

CNC

MELDAS 60/60S Series

CONNECTION AND MAINTENANCE MANUAL



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Introduction

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

List of related manuals

The following manuals are available for reference.

Manual names

M60/60S Series	Specifications Manual	(BNP-B2210)
M60/60S/MELDASMAGIC64	PLC Interface Manual	(BNP-B2211)
MELDAS MDS-C1 Series	Specifications Manual	(BNP-C3000)
MELDAS MDS-A/B Series	Specifications Manual	(BNP-B3759)
MELDAS MDS-B/SVJ2 Series	Specifications Manual	(BNP-B3937)
MELDAS MDS-B/SPJ2 Series	Specifications Manual	(BNP-B2164)

Precautions for Safety

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

This manual ranks the safety precautions into "**DANGER**", "**WARNING**" and "**CAUTION**".



DANGER

When there is a great risk that the user could be subject to fatalities or serious injuries if handling is mistaken.



WARNING

When the user could be subject to fatalities or serious injuries if handling is mistaken.



CAUTION

When the user could be subject to injuries or when physical damage could occur if handling is mistaken.

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



DANGER

Not applicable in this manual.



WARNING

1. Items related to prevention of electric shocks



Do not operate the switches with wet hands, as this may lead to electric shocks.



Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.

⚠ CAUTION

1. Items related to noise

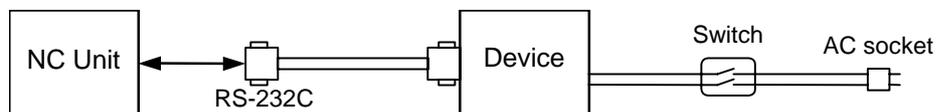
- ⚡ Always treat the shield cables indicated in this manual with grounding treatment such as cable clamps.
- ⚠ Separate the signal wire from the drive line/power line when wiring.

2. Items related to installation

- ⚠ Install the NC Card on noncombustible material. Installation directly on or near combustible material may lead to fires.
- ⚠ Always observe the installation direction.
- ⚠ Do not install or operate an NC Card that is damaged or that have missing parts.
- ⚠ Do not allow conductive foreign matter such as screws or metal chips or combustible foreign matter such as oil enter the NC Card.
- ⚠ The NC Card are precision devices so do not drop or apply strong impacts on them.
- ⚠ Do not install the NC Card where it may be subject to cutting oil.

3. Items related to connection

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



4. Items related to battery

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

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I. CONNECTION MANUAL

1. OUTLINE

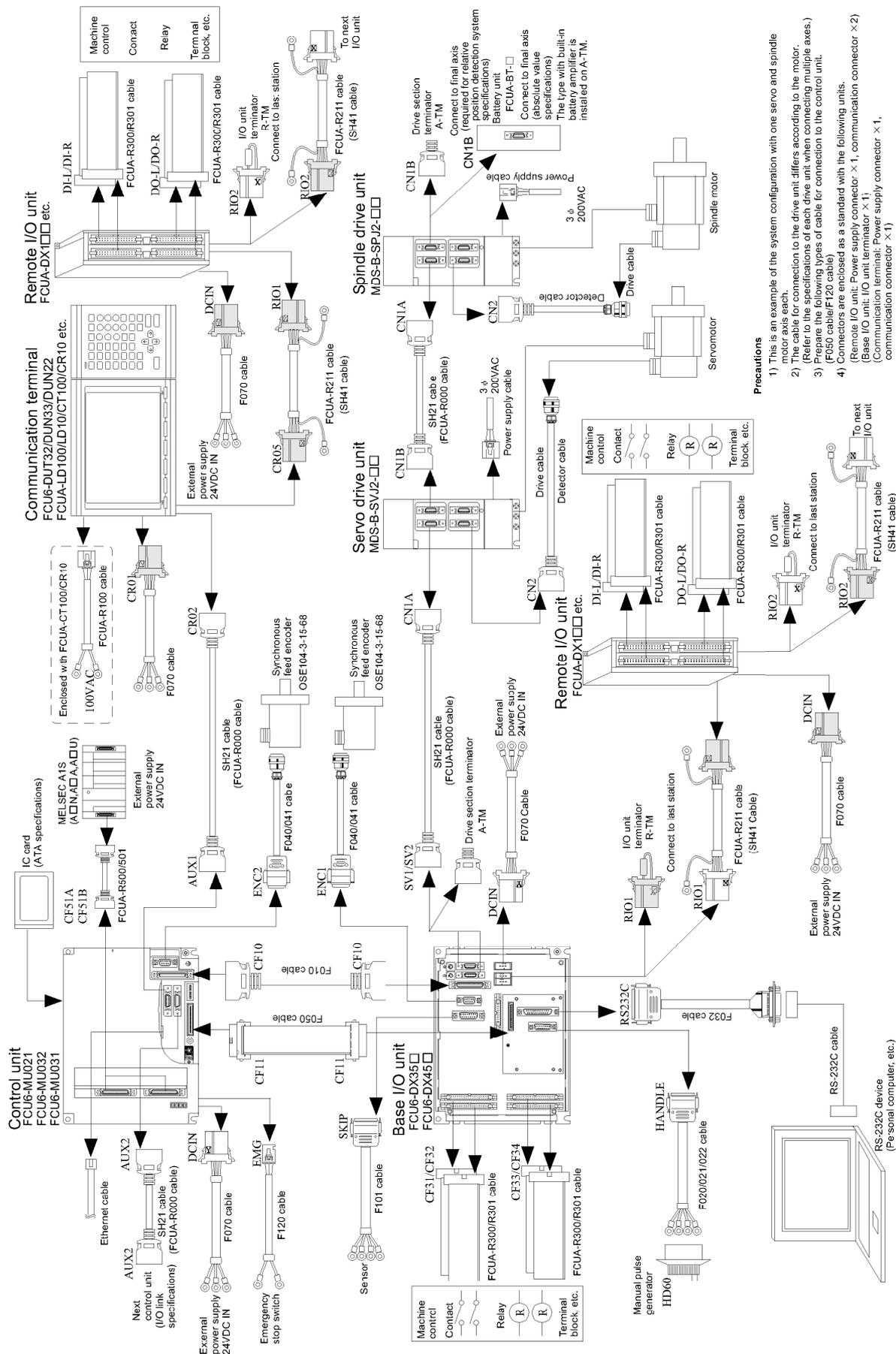
This manual explains the items required for installing and connecting the MELDAS60/60S Series. Read this manual thoroughly and understand the product's functions and performance before starting use.

This manual assumes that all functions are added, but the actually delivered device may not have all functions.

2. CONFIGURATION

2.1 System Configuration List

2.1.2 M64AS/M64S/M65/M65S/M66/M66S System Configuration List



2. CONFIGURATION

2.2 List of Configuration Units

2.2 List of Configuration Units

2.2.1 Control Unit

(1) Control unit

Type	Function	Configuration element	Details
FCU6-MU011	M64 control unit set FCA64A-B, FCA64-B system compatible unit	Main control card (HR113) 24V input power supply card (HR083) Communication card (HR531) Case set	Export Trade Control Ordinance and Foreign Trade Ordinance noncompliant unit
FCU6-MU015	M64 control unit set FCA64-P (optical) system compatible unit	Main control card (HR113) 24V input power supply card (HR083) Communication card (HR541) Case set	Export Trade Control Ordinance and Foreign Trade Ordinance noncompliant unit
FCU6-MU021	M65 control unit set FCA65-A, FCA65-P1 system compatible unit	Main control card (HR114) 24V input power supply card (HR083) Communication card (HR171) Case set	Export Trade Control Ordinance and Foreign Trade Ordinance noncompliant unit
FCU6-MU023	M65 control unit set FCA65-P1 (optical) system compatible unit FCA65V-P1 (optical) system compatible unit	Main control card (HR114) 24V input power supply card (HR083) Communication card (HR541) Case set	Export Trade Control Ordinance and Foreign Trade Ordinance noncompliant unit Use when there is no high-speed program server function Use FCU6-MA031 when server function is provided
FCU6-MU032	M64AS/64S/65S control unit set FCA64AS/64S/65S system compatible unit	Main control card (HR116) 24V input power supply card (HR083) Communication card (HR171) Case set	Export Trade Control Ordinance and Foreign Trade Ordinance noncompliant unit M64AS is used as a set with FCU6-HR410 M64S is used as a set with FCU6-HR411 M65S is used as a set with FCU6-HR415
FCU6-MA031	M66/M66S control unit set FCA66-A/FCA66S system compatible unit	Main control card (HR146) 24V input power supply card (HR083) Communication card (HR171) Case set	Export Trade Control Ordinance and Foreign Trade Ordinance compliant unit M66S is used as a set with FCU6-HR415

(2) Control unit options

Type	Function	Configuration element	Details
HR513	External PLC link II (bus connection, interface) Mounted into control unit's extension slot	Control card (HR513)	Dedicated for MELDAS60/60S series Type connected to MELSEC A1S, A□N, A□A, A□U Series
HR571	External PLC link I (M-NET interface) Mounted into control unit's extension slot	Control card (HR571)	Dedicated for MELDAS60 series Type connected to MELSEC AJ71C22 unit (serial link)
FCU6-EP203-1	(1) High-speed program server (2) Data input/output (Ethernet communication) (IC card)	Control card for IC card (HR831) Communication card for Ethernet (HR832) Connection cable	(1) Dedicated for MELDAS64S/ 65/65S/66/66S (2) Dedicated for MELDAS60S series ATA memory card interface + Ethernet interface
HR576	CC-Link card	Control card (HR576)	Dedicated for MELDAS60S series

2. CONFIGURATION

2.2 List of Configuration Units

2.2.2 Communication Terminal

Type	Function	Configuration element	Details
FCU6-DUT32	10.4-type monochrome LCD display unit (separated type)	10.4-type LCD, Escutcheon Control card (RX215)	Used as a set with FCUA-KB20. Control card 24VDC input
FCU6-DUN22	8.4-type color LCD unit (separated type)	8.4-type LCD, Escutcheon Control card (HR213)	Used as a set with FCU6-KB022 Control card 24VDC input
FCU6-DUN33	10.4-type color LCD display unit (separated type)	10.4-type LCD, Escutcheon Control card (RX215)	Used as a set with FCUA-KB20. Control card 24VDC input
FCUA-LD100	7.2-type monochrome LCD liquid crystal (integrated type)	7.2-type LCD, Escutcheon Control card (RX213), Key switches	Control card 24VDC input
FCUA-LD10	7.2-type monochrome LCD display unit (separated type)	7.2-type LCD, Escutcheon Control card (RX213)	Used as a set with FCUA-KB20. Control card 24VDC input
FCUA-EL10	9.5-type EL display unit (separated type)	9.5-type EL, Escutcheon	Used as a set with FCUA-KB10/KB12. Control card EL common 24VDC input
FCUA-CT100	9-type monochrome CRT + communication terminal (integrated type, machining center system sheet)	9-type monochrome CRT, Escutcheon Control card (RX211), Key switches	Control card 24VDC input CRT section 100VAC input
FCUA-CT120	9-type monochrome CRT + communication terminal (integrated type, lathe system sheet)	9-type monochrome CRT, Escutcheon Control card (RX211), Key switches	Control card 24VDC input CRT section 100VAC input
FCUA-CR10	9-type monochrome CRT communication terminal (separated type)	9-type monochrome CRT, Escutcheon	Used as a set with FCUA-KB10/KB12. Control card 24VDC input CRT section 100VAC input
FCUA-KB10	Communication terminal (separated type, machining center system sheet)	Key switch Control card	Used as a set with FCUA-EL10 or FCUA-CR10.
FCUA-KB12	Communication terminal (separated type, lathe system sheet)	Key switch Control card	Used as a set with FCUA-EL10 or FCUA-CR10.
FCUA-KB20	Communication terminal (separated type, machining center system sheet)	Key switch	Use as a set with FCU6-DUT32/ DUN33 or FCUA-LD10
FCUA-KB021	Communication terminal (separated type, machining center system sheet)	Key switch	Use as a set with FCU6-DUT32/ DUN33 KB20 with changed outline dimensions
FCU6-KB022	Communication terminal (separated type/machining center system sheet)	Key switch	Used as a set with FCU6-DUN22
FCUA-KB30	Communication terminal (separated type, lathe system sheet)	Key switch	Use as a set with FCU6-DUT32/ DUN33 or FCUA-LD10
FCUA-KB031	Communication terminal (separated type, lathe system sheet)	Key switch	Use as a set with FCU6-DUT32/ DUN33 KB30 with changed outline dimensions

2. CONFIGURATION

2.2 List of Configuration Units

2.2.3 Base I/O Unit

Type	Function	Configuration element	Details
FCU6-DX350	Sink input + sink output base I/O unit	I/O card (HR325) Aluminum panel for panel installation Additional I/O card (HR211)	DI/DO input/output sink input 48 points + sink output 48 points Synchronous feed encoder interface 1ch, Skip input 8 points Remote I/O unit interface 2ch Servo drive unit interface 2 part systems RS-232C device 1ch, manual pulse generator 3ch
FCU6-DX351	Source input + source output base I/O unit	I/O card (HR335) Aluminum panel for panel installation Additional I/O card (HR211)	DI/DO input/output source input 48 points + source output 48 points Synchronous feed encoder interface 1ch, Skip input 8 points Remote I/O unit interface 2ch Servo drive unit interface 2 part systems RS-232C device 1ch, manual pulse generator 3ch
FCU6-DX450	Sink input + sink output base I/O unit	I/O card (HR327) Aluminum panel for panel installation Additional I/O card (HR211)	DI/DO input/output sink input 64 points + sink output 64 points Synchronous feed encoder interface 1ch, Skip input 8 points Remote I/O unit interface 2ch Servo drive unit interface 2 part systems RS-232C device 1ch, manual pulse generator 3ch
FCU6-DX451	Source input + source output base I/O unit	I/O card (HR337) Aluminum panel for panel installation Additional I/O card (HR211)	DI/DO input/output source input 64 points + source output 64 points Synchronous feed encoder interface 1ch, Skip input 8 points Remote I/O unit interface 2ch Servo drive unit interface 2 part systems RS-232C device 1ch, manual pulse generator 3ch
FCU6-HR377	Source input + 200mA source output base I/O unit	I/O card (HR377) Reinforcing fitting	DI/DO input/output source input 64 points + source output 64 points Synchronous feed encoder interface 1ch, Skip input 8 points Remote I/O unit interface 2ch Servo drive unit interface 2 part systems RS-232C device 1ch, manual pulse generator 3ch
FCU6-HR378	Source input + 200mA source output base I/O unit Common separated, with output protection fuse	I/O card (HR378) Reinforcing fitting	DI/DO input/output source input 64 points + source output 64 points Synchronous feed encoder interface 1ch, Skip input 8 points Remote I/O unit interface 2ch Servo drive unit interface 2 part systems RS-232C device 1ch, manual pulse generator 3ch

2. CONFIGURATION

2.2 List of Configuration Units

2.2.4 Remote I/O Unit

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

2.2.5 Scan I/O Card

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

2.2.6 Extended I/O Card

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

3. INSTALLATION
3.1 General Specification

3. INSTALLATION

3.1 General Specification

(1) Environment conditions in control part

Unit name		Control unit	
Type		FCU6-MU011/MU015/MU021/MU023/MU032/MA031/MA034	
General specifications	Ambient temperature	During operation	0 to 55°C
		During storage	-20 to 60°C
	Ambient humidity	During operation	Long term, to 75% RH (with no dew condensation) Short term, to 95% RH (with no dew condensation) (Note 1)
		During storage	to 75% RH (with no dew condensation)
	Vibration resistance		4.9m/s ² or less (during operation)
	Shock resistance		29.4m/s ² or less (during operation)
Working atmosphere		No corrosive gases, dust or oil mist	
Power specifications	Power voltage		24VDC±5% Ripple ±5% (P-P)
	Instantaneous stop tolerance time		Depends on the specifications of the 24VDC power supply used.
	Current consumption		1.5A
Heating value		20W (Standard specification)	
Mass		1.1kg	
Unit size		Refer to Appendix.	

(Note 1) The period is within one month.

(2) Environment conditions in electric cabinet

Unit name		Base I/O unit	
Type		FCU6-DX350/351/450/451	FCU6-HR377/378
General specifications	Ambient temperature	During operation	0 to 55°C
		During storage	-20 to 60°C
	Ambient humidity	During operation	Long term, to 75% RH (with no dew condensation) Short term, to 95% RH (with no dew condensation) (Note 1)
		During storage	to 75% RH (with no dew condensation)
	Vibration resistance		4.9m/s ² or less (during operation)
	Shock resistance		29.4m/s ² or less (during operation)
Working atmosphere		No corrosive gases, dust or oil mist	
Power specifications	Power voltage	24VDC±5% Ripple ±5% (P-P)	5VDC±5%
	Current consumption	24V 1.2A (Note 2) 24V max. 5.0A (Note 3)	24V 13A (Note 3) 5V 1.0A (when using as second unit)
Heating value		Max. 30W (Note 3)	Max. 50W (Note 3)
Mass		2kg	
Unit size		Refer to Appendix.	195mm (W) × 280mm (H)

(Note 1) The period is within one month.

(Note 2) Amount consumed by control circuit

(Note 3) Differs according to the number of machine input operation points and the load and number of points connected to the machine output. The maximum value applies when all points are ON.

3. INSTALLATION

3.1 General Specification

Unit name		Communication terminal								
Type		FCUA-CT 100/120	FCUA- CR10	FCUA- EL10	FCU6- DUN22	FCUA- KB10/ KB12	FCUA- KB20/30 FCU6- KB021/ 022/031	FCUA- LD10/ 100	FCU6-DUT32 FCU6-DUN33	
General specifications	Ambient temperature	During operation	0 to 55°C					0 to 50°C		
		During storage	-20 to 65°C					-20 to 60°C		
	Ambient humidity	During operation	Long term, to 75% RH (with no dew condensation) Short term, to 95% RH (with no dew condensation) (Note 1)							
		During storage	to 75% RH (with no dew condensation)							
	Vibration resistance		4.9m/s ² or less (during operation)							
	Shock resistance		29.4m/s ² or less (during operation)							
	Working atmosphere		No corrosive gases, dust							
	Power noise		1kV (P-P)							
Power specifications	Power voltage		Single-phase 100 VAC to 115 VAC -15% +10% 50/60Hz ±5% Ripple ±5% (P-P)		24VDC±5% Ripple ±5% (P-P)					
			24VDC ±5%	—						
	Instantaneous stop tolerance time		20ms or less							
Current consumption		100V, 0.4A 24V, 0.6A	100V, 0.4A	24V, 0.9A	24V, 0.9A	24V, 0.6A	—	24V, 0.9A	24V, 0.9A	
Heating value		55W	40W	20W	16W	15W	—	20W	20W	
Mass		4.8kg	4.2kg	1.2kg	2.5kg	0.7kg	0.4kg	1.2kg	1.8kg	
Unit size		Refer to Appendix.								

(Note 1) The period is within one month.

Unit name		Remote I/O unit				
Type		FCUA-DX10□	FCUA-DX11□	FCUA-DX12□	FCUA-DX14□	
General specifications	Ambient temperature	During operation	0 to 55°C			
		During storage	-20 to 65°C			
	Ambient humidity	During operation	Long term, to 75% RH (with no dew condensation) Short term, to 95% RH (with no dew condensation) (Note 1)			
		During storage	to 75% RH (with no dew condensation)			
	Vibration resistance		4.9m/s ² or less (during operation)			
	Shock resistance		29.4m/s ² or less (during operation)			
	Working atmosphere		No corrosive gases, dust			
	Power noise		1kV (P-P)			
Power specifications	Power voltage		24VDC±5% Ripple ±5% (P-P)			
	Instantaneous stop tolerance time		—			
	Current consumption		24V 0.7A (Note 2)	24V 1.5A (Note 2)	24V 0.7A (Note 2)	
Heating value		Max. 25W (Note 3)	Max. 30W (Note 3)	Max. 30W (Note 3)		
Mass		470g	570g	590g	550g	
Unit size		Refer to Appendix.				

(Note 1) The period is within one month.

(Note 2) Amount consumed by control circuit

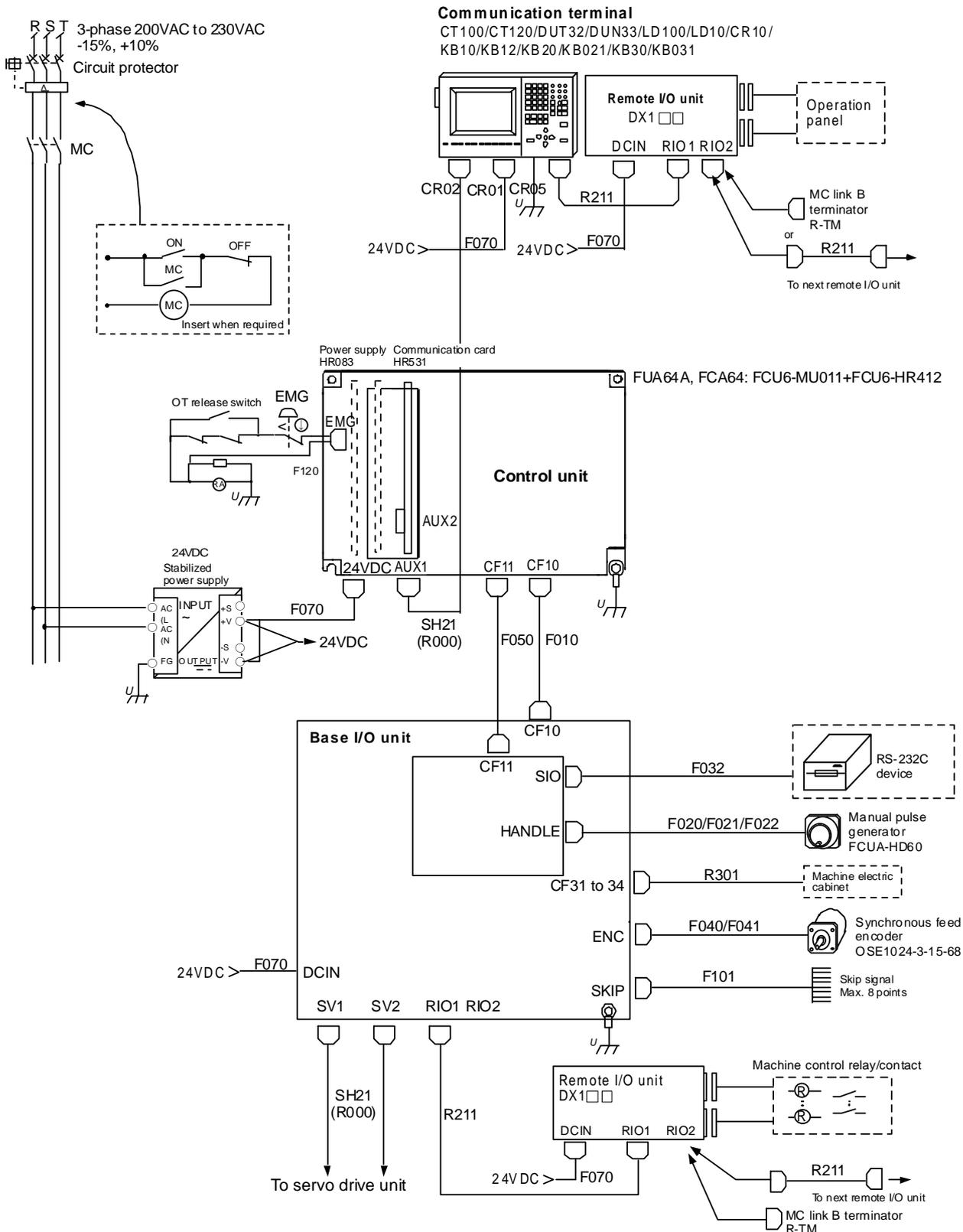
(Note 3) Differs according to the number of machine input operation points and the load and number of points connected to the machine output. The maximum value applies when all points are ON.

3. INSTALLATION

3.2 General System Diagram

3.2 General System Diagram

3.2.1 M64A/M64

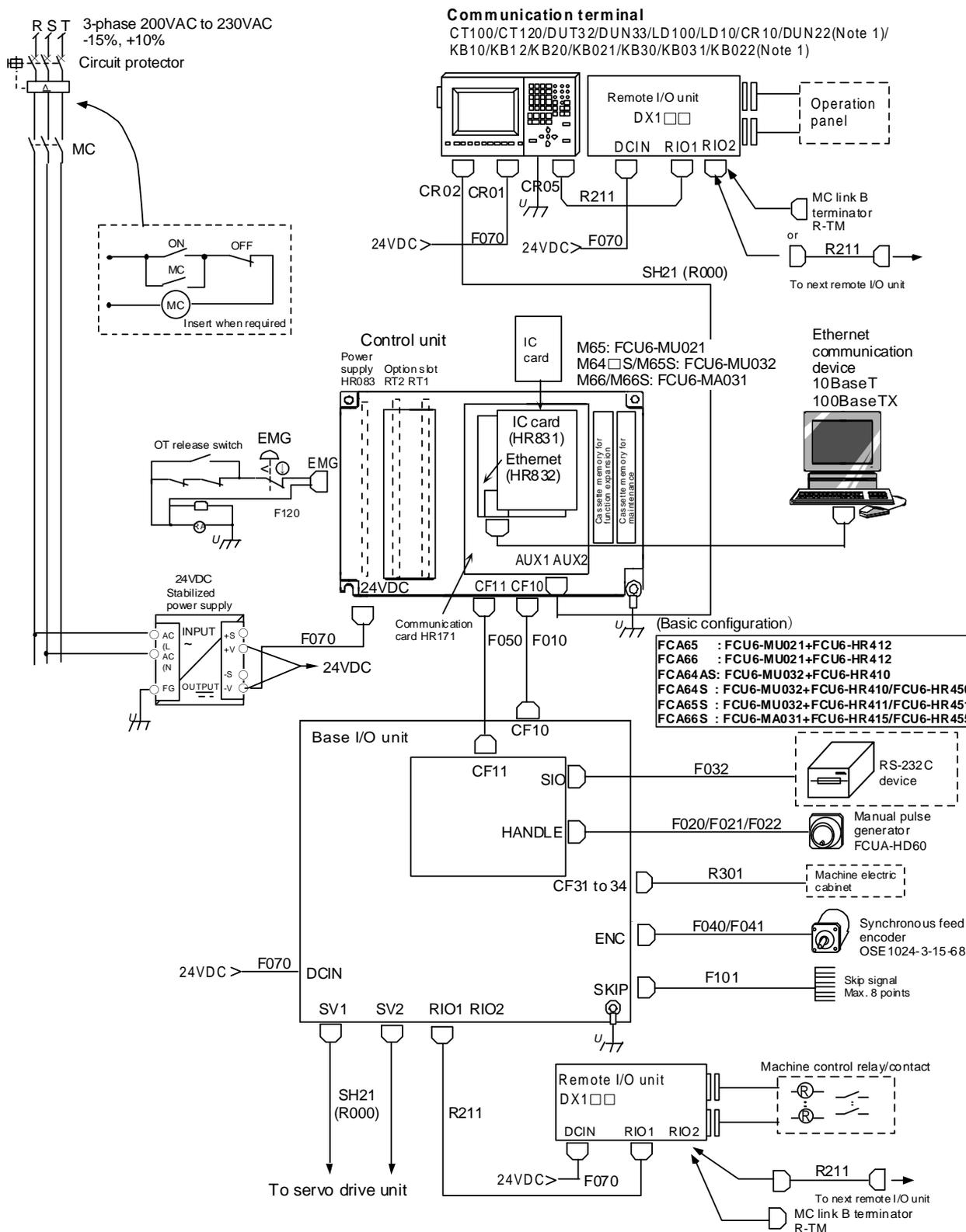


* The R200 cable can also be used for the +24V power supply cable F070.
 The R000 cable can be used for the servo drive unit's communication cable and communication terminal's communication cable SH21.

3. INSTALLATION

3.2 General System Diagram

3.2.2 M64AS/M64S/M65/M65S/M66/M66S



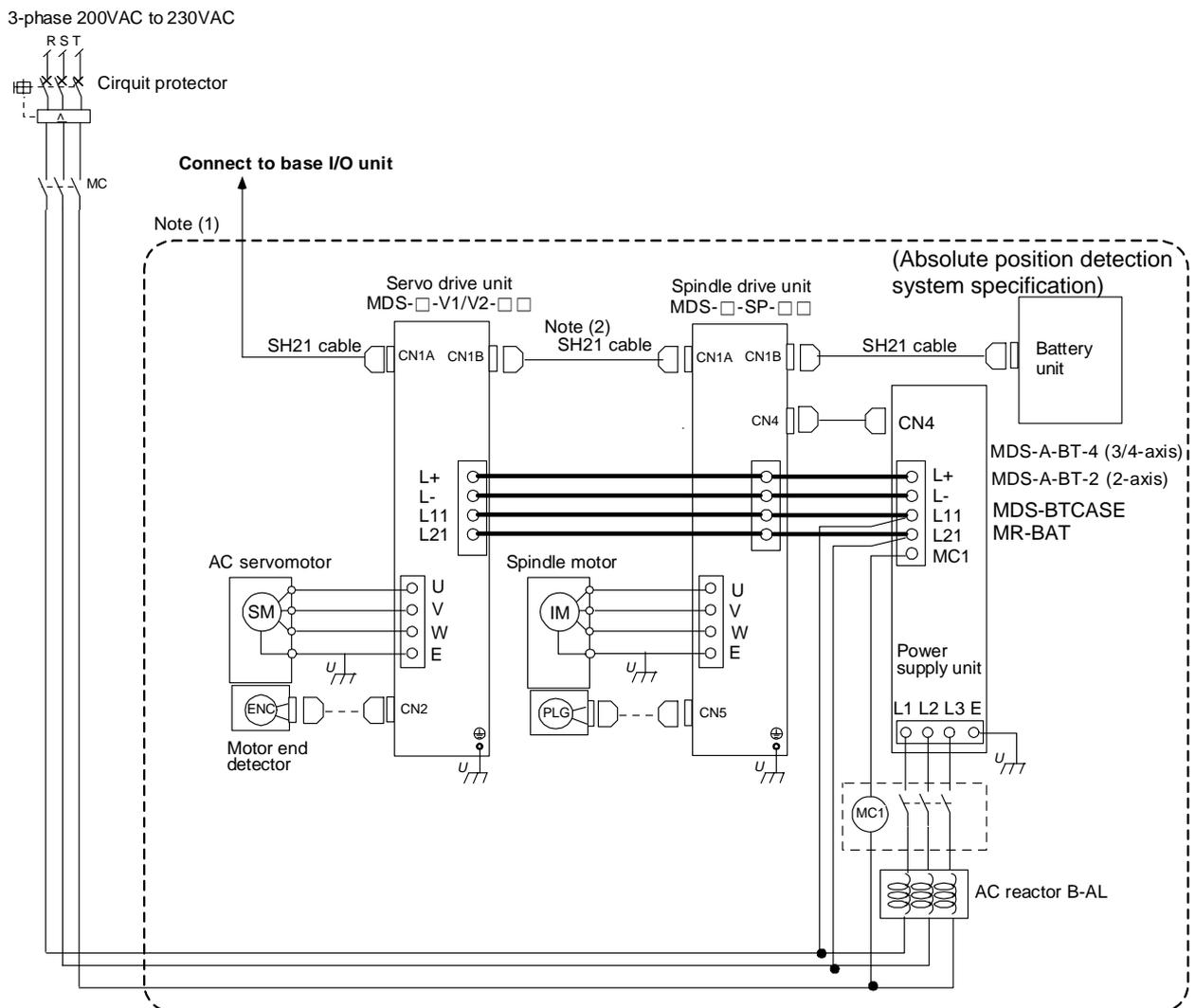
* The R200 cable can also be used for the +24V power supply cable F070.
The R000 cable can be used for the servo drive unit's communication cable and communication terminal's communication cable SH21.

(Note 1) FCU6-DUN22 and FCU6-KB022 cannot be used with M65/M66.

3. INSTALLATION

3.2 General System Diagram

3.2.3 Example of Connection when Using V1/V2/SP for Drive Section



- (Note 1)** The drive section connection will differ according to the configuration of the servo drive unit and servo motor being used.
- (Note 2)** The R000 cable has the same specifications (connector types and connections) as the SH21 cable.
- (Note 3)** When connecting the spindle drive unit, set the axis No. to the value after the last servo axis.
- (Note 4)** Connect the power supply unit to the final axis where a battery unit or a terminator is connected.

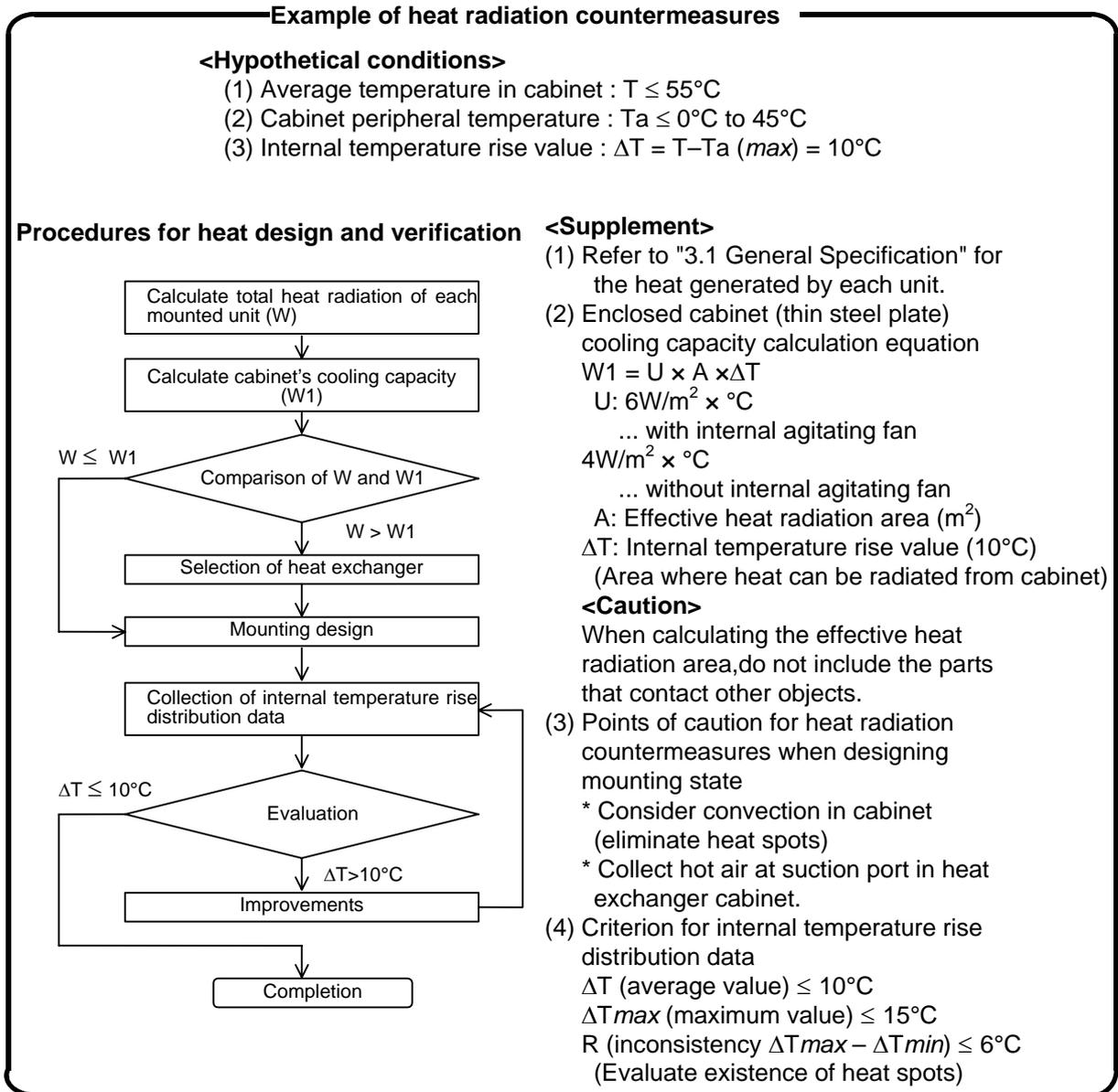


⚠ Separate the signal wire and drive line/power line when wiring.

3. INSTALLATION
3.3 Heat Radiation Countermeasures

3.3 Heat Radiation Countermeasures

Please refer to following method for heat radiation countermeasures.

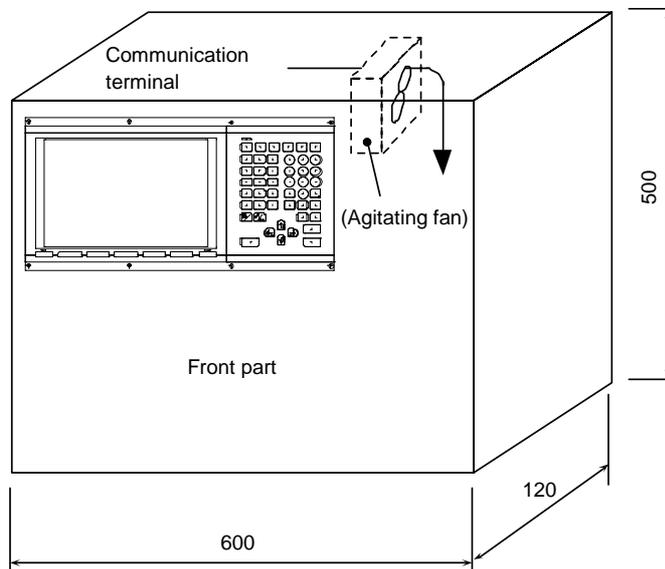


3. INSTALLATION

3.3 Heat Radiation Countermeasures

The following shows an example of heat radiation countermeasures for the operation box. Because heat will accumulate in the upper portions of the communication terminal, install an agitating fan as required.

<Operation box outline example (provisional)>



Heat radiation area (A):

except front, bottom surface

$$A = \underbrace{0.6 \times 0.12}_{\text{(Top surface)}} + \underbrace{0.6 \times 0.5}_{\text{(Rear surface)}} + \underbrace{0.12 \times 0.5 \times 2}_{\text{(Both sides surface)}}$$

$$\doteq 0.49 \text{ (m}^2\text{)}$$

Heating value (W)

- Power capacity = 24V × 5A = 120W
- Power consumption = 24V × 3A = 72W (Typ)
- Heating value

$$= \frac{\text{Power consumption}}{\text{Power efficiency}} - \text{Power consumption}$$

$$= \frac{72}{0.7} - 72$$

$$\doteq 31 \text{ (W)}$$

<Examination of agitating fan necessity>

1. Temperature standard

- (1) Temperature standard in cabinet $T \leq 55^\circ\text{C}$ (10.4-type LCD ... 50°C)
(each unit peripheral)
- (2) Cabinet peripheral temperature $T_a = 0$ to 45°C (10.4-type LCD ... 40°C)
- (3) Internal temperature rise value $\Delta T = T - T_{a(\text{max})} = 10^\circ\text{C}$

2. Cooling capacity of operation box (W1)

$$W1 = U \times A \times \Delta T$$

$$\left(\begin{array}{l} \Delta T = \text{Internal temperature rise value (} 10^\circ\text{C)} \\ U = 6\text{W/m}^2\cdot^\circ\text{C} \text{ <with internal agitating fan>} \\ \quad 4\text{W/m}^2\cdot^\circ\text{C} \text{ <without internal agitating fan>} \\ A = \text{Effective heat radiation area (m}^2\text{)} \end{array} \right)$$

- (1) With internal agitating fan : $W1 = 6 \times 0.49 \times 10 = 29.4\text{W} \doteq 31\text{W} \rightarrow \Delta T \doteq 10.5^\circ\text{C}$
- (2) Without internal agitating fan : $W1 = 4 \times 0.49 \times 10 = 19.6\text{W} < 31\text{W} \rightarrow \Delta T \doteq 15.8^\circ\text{C}$

3. INSTALLATION

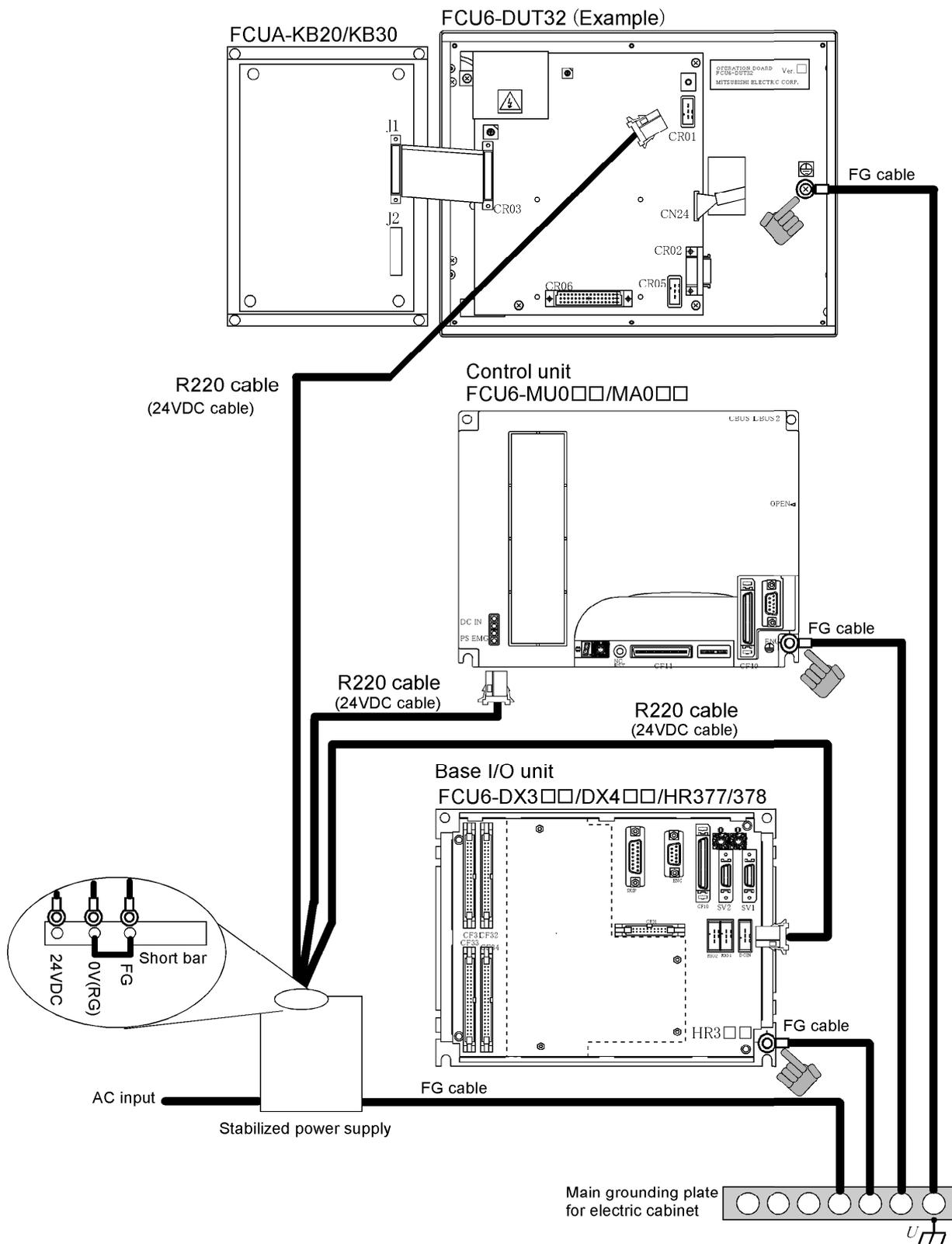
3.4 Noise Countermeasures

3.4 Noise Countermeasures

3.4.1 Connection of FG (Frame Ground)

The frame should basically be grounded at one ground point.
Connect the control unit and base I/O unit's 0V (RG) to the FG on the +24V stabilized power supply side.

Communication terminal

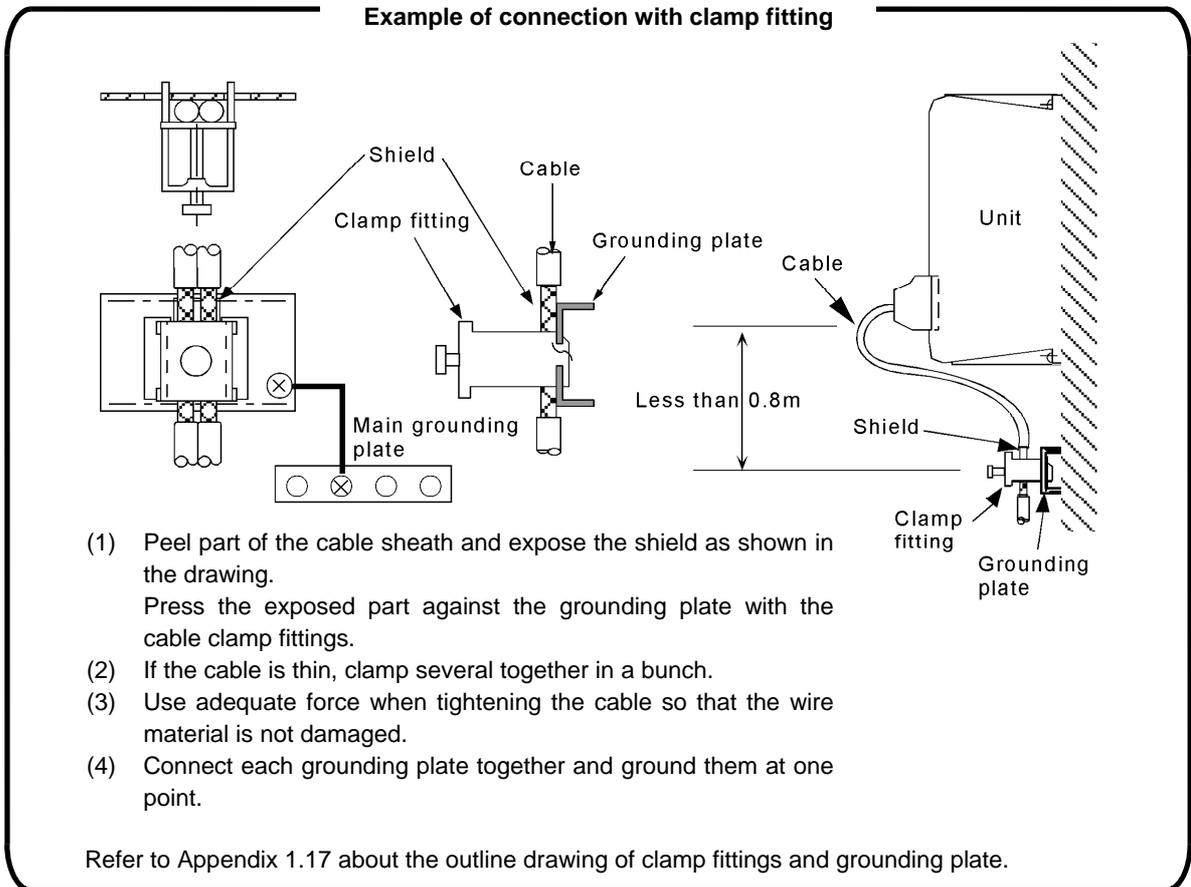


3. INSTALLATION

3.4 Noise Countermeasures

3.4.2 Shield Clamping of Cables

The shield cable connected to the control unit, base I/O unit, servo drive unit and spindle drive unit must be connected to the ground by using clamp fitting to stabilize operation while preventing malfunctioning due to noise.

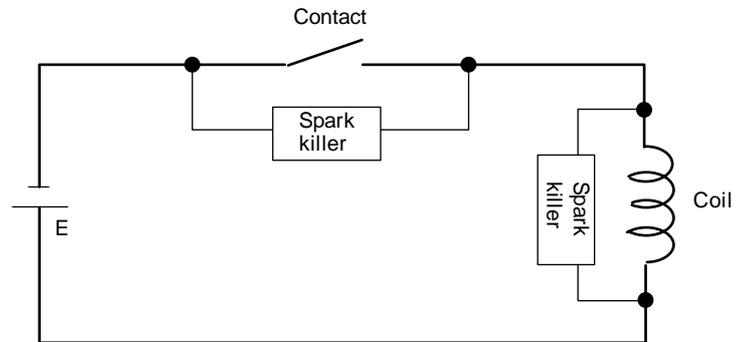


3. INSTALLATION

3.4 Noise Countermeasures

3.4.3 Connecting Spark Killers

Connect a spark killer on the coil or contact in parallel for noise countermeasures.
Use spark killers which are 0.033 to 0.1 μ F, 10 to 120 Ω .



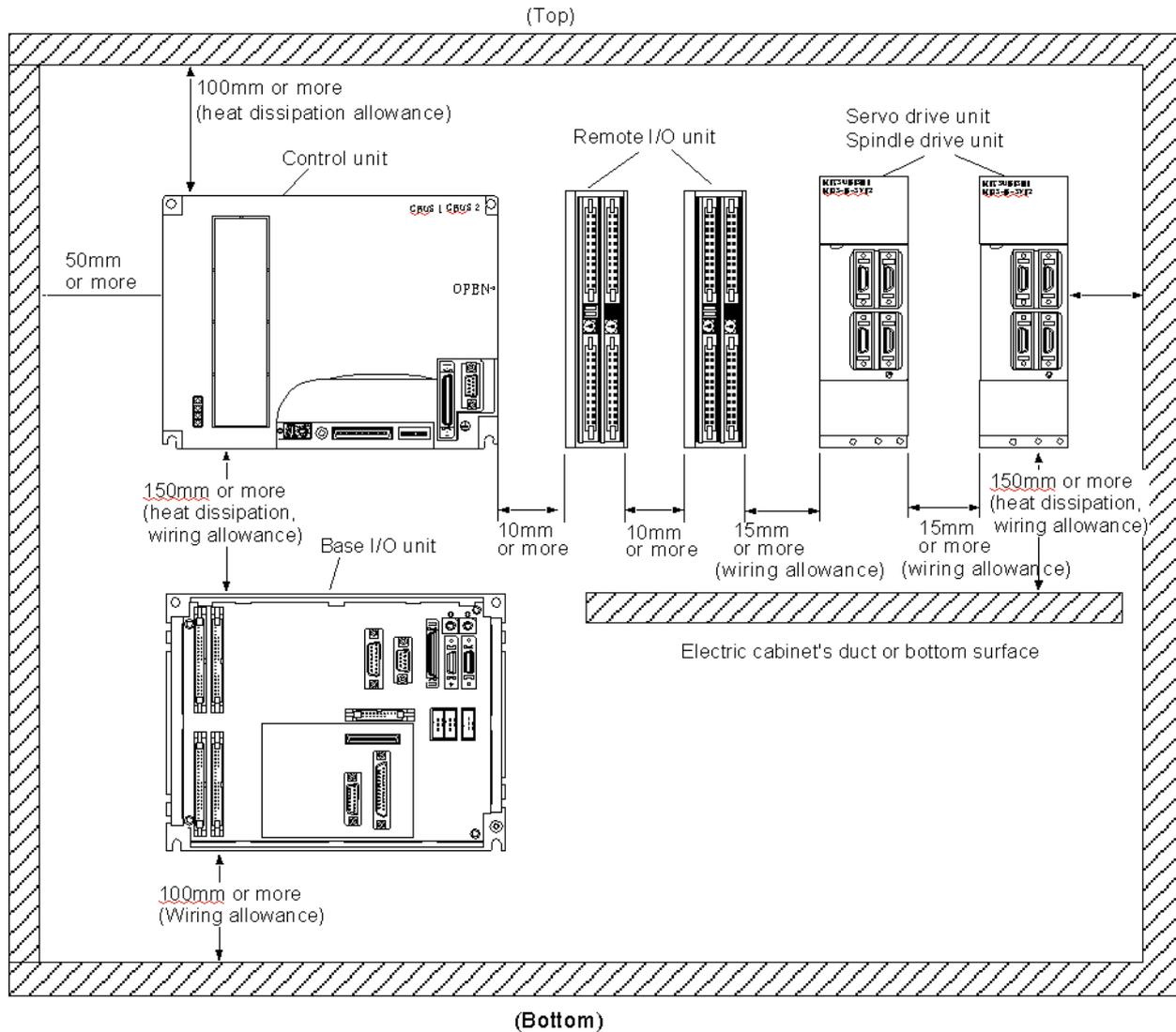
3. INSTALLATION

3.5 Installation

3.5 Installation

Each unit is installed in the sealed structure cabinet as a principle. Before installing into the cabinet, refer to the following drawing and secure sufficient space allowing for each unit's heat dissipation and cable wiring lead-in space.

- (1) Install each unit vertically so that the front is visible.
- (2) Provide sufficient space allowing for each unit's heat dissipation and cable wiring.



⚠ CAUTION

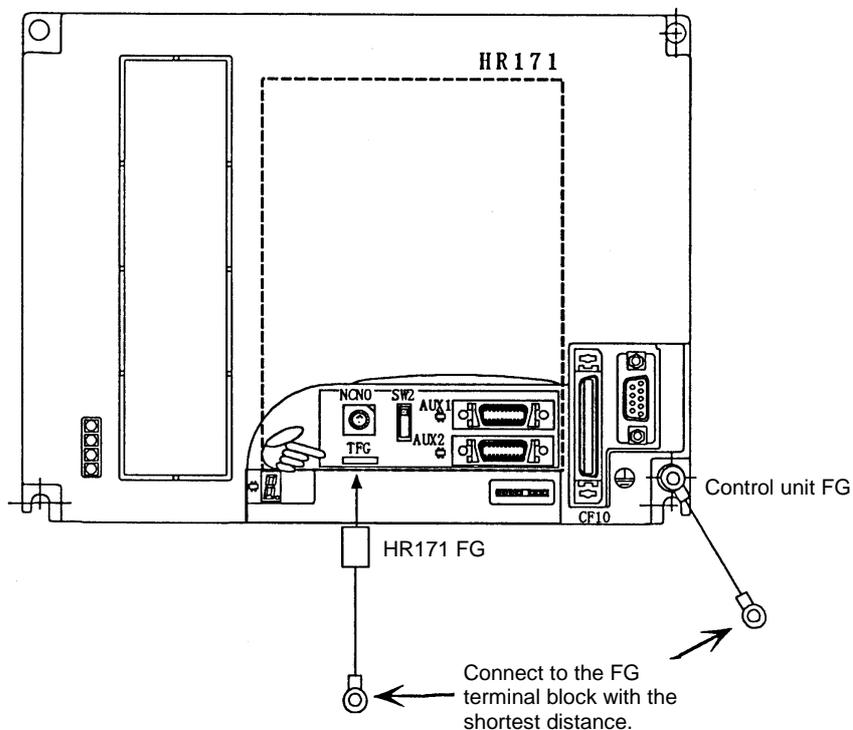
- ⚠ Install the control unit and communication terminal on noncombustible material. Installation directly on or near combustible material may lead to fires.
- ⚠ Always observe the installation direction.
- ⚠ Do not install or operate a control unit or communication terminal that is damaged or that has missing parts.
- ⚠ The control unit and communication terminal are precision devices so do not drop or apply strong impacts on them.

3. INSTALLATION

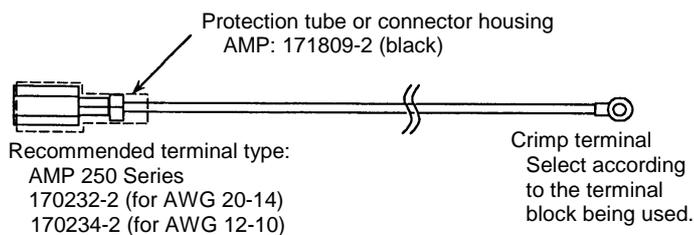
3.6 Connection of M64AS/64S/65/65S/66/66S FG

3.6 FG Connection of M64AS/64S/65/65S/66/66S

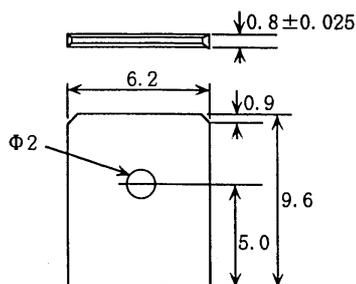
The communication card HR171 used with the M64AS/64S/65/65S/66/66S must be connected to a dedicated FG wire separate from the control unit FG. Refer to the FG cable drawing and separately connect to the HR171 card FG terminal TFG.



HR171 card FG cable assembly drawing



HR171 applicable tab shape



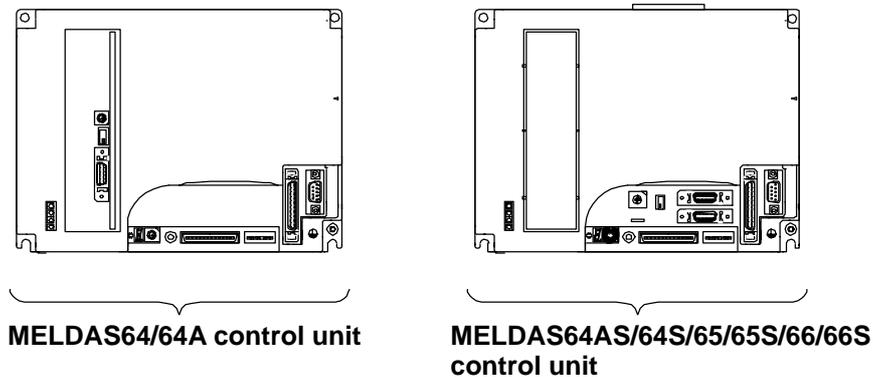
4. CONTROL UNIT

4.1 Outline of Control Unit

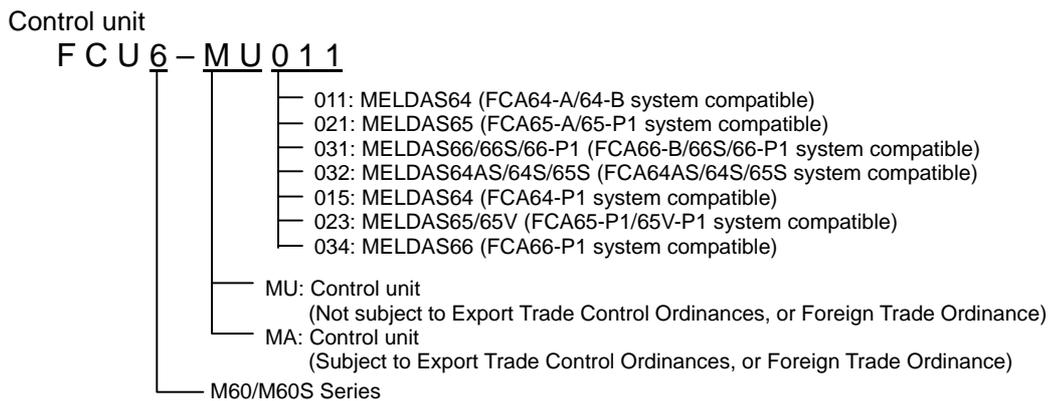
4. CONTROL UNIT

4.1 Outline of Control Unit

The installation methods for the control unit are common for all series. Select the optimum NC system that matches the application from the various types of units.



4.1.1 Configuration of Type



4.1.2 Features of Each Unit

Control unit	Features
FCU6-MU011	Control unit for MELDAS64
FCU6-MU021	Control unit for MELDAS65 (High-speed program server compatible unit)
FCU6-MU032	Control unit for MELDAS64AS/64S/65S (High-speed program server compatible unit)
FCU6-MA031	Control unit for MELDAS66/66S (High-speed program server compatible unit) Subject to Foreign Trade Ordinance Laws.
FCU6-MU015	Control unit for MELDAS64 (Special for optical communication)
FCU6-MU023	Control unit for MELDAS65/65V (Special for optical communication, unit when high-speed program server function is absent.)
FCU6-MU034	Control unit for MELDAS66 (Special for optical communication, unit when high-speed program server function is absent.) Subject to Foreign Trade Ordinance Laws.

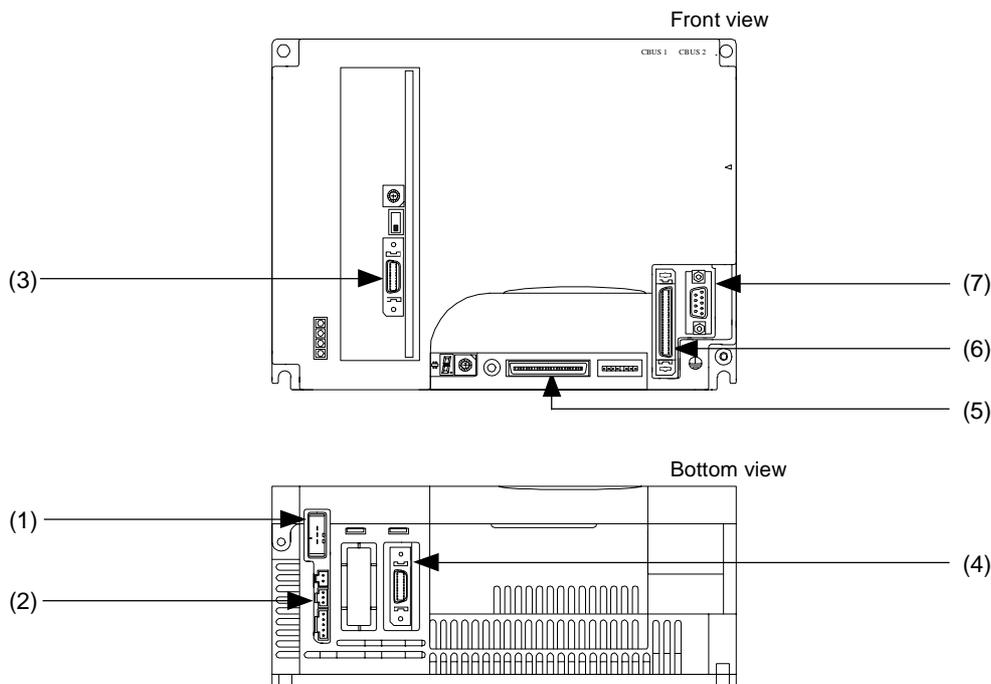
4. CONTROL UNIT

4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

The FCU6-MU011 unit is explained in this section.
This unit is the NC control unit for the MELDAS64/64A.

4.2.1 Names and Functions of Each Section



No.	Connector name	Function explanation
(1)	DCIN	Power input terminal (24VDC)
(2)	EMG	External emergency stop connection terminal
(3)	AUX2	I/O link connection terminal
(4)	AUX1	Communication terminal connection terminal
(5)	CF11	Base I/O unit connection terminal
(6)	CF10	Base I/O unit connection terminal
(7)	ENC2	Synchronous feed encoder connection terminal

Accessories

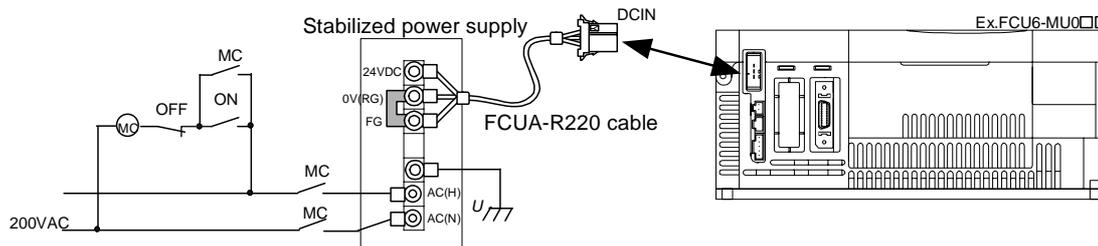
Cables and screws are not enclosed with the control unit.
The FCU6-HR412 (memory cassette) is mounted in CBUS2 in the unit.

4. CONTROL UNIT

4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

4.2.2 Connection of Power Supply

24VDC is supplied from the "DCIN" connector at the bottom of the control unit.



Turn the control unit power ON after turning or simultaneously with the turning ON of the peripheral units (servo drive unit, remote I/O, etc.).

If the control unit power is turned ON first, the peripheral unit will not be recognized correctly. Select a stabilized power supply and magnetic contact that satisfy the following specifications.

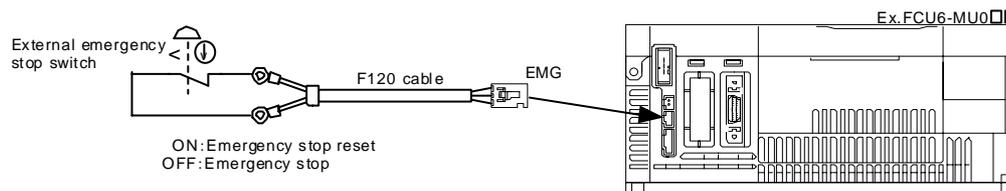
Stabilized power supply
Rated voltage: 24VDC \pm 5%
Ripple: \pm 5% [p-p]
Rated current: 24VDC, 1.5A or more

Magnetic contact
Contact rating: 250VAC/1A or more
Operation coil: 250VAC/0.2A or more
No. of contacts: 3 contacts (a connection)

Select VDE Standard approved parts.
The above MC is for a 200VAC input voltage.

4.2.3 Connection of External Emergency Stop

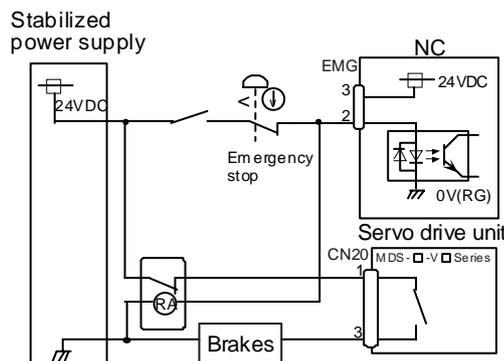
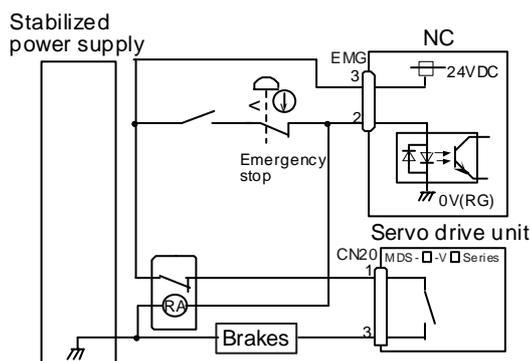
An external emergency stop can be applied on the NC by using the "EMG" connector at the bottom of the control unit.



Sequencing emergency stop with motor brakes

1. When supplying power from NC side

2. When supplying power from external power source



Precautions

- When validating an emergency stop with sequence conditions, in addition to the emergency stop switch, select a switch (SW) compatible with minute currents (5mA).
- The GND for the stabilized power supplied to the brakes and the GND for the power supplied to the NC side "DCIN" must be common.
- The brake wiring differs according to the servo drive unit being used. Refer to the specifications manual of each drive section for details.

