 0V.

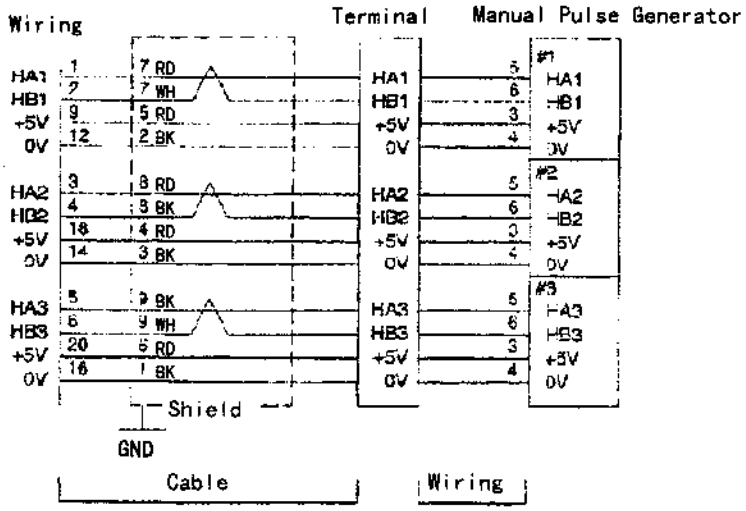
Note) From the safety viewpoint, Emergency Stop signal must be assigned on the address Xm+2.0 ～Xm+2.7. As refer to the **5. DI/DO mapping**, assign the Emergency stop DI.

Note) Xm+2.0～Xm+2.7 common line are fixed. So, if these DI pins in this address open, the status of these one stay "0". And in case of Xm+1.0～Xm+1.7 and Xm+3.0～Xm+3.7 which have a selectable common line, if the DICOM1(CM58-A02pin) and DICOM3(CM58-B02pin) are connected to 0V and these DI pins open, the status of these one stay "0". And if the DICOM1 and DICOM3 are connected to +24V and these DI pins open, the status of these one stay "1". And if the DICOM1 and DICOM3 are not connected to 0V or +24V and these DI pins open, the status of these one don't care.

3.6 Manual pulse generator connection

Example of the 3 Manual pulse Generator connection is as follows. i series CNC is only possible to use the MPG interface. If i series CNC uses some I/O unit having MPG interface (ex.Dispersion type I/O module for panel) and this operator's panel, the MPG interface nearest the CNC is only available on the I/O Link connection.





Recommended wire material : A66L-0001-0286(#20AWG × 6+#24AWG × 3pairs)
Recommended connector : A02B-0120-K303(Including below connector and case)
(Connector : HIROSE FI40-2015S Soldering type)
(Case : HIROSE FI40-20-CV5)

Recommended cable : A02B-0120-K841(7m) (MPG 3 units)
A02B-0120-K848(7m) (MPG 2 units)
A02B-0120-K847(7m) (MPG 1 unit)
(These cables don't include the wiring part in the figure.)

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Note) Calculate the MPG cable max. Length as refer to the following calculation.

MPG needs a DC5V power supply and the voltage must be less than 0.2V dropping.
(the 0.2V dropping includes the resistance in the cable.)

$$0.2 \geq \frac{0.1 \times R \times 2L}{m}$$

Because

$$L \leq \frac{m}{R}$$

0.1 : MPG power supply current 0.1A
R : Resistance per wire length(Ω /m)
m : Wire Number(Both 0V and 5V)
L : Cable length(m)

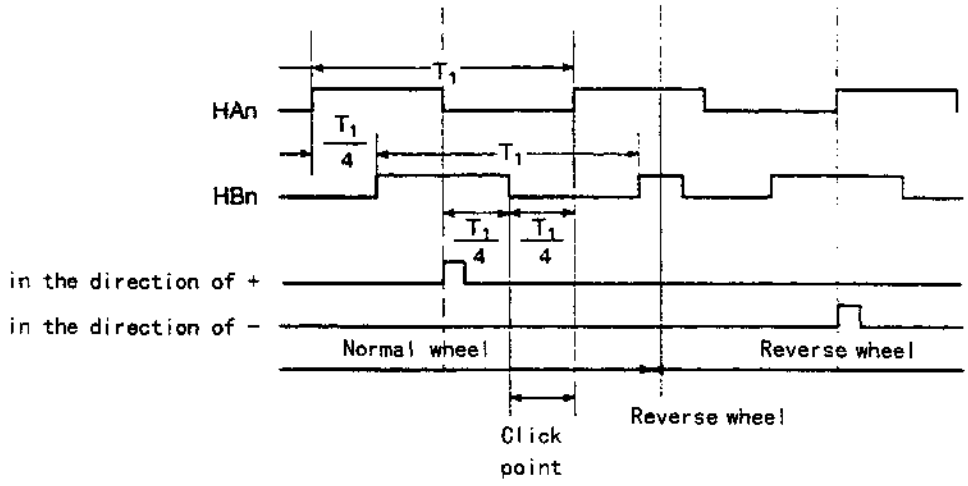
Example: In case of cable A66L-0001-0286
It has 3 pairs signal wires and 6 power line wires(20/0.18, 0.0394 Ω /m).
If the cable is used and each 3 wires are used for 0V and 5V power line, then max. cable length is as follows.

$$L \leq \frac{3}{0.0394} = 76.75(m)$$

The answer is 76.75m, if MPG unit is 1.
(But FANUC decide any cable must be less than 50m.)
The answer is 38.37m, if MPG units are 2.
The answer is 25.58m, if MPG units are 3.

If the customer will use a some other vender's MPG ,not FANUC's MPG, the electrical condition must be as follows.

HAn, HBn signals form MPG and CNC internal pulse are as follows. A cycle of the HA/HB pulse T_1 must be more than 200 μ sec and $4/T_1$ must be more than 50 μ sec.



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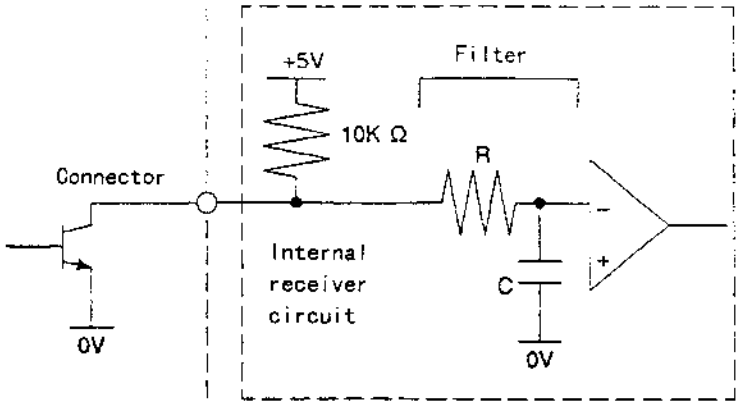
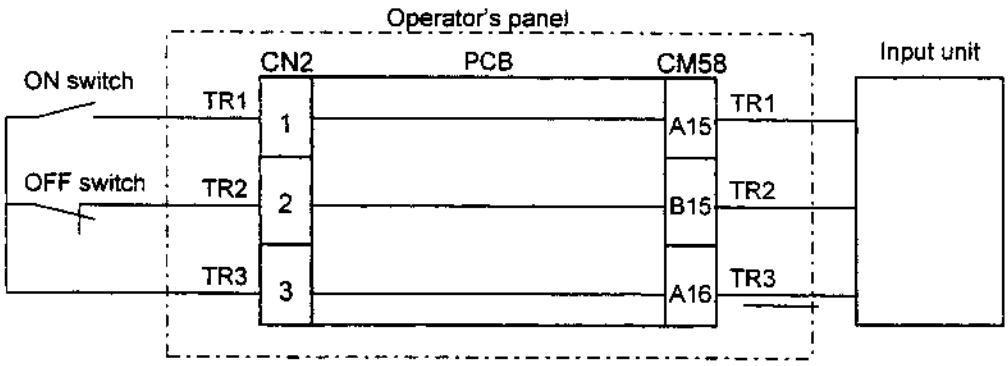
And the receiver circuit is as follows.



V_{IH},V_{IL} level at Connector pin
If Vin low to high, V_{IH} must be higher than 3.7V.
If Vin high to low, V_{IL} must be lower than 1.5V.

3.7 Transit terminal connection

This terminals are used to relay the signal on the operator's panel. These signals are not output to CNC with I/O Link. Following example is transit of ON/OFF control signal for power supply.



Recommended connector CN1 for cable Housing : AMP 2-178288-3
Contact : AMP 1-175218-5
Recommended connector CM58 for cable HIROSE HIF3BA-34DA-2.54R

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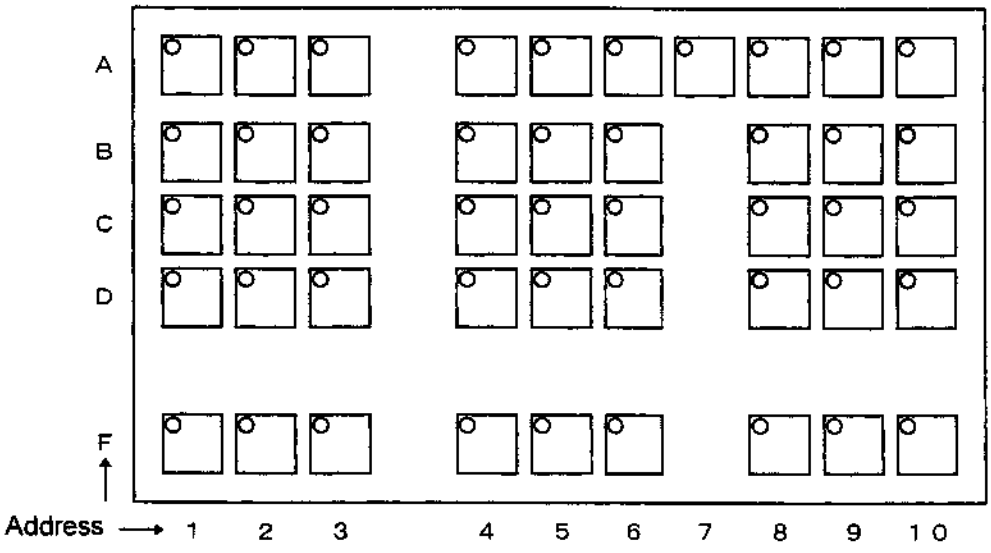
4. DI/DO address

4.1 Keyboard

(In case of small type operator's panel)
DI/DO address of Keyswitches and LED on the keyboard are as follows.

BIT / Key/LED	7	6	5	4	3	2	1	0
Xm+4/Yn	F3	F2	F1		D1	C1	B1	A1
Xm+5/Yn+1	F4				D2	C2	B2	A2
Xm+6/Yn+2	D4	D3	C4	C3	B4	B3	A4	A3
Xm+7/Yn+3		F6	F5		D5	C5	B5	A5
Xm+8/Yn+4	F8				D6	C6	B6	A6
Xm+9/Yn+5	D8		C8		B8		A8	A7
Xm+10/Yn+6			F9		D9	C9	B9	A9
Xm+11/Yn+7			F10		D10	C10	B10	A10

Keyswitches/LED position



Note) T type : 42 keys , M type : 46keys
In case of the T type operator's panel, keyswitches at the marking [ ] are not mounted.

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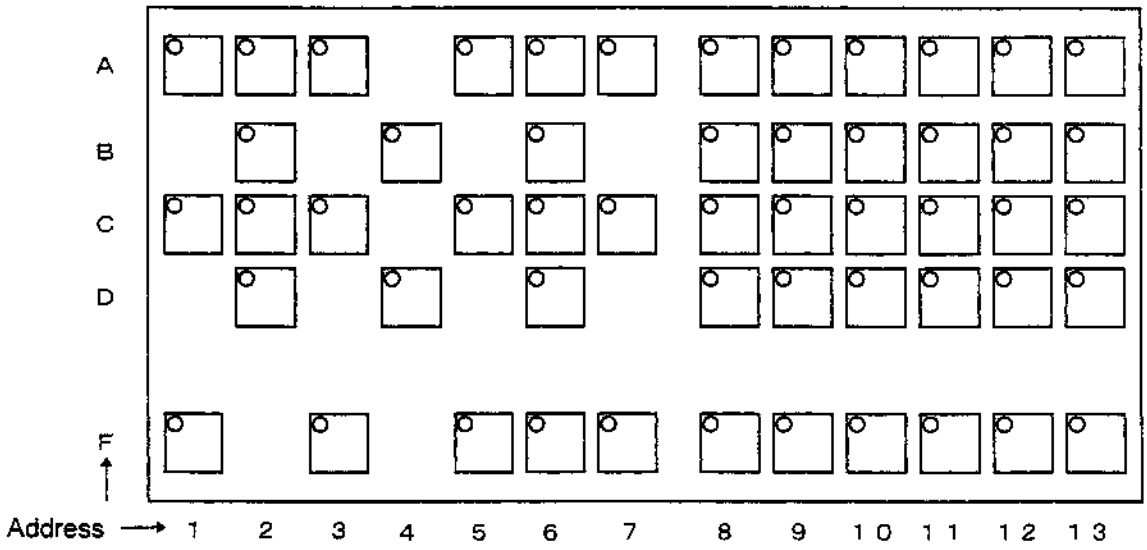
(In case of fullkey type operator's panel)
DI/DO address of Keyswitches and LED on the keyboard are as follows.

Key/LED \ BIT	7	6	5	4	3	2	1	0
Xm+4/Yn	F1	C1	A1	F6	D6	C6	B6	A6
Xm+5/Yn+1		C2	A2	F7		C7		A7
Xm+6/Yn+2	F3	C3	A3	F8	D8	C8	B8	A8
Xm+7/Yn+3	F5			F9	D9	C9	B9	A9
Xm+8/Yn+4	D2	C5	A5	F10	D10	C10	B10	A10
Xm+9/Yn+5	D4		B2	F11	D11	C11	B11	A11
Xm+10/Yn+6			B4	F12	D12	C12	B12	A12
Xm+11/Yn+7				F13	D13	C13	B13	A13

Keyswitches/LED position



Note) Both of T type and M type : 53keys

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4.2 Other output signals

DI address	Signal	Name
Xm+0.0	*OVA	Override signals Note)
Xm+0.1	*OVB	
Xm+0.2	*OVC	
Xm+0.3	*OVD	
Xm+0.4	*OVE	
Xm+0.5	KEY	Program protect signal

Note) Override signals(*OVA～ *OVE)

Table of gray code output is as follows.

%	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
*OVA	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
*OVB	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1
*OVC	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1
*OVD	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
*OVE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1

5. DI/DO mapping

I/O address map is as follows.

DI map

Xm	Override etc.
Xm+1	Normal DI
Xm+2	
Xm+3	
Xm+4	Keyboard (Keyswitches)
Xm+5	
Xm+6	
Xm+7	
Xm+8	
Xm+9	
Xm+10	
Xm+11	
Xm+12 (1st MPG)	MPG
Xm+13 (2nd MPG)	
Xm+14 (3rd MPG)	
Xm+15	Reserve

DO map

Yn	Keyboard (LED)
Yn+1	
Yn+2	
Yn+3	
Yn+4	
Yn+5	
Yn+6	
Yn+7	

DI mapping should be assigned 1 group = 16 byte mapping and DO mapping should be assigned 1 group = 8 byte mapping. The reason is as follows.

MPG interface(the counter for MPG) uses Xm+12～Xm+14 area and it is fixed. And if MPG interface will be used, Xm+12～Xm+14 area must be assigned. therefore, in case of i series and using MPG interface, DI mapping must be assigned 16 byte mapping. MPG counter area are directly
processed by CNC software. So you must not use this area by customer ladder.

It is possible to assign any address for this operator's panel. But in DI address, each CNC have some fixed address that is directly processed by CNC software. So, as refer to the following mention,assign the DI mapping.

Directly processed address by CNC(in case of FS18,16)

	7	6	5	4	3	2	1	0
X0004	SKIP#1	ESKIP	-MIT2#1	+MIT2#1	-MIT1#1	+MIT1#1	ZAE#1	XAE#1
		SKIP6#1	SKIP5#1	SKIP4#1	SKIP3#1	SKIP2#1	SKIP8#1	SKIP7#1
	SKIP#1	ESKIP	SKIP5#1	SKIP4#1	SKIP3#1	ZAE#1	YAE#1	XAE#1
		SKIP6#1				SKIP2#1	SKIP8#1	SKIP7#1
X0005								
X0006								
X0007		* DEC7#2	* DEC6#2	* DEC5#2	* DEC4#2	* DEC3#2	* DEC2#2	* DEC1#2
X0008				* ESP				
X0009		* DEC7#1	* DEC6#1	* DEC5#1	* DEC4#1	* DEC3#1	* DEC2#1	* DEC1#1
X0010								
X0011								
X0012								
X0013	SKIP#2	SKIP6#2	-MIT2#2	+MIT2#2	-MIT1#2	+MIT1#2	ZAE#2	XAE#2
			SKIP5#2	SKIP4#2	SKIP3#2	SKIP2#2	SKIP8#2	SKIP7#2
	SKIP#2	SKIP6#2	SKIP5#2	SKIP4#2	SKIP3#2	ZAE#2	YAE#2	XAE#2
						SKIP2#2	SKIP8#2	SKIP7#2

#1 means the signales in 1st path. #2 means the signals in 2nd path. And up column means the T series signals and down column means the M series signals.

Ex. In case of 16 byte mapping start from X0006 for DI area.