CAUTION

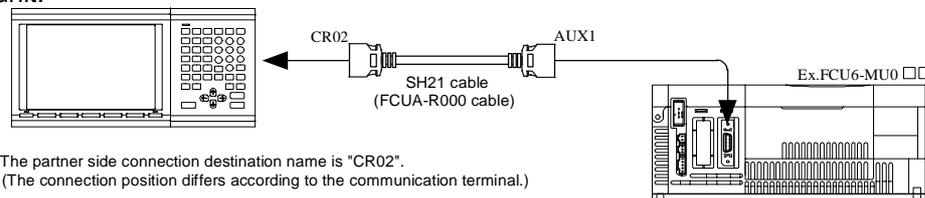
- Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- Incorrect connections may damage the devices, so connect the cables to the specified connectors.

4. CONTROL UNIT

4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

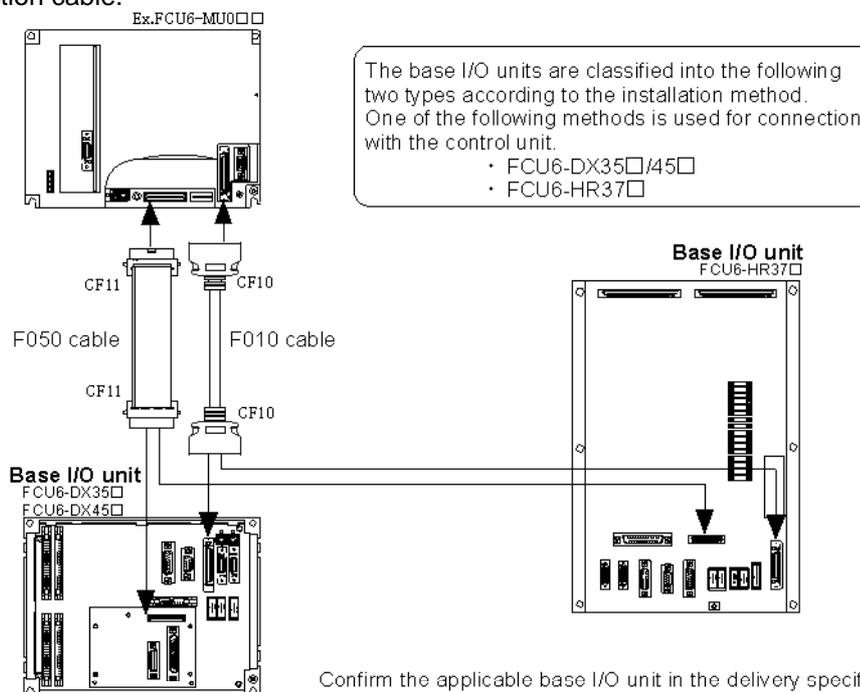
4.2.4 Connection of Communication Terminal

Connect the cable for connecting the communication terminal to the "AUX1" connector on the bottom of the control unit.



4.2.5 Connection of Base I/O Unit

Connect the "CF10" and "CF11" connectors on the front of the control unit with the base I/O unit. The installation pitch between the base I/O unit and control unit depends on the length of the connection cable.

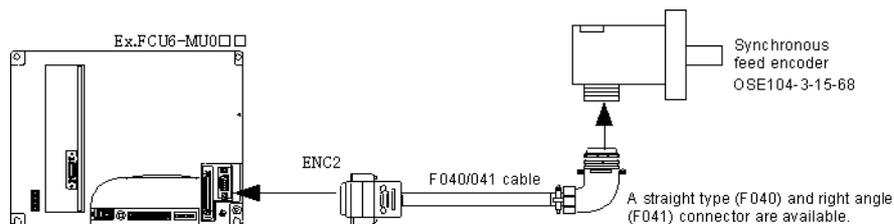


4.2.6 Connection of Synchronous Feed Encoder

Connect the synchronous feed encoder (OSE-1024-3-15-68) to the "ENC2" connector on the front of the control unit.

There is a connection connector for the base I/O unit and for the control unit.

Refer to the respective system specifications for details on the connection destination and usage methods.



4. CONTROL UNIT

4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

4.2.7 Connection of I/O Link (When using M64)

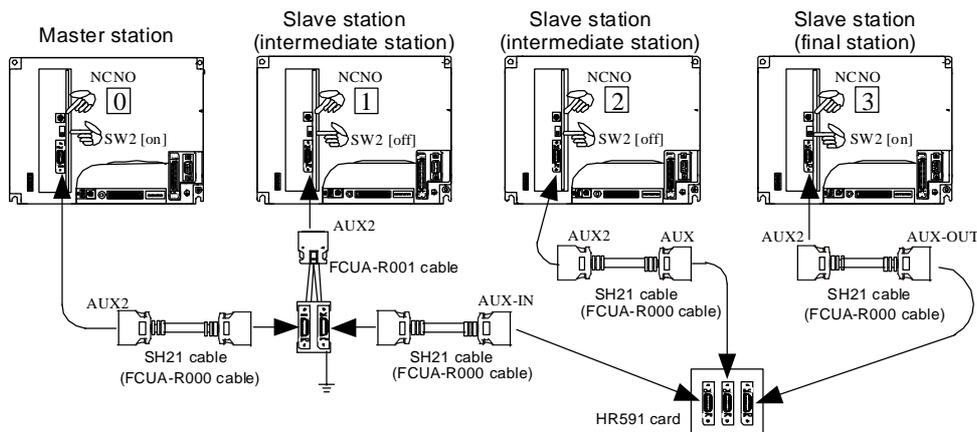
The I/O link is a function used to exchange various data between NC units. (System option function)
 Connect the "AUX2" connectors found on the front of each control unit.
 Up to four salve NC units can be connected to one master NC unit.

1) Setting the master station and slave station

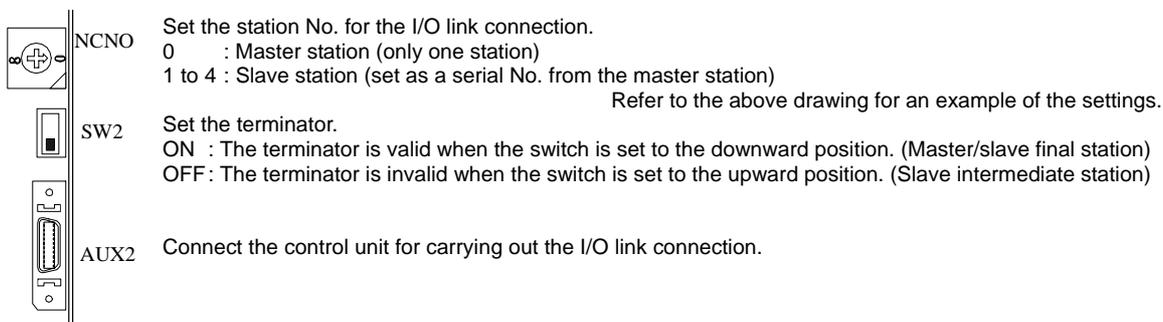
The master station and slave station number must be set and the terminator must be set for the I/O link. Refer to the following drawings and set. The master station and slave station are set with the rotary switch "NCNO".

Turn ON the terminator changeover switch "SW2" for the master station and slave (final) station.

Connecting one master station and three slave stations



- The FCUA-R001 cable or HR591 card is used to relay the control units.
- The maximum cable length between the master station and final station is 15m.
- Control units with the HR531B/532B card can also be used.



⚠ CAUTION

- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

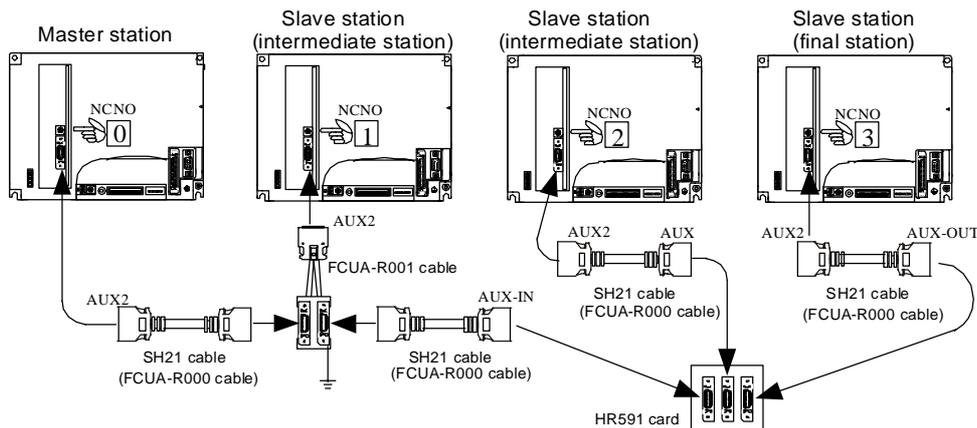
4. CONTROL UNIT

4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

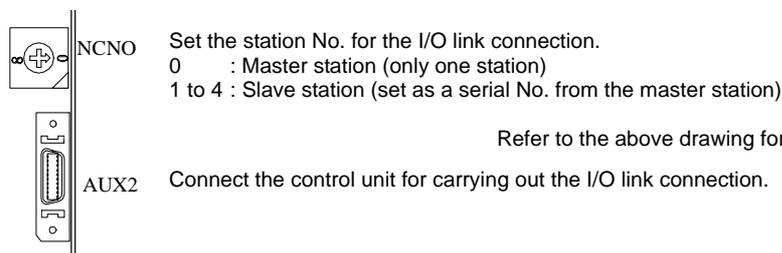
2) Connecting a unit using the HR531B/532B card

In some initially produced control units, the I/O link system was configured with the HR531B card, on which the terminator was mounted, and the HR532B card, on which the terminator was not mounted. In the I/O link system using the HR531B and HR532B cards, an HR531B card is used for the master station and slave (final) station. HR532B cards are used for the slave (intermediate) stations in between. The master station and slave station are set with the rotary switch "NCNO". The control units subsequent to the initially produced units, explained in the previous section, use the HR531C card with terminator ON/OFF switch.

Connecting one master station and three slave stations



- The FCUA-R001 cable or HR591 card is used to relay the control units.
- The maximum cable length between the master station and final station is 15m.
- Control units with the HR531C card can also be used.



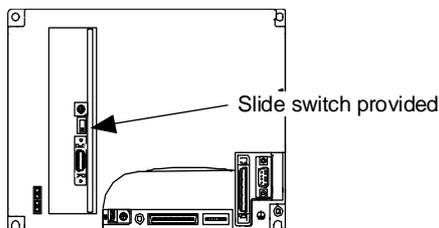
Refer to the above drawing for an example of the settings.

3) Determining whether HR531C card, HR531B or HR532B is in use

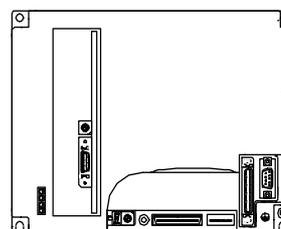
Refer to the control unit's appearance and Alarm Diagnosis screen configuration (hardware monitor), and confirm which type of control unit is in use.

Determining the control unit

Control unit using HR531C card



Control unit using HR531B/HR532B card

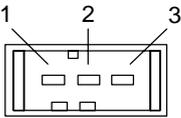


The type of unit being used can be judged by whether there is a slide switch looking from the front of the control unit.

4. CONTROL UNIT
4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

4.2.8 Connector Pin Assignment

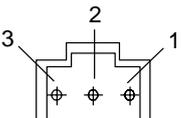
Power input terminal (24VDC)
 DCIN



<Cable side connector type>
 Connector : 2-178288-3
 Contact : 1-175218-5
 Recommended manufacturer:
 Tyco Electronics AMP

1	I	24VDC
2		0V(RG)
3		FG

External emergency stop connection terminal
 EMG

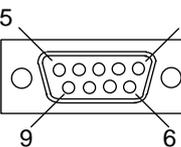


<Cable side connector type>
 Connector : 51030-0330
 Contact : 50084-8160
 Recommended manufacturer: MOLEX

1		FG
2	I	EMG IN
3	O	COM

(COM pin is a 24VDC output)

Synchronous feed encoder connection terminal
 ENC2



1	I	ENC2A	6	I	ENC2A*
2	I	ENC2B	7	I	ENC2B*
3	I	ENC2Z	8	I	ENC2Z*
4		GND	9	O	+5V
5		GND			

<Cable side connector type>
 Connector : CDE-9PF
 Contact : CD-PC-111
 Case : HDE-CTH
 Recommended manufacturer: Hirose Electric

(Connect the connector case to shield.)

⚠ CAUTION

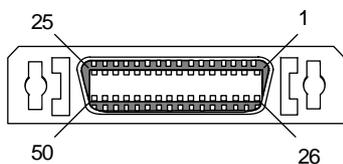
- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

4. CONTROL UNIT

4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

Base I/O unit connection terminal

CF10



<Cable side connector type>

Plug : 10150-6000EL

Shell : 10350-3210-000

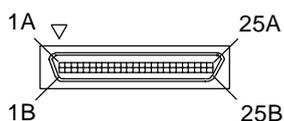
Recommended manufacturer: 3M

(Connect the connector case to shield.)

1	I/O	TXRX1	26	I/O	TXRX1*
2	I/O	TXRX2	27	I/O	TXRX2*
3		GND	28		GND
4	I	SKIP1	29	I	SKIP1*
5	I	SKIP2	30	I	SKIP2*
6	I	SKIP3	31	I	SKIP3*
7	I	SKIP4	32	I	SKIP4*
8	I	SKIP5	33	I	SKIP5*
9	I	SKIP6	34	I	SKIP6*
10	I	SKIP7	35	I	SKIP7*
11	I	SKIP8	36	I	SKIP8*
12		GND	37		GND
13	I	ENC1A	38	I	ENC1A*
14	I	ENC1B	39	I	ENC1B*
15	I	ENC1Z	40	I	ENC1Z*
16		GND	41		GND
17	O	SVTXD2	42	O	SVTXD2*
18	I	SVALM2	43	I	SVALM2*
19	I	SVRXD2	44	I	SVRXD2*
20	O	SVEMG2	45	O	SVEMG2*
21		GND	46		GND
22	O	SVTXD1	47	O	SVTXD1*
23	I	SVALM1	48	I	SVALM1*
24	I	SVRXD1	49	I	SVRXD1*
25	O	SVEMG1	50	O	SVEMG1*

Base I/O unit connection terminal

CF11



<Cable side connector type>

Connector: DHD-RB50-20AN

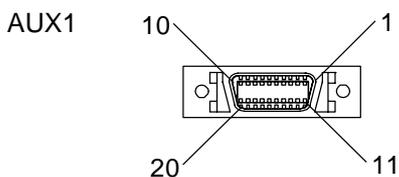
Recommended manufacturer: DDK

		A			B
1	O	+5V	1	O	+5V
2	I/O	TXRX3	2	I/O	TXRX3*
3		GND	3		GND
4	I	HA1A	4	I	HA1B
5	I	HA2A	5	I	HA2B
6	I	HA3A	6	I	HA3B
7	O	+12V	7	O	+12V
8		GND	8		GND
9	I	KBD0*	9	O	KBADCS0
10	I	KBD1*	10	O	KBADCS1
11	I	KBD2*	11	O	KBADCS2
12	I	KBD3*	12	O	KBADCS3
13	O	KBAD0	13	O	BUZ
14	O	KBAD1	14	O	RDY
15	O	KBAD2	15	O	SP
16		reserve	16	I	KBRES
17		GND	17		GND
18	O	SD1	18	I	RD1
19	O	RS1	19	I	CS1
20	O	ER1	20	I	DR1
21	O	SD2	21	I	RD2
22	O	RS2	22	I	CS2
23	O	ER2	23	I	DR2
24		GND	24		GND
25	O	+5V	25	O	+5V

4. CONTROL UNIT

4.2 FCU6-MU011 Control Unit (MELDAS64 compatible)

Communication terminal connection terminal



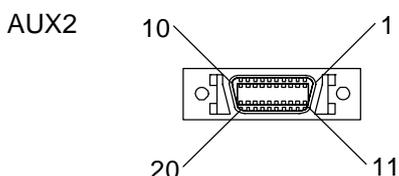
<Cable side connector type>

Plug : 10120-6000EL
 Shell : 10320-3210-00
 Recommended manufacturer: 3M

1	GND	11	EN_RT
2	I_RXD	12	I_RXD*
3		13	
4	O_TXD	14	O_TXD*
5	GND	15	GND
6		16	
7		17	
8	GND	18	
9		19	
10		20	

(Connect the connector case to shield.)

I/O link connection terminal



<Cable side connector type>

Plug : 10120-6000EL
 Shell : 10320-3210-00
 Recommended manufacturer: 3M

1	GND	11	EN_RT
2	I_RXD	12	I_RXD*
3		13	
4	O_TXD	14	O_TXD*
5	GND	15	GND
6		16	
7		17	
8	GND	18	
9		19	
10		20	

(Connect the connector case to shield.)

⚠ CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

4. CONTROL UNIT

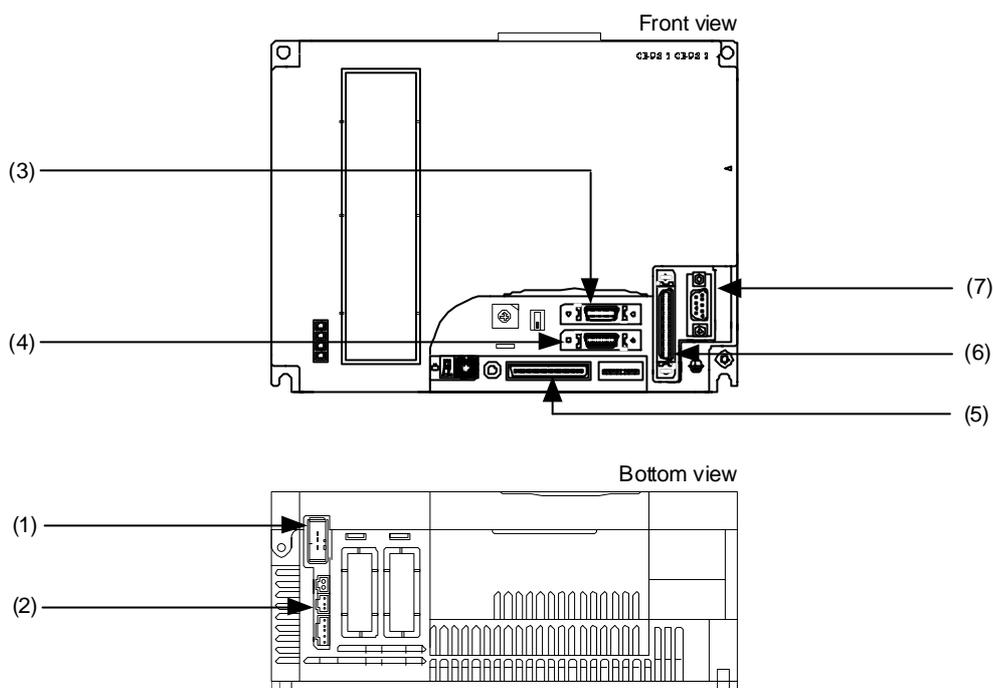
4.3 FCU6-MU021/MA031 Control Unit (MELDAS64AS/M64S/65/65S/66/66S compatible)

4.3 FCU6-MU021/MU032/MA031 Control Unit (MELDAS64AS/M64S/65/65S/66/66S compatible)

The FCU6-MU021/MU032/MA031 unit is explained in this section.

This unit is the NC control unit for the MELDAS64AS/M64S/65/65S/66/66S.

4.3.1 Names and Functions of Each Section



No.	Connector name	Function explanation
(1)	DCIN	Power input terminal (24VDC)
(2)	EMG	External emergency stop connection terminal
(3)	AUX1	Communication terminal connection terminal
(4)	AUX2	I/O link connection terminal
(5)	CF11	Base I/O unit connection terminal
(6)	CF10	Base I/O unit connection terminal
(7)	ENC2	Synchronous feed encoder connection terminal

Accessories

Cables and screws are not enclosed with the control unit.

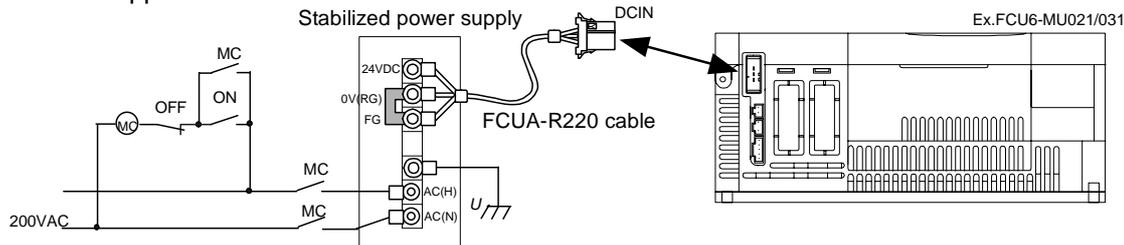
The FCU6-HR412 (memory cassette) is mounted in CBUS2 in the unit.

4. CONTROL UNIT

4.3 FCU6-MU021/MA031 Control Unit (MELDAS64AS/M64S/65/65S/66/66S compatible)

4.3.2 Connection of Power Supply

24VDC is supplied from the "DCIN" connector at the bottom of the control unit.



Turn the control unit power ON after turning or simultaneously with the turning ON of the peripheral units (servo drive unit, remote I/O, etc.).

If the control unit power is turned ON first, the peripheral unit will not be recognized correctly.

Select a stabilized power supply and magnetic contact that satisfy the following specifications.

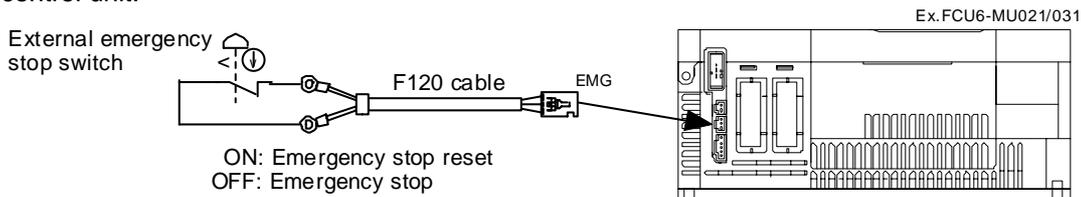
Stabilized power supply
Rated voltage: 24VDC \pm 5%
Ripple: \pm 5% [p-p]
Rated current: 24VDC, 1.5A or more

Magnetic contact
Contact rating: 250VAC/1A or more
Operation coil: 250VAC/0.2A or more
No. of contacts: 3 contacts (a connection)

Select VDE Standard approved parts.
The above MC is for a 200VAC input voltage.

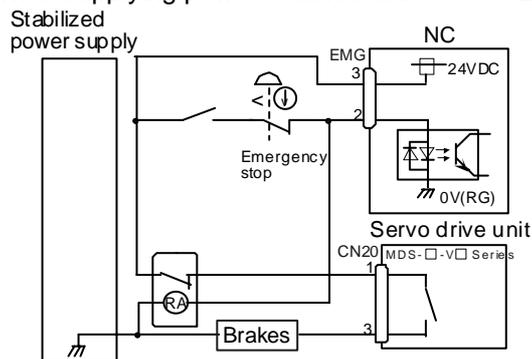
4.3.3 Connection of External Emergency Stop

An external emergency stop can be applied on the NC by using the "EMG" connector at the bottom of the control unit.

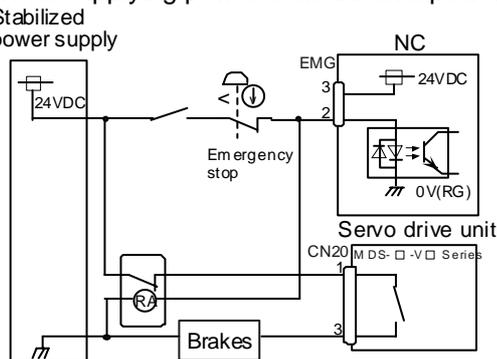


Sequencing emergency stop with motor brakes

1. When supplying power from NC side



2. When supplying power from external power source



Precautions

- When validating an emergency stop with sequence conditions, in addition to the emergency stop switch, select a switch (SW) compatible with minute currents (5mA).
- The GND for the stabilized power supplied to the brakes and the GND for the power supplied to the NC side "DCIN" must be common.
- The brake wiring differs according to the servo drive unit being used. Refer to the specifications manual of each drive section for details.

CAUTION

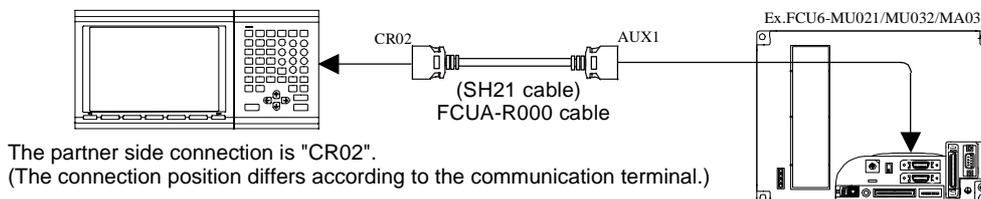
- Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- Incorrect connections may damage the devices, so connect the cables to the specified connectors.

4. CONTROL UNIT

4.3 FCU6-MU021/MA031 Control Unit (MELDAS64AS/M64S/65/65S/66/66S compatible)

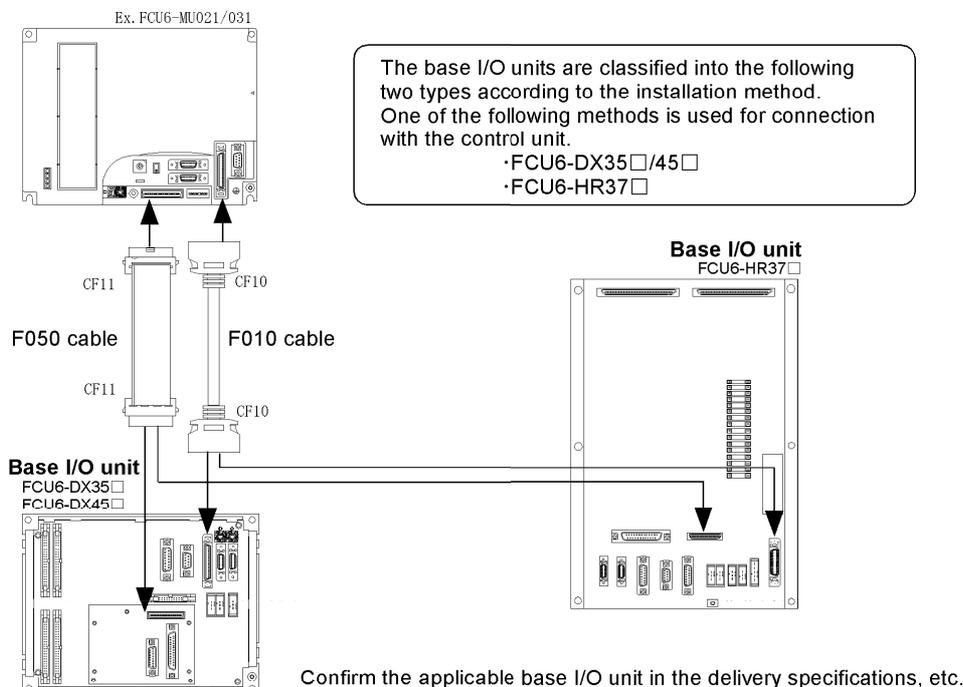
4.3.4 Connection of Communication Terminal

Connect the cable for connecting the communication terminal to the "AUX1" connector on the bottom of the control unit.



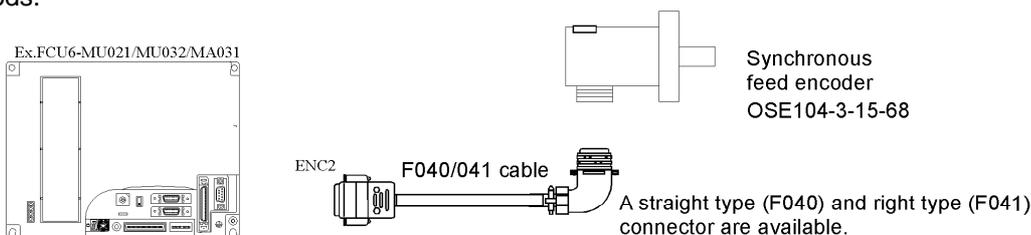
4.3.5 Connection of Base I/O Unit

Connect the "CF10" and "CF11" connectors on the front of the control unit with the base I/O unit. The installation pitch between the base I/O unit and control unit depends on the length of the connection cable.



4.3.6 Connection of Synchronous Feed Encoder

Connect the synchronous feed encoder (OSE-1024-3-15-68) to the "ENC2" connector on the front of the control unit. There is a connection connector for the base I/O unit and for the control unit. Refer to the respective system specifications for details on the connection destination and usage methods.



4. CONTROL UNIT

4.3 FCU6-MU021/MA031 Control Unit (MELDAS64AS/M64S/65/65S/66/66S compatible)

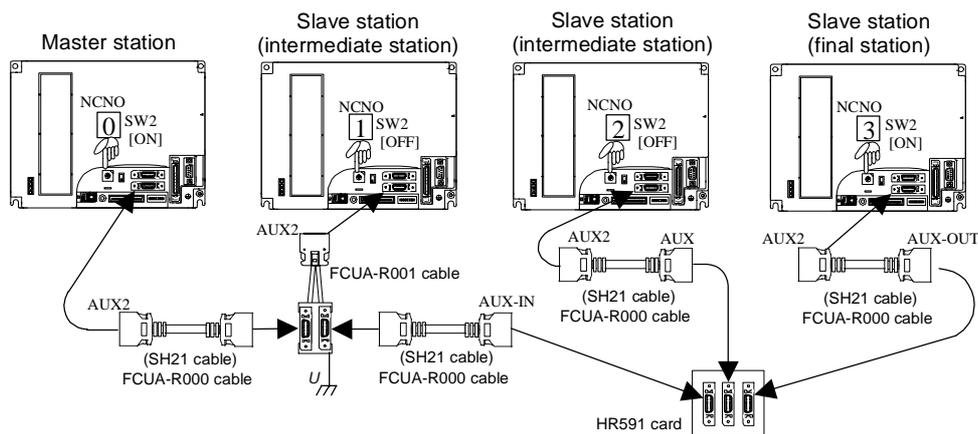
4.3.7 Connection of I/O Link (When using MELDAS64AS/M64S/65/65S/66/66S)

The I/O link is a function used to exchange various data between NC units. (System option function)
Connect the "AUX2" connectors found on the front of each control unit.
Up to three slave NC units can be connected to one master NC unit.

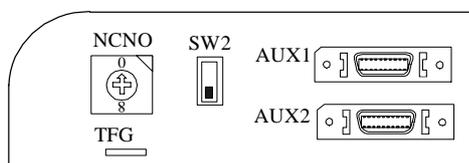
1) Connection example

The master station and slave station are set with the rotary switch "NCNO".
Turn ON the terminator changeover switch "SW2" for the master station and slave (final) station.

Connecting one master station and three slave stations



- The FCUA-R001 cable or HR591 card is used to relay the control units.
- The maximum cable length between the master station and final station is 15m.
- Control units with the HR531/532B card can also be used.



NCNO Set the station No. for the I/O link connection.

- 0 : Master station (only one station)
- 1 to 4 : Slave station (set as a serial No. from the master station)

Refer to the above drawing for an example of the settings.

SW2 Set the terminator

- ON : The terminator is valid when the switch is set to the downward position. (Master/slave final station)
- OFF : The terminator is invalid when the switch is set to the upward position. (Slave intermediate station)

AUX2 Connect the control unit for carrying out the I/O link connection.

AUX1 Connect the communication terminal.

TFG This is the FG terminal.



- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

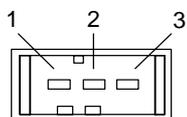
4. CONTROL UNIT

4.3 FCU6-MU021/MA031 Control Unit (MELDAS64AS/M64S/65/65S/66/66S compatible)

4.3.8 Connector Pin Assignment

Power input terminal (24VDC)

DCIN



<Cable side connector type>

Connector : 2-178288-3

Contact : 1-175218-5

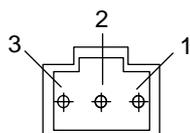
Recommended manufacturer:

Tyco Electronics AMP

1	I	24VDC
2		0V(RG)
3		FG

External emergency connection terminal

EMG



<Cable side connector type>

Connector : 51030-0330

Contact : 50084-8160

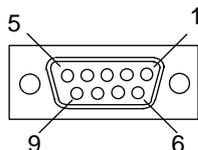
Recommended manufacturer: MOLEX

(COM pin is a 24VDC output)

1		FG
2	I	EMG IN
3	O	COM

Synchronous feed encoder connection terminal

ENC2



<Cable side connector type>

Connector : CDE-9PF

Contact : CD-PC-111

Case : HDE-CTH

Recommended manufacturer: Hirose Electric

1	I	ENC2A	6	I	ENC2A*
2	I	ENC2B	7	I	ENC2B*
3	I	ENC2Z	8	I	ENC2Z*
4		GND	9	O	+5V
5		GND			

(Connect the connector case to shield.)

CAUTION

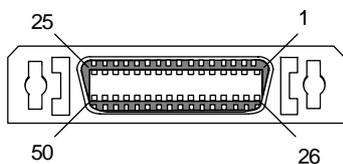
- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

4. CONTROL UNIT

4.3 FCU6-MU021/MA031 Control Unit (MELDAS64AS/M64S/65/65S/66/66S compatible)

Base I/O unit connection terminal

CF10



<Cable side connector type>

Plug : 10150-6000EL

Shell : 10350-3210-000

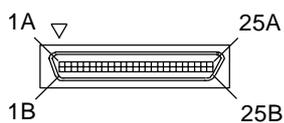
Recommended manufacturer: 3M

(Connect the connector case to shield.)

1	I/O	TXRX1	26	I/O	TXRX1*
2	I/O	TXRX2	27	I/O	TXRX2*
3		GND	28		GND
4	I	SKIP1	29	I	SKIP1*
5	I	SKIP2	30	I	SKIP2*
6	I	SKIP3	31	I	SKIP3*
7	I	SKIP4	32	I	SKIP4*
8	I	SKIP5	33	I	SKIP5*
9	I	SKIP6	34	I	SKIP6*
10	I	SKIP7	35	I	SKIP7*
11	I	SKIP8	36	I	SKIP8*
12		GND	37		GND
13	I	ENC1A	38	I	ENC1A*
14	I	ENC1B	39	I	ENC1B*
15	I	ENC1Z	40	I	ENC1Z*
16		GND	41		GND
17	O	SVTXD2	42	O	SVTXD2*
18	I	SVALM2	43	I	SVALM2*
19	I	SVRXD2	44	I	SVRXD2*
20	O	SVEMG2	45	O	SVEMG2*
21		GND	46		GND
22	O	SVTXD1	47	O	SVTXD1*
23	I	SVALM1	48	I	SVALM1*
24	I	SVRXD1	49	I	SVRXD1*
25	O	SVEMG1	50	O	SVEMG1*

Base I/O unit connection terminal

CF11



<Cable side connector type>

Connector: DHD-RB50-20AN

Recommended manufacturer: DDK

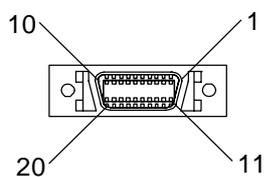
		A			B
1	O	+5V	1	O	+5V
2	I/O	TXRX3	2	I/O	TXRX3*
3		GND	3		GND
4	I	HA1A	4	I	HA1B
5	I	HA2A	5	I	HA2B
6	I	HA3A	6	I	HA3B
7	O	+12V	7	O	+12V
8		GND	8		GND
9	I	KBD0*	9	O	KBADCS0
10	I	KBD1*	10	O	KBADCS1
11	I	KBD2*	11	O	KBADCS2
12	I	KBD3*	12	O	KBADCS3
13	O	KBAD0	13	O	BUZ
14	O	KBAD1	14	O	RDY
15	O	KBAD2	15	O	SP
16		reserve	16	I	KBRES
17		GND	17		GND
18	O	SD1	18	I	RD1
19	O	RS1	19	I	CS1
20	O	ER1	20	I	DR1
21	O	SD2	21	I	RD2
22	O	RS2	22	I	CS2
23	O	ER2	23	I	DR2
24		GND	24		GND
25	O	+5V	25	O	+5V

4. CONTROL UNIT

4.3 FCU6-MU021/MA031 Control Unit (MELDAS64AS/M64S/65/65S/66/66S compatible)

Communication terminal connection terminal

AUX1



<Cable side connector type>

Plug : 10120-6000EL

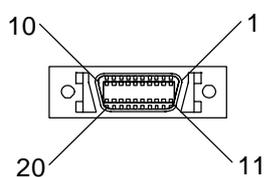
Shell : 10320-3210-00

Recommended manufacturer: 3M

1	GND	11	EN RT
2	I RXD	12	I RXD*
3		13	
4	O TXD	14	O TXD*
5	GND	15	GND
6		16	
7		17	
8	GND	18	
9		19	
10		20	

I/O link connection terminal

AUX2



<Cable side connector type>

Plug : 10120-6000EL

Shell : 10320-3210-00

Recommended manufacturer: 3M

1	GND	11	EN RT
2	I RXD	12	I RXD*
3		13	
4	O TXD	14	O TXD*
5	GND	15	GND
6		16	
7		17	
8	GND	18	
9		19	
10		20	

⚠ CAUTION

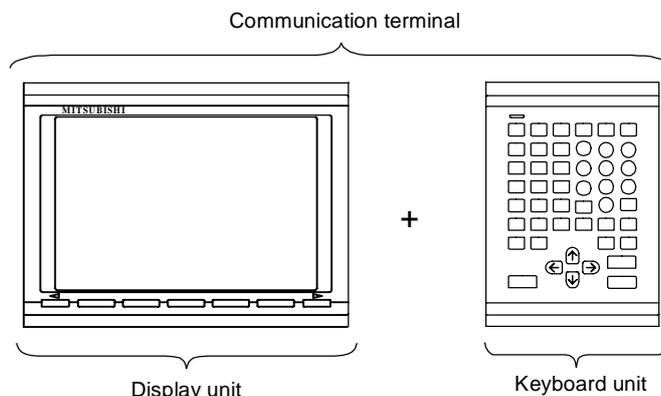
- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL
5.1 Outline of Communication Terminal

5. COMMUNICATION TERMINAL

5.1 Outline of Communication Terminal

The communication terminal is configured of the display unit and keyboard unit.
 The optimum terminal can be selected from the following combinations.



5.1.1 Configuration of Type

Display unit

FCUA – CT 100

- 100 : Keyboard integrated type (M system)
- 120 : Keyboard integrated type (L system)
- 10 : Separated type (separate keyboard)
- CT : Communication terminal (9 type CRT)
- LD : 7.2-type monochrome LCD
- CR : 9-type monochrome CRT
- EL : 9.5-type monochrome EL
(Cannot be used with M60S Series.)

FCU6 – D U T 3 2

- Series serial No.
- 2: 8.4-type
- 3: 10.4-type
- T : Monochrome LCD
- N : Color LCD
- DU: Display unit

Keyboard unit

FCUA – KB 10

- 10 : For CRT/EL (M system)
 - 12 : For CRT/EL (L system)
 - 20 : For LCD (M system)
 - 021: For LCD (M system) For FCU6-DUT32/DUN33
 - 022: For LCD (M system) For FCU6-DUN22
 - 30 : For LCD (L system)
 - 031: For LCD (L system) For FCU6-DUT32/DUN33
 - KB: NC keyboard
- A or 6

5.1.2 Features of Each Unit

	Display unit	Keyboard unit	Features
1	FCU6-DUT32	FCU6-KB021/031	Thin type (minimum depth) with large display characters. CE compatible.
2	FCU6-DUN33		Series' first color terminal. Although thin, the view angle is the same as the CRT. CE compatible.
3	FCU6-DUN22	FCU6-KB022	8.4-type color TFT. The installation pitch is the same as LD10/EL10/CR10 and KB10/12/20/30.
4	FCUA-LD100	Keyboard integrated	Although thin, installation pitch is the same as the CRT type. CE compatible.
5	FCUA-LD10	FCUA-KB20/30	
6	FCUA-EL10	FCUA-KB10/KB12	Thin and easy-to-view.
7	FCUA-CT100/120	Keyboard integrated	CRT type display unit.
8	FCUA-CR10	FCUA-KB10/KB12	

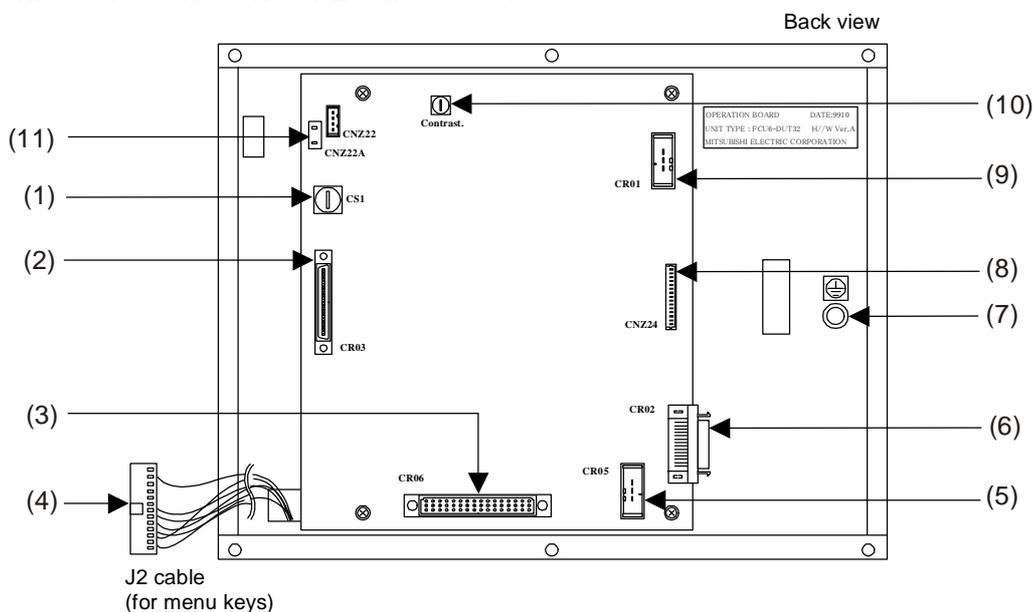
5. COMMUNICATION TERMINAL

5.2 FCU6-DUT32 Display Unit (10.4-type monochrome LCD)

5.2 FCU6-DUT32 Display Unit (10.4-type monochrome LCD)

The thin-type monochrome LCD communication terminal is described in this section.
The FCU6-KB021/KB031 NC keyboard can be connected to this unit.

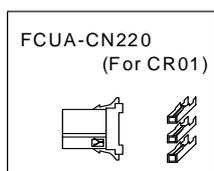
5.2.1 Names and Functions of Each Section



No.	Connector name	Function explanation
(1)	CS1	Select the type of keyboard connected. (M system: 0/L system: 1)
(2)	CR03	NC keyboard (FCU6-KB021/KB031) connection terminal
(3)	CR06	Function extension connector (Not used)
(4)	J2	NC keyboard (FCU6-KB021/KB031) J2 terminal connection cable
(5)	CR05	Remote I/O connection terminal
(6)	CR02	Control unit connection terminal
(7)	FG	Frame ground connection terminal
(8)	CNZ24	LCD display signal output terminal
(9)	CR01	Power input terminal (24VDC)
(10)	CONTRAST	LCD display contrast adjustment potentiometer (adjusted before shipment)
(11)	CNZ22/CNZ22A	LCD backlight power output terminal

Accessories

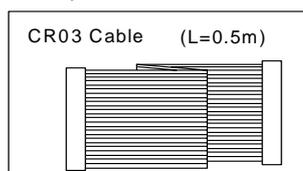
Enclosed connector set



FCUA-CN211
(For CR05)



NC keyboard cable

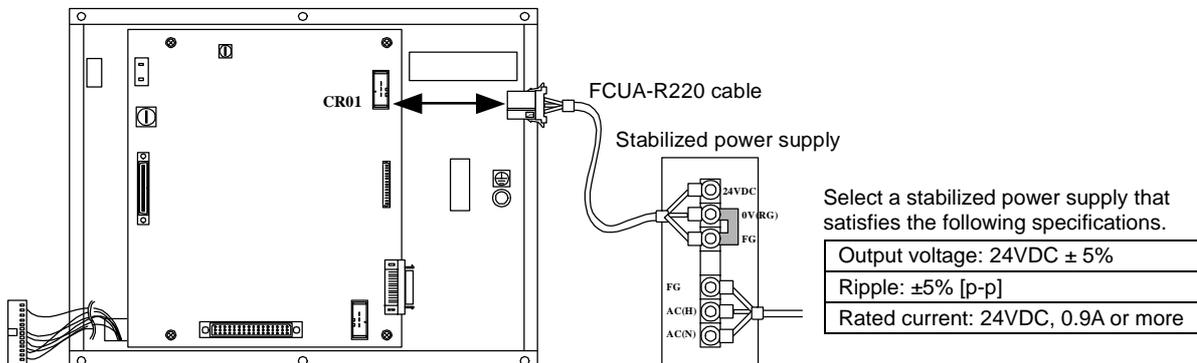


5. COMMUNICATION TERMINAL

5.2 FCU6-DUT32 Display Unit (10.4-type monochrome LCD)

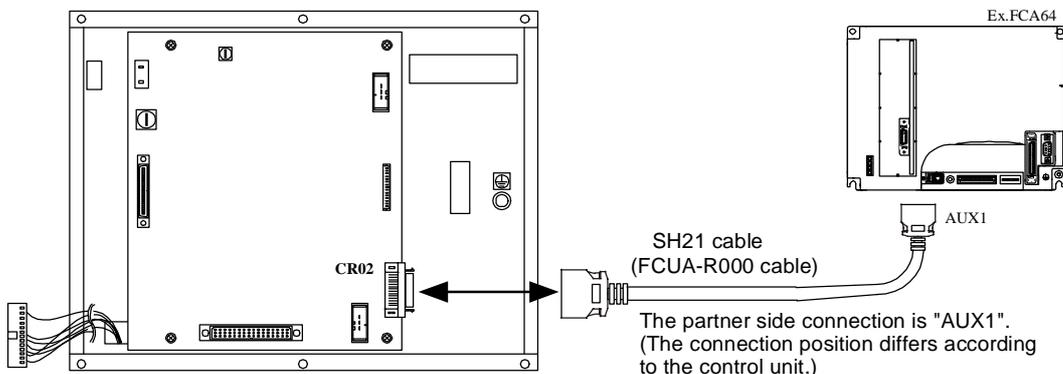
5.2.2 Connection of Power Supply

24VDC is supplied from the "CR01" connector on the back of the communication terminal.



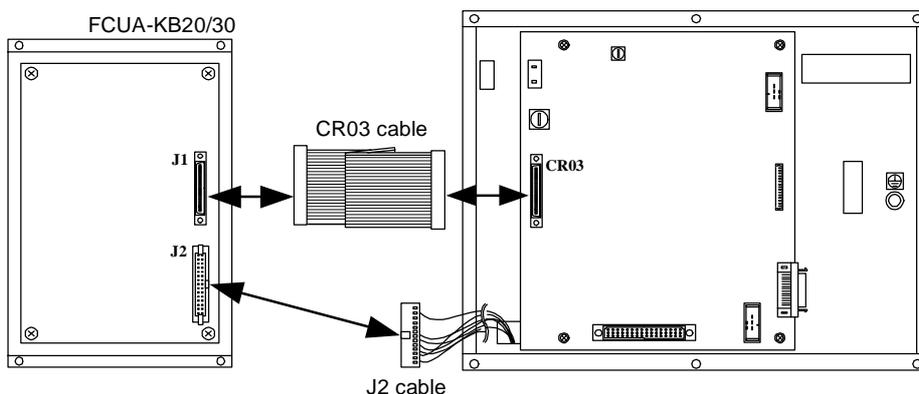
5.2.3 Connection of Control Unit

Connect the cable from the control unit to the "CR02" connector on the back of the communication terminal.



5.2.4 Connection of NC Keyboard

Connect to the "J1" connector on the NC keyboard with the CR03 cable connected to the "CR03" connector. Connect the J2 cable for the menu keys to the "J2" connector on the NC keyboard.



⚠ CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL

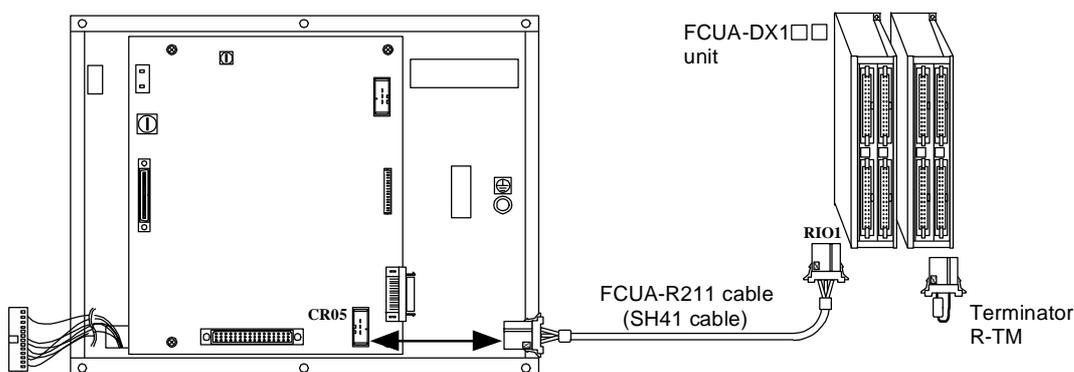
5.2 FCU6-DUT32 Display Unit (10.4-type monochrome LCD)

5.2.5 Connection of Remote I/O Unit

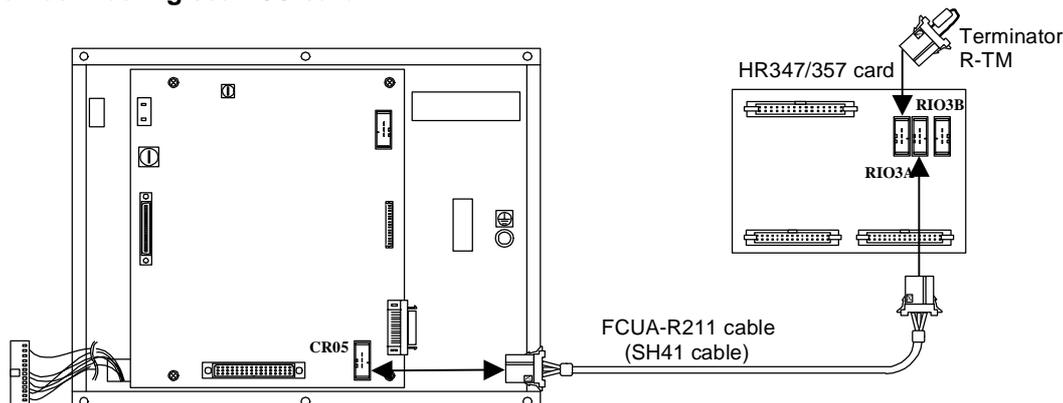
Connect to the remote I/O unit from the "CR05" connector on the back of the communication terminal. The scan I/O card (HR347/357) and expansion I/O card (QY231) can be connected in addition to the remote I/O unit.

Up to four stations can be set. (Example: Up to two FCUA-DX111 units can be connected.)
The analog input/output unit (FCUA-DX120/121/140/141) cannot be used.

When connecting remote I/O unit



When connecting scan I/O card



Refer to the explanation on each I/O item for details on setting the number of stations, etc.
When connecting the remote I/O, always connect a terminator (R-TM) to the final station.
Refer to the "PLC Interface Manual" for details on the interface assignments.

5.2.6 Adjustment of Display Screen

The LCD display screen is set to the optimum display looking from the front. However, this may be difficult to view depending on the installation position. Adjust with the following items in this case.
(When adjusting with the internal CONTRAST potentiometer, set the following parameter values to "0".)

Basic specification parameter

#1132 CRT	LCD contrast adjustment	"Setting range: -3 ^{Dark} to 3 ^{Bright} "
#1134 LCDneg	LCD display reverse display	"Setting range: 0/1"



- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

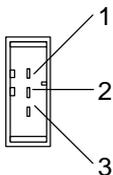
5. COMMUNICATION TERMINAL

5.2 FCU6-DUT32 Display Unit (10.4-type monochrome LCD)

5.2.7 Connector Pin Assignment

Power input terminal
(24VDC)

CR01



<Cable side connector type>

Connector : 2-178288-3

Contact : 1-175218-5

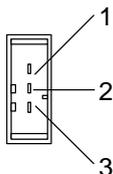
Recommended manufacturer:

Tyco Electronics AMP

1	I	24VDC
2		0V(RG)
3		FG

Remote I/O connection
terminal

CR05



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

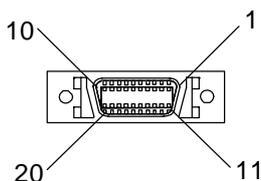
Recommended manufacturer:

Tyco Electronics AMP

1	I/O	TXRX
2	I/O	TXRX*
3		GND

Control unit connection terminal

CR02



<Cable side connector type>

Plug : 10120-6000EL

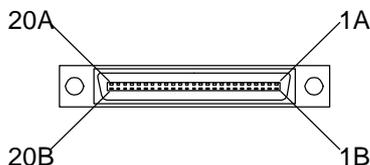
Shell: 10320-3210-00

Recommended manufacturer: 3M

1		GND	11		EN RT
2	I	RXD	12	I	RXD*
3			13		
4	O	TXD	14	O	TXD*
5		GND	15		GND
6			16		
7			17		
8		GND	18		
9			19		
10			20		

NC keyboard connection terminal (FCU6-KB021/KB031)

CR03



<Cable side connector type>

Plug : 8830E-50

Recommended manufacturer: KEL

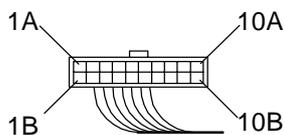
A		B	
1	GND	1	GND
2	I KSC0	2	I KSC1
3	Vcc	3	Vcc
4	I KSC2	4	I KSC3
5	I KSC4	5	I KSC5
6	I KSC6	6	I KSC7
7	I KSC8	7	I KSC9
8	I KSC10	8	I KSC11
9	I KSC12	9	
10		10	
11		11	
12		12	
13	I BUZCM	13	I BUZCM
14		14	
15	GND	15	GND
16	I RESET	16	I FAST
17	Vcc	17	Vcc
18	O NKD0	18	O NKD1
19	O NKD2	19	O NKD3
20	O NKD4	20	O NKD5
21	O NKD6	21	O NKD7
22	O BUZ	22	
23	Vcc	23	GND
24	O READY	24	
25	Vcc	25	Vcc

5. COMMUNICATION TERMINAL

5.2 FCU6-DUT32 Display Unit (10.4-type monochrome LCD)

NC keyboard J2 terminal connection cable
(FCU6-KB021/KB031)

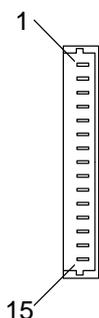
J2



A		B	
1		1	
2	I SC0	2	I SC1
3	I SC2	3	I SC3
4	I SC4	4	I SC5
5	I SC6	5	
6		6	O KD7
7		7	
8		8	
9		9	
10		10	

LCD display signal output terminal

CNZ24



<Cable side connector type>

Connector : 51021-1500

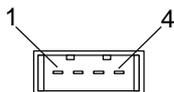
Contact : 50079-8000

Recommended manufacturer: MOLEX

1	O	FLM
2	O	LP
3	O	CP
4	O	DISPOFF*
5		Vcc
6		Vss
7		VEE
8	O	DU0
9	O	DU1
10	O	DU2
11	O	DU3
12	O	DL0
13	O	DL1
14	O	DL2
15	O	DL3

LCD backlight power output terminal

CNZ22



<Cable side connector type>

Connector : M63M83-04

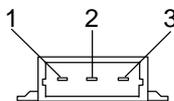
Contact : M63C84-1

Recommended manufacturer: MITSUMI

1	I	CCFL_HOT
2		NC
3		NC
4		CCFL_GND

LCD backlight power output terminal

CNZ22A



<Cable side connector type>

Connector : QZ-19-3F01

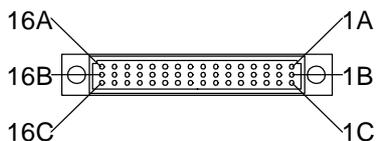
Contact : QZ-19-F114A

Recommended manufacturer: HONDA TSUSHIN KOGYO

1	I	CCFL_HOT
2		NC
3		CCFL_GND

Function extension connector (Not used)

CR06



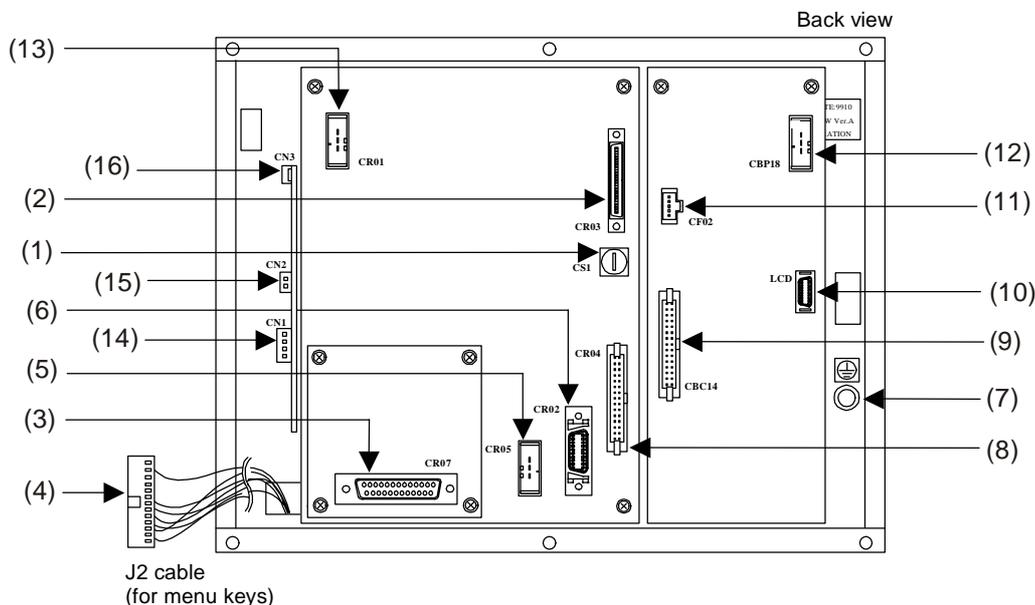
5. COMMUNICATION TERMINAL

5.3 FCU6-DUN33 Display Unit (10.4-type color LCD)

5.3 FCU6-DUN33 Display Unit (10.4-type color LCD)

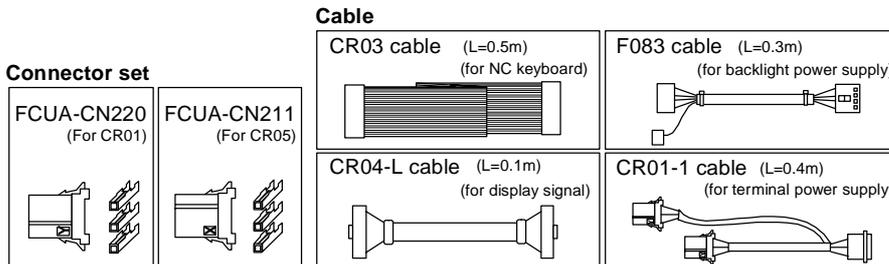
The thin color LCD communication terminal is described in this section.
The FCU6-KB021/KB031 NC keyboard can be connected to this unit.

5.3.1 Names and Functions of Each Section



No.	Connector name	Function explanation
(1)	CS1	Select the type of keyboard connected. (M system: 0/L system: 1)
(2)	CR03	NC keyboard (FCU6-KB021/KB031) connection terminal
(3)	CR07	Serial connector (Not used)
(4)	J2	NC keyboard (FCU6-KB021/KB031) J2 terminal connection cable
(5)	CR05	Remote I/O connection terminal
(6)	CR02	Control unit connection terminal
(7)	FG	Frame ground connection terminal
(8)	CR04	Display signal output terminal
(9)	CBC14	Display signal input terminal
(10)	LCD	LCD display signal output terminal
(11)	CF02	Backlight inverter power output terminal
(12)	CBP18	Power input terminal (24VDC)
(13)	CR01	Power input terminal (24VDC)
(14)	CN3	LCD backlight power output terminal
(15)	CN1	Backlight inverter power input terminal
(16)	CN2	Backlight control signal terminal

Accessories

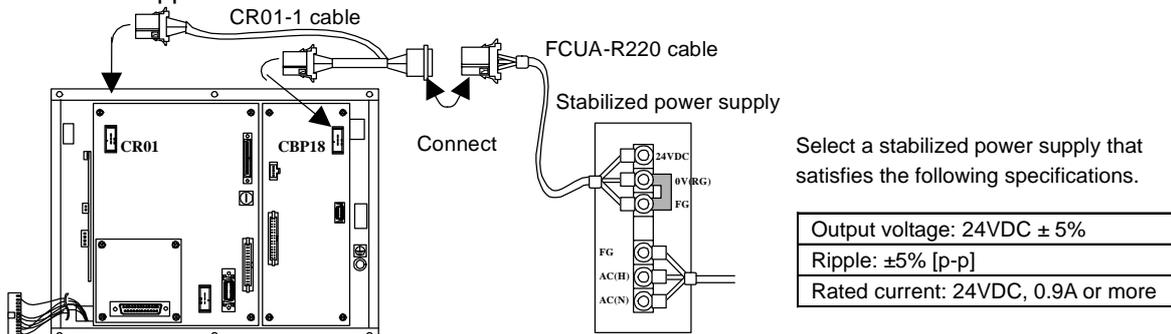


5. COMMUNICATION TERMINAL

5.3 FCU6-DUN33 Display Unit (10.4-type color LCD)

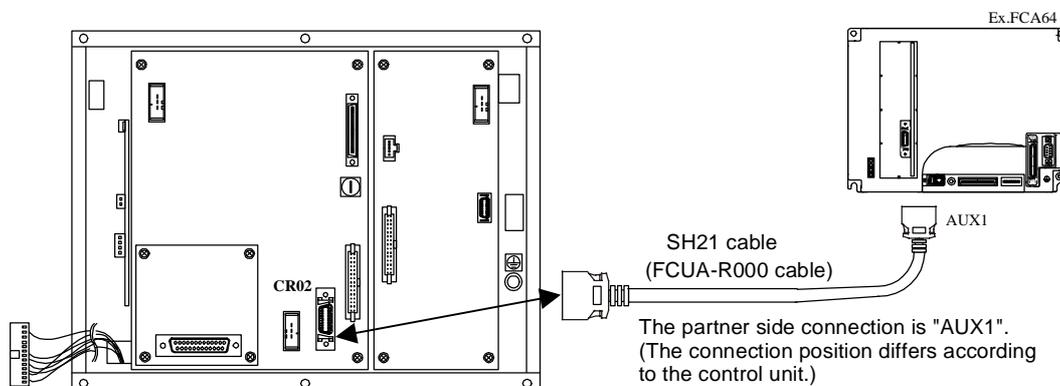
5.3.2 Connection of Power Supply

24VDC is supplied from the CR01-1 cable enclosed with FCU6-DUN33.



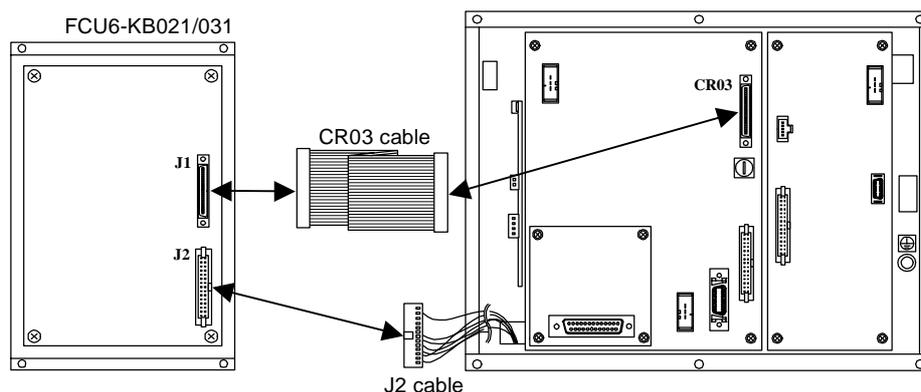
5.3.3 Connection of Control Unit

Connect the cable from the control unit to the "CR02" connector on the back of the communication terminal.



5.3.4 Connection of NC Keyboard

Connect to the "J1" connector on the NC keyboard with the CR03 cable connected to the "CR03" connector. Connect the J2 cable for the menu keys to the "J2" connector on the NC keyboard.



- Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL

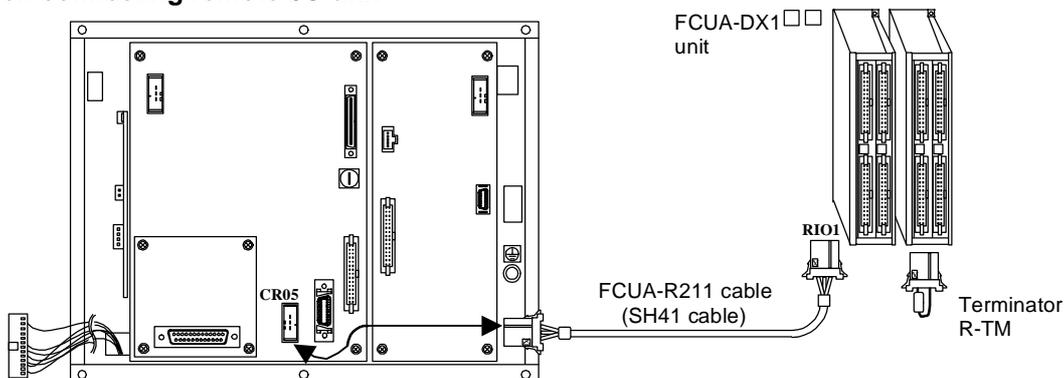
5.3 FCU6-DUN33 Display Unit (10.4-type color LCD)

5.3.5 Connection of Remote I/O Unit

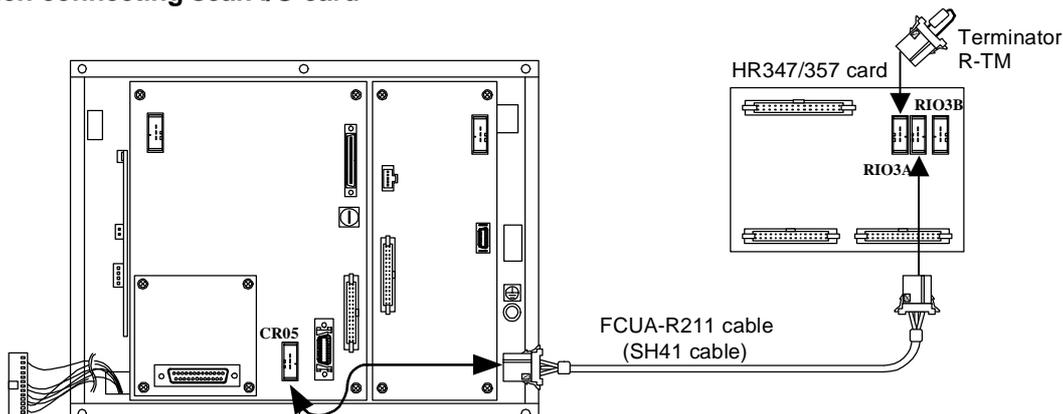
Connect to the remote I/O unit from the "CR05" connector on the back of the communication terminal. The scan I/O (HR347/357) and expansion I/O card (QY231) can be connected in addition to the remote I/O unit.

Up to four stations can be set. (Example: Up to two FCUA-DX111 units can be connected.)
The analog input/output unit (FCUA-DX120/121/140/141) cannot be used.

When connecting remote I/O unit



When connecting scan I/O card



Refer to the explanation on each I/O item for details on setting the number of stations, etc.
When connecting the remote I/O, always connect a terminator (R-TM) to the final station.
Refer to the "PLC Interface Manual" for details on the interface assignments.



- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

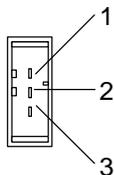
5. COMMUNICATION TERMINAL

5.3 FCU6-DUN33 Display Unit (10.4-type color LCD)

5.3.6 Connector Pin Assignment

Power input terminal
(24VDC)

CR01
CBP18



<Cable side connector type>

Connector : 2-178288-3

Contact : 1-175218-5

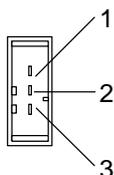
Recommended manufacturer:

Tyco Electronics AMP

1		24VDC
2		0V (RG)
3		FG

Remote I/O connection terminal

CR05



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

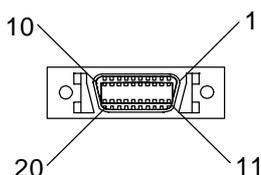
Recommended manufacturer:

Tyco Electronics AMP

1		TXRX
2		TXRX*
3		GND

Control unit connection terminal

CR02



<Cable side connector type>

Plug : 10120-6000EL

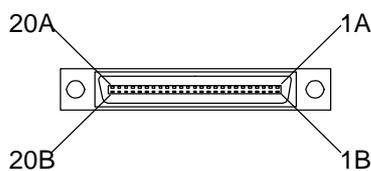
Shell: 10320-3210-00

Recommended manufacturer: 3M

1		GND	11		EN_RT
2		RXD	12		RXD*
3			13		
4	O	TXD	14	O	TXD*
5		GND	15		GND
6			16		
7			17		
8		GND	18		
9			19		
10			20		

NC keyboard connection terminal (FCU6-KB021/KB031)

CR03



<Cable side connector type>

Plug : 8830E-50

Recommended manufacturer: KEL

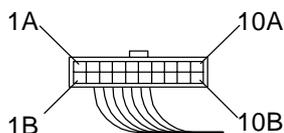
A		B	
1	GND	1	GND
2	KSC0	2	KSC1
3	Vcc	3	Vcc
4	KSC2	4	KSC3
5	KSC4	5	KSC5
6	KSC6	6	KSC7
7	KSC8	7	KSC9
8	KSC10	8	KSC11
9	KSC12	9	
10		10	
11		11	
12		12	
13	BUZCM	13	BUZCM
14		14	
15	GND	15	GND
16	RESET	16	FAST
17	Vcc	17	Vcc
18	O NKD0	18	O NKD1
19	O NKD2	19	O NKD3
20	O NKD4	20	O NKD5
21	O NKD6	21	O NKD7
22	O BUZ	22	
23	Vcc	23	GND
24	O READY	24	
25	Vcc	25	Vcc

5. COMMUNICATION TERMINAL

5.3 FCU6-DUN33 Display Unit (10.4-type color LCD)

NC keyboard J2 terminal connection cable
(FCU6-KB021/KB031)

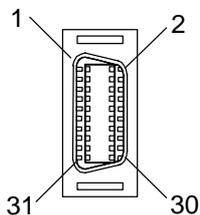
J2



A		B	
1		1	
2	I SC0	2	I SC1
3	I SC2	3	I SC3
4	I SC4	4	I SC5
5	I SC6	5	
6		6	O KD7
7		7	
8		8	
9		9	
10		10	

LCD display signal output terminal

LCD



<Cable side connector type>

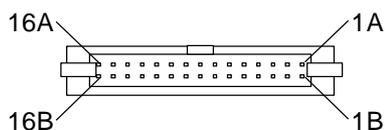
Connector : 53047-1510

Recommended manufacturer: DDK

1	O	FLM	2	O	FLM
3	O	LP	4	O	LP
5	O	CP	6	O	CP
7	O	DISPOFF*	8	O	DISPOFF*
9		Vcc	10		Vcc
11		Vss	12		Vss
13		VEE	14		VEE
15	O	DU0	16	O	DU0
17	O	DU1	18	O	DU1
19	O	DU2	20	O	DU2
21	O	DU3	22	O	DU3
23	O	DL0	24	O	DL0
25	O	DL1	26	O	DL1
27	O	DL2	28	O	DL2
29	O	DL3	30	O	DL3
31					

Display signal output terminal

CR04
CBC14



<Cable side connector type>

Connector : 8426-4500

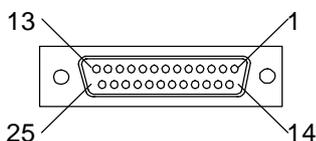
Contact : 3690-1000

Recommended manufacturer: 3M

A		B	
1		1	
2		2	
3		3	
4	GND	4	GND
5	O VD	5	
6	O HD	6	GND
7	O DCLK	7	GND
8	O R	8	O G
9	O B	9	GND
10	O DTMG	10	GND
11		11	GND
12	O I	12	GND
13	O BLON*	13	
14		14	
15		15	
16		16	

Serial Interface (for Mitsubishi maintenance)

CR06

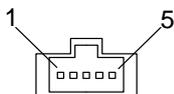


This connector is not used with this product.

5. COMMUNICATION TERMINAL
5.3 FCU6-DUN33 Display Unit (10.4-type color LCD)

Inverter power output

CR06



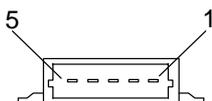
<Cable side connector type>

Connector : 51030-0530
 Contact : 50083-8160
 Recommended manufacturer: MOLEX

1	I	12VDC
2		
3		
4		
5		GND

Backlight inverter power input terminal

CN1



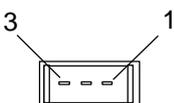
<Cable side connector type>

Connector : LZ-5S-SC3
 Contact : LZ-SC-C3-A1-15000
 Recommended manufacturer:
 Japan Aviation Electronics

1		VDDB(12V)
2		VDDB(12V)
3		GND B
4		GND B
5		BRTHL

Backlight control signal terminal

CN2



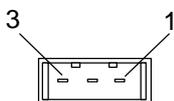
<Cable side connector type>

Connector : IL-Z-3C-S125C3
 Contact : IL-Z-C3-A-15000
 Recommended manufacturer:
 Japan Aviation Electronics

1	O	BTTC(ON/OFF)
2	O	BRTH
3	O	BRTL

LCD backlight power output terminal

CN3



<Cable side connector type>

Connector : BHR-03VS-1
 Contact : SBH-001T-P0.5
 Recommended manufacturer: JST

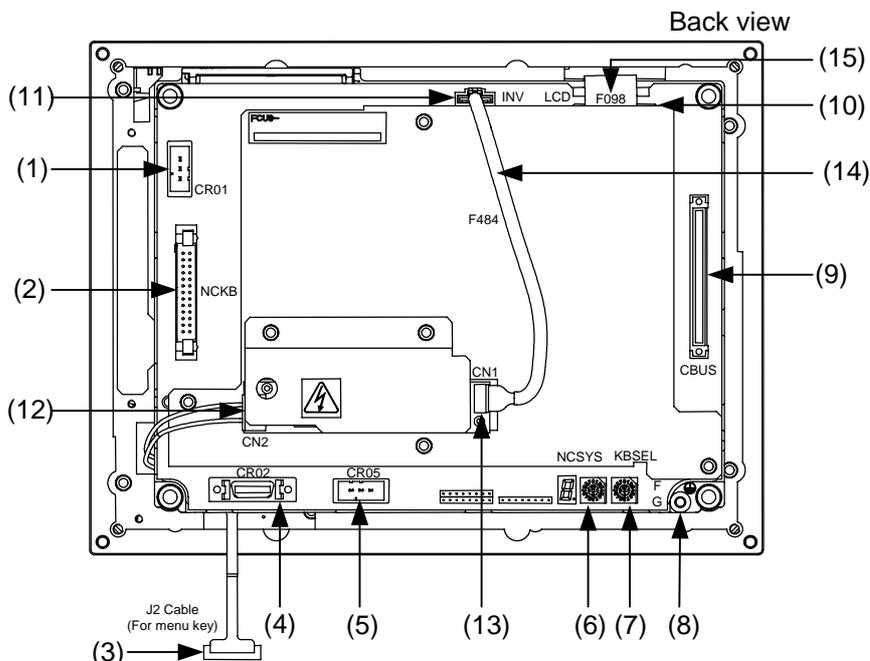
1		GND
2		H.V.
3		H.V.

5. COMMUNICATION TERMINAL
5.4 FCU6-DUN22 Display Unit (8.4-type color LCD)

5.4 FCU6-DUN22 Display Unit (8.4-type color LCD)

The 8.4-type color LCD communication terminal is described in this section.
 The FCU6-KB022 NC keyboard can be connected to this unit.

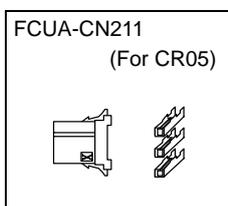
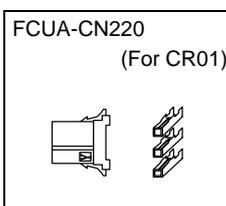
5.4.1 Names and Functions of Each Section



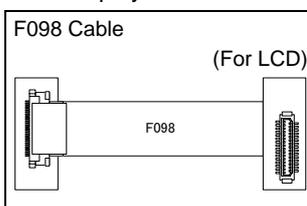
No.	Connector name	Function explanation
(1)	CR01	Power input terminal (24VDC)
(2)	NCKB	NC keyboard (FCU6-KB022) connection terminal
(3)	J2	NC keyboard (FCU6-KB022) J2 terminal connection cable
(4)	CR02	Control unit connection terminal
(5)	CR05	Remote I/O connection terminal
(6)	NCSYS	Internal setting switch (Use prohibited)
(7)	KBSEL	Switch for designating connection keyboard type (M system: 0)
(8)	FG	Frame ground connection terminal
(9)	CBUS	Memory cassette connection terminal (For maintenance; SRAM memory cassette use prohibited)
(10)	LCD	LCD display signal output terminal
(11)	INV	Backlight inverter power output terminal
(12)	CN2	LCD backlight power output terminal
(13)	CN1	Backlight inverter power input terminal
(14)	F484	Control card – backlight inverter connection cable
(15)	F098	Control card – LCD connection cable

Accessories

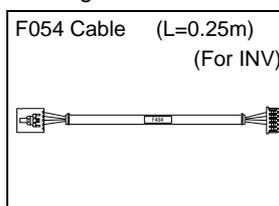
Enclosed connector set



LCD display cable



Backlight inverter cable

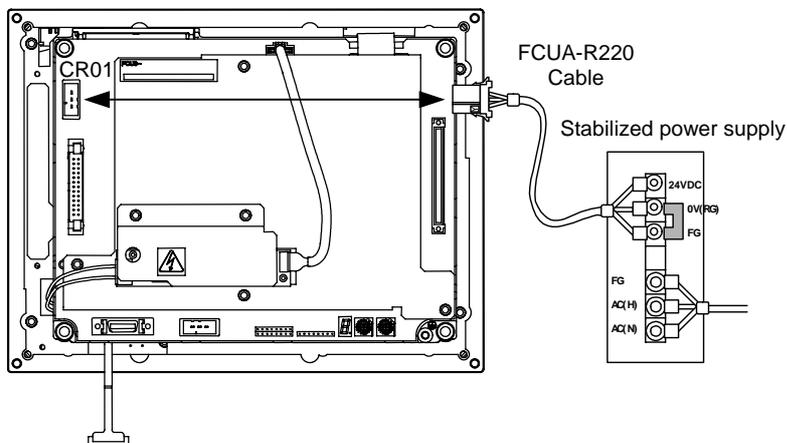


5. COMMUNICATION TERMINAL

5.4 FCU6-DUN22 Display Unit (8.4-type color LCD)

5.4.2 Connection of Power Supply

24VDC is supplied from the "CR01" connector on the back of the communication terminal.

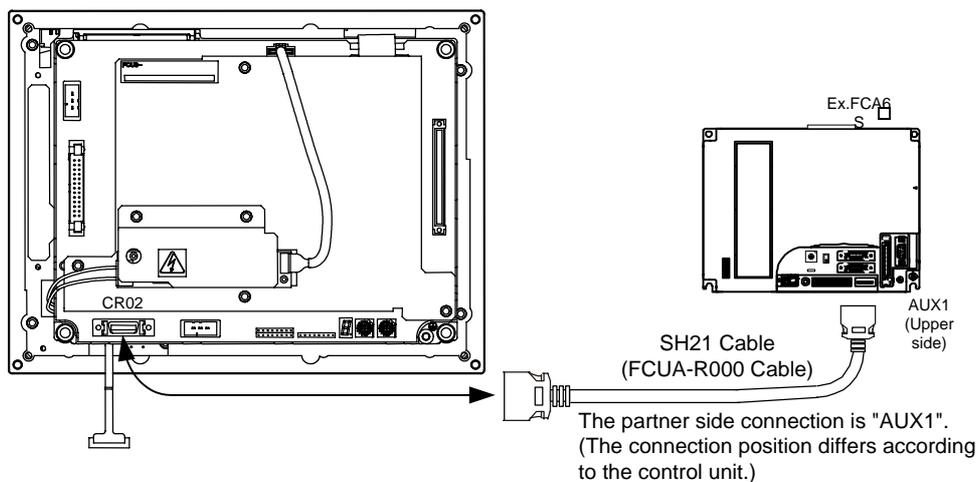


Select a stabilized power supply that satisfies the following specifications.

Output voltage: 24VDC±5%
Ripple: ±5%[p-p]
Rated current: 24VDC, 0.9A or more

5.4.3 Connection of Control Unit

Connect the cable from the control unit to the "CR02" connector on the back of the communication terminal.

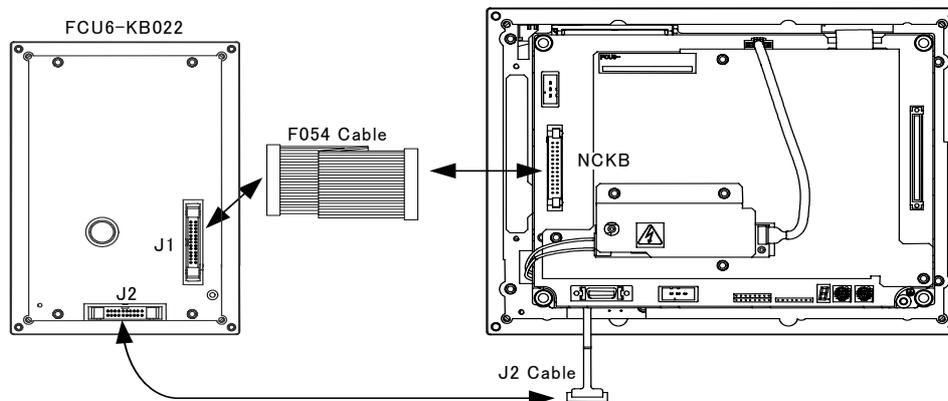


5. COMMUNICATION TERMINAL

5.4 FCU6-DUN22 Display Unit (8.4-type color LCD)

5.4.4 Connection of NC Keyboard

Connect the F054 cable connected to the "J1" connector on the NC keyboard to the "NCKB" connector. Connect the J2 cable for the menu keys to the "J2" connector on the NC keyboard.



CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL

5.4 FCU6-DUN22 Display Unit (8.4-type color LCD)

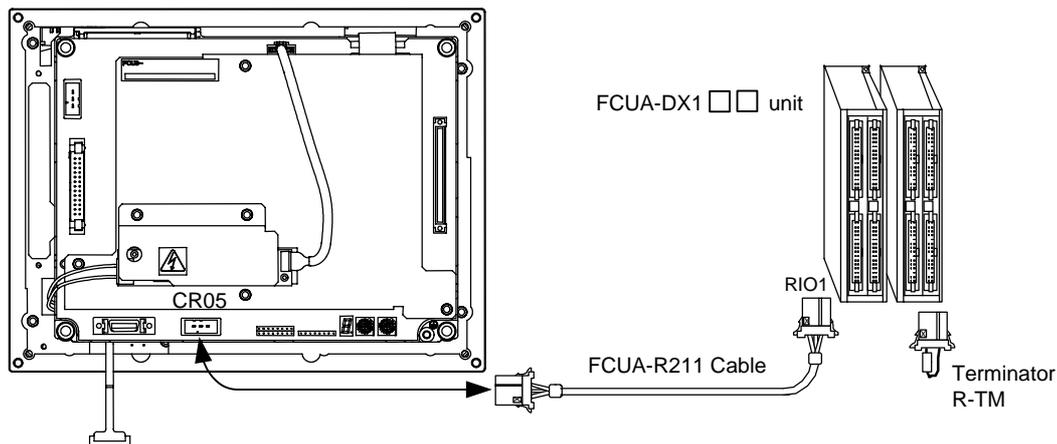
5.4.5 Connection of Remote I/O Unit

Connect to the remote I/O unit from the "CR05" connector on the back of the communication terminal. The scan I/O card (HR347/357) and expansion I/O card (QY231) can be connected in addition to the remote I/O unit.

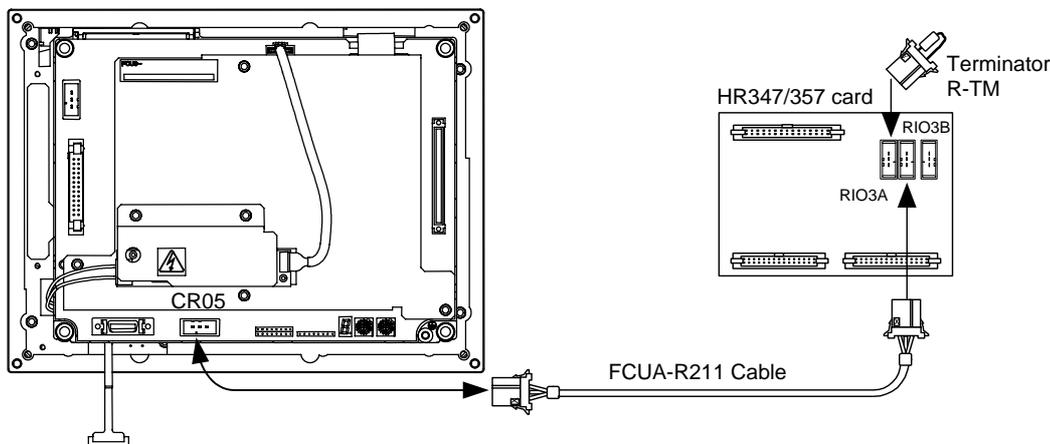
Up to four stations can be set. (Example: Up to two FCUA-DX111 units can be connected.)

The analog input/output unit (FCUA-DX120/121/140/141) cannot be used.

When connecting remote I/O unit



When connecting scan I/O card



Refer to the explanation on each I/O item for details on setting the number of stations, etc. When connecting the remote I/O, always connect a terminator (R-TM) to the final station. Refer to the "PLC Interface Manual" for details on the interface assignments.

5.4.6 Adjustment of Display Screen

The LCD display screen is set to the optimum display looking from the front. However, this may be difficult to view depending on the installation position. Adjust with the following items in this case.

Basic specification parameter

#1132 CRT

LCD contrast adjustment

"Setting range: -3 ^{Dark} to 3 ^{Bright}"



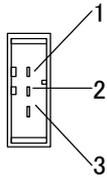
- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL

5.4 FCU6-DUN22 Display Unit (8.4-type color LCD)

5.4.7 Connector Pin Assignment

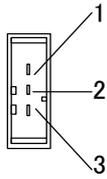
Power input terminal (24VDC)
CR01



<Cable side connector type>
Connector: 2-178288-3
Contact: 1-175218-5
Recommended manufacturer:
Tyco Electronics AMP

1	I	24VDC
2		0V(RG)
3		FG

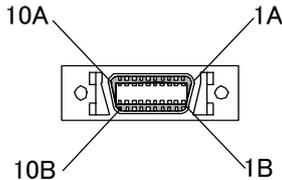
Remote I/O connection terminal
CR05



<Cable side connector type>
Connector: 1-178288-3
Contact: 1-175218-5
Recommended manufacturer:
Tyco Electronics AMP

1	I/O	TXRX
2	I/O	TXRX*
3		GND

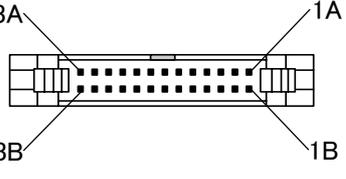
Control unit connection terminal
CR02



<Cable side connector type>
Plug: 10120-6000EL
Shell: 10320-3210-00
Recommended manufacturer: 3M

A			B		
1		GND	1		GND
2	I	RXD	2	I	RXD*
3			3		
4	O	TXD	4	O	TXD*
5		GND	5		GND
6			6		
7			7		
8		EN_RT	8		
9			9		
10			10		

NC Keyboard connection terminal
(FCU6-KB022)
NCKB



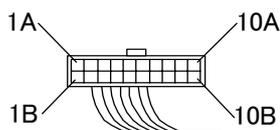
<Cable side connector type>
Plug: 7926-6500SC
Strain relief: 3448-7926
Recommended manufacturer: 3M

A			B		
1	O	KBCS0*	1	O	KBCS1*
2	O	KBCS2*	2	O	KBCS3*
3	O	KBAD0	3	O	KBAD1
4	O	KBAD2	4	O	BUZOUT*
5	O	RDYOUT*	5	O	SPOUT
6	I	KBRES*	6		
7	I	KBD0	7	I	KBD1
8	I	KBD2	8	I	KBD3
9		GND	9		GND
10		GND	10		GND
11		GND	11		GND
12		Vcc	12		Vcc
13		Vcc	13		Vcc

5. COMMUNICATION TERMINAL

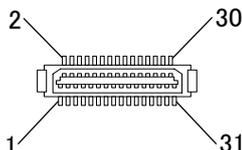
5.4 FCU6-DUN22 Display Unit (8.4-type color LCD)

NC keyboard J2 terminal connection cable
(FCU6-KB022)
J2



A			B		
1			1		
2	I	SC3	2	I	SC5
3	I	SC7	3	I	SC11
4	I	SC13	4	I	SC15
5	I	SC17	5		
6			6	O	KBD3
7	O	KBD2	7		
8			8		
9			9		
10			10		

LCD display signal output terminal
LCD



<Cable side connector type>
Connector: DF9-31S-1V
Recommended manufacturer:
Hirose Electric

1		GND	2	O	DCLK
3	O	Hsync	4	O	Vsync
5		GND	6	O	R0
7	O	R1	8	O	R2
9	O	R3	10	O	R4
11	O	R5	12		GND
13	O	G0	14	O	G1
15	O	G2	16	O	G3
17	O	G4	18	O	G5
19		GND	20	O	B0
21	O	B1	22	O	B2
23	O	B3	24	O	B4
25	O	B5	26		GND
27	O	DENA	28		3VDD
29		3VDD	30		
31	O	SC			

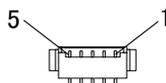
Backlight inverter power output terminal
INV



<Cable side connector type>
Connector: 51030-0530
Contact: 50083-8160
Recommended manufacturer: MOLEX

1		12V
2		GND
3	O	Vrmt
4	O	Vbr
5		

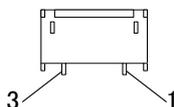
Backlight inverter power input terminal
CN1



<Cable side connector type>
Connector: 51021-0500
Contact: 50058-8100
Recommended manufacturer: MOLEX

1		12V
2		GND
3	I	Vrmt
4	I	Vbr
5		

LCD backlight power output terminal
CN2



<Cable side connector type>
Connector: BHR-03VS-1
Contact: SBH-001T-P0.5
Recommended manufacturer: JST

1		VHIGH
2		
3		VLOW

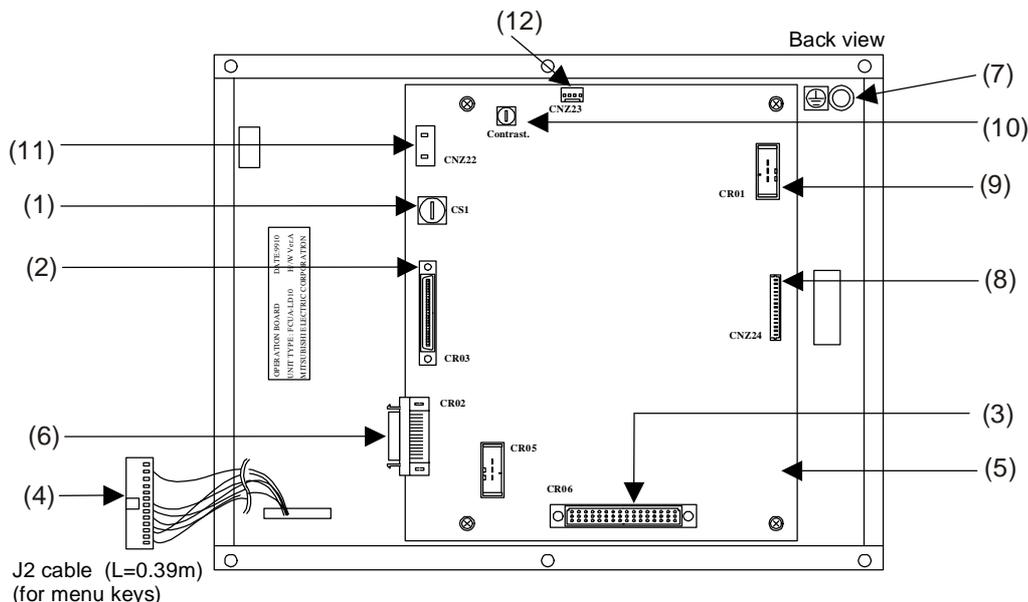
5. COMMUNICATION TERMINAL

5.5 FCUA-LD10/LD100 Display Unit (7.2-type monochrome LCD)

5.5 FCUA-LD10/LD100 Display Unit (7.2-type monochrome LCD)

The thin-type monochrome LCD communication terminal is described in this section.
 The FCUA-KB20/KB30 NC keyboard can be connected to the FCUA-LD10 unit.
 The FCUA-LD100 unit integrates the FCUA-LD10 and FCUA-KB20.

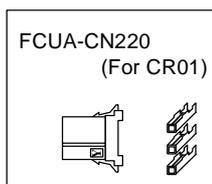
5.5.1 Names and Functions of Each Section



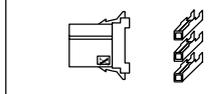
No.	Connector name	Function explanation
(1)	CS1	Select the type of keyboard connected. (M system: 0/L system: 1)
(2)	CR03	NC keyboard (FCUA-KB20/KB30) connection terminal
(3)	CR06	Function extension connector (Not used)
(4)	J2	NC keyboard (FCUA-KB20/KB30) J2 terminal connection cable
(5)	CR05	Remote I/O connection terminal
(6)	CR02	Control unit connection terminal
(7)	FG	Frame ground connection terminal
(8)	CNZ24	LCD display signal output terminal
(9)	CR01	Power input terminal (24VDC)
(10)	CONTRAST	LCD display contrast adjustment potentiometer (adjusted before shipment)
(11)	CNZ22A	LCD backlight power output terminal
(12)	CNZ23	External contrast adjustment terminal

Accessories

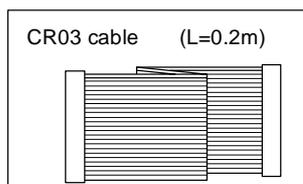
Enclosed connector set



FCUA-CN211
(For CR05)



NC keyboard cable

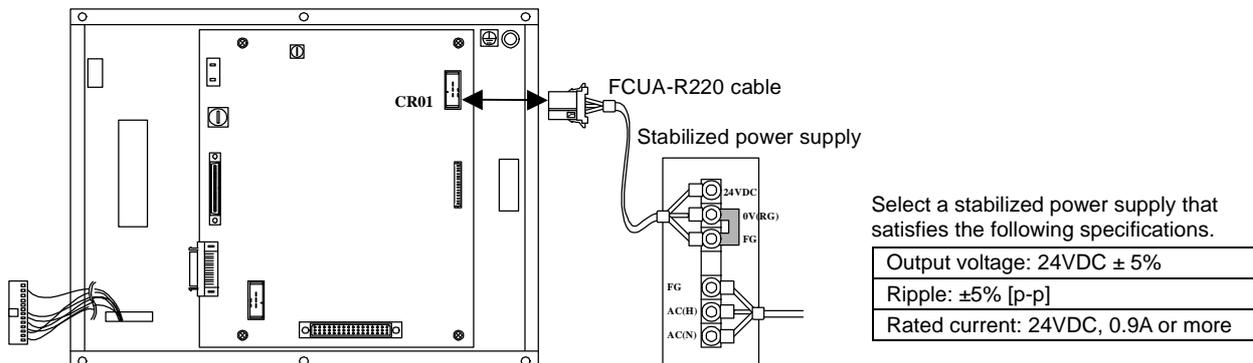


5. COMMUNICATION TERMINAL

5.5 FCUA-LD10/LD100 Display Unit (7.2-type monochrome LCD)

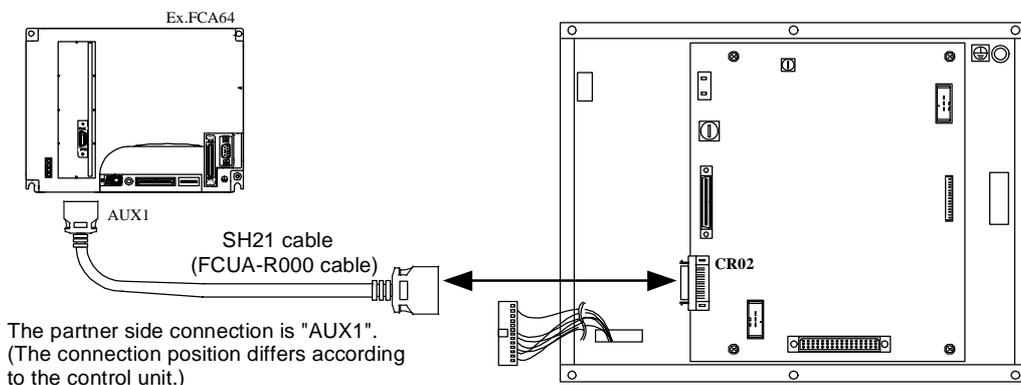
5.5.2 Connection of Power Supply

24VDC is supplied from the "CR01" connector on the back of the communication terminal.



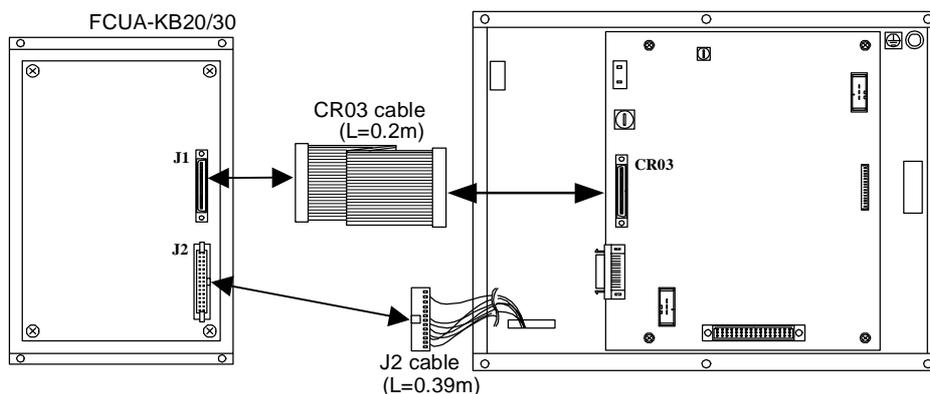
5.5.3 Connection of Control Unit

Connect the cable from the control unit to the "CR02" connector on the back of the communication terminal.



5.5.4 Connection of NC Keyboard

Connect to the "J1" connector on the NC keyboard with the CR03 cable connected to the "CR03" connector. Connect the J2 cable for the menu keys to the "J2" connector on the NC keyboard. The FCUA-LD100 is wired before shipment. (The NC keyboard is the FCUA-KB20.)



- Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL

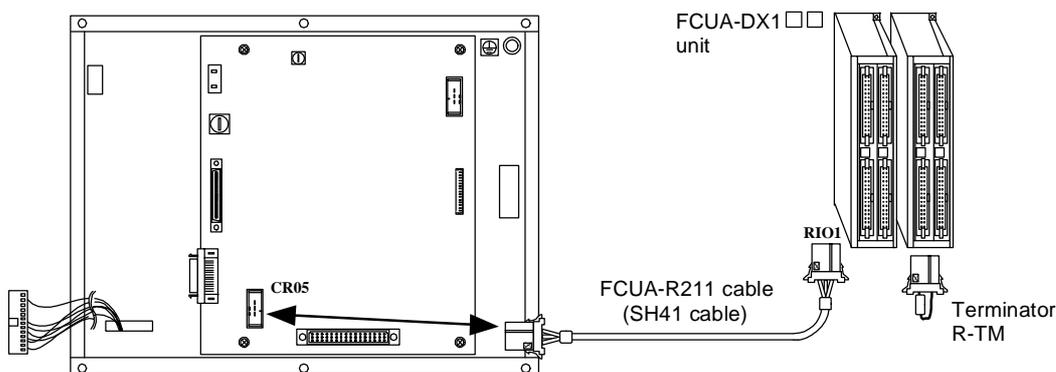
5.5 FCUA-LD10/LD100 Display Unit (7.2-type monochrome LCD)

5.5.5 Connection of Remote I/O Unit

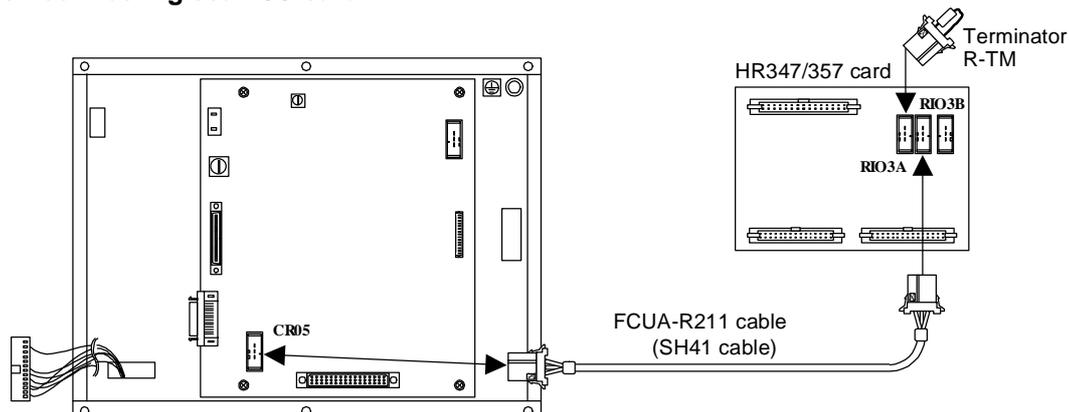
Connect to the remote I/O unit from the "CR05" connector on the back of the display unit. The scan I/O (HR347/357) and expansion I/O card (QY231) can be connected in addition to the remote I/O unit.

Up to four stations can be set. (Example: Up to two FCUA-DX111 units can be connected.) The analog input/output unit (FCUA-DX120/121/140/141) cannot be used.

When connecting remote I/O unit



When connecting scan I/O card



Refer to the explanation on each I/O item for details on setting the number of stations, etc. When connecting the remote I/O, always connect a terminator (R-TM) to the final station. Refer to the "PLC Interface Manual" for details on the interface assignments.



- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

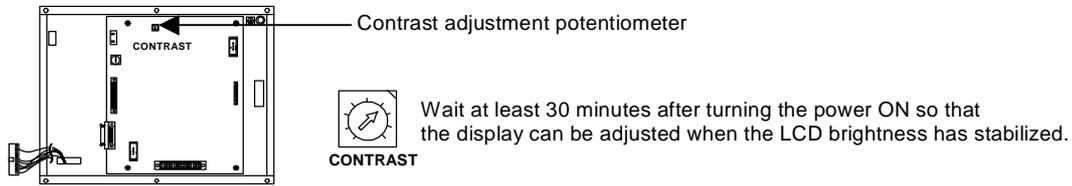
5. COMMUNICATION TERMINAL

5.5 FCUA-LD10/LD100 Display Unit (7.2-type monochrome LCD)

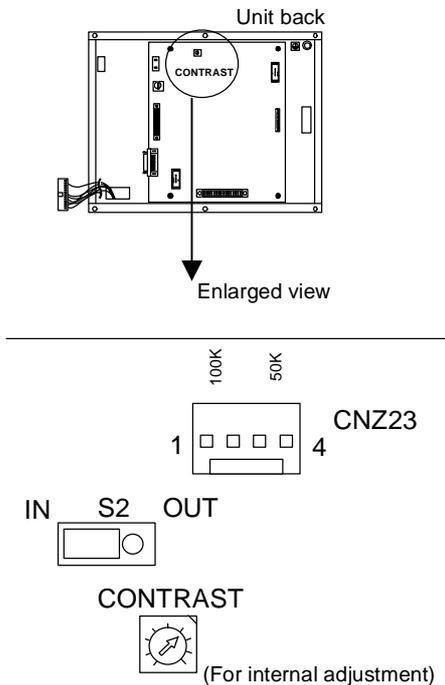
5.5.6 Adjustment of Display Screen

The LCD display screen is set to the optimum display looking from the front. However, this may be difficult to view depending on the installation position. Adjust with the following items in this case.

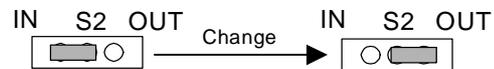
1. Internal adjustment



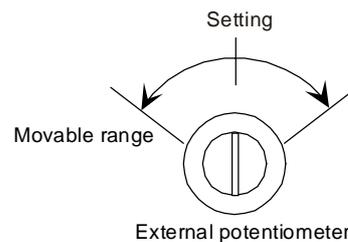
2. External adjustment



1. Change the S2 terminal from IN to OUT.

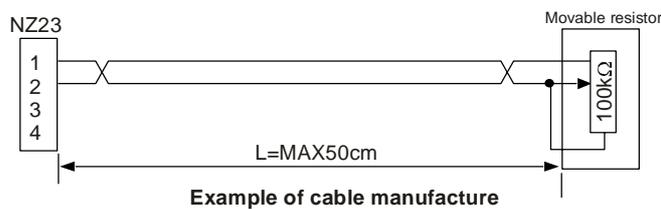


2. Adjust the attached potentiometer to the center of the movable range.



3. Attach the external potentiometer to the CNZ23 connector. Connect across "pins 1 and 2" of the CNZ23 connector.

4. Adjust the potentiometer to the optimum setting.



<Precautions>

- 1) Attach the external potentiometer after turning the power OFF. (In the worst case, the control card could be damaged.)
- 2) The cable connected to CNZ23 must be 50cm or less.

⚠ CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

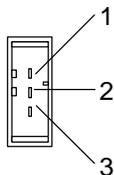
5. COMMUNICATION TERMINAL

5.5 FCUA-LD10/LD100 Display Unit (7.2-type monochrome LCD)

5.5.7 Connector Pin Assignment

Power input terminal
(24VDC)

CR01



<Cable side connector type>

Connector : 2-178288-3

Contact : 1-175218-5

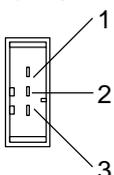
Recommended manufacturer:

Tyco Electronics AMP

1	I	24VDC
2		0V (RG)
3		FG

Remote I/O unit connection terminal

CR05



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

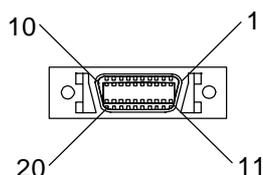
Recommended manufacturer:

Tyco Electronics AMP

1	I/O	TXRX
2	I/O	TXRX*
3		GND

Control unit connection terminal

CR02



<Cable side connector type>

Plug : 10120-6000EL

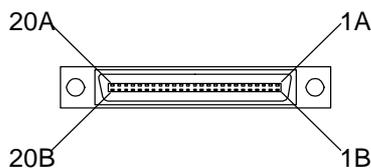
Shell: 10320-3210-00

Recommended manufacturer: 3M

1		GND	11		EN RT
2	I	RXD	12	I	RXD*
3			13		
4	O	TXD	14	O	TXD*
5		GND	15		GND
6			16		
7			17		
8		GND	18		
9			19		
10			20		

NC keyboard connection terminal (FCUA-KB20/KB30)

CR03



<Cable side connector type>

Plug : 8830E-50

Recommended manufacturer: KEL

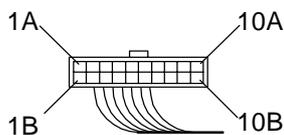
A		B	
1	GND	1	GND
2	I KSC0	2	I KSC1
3	Vcc	3	Vcc
4	I KSC2	4	I KSC3
5	I KSC4	5	I KSC5
6	I KSC6	6	I KSC7
7	I KSC8	7	I KSC9
8	I KSC10	8	I KSC11
9	I KSC12	9	
10		10	
11		11	
12		12	
13	I BUZCM	13	I BUZCM
14		14	
15	GND	15	GND
16	I RESET	16	I FAST
17	Vcc	17	Vcc
18	O NKD0	18	O NKD1
19	O NKD2	19	O NKD3
20	O NKD4	20	O NKD5
21	O NKD6	21	O NKD7
22	O BUZ	22	
23	Vcc	23	GND
24	O READY	24	
25	Vcc	25	Vcc

5. COMMUNICATION TERMINAL

5.5 FCUA-LD10/LD100 Display Unit (7.2-type monochrome LCD)

NC keyboard J2 terminal connection cable
(FCUA-KB20/KB30)

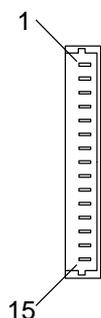
J2



A		B	
1		1	
2	I SC0	2	I SC1
3	I SC2	3	I SC3
4	I SC4	4	I SC5
5	I SC6	5	
6		6	O KD7
7		7	
8		8	
9		9	
10		10	

LCD display signal output terminal

CNZ24



<Cable side connector type>

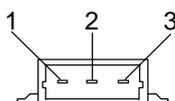
Connector : 53047-1510

Recommended manufacturer: MOLEX

1	O	FLM
2	O	LP
3	O	CP
4	O	DISPOFF*
5		Vcc
6		Vss
7		VEE
8	O	DU0
9	O	DU1
10	O	DU2
11	O	DU3
12	O	DL0
13	O	DL1
14	O	DL2
15	O	DL3

LCD backlight power output terminal

CNZ22A



<Cable side connector type>

Connector : QZ-19-3F01

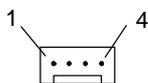
Contact : QZ-19-F114A

Recommended manufacturer: HONDA TSUSHIN KOGYO

1	I	CCFL_HOT
2		NC
3		CCFL_GND

External contrast adjustment terminal

CNZ23



<Cable side connector type>

Connector : 5051-04

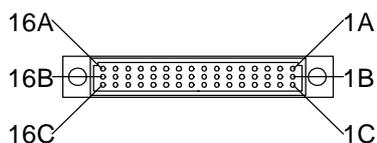
Contact : 2759-PBGL

Recommended manufacturer: MOLEX

1	I	CCFL_HOT
2		NC
3		CCFL_GND

Function extension connector (Not used)

CR06



The pin assignments for this connector have not been released.

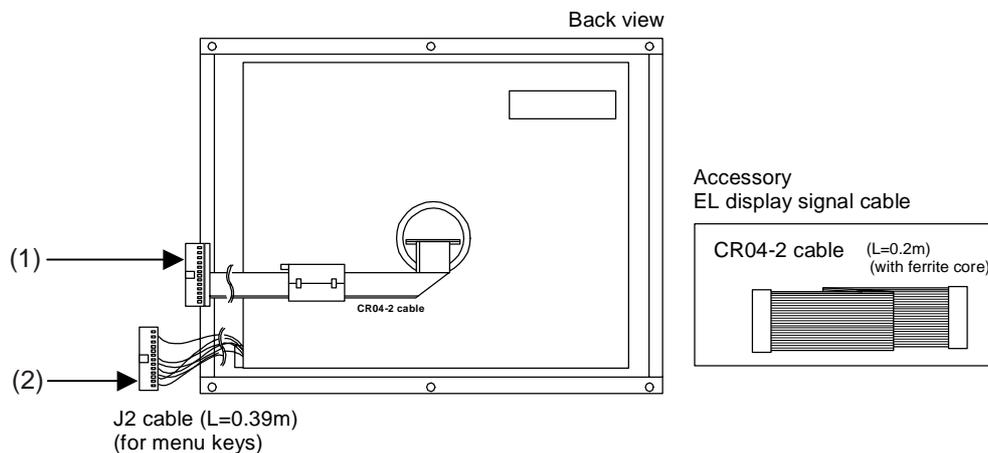
5. COMMUNICATION TERMINAL

5.6 FCUA-EL10 Display Unit (9.5-type EL)

5.6 FCUA-EL10 Display Unit (9.5-type EL) * Cannot be used with M60S Series.

The thin-type EL communication terminal is described in this section.
The FCUA-KB10/KB12 NC keyboard can be connected to the FCUA-EL10 unit.

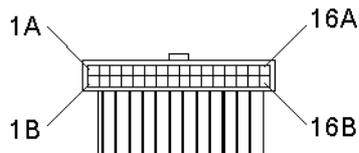
5.6.1 Names and Functions of Each Section



No.	Connector name	Function explanation
(1)	CR04	Display signal input terminal to EL
(2)	J2	NC keyboard (FCUA-KB10/KB12) J2 terminal connection cable

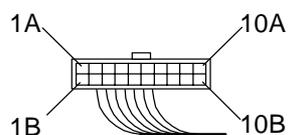
5.6.2 Connector Pin Assignment

Display signal input terminal to EL
CR 04



A		B	
1		1	
2		2	
3		3	
4	GND	4	GND
5	O VD	5	
6	O HD	6	GND
7	O DCLK	7	GND
8	O R	8	O G
9	O B	9	GND
10	O DTMG	10	GND
11		11	GND
12	O I	12	GND
13	O BLON*	13	
14		14	
15		15	
16		16	

NC keyboard J2 terminal connection cable (FCUA-KB10/KB12)
J2



A		B	
1		1	
2	I SC0	2	I SC1
3	I SC2	3	I SC3
4	I SC4	4	I SC5
5	I SC6	5	
6		6	O KD7
7		7	
8		8	
9		9	
10		10	

5. COMMUNICATION TERMINAL

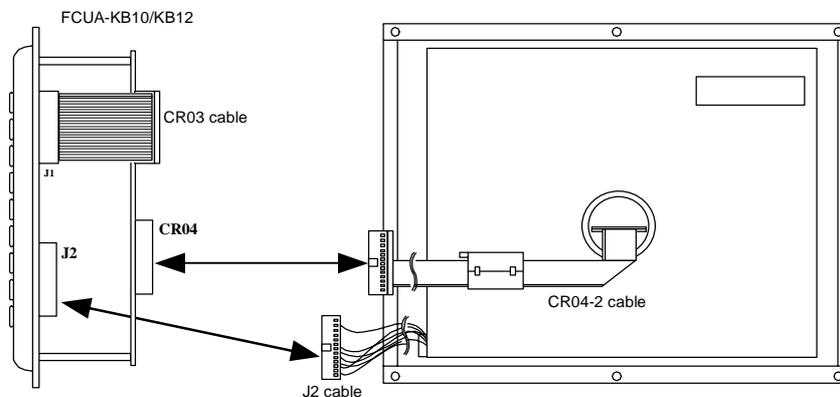
5.6 FCUA-EL10 Display Unit (9.5-type EL)

5.6.3 Connection of NC Keyboard Unit

Connect the CR04-2 cable to the FCUA-KB10/KB12 "CR04" connector.

Connect the J2 cable to the NC keyboard's "J2" connector.

The FCUA-EL10 (9.5-type EL) power is supplied from the CR04 connector via the CR04-2 cable.



CAUTION

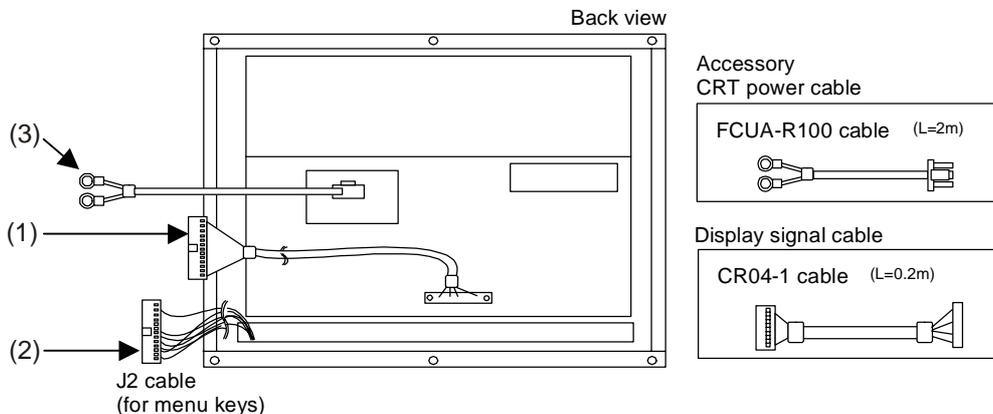
- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL
5.7 FCUA-CR10/CT100/CT120 Display Unit (9-type monochrome CRT)

5.7 FCUA-CR10/CT100/CT120 Display Unit (9-type monochrome CRT)

The CRT type communication terminal is described in this section.
 The FCUA-CT100 unit integrates the FCUA-CR10 and FCUA-KB10/KB12.
 The FCUA-CT120 unit is integrated with the FCUA-CT100 lathe system keyboard.

5.7.1 Names and Functions of Each Section



No.	Connector name	Function explanation
(1)	CR04	Display signal input terminal to CRT
(2)	J2	NC keyboard J2 terminal connection cable
(3)	Power input terminal	This terminal supplies the power to the CRT. (100VAC)

5.7.2 Connector Pin Assignment

Display signal input terminal to CRT
CR04

A		B	
1		1	
2		2	
3		3	
4	GND	4	GND
5	○ VD	5	
6	○ HD	6	GND
7	○ DCLK	7	GND
8	○ R	8	○ G
9	○ B	9	GND
10	○ DTMG	10	GND
11		11	GND
12	○ I	12	GND
13	○ BLON*	13	
14		14	
15		15	
16		16	

NC keyboard J2 terminal connection cable
J2

A		B	
1		1	
2	SC0	2	SC1
3	SC2	3	SC3
4	SC4	4	SC5
5	SC6	5	
6		6	○ KD7
7		7	
8		8	
9		9	
10		10	

Terminal supplying power to CRT

Crimp terminal: V1.25-4
 Recommended manufacturer: JST

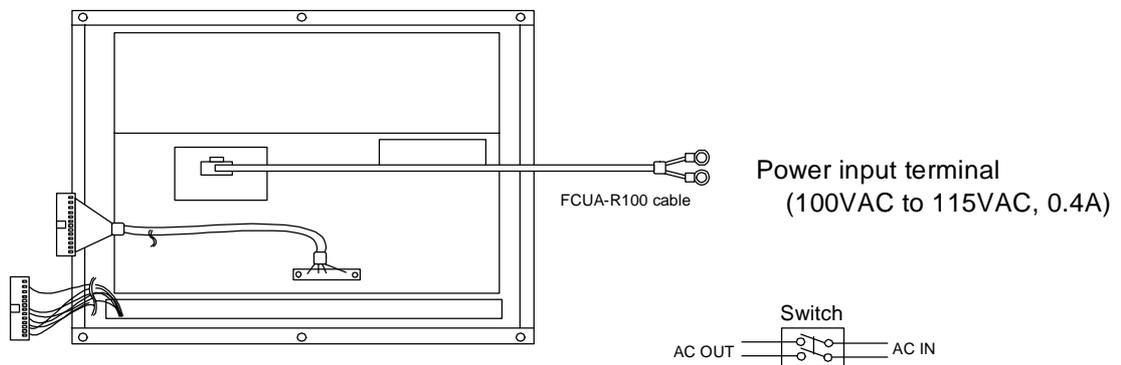
1		AC (H)
2		AC (N)

5. COMMUNICATION TERMINAL

5.7 FCUA-CR10/CT100/CT120 Display Unit (9-type monochrome CRT)

5.7.3 Connection of Power Supply

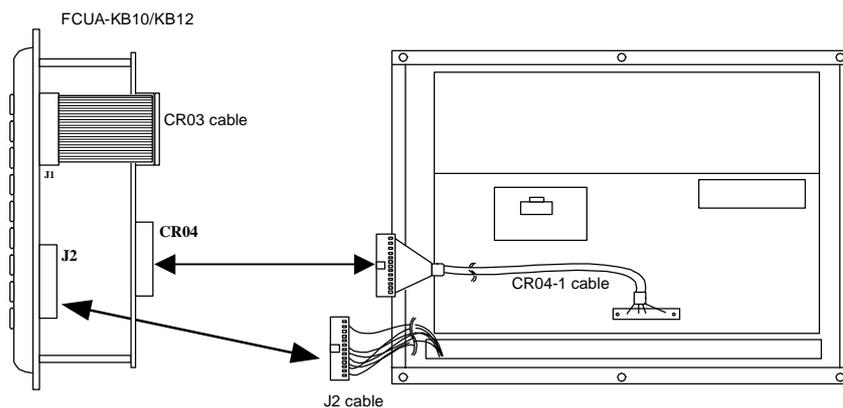
100VAC is supplied from the FCUA-R100 cable on the back of the communication terminal.



Use a double-OFF type that completely cuts off the circuit when turning the power ON and OFF.

5.7.4 Connection of NC Keyboard Unit

Connect the CR04-2 cable to the FCUA-KB10/KB12 "CR04" connector.
Connect the J2 cable to the NC keyboard's "J2" connector.



CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL
5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

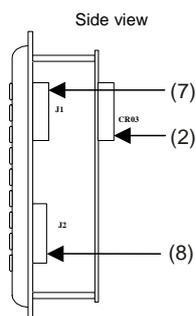
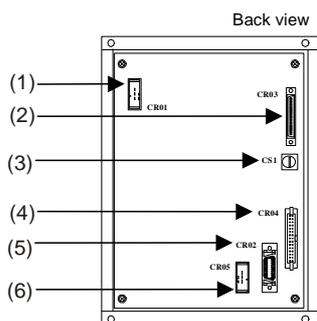
The NC keyboard unit for the communication terminal is described in this section.
 This unit is a separable type. The integrated type is designated with the communication type.

Combination of keyboard unit and display unit

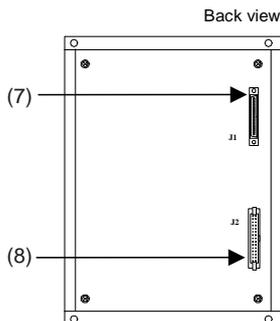
Keyboard type	Compatible display unit type
FCUA-KB10 (M system)	FCUA-CR10 (9-type CRT)/FCUA-EL10 (9.5-type EL)
FCUA-KB12 (L system)	FCUA-CR10 (9-type CRT)/FCUA-EL10 (9.5-type EL)
FCUA-KB20 (M system)	FCUA-LD10 (7.2-type LCD)/FCU6-DUT32 (10.4-type LCD)
FCUA-KB30 (L system)	FCU6-DUN33 (10.4-type LCD)
FCU6-KB021 (M system)	FCU6-DUN32 (10.4-type LCD)
FCU6-KB031 (L system)	FCU6-DUN33 (10.4-type LCD)
	* Same height dimensions as 10.4-type LCD display
FCU6-KB022 (M system)	FCU6-DUN22 (8.4-type LCD)

5.8.1 Names and Functions of Each Section

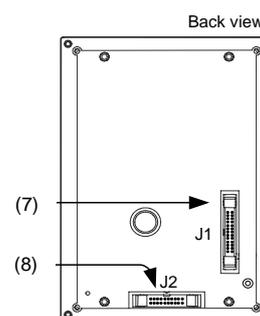
FCUA-KB10/KB12



**FCUA-KB20/KB30
FCU6-KB021/KB031**



FCUA-KB022

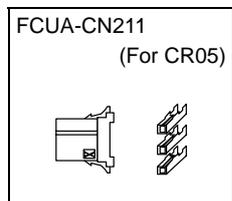
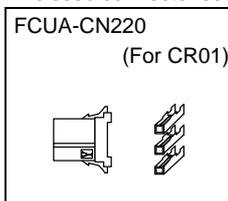


No.	Connector name	Function explanation
(1)	CR01	Power input terminal (24VDC)
(2)	CR03	NC keyboard connection terminal (CR03 cable is already wired.)
(3)	CS1	Select the type of keyboard connected. (M system: 0/L system: 1)
(4)	CR04	Display signal output terminal (For CRT/EL connection)
(5)	CR02	Control unit connection terminal
(6)	CR05	Remote I/O connection terminal
(7)	J1	NC keyboard connection terminal (Connect the CR03 cable. Connect the F054 cable for FCU6-KB022.)
(8)	J2	Menu key connection terminal (Connect the J2 cable from the display unit.)

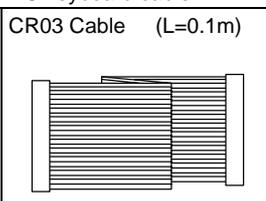
Accessories

Enclosed with FCUA-KB10/KB12

Enclosed connector set

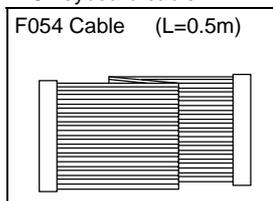


NC keyboard cable



Enclosed with FCU6-KB022

NC keyboard cable

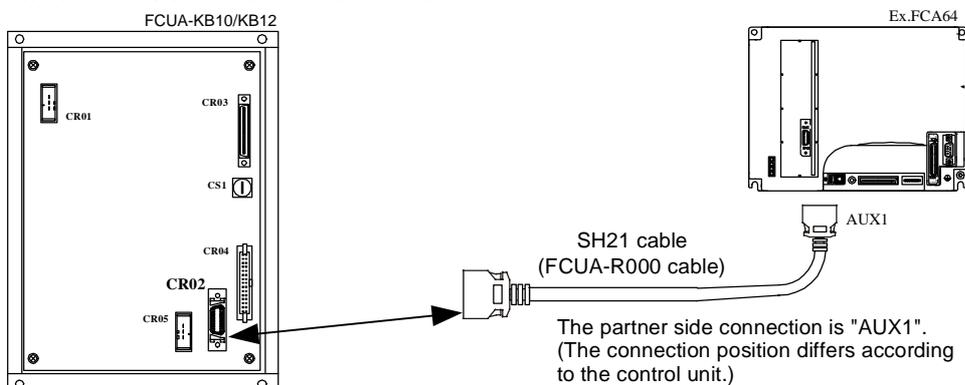


5. COMMUNICATION TERMINAL

5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

5.8.2 Connection of Control Unit

Connect the cable from the control unit to the FCUA-KB10/KB12 unit's "CR02" connector. FCUA-KB20/30 and FCU6-KB021/KB022/KB031 do not have a connection.

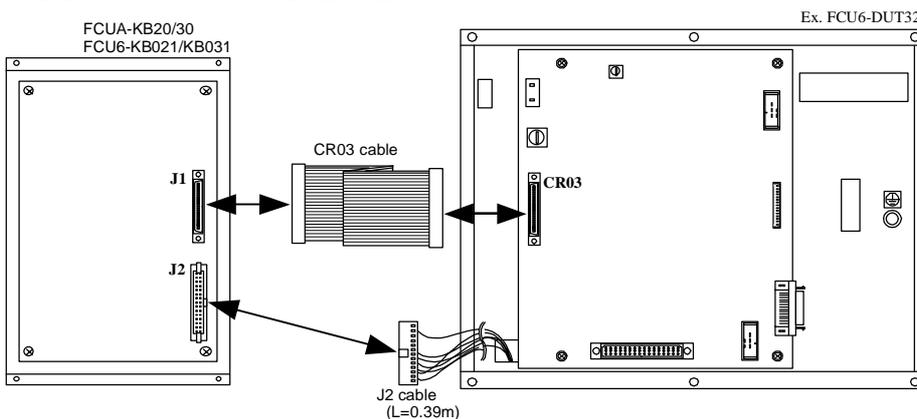


5.8.3 Connection of Display Unit

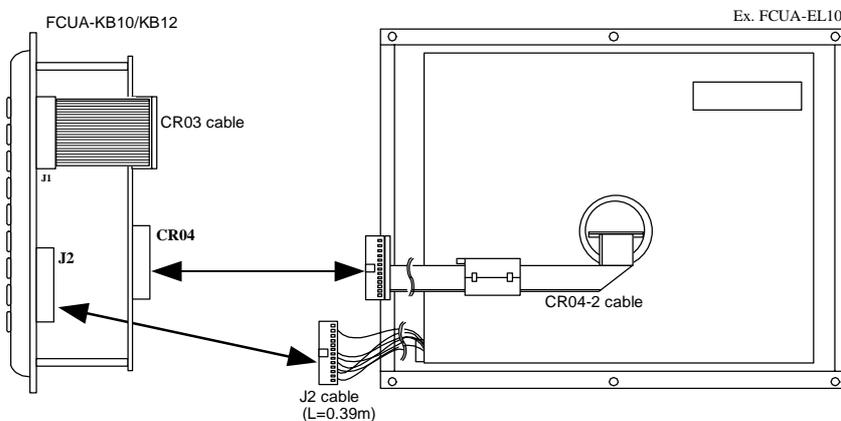
Connect the CR03 cable connected to the "CR03" connector to the NC keyboard's "J1" connector. For FCU6-KB022, connect the F054 cable connected to the "J1" connector to the "NCKB" connector of FCU6-DUN22.

Connect the J2 cable from the display unit to the NC keyboard's "J2" connector.

For FCUA-KB20/30 and FCU6-KB021/KB031

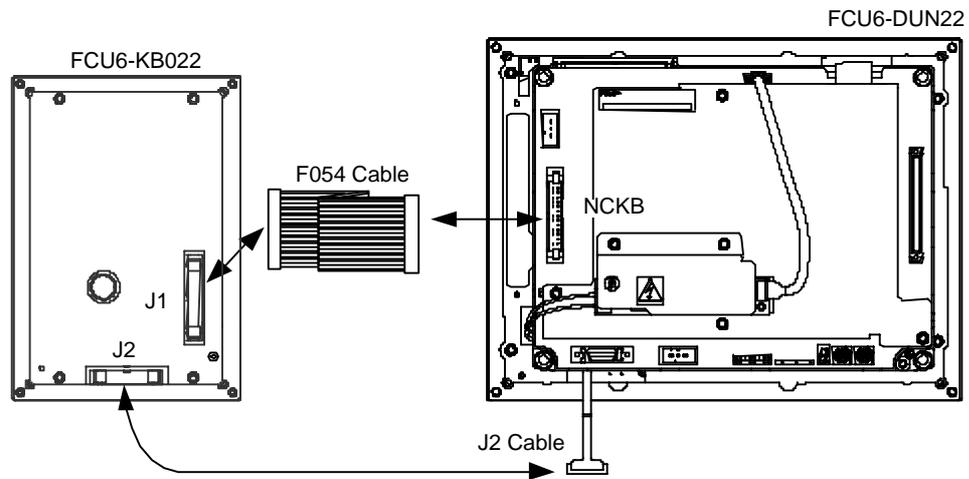


For FCUA-KB10/KB12



5. COMMUNICATION TERMINAL
5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

For FCU6-KB022



CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

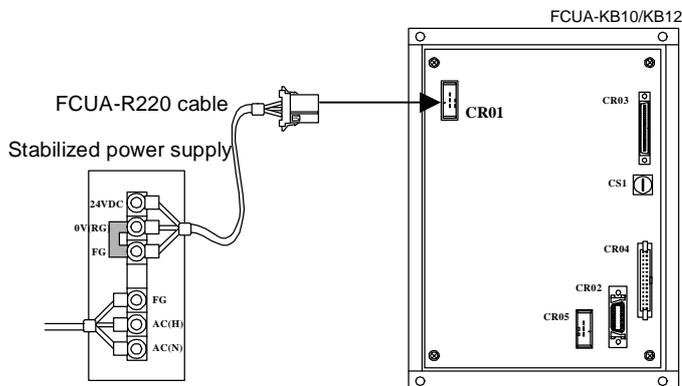
5. COMMUNICATION TERMINAL

5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

5.8.4 Connection of Power Supply

Supply 24VDC from the FCUA-KB10/KB12 CR01 connector.

FCUA-KB20/30 and FCU6-KB021/KB022/KB031 do not have a power supply terminal.



Select a stabilized power supply that satisfies the following specifications.

Output voltage: 24VDC \pm 5%
Ripple: \pm 5% [p-p]
Rated current: 24VDC, 0.6A or more

Note) 24VDC, 1.5A or more is required when FCUA-EL10 is used.



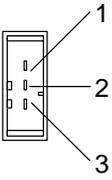
- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL

5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

5.8.5 Connector Pin Assignment

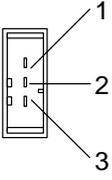
Power input terminal (24VDC)
CR01



<Cable side connector type>
 Connector: 2-178288-3
 Contact: 1-175218-5
 Recommended manufacturer: Tyco Electronics AMP

1	I	24VDC
2		0V (RG)
3		FG

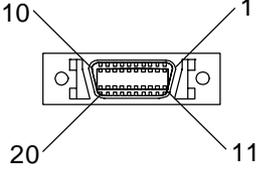
Remote I/O unit connection terminal
CR05



<Cable side connector type>
 Connector: 1-178288-3
 Contact: 1-175218-2
 Recommended manufacturer: Tyco Electronics AMP

1	I/O	TXRX
2	I/O	TXRX*
3		GND

Control unit connection terminal
CR02



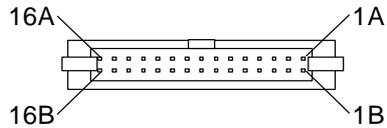
<Cable side connector type>
 Plug: 10120-6000EL
 Shell: 10320-3210-00
 Recommended manufacturer: 3M

1		GND	11		EN RT
2	I	RXD	12	I	RXD*
3			13		
4	O	TXD	14	O	TXD*
5		GND	15		GND
6			16		
7			17		
8		GND	18		
9			19		
10			20		

5. COMMUNICATION TERMINAL

5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

Display signal output terminal (For CRT/EL connection)
CR04



<Cable side connector type>

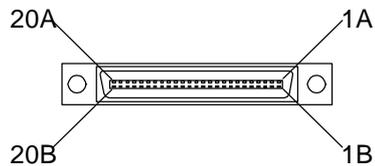
Connector: 8426-4500
Contact: 3690-1000
Recommended manufacturer: 3M

A		B	
1		1	
2		2	
3		3	
4	GND	4	GND
5	O VD	5	
6	O HD	6	GND
7	O DCLK	7	GND
8	O R	8	O G
9	O B	9	GND
10	O DTMG	10	GND
11		11	GND
12	O I	12	GND
13	O BLON*	13	
14		14	
15		15	
16		16	

NC keyboard connection terminal (CR03 cable is already wired.)