X0006	Override etc.	
X0007	Normal DI	← * DECn#2 Fixed signals
X0008		← * ESP Fixed signal
X0009		← * DECn#1 Fixed signals
X0010	Keybosrd (Keyswitches)	
X0011		
X0012		
X0013		
X0014		
X0015		
X0016		
X0017		
X0018 (1st MPG)	MPG	
X0019 (2nd MPG)		
X0020 (3rd MPG)		
X0021	Reserve	

In case of mapping start from X0006,
* DECn#1 and * DECn#2 singals which are address fixed signals can be used any time. And * ESP signal can be placed at +24V common fixed address.
But SKIP signals can not be used.
Don't map the * ESP signal matrix DI area.

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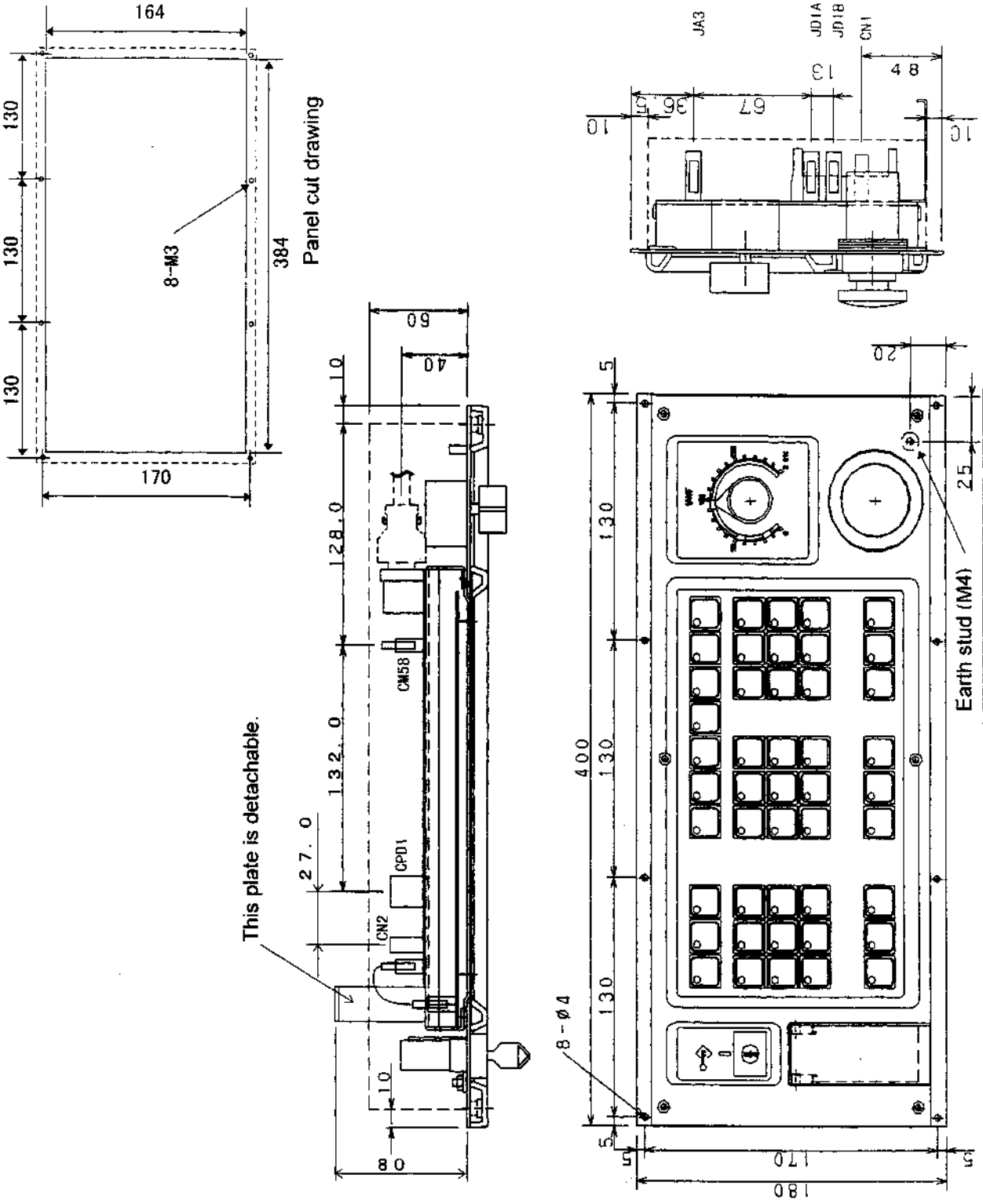
6. Outline

In case of small type operator's panel



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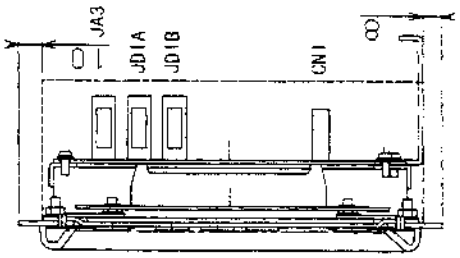
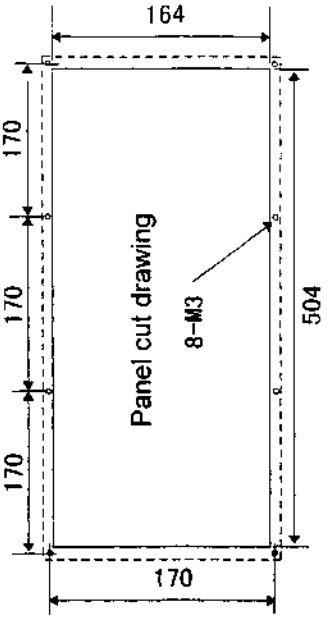
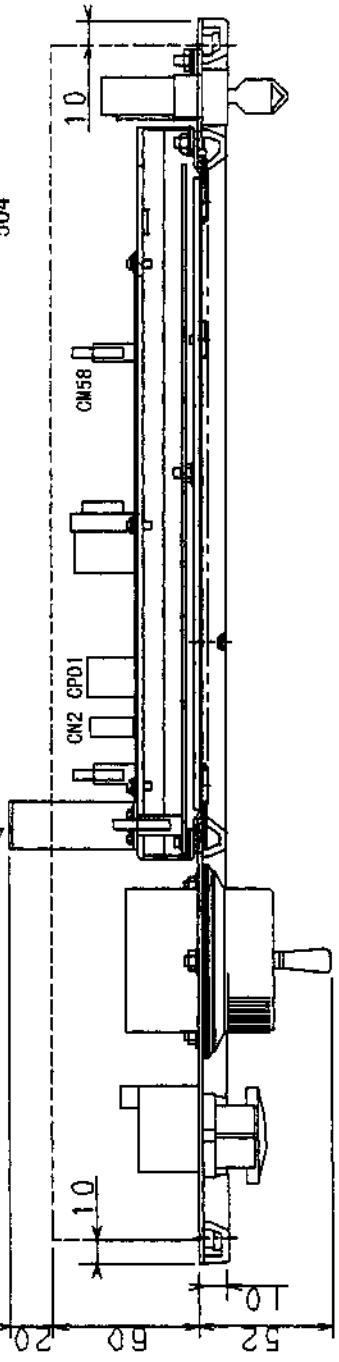
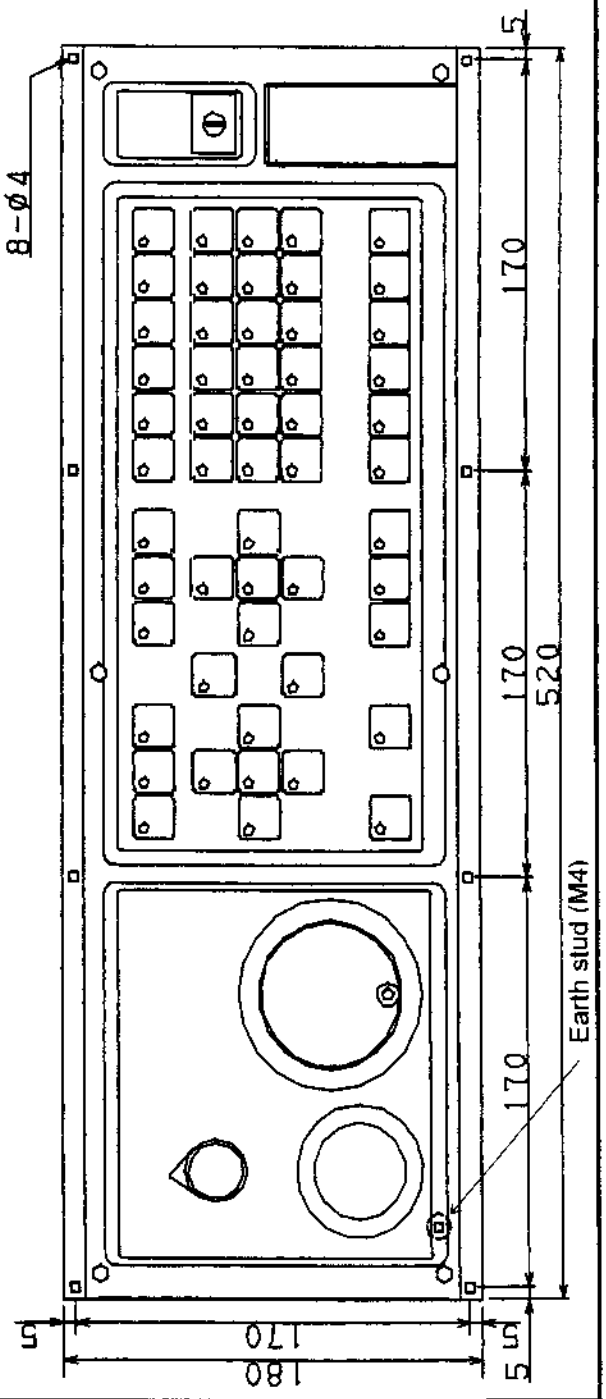
In case of fullkey type operator's panel









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7. Specification

7.1 Environmental Requirement

Temperature around a unit	At operation 0℃～58℃ Storing or transporting -20℃～60℃
Temperature variance	Max. 1.1℃/min
Humidity	Normally 75% or less (Relative humidity) Short time(Within one month) 95% or less (Relative humidity)
Vibration	Operating 0.5G or less
Atmosphere	Normal FA atmosphere(Consult us when using the system under environments with higher degree of dust, coolant, or organic solution.)

7.2 Order specification

Name	Specification	Note
Distributable I/O type Operator's panel	A02B-0236-C141#TBS	Small,T type,Symbolic keysheet
	A02B-0236-C141#TBR	Small,T type,English keysheet
	A02B-0236-C141#MBS	Small,M type,Symbolic keysheet
	A02B-0236-C141#MBR	Small,M type,English keysheet
Distributable I/O type Operator's panel	A02B-0236-C140#TBS	Fullkey,T type,Symbolic keysheet
	A02B-0236-C140#TBR	Fullkey,T type,English keysheet
	A02B-0236-C140#MBS	Fullkey,M type,Symbolic keysheet
	A02B-0236-C140#MBR	Fullkey,M type,English keysheet
Fuse(Spare part)	A03B-0815-K001	1A

7.3 Operator's panel specification

Item	Specification	Note
Normal DI points	24 points	24V type input
Keyswitches	42 keys : T type 46 keys : M type	Sheetkey type, Matrix DI
LED	Color : Red	Attached to all keyswitches,Matrix DO
Override rotary switch	5 bit	Gray code output
Emergency stop awitch	1 bit	
Program protect key	1 bit	
MPG interface	Max. 3 units	i series is only available.
Interface to CNC	FANUC I/O Link connection	Max. 16 modules or total points max. 1024/1024 will be available.

7.4 Power supply specification

Voltage	Capacity	Note
DC24V±10% (from Power connector CPD1, including momentary values)	0.4A	Including all DI consumption

7.5 Normal DI signal definition

Capacity	DC30V, 16mA or higher
Interconnect leakage current in closed circuit	1mA or less(at 26.4V)
Interconnect voltage drop in closed circuit	2V or less(including the voltage drop in the cables)
Delay time	Delay time of receiver IC : 2ms(MAX) Need to consider about the serial communication (I/O Link)delay between CNC and operator's panel 2ms(MAX)+Scan cycle of ladder(Scan cycle is different each CNCs).

8. Others

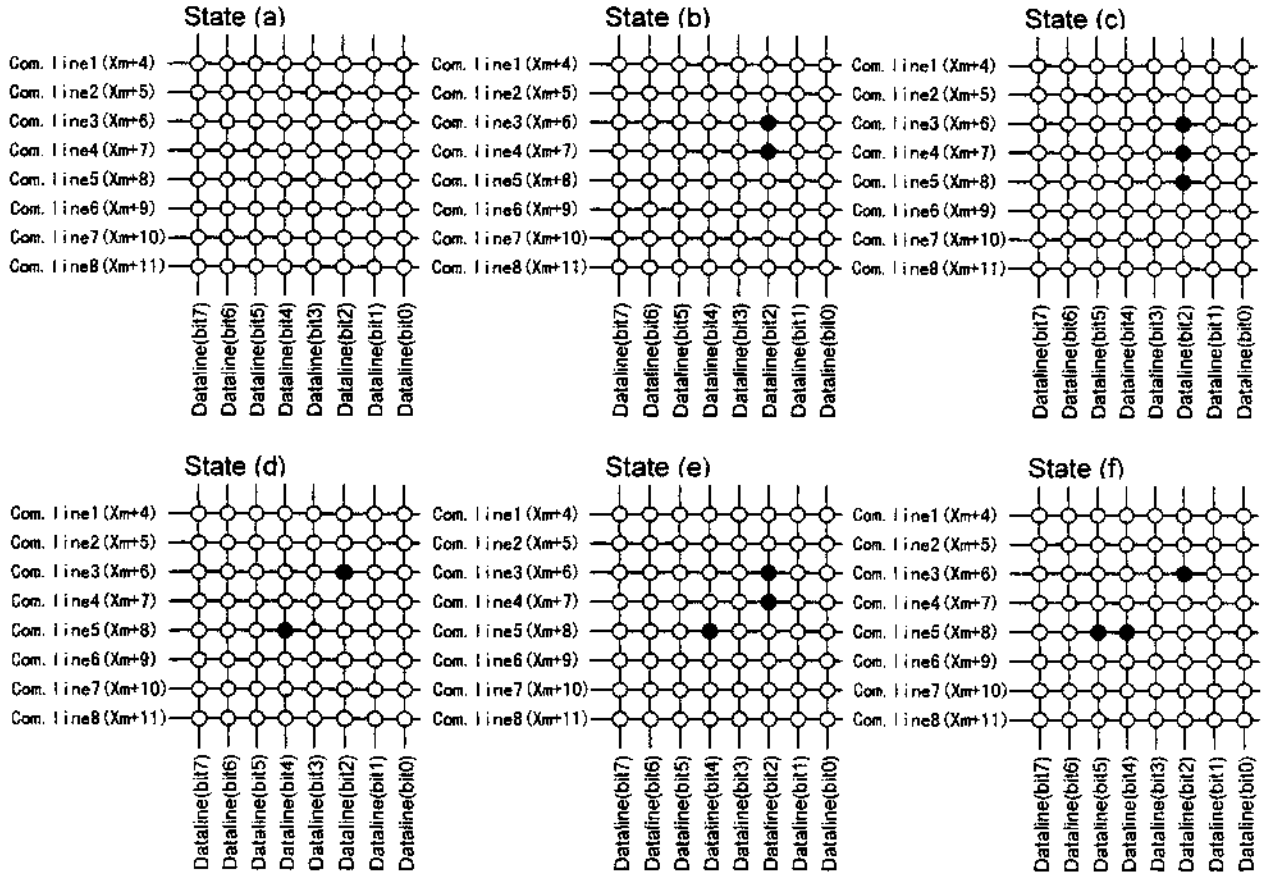
The keyboard of this operator's panel is a matrix composition. When three or more keys are pushed, the bypass current cause unrelated key to be available. This malfunction can be prevented with ladder program. One example is shown as follows.

(Elimination rule of malfunction)

When three keyinputs or more is input, all the keyinput since the third is made invalid.
However, when the number of all keyinput becomes two or less because keyinput was lost, all keyinputs are made effective.

(Operation of ladder program)

The example of the operation of ladder program is shown about matrix DI composed of 8bits × 8commons as follows.



○ : Keyswitch OFF("0")　　● : Keyswitch ON("1")

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[1] The number of datalines where the keyinput exists is examined.

Logical add R1 of the data of all addresses is calculated. The number of bits which are "1" in the 8bits data of R1 corresponds to the number of datalines where the keyinput exists.

(1) When the data of R1 is corresponding to 00h, there is no bit which is "1" in the data of R1.

Ex. State (a) : R1=(00000000) → There is no dataline where input exists.

(2) when the data of R1 is corresponding to the data in undermentioned datatable1., the number of bits which are "1" in the data of R1 is one. Similarly, when the data of R1 is corresponding to the data in datatable2., the number of bits which are "1" in the data of R1 is two.

Ex. State (b) or (c) : R1 = (00000100) → There is one dataline where input exists.

Ex. State (d) or (e) : R1 = (00010100) → There are two datalines where input exists.

(3) If the data of R1 is not corresponding to 00h and the both datatables, the number of bits which are "1" in the data of R1 is three or more.

Ex. State (f) : R1 = (00110100) → There are three datalines where input exists.

Data table 1.

00000001	00000010
00000100	00001000
00010000	00100000
01000000	10000000

Data table 2.

00000011	00000110	00001100	00011000
00110000	01100000	11000000	10000001
00000101	00001010	00010100	00101000
01010000	10100000	01000001	10000010
00001001	00010010	00100100	01001000
10010000	00100001	01000010	10000100

[2] Judgment 1

(1) If there is no dataline where the keyinput exists.

→ Any key switch is not pushed. : Ex. State (a)

(2) When the keyinput exists in two datalines or less.

→ To [3]

(3) When the keyinput exists in three data lines or more.

→ There are three keyinputs or more. It is invalid keyinput. : Ex. State (f)

[3] When the keyinput exists in two datalines or less, it is examined whether two or more keyinput exists on the same dataline.

The data of all addresses is subtracted from logical add R1 and subtraction result R2 is obtained. There are no two or more keyinput on the same dataline if it is R2=00h.

Ex. When there is one dataline where input exists.

State (b) : R2 = FCh

State (c) : R2 = F8h

When there are two datalines where input exists.

State (d) : R2 = 00h

State (e) : R2 = FCh

[4] Judgment 2

(1) In case of R2 =00h → There are two or less datalines where input exists, and there are no two or more keyinputs on the same dataline. In this case, the numbers of all keyinputs are one or two. It is effective keyinput.
: Ex. State (d)

(2) In case of R2≠00h → There are two or less datalines where input exists, and two or more keyinputs exists on the same dataline. To [5].

[5] Judgment 3

When there is one dataline where input exists → To [6].

When there are two datalines where input exists → There are three keyinputs or more. It is invalid keyinput. : Ex. State (e)

[6] Subtraction result R2 is added to logical add R1. If this addition result is 00h, the number of all keyinputs is two. Ex. State (b) : R1 + R2 = 04h + FCh = 00h

State (c) : R1 + R2 = 04h + F8h = FCh

[7]Judgment 4

In case of R1 + R2 = 00h → There is one dataline where input exists, and there are two keyinputs on this dataline.That is, because the numbers of all input are two keys, it is effective input. : Ex. State (b)

In case of R1+R2 ≠ 00h → There are three keyinputs or more on the same dataline. It is invalid keyinput. : Ex. State (c)

[8] Only when the keyinput becomes effective because of judgment 1-4, all DI data (Xm+4-Xm+11) is used by the ladder program.

SECTION 3:
72 IN / 56 OUT CONNECTION UNIT

This section contains:

- **Drawing A-71199E/03 for Operator Panel Connection Unit A20B-2002-0470.**

Note

Inputs are multiplexed.

This panel must be ordered separately for use with all GE Fanuc North American *i* Series Operator Panels.

I/O Module for Operator's Panel Connection Manual

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03	96.11.1	Jinnai	Page 016 is modified. Jinnai	I/O Module for Operator's Panel Connection Manual	
02	96.10.15	Jinnai	Page 003 is modified. Jinnai		
01	96.8.3	Jinnai	Jinnai	DRAW. NO. A-71199E/03	CUST.
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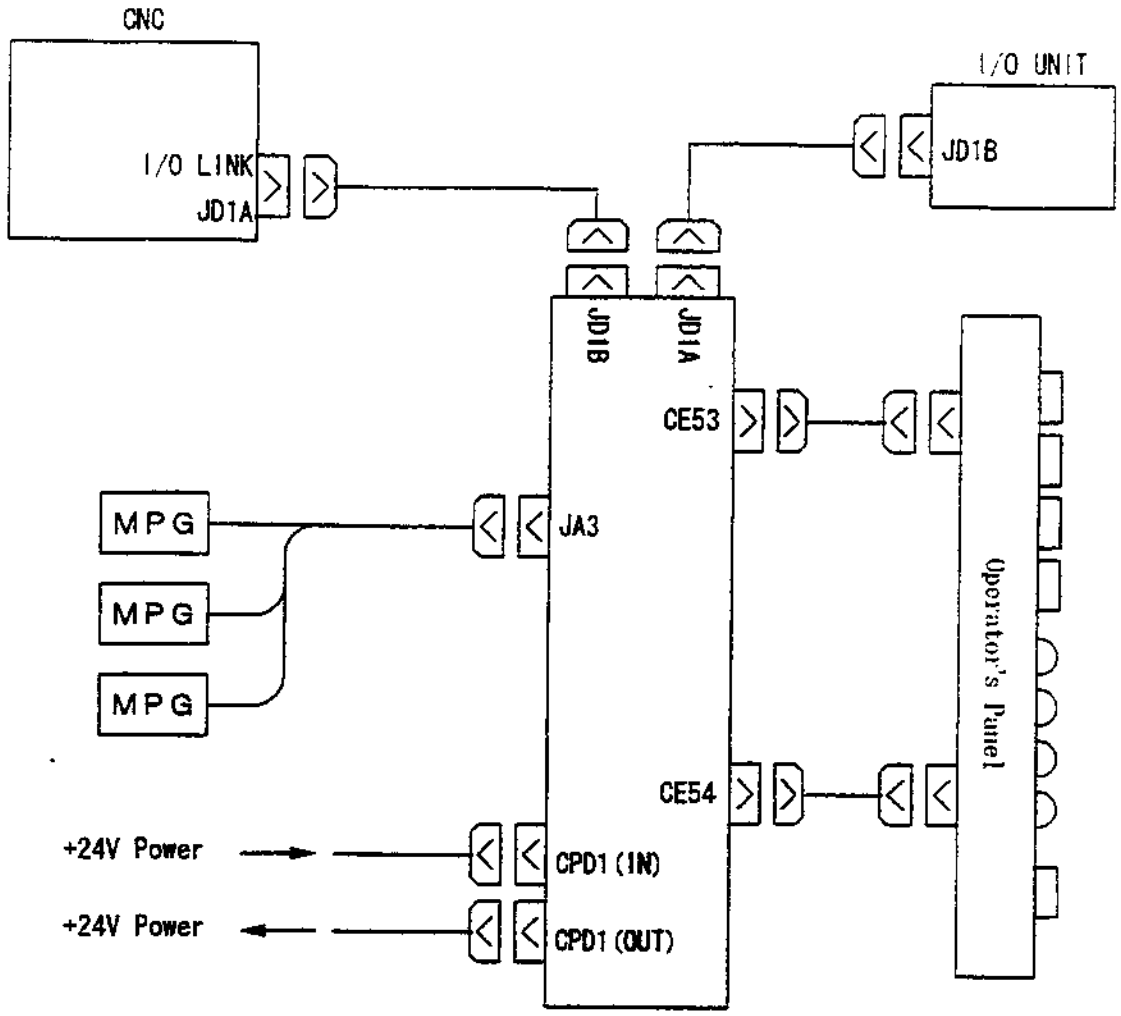
1. Total Connection diagram



Note) i series CNC is only possible to use the MPG interface on this I/O module.
If i series CNC uses some I/O unit having MPG interface (ex. Dispersion type I/O module for panel) and this I/O module, the MPG interface nearest the CNC is only available on the I/O-Link connection.

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2. Each connections

2.1 I/O-Link Connection

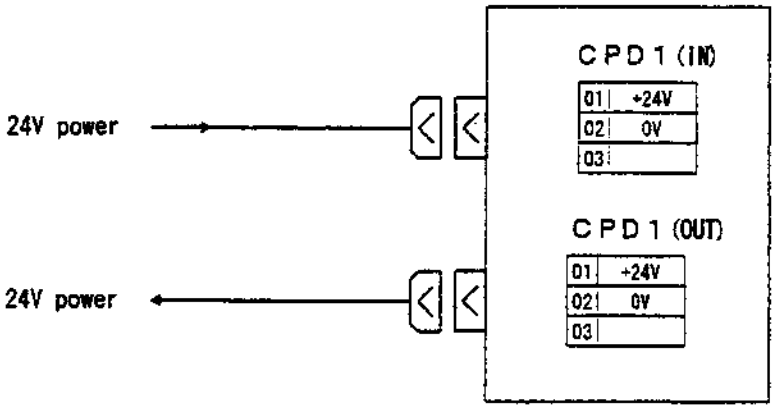
Refer to each CNC connection Manual, all I/O-Link connection methods are in common. But it is not possible to use the below connectors which will be used for the main board of the i Series.

Not avairable connectors for the I/O Module for Operator's Panel

	Specification	Maker
Connector Housing	FI-20-CV7	HIROSE
Connector Housing and Connector	FI30-20S-CV7	HIROSE

2.2 Power supply connection

Supply a power form the connector CPD1(IN). That is for the PCB activity and all DI power. And the PCB has connector CPD1(OUT). It will be useful for branching off the power. The power supplied form CPD1(IN) is through the PCB and output form CPD1(OUT).



Recommended connector for cable : ② A02B-0120-~~K323~~ K324
(Including below connector and case)
②(Housing : AMP ~~2-178288-3~~ 1-178288-3)
(Contact : AMP 1-175218-5)

Note) Both connectors CPD1(IN) and CPD1(OUT) are same specification. And there is not indication of (IN) and (OUT) on the PCB.

Note) Power supply for the I/O module must not turn off at operation. If +24V is turned off at operation, CNC happen to get system alarm(Communication alarm between CNC and I/O module). +24V for I/O module must be supplied before or same time CNC power on. And +24V for I/O module must be turned off after or same time CNC power off.

2.3 DI/DO Connector pin assignment

CE53

	A	B
01	0V	0V
02	N. C.	+24V
03	Xm+0. 0	Xm+0. 1
04	Xm+0. 2	Xm+0. 3
05	Xm+0. 4	Xm+0. 5
06	Xm+0. 6	Xm+0. 7
07	Yn+0. 0	Yn+0. 1
08	Yn+0. 2	Yn+0. 3
09	Yn+0. 4	Yn+0. 5
10	Yn+0. 6	Yn+0. 7
11	Yn+1. 0	Yn+1. 1
12	Yn+1. 2	Yn+1. 3
13	Yn+1. 4	Yn+1. 5
14	Yn+1. 6	Yn+1. 7
15	Yn+2. 0	Yn+2. 1
16	Yn+2. 2	Yn+2. 3
17	Yn+2. 4	Yn+2. 5
18	Yn+2. 6	Yn+2. 7
19	KYD0	KYD1
20	KYD2	KYD3
21	KYD4	KYD5
22	KYD6	KYD7
23	KCM1	KCM2
24	KCM3	KCM4
25	DOCOM	DOCOM

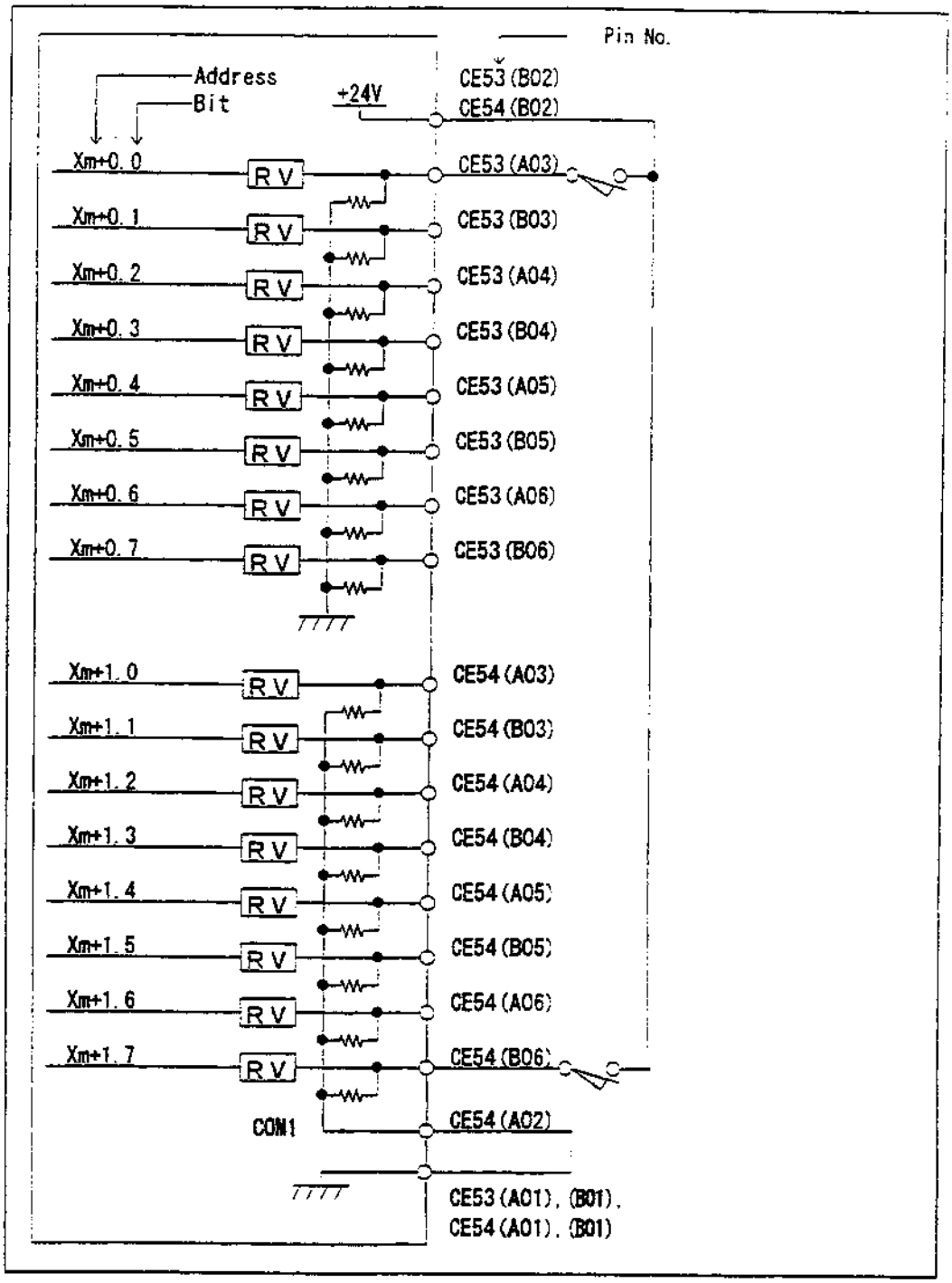
CE54

	A	B
01	0V	0V
02	COM1	+24V
03	Xm+1. 0	Xm+1. 1
04	Xm+1. 2	Xm+1. 3
05	Xm+1. 4	Xm+1. 5
06	Xm+1. 6	Xm+1. 7
07	Yn+3. 0	Yn+3. 1
08	Yn+3. 2	Yn+3. 3
09	Yn+3. 4	Yn+3. 5
10	Yn+3. 6	Yn+3. 7
11	Yn+4. 0	Yn+4. 1
12	Yn+4. 2	Yn+4. 3
13	Yn+4. 4	Yn+4. 5
14	Yn+4. 6	Yn+4. 7
15	Yn+5. 0	Yn+5. 1
16	Yn+5. 2	Yn+5. 3
17	Yn+5. 4	Yn+5. 5
18	Yn+5. 6	Yn+5. 7
19	Yn+6. 0	Yn+6. 1
20	Yn+6. 2	Yn+6. 3
21	Yn+6. 4	Yn+6. 5
22	Yn+6. 6	Yn+6. 7
23	KCM5	KCM6
24	KCM7	DOCOM
25	DOCOM	DOCOM

Connector spec. for flat cable : A02B-0120-K342 (HIROSE HIFBB-50D-2.54R) 50 contacts
Wire spec. for flat cable : A02B-0120-K886 (50wires 61m)

2.4 DI(Normal input signal) Connection

○16 points



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(2.4 DI(Normal input signal) connection continuing)

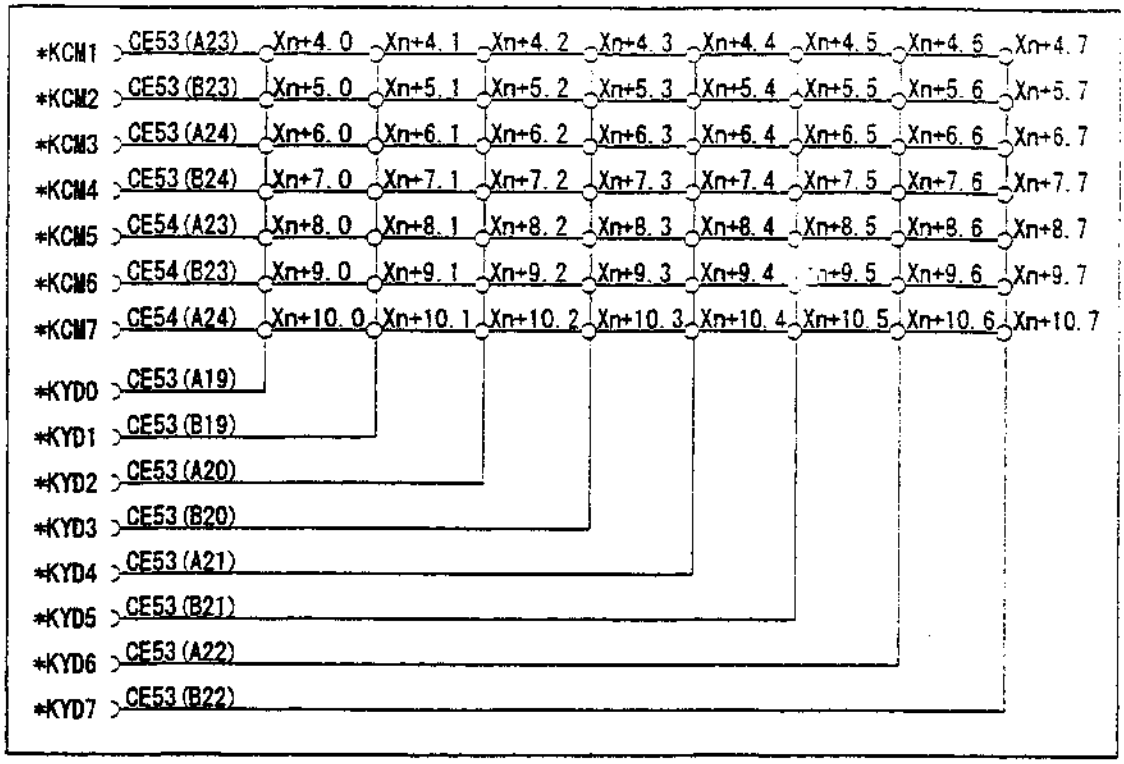
Note) Xm+1.0～Xm+1.7 have a common line which is possible to select the source/sink type. If COM1(CE54-A02pin) is connected to +24V, the DI signal logic is negative. But in this connection, if the DI signal wires happen to drop the ground level, the status of the DI signal is same as the DI signal is "ON". From the safety viewpoint, COM1 (CE54-A02pin) should be connected 0V.