CR03

J1



<Cable side connector type>

Plug: 8830E-50
Recommended manufacturer: KEL

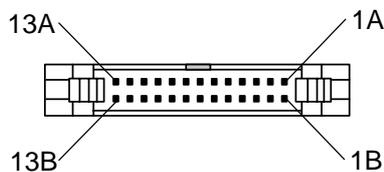
A		B	
1	GND	1	GND
2	I KSC0	2	I KSC1
3	Vcc	3	Vcc
4	I KSC2	4	I KSC3
5	I KSC4	5	I KSC5
6	I KSC6	6	I KSC7
7	I KSC8	7	I KSC9
8	I KSC10	8	I KSC11
9	I KSC12	9	
10		10	
11		11	
12		12	
13	I BUZCM	13	I BUZCM
14		14	
15	GND	15	GND
16	I RESET	16	I FAST
17	Vcc	17	Vcc
18	O NKD0	18	O NKD1
19	O NKD2	19	O NKD3
20	O NKD4	20	O NKD5
21	O NKD6	21	O NKD7
22	O BUZ	22	
23	Vcc	23	GND
24	O READY	24	
25	Vcc	25	Vcc

5. COMMUNICATION TERMINAL

5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

NC keyboard connection terminal (FCU6-KB022 only)
(F054 cable is already wired.)

J1



<Cable side connector type>

Plug: 7926-6500SC

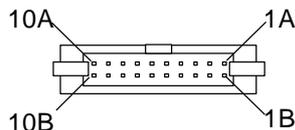
Strain relief: 3448-7926

Recommended manufacturer: 3M

A		B			
1	I	KBCS0*	1	I	KBCS1*
2	I	KBCS2*	2	I	KBCS3*
3	I	KBAD0	3	I	KBAD1
4	I	KBAD2	4	I	BUZOUT*
5	I	RDYOUT*	5	I	SPOUT
6	O	KBRES*	6		
7	O	KBD0	7	O	KBD1
8	O	KBD2	8	O	KBD3
9		GND	9		GND
10		GND	10		GND
11		GND	11		GND
12		Vcc	12		Vcc
13		Vcc	13		Vcc

Menu key connection terminal
(Connect the J2 cable from the display unit.)

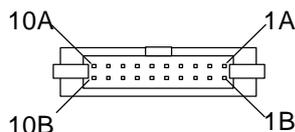
J2



A		B			
1		1			
2	I	SC0	2	I	SC1
3	I	SC2	3	I	SC3
4	I	SC4	4	I	SC5
5	I	SC6	5		
6			6	O	KD7
7			7		
8			8		
9			9		
10			10		

Menu key connection terminal (FCU6-KB022 only)
(Connect the J2 cable from the FCU6-DUN22.)

J2



A		B			
1		1			
2	I	SC3	2	I	SC5
3	I	SC7	3	I	SC11
4	I	SC13	4	I	SC15
5	I	SC17	5		
6			6	O	KBD3
7	O	KBD2	7		
8			8		
9			9		
10			10		

5. COMMUNICATION TERMINAL

5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

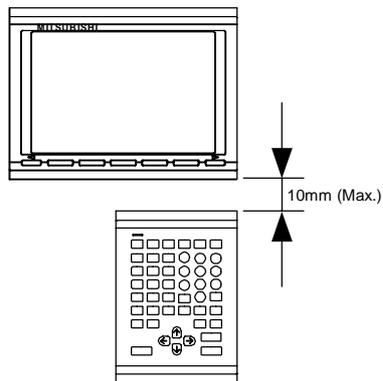
5.8.6 Keyboard and Display Unit Installation Pitch

Basically, the display unit and keyboard unit should be installed next to each other. When separating the communication terminal from the keyboard, use the following explanation as a guideline.

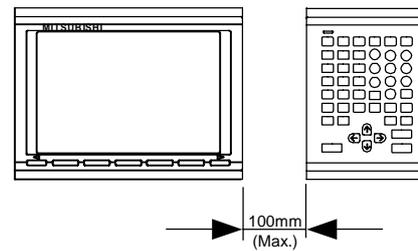
- (1) The installation pitch applies when installing on a flat structure.
- (2) The installation pitch may be narrower depending on the panel structure and layout of other devices.
- (3) The CR03 cable (F054 cable for FCU6-KB022) and J2 cable from the display unit are connected to the keyboard unit.

FCUA-LD10

For vertical placement

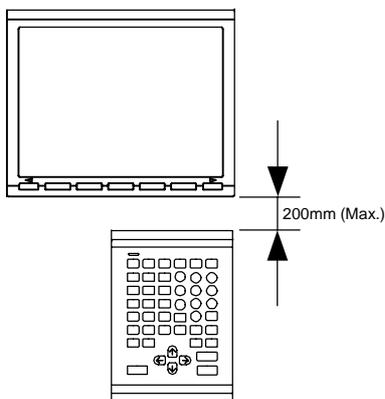


For horizontal placement

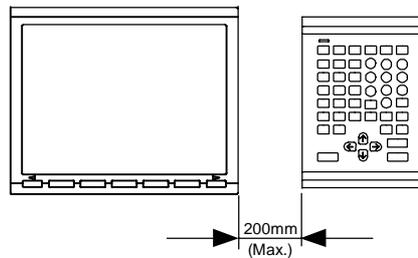


FCU6-DUT32/FCU6-DUN33

For vertical placement



For horizontal placement

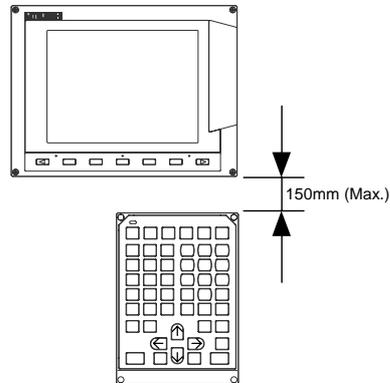


5. COMMUNICATION TERMINAL

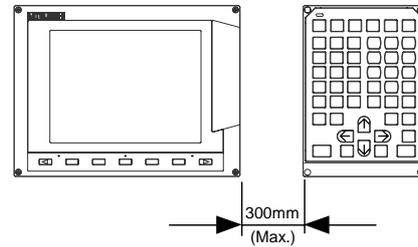
5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

FCU6-DUN22

For vertical placement



For horizontal placement



FCUA-EL10/FCUA-CR10

The CR04/CR04-2 cable length for the display unit with FCUA-KB10/KB12 is short, so the installation pitch cannot be increased.



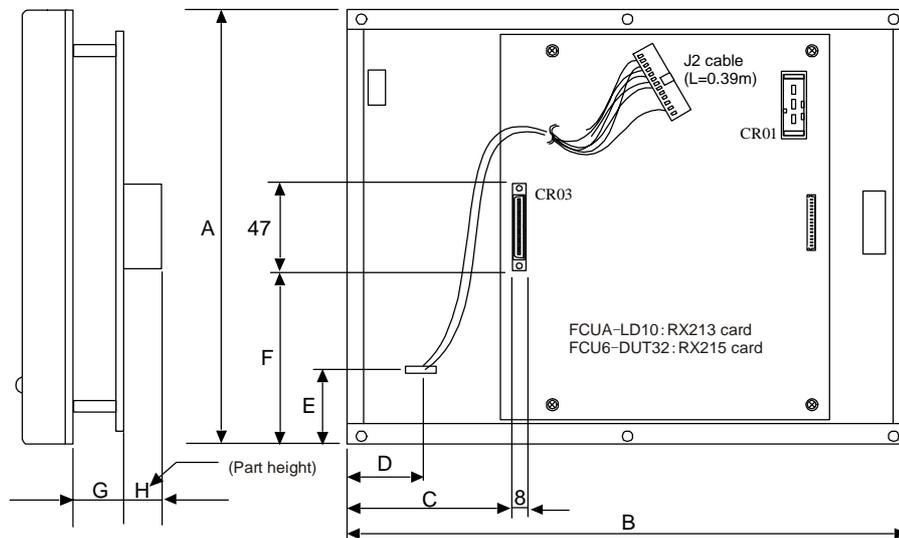
- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

5. COMMUNICATION TERMINAL

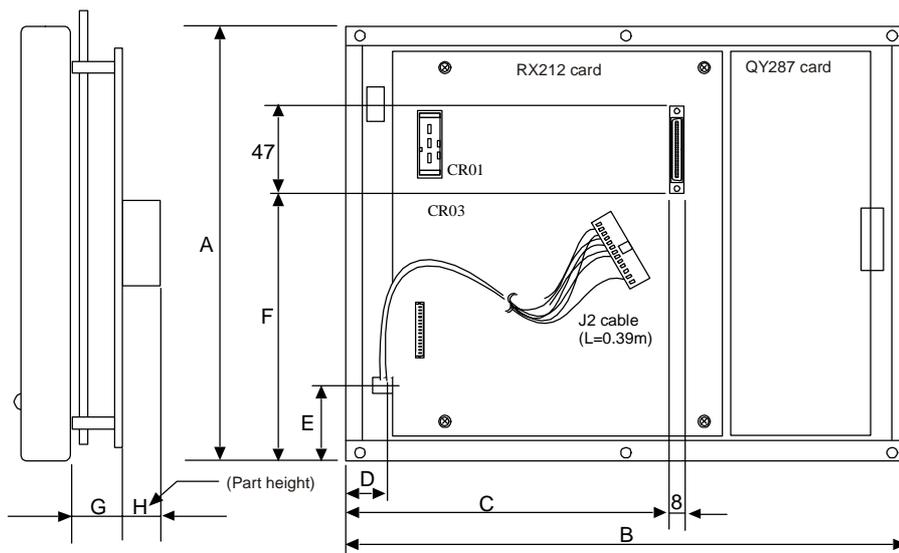
5.8 FCUA-KB10/KB12/KB20/KB30 and FCU6-KB021/KB022/031 NC Keyboard Unit

When separating the display unit and keyboard unit, review the machine operation panel while referring to the following connector layout.

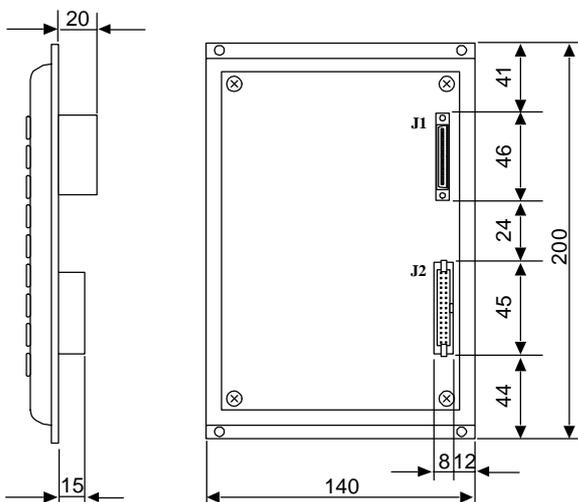
**FCUA-LD10
FCU6-DUT32**



FCU6-DUN33



**FCUA-KB20
FCUA-KB30**



Display unit type	Unit: mm								
	A	B	C	D	E	F	G	H	CR03 Cable
FCUA-LD10	200	260	78	48	26	59	22	20	200
FCU6-DUT32	210	270	30	18	30	86	9	30	500
FCU6-DUN33	210	270	150	25	19	124	9	30	500

J2 cable length: 390mm

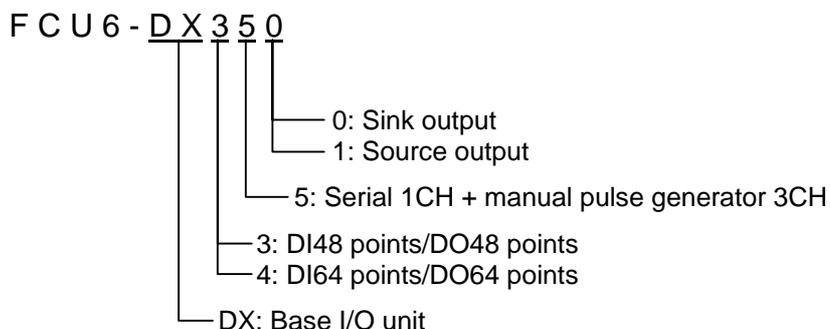
6. CONNECTION OF BASE I/O UNIT
6.1 Outline of I/O Unit

6. CONNECTION OF BASE I/O UNIT

6.1 Outline of I/O Unit

The base I/O unit is used to connect the servo drive unit, synchronous feed encoder, skip signal and remote I/O unit. One unit is always required for each control unit.

6.1.1 Configuration of model name



6.1.2 Configuration and functions of each unit

Machine input circuit type and number of points

		FCU6-DX350	FCU6-DX351	FCU6-DX450	FCU6-DX451
1	Input type	Sink/source			
2	COM pin connection	24VDC		0V (RG)	
3	No. of input points	48 points		64 points	

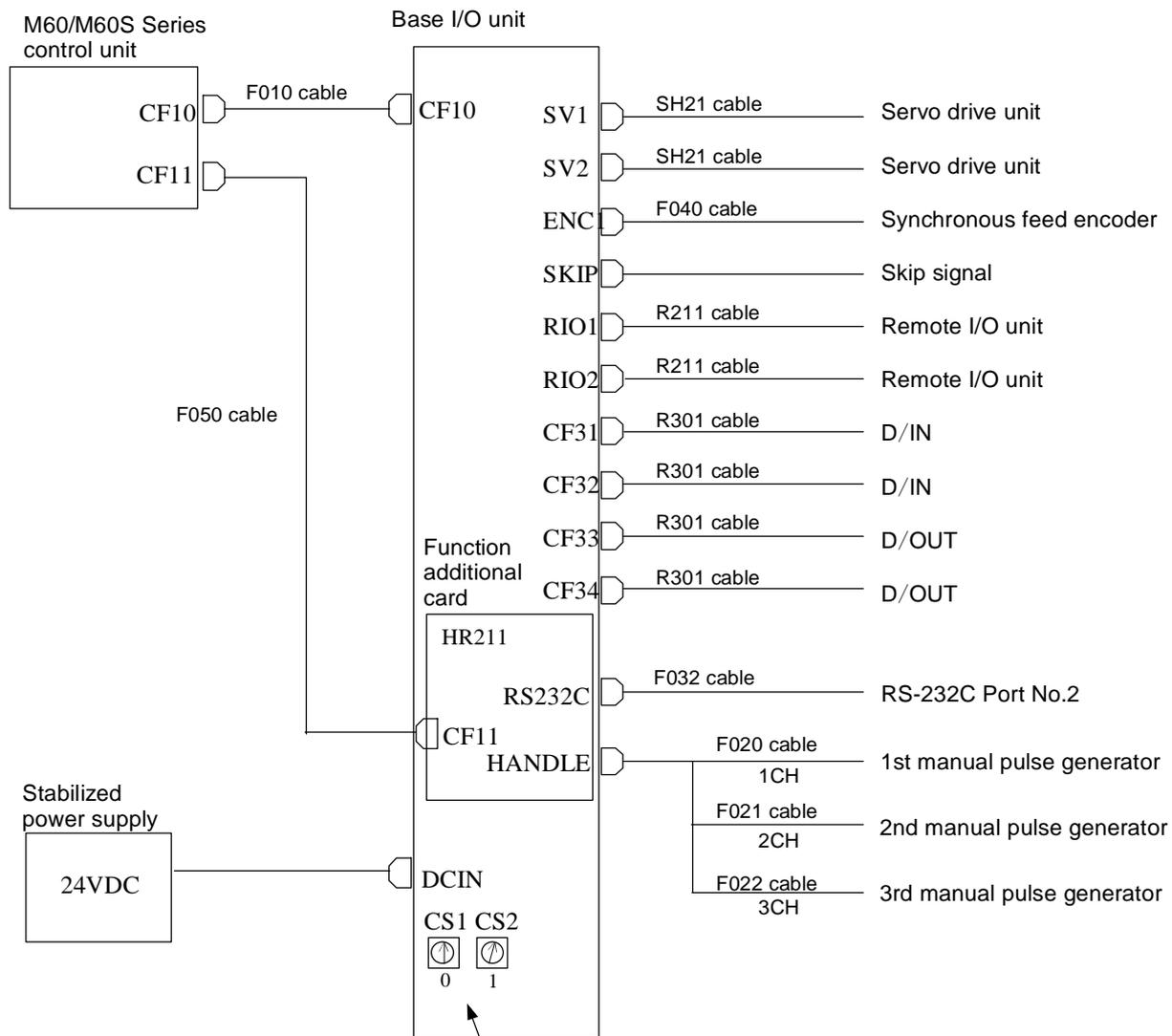
Machine output circuit type and number of points

		FCU6-DX350	FCU6-DX351	FCU6-DX450	FCU6-DX451
1	Output type	Sink type	Source type	Sink type	Source type
2	Output current	60mA/1 points			
3	No. of output points	48 points		64 points	

The specifications other than the machine input and machine output connector are common.

6. CONNECTION OF BASE I/O UNIT
6.2 Base I/O Unit Connection System Drawing

6.2 Base I/O Unit Connection System Drawing



* CS1 and CS2 set the remote I/O communication station numbers.

(Note) The base I/O unit occupies two stations of the remote I/O communication (MC link B communication).

6. CONNECTION OF BASE I/O UNIT
6.2 Base I/O Unit Connection System Drawing

I/O unit name Connector name	FCU6-DX350	FCU6-DX351	FCU6-DX450	FCU6-DX451
CF10	Connect with the control unit (servo drive unit, synchronous feed encoder, skip signal, remote I/O unit).			
CF11	Connect with the control unit (+5V, RS-232C, manual pulse generator).			
SV1	Connect with the servo drive unit/spindle drive unit.			
SV2	Connect with the auxiliary axis.			
ENC1	Connect with the synchronous feed encoder. When using two units for the synchronous feed encoder, connect the second unit to ENC2 of the control unit.			
SKIP	Connect with the skip signal input. Up to eight points can be used.			
RIO1	Connect with the remote I/O unit. There are two stations occupied on this unit, so the additional remote I/O units for six stations can be used.			
RIO2	Connect with the remote I/O unit.			
CF31	DI: 32 (sink/source)		DI: 32 (sink/source)	
CF32	DI: 16 (sink/source)		DI: 32 (sink/source)	
CF33	DO: 32 (sink type)	DO: 32 (source type)	DO: 32 (sink type)	DO: 32 (source type)
CF34	DO: 16 (sink type)	DO: 16 (source type)	DO: 32 (sink type)	DO: 32 (source type)
RS232C	Connect with an RS-232C device.			
HANDLE	Connect with the 12VDC power supply type handle. Up to three units can be connected.			
CS1	Rotary switch CS1: Sets the 32-point station No. with remote I/O communication 1CH DI: X0-X1F and DO: Y0-Y1F. This is normally used set to "0".			
CS2	Rotary switch CS2: Sets the 32-point station No. with remote I/O communication 1CH DI: X20-X3F and DO: Y20-Y3F. This is normally used set to "1".			

* The rotary switch CS1 and CS2 settings may differ according to the machine configuration and whether other remote I/O units are being used. Set within the range of 0 to 7.

6. CONNECTION OF BASE I/O UNIT

6.2 Base I/O Unit Connection System Drawing

Machine input/output terminal

I/O

CF31

B			A		
20	I	X0	20	I	X10
19	I	X1	19	I	X11
18	I	X2	18	I	X12
17	I	X3	17	I	X13
16	I	X4	16	I	X14
15	I	X5	15	I	X15
14	I	X6	14	I	X16
13	I	X7	13	I	X17
12	I	X8	12	I	X18
11	I	X9	11	I	X19
10	I	XA	10	I	X1A
9	I	XB	9	I	X1B
8	I	XC	8	I	X1C
7	I	XD	7	I	X1D
6	I	XE	6	I	X1E
5	I	XF	5	I	X1F
4			4		
3	I	COM	3	I	COM
2		24VDC	2		0V(RG)
1		24VDC	1		0V(RG)

CF32

B			A		
20	I	X20	20	I	(X30)
19	I	X21	19	I	(X31)
18	I	X22	18	I	(X32)
17	I	X23	17	I	(X33)
16	I	X24	16	I	(X34)
15	I	X25	15	I	(X35)
14	I	X26	14	I	(X36)
13	I	X27	13	I	(X37)
12	I	X28	12	I	(X38)
11	I	X29	11	I	(X39)
10	I	X2A	10	I	(X3A)
9	I	X2B	9	I	(X3B)
8	I	X2C	8	I	(X3C)
7	I	X2D	7	I	(X3D)
6	I	X2E	6	I	(X3E)
5	I	X2F	5	I	(X3F)
4			4		
3	I	COM	3	I	COM
2		24VDC	2		0V(RG)
1		24VDC	1		0V(RG)

The devices shown in parentheses are used only with FCU6-DX450/451.

CF33

B			A		
20	O	Y0	20	O	Y10
19	O	Y1	19	O	Y11
18	O	Y2	18	O	Y12
17	O	Y3	17	O	Y13
16	O	Y4	16	O	Y14
15	O	Y5	15	O	Y15
14	O	Y6	14	O	Y16
13	O	Y7	13	O	Y17
12	O	Y8	12	O	Y18
11	O	Y9	11	O	Y19
10	O	YA	10	O	Y1A
9	O	YB	9	O	Y1B
8	O	YC	8	O	Y1C
7	O	YD	7	O	Y1D
6	O	YE	6	O	Y1E
5	O	YF	5	O	Y1F
4			4		
3			3		
2		24VDC	2		0V(RG)
1		24VDC	1		0V(RG)

CF34

B			A		
20	O	Y20	20	O	(Y30)
19	O	Y21	19	O	(Y31)
18	O	Y22	18	O	(Y32)
17	O	Y23	17	O	(Y33)
16	O	Y24	16	O	(Y34)
15	O	Y25	15	O	(Y35)
14	O	Y26	14	O	(Y36)
13	O	Y27	13	O	(Y37)
12	O	Y28	12	O	(Y38)
11	O	Y29	11	O	(Y39)
10	O	Y2A	10	O	(Y3A)
9	O	Y2B	9	O	(Y3B)
8	O	Y2C	8	O	(Y3C)
7	O	Y2D	7	O	(Y3D)
6	O	Y2E	6	O	(Y3E)
5	O	Y2F	5	O	(Y3F)
4			4		
3			3		
2		24VDC	2		0V(RG)
1		24VDC	1		0V(RG)

The devices shown in parentheses are used only with FCU6-DX450/451.

CS1



CS2



<Cable side connector type>

Connector: 7940-6500SC
Recommended manufacturer: 3M

* This examples shows CS1 set to "0" and CS2 set to "1".
Refer to the PLC Interface Manual for details.

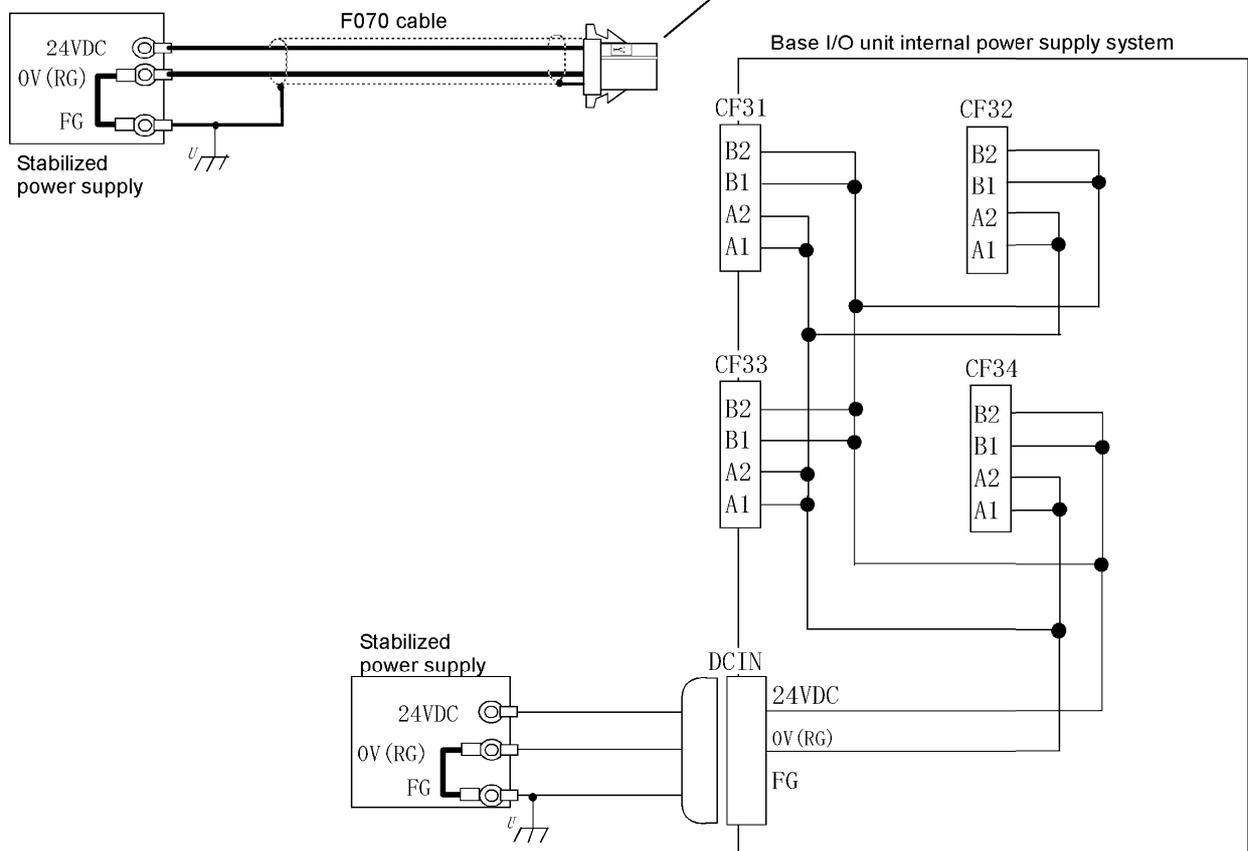
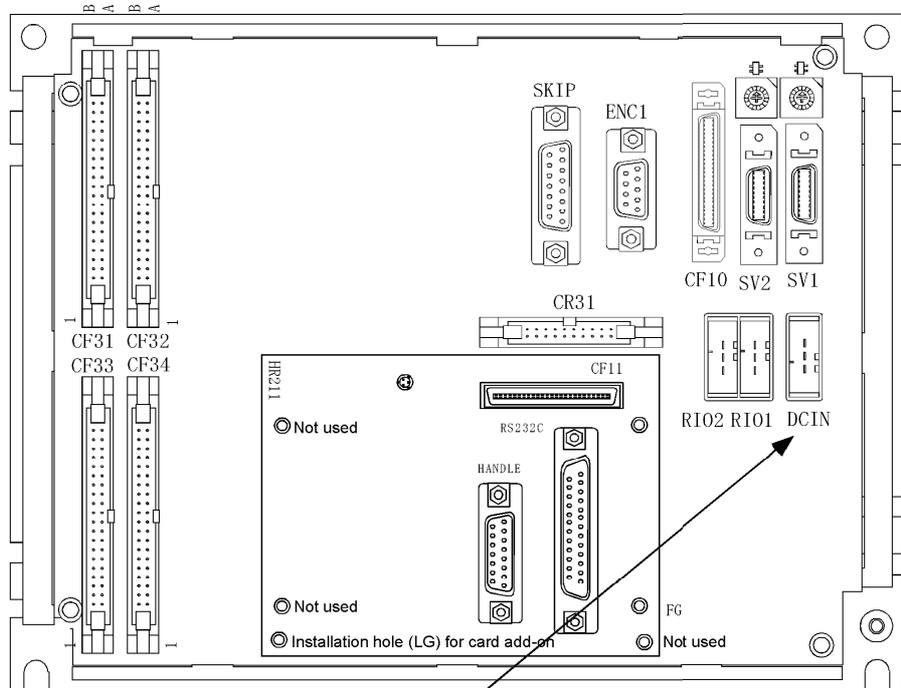
6. CONNECTION OF BASE I/O UNIT

6.3 Connection of Power Supply

6.3 Connection of Power Supply

Supply the 24VDC power for the base I/O unit from the DCIN connector.

Base I/O unit



(Note) A 24VDC power supply input is required for both the sink type and source type.

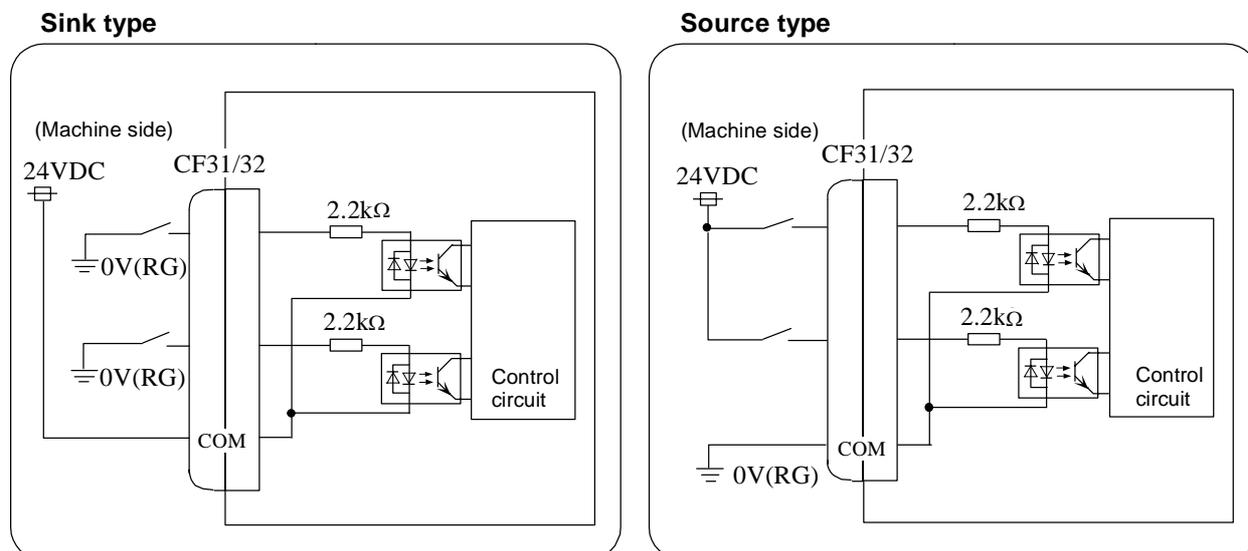
6. CONNECTION OF BASE I/O UNIT

6.4 Connection of I/O Signal

6.4 Connection of I/O Signal

(1) CF31 and CF32 input circuit specifications

The sink and source input is changed by connecting 24VDC to COM or connecting 0V (RG). There are 48 or 64 input points, and the input device numbers are X0 to X3F.

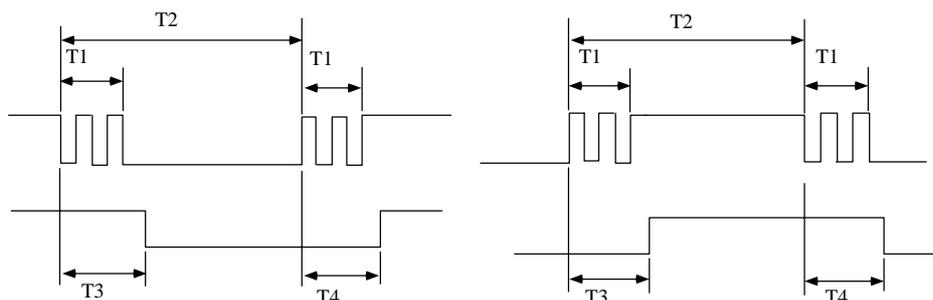


Input conditions Use the input signals within the range of the following conditions.

		Sink type	Source type
1	Input voltage at external contact ON	6V or less	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more	
3	Input voltage at external contact OFF	20V or more, 25.2V or less	4V or less
4	Input current at external contact OFF	2mA or less	
5	Tolerable chattering time	3ms or less (Refer to T1 below)	
6	Input signal holding time	40ms or more (Refer to T2 below)	
7	Input circuit operation delay time	$3\text{ms} \leq T3 \leq T4 \leq 16\text{ms}$	
8	Machine side contact capacity	+30V or more, 16mA or more	

<Caution>

Input signal holding time: 40ms or more as a guideline. The input signal can only be confirmed if held longer than the ladder process cycle time.

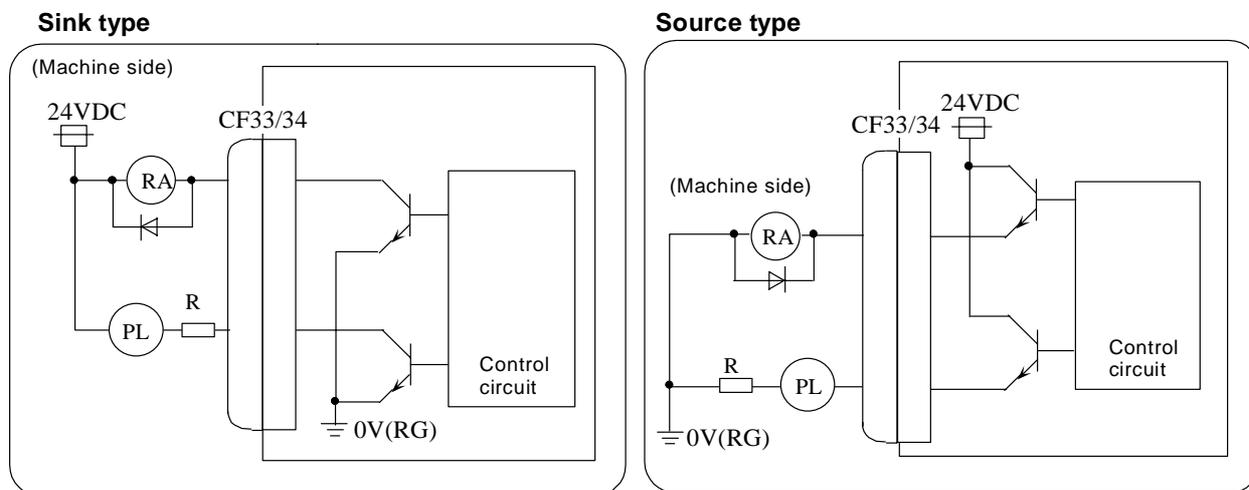


6. CONNECTION OF BASE I/O UNIT

6.4 Connection of I/O Signal

(2) Specifications of CF33, CF34 output circuit

The output is fixed to a sink or source output. There are 48 or 64 output points, and the Y0 to Y2F or Y0 to Y3F output pins are used. Use within the specification range shown below.



Output conditions

Insulation method	Non-insulation
Rated load voltage	24VDC
Max. output current	60mA/point
Output delay time	40μs

(3) Rotary switch (CS1, CS2) setting

CS1	Rotary switch CS1: Set the station No. of the 32 points remote I/O DI: X0-X1F and DO: Y0-Y1F for system 1. Normally, this is used set at "0".
CS2	Rotary switch CS2: Set the station No. of the 32 points remote I/O DI: X20-X3F and DO: Y20-Y3F for system 1. Normally, this is used set at "1".

The No. of stations occupied with this card is two stations.

<Caution>

- * When using an inductive load such as a relay, always connect a diode (voltage resistance 100V or more, 100mA or more) in parallel to the load.
- * When using a lamp or capacitive load, always connect a protective resistor (R = 150Ω) serially to the load to suppress rush currents. (Make sure that the current is less than the above tolerable current including the momentary current.)



- ❗ When using an inductive load such as a relay, always connect a diode in parallel to the load.
- ❗ When using a lamp or capacitive load, always connect a protective resistor serially to the load to suppress rush currents.

6. CONNECTION OF BASE I/O UNIT

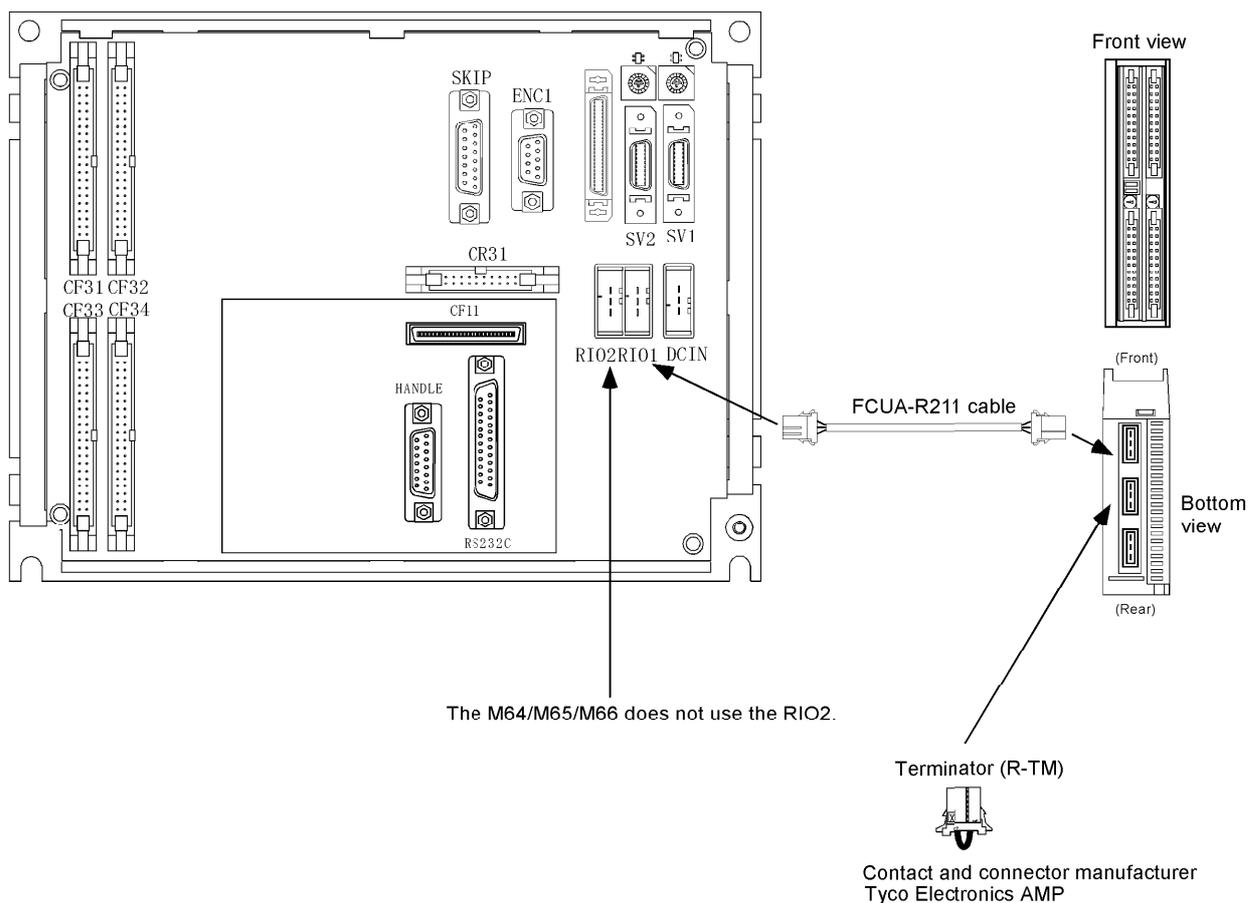
6.5 Example of Remote I/O Unit Connection

6.5 Example of Remote I/O Unit Connection

The number of I/O points can be expanded by connecting a remote I/O unit to the base I/O unit. Refer to Chapter 7 CONNECTION OF REMOTE I/O UNIT for details on the remote I/O unit.

(Example of connection using remote I/O unit)

(Ex.) Remote I/O unit
FCUA-DX11□/FCUA-DX12□



(2) RIO1 terminator

Connect a terminator to the final remote I/O unit connected to RIO1.

Terminator type: R-TM Refer to Appendix 2.22.

Terminator (R-TM)



Contact and connector manufacturer:
Tyco Electronics AMP

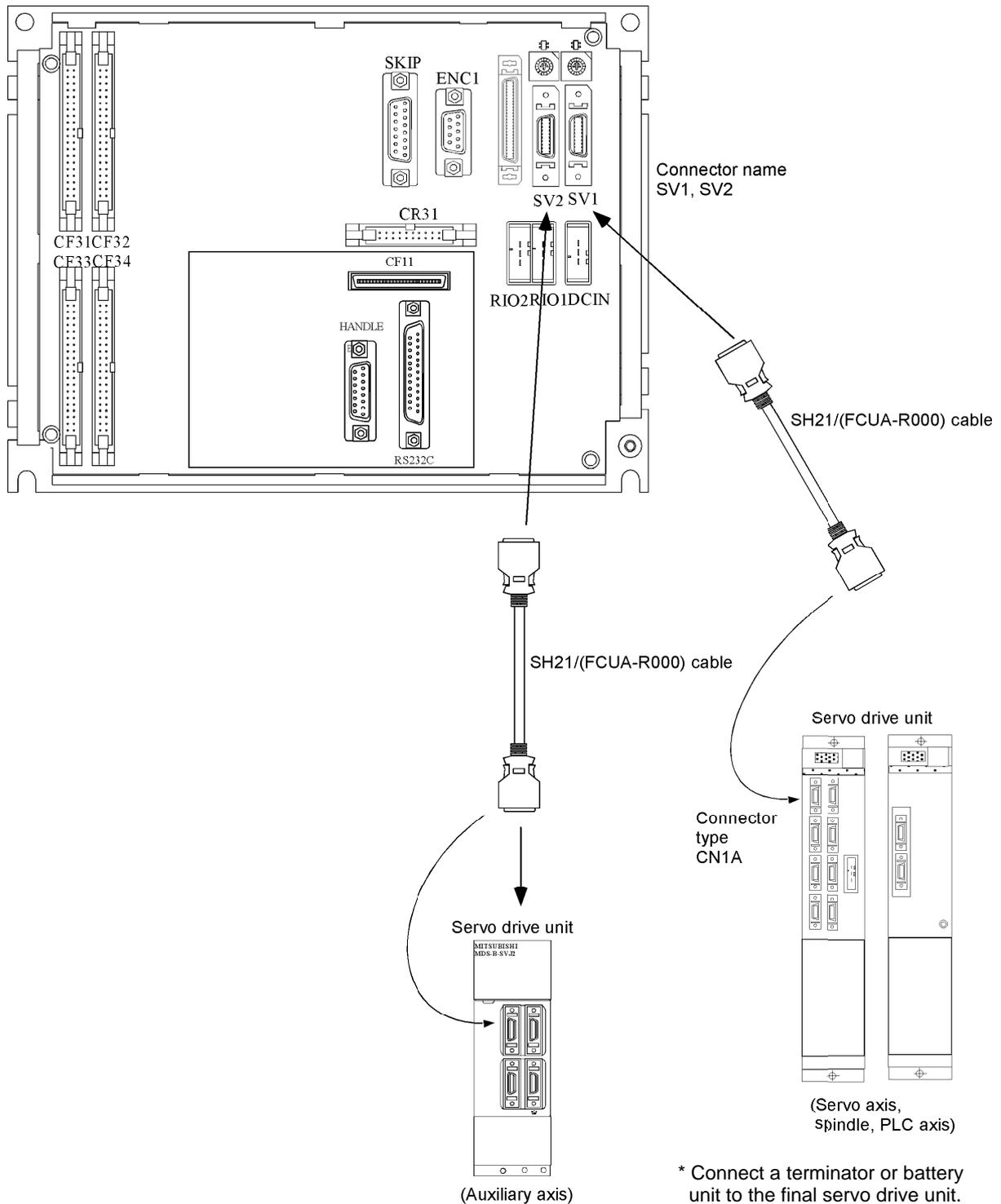
6. BASE I/O UNIT CONNECTION

6.6 Connection of Servo Drive Unit

6.6 Connection of Servo Drive Unit

Connect the servo drive unit to SV1 (servo axis, PLC axis, spindle) and SV2 (auxiliary axis: MR-J2-CT) of the base I/O unit.

Refer to the M60/M60S Series Specifications Manual (BNP-B2210) for the number and types of servo drive units that can be connected to SV1 and SV2.



<Related items>

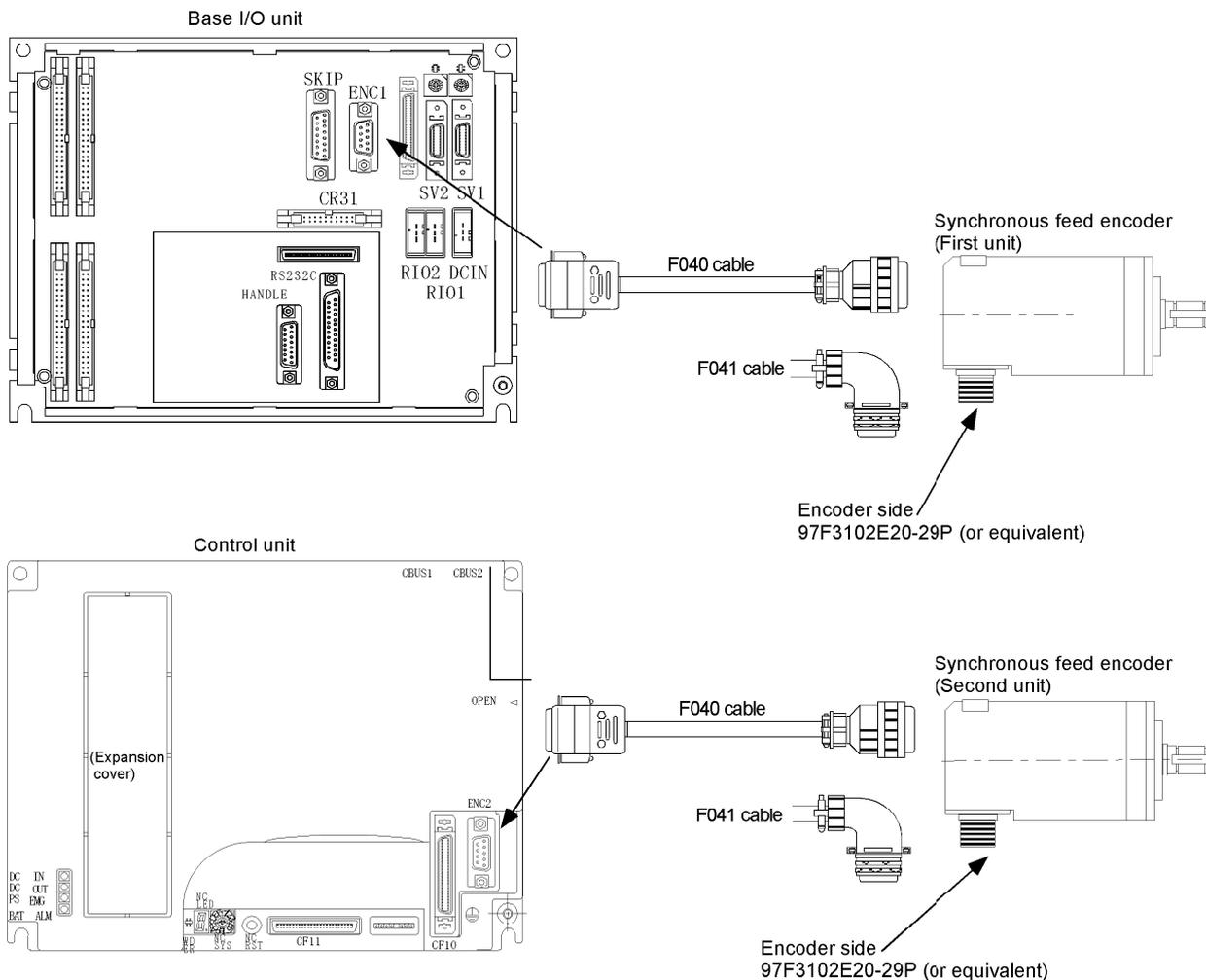
Cable manufacturing drawing: APPENDIX 2 (SH21 cable)

6. CONNECTION OF BASE I/O UNIT

6.7 Connection of Synchronous Feed Encoder

6.7 Connection of Synchronous Feed Encoder

Connect the encoder to ENC1 on the base I/O unit.
 When connecting the second unit, connect it to ENC2 on the control unit.



A	ENC1A	K	0V
B	ENC1Z	L	
C	ENC1B	M	
D		N	ENC1A*
E	Case ground	P	ENC1Z*
F		R	ENC1B*
G		S	
H	5VDC	T	
J			

<Related items>

Outline drawing: APPENDIX 1

Cable manufacturing drawing: APPENDIX 2 (F040 cable)

Connector pin assignment: 6.10 Base I/O Unit Connector Pin Assignment (ENC1)

4.2.8 Control Unit Connector Pin Assignment (ENC2)

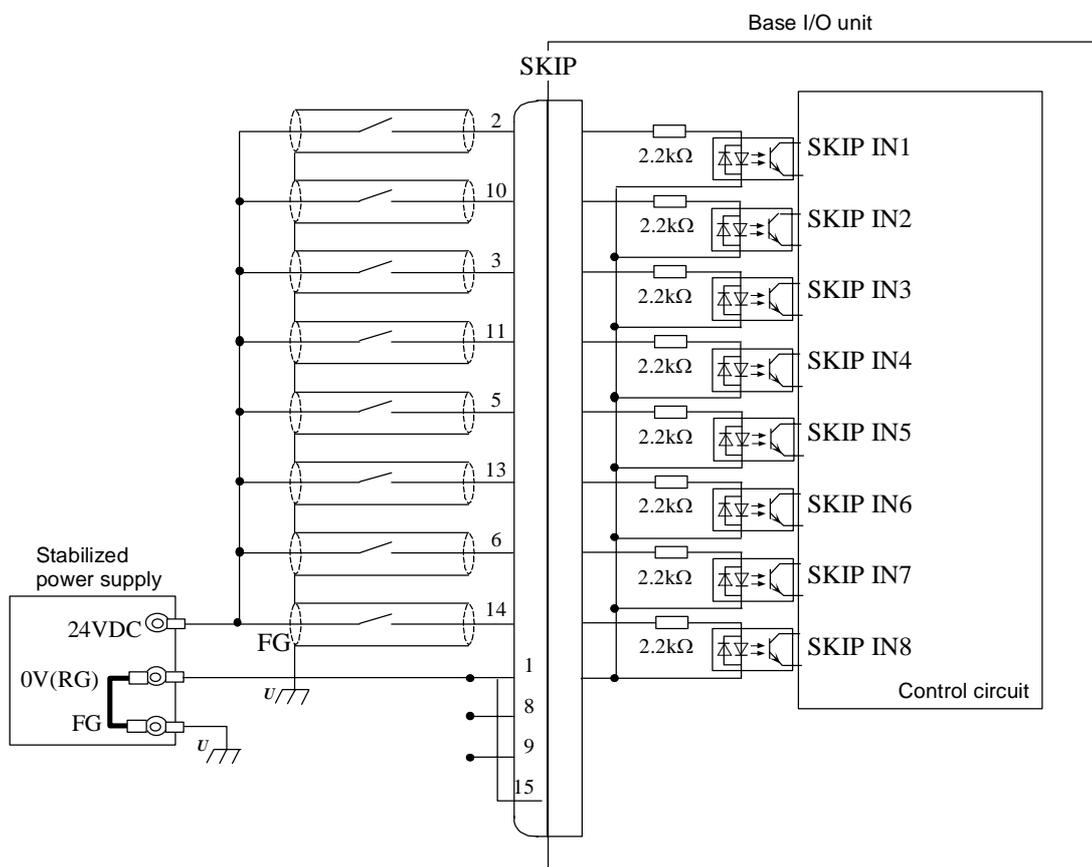
6. CONNECTION OF BASE I/O UNIT

6.8 Connection of Skip Signal (sensor)

6.8 Connection of Skip Signal (sensor)

Connect the skip signal to SKIP on the base I/O unit.
The skip signal is used for processing the high-speed signals. Always shield the cable.

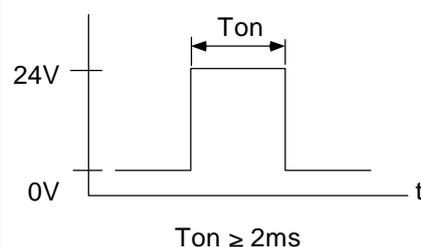
(1) Skip signal cable



(2) Input conditions

Use the input signal within the following condition range.

1	Input voltage at external contact ON	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more
3	Input voltage at external contact OFF	4V or less
4	Input current at external contact OFF	1mA or less
5	Input signal hold time (Ton)	2ms or more
6	Internal response time	0.08ms or less
7	Machine side contact capacity	+30V or more, 16mA or more



<Related item>

Connector pin assignment: 6.10 Base I/O Unit Connector Pin Assignment (SKIP)

⚠ CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

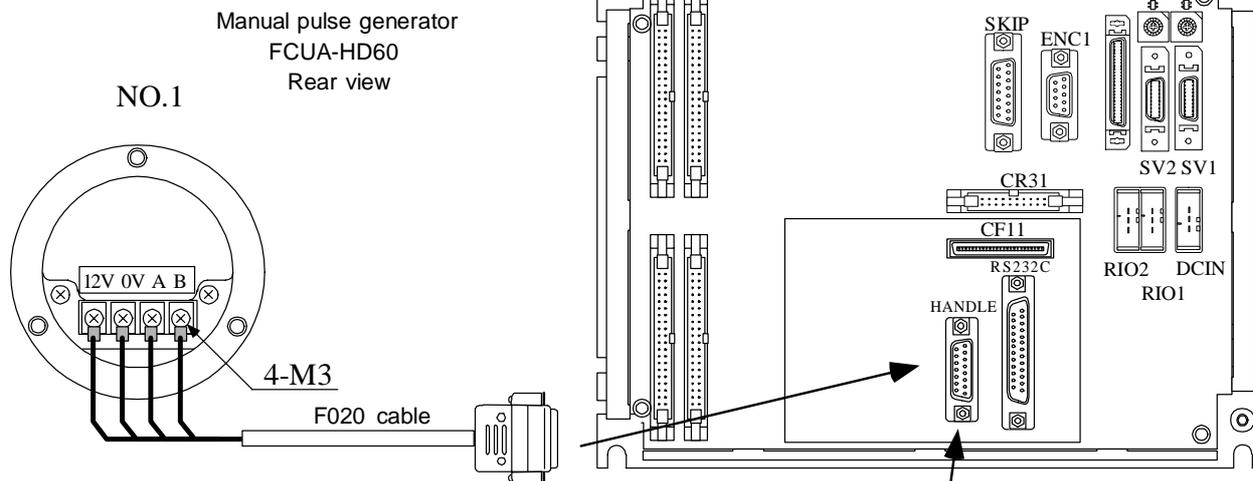
6. CONNECTION OF BASE I/O UNIT

6.9 Connection of Manual Pulse Generator

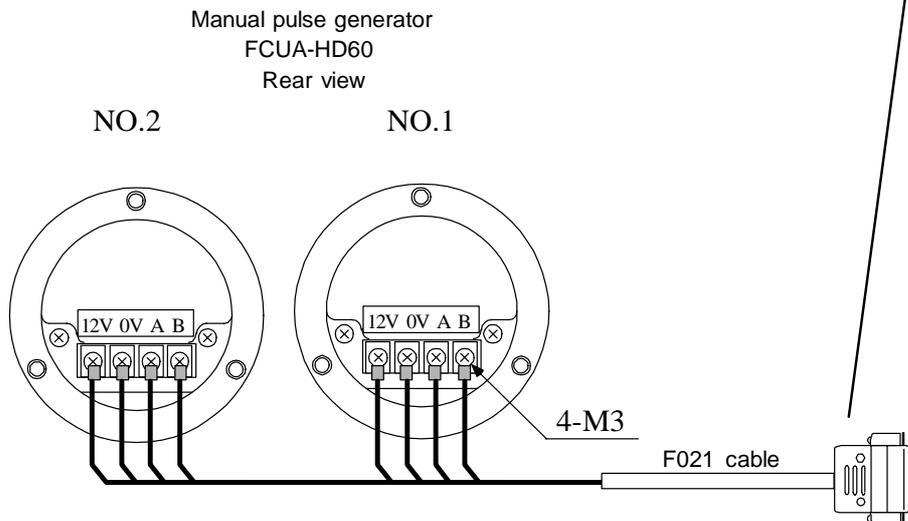
6.9 Connection of Manual Pulse Generator

To connect the manual pulse generators, connect an F020/021/022 cable to "HANDLE" on the HR211 card. Up to three manual pulse generators can be connected.
(Refer to Appendix 2.5 F020/021/022 Cable Manufacturing Drawings for cable details.)

Connecting one manual pulse generator



Connecting two manual pulse generators



CAUTION

- ⚠ Incorrect connections could damage the device, so always connect the cable to the designated connector.
- ⊘ Do not connect or disconnect the connection cables between each unit while the power is ON.

6. CONNECTION OF BASE I/O UNIT

6.9 Connection of Manual Pulse Generator

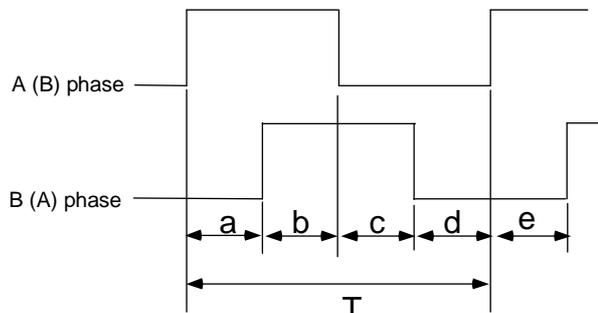
When devices (pulse generators) other than manual pulse generators (HD60) are connected to the additional I/O units, use within the ranges shown in the following specifications. The commercially-available manual pulse generators include the 25 pulse/rev type and 100 pulse/rev type. The MELDAS60/60S Series internally multiplies one pulse by four, so use the 25 pulse/rev type.

Input/output conditions

Input pulse signal type	90° phase difference between A phase and B phase. (Refer to waveform (e) below.)
Input signal voltage	H-level 3.5V to 5.25V, L-level 0V to 0.5V or less
Max. input pulse frequency	100kHz
Power voltage for pulse generators	12VDC \pm 10%
Max. output current	300mA
No. of pulses per rotation	25 pulse/rev (25 pulse/rev for HD60)

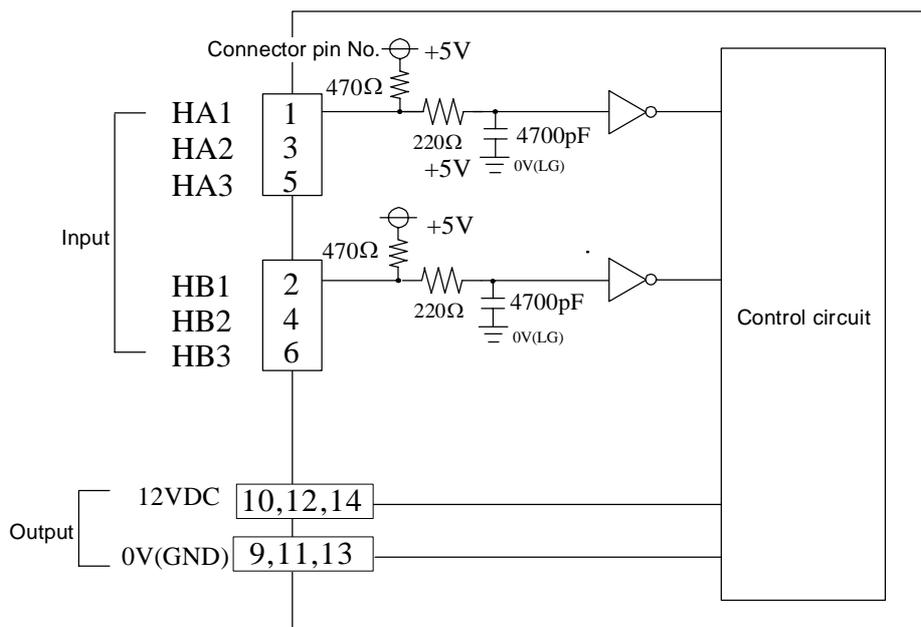
Input waveform

The input waveform phase difference must be $\pm T/10$ (T: cycle) or less.



a. b. c. d. e: A phase or B phase rising edge (falling edge) phase difference = $T/4 \pm T/10$
T: A or B phase cycle (Min. 10 μ s)

Input/output circuit



6. CONNECTION OF BASE I/O UNIT

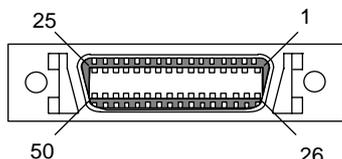
6.10 Connector Pin Assignment

6.10 Connector Pin Assignment

(1) Base I/O Unit Connector

Control unit connection terminal

CF10



Refer to section 4.2.8 Control Unit Connector Pin Assignment (CF10) for details on the connector pin assignment.

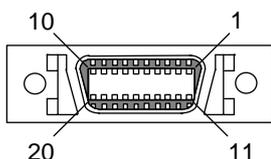
<Cable side connector type>

Plug : 10150-6000EL
 Shell : 10350-3210-000
 Recommended manufacturer: 3M

(Connect the connector case to shield.)

Servo drive unit connection terminal

SV1



1		GND	11		GND
2	O	SVTXD1	12	O	SVTXD1*
3	I	SVALM1	13	I	SVALM1*
4	I	SVRXD1	14	I	SVRXD1*
5		GND	15		GND
6			16		
7	O	SVEMG1	17	O	SVEMG1*
8			18		
9			19		
10	O	+5V	20		

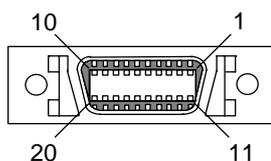
<Cable side connector type>

Plug : 10120-6000EL
 Shell : 10320-3210-000
 Recommended manufacturer: 3M

(Connect the connector case to shield.)

Servo drive unit connection terminal

SV2



1		GND	11		GND
2	O	SVTXD2	12	O	SVTXD2*
3	I	SVALM2	13	I	SVALM2*
4	I	SVRXD2	14	I	SVRXD2*
5		GND	15		GND
6			16		
7	O	SVEMG2	17	O	SVEMG2*
8			18		
9			19		
10	O	+5V	20		

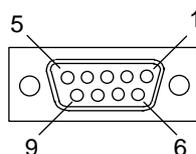
<Cable side connector type>

Plug : 10120-6000EL
 Shell : 10320-3210-000
 Recommended manufacturer: 3M

(Connect the connector case to shield.)

Synchronous feed encoder connection terminal

ENC1



1	I	ENC1A	6	I	ENC1A*
2	I	ENC1B	7	I	ENC1B*
3	I	ENC1Z	8	I	ENC1Z*
4		GND	9	O	+5V
5		GND			

<Cable side connector type>

Connector : CDE-9PF
 Contact : CD-PC-111
 Case : HDE-CTH
 Recommended manufacturer: Hirose Electric

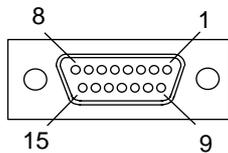
(Connect the connector case to shield.)

6. CONNECTION OF BASE I/O UNIT

6.10 Connector Pin Assignment

Skip signal input terminal

SKIP



<Cable side connector type>

Connector : CDA-15P

Contact : CD-PC-111

Case : HDA-CTH

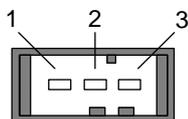
Recommended manufacturer: Hirose Electric

1		GND	9		GND
2	I	SKIP IN1	10	I	SKIP IN2
3	I	SKIP IN3	11	I	SKIP IN4
4			12		
5	I	SKIP IN5	13	I	SKIP IN6
6	I	SKIP IN7	14	I	SKIP IN8
7			15		GND
8		GND			

(Connect the connector case to shield.
Use a nickel-base chrome-plated part.)

Remote I/O unit connection terminal

RIO1



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

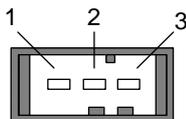
Recommended manufacturer:

Tyco Electronics AMP

1	I/O	TXRX1
2	I/O	TXRX1*
3		GND

Remote I/O unit connection terminal

RIO2



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

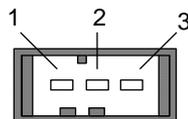
Recommended manufacturer:

Tyco Electronics AMP

1	I/O	TXRX2
2	I/O	TXRX2*
3		GND

Power input terminal (24VDC)

DCIN



<Cable side connector type>

Connector : 2-178288-3

Contact : 1-175218-5

Recommended manufacturer:

Tyco Electronics AMP

1	I	24VDC
2		0V(RG)
3		FG

⚠ CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

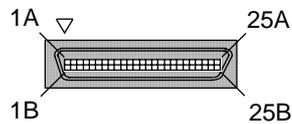
6. CONNECTION OF BASE I/O UNIT

6.10 Connector Pin Assignment

(2) Additional I/O Unit Connector

Control unit connection terminal

CF11



Refer to section 4.2.8 Control Unit Connector Pin Assignment (CF11) for details on the connector pin assignment.

<Cable side connector type>

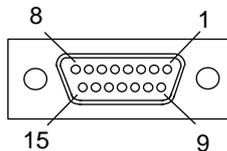
Connector: DHD-RB50-20AN

Recommended manufacturer: DDK

Manual pulse generator connection terminal

HANDLE

Reference materials
Appendix 2.5 F020/21/22
Cable Assembly Drawing



1	I	1HA	9		GND
2	I	1HB	10	O	12VDC
3	I	2HA	11		GND
4	I	2HB	12	O	12VDC
5	I	3HA	13		GND
6	I	3HB	14	O	12VDC
7			15		
8					

<Cable side connector type>

Connector : CDA-15P

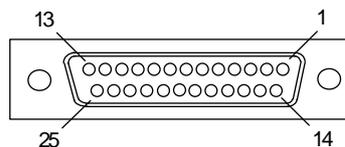
Contact : CD-PC-111

Case : HDA-CTH

Recommended manufacturer: Hirose Electric

RS-232C device connection terminal

RS232C



Reference materials
Appendix 2.6 F030/31/32
Cable Assembly Drawing

1			14	O	SD2
2	O	SD1 (Note)	15	O	ER2
3	I	RD1 (Note)	16	I	RD2
4	O	RS1 (Note)	17	I	CS2
5	I	CS1 (Note)	18		
6	I	DR1 (Note)	19	O	RS2
7		GND	20	O	ER1 (Note)
8			21	I	DR2
9			22		
10			23		
11		GND	24		GND
12		reserve	25		reserve
13					

Explanation of signals

SD: Send Data
RD: Receive Data
RS: Request to Send
CS: Clear to Send
DR: Data Set Ready
ER: Data Terminal Ready

(Note) Signal name meanings:

- 1: For maintenance by service personnel
- 2: General released channel

<Cable side connector type>

Connector : CDB-25P

Contact : CD-PC-111

Case : HDB-CTH

Recommended manufacturer: Hirose Electric



- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

7. CONNECTION OF REMOTE I/O UNIT
7.1 Outline of Remote I/O Unit

7. CONNECTION OF REMOTE I/O UNIT

This chapter describes the connection of the remote I/O unit and machine control signals.