Note) From the safety viewpoint, Emergency Stop signal must be assigned on the address Xm+0.0～Xm+0.7. As refer to the 5.2 DI/DO mapping, assign the Emergency stop DI.

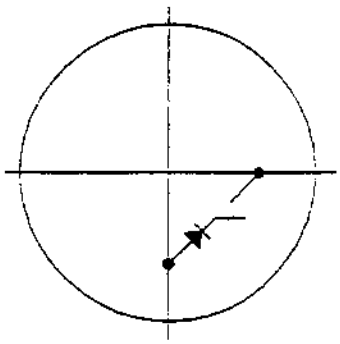
Note) Xm+0.0～Xm+0.7 common line are fixed. So, if these DI pins in this address open, the status of these one stay "0". And in case of Xm+1.0～Xm+1.7which have a selectable common line,
if the COM1(CE54-A02pin) is connected to 0V and these DI pins open, the status of these one stay "0". And if the COM1(CE54-A02pin) is connected to +24V and these DI pins open, the status of these one stay "1". And if the COM1(CE54-A02pin) is not connected to 0V or +24V and these DI pins open, the status of these one don't care.

3.5 DI(Matrix input signal) connection

○56 points



Note) Insert diode for preventing short cut current in all part of the switches as refer to the below figure. If the customer circuit does not have these diodes, you can not input more than two closed switches. If you input 3 or more closed switches, DI data may not be correct.



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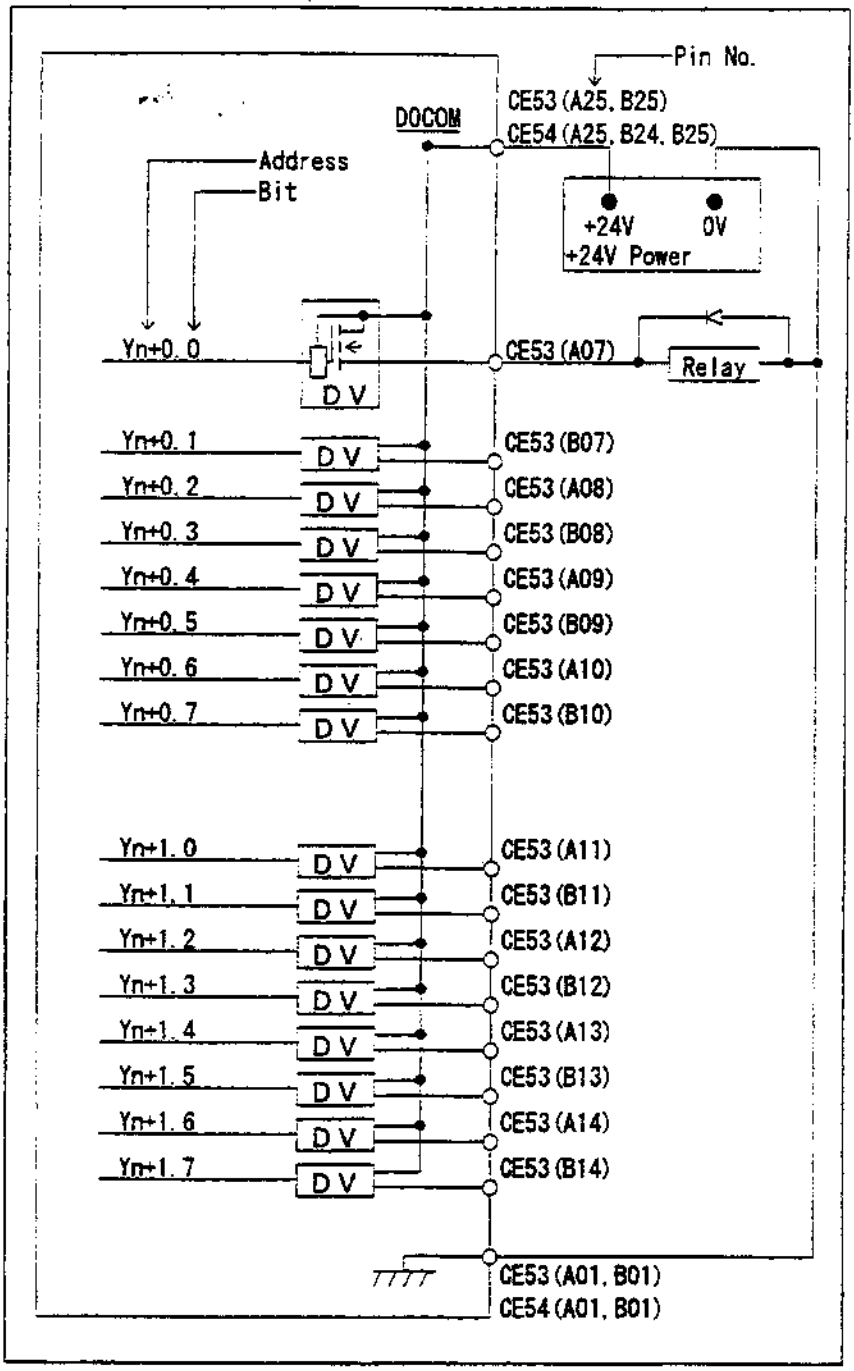
2.6 DO(Output signal) connection

○56 points



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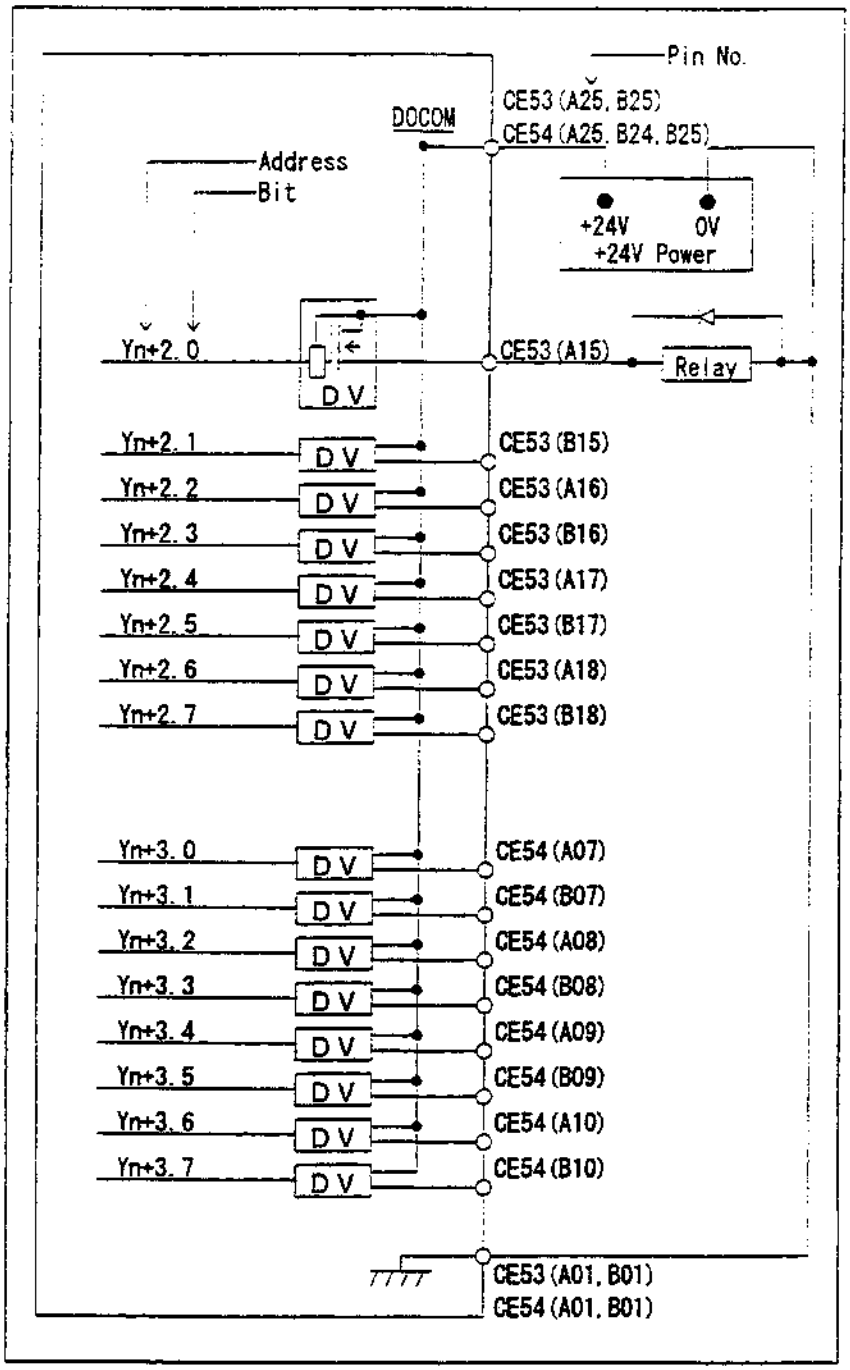

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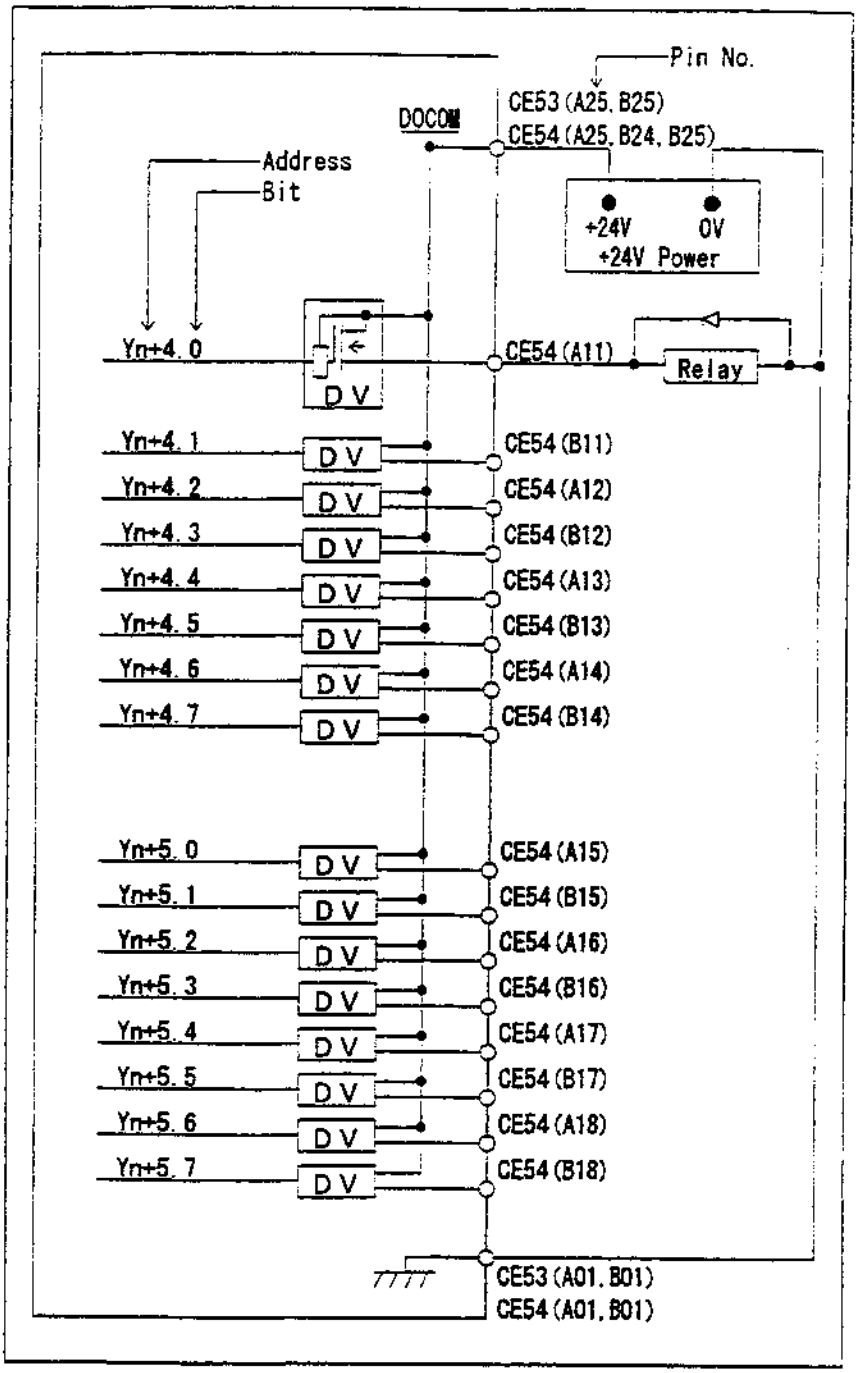

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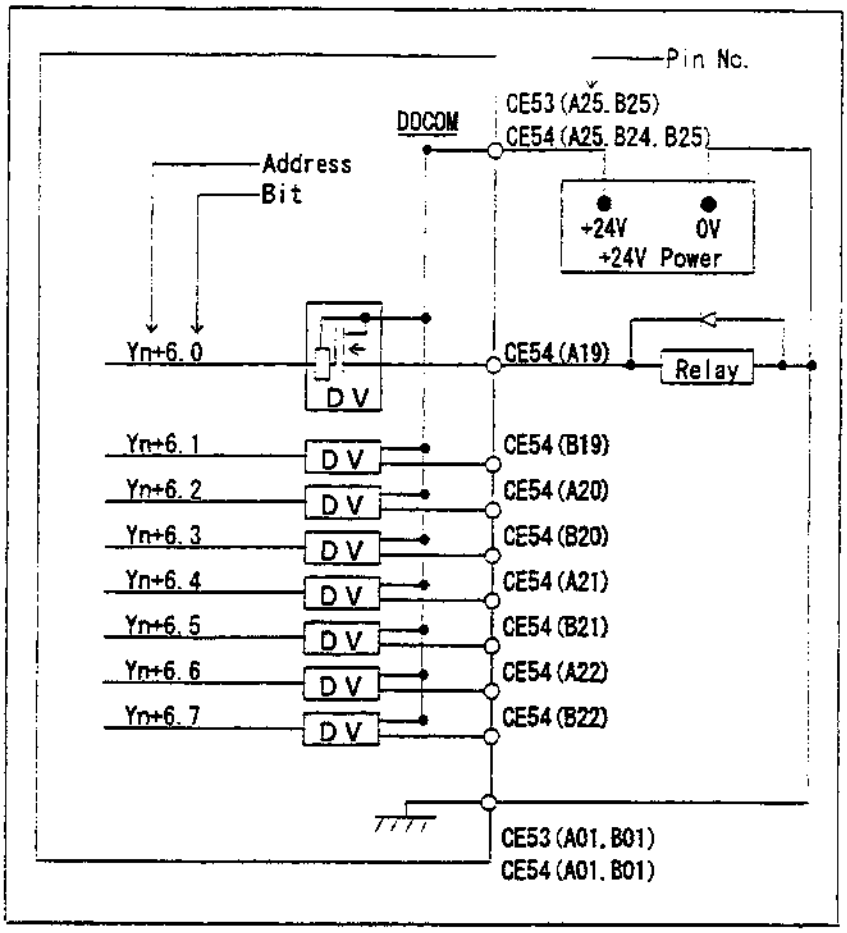

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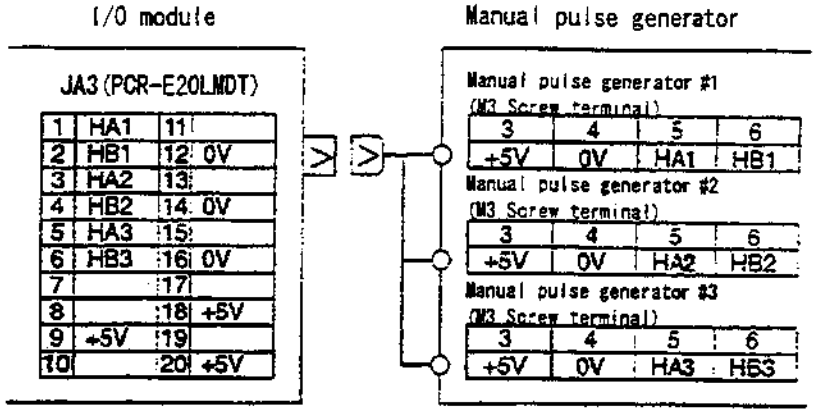
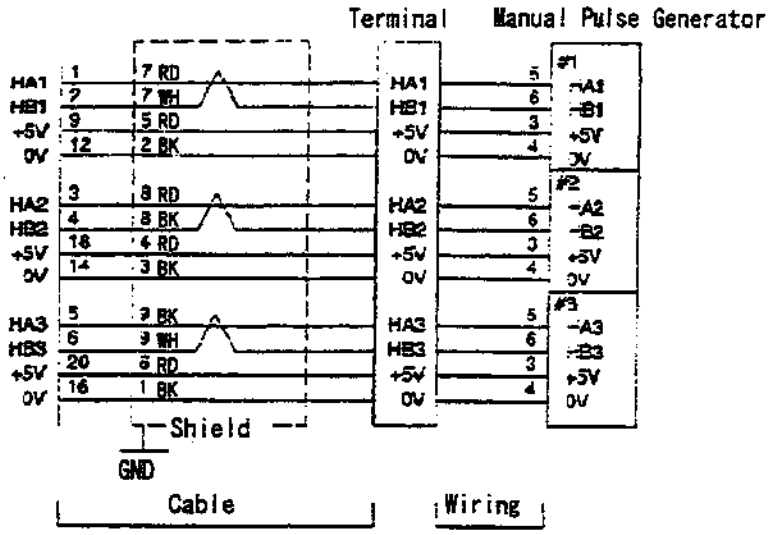
2.7 Manual Pulse Generator Connection

Example of the 3 Manual pulse Generator connection. i series CNC is only possible to use the MPG interface.



Wiring



Recommended wire material : A66L-0001-0286(#20AWG×6+#24AWG×3pairs)
Recommended connector : A02B-0120-K303(Including below connector and case)
(Connector : HIROSE FI40-2015S Soldering type)
(Case : HIROSE FI40-20-CV5)

Recommended cable : A02B-0120-K841(7m) (MPG 3 units)
A02B-0120-K848(7m) (MPG 2 units)
A02B-0120-K847(7m) (MPG 1 unit)
(These cables don't include the wiring part in the figure.)

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Note) Calculate the MPG cable max. length as refer to the following calculation.

MPG needs a DC5V power supply and the voltage must be less than 0.2V dropping.
(the 0.2V dropping includes the resistance in the cable.)

$$0.2 \geq \frac{0.1 \times R \times 2L}{m}$$

0.1 : MPG power supply current 0.1A
R : Resistance per wire length(Ω/m)
m : Wire Number(Both 0V and 5V)
L : Cable length(m)

Because

$$L \leq \frac{m}{R}$$

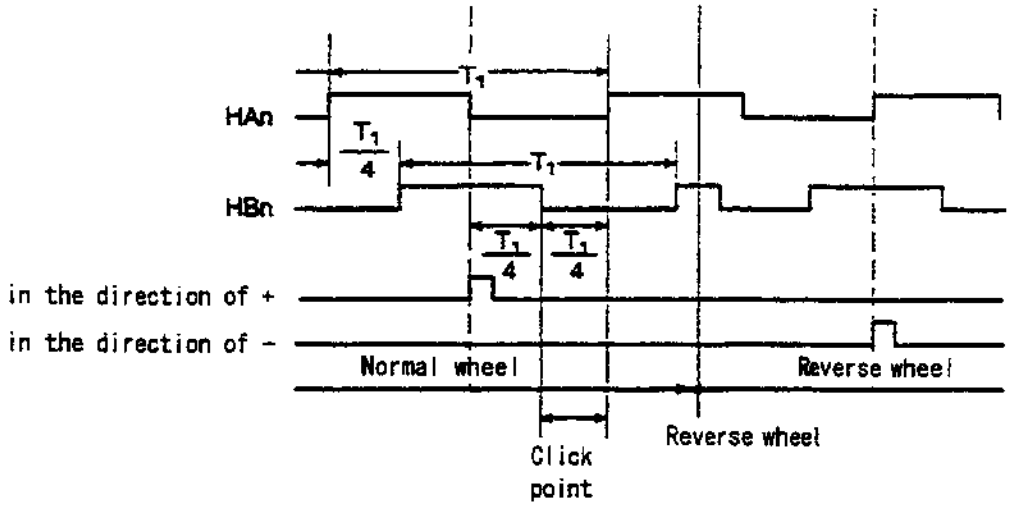
Example: In case of cable A66L-0001-0286
It has 3 pairs signal wires and 6 power line wires(20/0.18, 0.0394 Ω/m).
If the cable is used and each 3 wires are used for 0V and 5V power line, then max. cable length is as follows.

$$L \leq \frac{3}{0.0394} = 76.75(m)$$

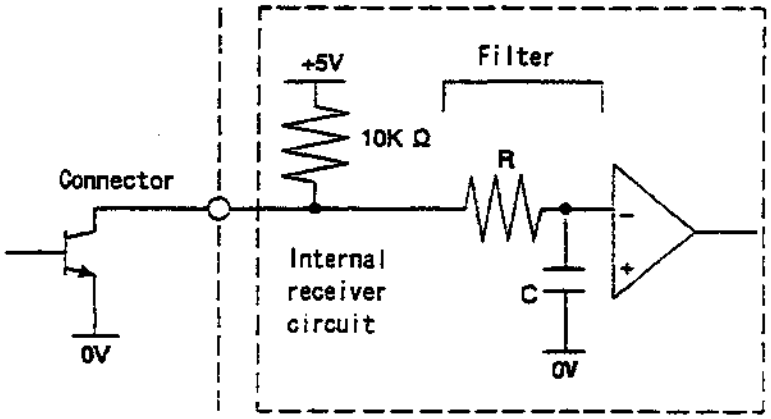
The answer is 76.75m, if MPG unit is 1.
(But FANUC decide any cable must be less than 50m.)
The answer is 38.37m, if MPG units are 2.
The answer is 25.58m, if MPG units are 3.

If the customer will use a some other vender's MPG ,not FANUC's MPG, the electrical condition must be as follows.

HAn, HBn signals form MPG and CNC internal pulse are as follows. A cycle of the HA/HB pulse T_1 must be more than 200 μ sec and $4/T_1$ must be more than 50 μ sec.

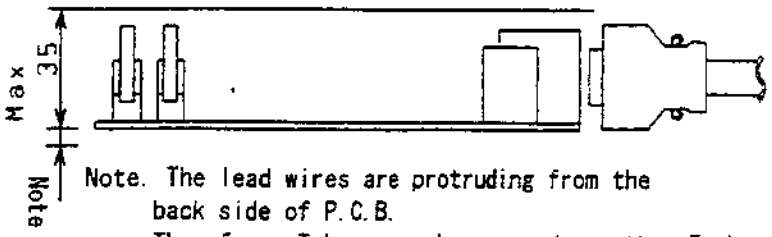


And the receiver circuit is as follows.

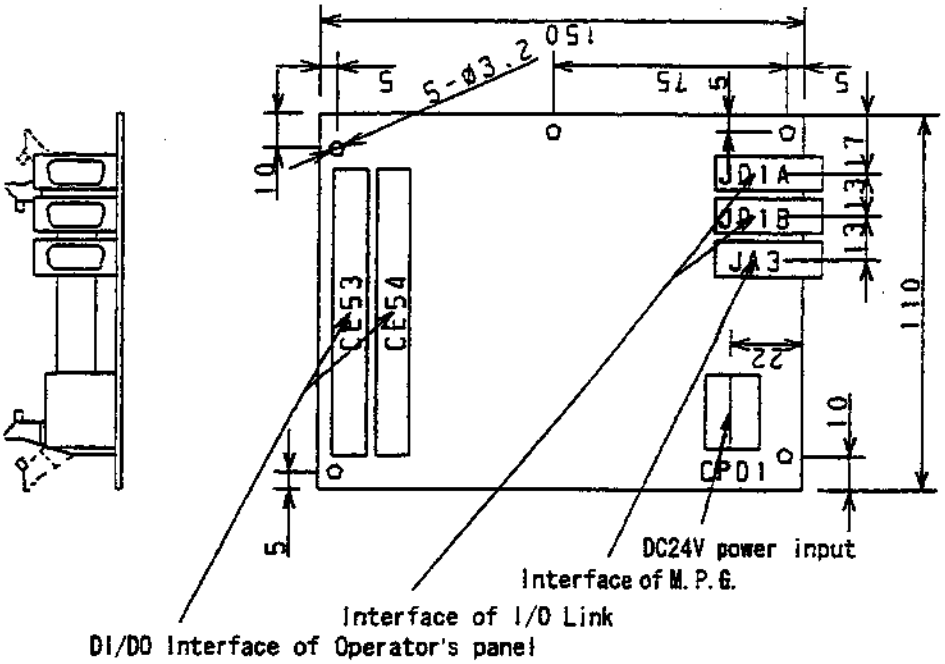


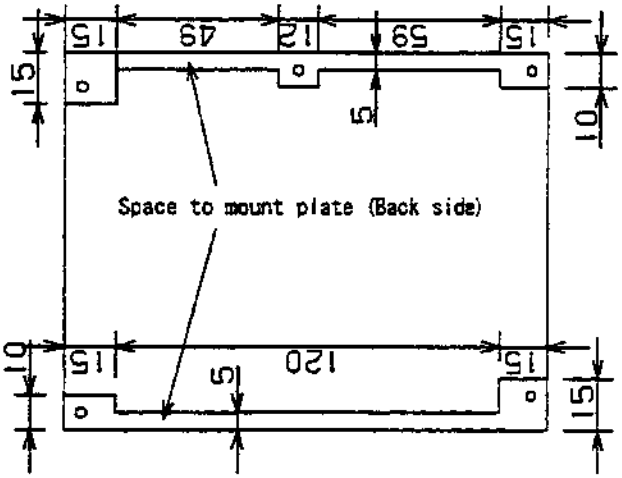
V_{IH},V_{IL} level at Connector pin
If Vin low to high, V_{IH} must be higher than 3.7V.
If Vin high to low, V_{IL} must be lower than 1.5V.

3. Module outline



Note. The lead wires are protruding from the back side of P.C.B.
Therefore, Take enough space. (more than 5mm)





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4. Specification

4.1 Environmental Requirement

③	Temperature around a cabinet around a unit	At operation 0℃～~~55℃~~58℃ Storing or transporting -20℃～60℃
	Temperature variance	Max. 1.1℃/min
	Humidity	Normally 75% or less (Relative humidity) Short time(Within one month) 95% or less (Relative humidity)
	Vibration	Operating 0.5G or less
	Atmosphere	Normal FA atmosphere(Consult us when using the system under environments with higher degree of dust, coolant, or organic solution.)
③	Other condition	(1) Use the I/O module in a cabinets that is always completely closed. ~~(2) It must be designed temperature rise within the cabinet shall be 10℃ or less of the open air.~~

4.2 Order specification

Name	Specification	Note
I/O module for Operator's panel	A20B-2002-0470	Normal DI : 16 points Matrix DI : 56 points DO : 56 points With MPG interface
Fuse(Spare part)	A03B-0815-K001	1A

4.3 Module specification

Item	Specification	Note
Normal DI points	16 points	24V type input
Matrix DI points	56 points(8×7)	5V type input
DO points	56 points	24V and source type output
Interface to CNC	FANUC I/O-Link connection	Max. 16 modules or total points max. 1024/1024 will be available.
MPG interface	Max. 3 units	i series is only available.

4.4 Power supply specification

Module	Voltage	Capacity	Note
I/O module for Operator's panel	DC24V±10% (from Power connector CPD1) (including momentary values)	0.35A	including all DI consumption No including DO consumption

4.5 DI(Input signal definition)

(Normal input signal)

Capacity	DC30V, 16mA or nigher
Intercontact leakage current in closed circuit	1mA or less(at 26.4V)
Intercontact voltage drop in closed circuit	2V or less(including the voltage drop in the cables)
Delay time	Delay time of receiver IC : 2ms(MAX) Need to consider about the serial communication (I/O-Link)delay between CNC and I/O module 2ms(MAX)+Scan cycle of ladder(Scan cycle is different each CNCs).

(Matrix input signal)

Capacity	DC6V, 2mA or higher
Intercontact leakage current in closed circuit	0.2mA or less(at 6V)
Intercontact voltage drop in closed circuit	0.9V or less(at 1mA)
Delay time	Matrix scan cycle 16ms(MAX)+Serial communication (I/O-Link)delay between CNC and I/O module 2ms(MAX)+Scan cycle of ladder(Scan cycle is different each CNCs).

Note) Intercontact voltage drop in closed circuit must be 0.9V or less including drop of prevention diode.

4. 6 DO(Output signal definition)

Maximum load current when driver in ON	200mA (including momentary values)
Saturation voltage when driver is ON	1V(MAX) (When 200mA loaded)
Withstand voltage	24V+20% (including momentary values)
Leakage current when driver is OFF	20 μ A or less
Delay time	Delay time of driver IC : 50 μ s(MAX) Need to consider about the serial communication (I/O-Link)delay between CNC and I/O module 2ms(MAX)+Scan cycle of ladder(Scan cycle is different each CNCs).

Note) One of DOCOM pin must be less than 0.7A.

5. Other notices

5.1 DO signal action when system alarm is happened

If a CNC using the I/O module will happen system alarm or comunication alarm between CNC and the I/O module, all DOs in the module will turn off. These situation should be understood. And also same situation happens when the power off.

5.2 DI/DO mapping

I/O address map is as follows.

DI map

Xm	Normal input
Xm+1	
Xm+2	Reserve
Xm+3	
Xm+4	Matrix input
Xm+5	
Xm+6	
Xm+7	
Xm+8	
Xm+9	
Xm+10	
Xm+11	Reserve
Xm+12 (MPG 1 unit)	MPG
Xm+13 (MPG 2 unit)	
Xm+14 (MPG 3 unit)	
Xm+15 (DO alarm)	DO alarm

DO map

Yn	Output signal
Yn+1	
Yn+2	
Yn+3	
Yn+4	
Yn+5	
Yn+6	
Yn+7	Reserve

DI mapping should be assigned 1 group, 16 byte mapping and DO mapping should be assigned 1 group, 8 byte mapping. The reason is as follows.

MPG interface(the counter for MPG) uses Xm+12~Xm+14 area and it fixes. And if MPG interface will be used, Xm+12~Xm+14 area must be assigned. And in case of i series and using MPG interface, DI mapping must be assigned 16 byte mapping. MPG counter area are directly processed by CNC software. So you must not use the area by customer ladder.

There are DO alarm(over current, over heat) indication area in Xm+15. (Refer to the 5.5 DO(Output detection of DO signals) Also this area fixes in Xm+15. And if this area will be used, this area must be assigned. So in case of using this area, DI mapping must be assigned 16 byte mapping.

(5.2 DI/DO mapping continueing)

It is possible to assign any address for the I/O module. But in DI address, Each CNC have some fixed address that is directly processed by CNC software. So, as refer to the following mention, assign the DI mapping.

Directly processed address by CNC(in case of FS18,16)

	7	6	5	4	3	2	1	0
X0004	SKIP#1	ESKIP	-MIT2#1	+MIT2#1	-MIT1#1	+MIT1#1	ZAE#1	XAE#1
		SKIP6#1	SKIP5#1	SKIP4#1	SKIP3#1	SKIP2#1	SKIP8#1	SKIP7#1
	SKIP#1	ESKIP	SKIP5#1	SKIP4#1	SKIP3#1	ZAE#1	YAE#1	XAE#1
		SKIP6#1				SKIP2#1	SKIP8#1	SKIP7#1
X0005								
X0006								
X0007		*DEC7#2	*DEC6#2	*DEC5#2	*DEC4#2	*DEC3#2	*DEC2#2	*DEC1#2
X0008				*ESP				
X0009		*DEC7#1	*DEC6#1	*DEC5#1	*DEC4#1	*DEC3#1	*DEC2#1	*DEC1#1
X0010								
X0011								
X0012								
X0013	SKIP#2	SKIP6#2	-MIT2#2	+MIT2#2	-MIT1#2	+MIT1#2	ZAE#2	XAE#2
			SKIP5#2	SKIP4#2	SKIP3#2	SKIP2#2	SKIP8#2	SKIP7#2
	SKIP#2	SKIP6#2	SKIP5#2	SKIP4#2	SKIP3#2	ZAE#2	YAE#2	XAE#2
						SKIP2#2	SKIP8#2	SKIP7#2

#1 means the signales in 1st path. #2 means the signals in 2nd path. And up column means the T series signals and down column means the M series signals.

(5.2 DI/DO mapping continueing)

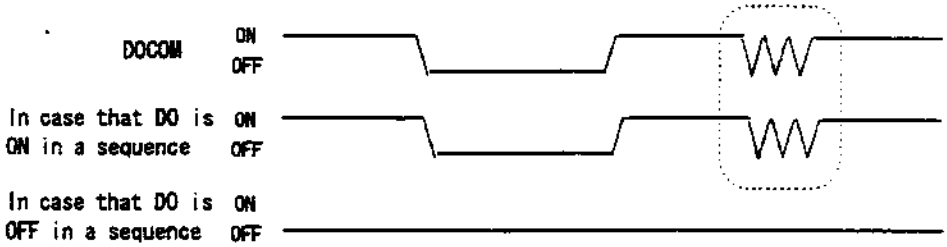
In case of 16 byte mapping start from X0008 - for DI area

X0008	Normal input	←*ESP fixed signal
X0009		←*DECn#1 fixed signals
X0010	Reserve	
X0011		
X0012	Matrix input	
X0013		
X0014		
X0015		
X0016		
X0017		
X0018		
X0019	Reserve	
X0020 (MPG 1unit)	MPG	
X0021 (MPG 2 unit)		
X0022 (MPG 3 unit)		
X0023 (DO alarm)	DO alarm	

In case of mapping form X0008. SKIP signals can not be used, but *DECn#1 singales which are address fixed signales can be used any time.
And *ESP signal can be placed at +24V common fixed address.(Don't map the *ESP signal matrix DI area.)

5.3 DO action when the DO Power(DOCOM) ON/OFF

If each DOCOM(Power supply for DO signals) are OFF, each DO will be all OFF per module unit. In this case, DO signal waveform is as follows.



Note) In case that DO is ON in a sequence, DO signal output same as DOCOM state like in a doted line in the figure.

Note) Power supply for I/O module (+24V) must not turn off at operation. If +24 is turned off at operation, CNC happen to get system alarm(Communication alarm between CNC and I/O module). +24V for I/O module must be supplied before or same time CNC power on.
And +24V for I/O module must be turn off after or same time CNC power off.