7.1 Outline of Remote I/O Unit

The following eight types of signals can be input/output from the remote I/O unit (FCUA-DX□□□) according to the type and No. of contacts. Use serial link connections (MC link B) to connect the unit with the base I/O unit or the communication terminal.

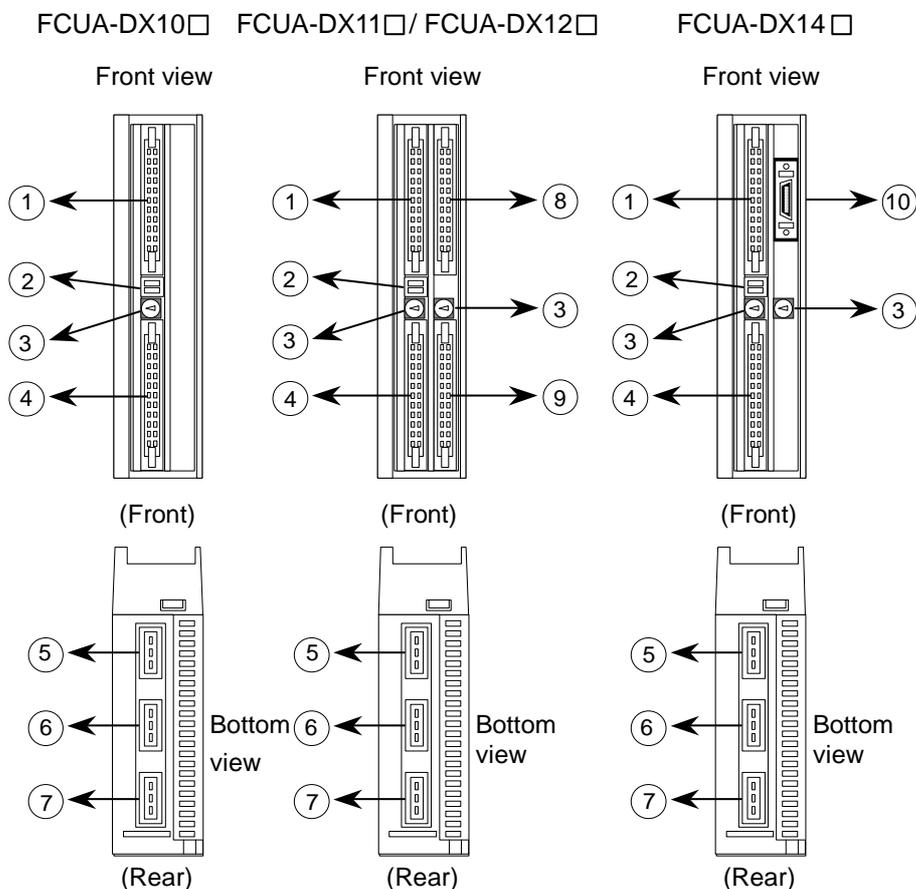
When the remote I/O unit is connected with serial links, multiple units can be used as long as the total No. of occupied stations (channels) is within 8 channels. Because the base I/O unit uses two stations when base I/O unit system 1 is used, up to six stations of the remote I/O unit can be connected. (Refer to Section 7.3 "Setting of Station No. When Using Multiple Remote I/O Units" for details.)

Unit type	Machine control signals that can be handled	No. of occupied serial link stations
FCUA-DX100	Digital input signal (DI) : 32 points (photo coupler insulation) sink/source type Digital output signal (DO) : 32 points (non-insulation) sink type	1
FCUA-DX101	Digital input signal (DI) : 32 points (photo coupler insulation) sink/source type Digital output signal (DO) : 32 points (non-insulation) source type	1
FCUA-DX110	Digital input signal (DI) : 64 points (photo coupler insulation) sink/source type Digital output signal (DO) : 48 points (non-insulation) sink type	2
FCUA-DX111	Digital input signal (DI) : 64 points (photo coupler insulation) sink/source type Digital output signal (DO) : 48 points (non-insulation) source type	2
FCUA-DX120	Digital input signal (DI) : 64 points (photo coupler insulation) sink/source type Digital output signal (DO) : 48 points (non-insulation) sink type Analog output (AO) : 1 point	2
FCUA-DX121	Digital input signal (DI) : 64 points (photo coupler insulation) sink/source type Digital output signal (DO) : 48 points (non-insulation) source type Analog output (AO) : 1 point	2
FCUA-DX140	Digital input signal (DI) : 32 points (photo coupler insulation) sink/source type Digital output signal (DO) : 32 points (non-insulation) sink type Analog input (AI) : 4 points Analog output (AO) : 1 point	2
FCUA-DX141	Digital input signal (DI) : 32 points (photo coupler insulation) sink/source type Digital output signal (DO) : 32 points (non-insulation) source type Analog input (AI) : 4 points Analog output (AO) : 1 point	2

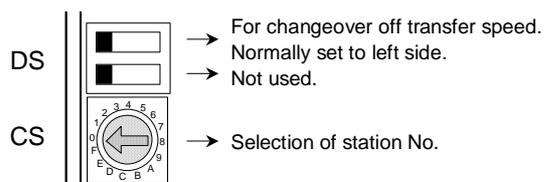
7. CONNECTION OF REMOTE I/O UNIT

7.2 Names of Each Remote I/O Unit Section

7.2 Names of Each Remote I/O Unit Section



- ① DI-L (machine input signal connector)
- ② DS (transfer speed changeover switch)
- ③ CS (station No. changeover switch)
- ④ DO-L (machine output signal connector)
- ⑤ RIO1 (serial connection connector #1)
- ⑥ RIO2 (serial connection connector #2)
- ⑦ DCIN (24VDC power input connector)
- ⑧ DI-R (machine input signal connector)
- ⑨ DO-R (machine output signal connector)
- ⑩ AIO (analog signal input/output connector)



Enlarged view of DS and CS

7. CONNECTION OF REMOTE I/O UNIT

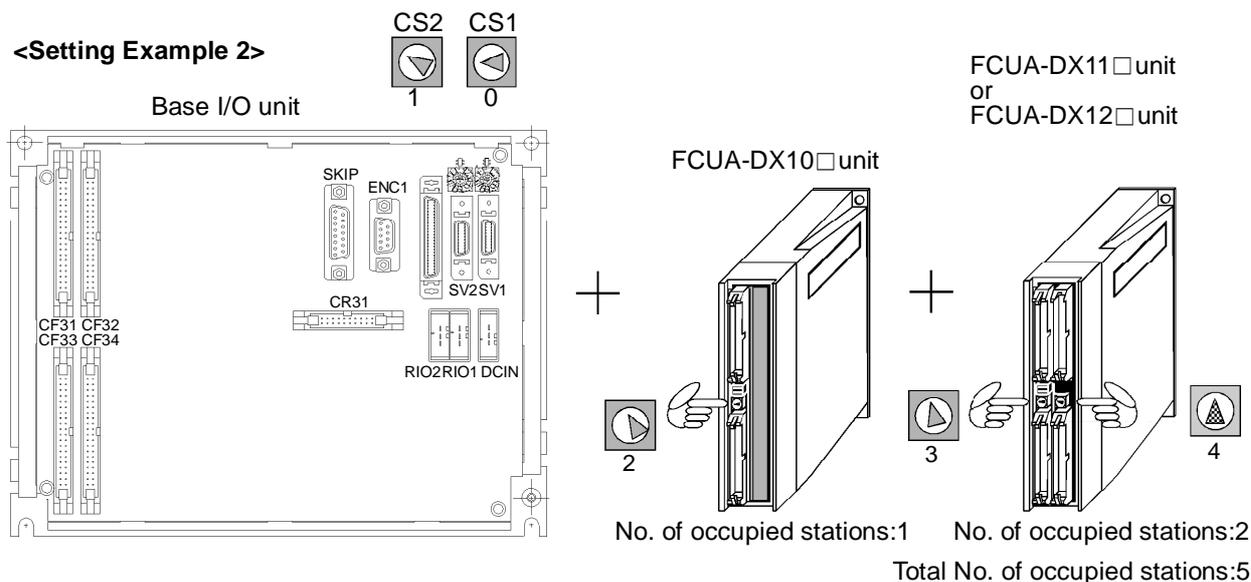
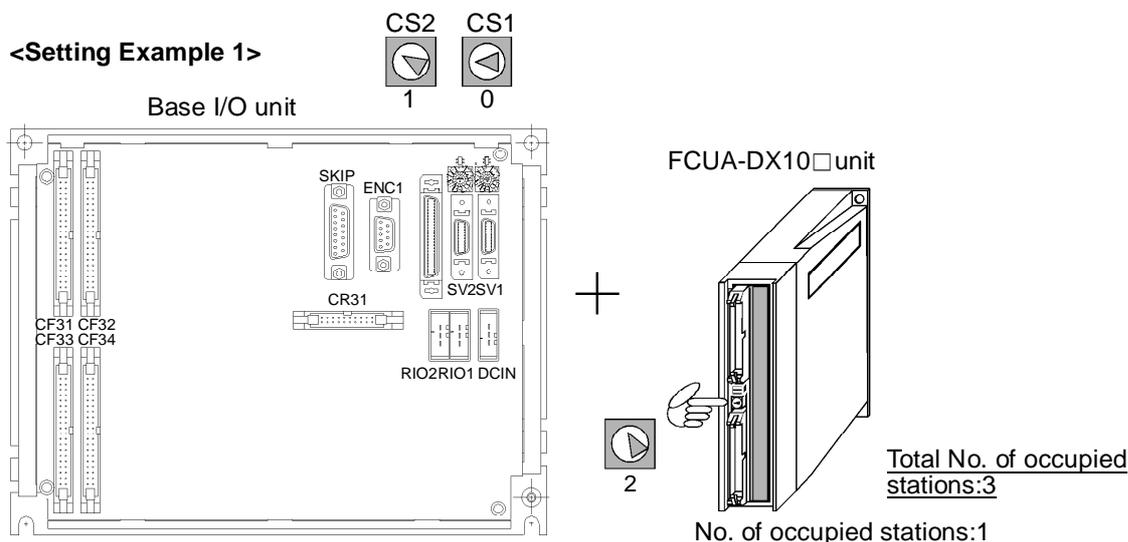
7.3 Setting of Station No. When Using Multiple Remote I/O Units

7.3 Setting of Station No. When Using Multiple Remote I/O Units

When the remote I/O unit is connected with serial links (MC link B), multiple units can be used as long as the total No. of occupied stations is within 8 stations. Because the base I/O unit uses two stations, up to six stations of the remote I/O unit stations can be connected to RIO1 of the base I/O unit.

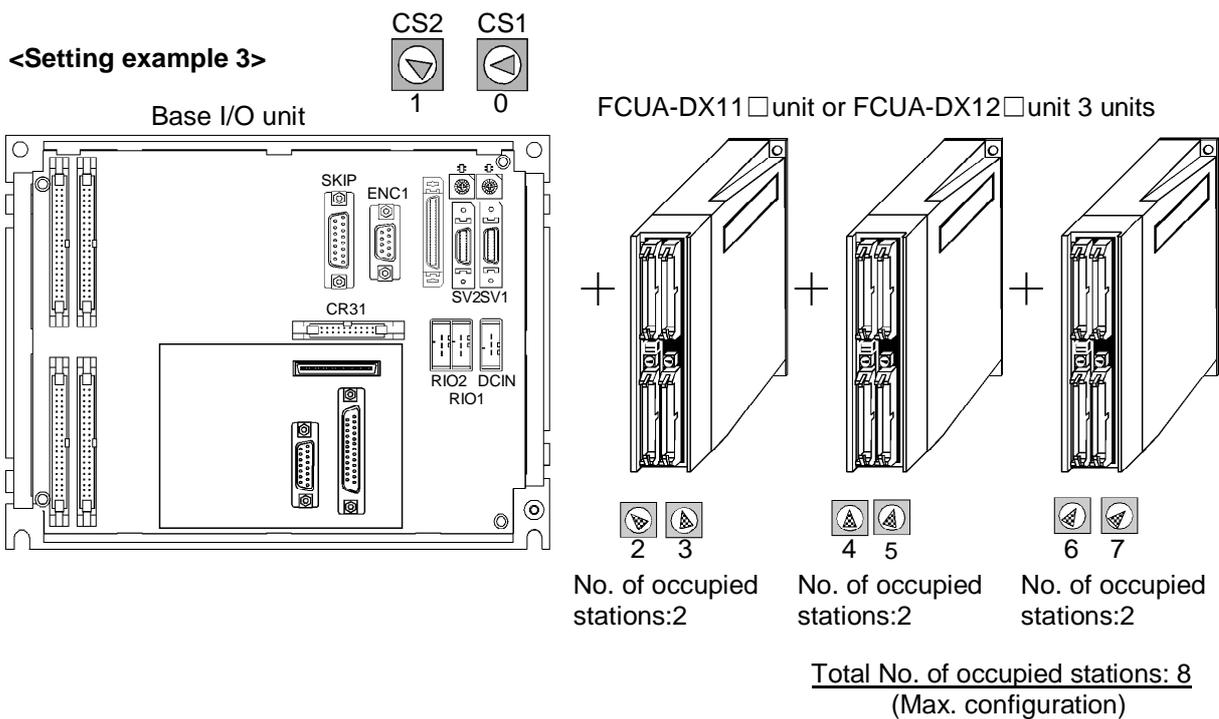
Unit name	No. of occupied serial link stations
FCUA-DX10 □	1
FCUA-DX11 □	2
FCUA-DX12 □	2
FCUA-DX14 □	2

When using multiple remote I/O units, a characteristic station No. must be set for each unit. The FCUA-DX10 □ unit has one station No. setting switch, and FCUA-DX11 □, DX12 □ and DX14 □ unit have two switches. Each of these switches must be set to a characteristic station No. within a range of 0 to 7.



7. CONNECTION OF REMOTE I/O UNIT

7.3 Setting of Station No. When Using Multiple Remote I/O Units



<CAUTION>

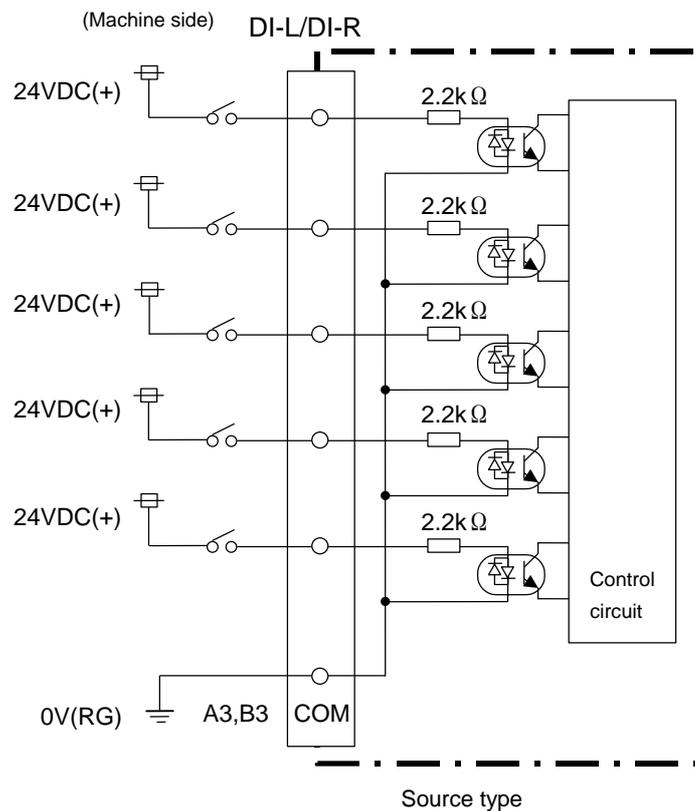
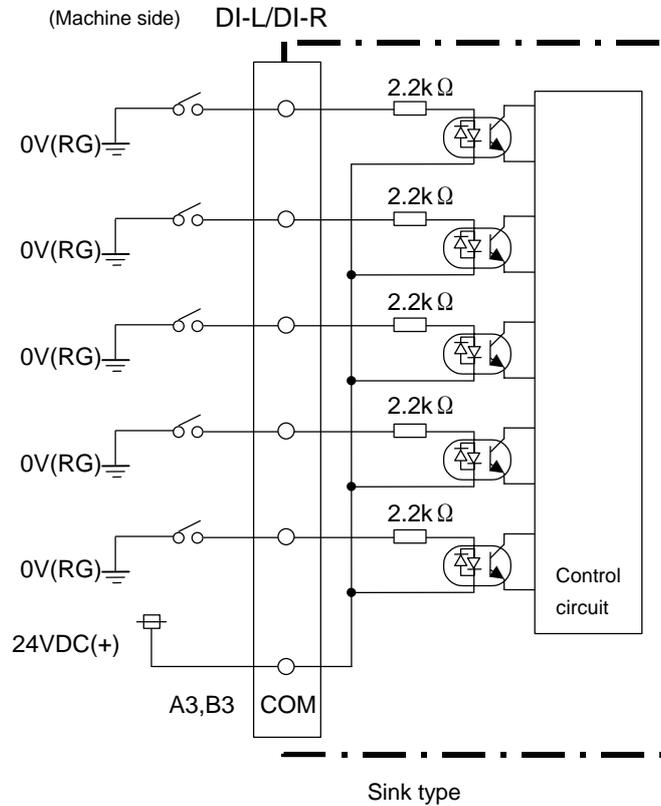
The assignment of each unit's input/output signal address will change with the setting of the channel No. Refer to "PLC Interface Manual" for details.

7. CONNECTION OF REMOTE I/O UNIT
7.4 Outline of Digital Signal Input Circuit

7.4 Outline of Digital Signal Input Circuit

Sink type and source type share the digital signal input circuit.
Connect according to each respective diagram below.

Input circuit



7. CONNECTION OF REMOTE I/O UNIT

7.4 Outline of Digital Signal Input Circuit

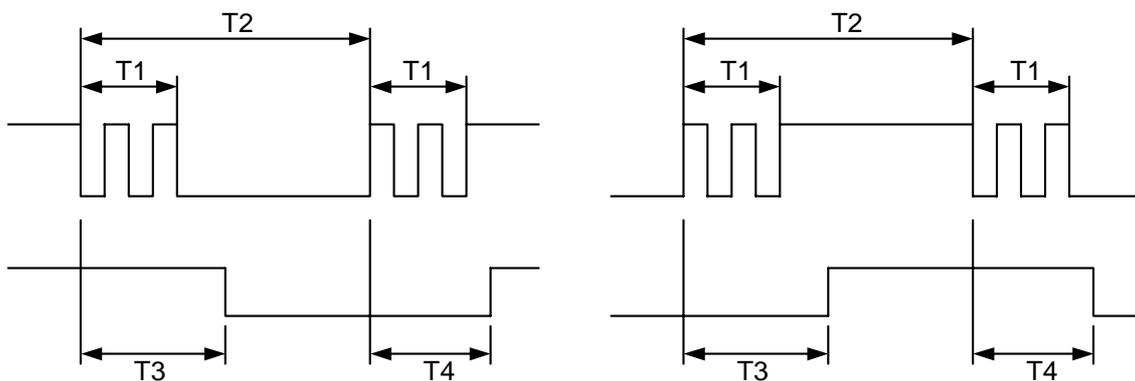
Input conditions

The input signals must be used within the following condition ranges.

		Sink type	Source type
1	Input voltage at external contact ON	6V or less	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more	
3	Input voltage at external contact OFF	20V or more, 25.2V or less	4V or less
4	Input current at external contact OFF	2mA or less	
5	Tolerable chattering time	3ms or less (Refer to T1 below)	
6	Input signal holding time	40ms or more (Refer to T2 below)	
7	Input circuit operation delay time	$3\text{ms} \leq T3 \cong T4 \leq 16\text{ms}$	
8	Machine side contact capacity	30V or more, 16mA or more	

<Caution>

Input signal holding time: 40ms or more as a guideline. The input signal can only be confirmed if held longer than the ladder process cycle time.

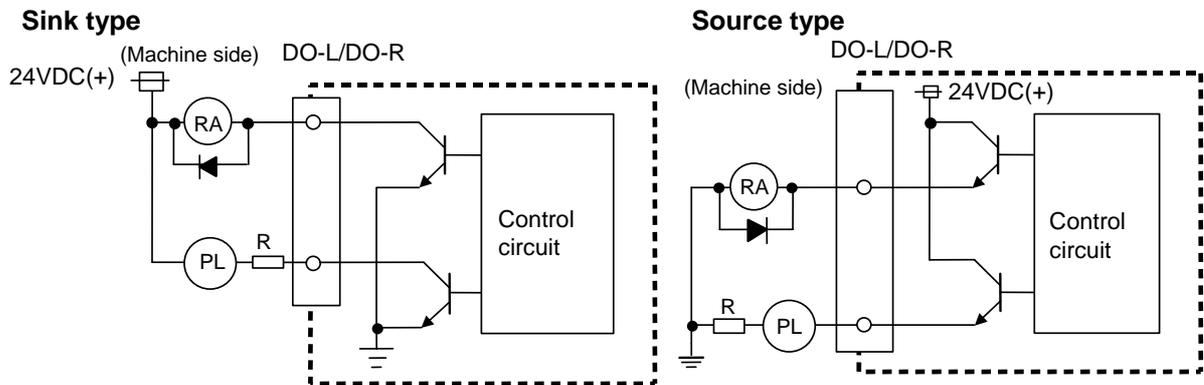


7. CONNECTION OF REMOTE I/O UNIT
7.5 Outline of Digital Signal Output Circuit

7.5 Outline of Digital Signal Output Circuit

The digital signal output circuit uses a sink type (DX1□0) or source type (DX1□1). Use within the specification ranges shown below.

Output circuit



Output conditions

Insulation method	Non-insulation
Rated load voltage	24VDC
Max. output current	60mA/1 point
Output delay time	40μs

<CAUTION>

- * When using an inductive load such as a relay, always connect a diode (voltage resistance 100V or more, 100mA or more) in parallel to the load.
- * When using a lamp or capacitive load, always connect a protective resistor (R=150Ω) serially to the load to suppress rush currents. (Make sure that the current is less than the above tolerable current including the momentary current.)

⚠ CAUTION

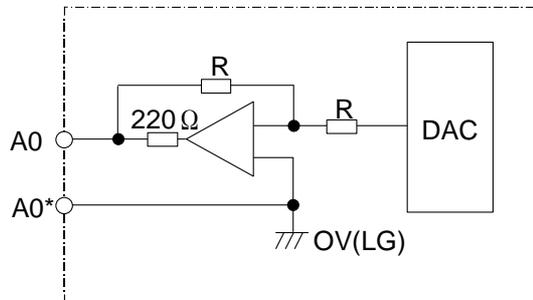
- ❗ When using an inductive load such as a relay, always connect a diode in parallel to the load.
- ❗ When using a lamp or capacitive load, always connect a protective resistor serially to the load to suppress rush currents.

7. CONNECTION OF REMOTE I/O UNIT
7.6 Outline of Analog Signal Output Circuit

7.6 Outline of Analog Signal Output Circuit

The analog signal output circuit can be used only for the FCUA-DX120/DX121/DX140/DX141.

Output circuit



Output conditions

Output voltage	0V to $\pm 10\text{V}$ ($\pm 5\%$)
Resolution	12bit ($\pm 10\text{V} \times n/4096$) (Note)
Load conditions	10k Ω load resistance
Output impedance	220 Ω

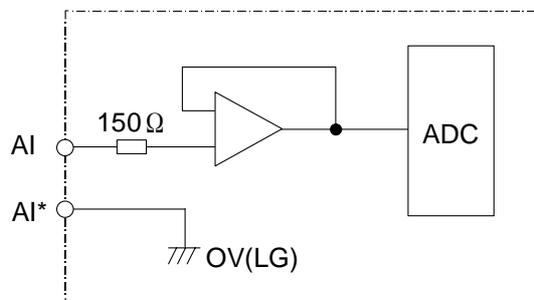
(Note) $n = (2^0 \text{ to } 2^{11})$

7. CONNECTION OF REMOTE I/O UNIT
7.7 Outline of Analog Signal Input Circuit

7.7 Outline of Analog Signal Input Circuit

The analog signal input circuit can be used only for the FCUA-DX140/DX141.

Input circuit



Input conditions

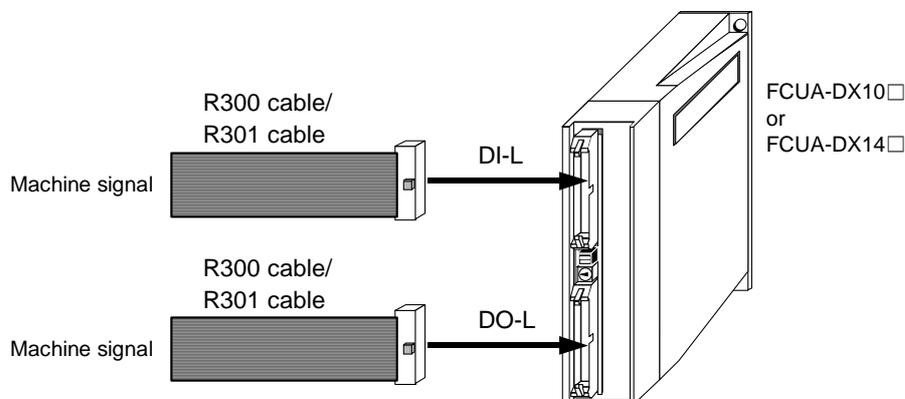
Max. input rating	±15V
Resolution	10V/2000 (5mV)
Precision	Within ±25mV
AD input sampling time	14.2ms (AI0)/42.6ms (AI1 to 3)

7. CONNECTION OF REMOTE I/O UNIT

7.8 Connection of FCUA-DX10□/14□ Unit and Machine Control Signal

7.8 Connection of FCUA-DX10□/14□ Unit and Machine Control Signal

Type of machine input/output signal and No. of points	Input	Output
	32 points	32 points

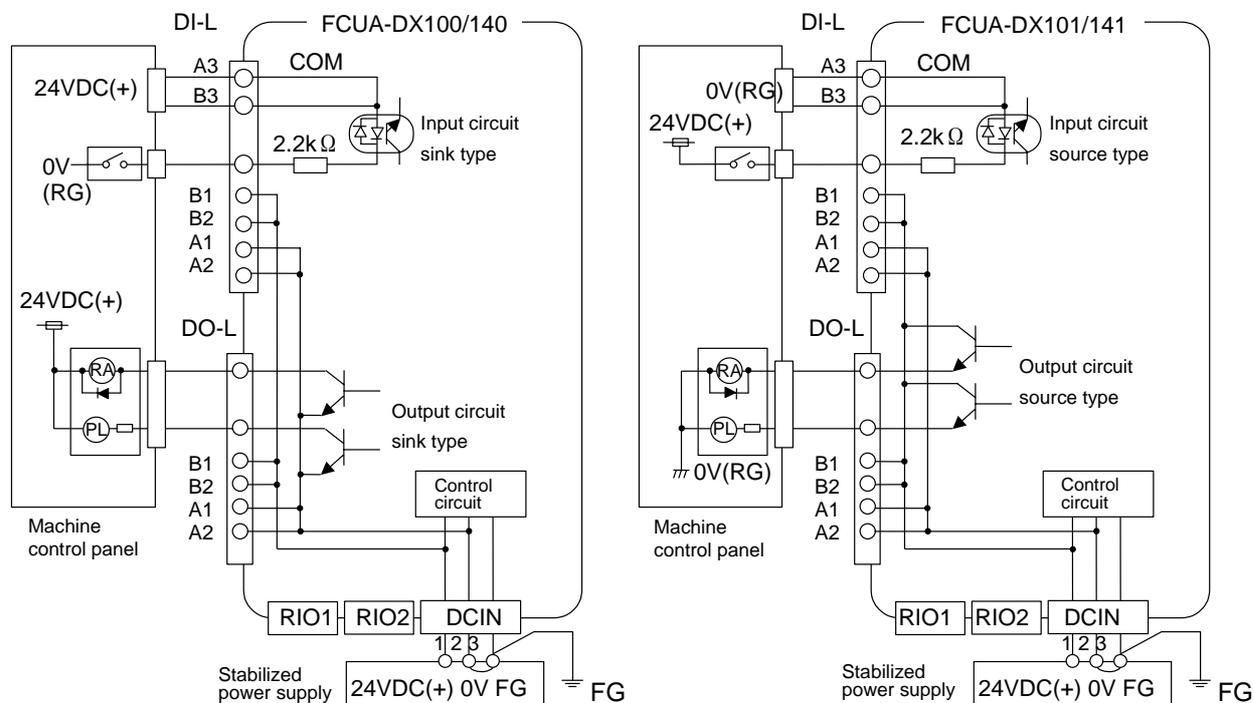


The remote I/O unit cable types include the R300 and R301 types. The R300 cable has one end cut off, and the R301 cable is used for connection to the IDEC IZUMI Corporation terminal block BX1F-T40A^(Note 1). The R300-3M and R301-3M cables are available. If a cable longer than 3m is required, use the CN300 and CS301 connector set.

The one-end CN300 connector (optional, with one end) includes the DI-L (DI-R) and DO-L (DO-R) connectors. The CS301 connector set (optional with both ends) includes the DI-L and DO-L connectors, and two connectors for connection with the terminal block (IDEC IZUMI Corporation).

(Note 1) IDEC IZUMI Corporation I/O terminal BX1F-T40

<Outline of connection>

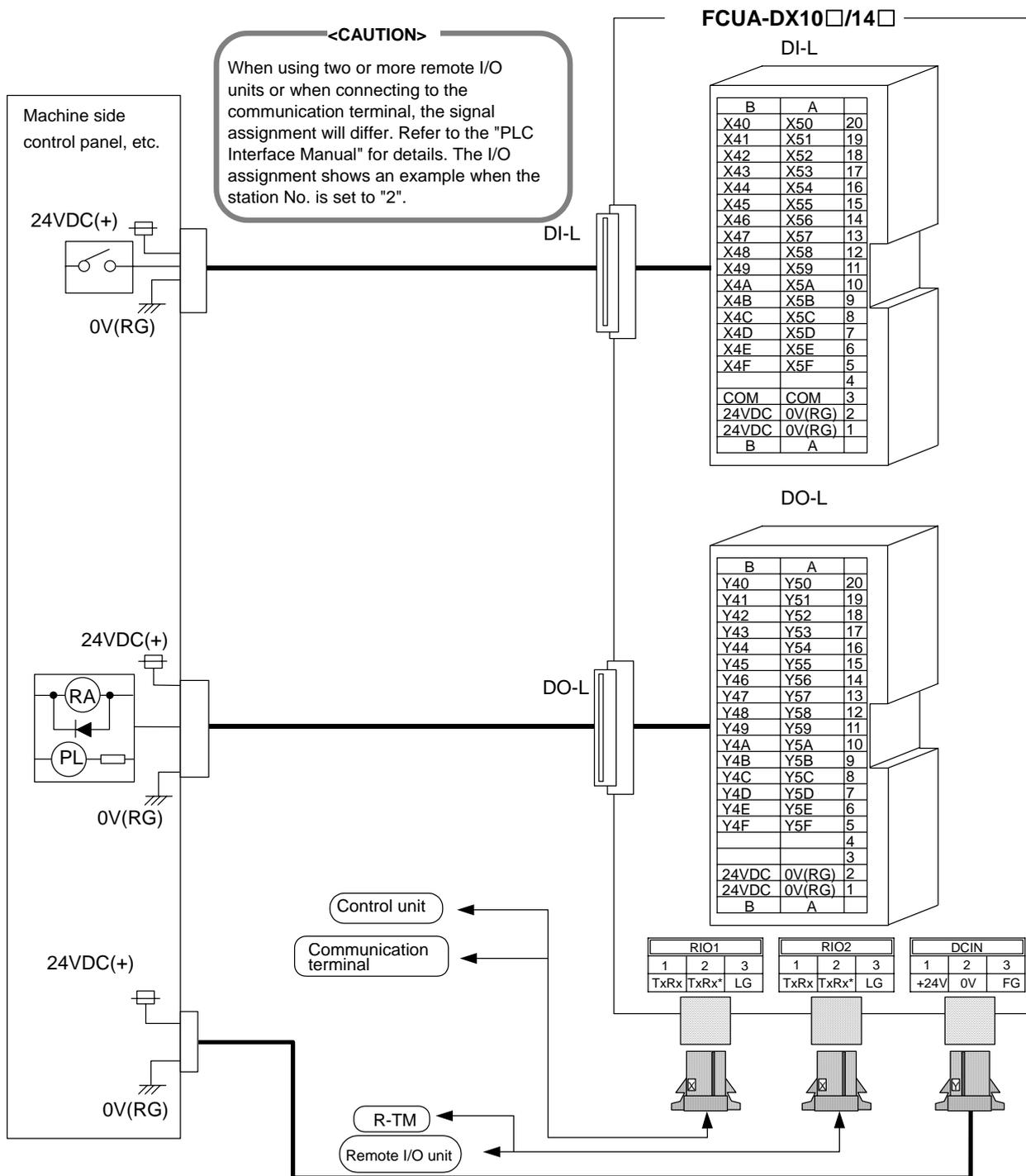


- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

7. CONNECTION OF REMOTE I/O UNIT

7.8 Connection of FCUA-DX10□/14□ Unit and Machine Control Signal

<Signal assignment table>



<Adaptive connector>

DCIN (CN220)
 Connector : 2-178288-3
 Contact : 1-175218-5
 Manufacturer : Tyco Electronics AMP

RIO1/RIO2 (CN211)
 Connector : 1-178288-3
 Contact : 1-175218-2
 Manufacturer : Tyco Electronics AMP

DI-L/DO-L (CN300)
 Solderless type connector:
 7940-6500SC
 Manufacturer : 3M

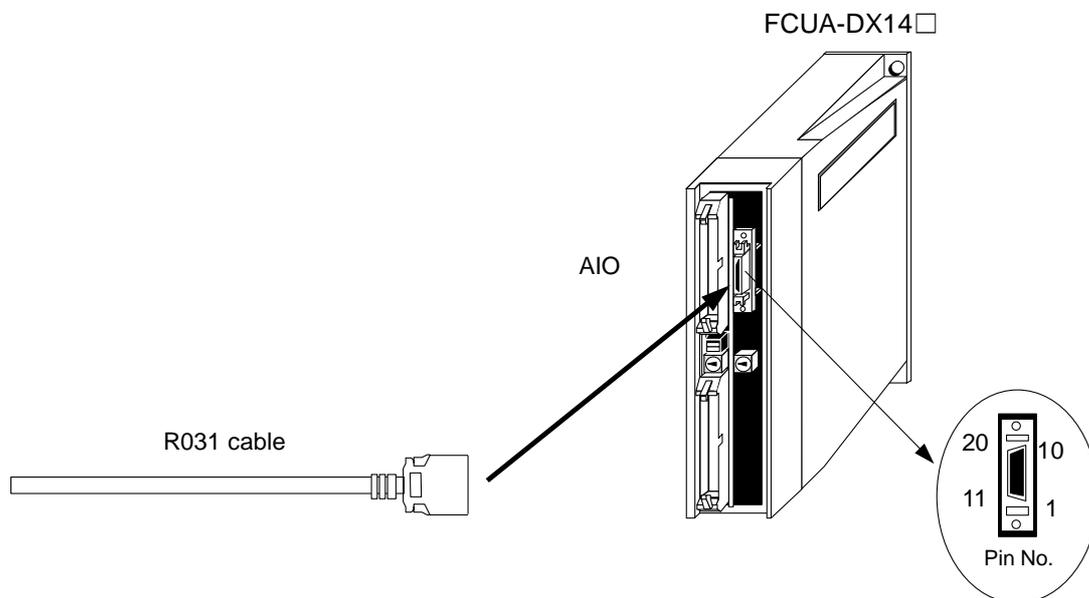
Terminator (R-TM)
 Manufacturer : Tyco Electronics AMP

7. CONNECTION OF REMOTE I/O UNIT

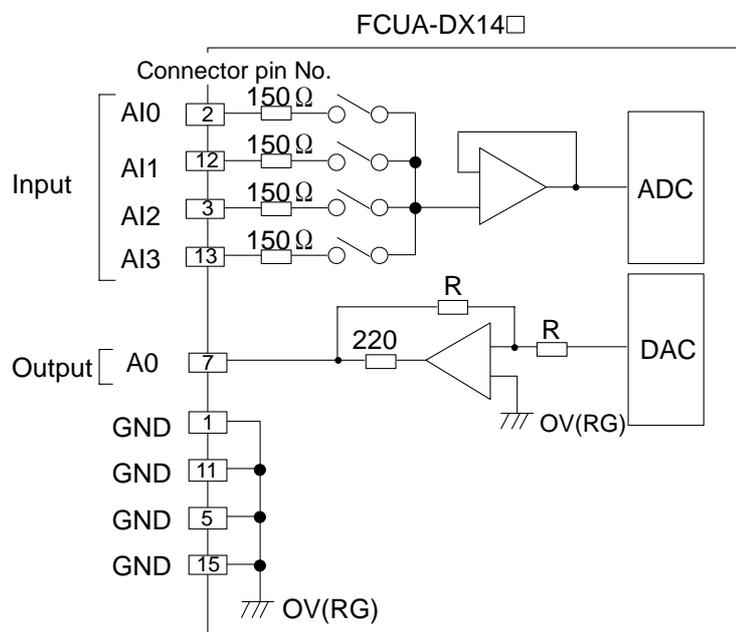
7.9 Connection of FCUA-DX14□ Unit and Analog Input/Output Signal

7.9 Connection of FCUA-DX14□ Unit and Analog Input/Output Signal

For the analog input/output signal, the R031 cable is connected to "AIO". Up to four input points and one output point of the analog input/output signal can be connected. When manufacturing the R031 cable, use the CS000 connector set (optional, with both ends).



Input/output circuit



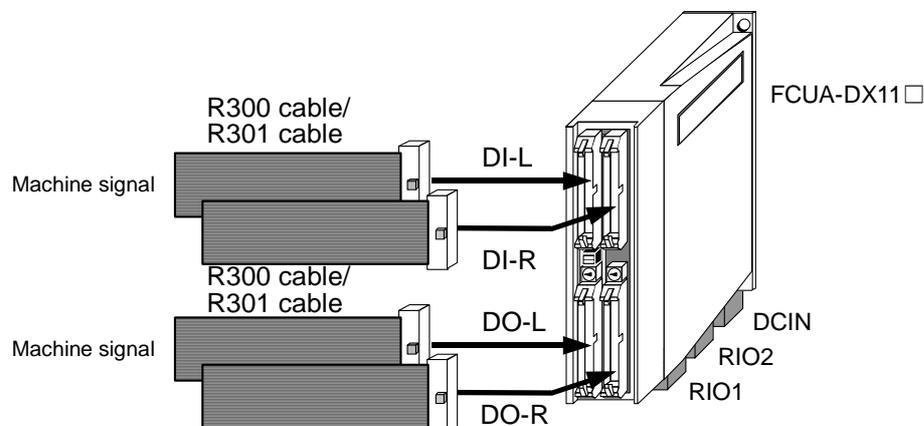
- ⚠ Incorrect connections could damage the device, so always connect the cable to the designated connector.
- ⊘ Do not connect or disconnect the connection cables between each unit while the power is ON.

7. CONNECTION OF REMOTE I/O UNIT

7.10 Connection of FCUA-DX11□ Unit and Machine Control Signal

7.10 Connection of FCUA-DX11□ Unit and Machine Control Signal

Type of machine input/output signal and No. of points	Input	Output
		64 points

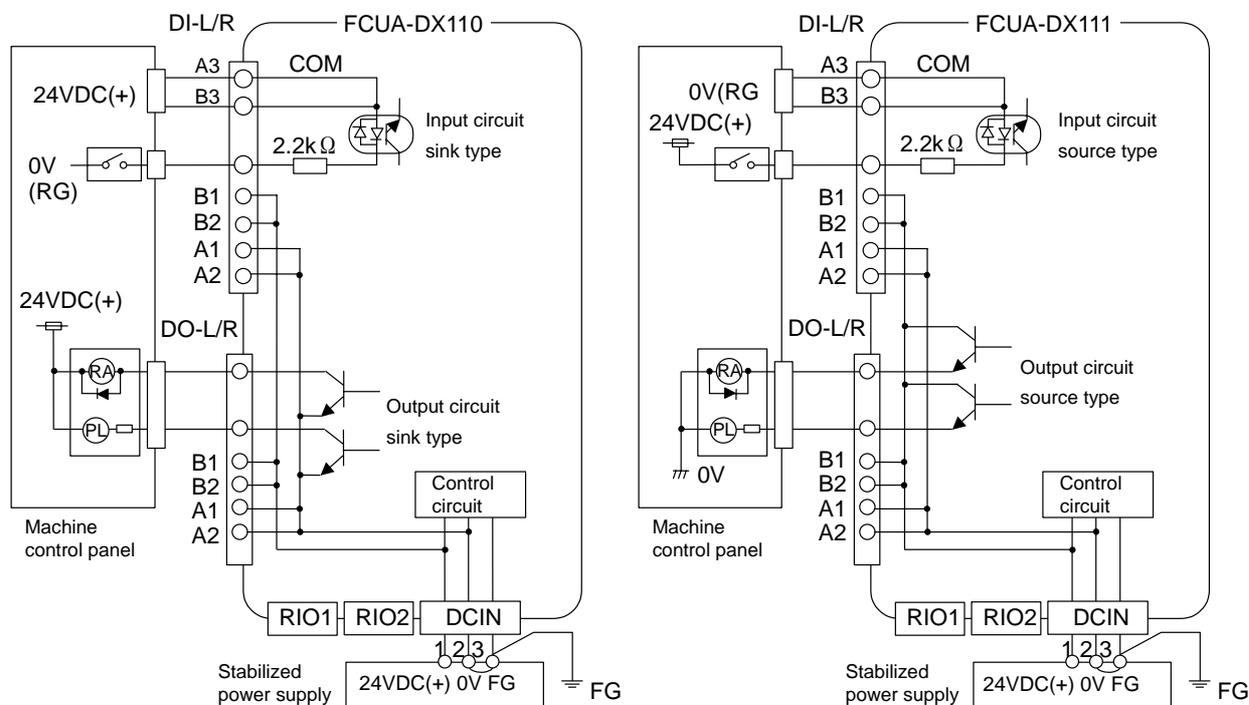


The remote I/O unit cable types include the R300 and R301 types. The R300 cable has one end cut off, and the R301 cable is used for connection to the IDEC IZUMI Corporation terminal block BX1F-T40^(Note 1). The R300-3M and R301-3M cables are available. If a cable longer than 3m is required, use the CN300 and CS301 connector set.

The one-end CN300 connector (optional, with one end) includes the DI-L (DI-R) and DO-L (DO-R) connectors. The CS301 connector set (optional with both ends) includes the DI-L and DO-L connectors, and two connectors for connection with the terminal block (IDEC IZUMI Corporation).

(Note 1) IDEC IZUMI Corporation I/O terminal BX1F-T40

<Outline of connection>

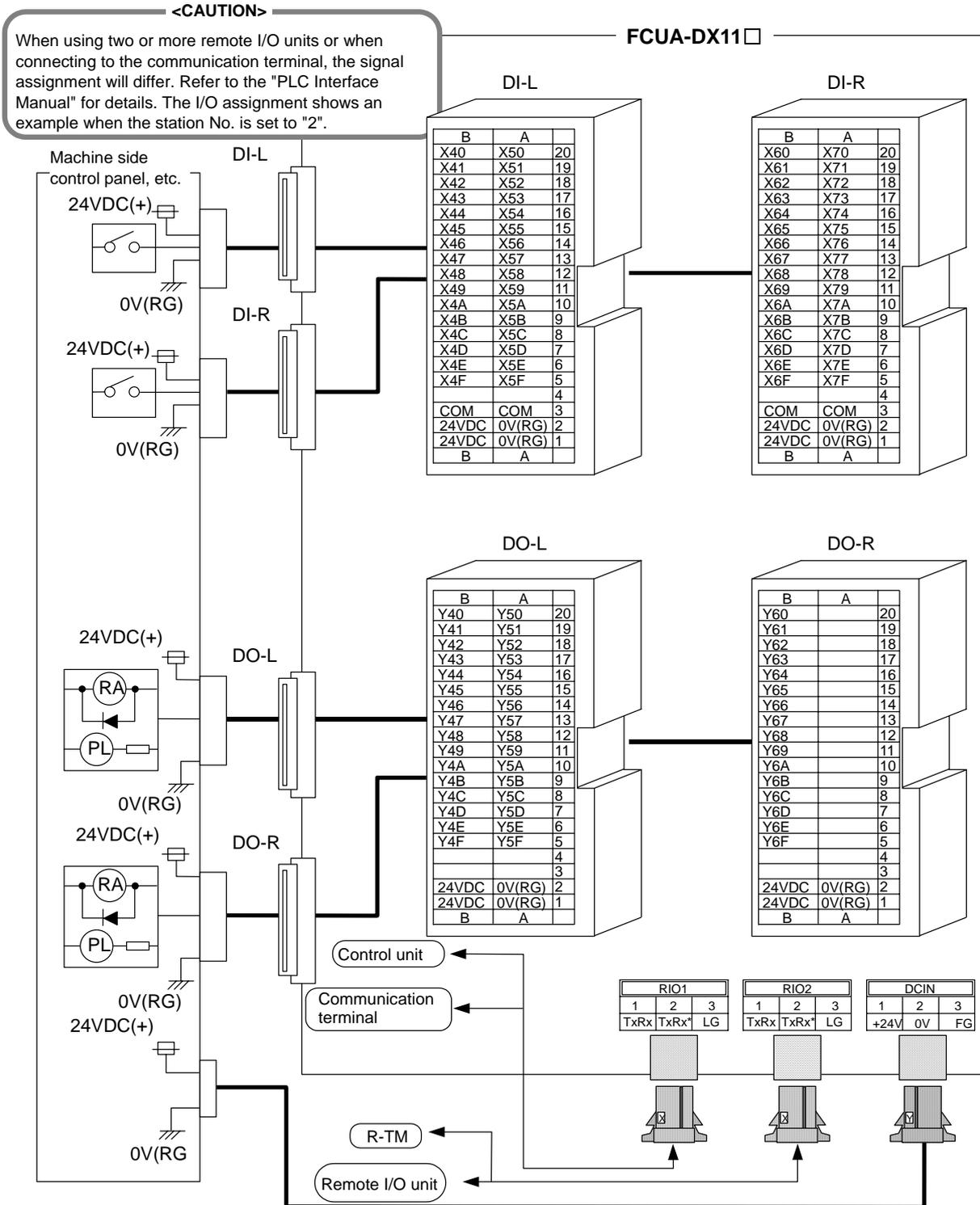


- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

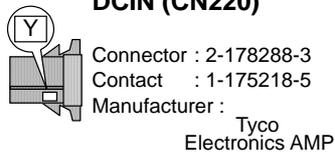
7. CONNECTION OF REMOTE I/O UNIT

7.10 Connection of FCUA-DX11□ Unit and Machine Control Signal

<Signal assignment table>



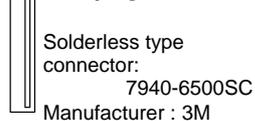
<Adaptive connector> DCIN (CN220)



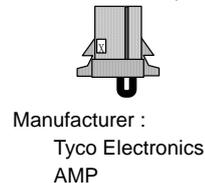
RIO1/RIO2 (CN211)



DI-L/DO-L (CN300) DI-R/DO-R



Terminator (R-TM)

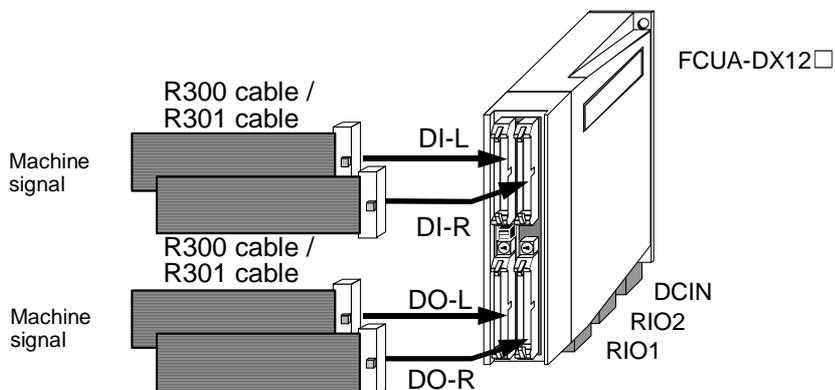


7. CONNECTION OF REMOTE I/O UNIT

7.11 Connection of FCUA-DX12□ Unit and Machine Control Signal

7.11 Connection of FCUA-DX12□ Unit and Machine Control Signal

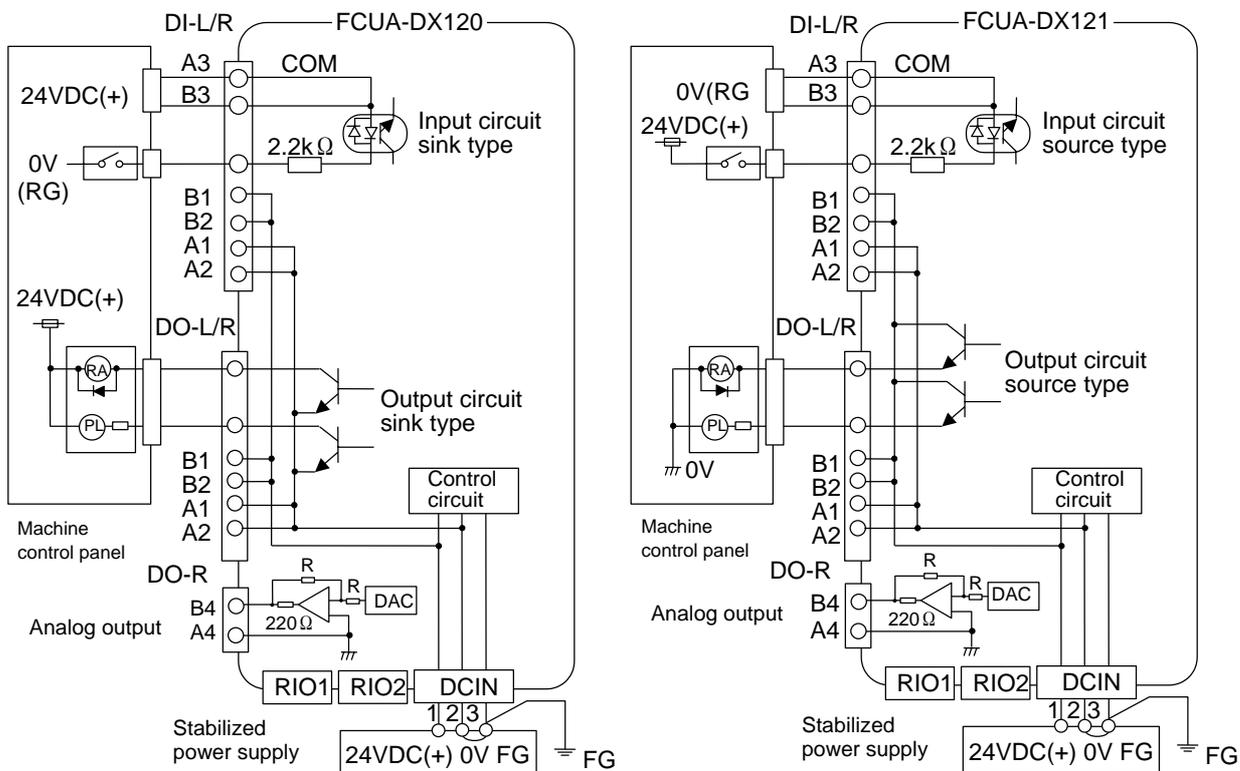
Type of machine input/output signal and No. of points	Input	Output	Analog output
		64 points	48 points



The remote I/O unit cable types include the R300 and R301 types. The R300 cable has one end cut off, and the R301 cable is used for connection to the IDEC IZUMI Corporation terminal block BX1F-T40A (**Note 1**). The R300-3M and R301-3M cables are available. If a cable longer than 3m is required, use the CN300 and CS301 connector set. The one-end connector CN300 (optional, with one end) includes the DI-L (DI-R) and DO-L (DO-R) connectors. The CS301 connector set (optional, with both ends) includes the DI-L and DO-L connectors, and two connectors for connection with the terminal block (IDEC IZUMI Corporation).

(Note 1) IDEC IZUMI Corporation I/O terminal BX1F-T40

<Outline of connection>



CAUTION

- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

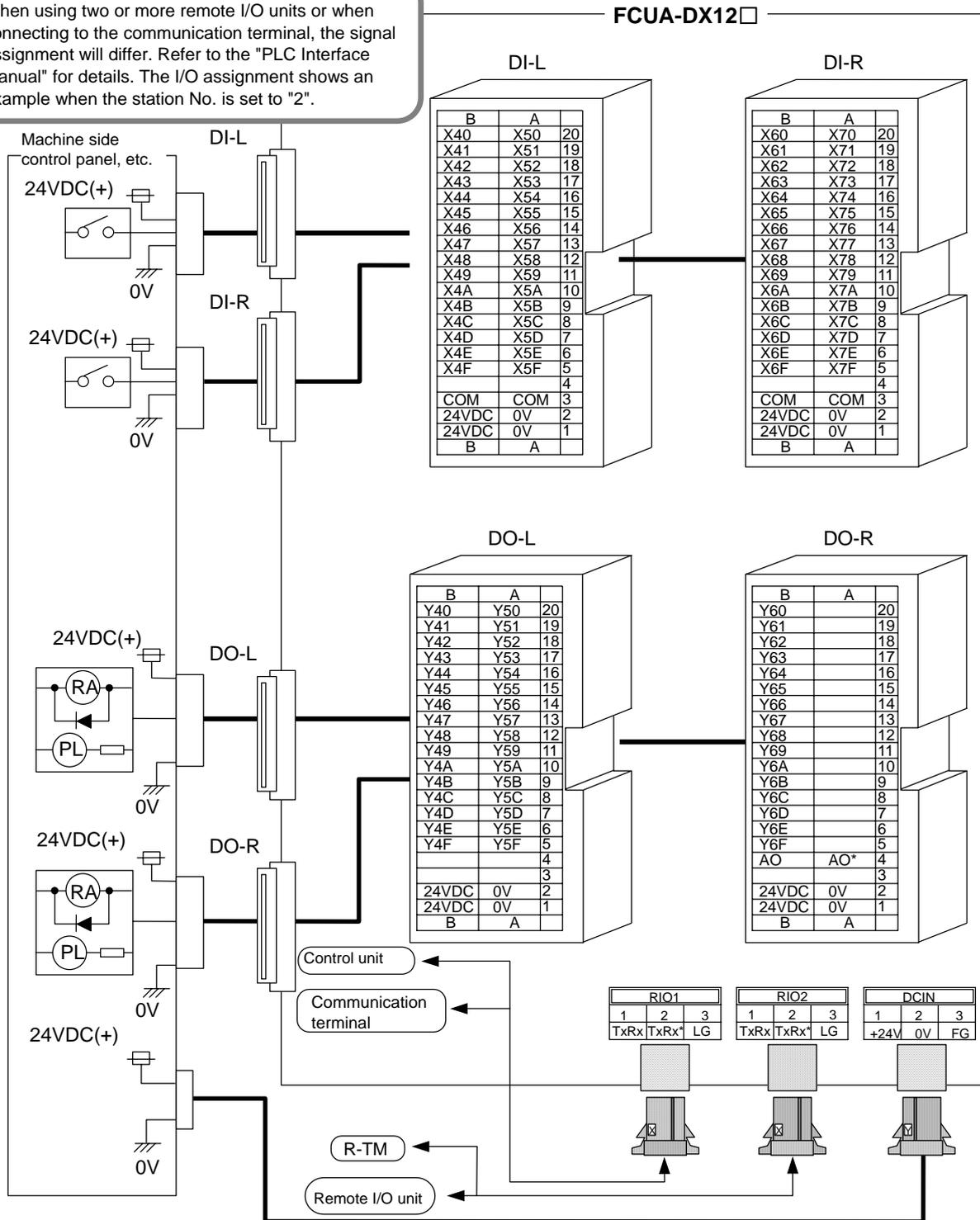
7. CONNECTION OF REMOTE I/O UNIT

7.11 Connection of FCUA-DX12□ Unit and Machine Control Signal

<Signal assignment table>

<CAUTION>

When using two or more remote I/O units or when connecting to the communication terminal, the signal assignment will differ. Refer to the "PLC Interface Manual" for details. The I/O assignment shows an example when the station No. is set to "2".



<Adaptive connector>

DCIN (CN220)

Connector :2-178288-3
 Contact :1-175218-5
 Manufacturer: Tyco Electronics AMP

RIO1/RIO2 (CN211)

Connector:1-178288-3
 Contact:1-175218-2
 Manufacturer: Tyco Electronics AMP

DI-L/DO-L (CN300) Terminator (R-TM)

Solderless type
 connector : 7940-6500SC
 Manufacturer : 3M



Manufacturer: Tyco Electronics AMP

7. CONNECTION OF REMOTE I/O UNIT

7.12 Cables

7.12 Cables

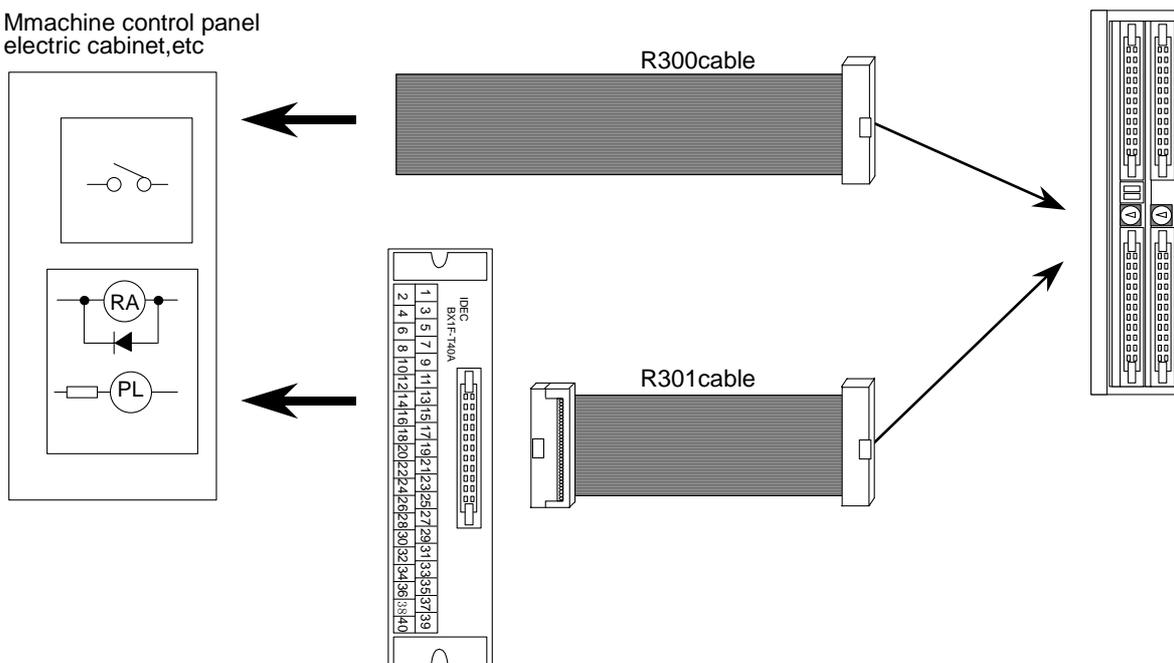
The remote I/O unit cable types include the R300 and R301 types. The R300 cable has one end cut off, and the R301 cable is used for connection to the IDEC IZUMI Corporation terminal block BX1F-T40A (**Note 1**). Both the R300-3M and R301-3M are available.

If a cable longer than 3m is required, use the CN300 or CS301 connector set.

For the analog input/output cable, the R031 cable must be manufactured by the user.

(Note 1) IDEC IZUMI Corporation I/O terminal BX1F-T40A

Mmachine control panel
electric cabinet, etc



Connector pin correspondence table

Terminal block BX1F	FCUA-DX1□□	Terminal block BX1F	FCUA-DX1□□
1	A1	2	B1
3	A2	4	B2
5	A3	6	B3
7	A4	8	B4
9	A5	10	B5
11	A6	12	B6
13	A7	14	B7
15	A8	16	B8
17	A9	18	B9
19	A10	20	B10
21	A11	22	B11
23	A12	24	B12
25	A13	26	B13
27	A14	28	B14
29	A15	30	B15
31	A16	32	B16
33	A17	34	B17
35	A18	36	B18
37	A19	38	B19
39	A20	40	B20

8. CONNECTION OF SCAN DI/DO
8.1 Outline

8. CONNECTION OF SCAN DI/DO

8.1 Outline

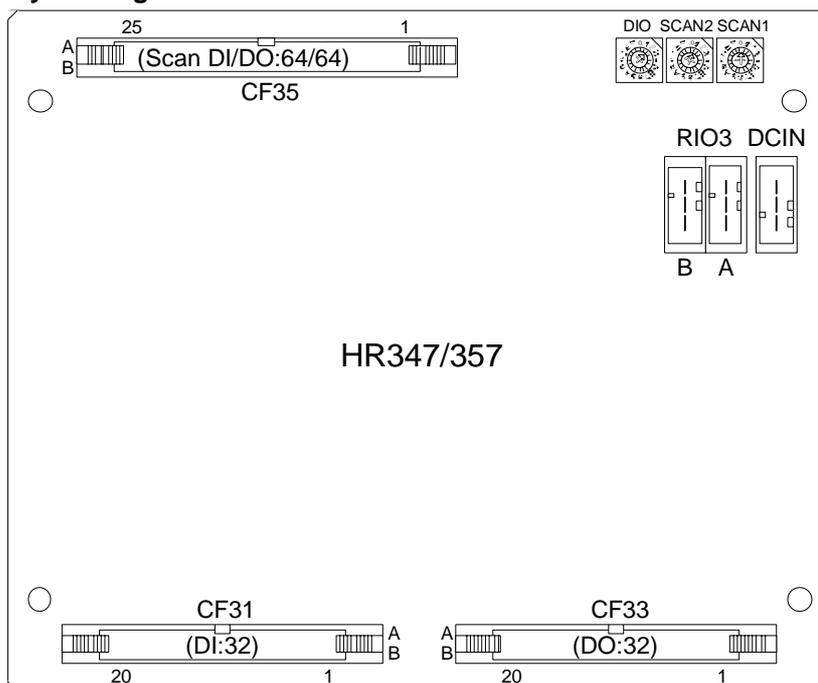
The HR347/357 card is the machine operation board input/output card of the M60/M60S Series. It has a digital input/output and scan input/output, and is connected to the machine operation board and other devices.

		Item	HR347	HR357	
Scan	Input	No. of points	64 points		
		Configuration	8 common × 8 data matrix		
		Rated voltage	5VDC		
		Max. current	80mA/point		
		Input cycle	1.46ms cycle, 11.68ms cycle		
			Input signal holding time	11.68ms or more (*1)	
	Output	No. of points	64 points		
		Configuration	4 common × 8 data + 4 common × 8 data matrix		
		Rated load voltage	5VDC		
		Max. output current	200mA/point		
Output cycle		1.46ms cycle, 5.84ms cycle			
Digital	Input	No. of points	32 points		
		Type	Sink/source		
		Input voltage at external contact ON	6V or less	18V or more, 25.2V or less	
		Input current at external contact ON	2mA or less	9mA or more	
		Input voltage at external contact OFF	20V or more, 25.2V or less	4V or less	
		Input current at external contact OFF	9mA or more	2mA or less	
		Tolerable chattering time	2.2ms or less		
		Input signal holding time	40ms or more (*5)		
		Input circuit operation delay time	$2.2\text{ms} \leq T3 \leq T4 \leq 11\text{ms}$		
		Machine side contact capacity	30V or more, 16mA or more		
	Output	No. of points	32 points		
		Rated load voltage	24VDC		
		Max. output current	60mA/point		
		Type	Sink	Source	

(*1) Input signal holding time: The guide is 11.68ms or more. The input signal will not be recognized unless it is held for the ladder processing cycle time or longer.

8.2 Hardware Interface

(1) Connector layout diagram

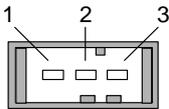


8. CONNECTION OF SCAN DI/DO

8.2 Hardware Interface

(2) Pin assignment

Remote I/O unit connection terminal
RIO3A/B



<Cable side connector type>

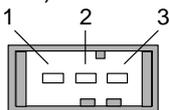
Connector : 1-178288-3

Contact : 1-175218-2

Recommended manufacturer :
Tyco Electronics AMP

1	I/O	TXRX3
2	I/O	TXRX3*
3		GND

Power input terminal (24VDC)
DCIN



<Cable side connector type>

Connector : 2-178288-3

Contact : 1-175218-5

Recommended manufacturer :
Tyco Electronics AMP

1	I	24VDC
2		0V(RG)
3		FG

Machine input/output terminal

CF31

		B			A
20	I	X40	20	I	X50
19	I	X41	19	I	X51
18	I	X42	18	I	X52
17	I	X43	17	I	X53
16	I	X44	16	I	X54
15	I	X45	15	I	X55
14	I	X46	14	I	X56
13	I	X47	13	I	X57
12	I	X48	12	I	X58
11	I	X49	11	I	X59
10	I	X4A	10	I	X5A
9	I	X4B	9	I	X5B
8	I	X4C	8	I	X5C
7	I	X4D	7	I	X5D
6	I	X4E	6	I	X5E
5	I	X4F	5	I	X5F
4			4		
3	I	COM	3	I	COM
2	I	24VDC	2		0V(RG)
1	I	24VDC	1		0V(RG)

CF33

		B			A
20	O	Y40	20	O	Y50
19	O	Y41	19	O	Y51
18	O	Y42	18	O	Y52
17	O	Y43	17	O	Y53
16	O	Y44	16	O	Y54
15	O	Y45	15	O	Y55
14	O	Y46	14	O	Y56
13	O	Y47	13	O	Y57
12	O	Y48	12	O	Y58
11	O	Y49	11	O	Y59
10	O	Y4A	10	O	Y5A
9	O	Y4B	9	O	Y5B
8	O	Y4C	8	O	Y5C
7	O	Y4D	7	O	Y5D
6	O	Y4E	6	O	Y5E
5	O	Y4F	5	O	Y5F
4			4		
3			3		
2	I	24VDC	2		0V(RG)
1	I	24VDC	1		0V(RG)

DIO



<Cable side connector type>

Connector : 7940-6500SC

Relief : 3448-7940

Recommended manufacturer : 3M

* This examples shows SCAN1 set to "0", SCAN2 set to "1" and DIO set to "2".