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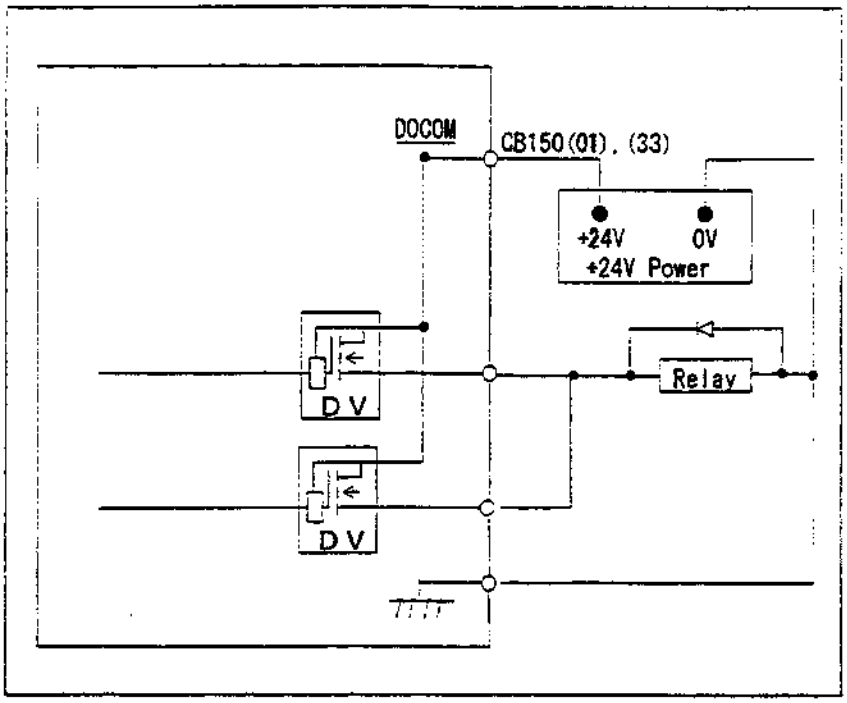
5.4 Parallel connection of DO signals

If DO signals are connected in parallel like a figure and controlled same ON/OFF timing in the ladder, that DO shall be output max. 400mA(twice a normal load). But remind that leakage current when driver is OFF is max. 40 μA(twice a normal leakage current).



5.5 Alarm detection of DO signals

This Module has DO drivers IC that can detect over load and over heat. This function will work for protection. if some cable happen to drop to the ground and increased load current, or DO driver gets so heat by some causes, DO driver protection circuit will work and DO will turn off per a driver IC unit(A unit is one byte) and the OFF state will continue till the cause is removed. In this case, CNC and I/O module are not no alarm and continue to work normally. But the I/O module indicate where DO driver detects alarm in address Xm+15.
The following table means relation between DO address and each bit in DI address Xm+15. If some bit is "1" in the address Xm+15, some relation DO driver detects alarm. So check the address Xm+15 in DGN display or make such a ladder processing the address.
Xm+15 will be useful for problem investigation and restoration.

Alarm detection address and bit	DO address	Remarks
Xm+15.0	Yn+0	
Xm+15.1	Yn+1	
Xm+15.2	Yn+2	
Xm+15.3	Yn+3	
Xm+15.4	Yn+4	
Xm+15.5	Yn+5	
Xm+15.6	Yn+6	
Xm+15.7	Yn+7	Reserve

SECTION 4:
48 / 32 POINTS I/O MODULE

This section contains:

- **Drawing No. A-73233E/01 for I/O Modules:**
  - **A20B-2002-0520 (with MPG).**
  - **A20B-2002-0521 (without MPG).**

Note

I/O points are not multiplexed.

48/32 points I/O Module Connection Manual

-Item-

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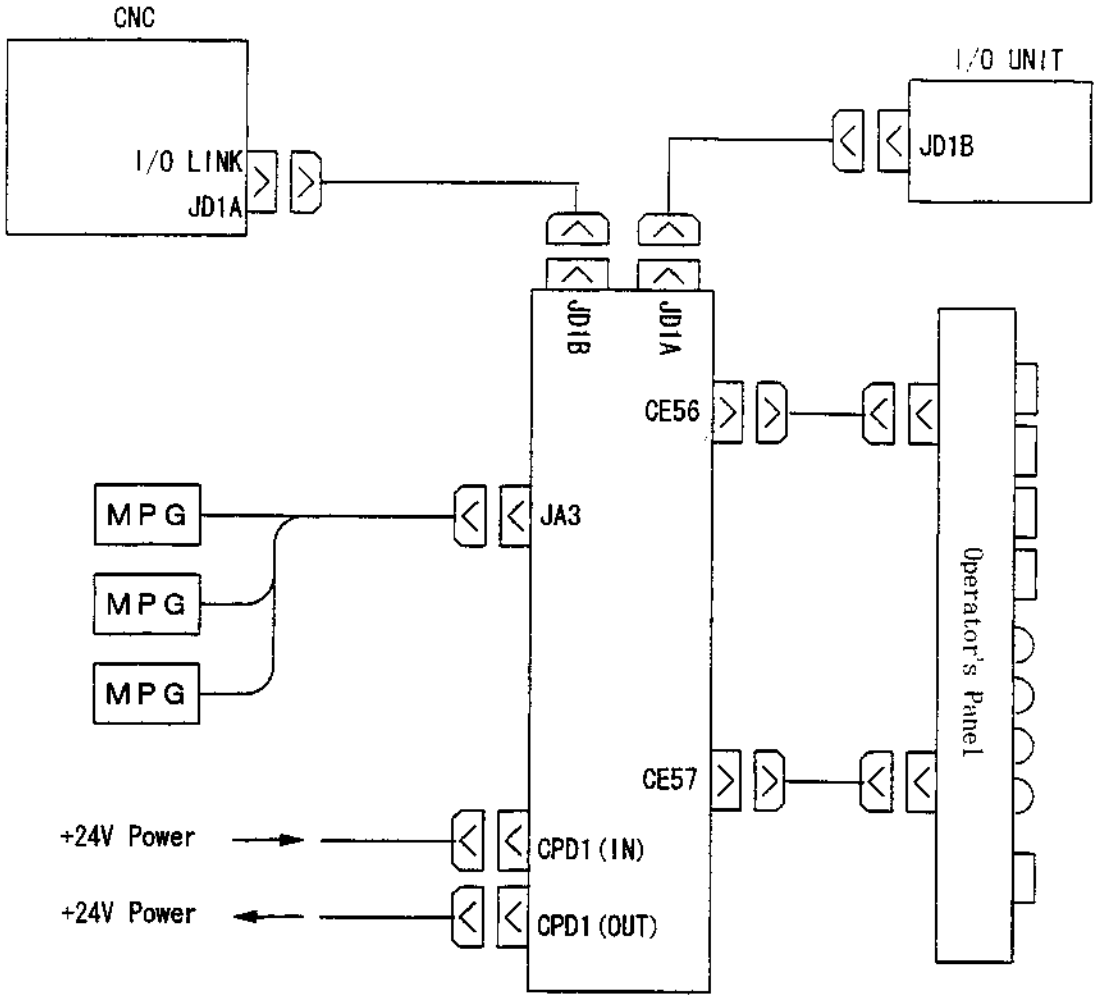
1. Total Connection diagram



Note) i series CNC is only possible to use the MPG interface on this I/O module.
If i series CNC uses some I/O unit having MPG interface (ex. Dispersional type I/O module for Operator's panel) and this I/O module, the MPG interface nearest the CNC is only available
on the I/O-Link connection.

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2. Each connections

2.1 I/O-Link Connection

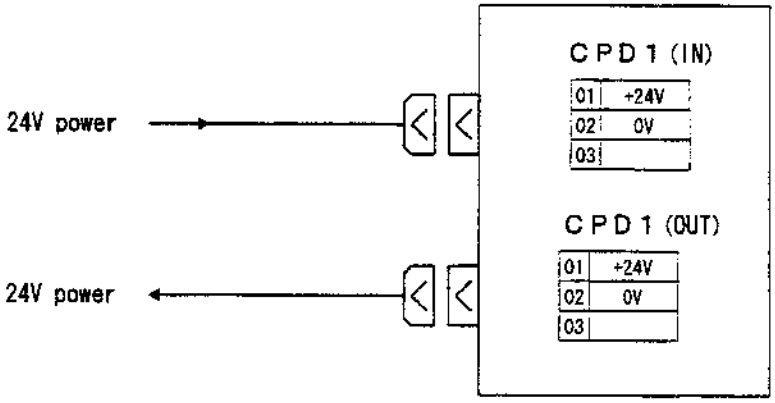
Refer to each CNC connection Manual, all I/O-Link connection methods are in common. But it is not possible to use the below connectors which will be used for the main board of the i Series.

Not avairable connectors for the 48/32 points I/O Module

	Specification	Maker
Connector Housing	FI-20-CV7	HIROSE
Connector Housing and Connector	FI30-20S-CV7	HIROSE

2.2 Power supply connection

Supply a power form the connector CPD1(IN). That is for the PCB activity and all DI power. And the PCB has connector CPD1(OUT). It will be useful for branching off the power. The power supplied form CPD1(IN) is through the PCB and output form CPD1(OUT).



Recommended connector for cable :A02B-0120-K324
(Including below connector and case)
(Housing : AMP 1-178288-3)
(Contact : AMP 1-175218-5)

Note) Both connectors CPD1(IN) and CPD1(OUT) are same specification. And there is not indication of (IN) and (OUT) on the PCB.

Note) Power supply for the I/O module must not turn off at operation. If +24V is turned off at operation, CNC happen to get system alarm(Communication alarm between CNC and I/O module). +24V for I/O module must be supplied before or same time CNC power on. And +24V for I/O module must be turned off after or same time CNC power off.

2.3 DI/DO Connector pin assignment

CE56

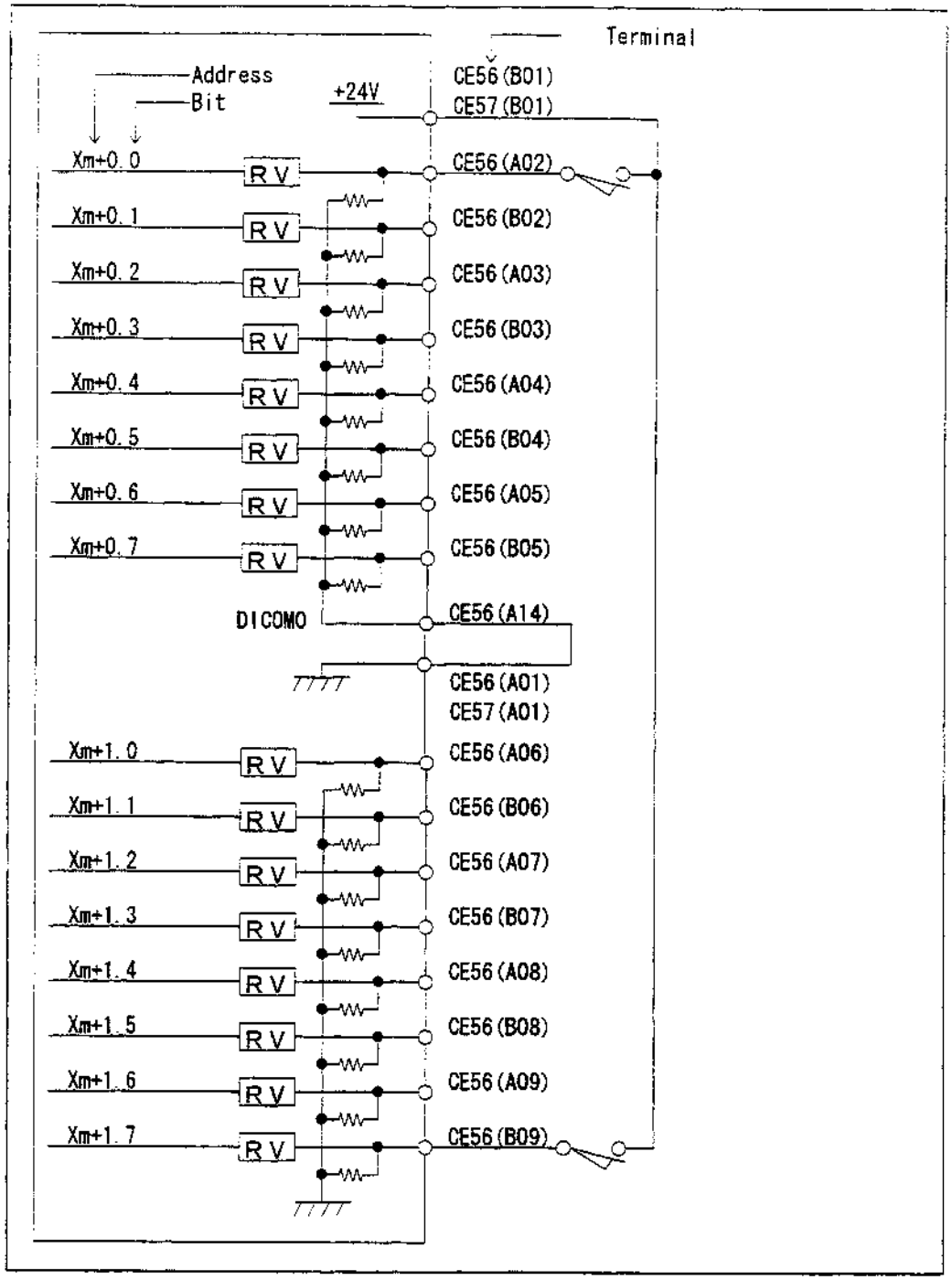
	A	B
01	0V	+24V
02	Xm+0.0	Xm+0.1
03	Xm+0.2	Xm+0.3
04	Xm+0.4	Xm+0.5
05	Xm+0.6	Xm+0.7
06	Xm+1.0	Xm+1.1
07	Xm+1.2	Xm+1.3
08	Xm+1.4	Xm+1.5
09	Xm+1.6	Xm+1.7
10	Xm+2.0	Xm+2.1
11	Xm+2.2	Xm+2.3
12	Xm+2.4	Xm+2.5
13	Xm+2.6	Xm+2.7
14	DICOM0	
15		
16	Yn+0.0	Yn+0.1
17	Yn+0.2	Yn+0.3
18	Yn+0.4	Yn+0.5
19	Yn+0.6	Yn+0.7
20	Yn+1.0	Yn+1.1
21	Yn+1.2	Yn+1.3
22	Yn+1.4	Yn+1.5
23	Yn+1.6	Yn+1.7
24	DOCOM	DOCOM
25	DOCOM	DOCOM

CE57

	A	B
01	0V	+24V
02	Xm+3.0	Xm+3.1
03	Xm+3.2	Xm+3.3
04	Xm+3.4	Xm+3.5
05	Xm+3.6	Xm+3.7
06	Xm+4.0	Xm+4.1
07	Xm+4.2	Xm+4.3
08	Xm+4.4	Xm+4.5
09	Xm+4.6	Xm+4.7
10	Xm+5.0	Xm+5.1
11	Xm+5.2	Xm+5.3
12	Xm+5.4	Xm+5.5
13	Xm+5.6	Xm+5.7
14		DICOM5
15		
16	Yn+2.0	Yn+2.1
17	Yn+2.2	Yn+2.3
18	Yn+2.4	Yn+2.5
19	Yn+2.6	Yn+2.7
20	Yn+3.0	Yn+3.1
21	Yn+3.2	Yn+3.3
22	Yn+3.4	Yn+3.5
23	Yn+3.6	Yn+3.7
24	DOCOM	DOCOM
25	DOCOM	DOCOM

Connector spec. for flat cable : A02B-0120-K342 (HIROSE HIFBB-50D-2.54R) 50 contacts
Wire spec. for flat cable : A02B-0120-K886 (50wires 61m)

2.4 DI(Input signal) Connection



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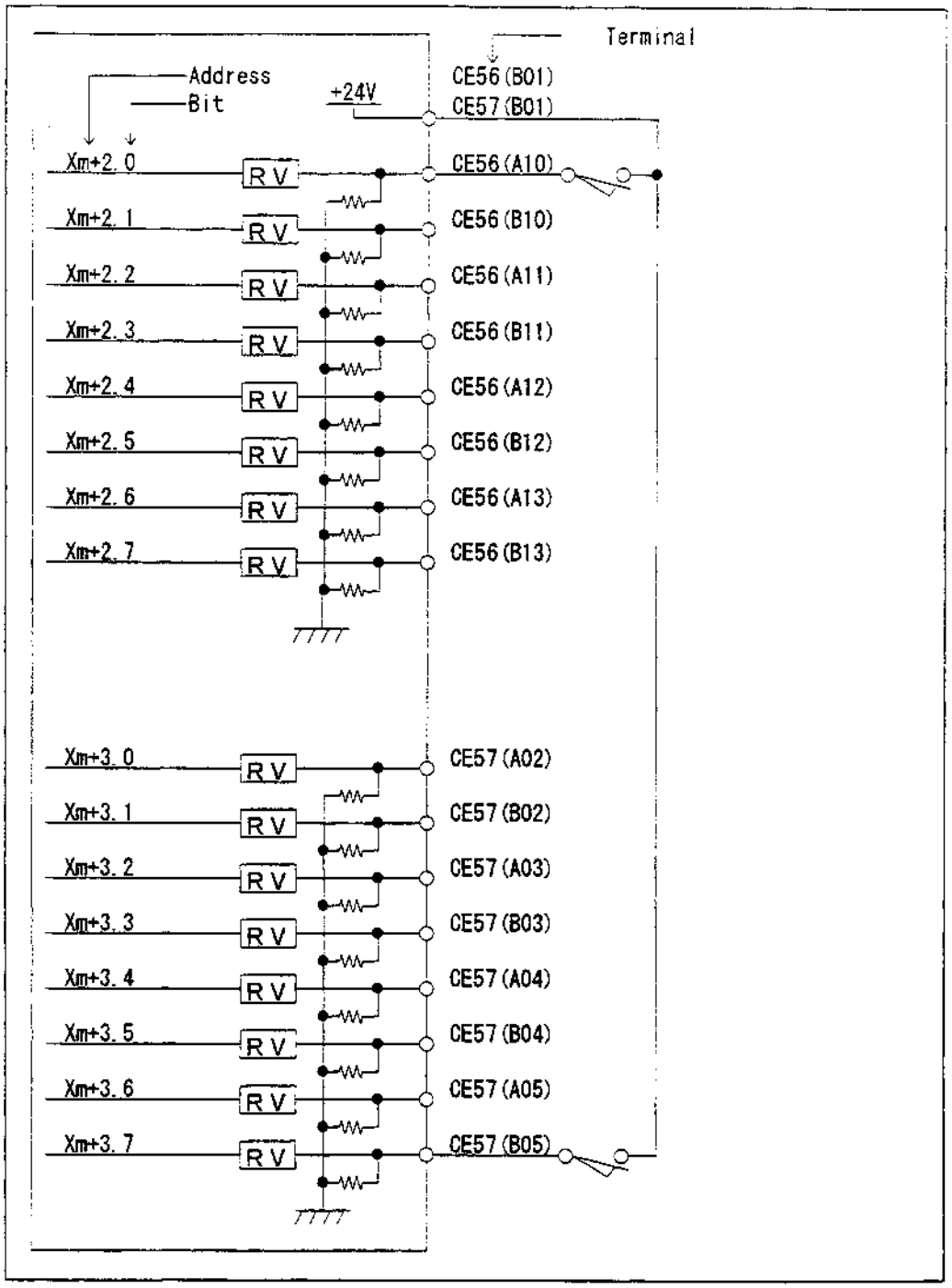