Refer to the PLC Interface Manual for details.

8. CONNECTION OF SCAN DI/DO

8.2 Hardware Interface

Scan type input/output terminals
CF35

		B			A
25		GND	25		GND
24	O	LC3B	24	O	LC3A
23	O	LC2B	23	O	LC2A
22	O	LC1B	22	O	LC1A
21	O	LC0B	21	O	LC0A
20	I	LD7B*	20	I	LD7A*
19	I	LD6B*	19	I	LD6A*
18	I	LD5B*	18	I	LD5A*
17	I	LD4B*	17	I	LD4A*
16	I	LD3B*	16	I	LD3A*
15	I	LD2B*	15	I	LD2A*
14	I	LD1B*	14	I	LD1A*
13	I	LD0B*	13	I	LD0A*
12		GND	12		
11			11		
10			10		
9	O	KYC7*	9	O	KYC6*
8	O	KYC5*	8	O	KYC4*
7	O	KYC3*	7	O	KYC2*
6	O	KYC1*	6	O	KYC0*
5	I	KYD7*	5	I	KYD6*
4	I	KYD5*	4	I	KYD4*
3	I	KYD3*	3	I	KYD2*
2	I	KYD1*	2	I	KYD0*
1			1		GND

(Note)
The GND pin is not normally used.
Do not connect the GND pin to the frame ground.

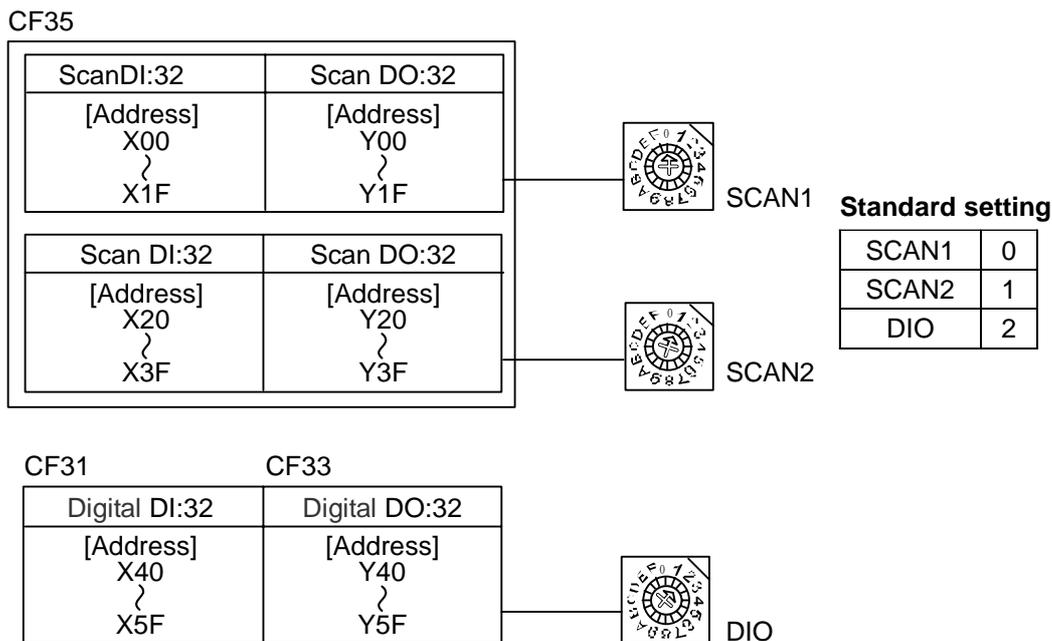
<Cable side connector type>
Connector : 7950-6500SC
Relief : 3448-7950
Recommended manufacturer : 3M

LCx/A/B	Common signal for scan DO
LDx/A/B*	Data signal for scan DO
KYCx*	Common signal for scan DI
KYDx*	Data signal for scan DI

* This examples shows SCAN1 set to "0",
SCAN2 set to "1" and DIO set to "2".
Refer to the PLC Interface Manual for details.

(3) Rotary switch

Set the address (station No.) assignment in DI/DO: 32/32 point units. Set using SCAN1, SCAN 2 and DIO rotary switches. The assignment address is changed with the rotary switch setting.



8. CONNECTION OF SCAN DI/DO

8.3 Connections

8.3 Connections

(1) External power supply (DCIN)

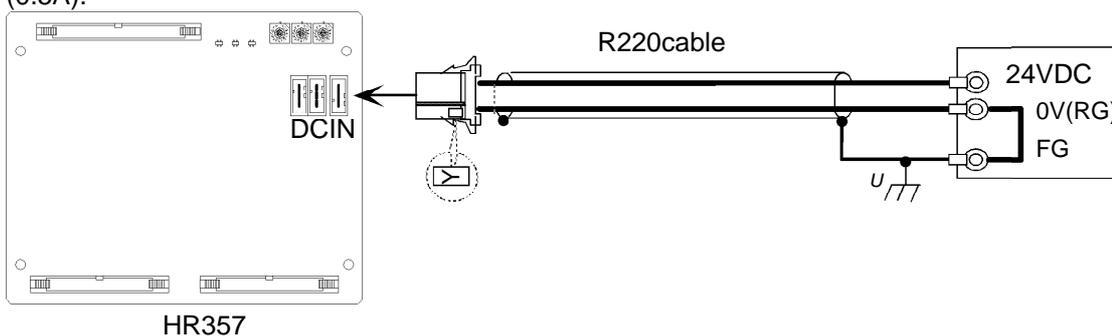
24VDC is required for the HR347/HR357 card operation. Prepare a stabilized power supply that satisfies the following specifications.

Output : 24VDC \pm 5%

Ripple : \pm 5% (P-P)

Rated output current: 2.5A

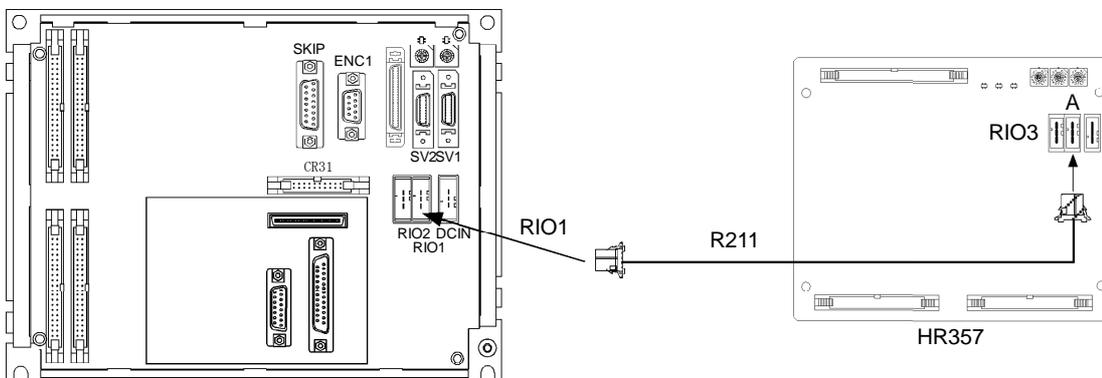
- * The rated output current is the value when using 60mA \times 32 points for the machine output. Prepare a power supply that satisfies the 24VDC output's total output current and control current (0.5A).



(2) Connecting the remote I/O communication cable (RIO3A/B)

1) Connection of the RIO3A connector

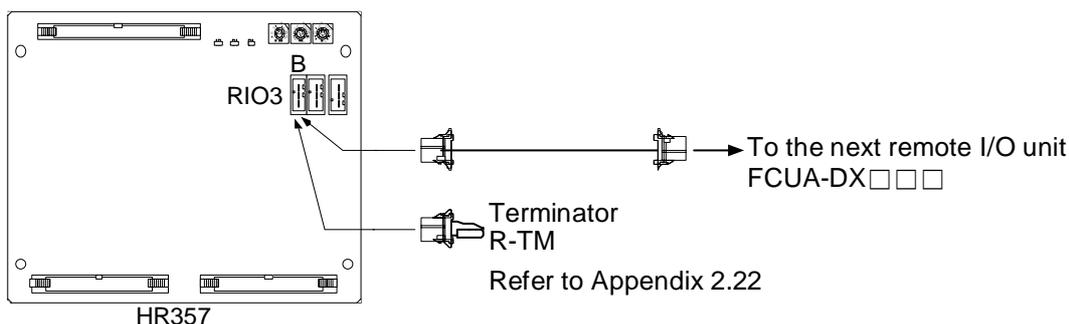
Connect the RIO3A to the RIO1 connector of the base I/O unit.



2) Connection of the RIO3B connector

When the remote I/O unit is connected with a serial link, multiple units can be combined and used in a range of eight or less total occupied stations. (Refer to the Connection Manual, Chapter 7 "CONNECTION OF REMOTE I/O UNIT" for details.)

HR357 occupies three stations, so the remote I/O units can be connected to the RIO3B in combinations of 5 stations or less. Connect a terminator to the RIO3B when it is not connected to any device.

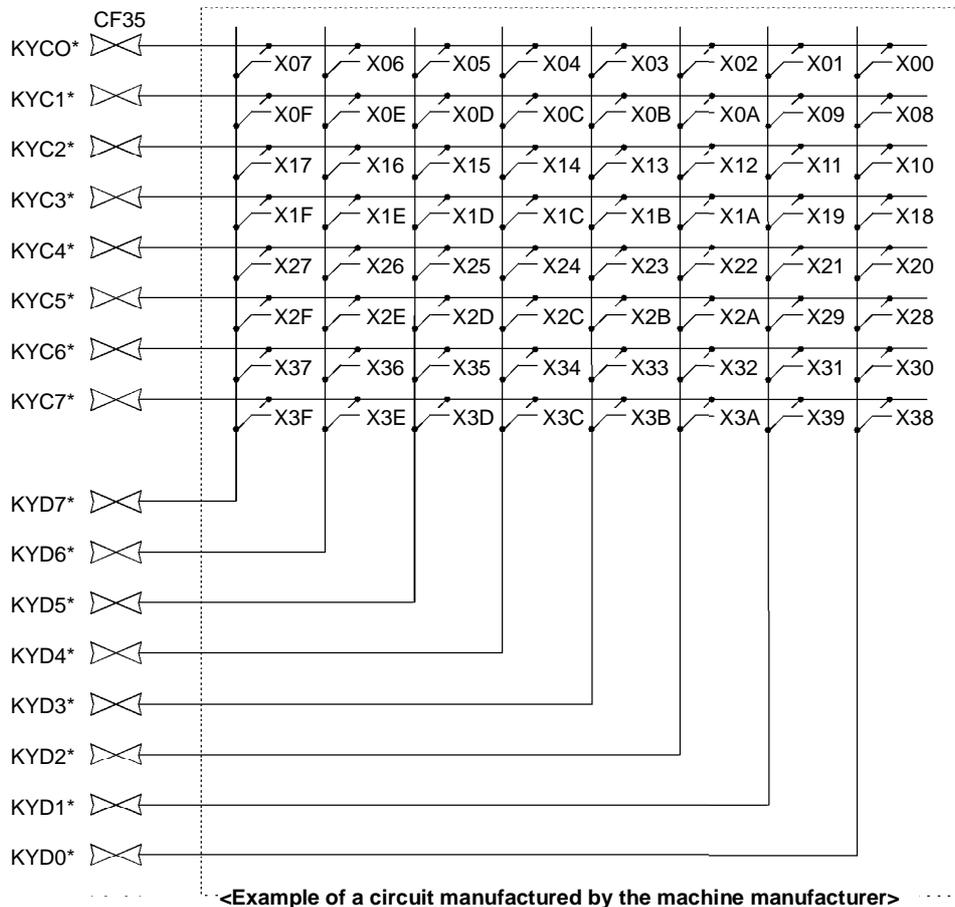


8. CONNECTION OF SCAN DI/DO

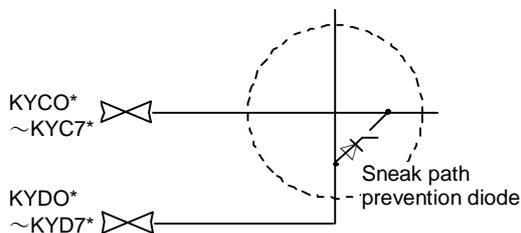
8.3 Connections

(3) Scan input (CF35)

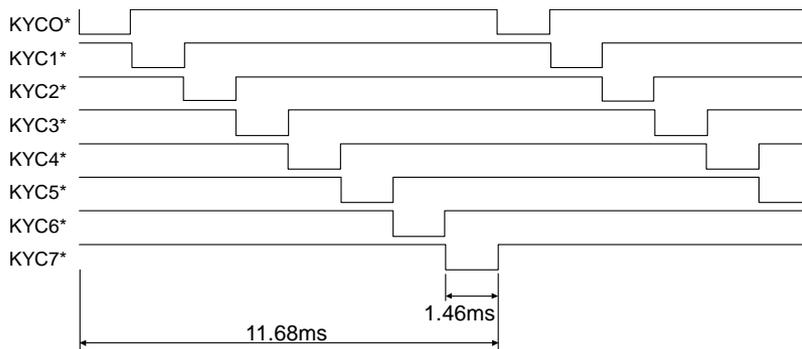
An example is shown of a scan input circuit manufactured by the machine manufacturer. Refer to 8.2 (2) "Pin assignment" for the connector pin assignments.



(Note) To scan input, connect a sneak path prevention diode as shown in the following drawing. The unit may not be able to read the correct input signals without a sneak path prevention diode installed.



The common signals are changed over with scan input as shown in the following drawing. Key input data can be received when the common signal is LOW. The common signal changeover cycle is 11.68ms, but the input signal will not be recognized unless it is held for the ladder processing cycle time or longer.

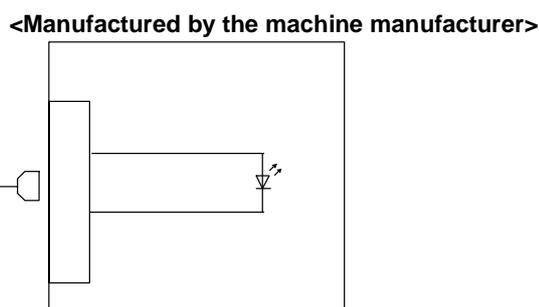
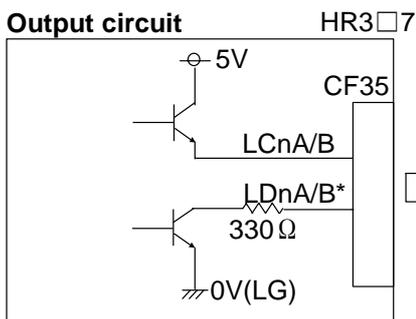
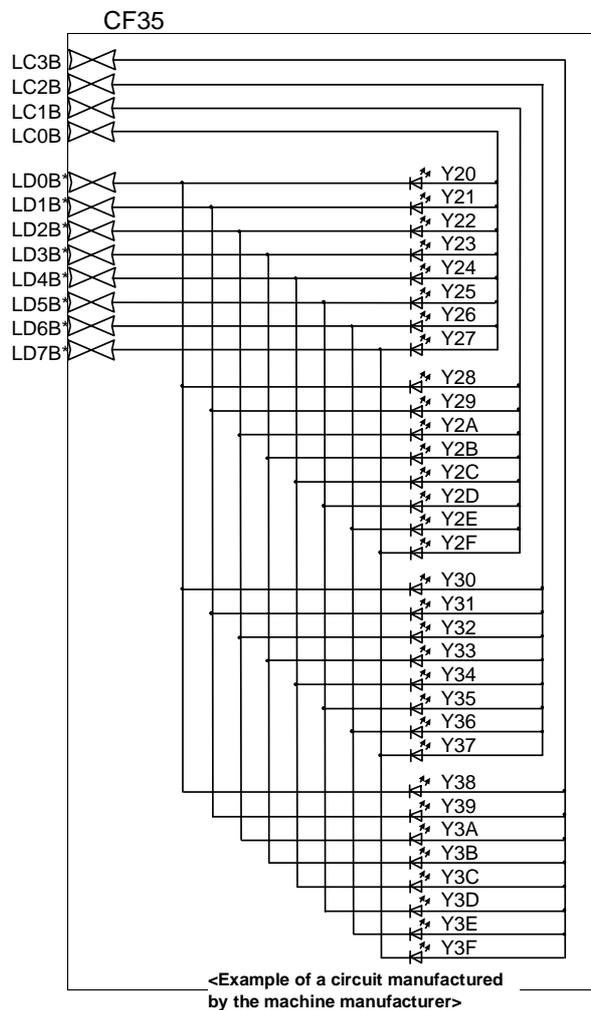
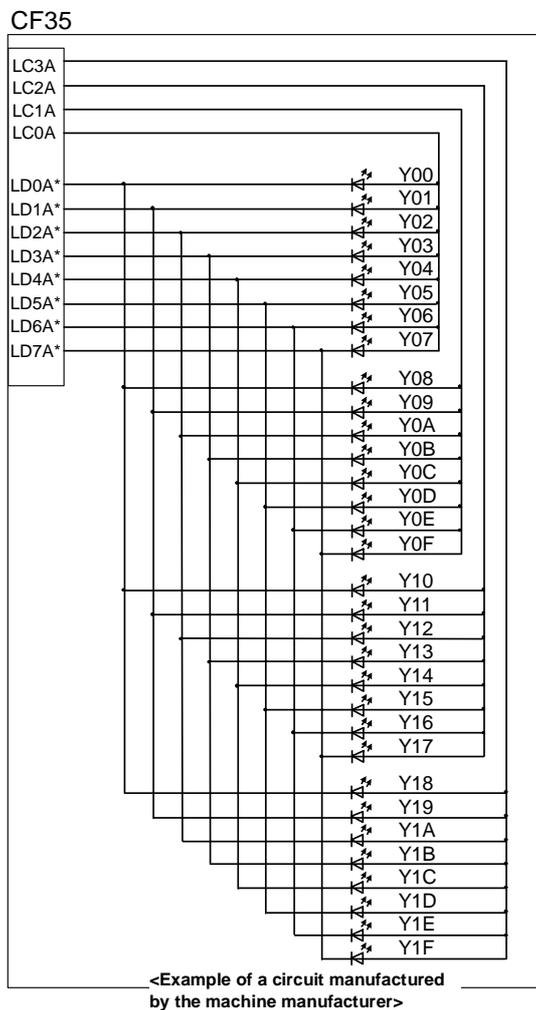


8. CONNECTION OF SCAN DI/DO

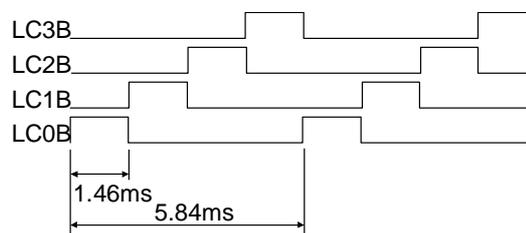
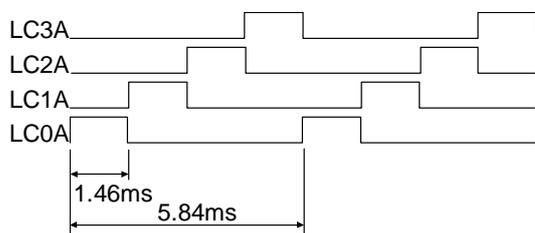
8.3 Connections

(4) Scan output (CF35)

An example is shown of a scan output circuit manufactured by the machine manufacturer. Refer to 8.2 (2) "Pin assignment" for the connector pin assignments.



The common signals are changed over with scan output as shown in the following drawing. The LED outputs data, and lights only when the common signal is HIGH. The common signal changes to 4 signals in succession, and lights once every 5.84ms for 1.46ms only. The scan output is a 5V system.



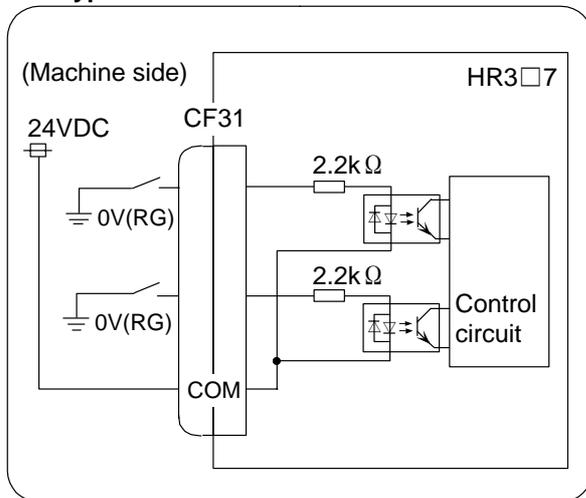
8. CONNECTION OF SCAN DI/DO

8.3 Connections

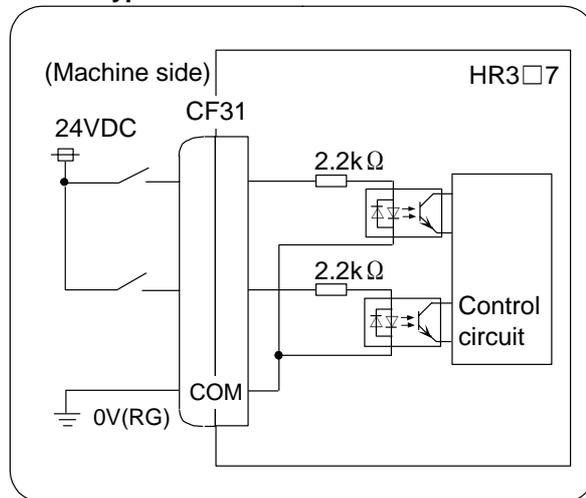
(5) Digital input (CF31)

A source type input circuit corresponding to source output is shown.

Sink type



Source type

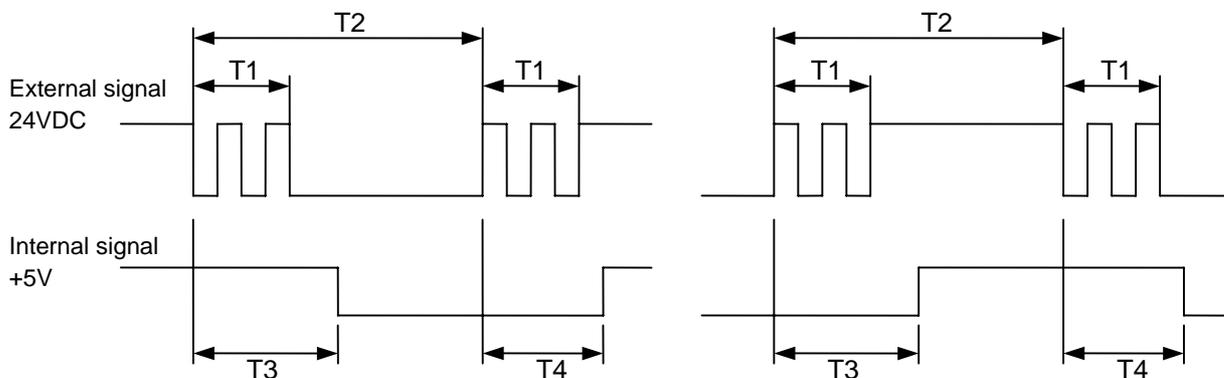


Input conditions Set so the input conditions are within the ranges shown in the following conditions.

		Sink type	Source type
1	Input voltage at external contact ON	6V or less	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more	
3	Input voltage at external contact OFF	20V or more, 25.2V or less	4V or less
4	Input current at external contact OFF	2mA or less	
5	Tolerable chattering time	3ms or less (Refer to T1 below)	
6	Input signal holding time	40ms or more (Refer to T2 below)	
7	Input circuit operation delay time	$3\text{ms} \leq T3 \leq T4 \leq 16\text{ms}$	
8	Machine side contact capacity	30V or more, 16mA or more	

<Caution>

Input signal holding time: 40ms or more as a guideline. The input signal can only be confirmed if held longer than the ladder process cycle time.

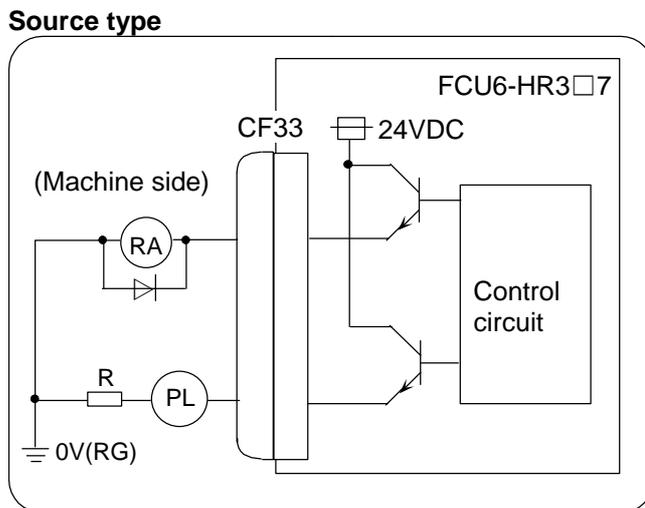


8. CONNECTION OF SCAN DI/DO

8.3 Connections

(6) Digital output (CF33)

The HR357 output circuit is a source type (source output).



CAUTION

- ⚠ **Do not apply any voltage to the connector other than that specified in this manual. Failure to observe this could cause bursting, damage, etc.**

Output conditions

Insulation method	Non-insulation
Rated load voltage	24VDC
Max. output current	60mA/1 point
Saturation voltage	1.6V (standard)
Output delay time	40μs

<Caution>

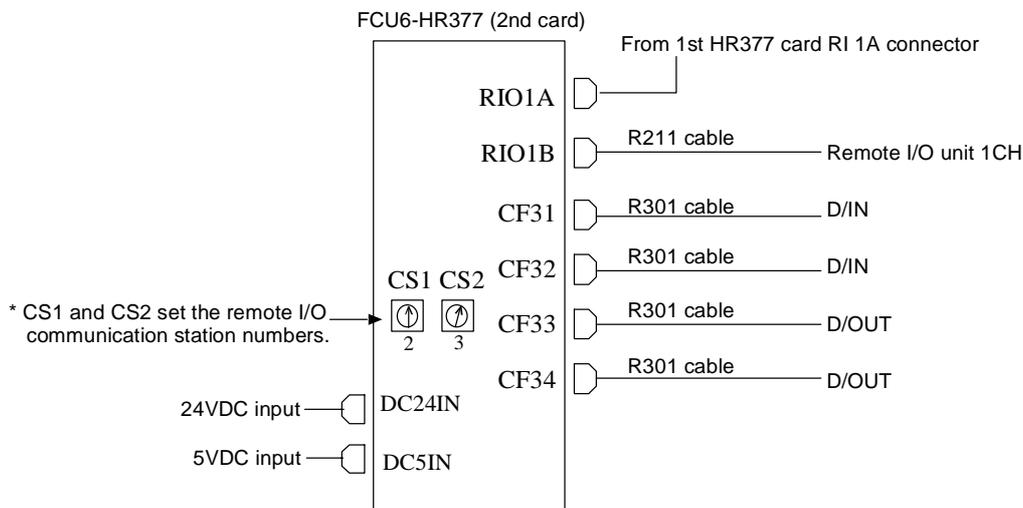
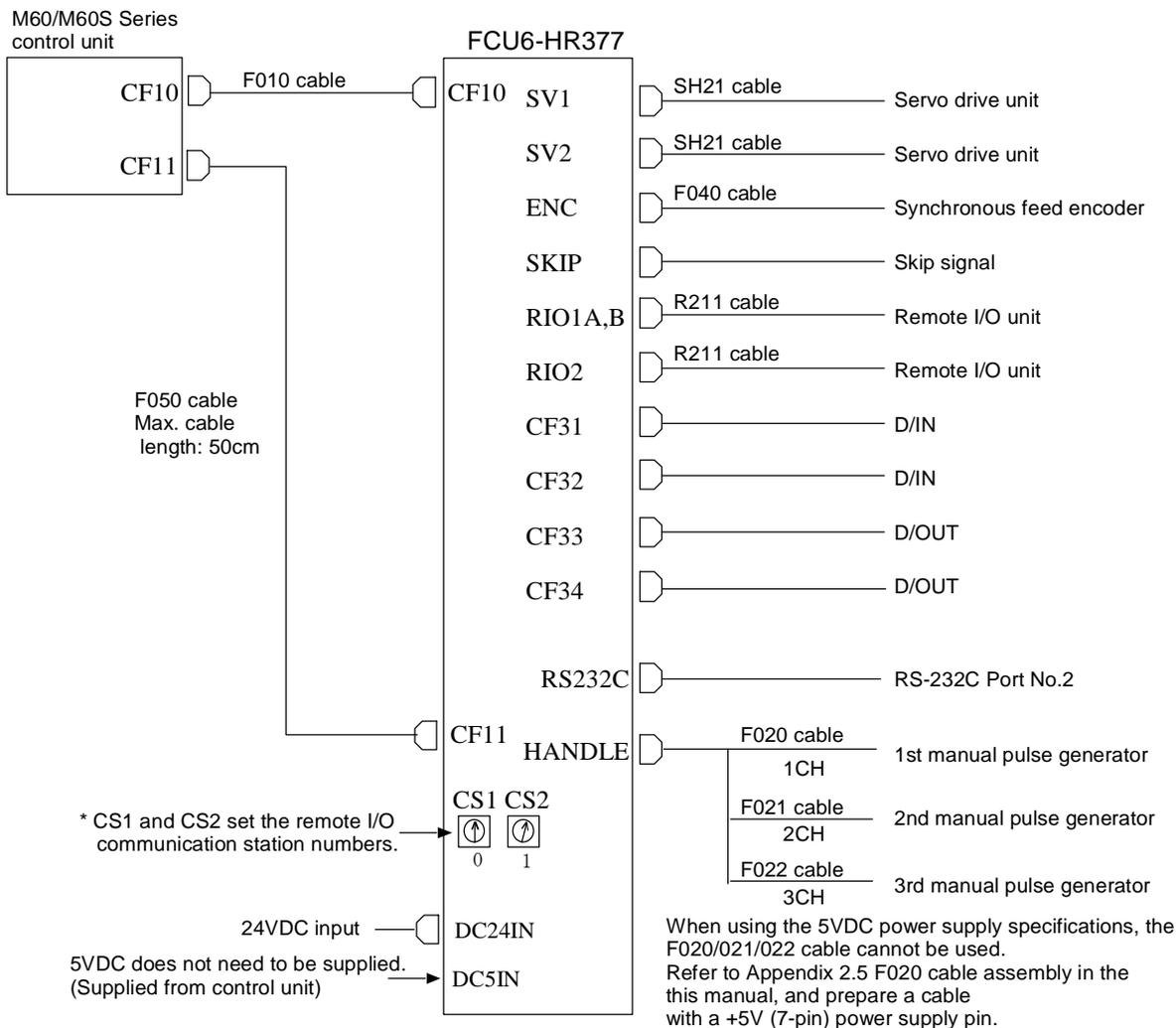
- * When using an inductive load such as a relay, always connect a diode (voltage resistance 100V or more, 100mA or more) in parallel to the load.
- * When using a lamp or capacitive load, always connect a protective resistor ($R=150\Omega$) serially to the load to suppress rush currents. (Make sure that the current is less than the above tolerable current including the momentary current.)

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.1 Connection System Drawing

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377

The HR377 is a DI/DO unit capable of a 200mA current output per 1 point. The DI/DO connector is common with the base I/O unit.

9.1 Connection System Drawing



* When using two FCU6-HR377 cards, the 5VDC for the second card must be supplied from an external source as it is not supplied from the control unit.

* Change the rotary switch CS1 and CS2 settings according to the machine's DI/DO assignment.

(Note) The FCU6-HR377 card occupies two stations of the remote I/O communication (MC link B communication).

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.1 Connection System Drawing

Connector name	Explanation of functions
CF10	Connect with the control unit (servo drive unit, synchronous feed encoder, skip signal, remote I/O unit).
CF11	Connect with the control unit (5VDC, RS-232C, manual pulse generator).
SV1	Connect with the servo drive unit/spindle drive unit.
SV2	Connect with the auxiliary axis.
ENC1	Connect with the synchronous feed encoder. When using two units for the synchronous feed encoder, connect the second unit to ENC2 of the control unit.
SKIP	Connect with the skip signal input. Up to eight points can be used.
RIO1A RIO1B	Connect with the remote I/O unit. The No. of occupied stations on this unit is two stations, so the additional remote I/O units for six stations can be connected. RIO1A and RIO1B are relay connectors for the remote I/O communication signals. Either cable can be inserted without problem. If this unit is the final station, the terminator R-TM must be connected to one of these connectors.
RIO2	Connect with the remote I/O unit.
CF31	DI: 32 (sink/source type)
CF32	DI: 32 (sink/source type)
CF33	DO: 32 (source type)
CF34	DO: 32 (source type)
RS232C	Connect with an RS-232C device.
HANDLE	Connection with 12VDC power supply type or 5VDC power supply type manual pulse generator.
MJ2	Not used.
MJ3	Not used.

CS1	Rotary switch CS1: Sets the 32-point station No. with remote I/O communication 1CH DI: X0-X1F and DO: Y0-Y1F. This is normally used set to "0".
CS2	Rotary switch CS2: Sets the 32-point station No. with remote I/O communication 1CH DI: X20-X3F and DO: Y20-Y3F. This is normally used set to "1".

* The rotary switch CS1 and CS2 settings may differ according to the machine configuration and whether other remote I/O units are being used. Set within the range of 0 to 7.

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.1 Connection System Drawing

Machine input/output

DI/DO

CF31

B			A		
20	I	X0	20	I	X10
19	I	X1	19	I	X11
18	I	X2	18	I	X12
17	I	X3	17	I	X13
16	I	X4	16	I	X14
15	I	X5	15	I	X15
14	I	X6	14	I	X16
13	I	X7	13	I	X17
12	I	X8	12	I	X18
11	I	X9	11	I	X19
10	I	XA	10	I	X1A
9	I	XB	9	I	X1B
8	I	XC	8	I	X1C
7	I	XD	7	I	X1D
6	I	XE	6	I	X1E
5	I	XF	5	I	X1F
4			4		
3	I	COM	3	I	COM
2		24VDC	2		0V(RG)
1		24VDC	1		0V(RG)

CF32

B			A		
20	I	X20	20	I	X30
19	I	X21	19	I	X31
18	I	X22	18	I	X32
17	I	X23	17	I	X33
16	I	X24	16	I	X34
15	I	X25	15	I	X35
14	I	X26	14	I	X36
13	I	X27	13	I	X37
12	I	X28	12	I	X38
11	I	X29	11	I	X39
10	I	X2A	10	I	X3A
9	I	X2B	9	I	X3B
8	I	X2C	8	I	X3C
7	I	X2D	7	I	X3D
6	I	X2E	6	I	X3E
5	I	X2F	5	I	X3F
4			4		
3	I	COM	3	I	COM
2		24VDC	2		0V(RG)
1		24VDC	1		0V(RG)

CF33

B			A		
20	O	Y0	20	O	Y10
19	O	Y1	19	O	Y11
18	O	Y2	18	O	Y12
17	O	Y3	17	O	Y13
16	O	Y4	16	O	Y14
15	O	Y5	15	O	Y15
14	O	Y6	14	O	Y16
13	O	Y7	13	O	Y17
12	O	Y8	12	O	Y18
11	O	Y9	11	O	Y19
10	O	YA	10	O	Y1A
9	O	YB	9	O	Y1B
8	O	YC	8	O	Y1C
7	O	YD	7	O	Y1D
6	O	YE	6	O	Y1E
5	O	YF	5	O	Y1F
4			4		
3			3		
2		24VDC	2		
1		24VDC	1		

CF34

B			A		
20	O	Y20	20	O	Y30
19	O	Y21	19	O	Y31
18	O	Y22	18	O	Y32
17	O	Y23	17	O	Y33
16	O	Y24	16	O	Y34
15	O	Y25	15	O	Y35
14	O	Y26	14	O	Y36
13	O	Y27	13	O	Y37
12	O	Y28	12	O	Y38
11	O	Y29	11	O	Y39
10	O	Y2A	10	O	Y3A
9	O	Y2B	9	O	Y3B
8	O	Y2C	8	O	Y3C
7	O	Y2D	7	O	Y3D
6	O	Y2E	6	O	Y3E
5	O	Y2F	5	O	Y3F
4			4		
3			3		
2		24VDC	2		0V(RG)
1		24VDC	1		0V(RG)



<Cable side connector type>
 Connector : 7940-6500SC
 Recommended manufacturer: 3M

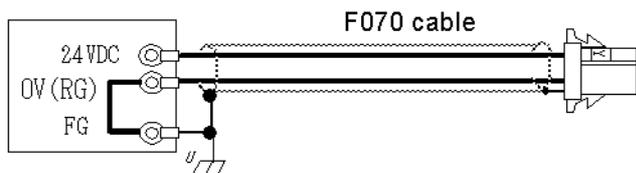
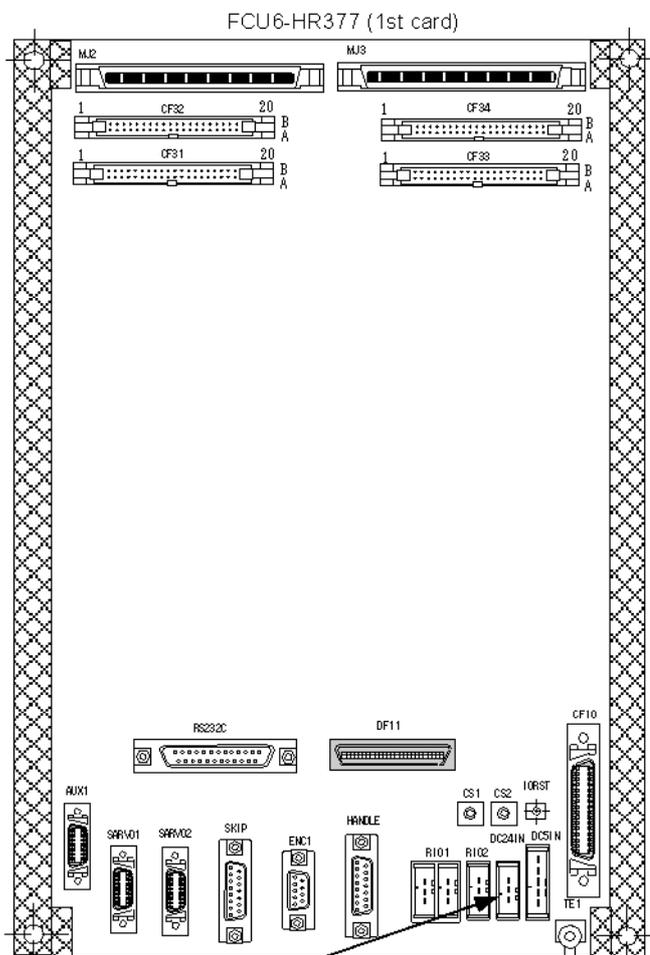
* This examples shows CS1 set to "0" and CS2 set to "1".
 Refer to the PLC Interface Manual for details.

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.2 Connection of Power Supply

9.2 Connection of Power Supply

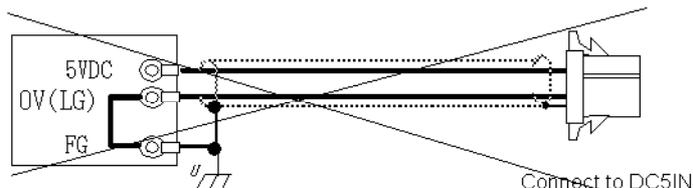
9.2.1 Connection of 1st Card's Power Supply

Supply the 24VDC power to the DC24IN connector. The 5VDC power for control in the card is supplied from the control unit via the CF11 connector. When using this 200mA-output DI/DO unit as the 1st card, the 5VDC supply from an external source is not required.

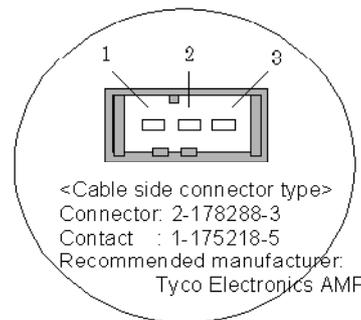


Supply the 24VDC stabilized power supply to both the 1st and 2nd cards. (Prepare the power supply separately.)

Connect to the FG terminal block with the shortest distance



Supply the 5VDC stabilized power supply only to the 2nd card. The 1st card is supplied power from the control unit.



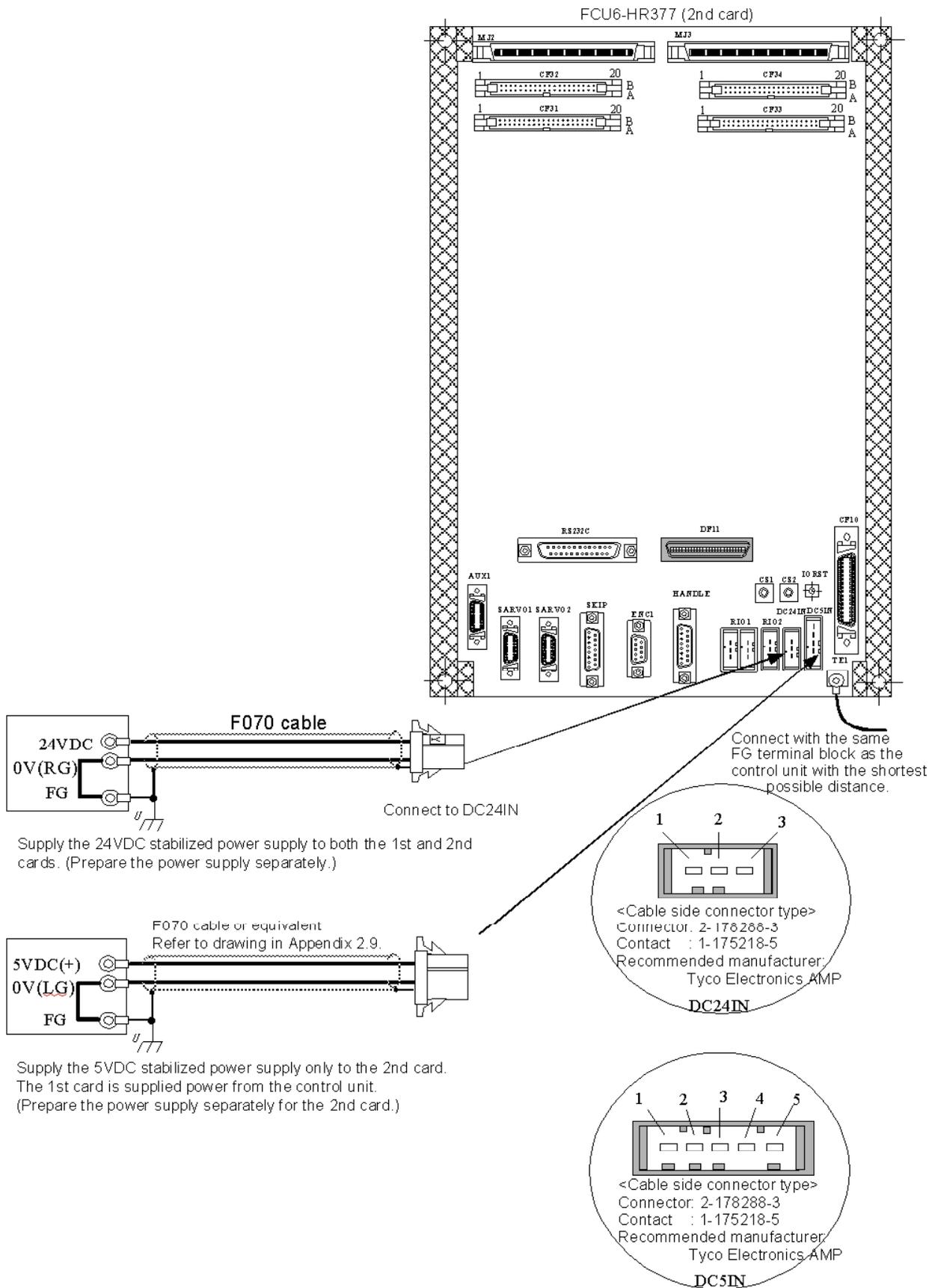
DC24 IN

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377

9.2 Connection of Power Supply

9.2.2 Connection of 2nd Card's Power Supply

When two or more units are connected as the expansion I/O of this 200mA-output DI/DO unit, supply the 5VDC power to the DC5IN connector on the second or following unit.



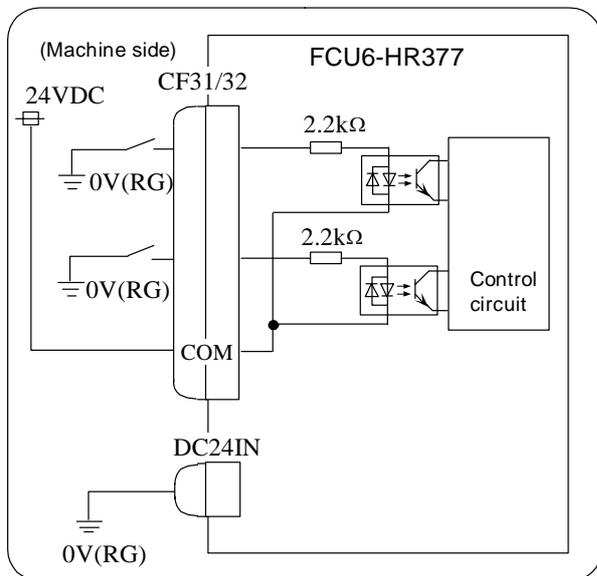
9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.3 Connection of DI/DO Signal

9.3 Connection of DI/DO Signal

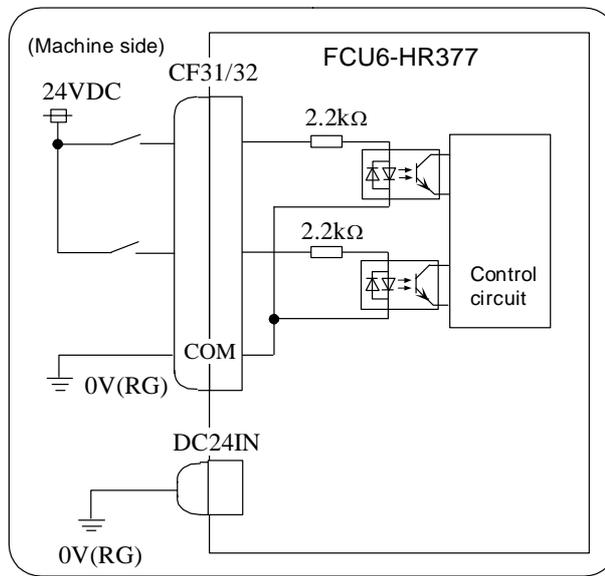
(1) CF31 and CF32 input circuit specifications

The sink and source input is changed by connecting 24VDC to COM pin or connecting 0V (RG). There are 64 input points, and the pins X0 to X3F are used for input device numbers.

Sink type



Source type

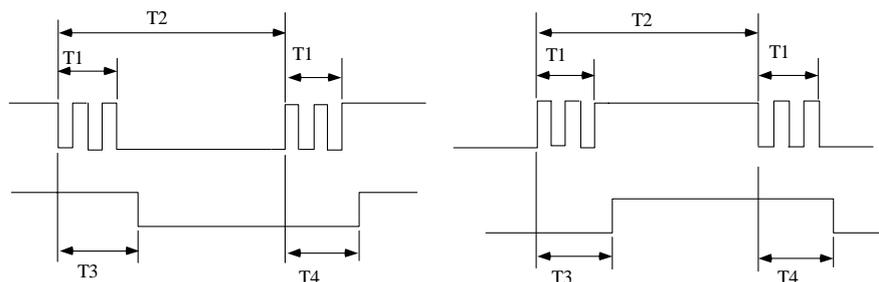


Input conditions Use the input signals within the range of the following conditions.

		Sink type	Source type
1	Input voltage at external contact ON	6V or less	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more	
3	Input voltage at external contact OFF	20V or more, 25.2V or less	4V or less
4	Input current at external contact OFF	2mA or less	
5	Tolerable chattering time	3ms or less (Refer to T1 below)	
6	Input signal holding time	40ms or more (Refer to T2 below)	
7	Input circuit operation delay time	$3\text{ms} \leq T3 \cong T4 \leq 16\text{ms}$	
8	Machine side contact capacity	30V or more, 16mA or more	

<Caution>

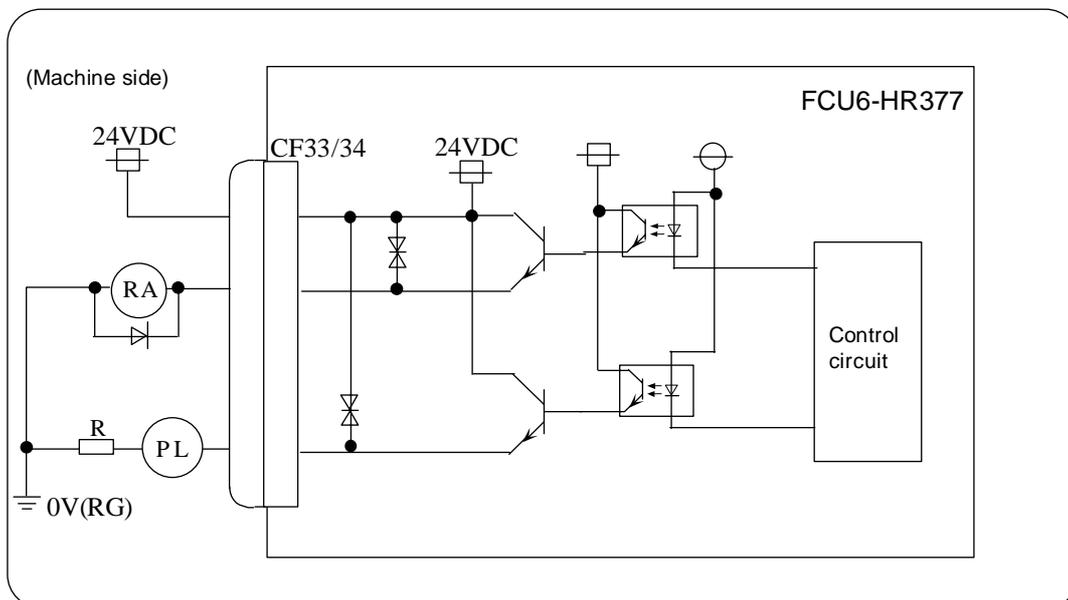
Input signal holding time: 40ms or more as a guideline. The input signal can only be confirmed if held longer than the ladder process cycle time.



9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.3 Connection of DI/DO Signal

(2) Specifications of CF33, CF34 output circuit

The output is fixed to a source output. There are 64 output points, and the pins used for output device numbers are Y0 to Y3F. Use within the specification range shown below.



Output conditions

	Item	Specifications
1	Output type	Source type
2	Output current	200mA/1 point
3	No. of output points	64 points
4	Device numbers	Y0 to Y3F
5	Insulation method	Insulation
6	Rated load voltage	24VDC \pm 5%
7	Output delay time	400 μ s

(3) Rotary switch (CS1, CS2) setting

CS1	Rotary switch CS1: Sets the 32-point station No. with remote I/O communication 1CH DI: X0-X1F and DO: Y0-Y1F. This is normally used set to "0".
CS2	Rotary switch CS2: Sets the 32-point station No. with remote I/O communication 1CH DI: X20-X3F and DO: Y20-Y3F. This is normally used set to "1".

The No. of stations occupied with this card is two stations.

<Caution>

- * When using an inductive load such as a relay, always connect a diode (voltage resistance 100V or more, 100mA or more) in parallel to the load.
- * When using a lamp or capacitive load, always connect a protective resistor (R = 150 Ω) serially to the load to suppress rush currents. (Make sure that the current is less than the above tolerable current including the momentary current.)

⚠ CAUTION

- ❗ When using an inductive load such as a relay, always connect a diode in parallel to the load.
- ❗ When using a lamp or capacitive load, always connect a protective resistor serially to the load to suppress rush currents.

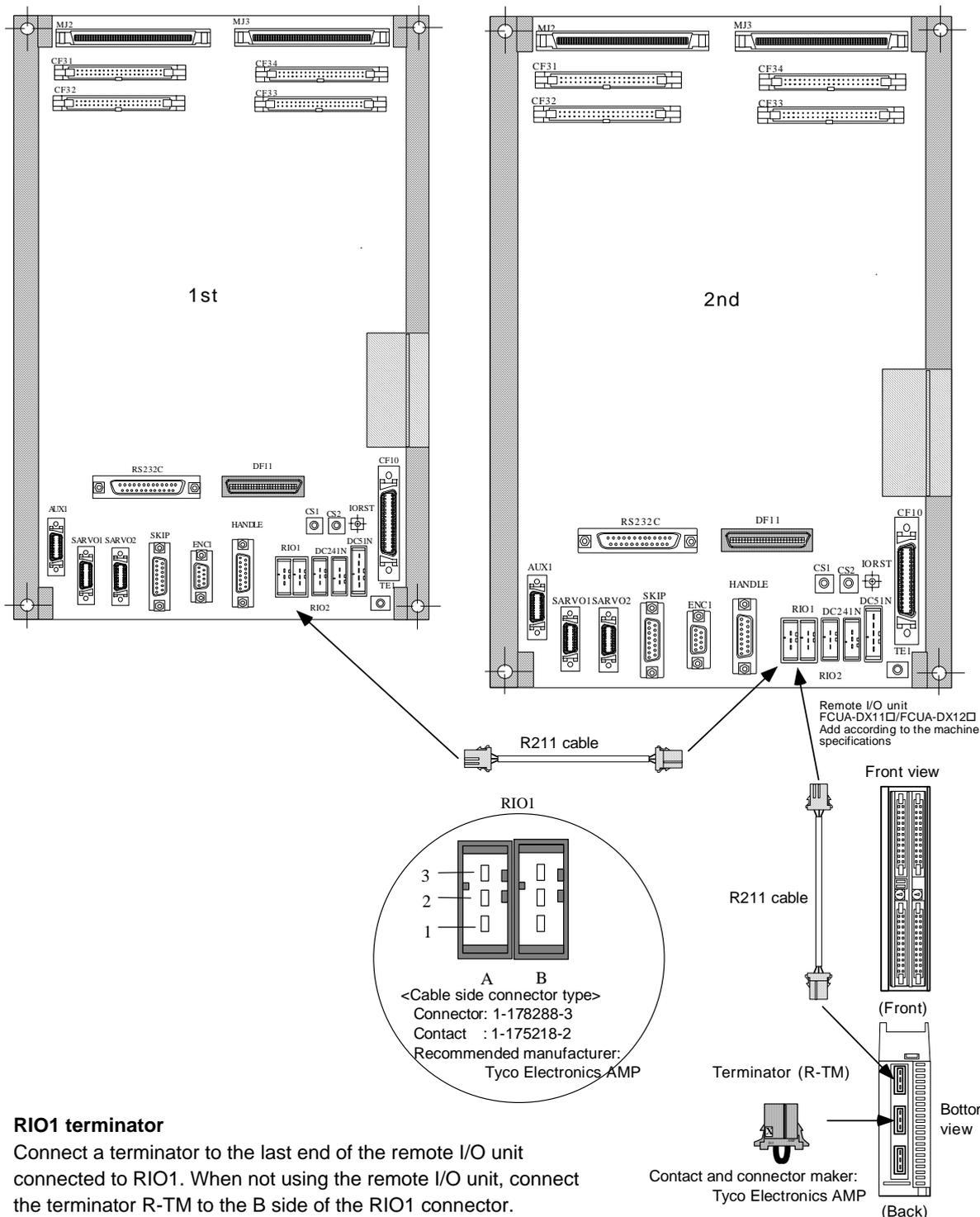
9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
 9.4 Example of Remote I/O Unit Connection

9.4 Example of Remote I/O Unit Connection

Normally one of these units is used. A remote I/O unit (RIO) is connected as an expansion I/O, and the No. of I/O points is configured to match the users' specifications. Using the first remote I/O communication system, this unit can be used as the 200mA-output DI/DO for the second and subsequent cards. In this case, the I/O connectors other than CF31, 32, 33 and 34 on the 2nd and following units are invalid.

Refer to Chapter 7 "CONNECTION OF REMOTE I/O UNIT" for details on the remote I/O unit.

(Example for using two FCU6-HR377 2 cards and remote I/O unit)



RIO1 terminator

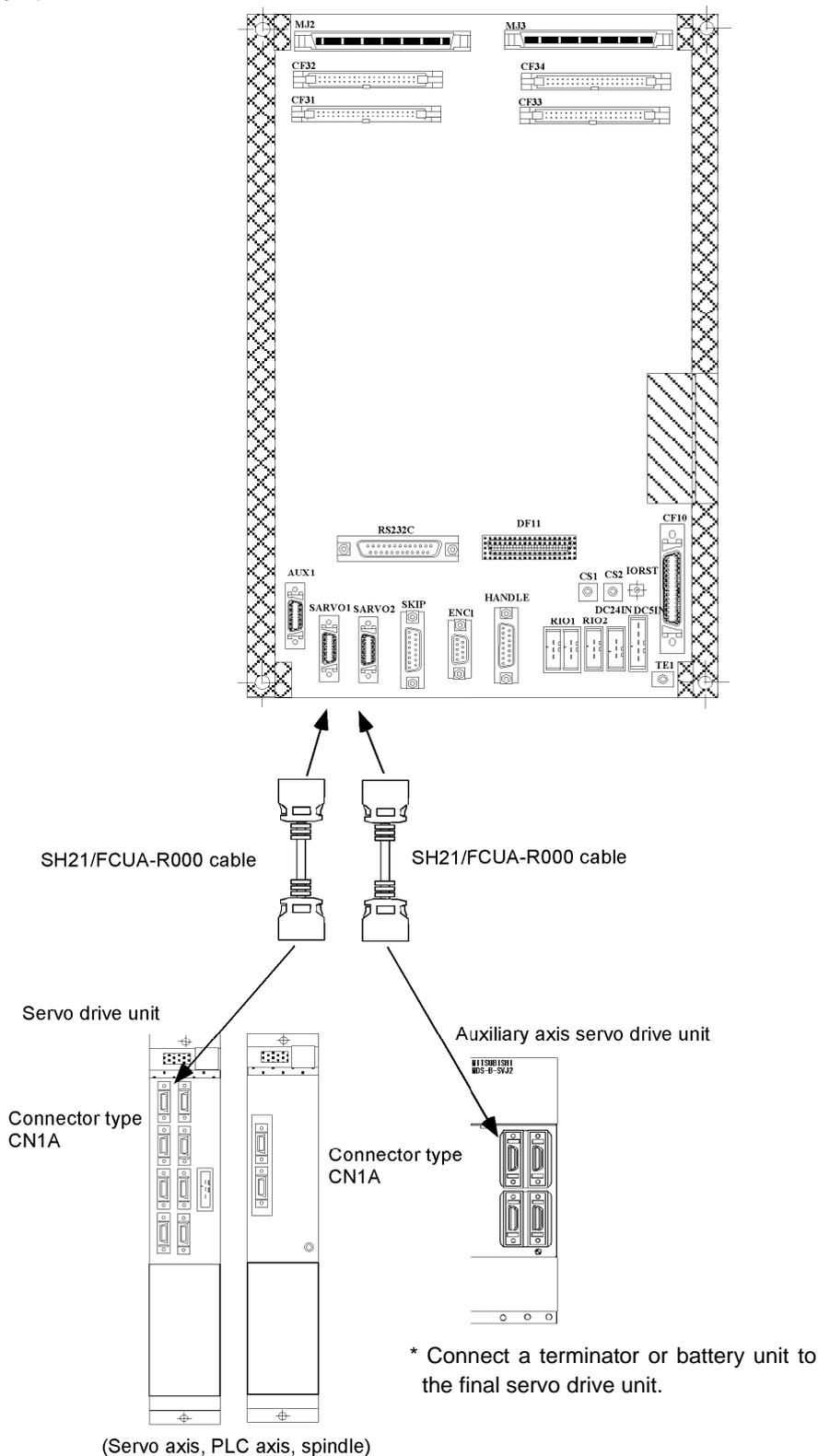
Connect a terminator to the last end of the remote I/O unit connected to RIO1. When not using the remote I/O unit, connect the terminator R-TM to the B side of the RIO1 connector.

Terminator type: R-TM Refer to Appendix 2.22.

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.5 Connection of Servo Drive Unit

9.5 Connection of Servo Drive Unit

Connect the servo drive unit to SV1 (servo axis, PLC axis, spindle) and SV2 (auxiliary axis: MR-J2-CT) of the base I/O unit.



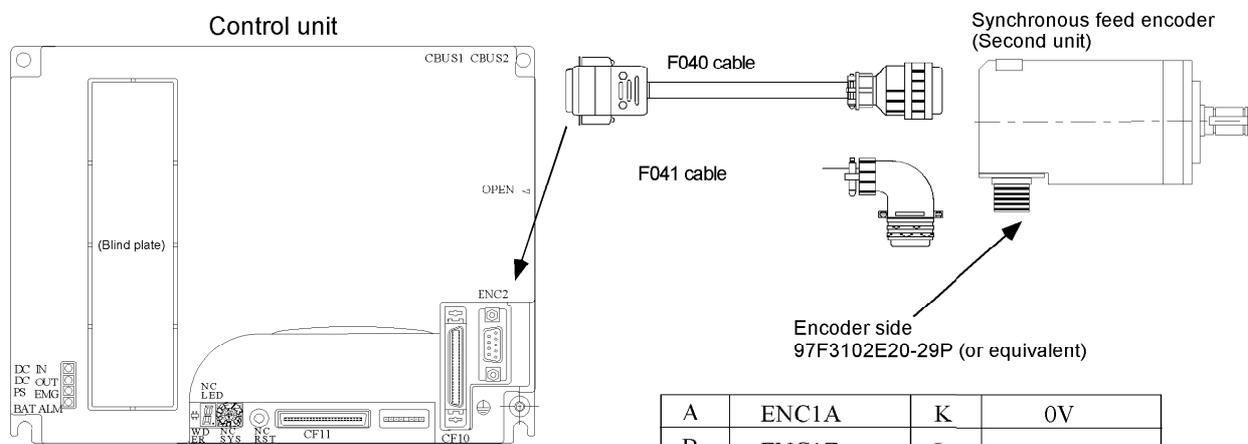
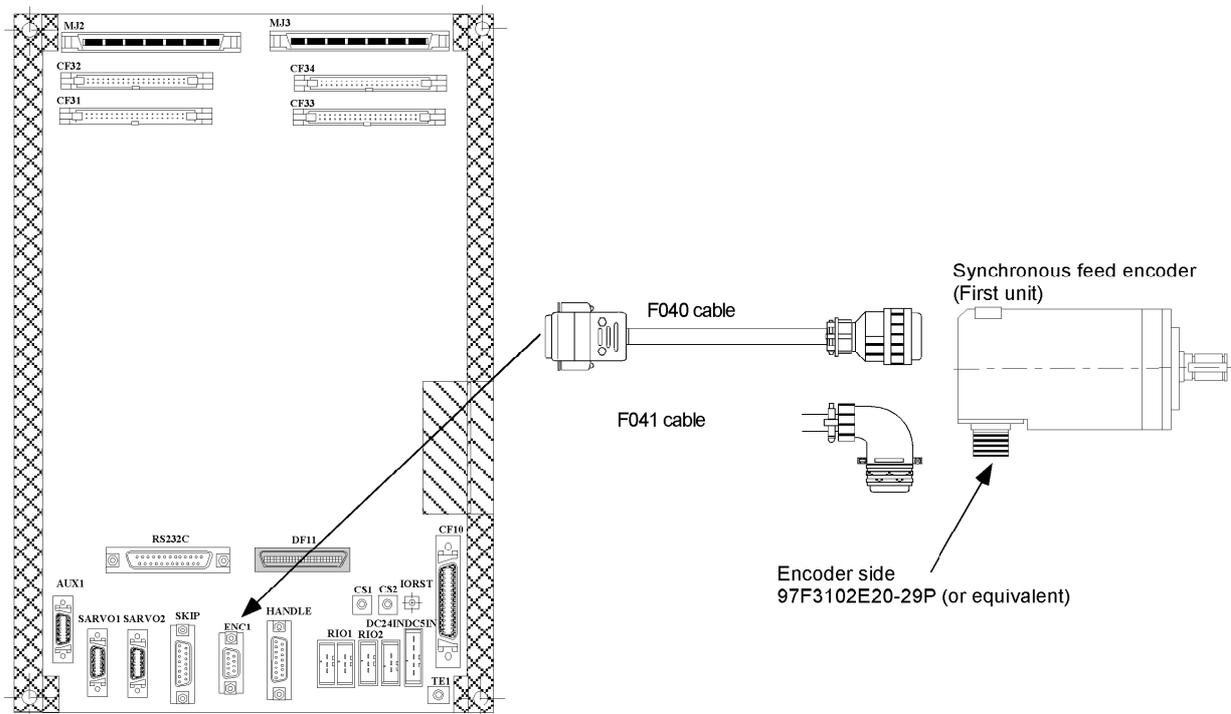
<Related items>

Cable manufacturing drawing: APPENDIX 2 (SH21 cable)

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.6 Connection of Synchronous Feed Encoder

9.6 Connection of Synchronous Feed Encoder

Connect the Synchronous feed encoder to ENC1 on the base I/O unit. When connecting the second unit, connect it to ENC2 on the control unit.



A	ENC1A	K	0V
B	ENC1Z	L	
C	ENC1B	M	
D		N	ENC1A*
E	Case ground	P	ENC1Z*
F		R	ENC1B*
G		S	
H	DC5V	T	
J			

<Related items>

Outline drawing: APPENDIX 1

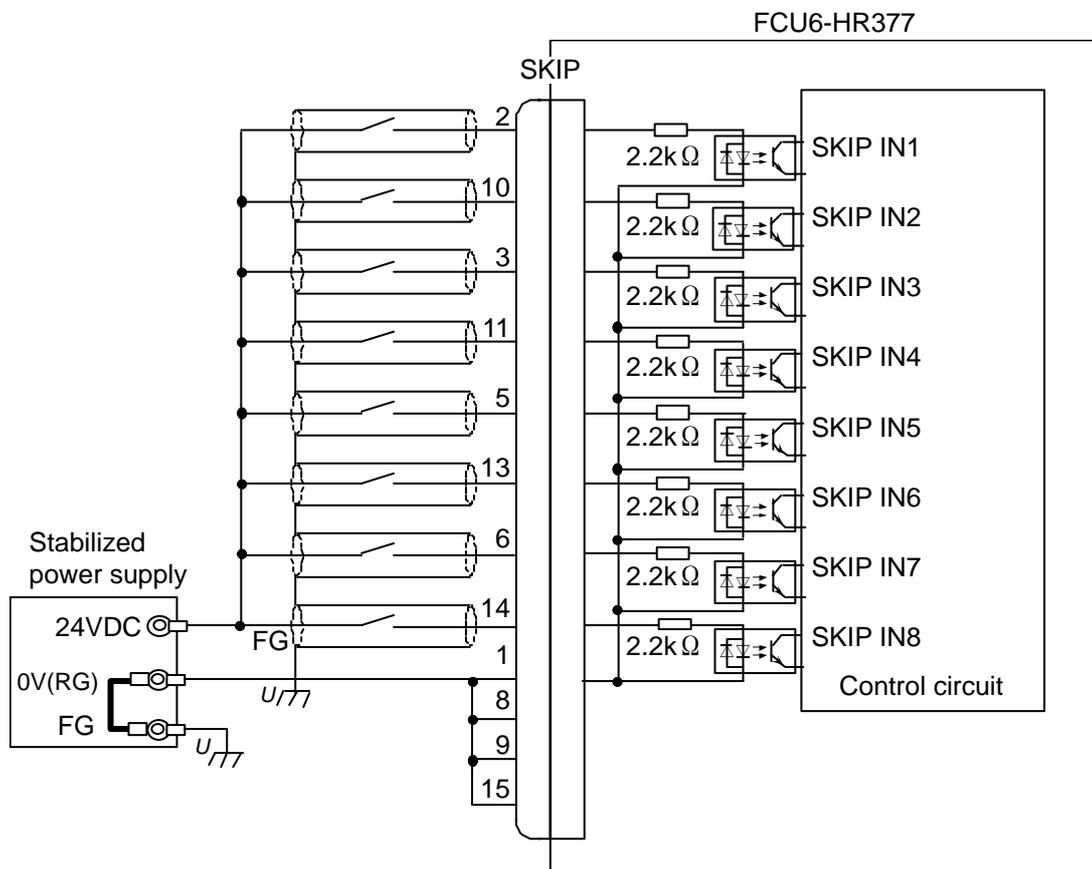
Cable manufacturing drawing: APPENDIX 2 (F040 cable)

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.7 Connection of Skip Signal (sensor)

9.7 Connection of Skip Signal (sensor)

Connect the skip signal to SKIP on the base I/O unit.
 The skip signal is used for processing the high-speed signals. Always shield the cable.

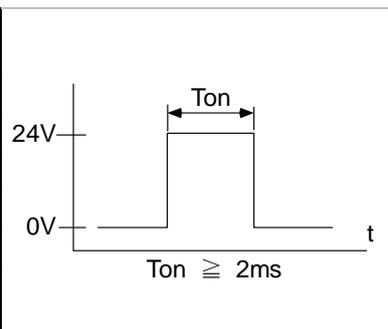
(1) Skip signal cable



(2) Input conditions

Use the input signal within the following condition range.

1	Input voltage at external contact ON	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more
3	Input voltage at external contact OFF	4V or less
4	Input current at external contact OFF	1mA or less
5	Input signal holding time (Ton)	2ms or more
6	Internal response time	0.08ms or less
7	Machine side contact capacity	30V or more, 16mA or more



<Related item>

Connector pin assignment: 6.10 Base I/O Unit Connector Pin Assignment (SKIP)

CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

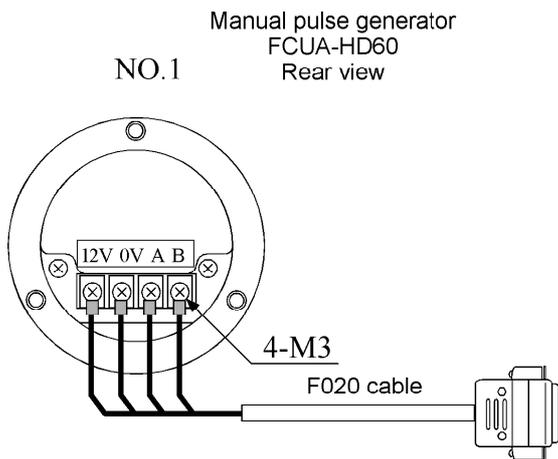
9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
 9.8 Connection of Manual Pulse Generator

9.8 Connection of Manual Pulse Generator

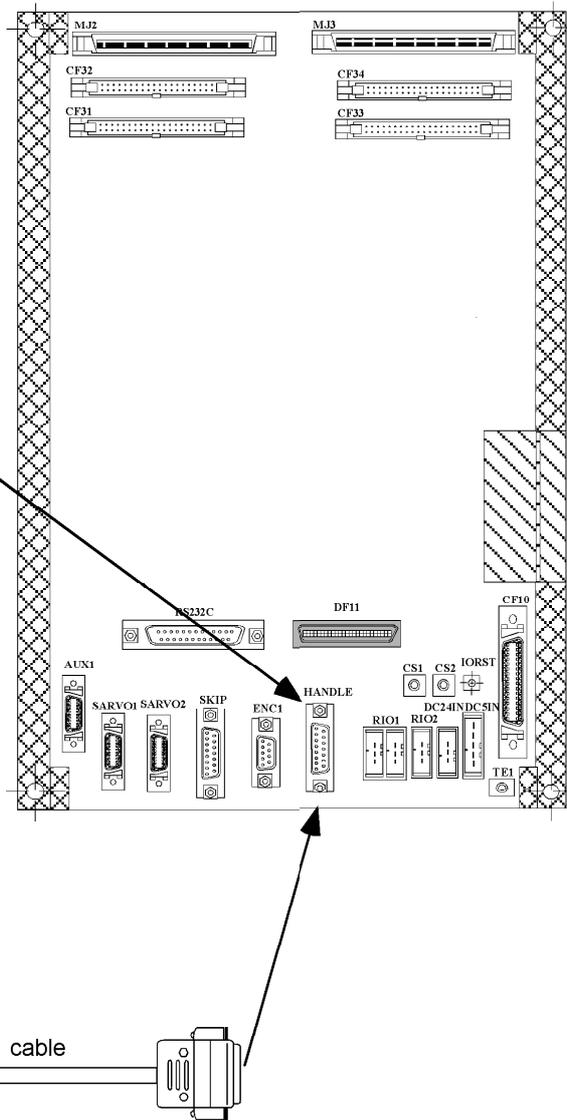
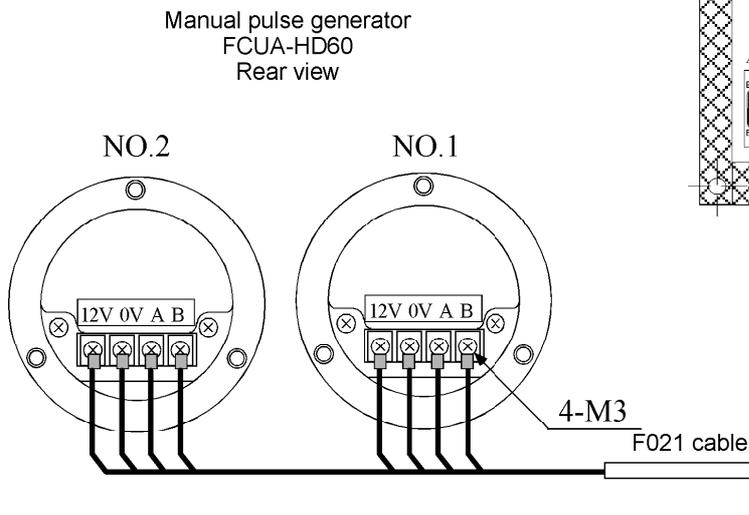
To connect the manual pulse generators, connect an F020/021/022 cable to "HANDLE" connector.
 Up to three manual pulse generators can be connected. In addition to the standard +12V power supply type, the manual pulse generator of the +5V power supply specifications handle can be used with this unit by using a dedicated cable.

(Refer to Appendix 2.5 F020/021/022 Cable Manufacturing Drawings for cable details.)

Connecting one manual pulse generator



Connecting two manual pulse generators



CAUTION

- ▲ Incorrect connections could damage the device, so always connect the cable to the designated connector.
- Do not connect or disconnect the connection cables between each unit while the power is ON.

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377

9.8 Connection of Manual Pulse Generator

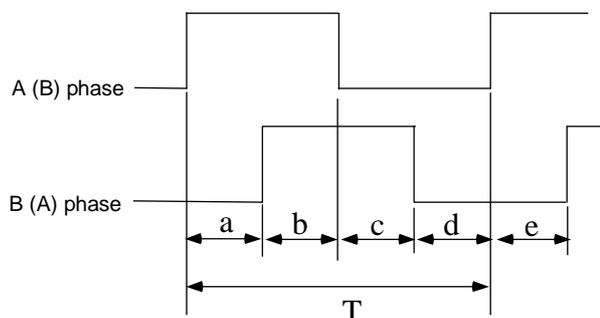
When devices (pulse generators) other than manual pulse generators (HD60) are connected to the additional I/O units, use within the ranges shown in the following specifications. The commercially-available manual pulse generators include the 25 pulse/rev type and 100 pulse/rev type. The MELDAS60/60S Series internally multiplies one pulse by four, so use the 25 pulse/rev type.

Input/output conditions

Input pulse signal type	90° phase difference between A phase and B phase. (Refer to waveform (e) below.)
Input signal voltage	H-level 3.5V to 5.25V, L-level 0V to 0.5V or less
Max. input pulse frequency	100kHz
Power voltage for pulse generator	12VDC \pm 10%
Max. output current	300mA
No. of pulses per rotation	25 pulse/rev (25 pulse/rev for HD60)

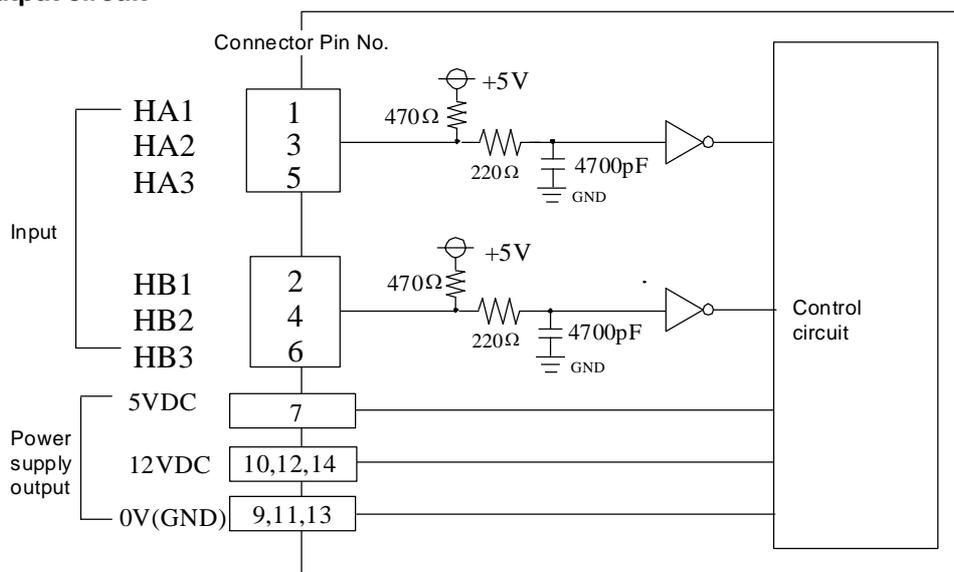
Input waveform

The input waveform phase difference must be $\pm T/10$ (T: cycle) or less.



a. b. c. d. e: A phase or B phase rising edge (falling edge) phase difference = $T/4 \pm T/10$
T: A or B phase cycle (Min. 10 μ s)

Input/output circuit



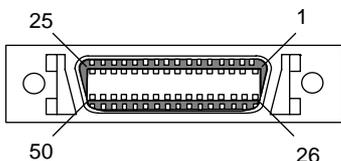
The power voltage supplied to the manual pulse generator can be changed between 5VDC and 12VDC by changing the cable wiring. Supply the power from pin 7 for the 5VDC power supply manual pulse generator, and from pins 10, 12 and 14 for the 12VDC power supply manual pulse generator. Use several power and 0V (GND) wire materials in the cable.

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.9 Connector Pin Assignment

9.9 Connector Pin Assignment

Control unit connection terminal

CF10



Refer to section 4.2.8 Control Unit Connector Pin Assignment (CF10) for details on the connector pin assignment.

<Cable side connector type>

Plug : 10150-6000EL

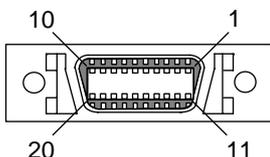
Shell : 10350-3210-000

Recommended manufacturer: 3M

(Connect the connector case to shield.)

Servo drive unit connection terminal

SARVO1



1		GND	11		GND
2	O	SVTXD1	12	O	SVTXD1*
3	I	SVALM1	13	I	SVALM1*
4	I	SVRXD1	14	I	SVRXD1*
5		GND	15		GND
6			16		
7	O	SVEMG1	17	O	SVEMG1*
8			18		
9			19		
10	O	+5V	20		

<Cable side connector type>

Plug : 10120-6000EL

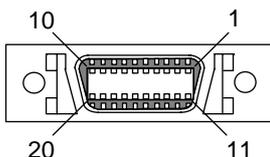
Shell : 10320-3210-000

Recommended manufacturer: 3M

(Connect the connector case to shield.)

Servo drive unit connection terminal

SARVO2



1		GND	11		GND
2	O	SVTXD2	12	O	SVTXD2*
3	I	SVALM2	13	I	SVALM2*
4	I	SVRXD2	14	I	SVRXD2*
5		GND	15		GND
6			16		
7	O	SVEMG2	17	O	SVEMG2*
8			18		
9			19		
10	O	+5V	20		

<Cable side connector type>

Plug : 10120-6000EL

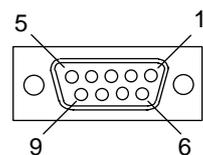
Shell : 10320-3210-000

Recommended manufacturer: 3M

(Connect the connector case to shield.)

Synchronous feed encoder connection terminal

ENC1



1	I	ENC1A	6	I	ENC1A*
2	I	ENC1B	7	I	ENC1B*
3	I	ENC1Z	8	I	ENC1Z*
4		GND	9	O	+5V
5		GND			

<Cable side connector type>

Connector : CDE-9PF

Contact : CD-PC-111

Case : HDE-CTH

Recommended manufacturer: Hirose Electric

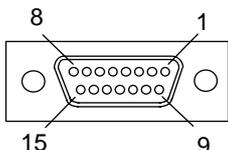
(Connect the connector case to shield.)

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377

9.9 Connector Pin Assignment

Skip signal input connection terminal

SKIP



<Cable side connector type>

Connector : CDA-15P

Contact : CD-PC-111

Case : HDA-CTH

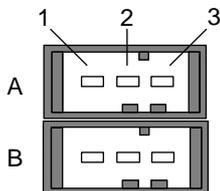
Recommended manufacturer: Hirose Electric

1		GND	9		GND
2	I	SKIP IN1	10	I	SKIP IN2
3	I	SKIP IN3	11	I	SKIP IN4
4			12		
5	I	SKIP IN5	13	I	SKIP IN6
6	I	SKIP IN7	14	I	SKIP IN8
7			15		GND
8		GND			

(Connect the connector case to shield.
Use a nickel-base chrome-plated part.)

Remote I/O unit connection terminal

RIO1



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

Recommended manufacturer:

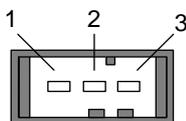
Tyco Electronics AMP

1	I/O	TXRX1
2	I/O	TXRX1*
3		GND

(* A and B are used for the remote I/O unit next station relay. The cable can be connected to either connector.)

Remote I/O unit connection terminal

RIO2



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

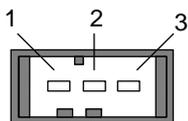
Recommended manufacturer:

Tyco Electronics AMP

1	I/O	TXRX2
2	I/O	TXRX2*
3		GND

Power input terminal (24VDC)

DC24IN



<Cable side connector type>

Connector : 2-178288-3

Contact : 1-175218-5

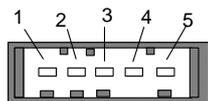
Recommended manufacturer:

Tyco Electronics AMP

1	I	24VDC
2		0V(RG)
3		FG

Power input terminal (5VDC)

DC5IN



<Cable side connector type>

Connector : 2-178288-5

Contact : 1-175218-5

Recommended manufacturer:

Tyco Electronics AMP

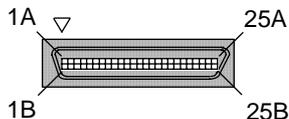
1		NC (Not used)
2		NC (Not used)
3		5VDC
4		0V(LG)
5		FG

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377

9.9 Connector Pin Assignment

Control unit connection terminal

CF11

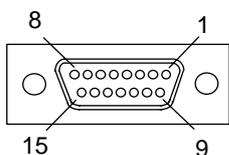


Refer to section 4.2.8 Control Unit Connector Pin Assignment (CF11) for details on the connector pin assignment.

<Cable side connector type>
 Connector: DHD-RB50-20AN
 Recommended manufacturer: DDK

Manual pulse generator connection terminal

HANDLE



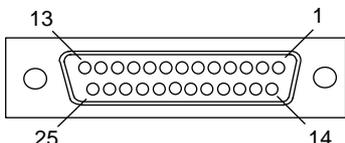
1	I	1HA	9		GND
2	I	1HB	10	O	12VDC
3	I	2HA	11		GND
4	I	2HB	12	O	12VDC
5	I	3HA	13		GND
6	I	3HB	14	O	12VDC
7	O	5VDC	15		
8					

<Cable side connector type>
 Connector : CDA-15P
 Contact : CD-PC-111
 Case : HDA-CTH
 Recommended manufacturer: Hirose Electric

(Connect the connector case to shield.)
 Use a nickel-base chrome-plated part.

RS-232C device connection terminal

RS232C



Revision A

1			14	O	SD1 (Note)
2	O	SD2	15	O	ER1 (Note)
3	I	RD2	16	I	RD1 (Note)
4	O	RS2	17	I	CS1 (Note)
5	I	CS2	18		
6	I	DR2	19	O	RS1 (Note)
7		GND	20	O	ER2
8			21	I	DR1 (Note)
9			22		
10			23		
11		GND	24		GND
12		reserve	25		24VDC
13					

Explanation of signals

SD: Send Data
 RD: Receive Data
 RS: Request to Send
 CS: Clear to Send
 DR: Data Set Ready
 ER: Data Terminal Ready

(Note)
 Signal name meanings:
1: For maintenance by service personnel
2: General released channel

<Cable side connector type>
 Connector : CDB-25P
 Contact : CD-PC-111
 Case : HDB-CTH
 Recommended manufacturer:
 Hirose Electric

(Connect the connector case to shield.)
 Use a nickel-base chrome-plated part.

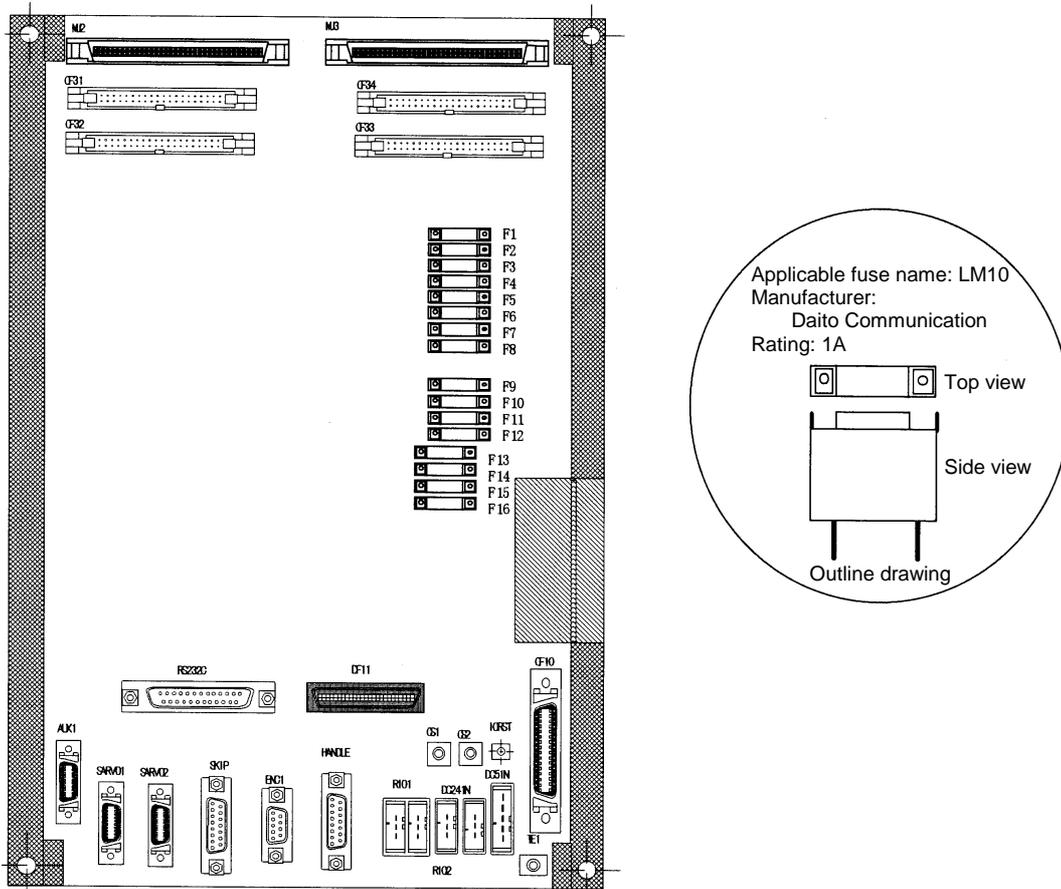


- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

9. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR377
9.10 Fuse for Machine Output Circuit Protection

9.10 Fuse for Machine Output Circuit Protection

At every 4-point output, the machine output (DO) circuit has a fuse for burning protection if any circuit should short-circuit.



Output name	Fuse name						
Y0	F8	Y10	F6	Y20	F14	Y30	F16
Y1	F8	Y11	F6	Y21	F14	Y31	F16
Y2	F8	Y12	F6	Y22	F14	Y32	F16
Y3	F8	Y13	F6	Y23	F14	Y33	F16
Y4	F7	Y14	F5	Y24	F13	Y34	F15
Y5	F7	Y15	F5	Y25	F13	Y35	F15
Y6	F7	Y16	F5	Y26	F13	Y36	F15
Y7	F7	Y17	F5	Y27	F13	Y37	F15
Y8	F2	Y18	F3	Y28	F10	Y38	F12
Y9	F2	Y19	F3	Y29	F10	Y39	F12
YA	F2	Y1A	F3	Y2A	F10	Y3A	F12
YB	F2	Y1B	F3	Y2B	F10	Y3B	F12
YC	F1	Y1C	F4	Y2C	F9	Y3C	F11
YD	F1	Y1D	F4	Y2D	F9	Y3D	F11
YE	F1	Y1E	F4	Y2E	F9	Y3E	F11
YF	F1	Y1F	F4	Y2F	F9	Y3F	F11

Caution: The HR377 unit fuse is inserted as protection against an instantaneous overcurrent that could occur during a short-circuit, etc. If a current of approx. 200mA to 1A flows to one output, protection of the circuit could be difficult.



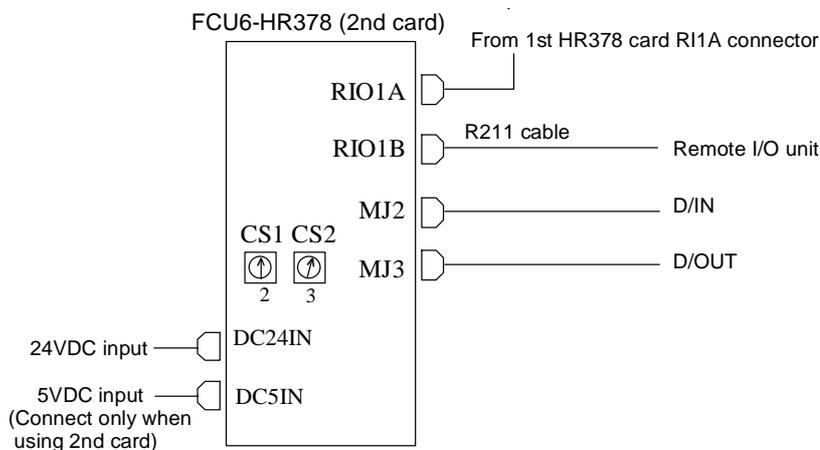
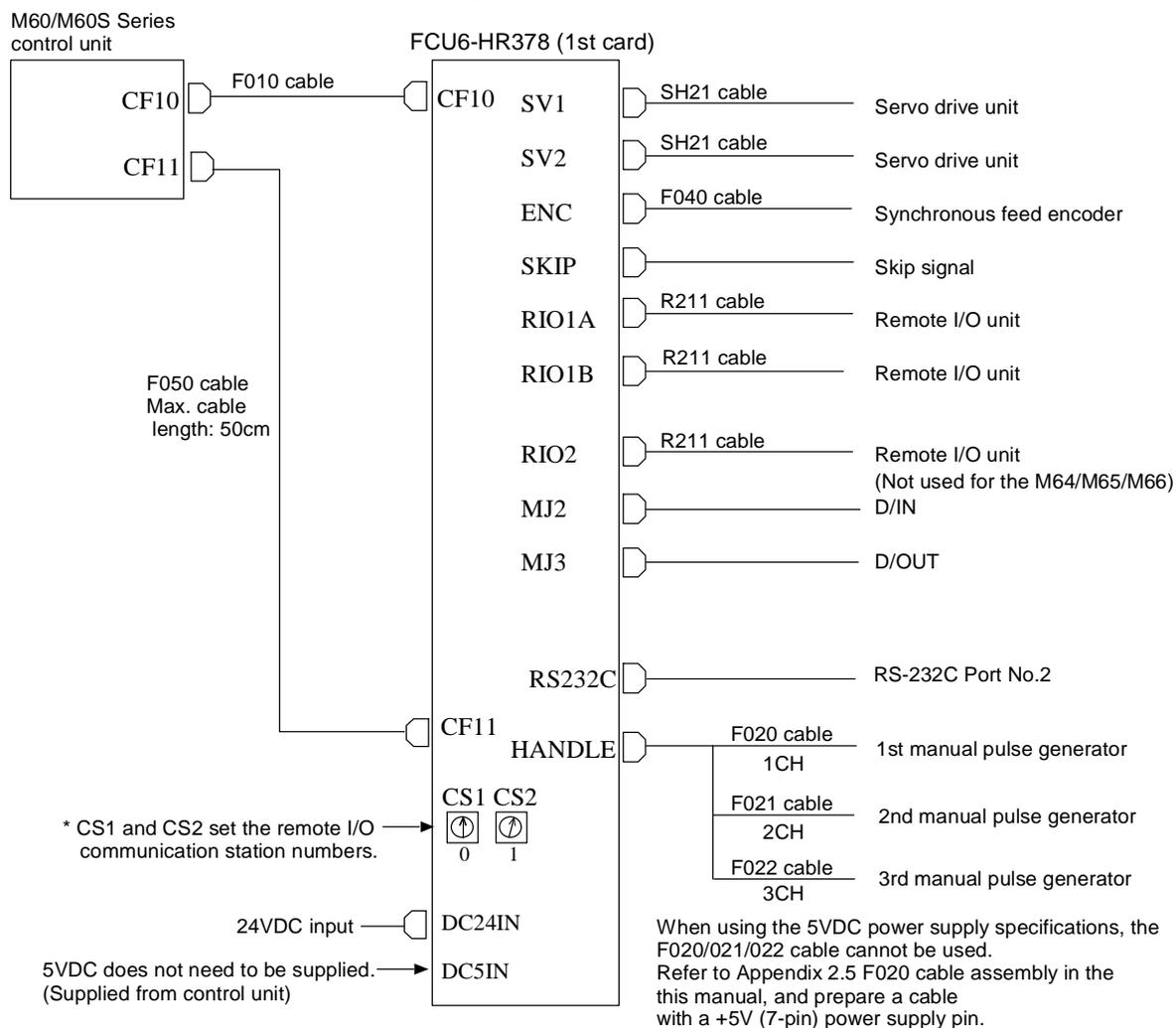
- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.1 Connection System Drawing

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378

The FCU6-HR378 is a DI/DO unit capable of a 200mA current output per 1 point. The DO output common is the 4-point common 13 block, and the 1-point 1 common is the 12-point common separated type.

10.1 Connection System Drawing



* When using two FCU6-HR378 cards, the 5VDC for the second card must be supplied from an external source as it is not supplied from the control unit.

* Change the rotary switch CS1 and CS2 settings according to the machine's DI/DO assignment.

(Note) The FCU6-HR378 card occupies two stations of the remote I/O communication (MC link B communication).

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.1 Connection System Drawing

Connector name	Explanation of functions
CF10	Connect with the control unit (servo drive unit, synchronous feed encoder, skip signal, remote I/O unit).
CF11	Connect with the control unit (5VDC, RS-232C, manual pulse generator).
SV1	Connect with the servo drive unit/spindle drive unit.
SV2	Connect with the auxiliary axis.
ENC1	Connect with the synchronous feed encoder. When using two units for the synchronous feed encoder, connect the second unit to ENC2 of the control unit.
SKIP	Connect with the skip signal input. Up to eight points can be used.
RIO1A RIO1B	Connect with the remote I/O unit. The No. of occupied stations on this unit is two stations, so the additional remote I/O units for six stations can be connected. RIO1A and RIO1B are relay connectors for the remote I/O communication signals. Either cable can be inserted without problem. If this unit is the final station, the terminator R-TM must be connected to one of these connectors.
RIO2	Connect with the remote I/O unit.
RS232C	Connect with an RS-232C device.
HANDLE	Connection with 12VDC power supply type or 5VDC power supply type manual pulse generator.
MJ2	DI: 64 (sink/source type)
MJ3	DO: 64 (source type)
CS1	Rotary switch CS1: Sets the 32-point station No. with remote I/O communication 1CH DI: X0-X1F and DO: Y0-Y1F. This is normally used set to "0".
CS2	Rotary switch CS2: Sets the 32-point station No. with remote I/O communication 1CH DI: X20-X3F and DO: Y20-Y3F. This is normally used set to "1".

* The rotary switch CS1 and CS2 settings may differ according to the machine configuration and whether other remote I/O units are being used. Set within the range of 0 to 7.

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.1 Connection System Drawing

Machine input/output

MJ2

No.	Input/output	Signal	No.	Input/output	Signal
1	I	X00	51	I	X20
2	I	X01	52	I	X21
3	I	X02	53	I	X22
4	I	X03	54	I	X23
5	I	X04	55	I	X24
6	I	X05	56	I	X25
7	I	X06	57	I	X26
8	I	X07	58	I	X27
9	I	CI0007	59	I	CI2027
10	I	X08	60	I	X28
11	I	X09	61	I	X29
12	I	X0A	62	I	X2A
13	I	X0B	63	I	X2B
14	I	X0C	64	I	X2C
15	I	X0D	65	I	X2D
16	I	X0E	66	I	X2E
17	I	X0F	67	I	X2F
18	I	CI080F	68	I	CI282F
19	I	X10	69	I	X30
20	I	X11	70	I	X31
21	I	X12	71	I	X32
22	I	X13	72	I	X33
23	I	X14	73	I	X34
24	I	X15	74	I	X35
25	I	X16	75	I	X36
26	I	X17	76	I	X37
27	I	CI1017	77	I	CI3037
28	I	X18	78	I	X38
29	I	X19	79	I	X39
30	I	X1A	80	I	X3A
31	I	X1B	81	I	X3B
32	I	X1C	82	I	X3C
33	I	X1D	83	I	X3D
34	I	X1E	84	I	X3E
35	I	X1F	85	I	X3F
36	I	CI181F	86	I	CI383F
37			87		
38			88		
39			89		
40			90		
41			91		
42	I	0V (RG)	92		
43	I	0V (RG)	93		
44	I	0V (RG)	94		
45	I	0V (RG)	95	O	
46			96	O	
47	I	24VDC	97	I	
48	I	24VDC	98	I	
49	I	24VDC	99	I	
50	I	24VDC	100	I	

MJ3

No.	Input/output	Signal	No.	Input/output	Signal
1	O	C00003	51	O	C02023
2	O	Y00	52	O	Y20
3	O	Y01	53	O	Y21
4	O	Y02	54	O	Y22
5	O	Y03	55	O	Y23
6	O	C00407	56	O	C02427
7	O	Y04	57	O	Y24
8	O	Y05	58	O	Y25
9	O	Y06	59	O	Y26
10	O	Y07	60	O	Y27
11	O	C0080B	61	O	C0282B
12	O	Y08	62	O	Y28
13	O	Y09	63	O	Y29
14	O	Y0A	64	O	Y2A
15	O	Y0B	65	O	Y2B
16	O	C00C0F	66	O	C02C2F
17	O	Y0C	67	O	Y2C
18	O	Y0D	68	O	Y2D
19	O	Y0E	69	O	Y2E
20	O	Y0F	70	O	Y2F
21	O	C01013	71	O	C030
22	O	Y10	72	O	Y30
23	O	Y11	73	O	C031
24	O	Y12	74	O	Y31
25	O	Y13	75	O	C032
26	O	C01417	76	O	Y32
27	O	Y14	77	O	C033
28	O	Y15	78	O	Y33
29	O	Y16	79	O	C034
30	O	Y17	80	O	Y34
31	O	C0181B	81	O	C035
32	O	Y18	82	O	Y35
33	O	Y19	83	O	C036
34	O	Y1A	84	O	Y36
35	O	Y1B	85	O	C037
36	O	C01C1F	86	O	Y37
37	O	Y1C	87	O	C038
38	O	Y1D	88	O	Y38
39	O	Y1E	89	O	C039
40	O	Y1F	90	O	Y39
41	O	0V (RG)	91	O	C03A
42	O	0V (RG)	92	O	Y3A
43	O	0V (RG)	93	O	C03B
44	O	0V (RG)	94	O	Y3B
45	O	0V (RG)	95	O	C03C3F
46	O	FG	96	O	Y3C
47	O	FG	97	O	Y3D
48	O	FG	98	O	Y3E
49	O	FG	99	O	Y3F
50	O	FG	100		

<Cable side connector type>

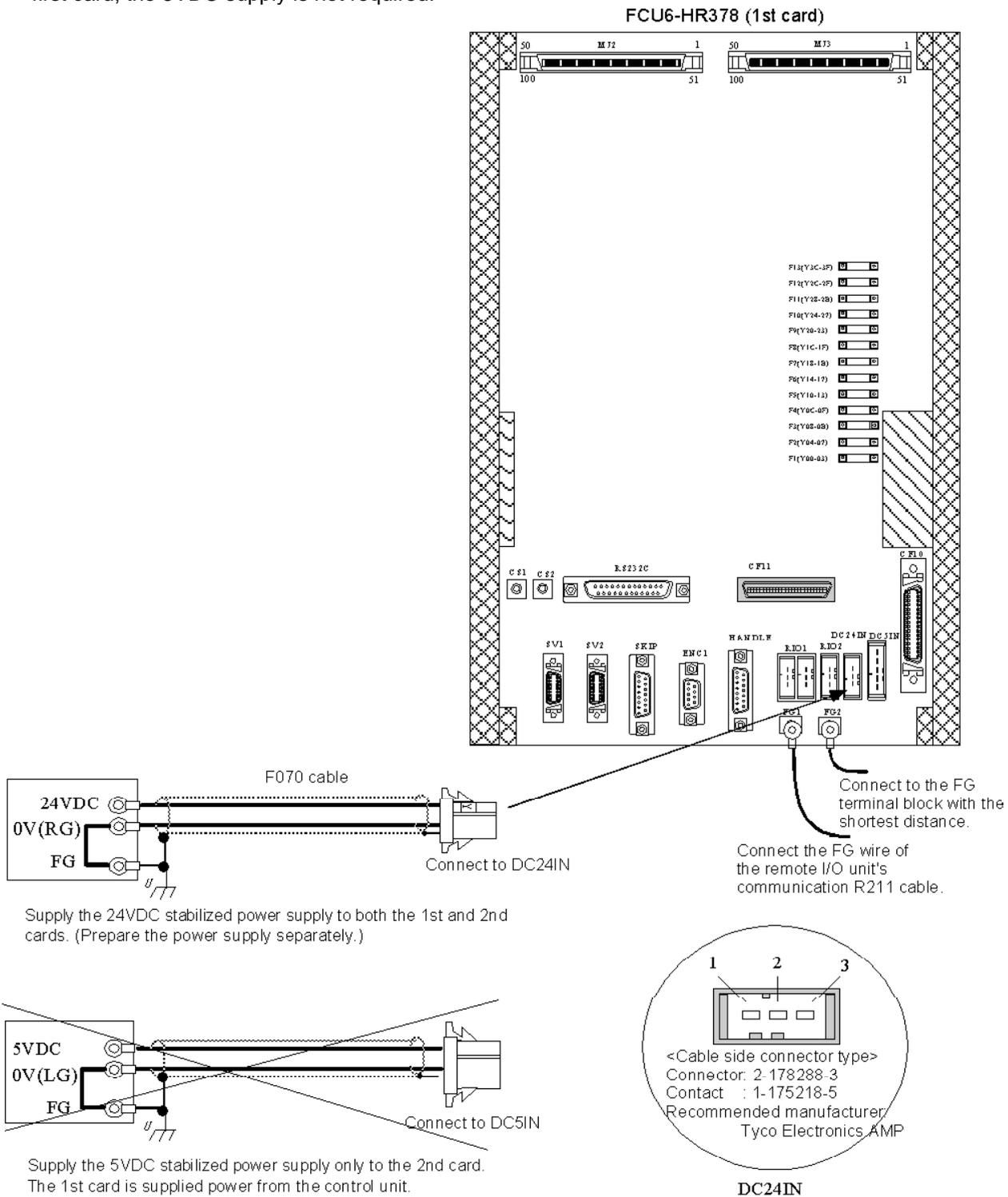
PCB side connector : DHD-PB100-S121NO
 Cable side connector : DHD-RA100-20AS (or equivalent)
 Recommended maker : DDK

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT HR378
10.2 Connection of Power Supply

10.2 Connection of Power Supply

10.2.1 Connection of 1st Card's Power Supply

Supply the 24VDC power from the DC24IN connector or the I/O connector MJ2. When supplying the 24VDC power supply from the MJ2 connector, supply to all 24VDC pins and 0V (RG) pins. The 5VDC power for control in the card is supplied from the control unit via the CF11 connector. When using as the first card, the 5VDC supply is not required.

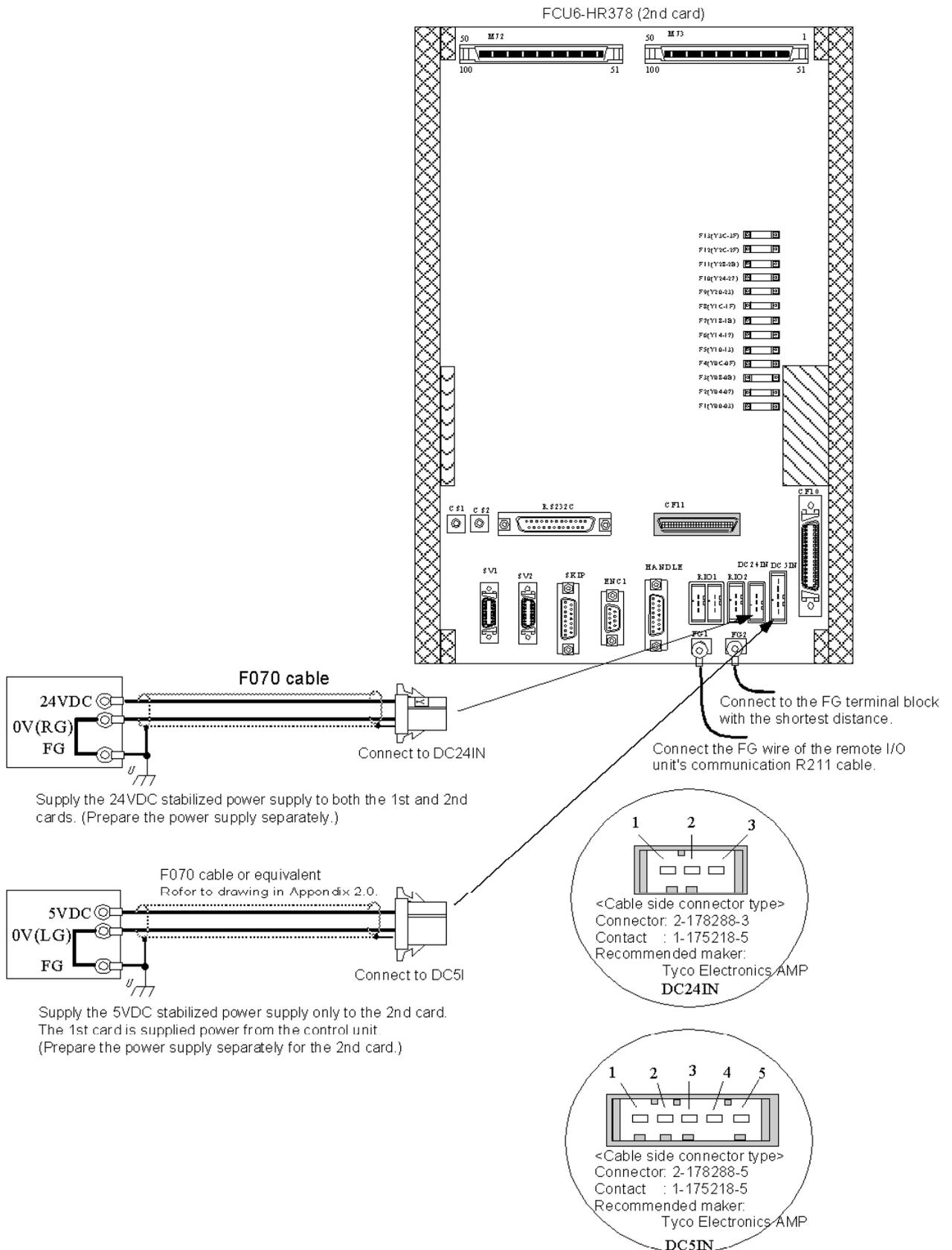


10. CONNECTION OF 200mA OUTPUT DI/DO UNIT HR378

10.2 Connection of Power Supply

10.2.2 Connection of 2nd Card's Power Supply

When two or more units are connected as the expansion I/O of this 200mA-output DI/DO unit, supply the 5VDC power to the DC5IN connector on the second or following unit.



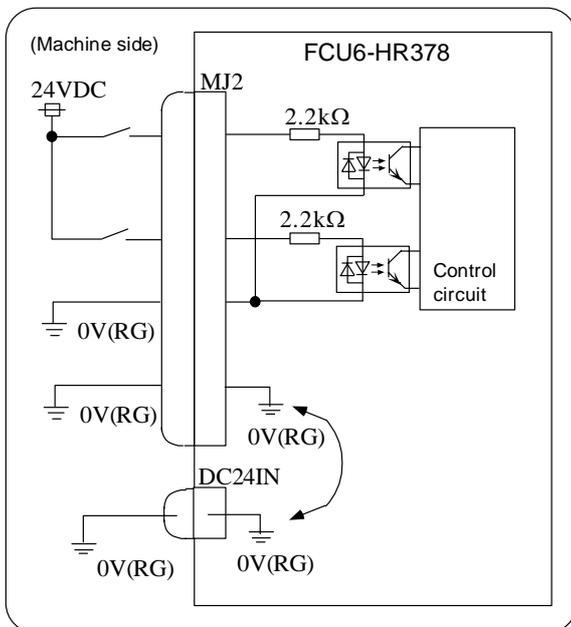
10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.3 Connection of DI/DO Signal

10.3 Connection of DI/DO Signal

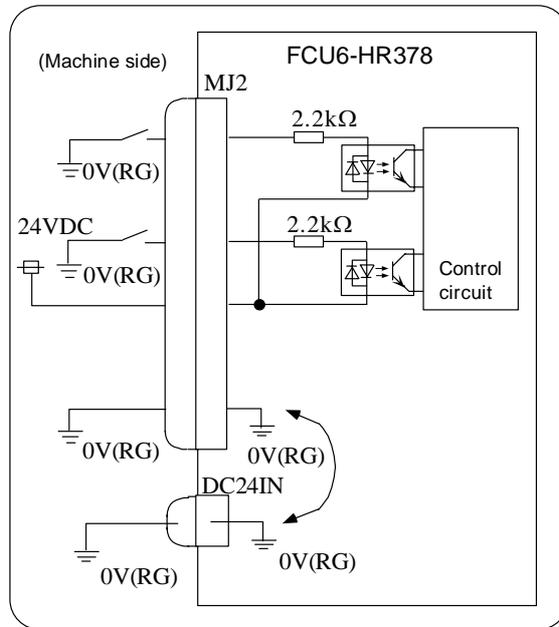
(1) MJ2 input circuit specifications

The sink and source input is changed by connecting 24VDC to COM pin or connecting 0V (RG). There are 64 input points, and the pins X0 to X3F are used for input device numbers.

Source type



Sink type



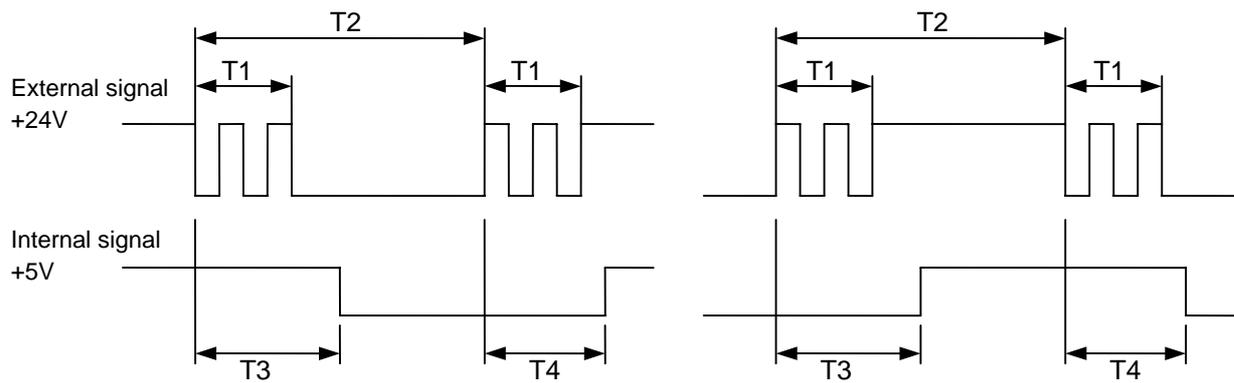
Input conditions Use the input signals within the range of the following conditions.

		Sink type	Source type
1	Input voltage at external contact ON	6V or less	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more	
3	Input voltage at external contact OFF	20V or more, 25.2V or less	4V or less
4	Input current at external contact OFF	2mA or less	
5	Tolerable chattering time	3ms or less (Refer to T1 below)	
6	Input signal holding time	40ms or more (Refer to T2 below)	
7	Input circuit operation delay time	$3\text{ms} \leq T3 \leq T4 \leq 16\text{ms}$	
8	Machine side contact capacity	30V or more, 16mA or more	

<Caution>

Input signal holding time: 40ms or more as a guideline. The input signal can only be confirmed if held longer than the ladder process cycle time.

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.3 Connection of DI/DO Signal



Relation of input common pin and DI input

Common name	Pin No.	Corresponding input signal name
CI0007	9	X00 to X07
CI080F	18	X08 to X0F
CI1017	27	X10 to X17
CI181F	36	X18 to X1F
CI2027	59	X20 to X27
CI282F	68	X28 to X2F
CI3037	77	X30 to X37
CI383F	86	X38 to X3F

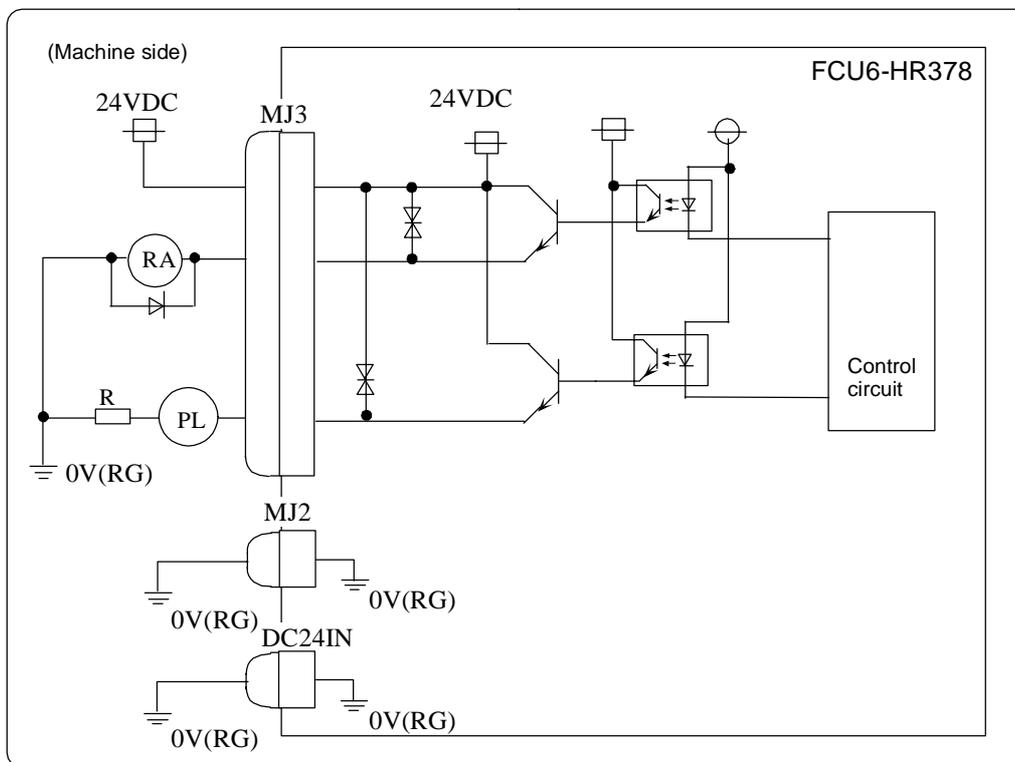
* The device numbers show the example when rotary switch CS1 is set to "0" and CS2 is set to "1".

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378

10.3 Connection of DI/DO Signal

(2) MJ3 output circuit specifications

The output is fixed to a source output. There are 64 output points, and the pins used for output are Y0 to Y3F. Use within the specification range shown below.



Output conditions

	Item	Specifications
1	Output type	Source type
2	Output current	200mA/1 point
3	No. of output points	64 points
4	Output applicable pins	Y0 to Y3F
5	Insulation method	Insulation
6	Rated load voltage	24VDC \pm 5%
7	Output delay time	400 μ s

Relation of output common pin and DO output device numbers

Common name	Pin No.	Corresponding device numbers
C00003	1	Y00 to Y03
C00407	6	Y04 to Y07
C0080B	11	Y08 to Y0B
C00C0F	16	Y0C to Y0F
C01013	21	Y10 to Y13
C01417	26	Y14 to Y17
C0181B	31	Y18 to Y1B
C01C1F	36	Y1C to Y1F
C02023	51	Y20 to Y23
C02427	56	Y24 to Y27
C0282B	61	Y28 to Y2B
C02C2F	66	Y2C to Y2F

Common name	Pin No.	Corresponding device numbers
C030	71	Y30
C031	73	Y31
C032	75	Y32
C033	77	Y33
C034	79	Y34
C035	81	Y35
C036	83	Y36
C037	85	Y37
C038	87	Y38
C039	89	Y39
C03A	91	Y3A
C03B	93	Y3B
C03C3F	95	Y3C to Y3F

* The device numbers show the example when rotary switch CS1 is set to "0" and CS2 is set to "1".

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.3 Connection of DI/DO Signal

(3) Rotary switch (CS1, CS2) setting

CS1	Rotary switch CS1: Sets the 32-point station No. with remote I/O communication 1CH DI: X0-X1F and DO: Y0-Y1F. This is normally used set to "0".
CS2	Rotary switch CS2: Sets the 32-point station No. with remote I/O communication 1CH DI: X20-X3F and DO: Y20-Y3F. This is normally used set to "1".

The No. of stations occupied with this card is two stations.

(4) Remote I/O unit terminator

Connect a terminator to the last end of the remote I/O unit connected to the RIO 1 connector. When using two of these cards and not connecting any other remote I/O unit to RIO1, connect the terminator R-TM to the B side connector of the second RIO1. (The RIO1 A and B connectors are the same signal for relay, so the communication cable and terminator can be connected to either without problem.)

Terminator (R-TM)

Terminator type: R-TM



<Caution>

- * When using an inductive load such as a relay, always connect a diode (voltage resistance 100V or more, 100mA or more) in parallel to the load.
- * When using a lamp or capacitive load, always connect a protective resistor (R = 150Ω) serially to the load to suppress rush currents. (Make sure that the current is less than the above tolerable current including the momentary current.)



- ❗ When using an inductive load such as a relay, always connect a diode in parallel to the load.
- ❗ When using a lamp or capacitive load, always connect a protective resistor serially to the load to suppress rush currents.

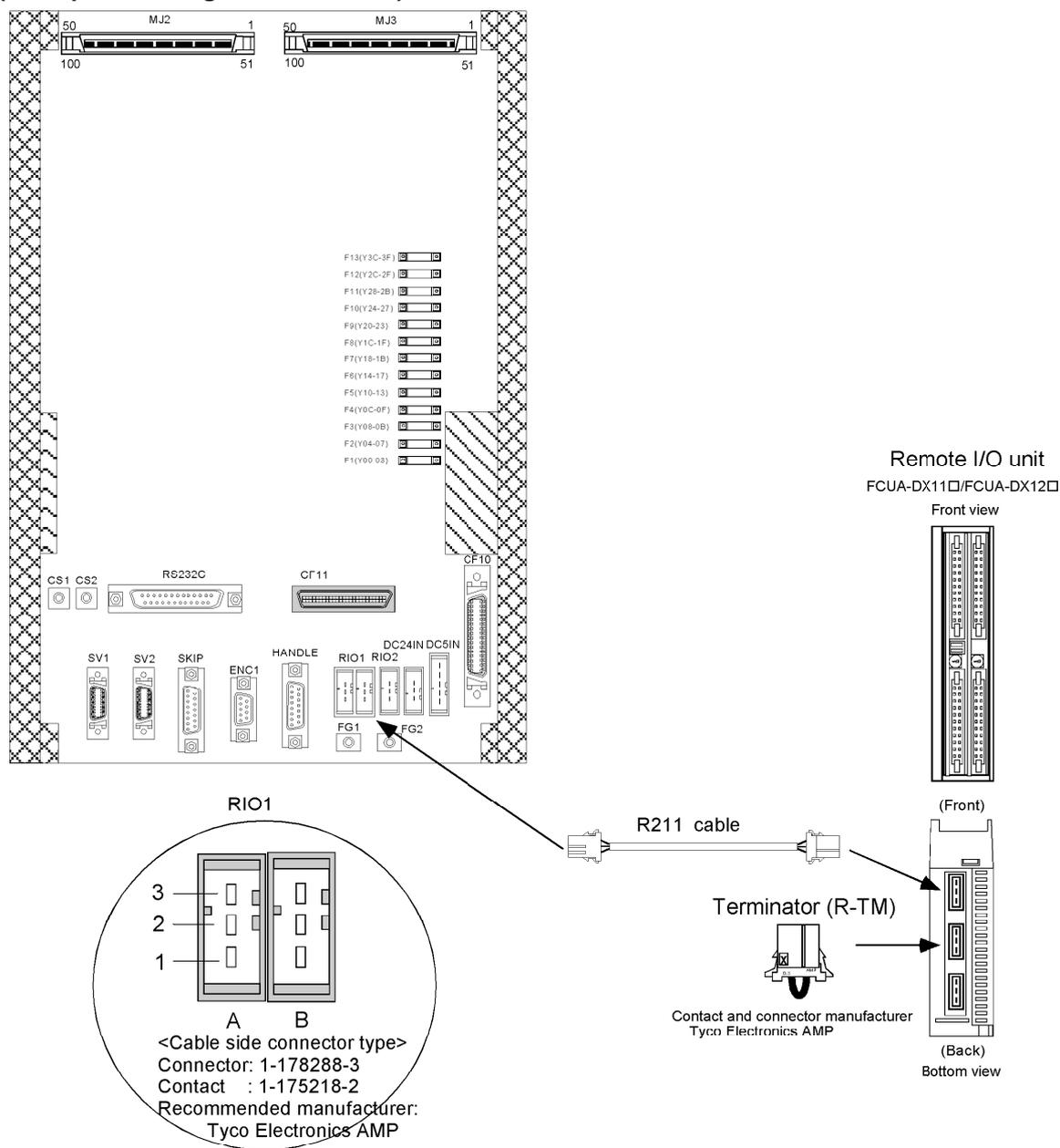
10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.4 Example of Remote I/O Unit Connection

10.4 Example of Remote I/O Unit Connection

Normally one of these units is used. A remote I/O unit is connected as an expansion I/O, and the No. of I/O points is configured to match the users' specifications. Using the first remote I/O communication system, this unit can be used as the 200mA-output DI/DO for the second and subsequent cards. In this case, the I/O connectors (SV1, SV2, SKIP, ENC1, HANDLE, RIO2, RS232C) other than MJ2 and MJ3 on the 2nd and following units are invalid.

Refer to Chapter 7 "CONNECTION OF REMOTE I/O UNIT" for details on the remote I/O unit.

(Example for using remote I/O unit)



RIO1 terminator

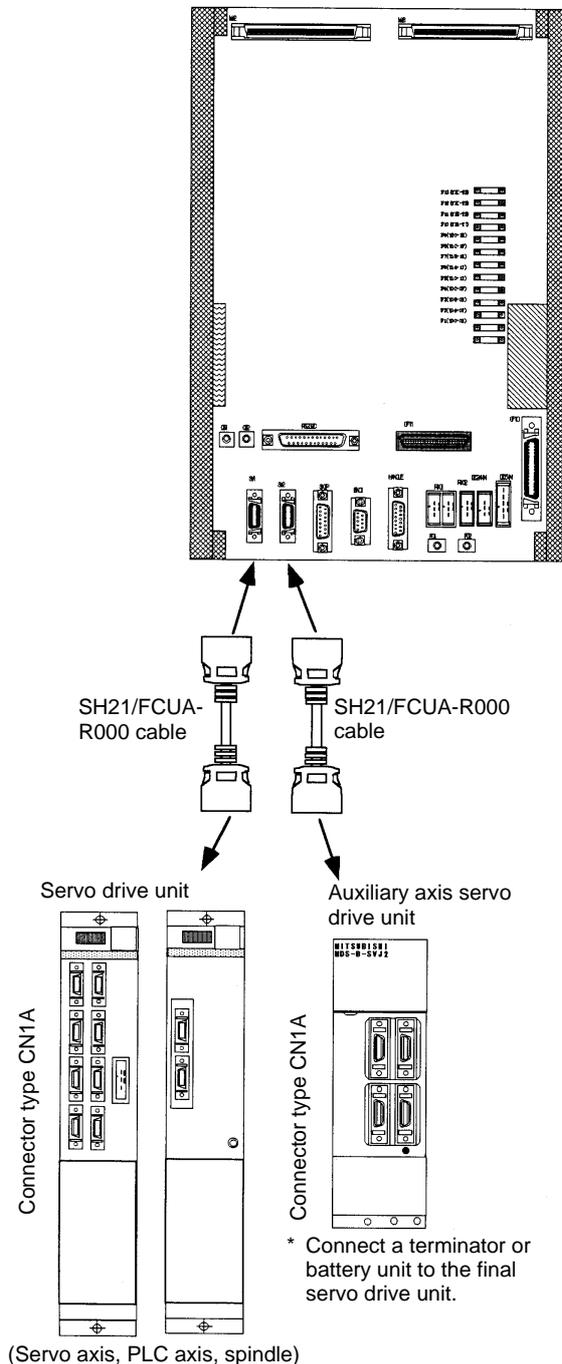
Connect a terminator to the last end of the remote I/O unit connected to RIO1 connector. When not using a remote I/O unit, connect the terminator R-TM to the RIO1 connector B side of this unit.

Terminator type: R-TM Refer to Appendix 2.22.

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.5 Connection of Servo Drive Unit

10.5 Connection of Servo Drive Unit

Connect the servo drive unit to SV1 (servo axis, PLC axis, spindle) and SV2 (auxiliary axis: MR-J2-CT) of the base I/O unit.



<Related items>

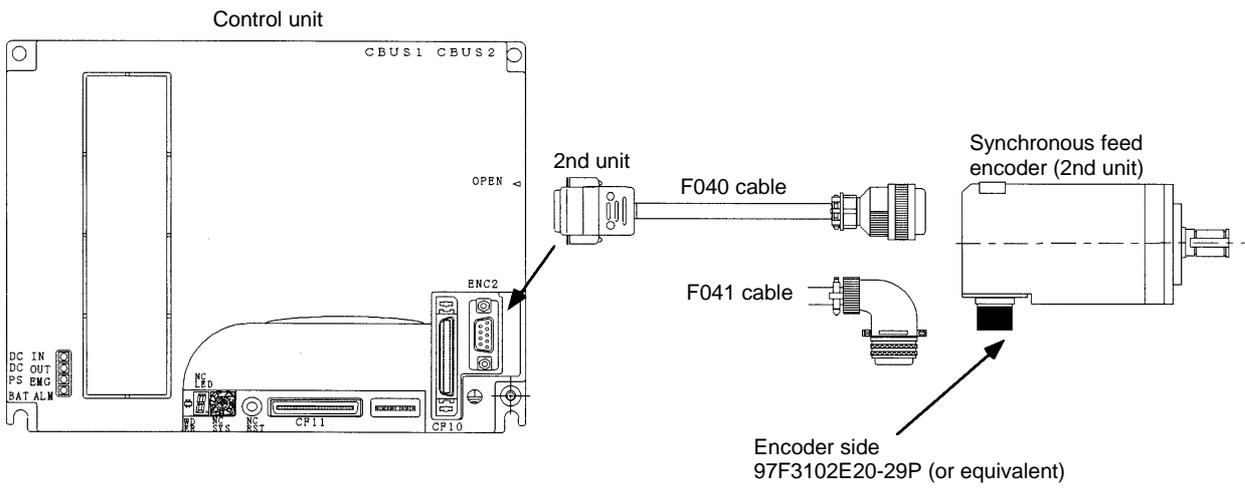
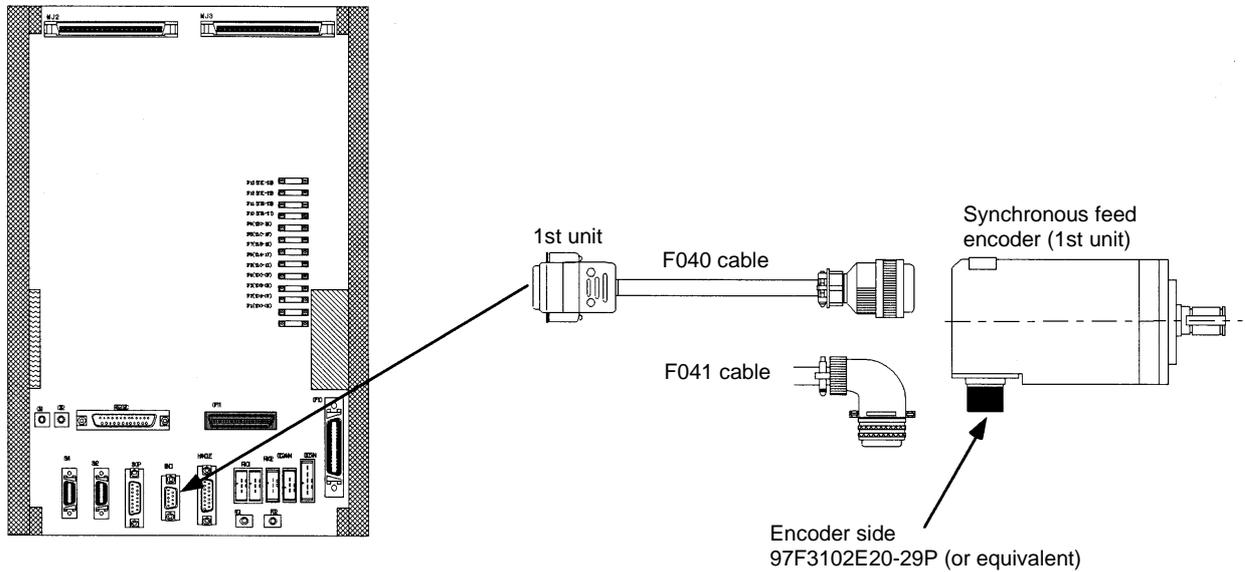
Cable manufacturing drawing: APPENDIX 2 (SH21 cable)

Connector pin assignment: 6.10 Base I/O Unit Connector Pin Assignment (SV1, SV2)

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.6 Connection of Synchronous Feed Encoder

10.6 Connection of Synchronous Feed Encoder

Connect the encoder to ENC1 on the base I/O unit. When connecting the second unit, connect it to ENC2 on the control unit.