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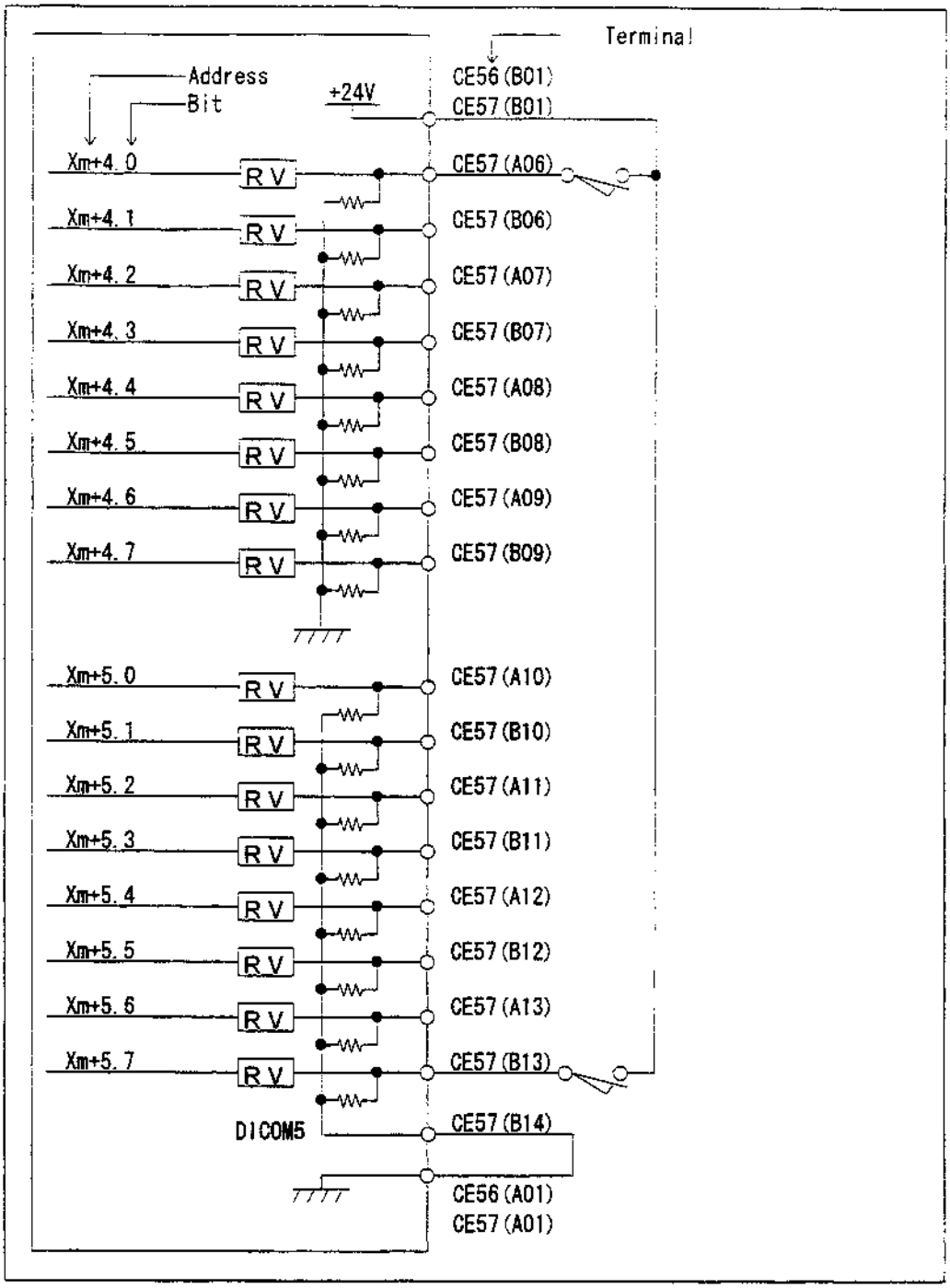

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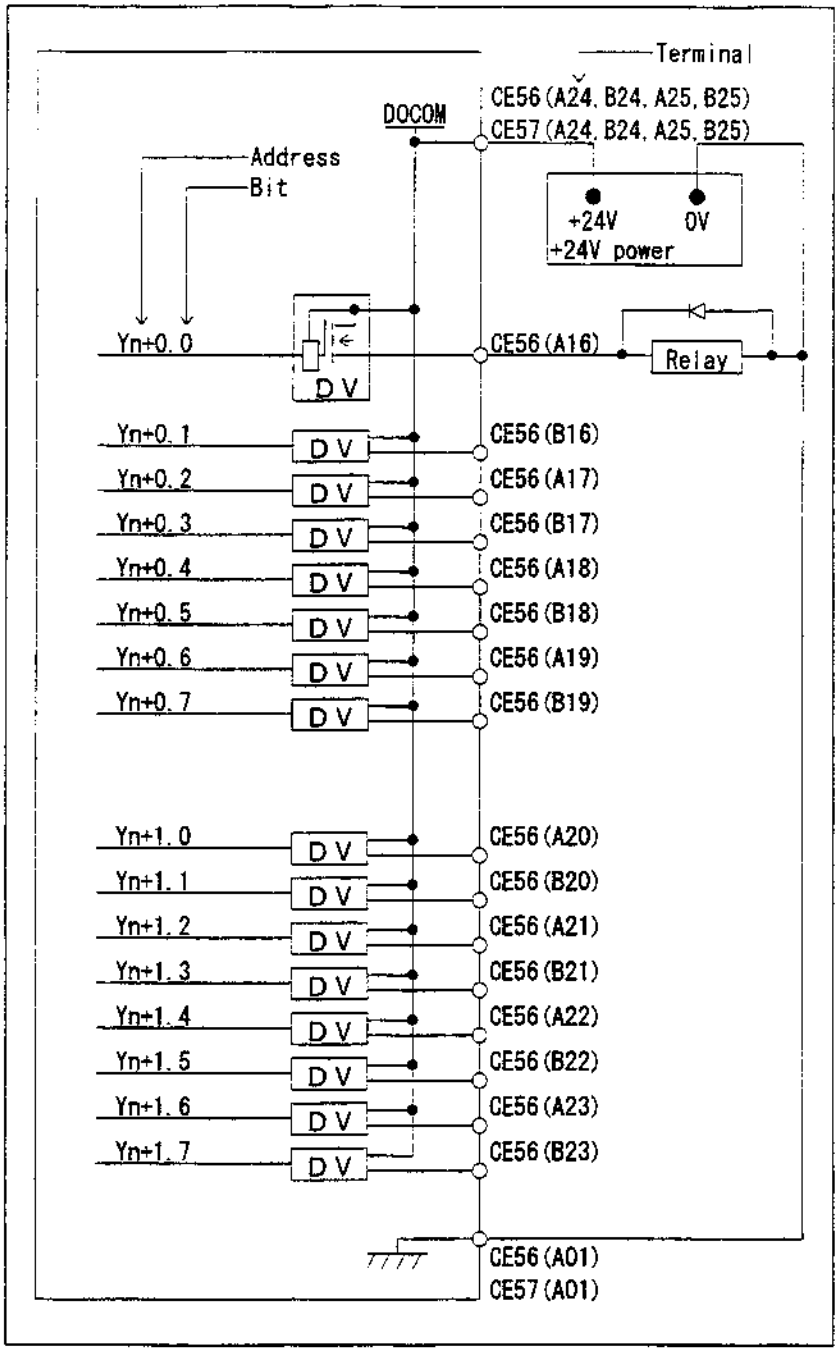
(2.4 DI(Input signal) connection continuing)

Note) Xm+0.0～Xm+0.7 and Xm+5.0～Xm+5.7 have a common line which are possible to select the source/sink type. If COM0(CE56-A14pin) and COM5(CE57-B14pin) are connected to +24V, the DI signal logic is negative. But in this connection, if the DI signal wires happen to drop the ground level, the status of the DI signal is same as the DI signal is "ON". From the safety viewpoint, COM0 and COM5 should be connected 0V.

Note) From the safety viewpoint, Emergency Stop signal must be assigned on the common fixed address. As refer to the 5.2 DI/DO mapping, assign the Emergency stop DI.

Note) As for the common fixed line, if these DI pins in this address open, the status of these one stay "0". And as for selectable common line, if the is connected to 0V and these DI pins open,
the status of these one stay "0". And if it is connected to +24V and these DI pins open, the status of these one stay "1". And if it is not connected to 0V or +24V and these DI pins open, the status of these one don't care.

2.5 DO(Output signal) connection



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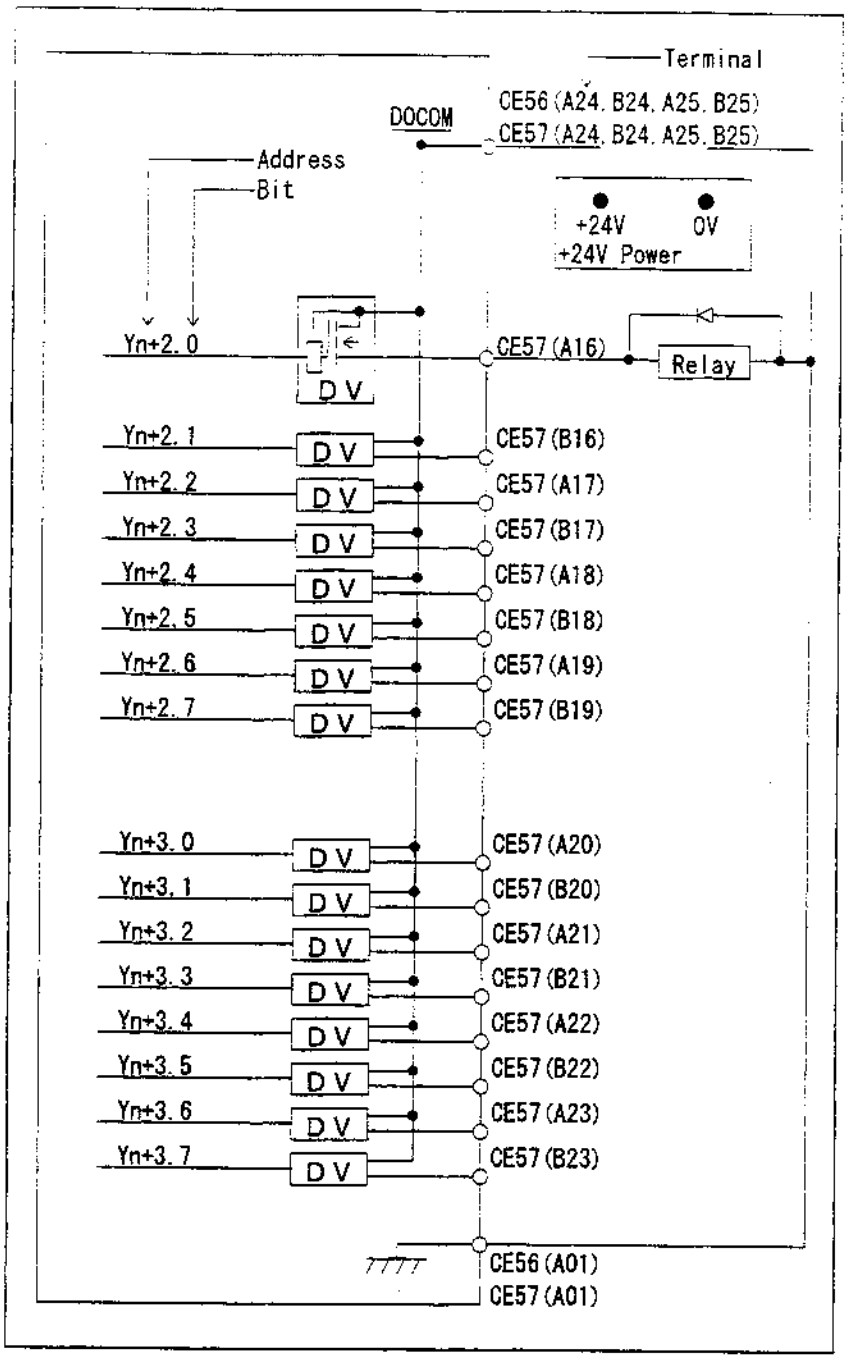

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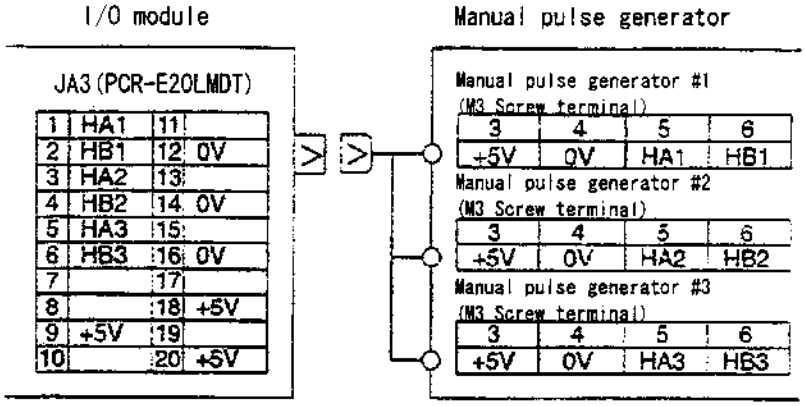
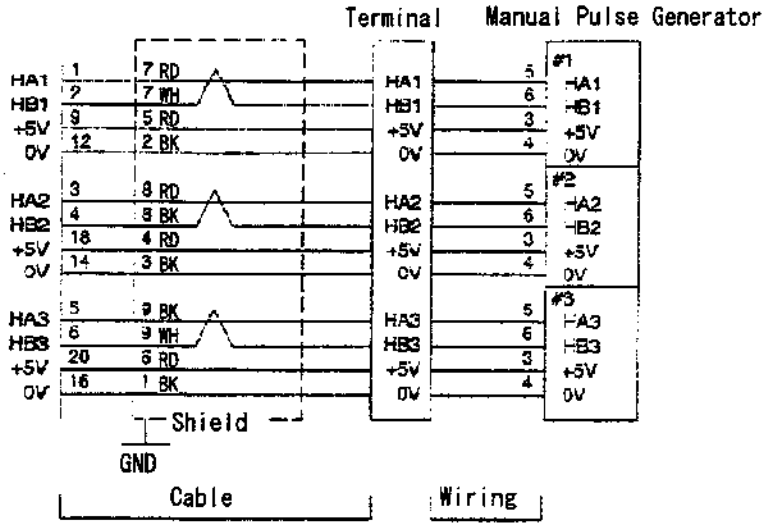
2.6 Manual Pulse Generator Connection

Example of the 3 Manual pulse Generator connection. i series CNC is only possible to use the MPG interface.



Wiring



Recommended wire material : A66L-0001-0286(#20AWG×6+#24AWG×3pairs)
Recommended connector : A02B-0120-K303(Including below connector and case)
(Connector : HIROSE FI40-2015S Soldering type)
(Case : HIROSE FI40-20-CV5)

Recommended cable : A02B-0120-K841(7m) (MPG 3 units)
A02B-0120-K848(7m) (MPG 2 units)
A02B-0120-K847(7m) (MPG 1 unit)
(These cables don't include the wiring part in the figure.)

Note) Calculate the MPG cable max. length as refer to the following calculation.

MPG needs a DC5V power supply and the voltage must be less than 0.2V dropping.
(the 0.2V dropping includes the resistance in the cable.)

$$0.2 \geq \frac{0.1 \times R \times 2L}{m}$$

0.1 : MPG power supply current 0.1A
R : Resistance per wire length(Ω/m)
m : Wire Number(Both 0V and 5V)
L : Cable length(m)

Because

$$L \leq \frac{m}{R}$$

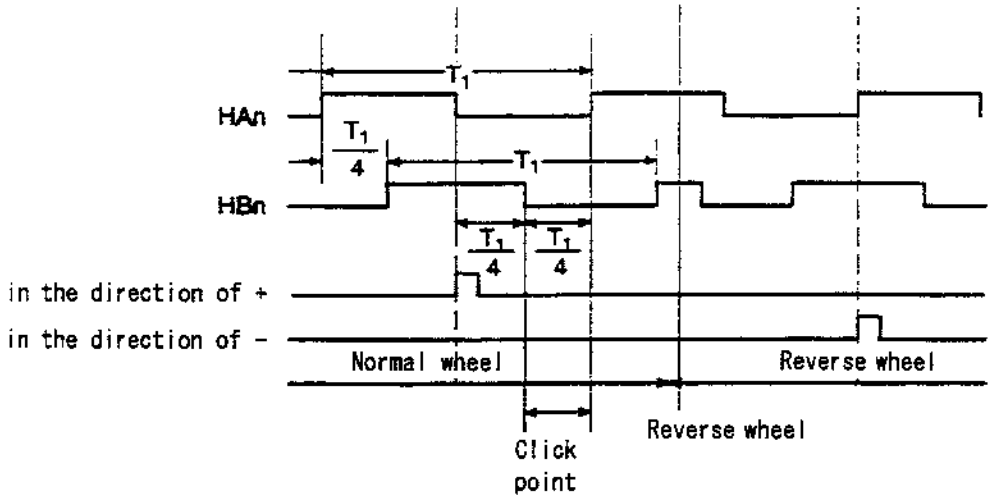
Example: In case of cable A66L-0001-0286
It has 3 pairs signal wires and 6 power line wires(20/0.18, 0.0394 Ω/m).
If the cable is used and each 3 wires are used for 0V and 5V power line, then max. cable length is as follows.

$$L \leq \frac{3}{0.0394} = 76.75(m)$$

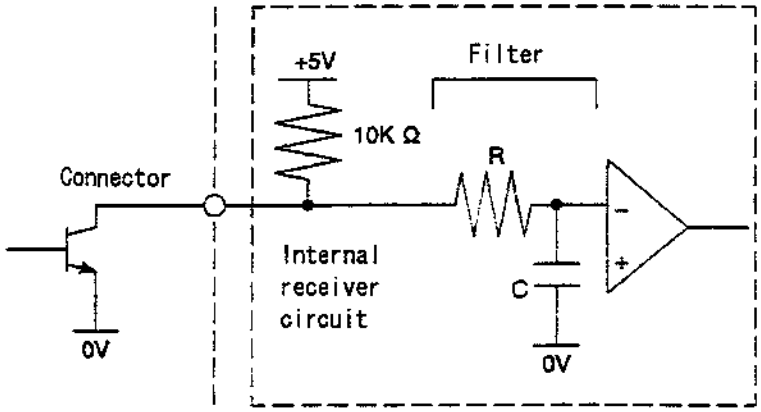
The answer is 76.75m, if MPG unit is 1.
(But FANUC decide any cable must be less than 50m.)
The answer is 38.37m, if MPG units are 2.
The answer is 25.58m, if MPG units are 3.

If the customer will use a some other vender's MPG ,not FANUC's MPG, the electrical condition must be as follows.

HAn, HBn signals form MPG and CNC internal pulse are as follows. A cycle of the HA/HB pulse T_1 must be more than 200 μ sec and 4/T, must be more than 50 μ sec.

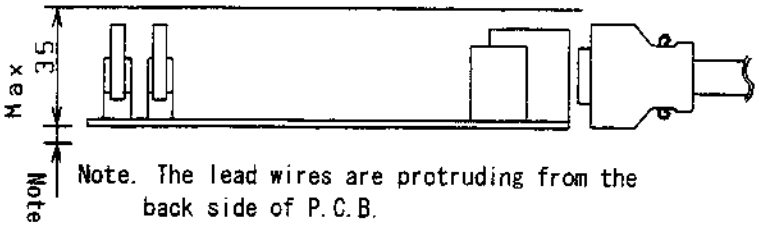


And the receiver circuit is as follows.

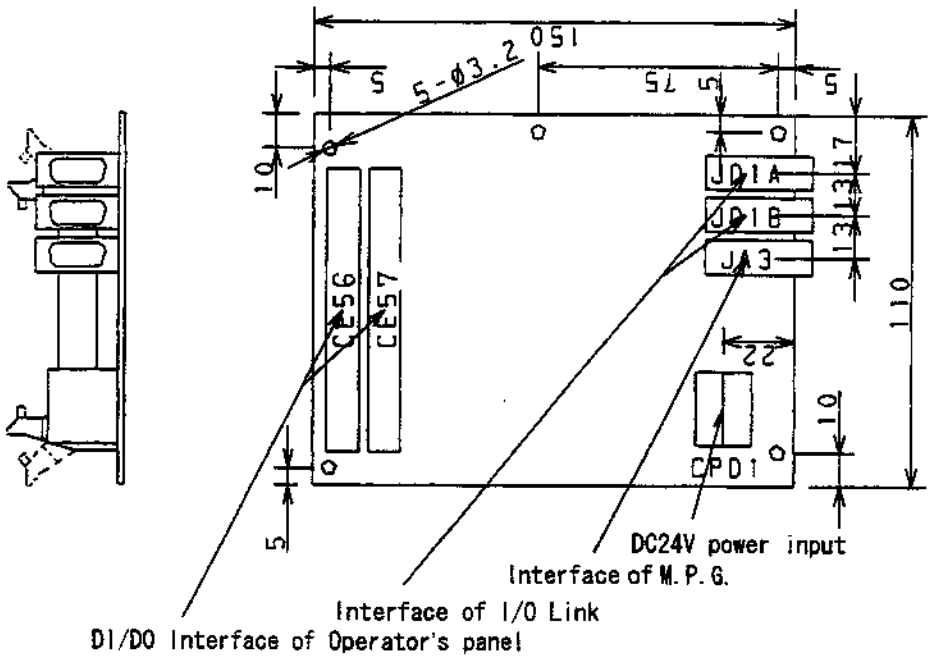


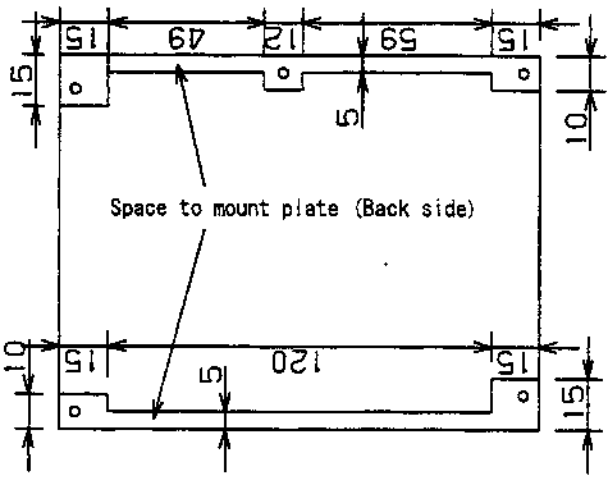
V_{IH},V_{IL} level at Connector pin
If Vin low to high, V_{IH} must be higher than 3.7V.
If Vin high to low, V_{IL} must be lower than 1.5V.

3. Module outline



Note. The lead wires are protruding from the back side of P.C.B.
Therefore, Take enough space. (more than 5mm)





				TITLE	48/32 points I/O Module Connection Manual
				DRAW. NO. A-73233E/01	CUST.
EDIT.	DATE	DESIG.	DESCRIPTION	FANUC LTD	SHEET 014/

4. Specification

4.1 Environmental Requirement

Temperature around a unit	At operation 0℃～58℃ Storing or transporting -20℃～60℃
Temperature variance	Max. 1.1℃/min
Humidity	Normally 75% or less (Relative humidity) Short time(Within one month) 95% or less (Relative humidity)
Vibration	Operating 0.5G or less
Atmosphere	Normal FA atmosphere(Consult us when using the system under environments with higher degree of dust, coolant, or organic solution.)
Other condition	Use the I/O module in a cabinets that is always completely closed.

4.2 Order specification

Name	Specification	Note
48/32 points I/O module with MPG interface	A20B-2002-0520	DI : 48 points DO : 32 points With MPG interface
48/32 points I/O module without MPG interface	A20B-2002-0521	DI : 48 points DO : 32 points Without MPG interface
Fuse(Spare part)	A03B-0815-K001	1A

4.3 Module specification

Item	Specification	Note
Normal DI points	48 points	24V type input
DO points	32 points	24V and source type output
Interface to CNC	FANUC I/O-Link connection	Max. 16 modules or total points max. 1024/1024 will be available.
MPG interface	Max. 3 units	i series is only available.

4.4 Power supply specification

Module	Voltage	Capacity	Note
48/32 points I/O module	DC24V±10% (from Power connector CPD1) (including momentary values)	0.3A+7.3mA×DI	DI=Number of "ON" state DI.

4.5 DI(Input signal definition)

(Input signal)

Capacity	DC30V, 16mA or higher
Intercontact leakage current in closed circuit	1mA or less(at 26.4V)
Intercontact voltage drop in closed circuit	2V or less(including the voltage drop in the cables)
Delay time	Delay time of receiver IC : 2ms(MAX) Need to consider about the serial communication (I/O-Link)delay between CNC and I/O module 2ms(MAX)+Scan cycle of ladder(Scan cycle is different each CNCs).

4. 6 DO(Output signal definition)

Maximum load current when driver in ON	200mA (including momentary values)
Saturation voltage when driver is ON	1V(MAX) (When 200mA loaded)
Withstand voltage	24V+20% (including momentary values)
Leakage current when driver is OFF	20 μ A or less
Delay time	Delay time of driver IC : 50 μ s(MAX) Need to consider about the serial communication (I/O-Link)delay between CNC and I/O module 2ms(MAX)+Scan cycle of ladder(Scan cycle is different each CNCs).

Note) One of DOCOM pin must be less than 0.7A.

5. Other notices

5.1 DO signal action when system alarm is happened

If a CNC using the I/O module will happen system alarm or comunication alarm between CNC and the I/O module, all DOs in the module will turn off. These situation should be understood. And also same situation happens when the power off.

5.2 DI/DO mapping

I/O address map is as follows.

DI map

Xm	Input signal
Xm+1	
Xm+2	
Xm+3	
Xm+4	
Xm+5	
Xm+6	No use
Xm+7	
Xm+8	
Xm+9	
Xm+10	
Xm+11	
Xm+12 (MPG 1 unit)	MPG
Xm+13 (MPG 2 unit)	
Xm+14 (MPG 3 unit)	
Xm+15 (DO alarm)	DO alarm

DO map

Yn	Output signal
Yn+1	
Yn+2	
Yn+3	

DI mapping should be assigned 1 group, 16 byte mapping and DO mapping should be assigned 1 group, 8 byte mapping. The reason is as follows.

MPG interface(the counter for MPG) uses Xm+12～Xm+14 area and it fixes. And if MPG interface will be used, Xm+12～Xm+14 area must be assigned. And in case of i series and using MPG interface, DI mapping must be assigned 16 byte mapping. MPG counter area are directly processed by CNC software. So you must not use the area by customer ladder.

There are DO alarm(over current, over heat) indication area in Xm+15. (Refer to the 5.5 DO(Output detection of DO signals) Also this area fixes in Xm+15. And if this area will be used, this area must be assigned. So in case of using this area, DI mapping must be assigned 16 byte mapping.

(5.2 DI/DO mapping continueing)

It is possible to assign any address for the I/O module. But in DI address. Each CNC have some fixed address that is directly processed by CNC software. So, as refer to the following mention. assign the DI mapping.

Directly processed address by CNC(in case of FS18i,16i)

	7	6	5	4	3	2	1	0
X0004	SKIP#1	ESKIP	-MIT2#1	+MIT2#1	-MIT1#1	+MIT1#1	ZAE#1	XAE#1
		SKIP6#1	SKIP5#1	SKIP4#1	SKIP3#1	SKIP2#1	SKIP8#1	SKIP7#1
	SKIP#1	ESKIP	SKIP5#1	SKIP4#1	SKIP3#1	ZAE#1	YAE#1	XAE#1
		SKIP6#1				SKIP2#1	SKIP8#1	SKIP7#1
X0005								
X0006								
X0007		*DEC7#2	*DEC6#2	*DEC5#2	*DEC4#2	*DEC3#2	*DEC2#2	*DEC1#2
X0008				*ESP				
X0009		*DEC7#1	*DEC6#1	*DEC5#1	*DEC4#1	*DEC3#1	*DEC2#1	*DEC1#1
X0010								
X0011								
X0012								
X0013	SKIP#2	SKIP6#2	-MIT2#2	+MIT2#2	-MIT1#2	+MIT1#2	ZAE#2	XAE#2
			SKIP5#2	SKIP4#2	SKIP3#2	SKIP2#2	SKIP8#2	SKIP7#2
	SKIP#2	SKIP6#2	SKIP5#2	SKIP4#2	SKIP3#2	ZAE#2	YAE#2	XAE#2
						SKIP2#2	SKIP8#2	SKIP7#2

#1 means the signales in 1st path. #2 means the signals in 2nd path. And up column means the T series signals and down column means the M series signals.

(5.2 DI/DO mapping continueing)

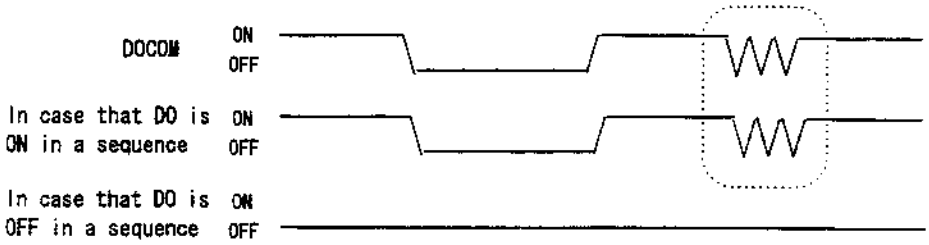
In case of 16 byte mapping start from X0004 - for DI area

X0004	Input signal	
X0005		
X0006		
X0007		
X0008		←*ESP fixed signal
X0009		←*DECn#1 fixed signals
X0010	No use	
X0011		
X0012		
X0013		
X0014		
X0015		
X0016(MPG 1unit)	MPG	
X0017(MPG 2 unit)		
X0018(MPG 3 unit)		
X0019(DO alarm)	DO alarm	

In case of mapping form X0004, 2nd SKIP signals can not be used, but *DECn#1 singales which are address fixed signales can be used any time.
And *ESP signal can be placed at +24V common fixed address.

5.3 DO action when the DO Power(DOCOM) ON/OFF

If each DOCOM(Power supply for DO signals) are OFF, each DO will be all OFF per module unit. In this case, DO signal waveform is as follows.

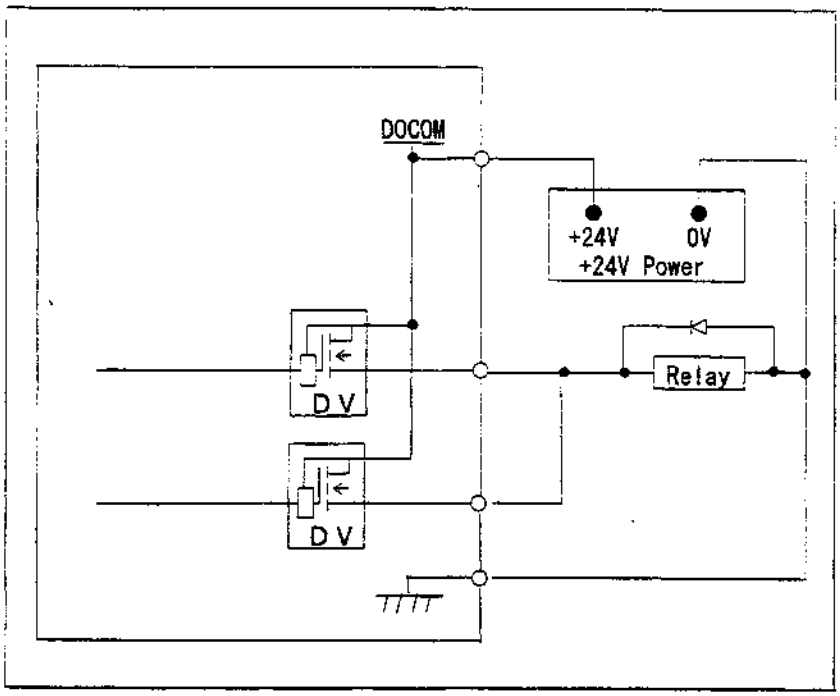


Note) In case that DO is ON in a sequence, DO signal output same as DOCOM state like in a doted line in the figure.

Note) Power supply for I/O module (+24V) must not turn off at operation. If +24 is turned off at operation, CNC happen to get system alarm(Communication alarm between CNC and I/O module). +24V for I/O module must be supplied before or same time CNC power on.
And +24V for I/O module must be turn off after or same time CNC power off.

5.4 Parallel connection of DO signals

If DO signals are connected in parallel like a figure and controlled same ON/OFF timing in the ladder, that DO shall be output max. 400mA(twice a normal load). But remind that leakage current when driver is OFF is max. 40 μ A(twice a normal leakage current).



5.5 Alarm detection of DO signals

This Module has DO drivers IC that can detect over load and over heat. This function will work for protection. if some cable happen to drop to the ground and increased load current, or DO driver gets so heat by some causes, DO driver protection circuit will work and DO will turn off per a driver IC unit(A unit is one byte) and the OFF state will continue till the cause is removed. In this case, CNC and I/O module are not no alarm and continue to work normally. But the I/O module indicate where DO driver detects alarm in address Xm+15.
The following table means relation between DO address and each bit in DI address Xm+15.
If some bit is "1" in the address Xm+15, some relation DO driver detects alarm. So check the address Xm+15 in DGN display or make such a ladder processing the address.
Xm+15 will be useful for problem investigation and restoration.

Alarm detection address and bit	DO address	Remarks
Xm+15.0	Yn+0	
Xm+15.1	Yn+1	
Xm+15.2	Yn+2	
Xm+15.3	Yn+3	
Xm+15.4	Yn+4	Reserve
Xm+15.5	Yn+5	Reserve
Xm+15.6	Yn+6	Reserve
Xm+15.7	Yn+7	Reserve