A	ENC1A	K	0V
B	ENC1Z	L	
C	ENC1B	M	
D		N	ENC1A*
E	Case ground	P	ENC1Z*
F		R	ENC1B*
G		S	
H	5VDC	T	
J			

<Related items>

Outline drawing: APPENDIX 1

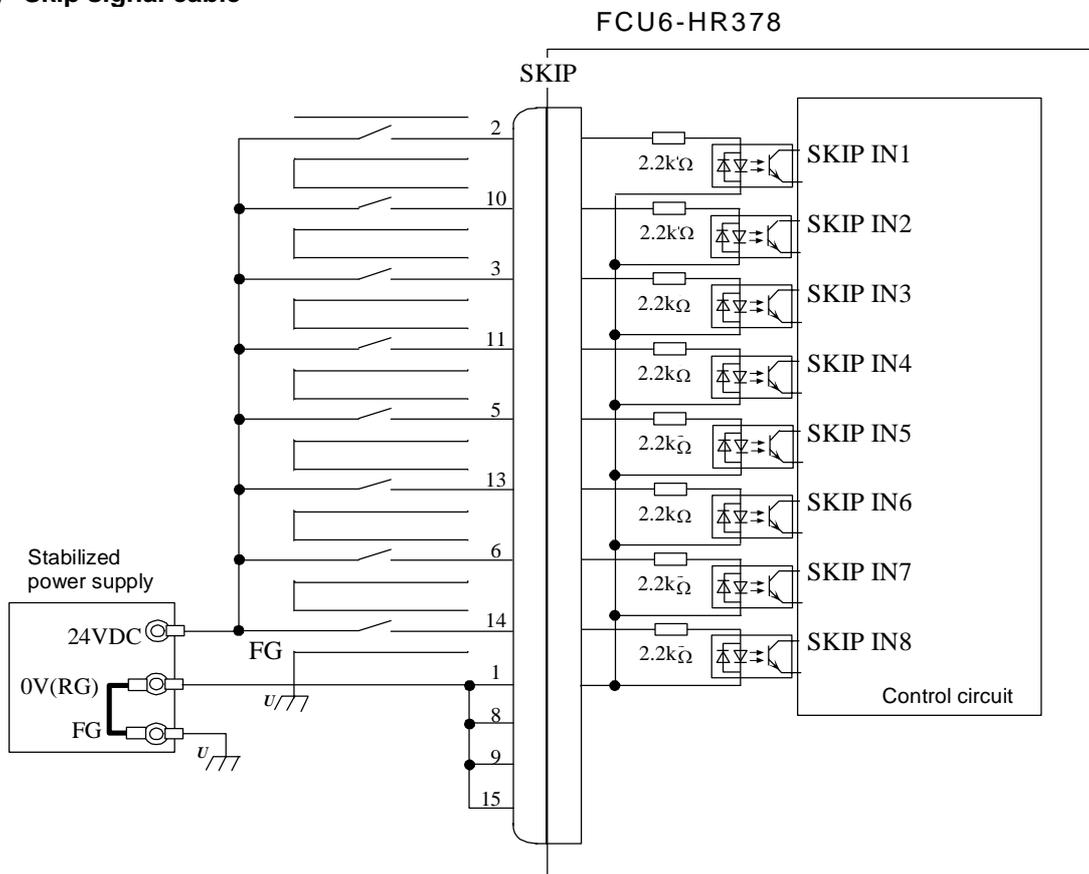
Cable manufacturing drawing: APPENDIX 2 (F040 cable)

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.7 Connection of Sip Signal (sensor)

10.7 Connection of Skip Signal (sensor)

Connect the skip signal to SKIP connector on the base I/O unit.
 The skip signal is used for processing the high-speed signals. Always shield the cable.

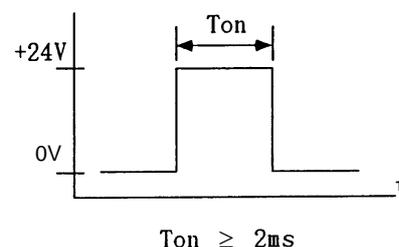
(1) Skip signal cable



(2) Input conditions

Use the input signal within the following condition range.

1	Input voltage at external contact ON	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more
3	Input voltage at external contact OFF	4V or less
4	Input current at external contact OFF	1mA or less
5	Input signal holding time (Ton)	2ms or more
6	Internal response time	0.08ms or less
7	Machine side contact capacity	30V or more, 16mA or more



⚠ CAUTION

- ⚠ Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.
- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.

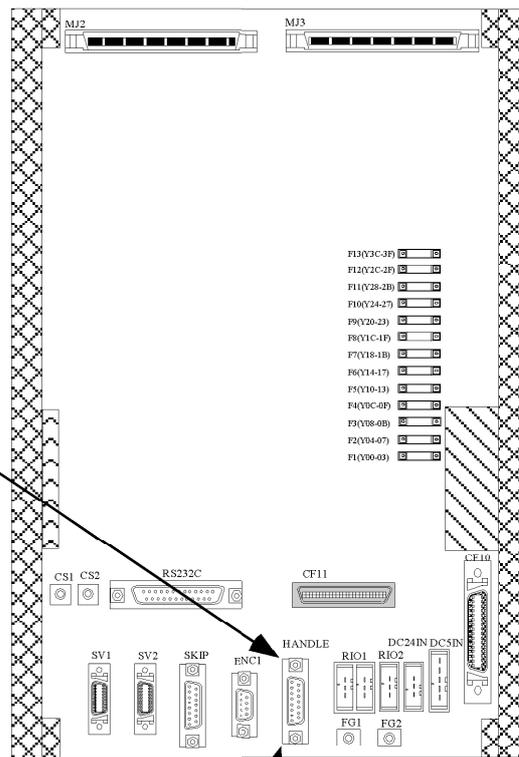
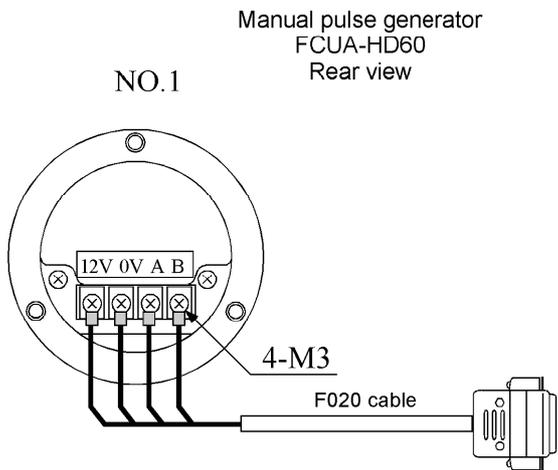
10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.8 Connection of Manual Pulse Generator

10.8 Connection of Manual Pulse Generator

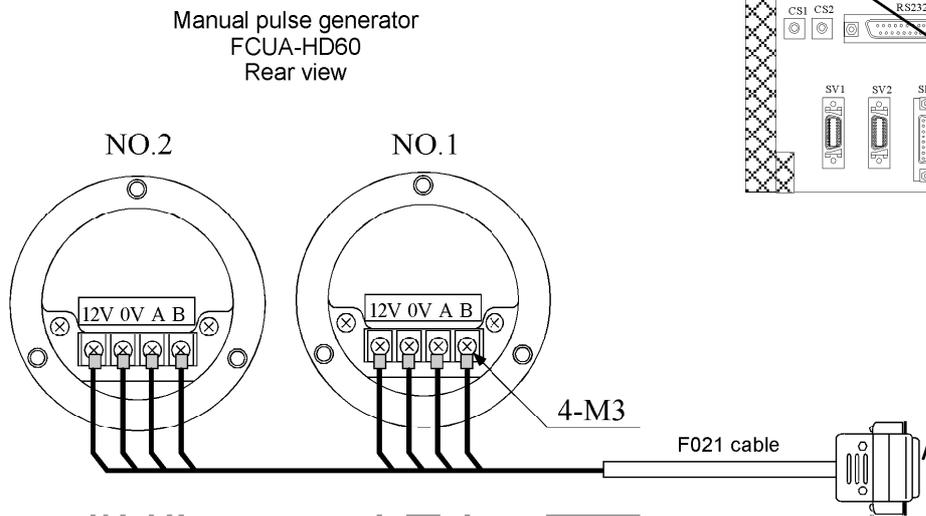
To connect the manual pulse generators, connect an F020/021/022 cable to "HANDLE" connector.
 Up to three manual pulse generators can be connected. In addition to the standard 12VDC power supply type, the manual pulse generator of the 5VDC power supply specifications can be used with this unit by using a dedicated cable.

(Refer to Appendix 2.5 F020/021/022 Cable Manufacturing Drawings for cable details.)

Connecting one manual pulse generator



Connecting two manual pulse generators



CAUTION

- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378

10.8 Connection of Manual Pulse Generator

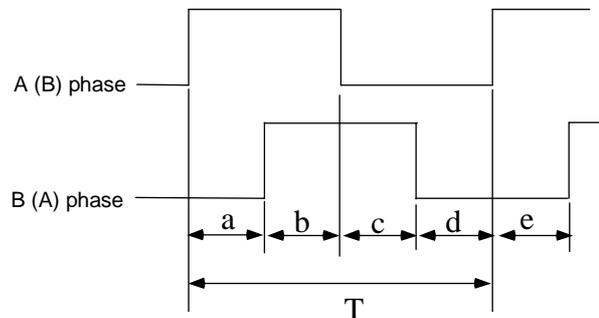
When devices (pulse generators) other than manual pulse generators (HD60) are connected to the FCU6-HR378, use within the ranges shown in the following specifications. The commercially- available manual pulse generators include the 25 pulse/rev type and 100 pulse/rev type. The MELDAS60/60S Series internally multiplies one pulse by four, so use the 25 pulse/rev type.

Input/output conditions

Input pulse signal type	90° phase difference between A phase and B phase. [Refer to waveform (e) below.]
Input signal voltage	H-level 3.5V to 5.25V, L-level 0V to 0.5V or less
Max. input pulse frequency	100kHz
Power voltage for pulse generator	12VDC \pm 10%
Max. output current	300mA
No. of pulses per rotation	25 pulse/rev (25 pulse/rev for HD60)

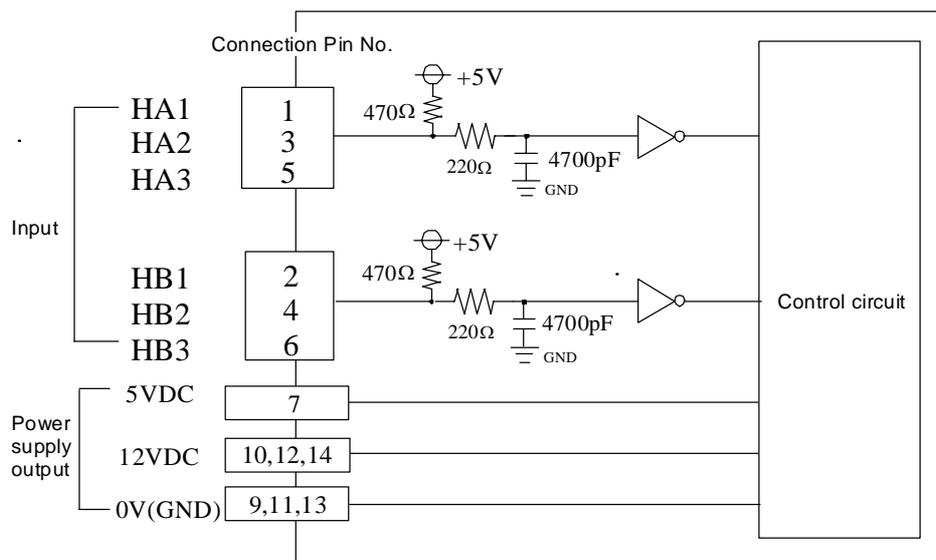
Input waveform

The input waveform phase difference must be $\pm T/10$ (T: cycle) or less.



a. b. c. d. e: A phase or B phase rising edge (falling edge) phase difference = $T/4 \pm T/10$
T: A or B phase cycle (Min. 10 μ s)

Input/output circuit



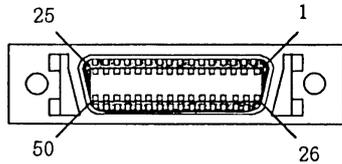
The power voltage supplied to the manual pulse generator can be changed between 5VDC and 12VDC by changing the cable wiring. Supply the power from pin 7 for the 5VDC power supply manual pulse generator, and from pins 10, 12 and 14 for the 12VDC power supply manual pulse generator. Use several power supply and 0V (GND) wire materials in the cable.

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378
10.9 Connector Pin Assignment

10.9 Connector Pin Assignment

Control unit connection terminal

CF10



Refer to section 4.2.8 Control Unit Connector Pin Assignment (CF10) for details on the connector pin assignment.

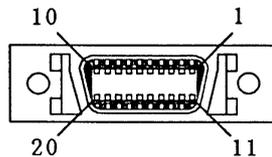
<Cable side connector type>

Plug : 10150-6000EL
 Shell : 10350-3210-000
 Recommended manufacturer: 3M

(Connect the connector case to shield.)

Servo drive unit connection terminal

SV1



1		GND	11		GND
2	O	SVTXD1	12	O	SVTXD1*
3	I	SVALM1	13	I	SVALM1*
4	I	SVRXD1	14	I	SVRXD1*
5		GND	15		GND
6			16		
7	O	SVEMG1	17	O	SVEMG1*
8			18		
9			19		
10	O	+5V	20		

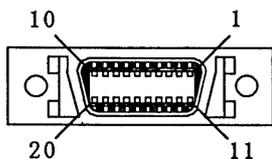
<Cable side connector type>

Plug : 10120-6000EL
 Shell : 10320-3210-000
 Recommended manufacturer: 3M

(Connect the connector case to shield.)

Servo drive unit connection terminal

SV2



1		GND	11		GND
2	O	SVTXD2	12	O	SVTXD2*
3	I	SVALM2	13	I	SVALM2*
4	I	SVRXD2	14	I	SVRXD2*
5		GND	15		GND
6			16		
7	O	SVEMG2	17	O	SVEMG2*
8			18		
9			19		
10	O	+5V	20		

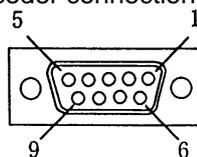
<Cable side connector type>

Plug : 10120-6000EL
 Shell : 10320-3210-000
 Recommended manufacturer: 3M

(Connect the connector case to shield.)

Synchronous feed encoder connection terminal

ENC1



1	I	ENC1A	6	I	ENC1A*
2	I	ENC1B	7	I	ENC1B*
3	I	ENC1Z	8	I	ENC1Z*
4		GND	9	O	+5V
5		GND			

<Cable side connector type>

Connector : CDE-9PF
 Contact : CD-PC-111
 Case : HDE-CTH
 Recommended manufacturer: Hirose Electric

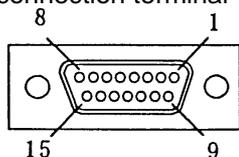
(Connect the connector case to shield.)

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378

10.9 Connector Pin Assignment

Skip signal input connection terminal

SKIP



<Cable side connector type>

Connector : CDA-15P

Contact : CD-PC-111

Case : HDA-CTH

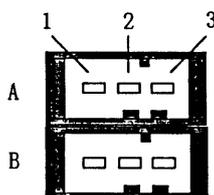
Recommended manufacturer: Hirose Electric

1		GND	9		GND
2	I	SKIP IN1	10	I	SKIP IN2
3	I	SKIP IN3	11	I	SKIP IN4
4			12		
5	I	SKIP IN5	13	I	SKIP IN6
6	I	SKIP IN7	14	I	SKIP IN8
7			15		GND
8		GND			

(Connect the connector case to shield.)
(Use a nickel-base chrome-plated part.)

Remote I/O unit connection terminal

RIO1



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

Recommended manufacturer:

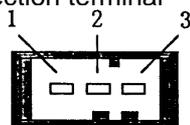
Tyco Electronics AMP

1	I/O	TXRX1
2	I/O	TXRX1*
3		GND

(* A and B are used for the remote I/O unit next station relay. The cable can be connected to either connector.)

Remote I/O unit connection terminal

RIO2



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

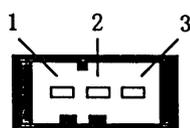
Recommended manufacturer:

Tyco Electronics AMP

1	I/O	TXRX2
2	I/O	TXRX2*
3		GND

Power input terminal (24VDC)

DC24IN



<Cable side connector type>

Connector : 2-178288-3

Contact : 1-175218-5

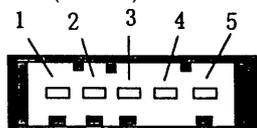
Recommended manufacturer:

Tyco Electronics AMP

1	I	24VDC
2		0V (RG)
3		FG

Power input terminal (5VDC)

DC5IN



<Cable side connector type>

Connector : 2-178288-5

Contact : 1-175218-5

Recommended manufacturer:

Tyco Electronics AMP

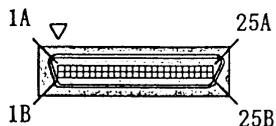
1		NC (Not used)
2		NC (Not used)
3		5VDC
4		0V (GND)
5		FG

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378

10.9 Connector Pin Assignment

Control unit connection terminal

CF11



Refer to section 4.2.8 Control Unit Connector Pin Assignment (CF11) for details on the connector pin assignment.

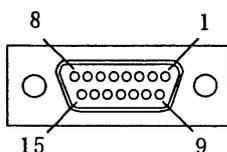
<Cable side connector type>

Connector: DHD-RB50-20AN

Recommended manufacturer: DDK

Manual pulse generator connection terminal

HANDLE



1	I	1HA	9		GND
2	I	1HB	10	O	12VDC
3	I	2HA	11		GND
4	I	2HB	12	O	12VDC
5	I	3HA	13		GND
6	I	3HB	14	O	12VDC
7	O	5VDC	15		
8					

<Cable side connector type>

Connector : CDA-15P

Contact : CD-PC-111

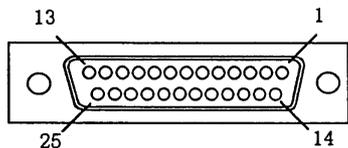
Case : HDA-CTH

Recommended manufacturer: Hirose Electric

(Connect the connector case to shield.)
(Use a nickel-base chrome-plated part.)

RS-232C device connection terminal

RS232C



1			14	O	SD1 (Note)
2	O	SD2	15	O	ER1 (Note)
3	I	RD2	16	I	RD1 (Note)
4	O	RS2	17	I	CS1 (Note)
5	I	CS2	18		
6	I	DR2	19	O	RS1 (Note)
7		GND	20	O	ER2
8			21	I	DR1 (Note)
9			22		
10			23		
11		GND	24		GND
12		reserve	25		24VDC
13					

Explanation of signals

SD: Send Data
RD: Receive Data
RS: Request to Send
CS: Clear to Send
DR: Data Set Ready
ER: Data Terminal Ready

(Note)

Signal name meanings:
□□1: For maintenance by service personnel
□□2: General released channel

<Cable side connector type>

Connector : CDB-25P

Contact : CD-PC-111

Case : HDB-CTH

Recommended manufacturer:
Hirose Electric

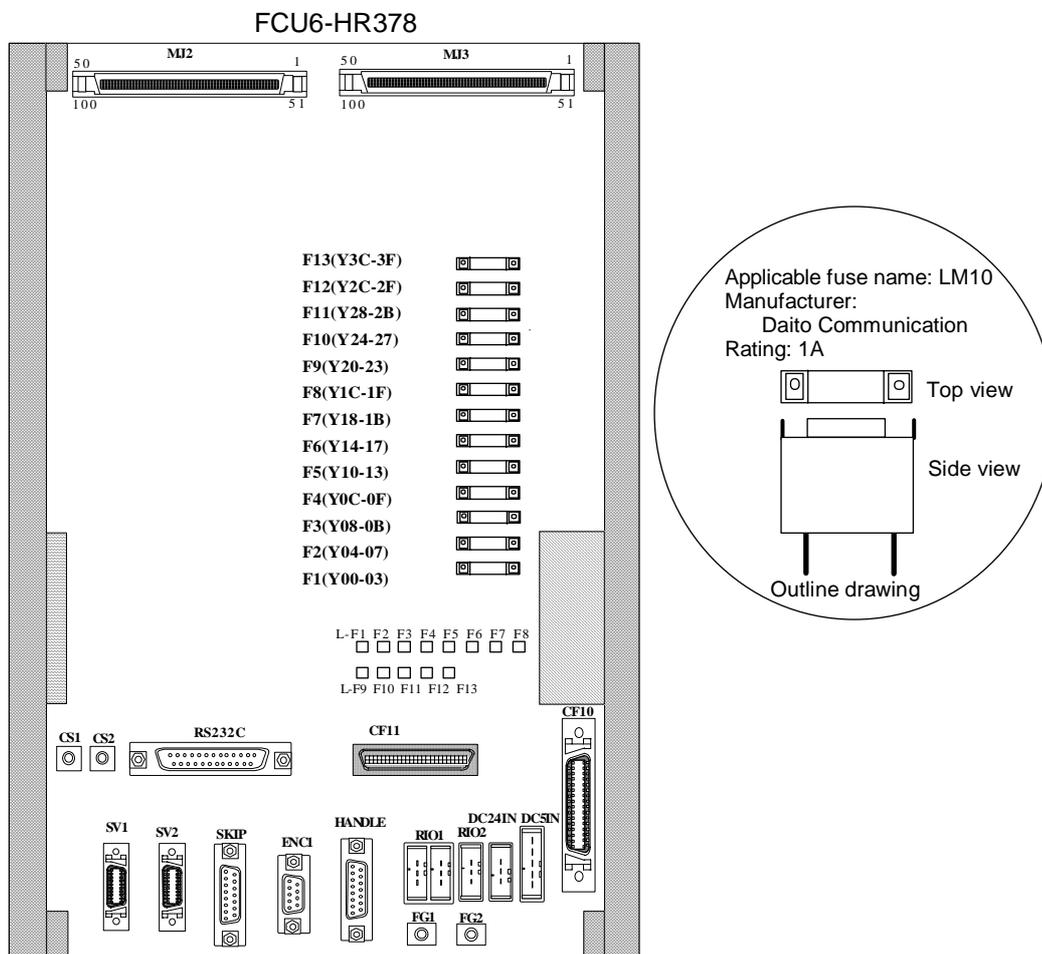
(Connect the connector case to shield.)
(Use a nickel-base chrome-plated part.)

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378

10.10 Fuse for Machine Output Circuit Protection

10.10 Fuse for Machine Output Circuit Protection

At every 4-point output, the machine output (DO) circuit has a fuse for burning protection if any circuit should short-circuit. The 1 common Y30 to Y3B outputs for each 1-point output do not have a fuse.



Output name	Fuse name						
Y0	F1	Y10	F5	Y20	F9	Y30	F16
Y1	F1	Y11	F5	Y21	F9	Y31	F16
Y2	F1	Y12	F5	Y22	F9	Y32	F16
Y3	F1	Y13	F5	Y23	F9	Y33	F16
Y4	F2	Y14	F6	Y24	F10	Y34	F15
Y5	F2	Y15	F6	Y25	F10	Y35	F15
Y6	F2	Y16	F6	Y26	F10	Y36	F15
Y7	F2	Y17	F6	Y27	F10	Y37	F15
Y8	F3	Y18	F7	Y28	F11	Y38	F12
Y9	F3	Y19	F7	Y29	F11	Y39	F12
YA	F3	Y1A	F7	Y2A	F11	Y3A	F12
YB	F3	Y1B	F7	Y2B	F11	Y3B	F12
YC	F4	Y1C	F8	Y2C	F12	Y3C	F11
YD	F4	Y1D	F8	Y2D	F12	Y3D	F11
YE	F4	Y1E	F8	Y2E	F12	Y3E	F11
YF	F4	Y1F	F8	Y2F	F12	Y3F	F11

Caution: The FCU6-HR378 unit fuse is inserted as protection against an instantaneous overcurrent that could occur during a short-circuit, etc. If a current of approx. 200mA to 1A flows to one output, protection of the circuit could be difficult.

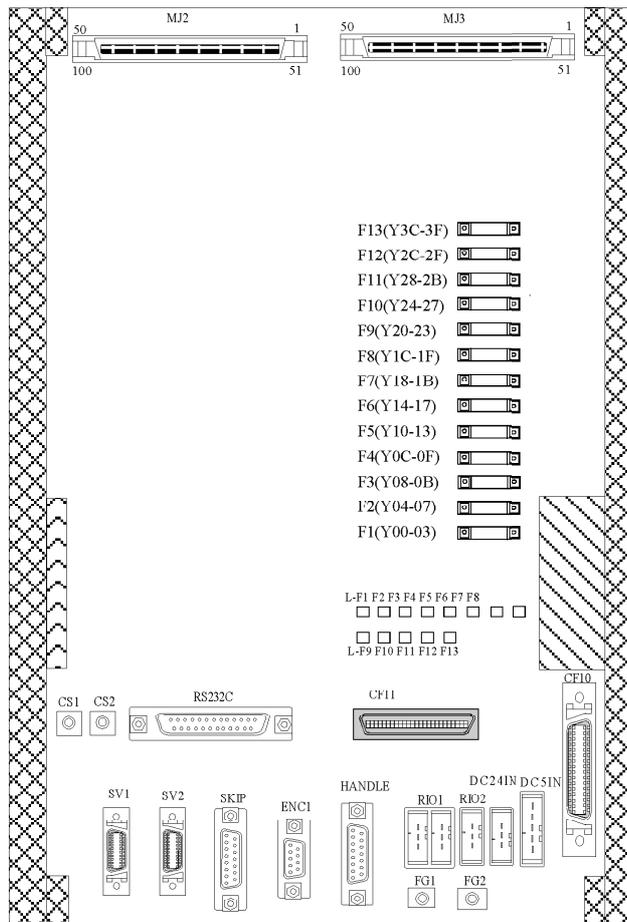


- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

10. CONNECTION OF 200mA OUTPUT DI/DO UNIT FCU6-HR378

10.11 Explanation of LED Function

10.11 Explanation of LED Function



Name	Function	Color	Status		Correspondence for error	
			When normal	During error		
LED 1 (two-color LED)	24IN	24VDC input check	Green	Lit	Not lit	Check 24VDC voltage
	RIO1	Rotary switch [CS1] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
LED 2 (two-color LED)	5OUT	Internal output voltage check	Green	Lit	Not lit	Contact the Mitsubishi Service Center
	RIO2	Rotary switch [CS2] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
L-F1	Y00 to 03 energization to fuse F1	Green	Lit	Not lit	Check CO0003 voltage	
L-F2	Y04 to 04 energization to fuse F2	Green	Lit	Not lit	Check CO0407 voltage	
L-F3	Y08 to 0B energization to fuse F3	Green	Lit	Not lit	Check CO080B voltage	
L-F4	Y0C to 0F energization to fuse F4	Green	Lit	Not lit	Check CO0C0F voltage	
L-F5	Y10 to 13 energization to fuse F5	Green	Lit	Not lit	Check CO1013 voltage	
L-F6	Y14 to 17 energization to fuse F6	Green	Lit	Not lit	Check CO1417 voltage	
L-F7	Y18 to 1B energization to fuse F7	Green	Lit	Not lit	Check CO181B voltage	
L-F8	Y1C to 1F energization to fuse F8	Green	Lit	Not lit	Check CO1C1F voltage	
L-F9	Y20 to 23 energization to fuse F9	Green	Lit	Not lit	Check CO2023 voltage	
L-F10	Y24 to 27 energization to fuse F10	Green	Lit	Not lit	Check CO2427 voltage	
L-F11	Y28 to 2B energization to fuse F11	Green	Lit	Not lit	Check CO282B voltage	
L-F12	Y2C to 2F energization to fuse F12	Green	Lit	Not lit	Check CO2C2F voltage	
L-F13	Y3C to 3F energization to fuse F13	Green	Lit	Not lit	Check CO3C3F voltage	

11. CONNECTION OF QY231 EXTENDED I/O CARD
11.1 Outline

11. CONNECTION OF QY231 EXTENDED I/O CARD

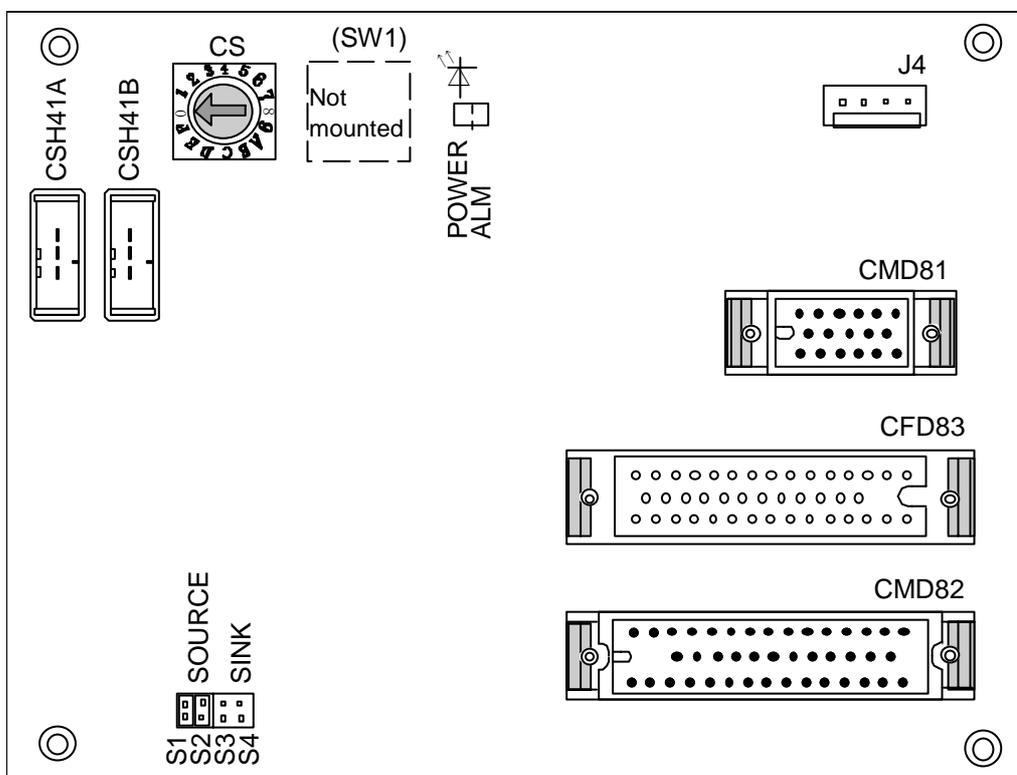
11.1 Outline

QY231 is the machine input/output and operation board input/output card connected to the base I/O unit's remote I/O communication or communication terminal remote I/O communication (MC link B).

Compatible machine control signals	No. of occupied stations
Digital input signal (DI) : 64 points (photocoupler insulation) sink/source shared type	2
Digital output signal (DO) : 48 points (non-insulation) source type	

11.2 Hardware Interface

(1) Connector layout diagram

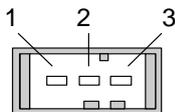


11. CONNECTION OF QY231 EXTENDED I/O CARD

11.2 Hardware Interface

(2) Pin assignments

Remote I/O unit connection terminal
CSH41A/B



<Cable side connector type>

Connector : 1-178288-3

Contact : 1-175218-2

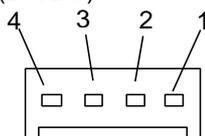
Recommended manufacturer :

Tyco Electronics AMP

1	I/O	TXRX
2	I/O	TXRX*
3		0V(LG)

Power input terminal (24VDC)

J4



<Cable side connector type>

Connector : 5251-04

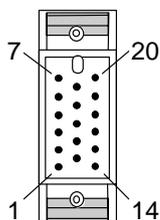
Contact : 5659PBT2L

Recommended manufacturer : MOLEX

1		0V(RG)
2		24VDC
3		24VDC
4		0V(RG)

Machine input terminal

CMD81/CMD82



<Cable side connector type>

Connector : MRP20F01

Contact : MRPF102

Case : MR20W

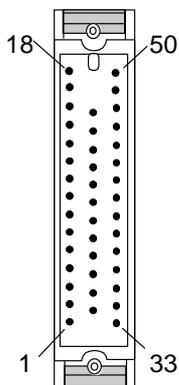
Recommended

manufacturer :

HONDA TSUSHIN KOGYO

CMD81

7	0V(RG)	13		20	24VDC
6		12	X36	19	X37
5	X35	11	X33	18	X34
4	X32	10	X30	17	X31
3	X3F	9	X3D	16	X3E
2	X3C	8	X3A	15	X3B
1	X39			14	X38



<Cable side connector type>

Connector : MRP50F01

Contact : MRPF102

Case : MR50W

Recommended

manufacturer :

HONDA TSUSHIN KOGYO

CMD82

18	0V(RG)			50	X27
17	X26			49	X25
16	X24	32	X22	48	X23
15	X21	31	X2F	47	X20
14	X2E	30	X2C	46	X2D
13	X2B	29	X29	45	X2A
12	X28	28	X16	44	X17
11	X15	27	X13	43	X14
10	X12	26	X10	42	X11
9	X1F	25	X1B	41	X1E
8	X1D	24	X18	40	X1C
7	X1A	23	X05	39	X19
6	X07	22	X02	38	X06
5	X04	21	X0F	37	X03
4	X01	20	X0C	36	X00
3	X0E	19	X09	35	X0D
2	X0B			34	X0A
1	X08			33	24VDC



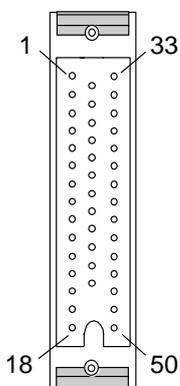
* This examples shows CS1 set to "0" and CS2 set to "1".

Refer to the PLC Interface Manual for details.

11. CONNECTION OF QY231 EXTENDED I/O CARD

11.2 Hardware Interface

Machine output terminal
CFD83



<Cable side connector type>
 Connector : MRP50M01
 Contact : MRPM102
 Case : MR50W
 Recommended manufacturer :
 HONDA TSUSHIN KOGYO

CFD83					
1	Y08			33	24VDC
2	Y0B			34	Y0A
3	Y0E	19	Y09	35	Y0D
4	Y01	20	Y0C	36	Y00
5	Y04	21	Y0F	37	Y03
6	Y07	22	Y02	38	Y06
7	Y1A	23	Y05	39	Y19
8	Y1D	24	Y18	40	Y1C
9	Y1F	25	Y1B	41	Y1E
10	Y12	26	Y10	42	Y11
11	Y15	27	Y13	43	Y14
12	Y28	28	Y16	44	Y17
13	Y2B	29	Y29	45	Y2A
14	Y2E	30	Y2C	46	Y2D
15	Y21	31	Y2F	47	Y20
16	Y24	32	Y22	48	Y23
17	Y26			49	Y25
18	0V(RG)			50	Y27



* This examples shows CS1 set to "0" and CS2 set to "1".
 Refer to the PLC Interface Manual for details.

(3) Rotary switch

Set the address (station No.) assignment for two stations in DI/DO: 64/48 point units. Set using the CS1 rotary switch. The assignment address is changed with the rotary switch setting.

CS1	
Setting	Function
0	Remote I/O station 0, 1 station selection
1	Invalid
2	Remote I/O station 2, 3 station selection
3	Invalid
4	Remote I/O station 4, 5 station selection
5	Invalid
6	Remote I/O station 6, 7 station selection
7	Invalid
8~F	Setting prohibited



CS1

* The X○ and Y○ assignments are reference values. When actually making the assignment, add DI/DO assignment No. to the head address assigned to each remote IO unit station No.

(4) Setting switches

Set the digital input sink type and source type changeover.

S1, S2	S3, S4	Function
ON	OFF	Source input selection
OFF	ON	Sink input selection

11. CONNECTION OF QY231 EXTENDED I/O CARD

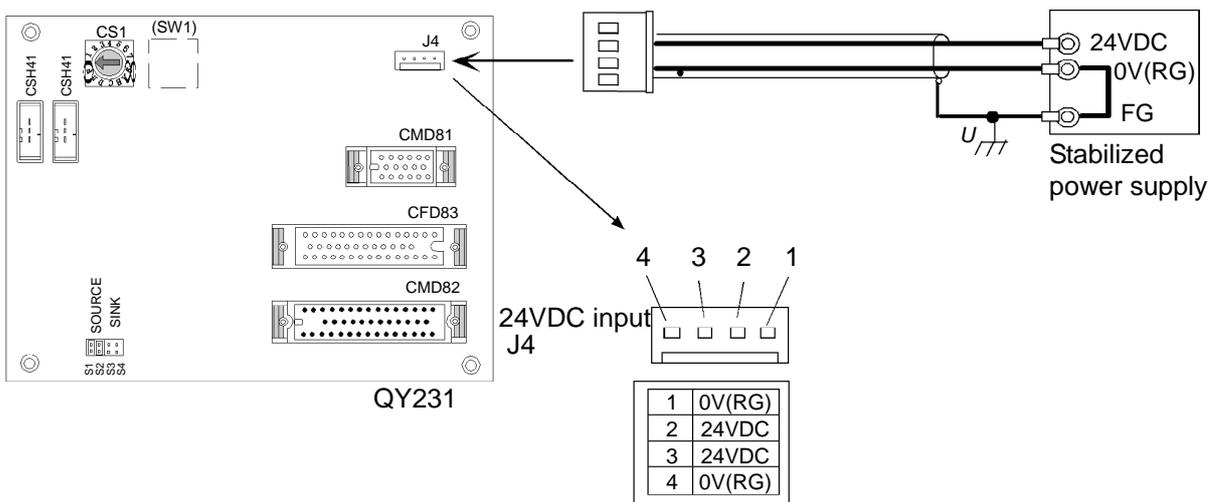
11.3 Connections

11.3 Connections

(1) External power supply (DCIN)

24VDC is required for card operation. Prepare a stabilized power supply that satisfies the following specifications.

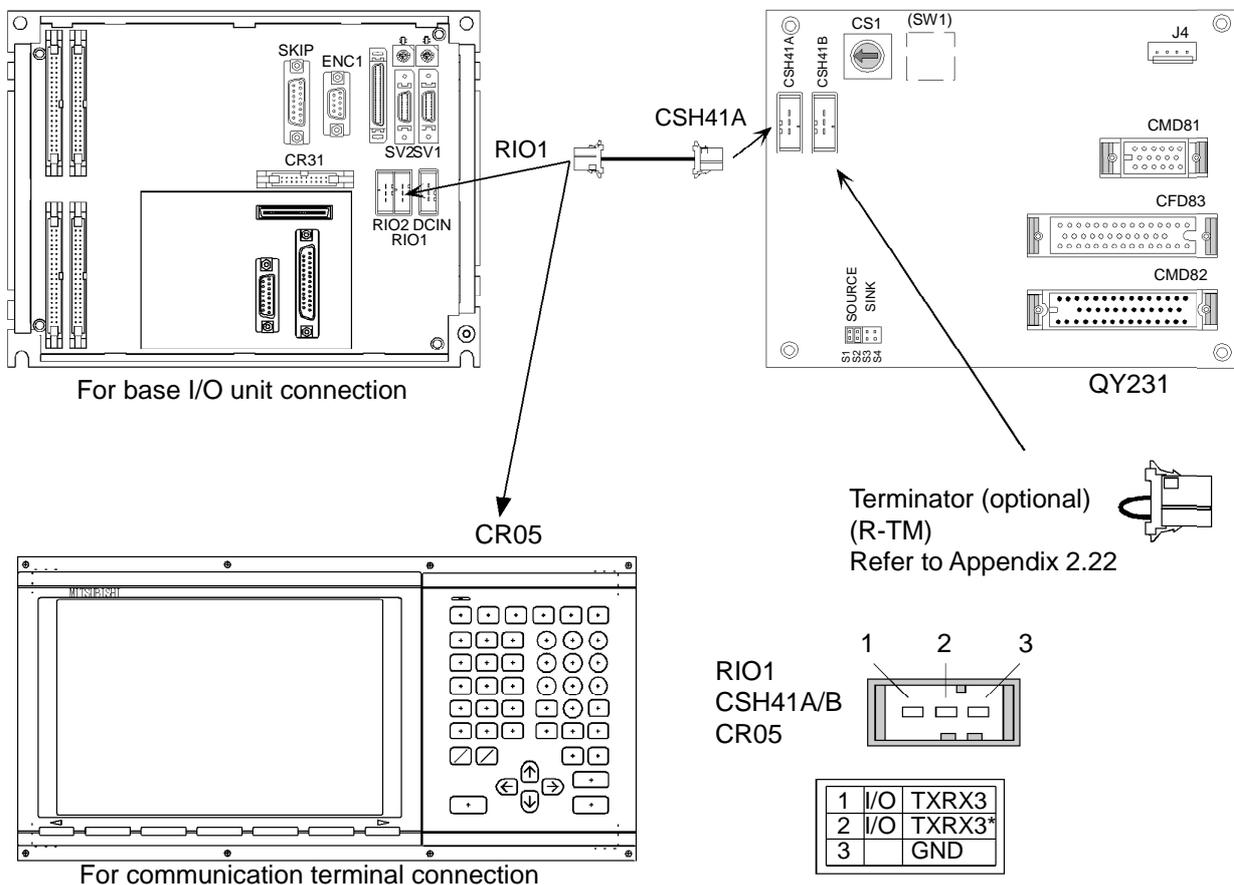
Rated output : 24VDC \pm 5% * The rated output current is the value when using 60mA \times 48 points for the machine output (DO). Prepare a power supply that satisfies the 24VDC output's total output current.
 Ripple : \pm 5% (P-P)
 Rated current : 3.8A



(2) Remote I/O connections (CSH41A/B)

1) Connection of the CSH41A connector

Connect the CSH41A connector to the base I/O unit RIO1 connector, or CR05 connector for the operation board remote I/O communication.



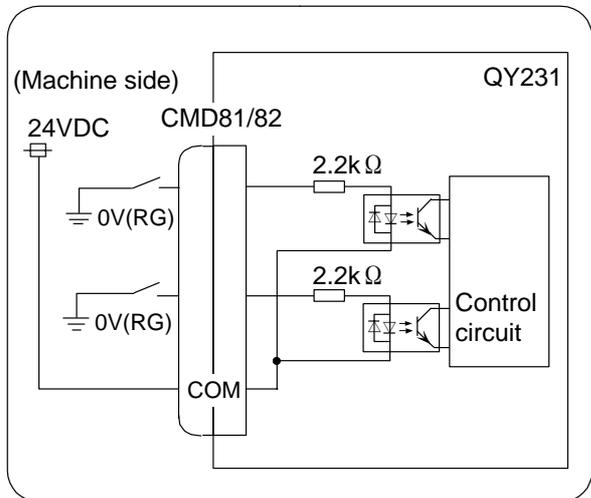
11. CONNECTION OF QY231 EXTENDED I/O CARD

11.3 Connections

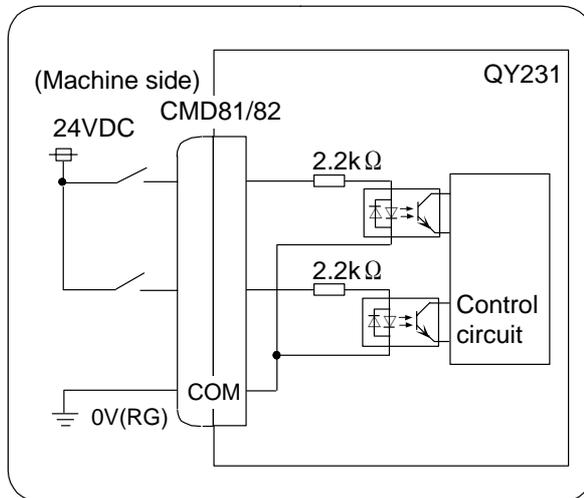
(3) Machine input terminal (CMD81, CMD82)

The following shows the sink type input circuit corresponding to the machine side sink output, and source type input circuit corresponding to the machine side source output.

Sink type



Source type



⚠ Do not apply any voltage to the connector other than that specified in this manual. Failure to observe this could cause bursting, damage, etc.

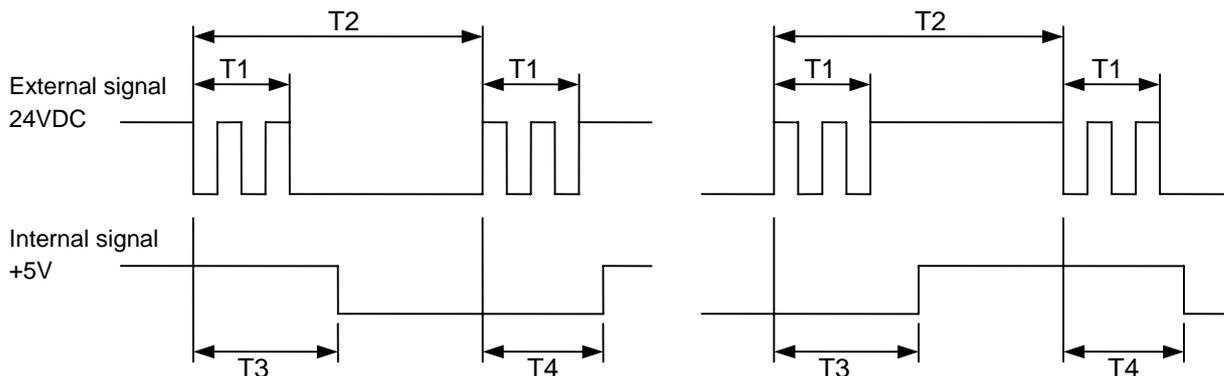
Input conditions

Set so the input conditions are within the ranges shown in the following conditions.

		Sink type	Source type
1	Input voltage at external contact ON	6V or less	18V or more, 25.2V or less
2	Input current at external contact ON	9mA or more	
3	Input voltage at external contact OFF	20V or more, 25.2V or less	4V or less
4	Input current at external contact OFF	2mA or less	
5	Tolerable chattering time	3ms or less (Refer to T1 below.)	
6	Input signal holding time	40ms or more (Refer to T2 below.)	
7	Input circuit operation delay time	$3\text{ms} \leq T3 \leq T4 \leq 16\text{ms}$	
8	Machine side contact capacity	30V or more, 16mA or more	

<Caution>

Input signal holding time: 40ms or more as a guideline. The input signal can only be confirmed if held longer than the ladder process cycle time.



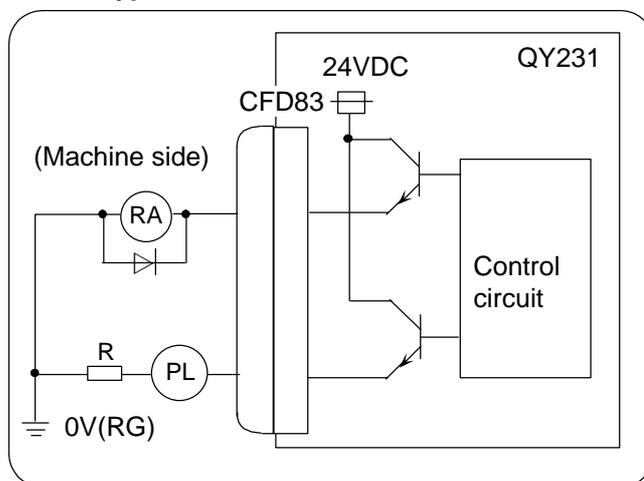
11. CONNECTION OF QY231 EXTENDED I/O CARD

11.3 Connections

(4) Machine output terminal (CFD83)

The QY231 output circuit is a source type (source output).

Source type



- ⚠ Do not apply any voltage to the connector other than that specified in this manual. Failure to observe this could cause bursting, damage, etc.**

Output conditions

Insulation method	Non-insulation
Rated load voltage	24VDC
Max. output current	60mA/point
Saturation voltage	1.6V (standard)
Output delay time	40μs

<Caution>

- * When using an inductive load such as a relay, always connect a diode (voltage resistance 100V or more, 100mA or more) in parallel to the load.
- * When using a lamp or capacitive load, always connect a protective resistor ($R = 150\Omega$) serially to the load to suppress rush currents. (Make sure that the current is less than the above tolerable current including the momentary current.)

11. CONNECTION OF QY231 EXTENDED I/O CARD

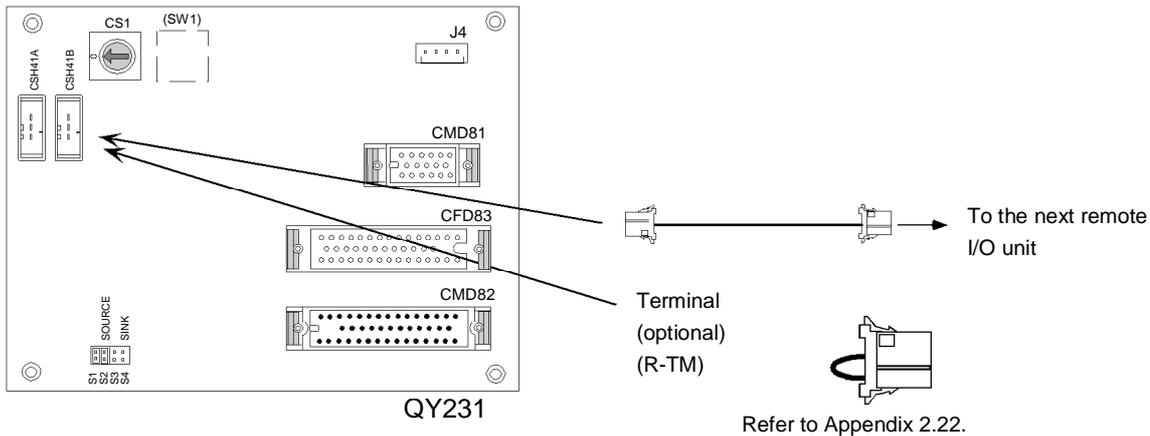
11.3 Connections

1) Connection of the remote I/O unit

When the remote I/O unit is connected with a serial link, multiple units can be combined and used in a range of eight or less total occupied stations. (Refer to the Connection Manual, Chapter 6 "CONNECTION OF REMOTE I/O UNIT" for details.)

QY231 occupies two stations, so the remote I/O units including this card can be connected to RIO1 of the base I/O unit in combinations of 6 stations or less.

Connect a terminator R-TM to the CSH41B when it is not connected to any device.



12. OPTION CARD

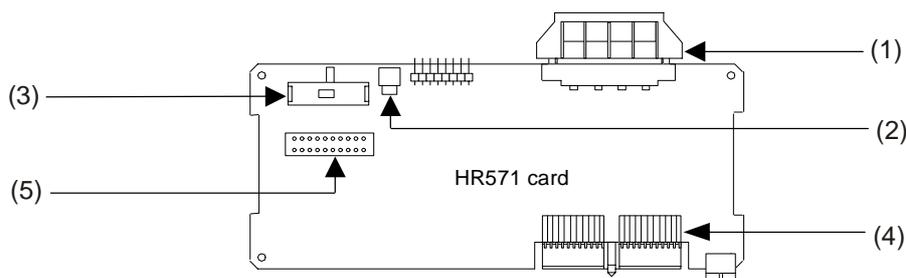
12.1 External PLC Link I (M-NET Interface)

12. OPTION CARD

12.1 External PLC Link I (M-NET Interface)

The Mitsubishi sequencer (MELSEC A Series) and MELDAS60 Series can be connected serially. A multi-drop link can be established, but the NC side cannot be set as the master station. This function is an option. Refer to the respective NC system specifications for details.

12.1.1 Names and Functions of Each Section

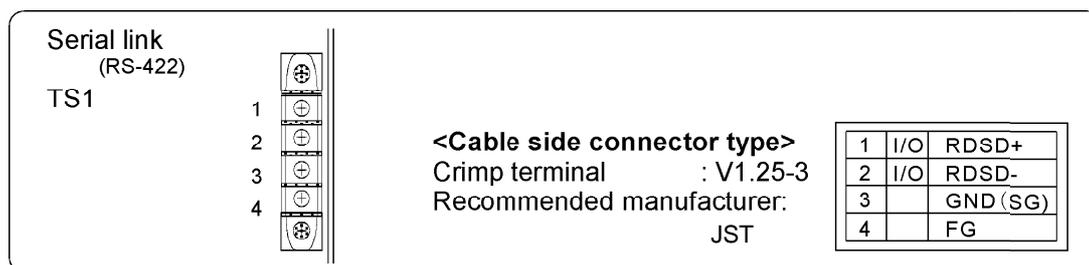


No.	Connector name	Function explanation
(1)	TS1	Serial link connection terminal
(2)	SW2	Operation mode setting rotary switch (Normally: 0)
(3)	SW1	Terminator setting switch (OFF ← → ON)
(4)	RTBUS	NC dedicated bus connection connector
(5)	TEST	Mitsubishi test terminal (Not used)

Accessories

No cables, etc., are enclosed.
This card is mounted in the control unit's extension slot.

12.1.2 Connector Pin Assignment



CAUTION

- Incorrect connections could damage the device, so always connect the cable to the designated connector.
- Do not connect or disconnect the connection cables between each unit while the power is ON.

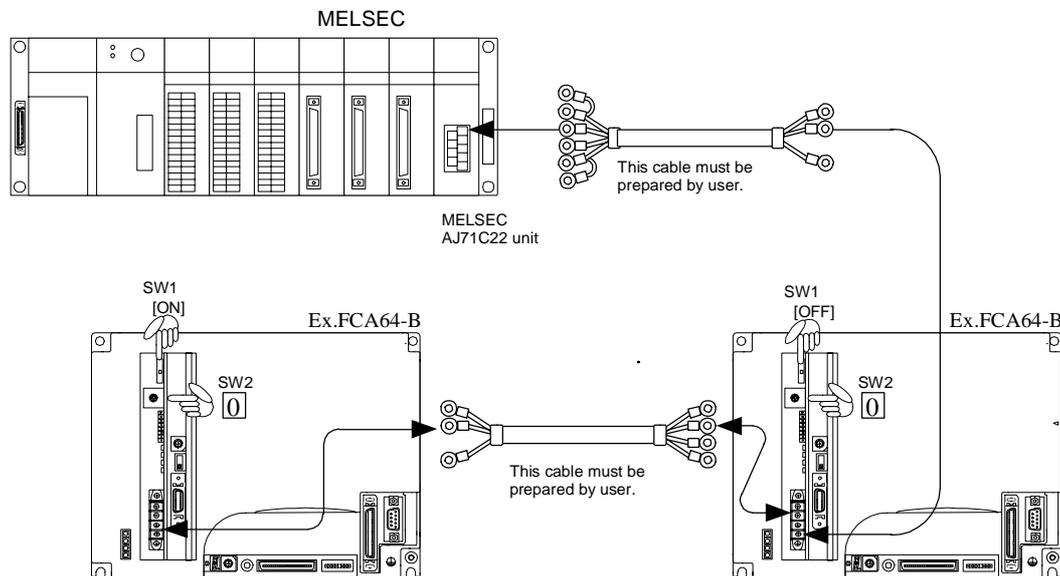
12. OPTION CARD

12.1 External PLC Link I (M-NET Interface)

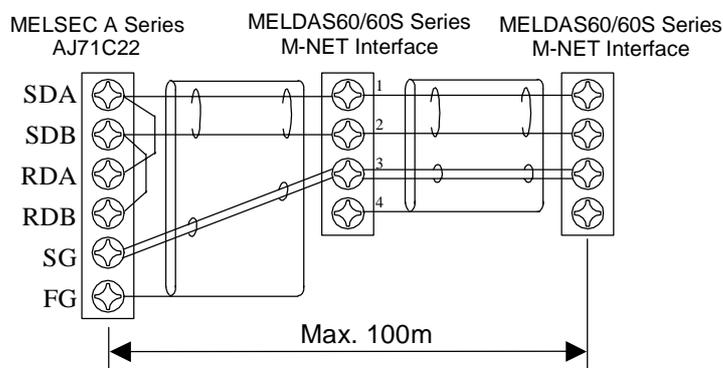
12.1.3 Connection with MELSEC

MELDAS60 act as serial link slave stations.

An example of the connection is shown below. Refer to each sequencer manual when connecting with the NC side control unit.



Example of cable connection



- (1) Up to seven slave stations can be linked.
- (2) When connecting the AJ71C22 and a slave station, position the AJ71C22 at the final end as shown above.
- (3) The maximum overall distance of the cable from the AJ71C22 to the final slave station is 100m.
- (4) Validate (turn ON) the terminator setting for the final slave station, and invalidate (turn OFF) the terminator for the other slave stations.
The final slave station is the slave station positioned at the final end of the transmission route. This is not related to the set station No.
- (5) In addition to M60/60S Series, models that support a serial link connection can be incorporated as slave stations within the same link.
- (6) The HR571 rotary switch is normally set to 0. Correct communication may not be possible if the setting is changed.

CAUTION

- ⚠ **Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- ⊘ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

12. OPTION CARD

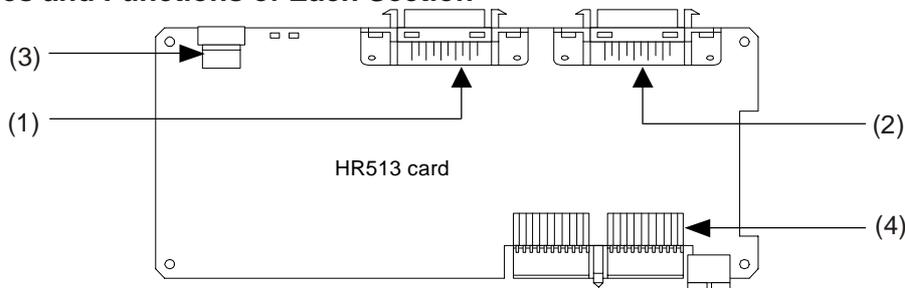
12.2 External PLC II (MELSEC bus connection)

12.2 External PLC II (MELSEC bus connection)

The Mitsubishi sequencer (MELSEC A Series) and MELDAS60/60S Series can be connected with a bus. Up to four NC control units can be connected to one sequencer.

One NC unit occupies one stage (0 slot) of the sequencer extension unit. Refer to the sequencer and NC system specifications for the number of stages that can be extended. This function is an option.

12.2.1 Names and Functions of Each Section



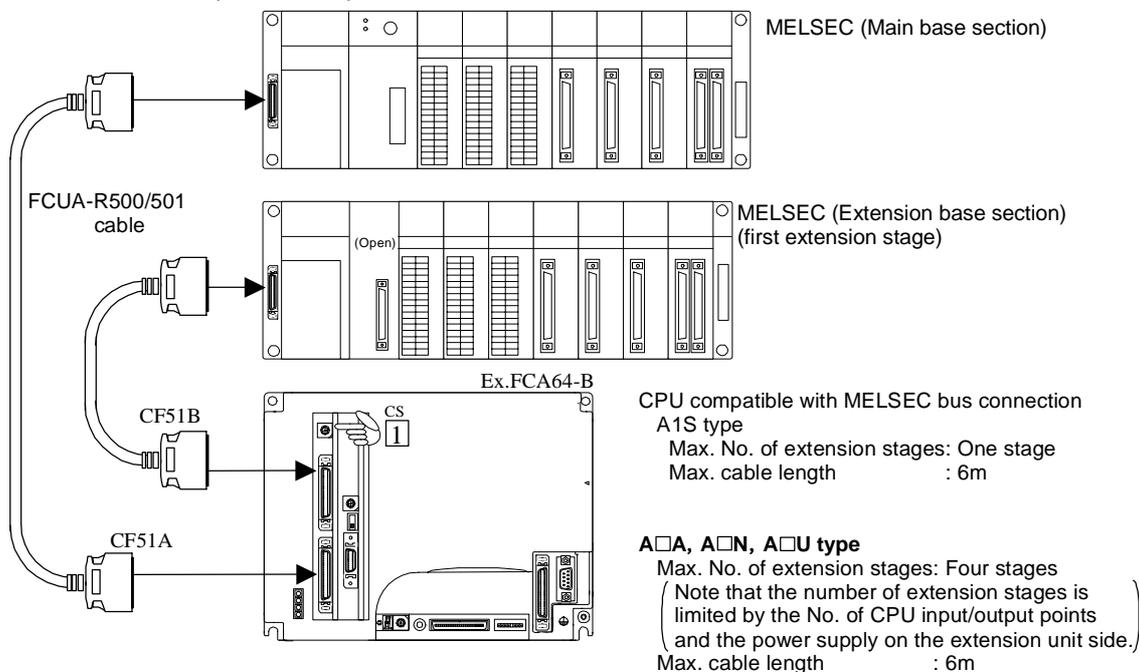
No.	Connector name	Function explanation
(1)	CF51A	MELSEC A bus connection connector (Basic base side)
(2)	CF51B	MELSEC A bus connection connector (Extension base side)
(3)	CS	Extension unit No. setting rotary switch (Setting stages: 1 to 7)
(4)	RTBUS	NC dedicated bus connection connector

Accessories

No cables, etc., are enclosed.
This card is mounted in the control unit's extension slot.

12.2.2 Connection with MELSEC

The MELDAS60/60S Series are handled as special extension units (32-point units) for the sequencer. The following connection example is for when there is one extension stage. Refer to the connection methods in the respective sequencer manual and connect with the NC control unit.



CAUTION

- ⚠ Incorrect connections could damage the device, so always connect the cable to the designated connector.
- ⊘ Do not connect or disconnect the connection cables between each unit while the power is ON.

12. OPTION CARD

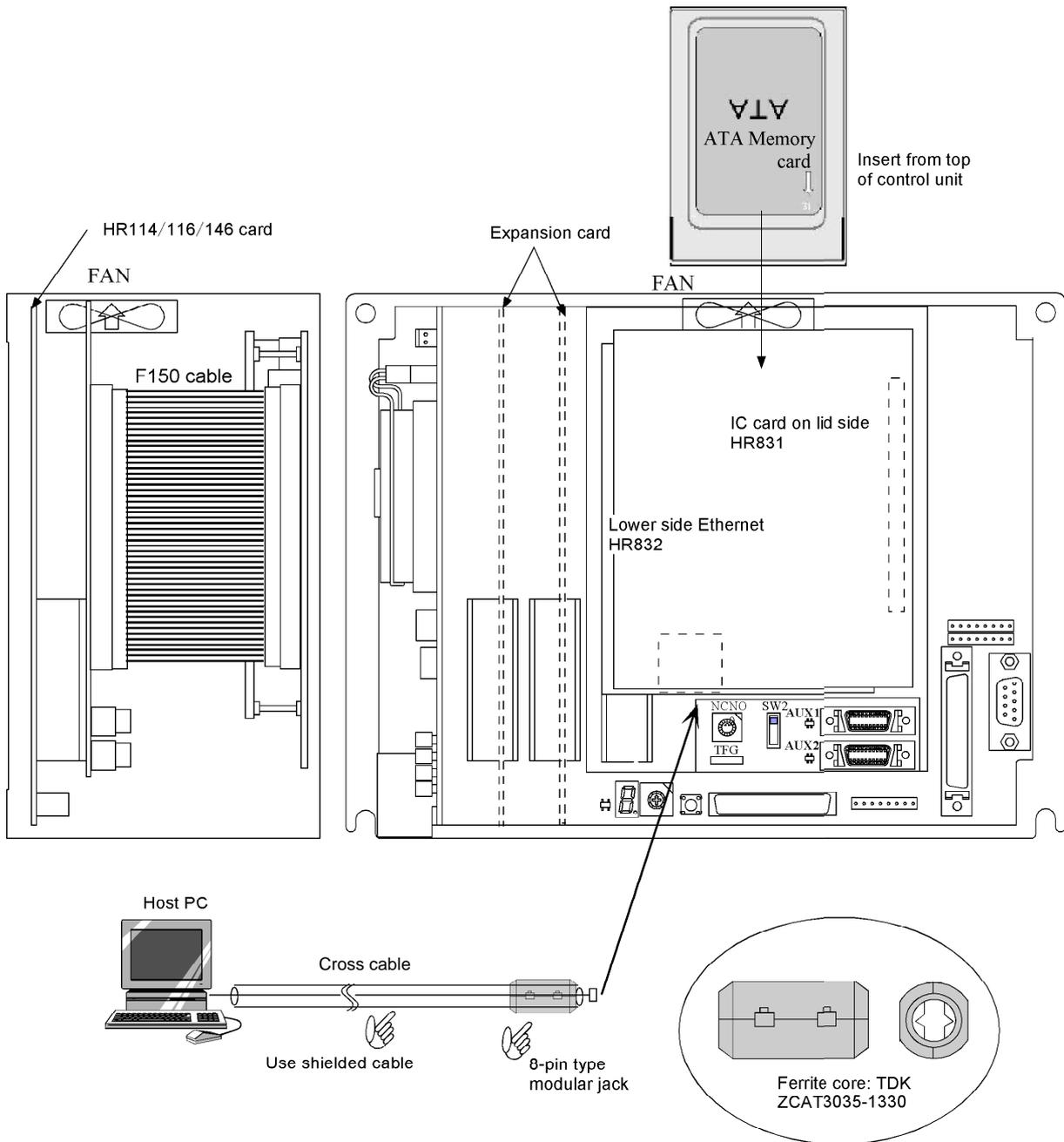
12.3 Connection of High-speed Program Server Unit

12.3 Connection of High-speed Program Server Unit

The high-speed program server function is used by adding the high-speed program server unit (FCU6-EP203-1), in which the ATA memory card HR831 and Ethernet card HR832 are assembled. The memory card has the ATA specifications, and either the 100BASE-TX or the 10BASE-T type Ethernet can be used.

As there are many environment types and varieties in which the Ethernet communication is used, install a ferrite core on the communication cable's NC control unit side connector end to stabilize the NC operation.

12.3.1 Connector Layout



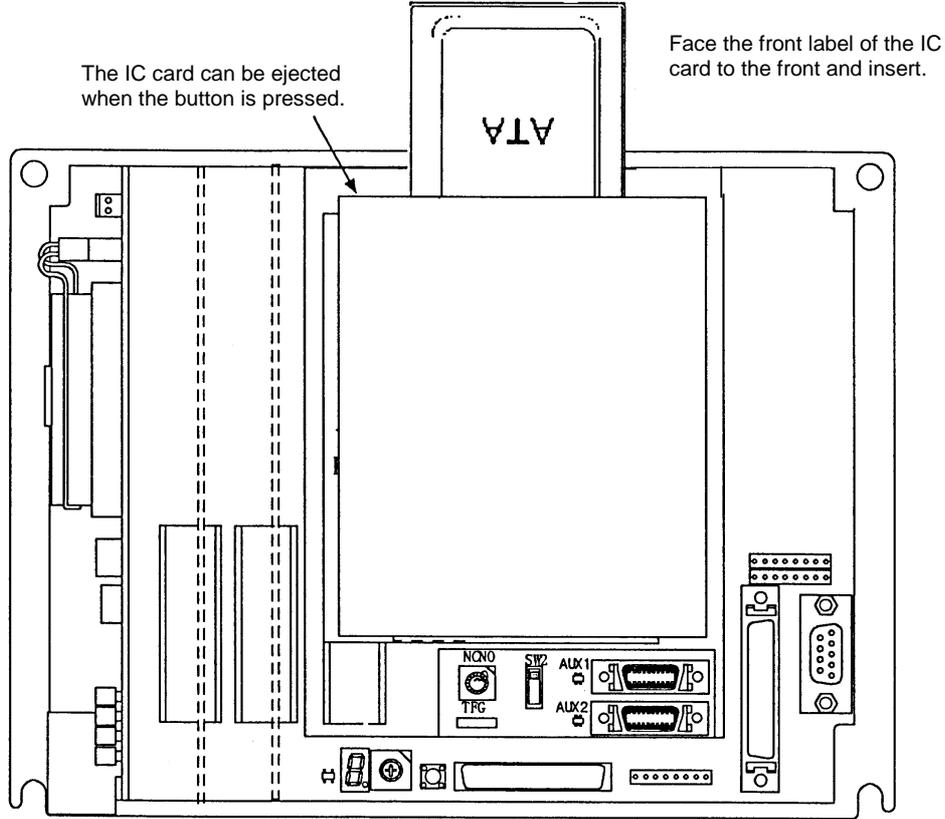
Precautions for use

- 1) Install the ferrite within 10cm from the end of the NC side connector.
- 2) Use a shielded cable for the 10BASE-T cable.
- 3) Do not wire the Ethernet cable in parallel with the drive line. Pass the cable through a dedicated duct, or separate to at least 10cm away from other wiring.

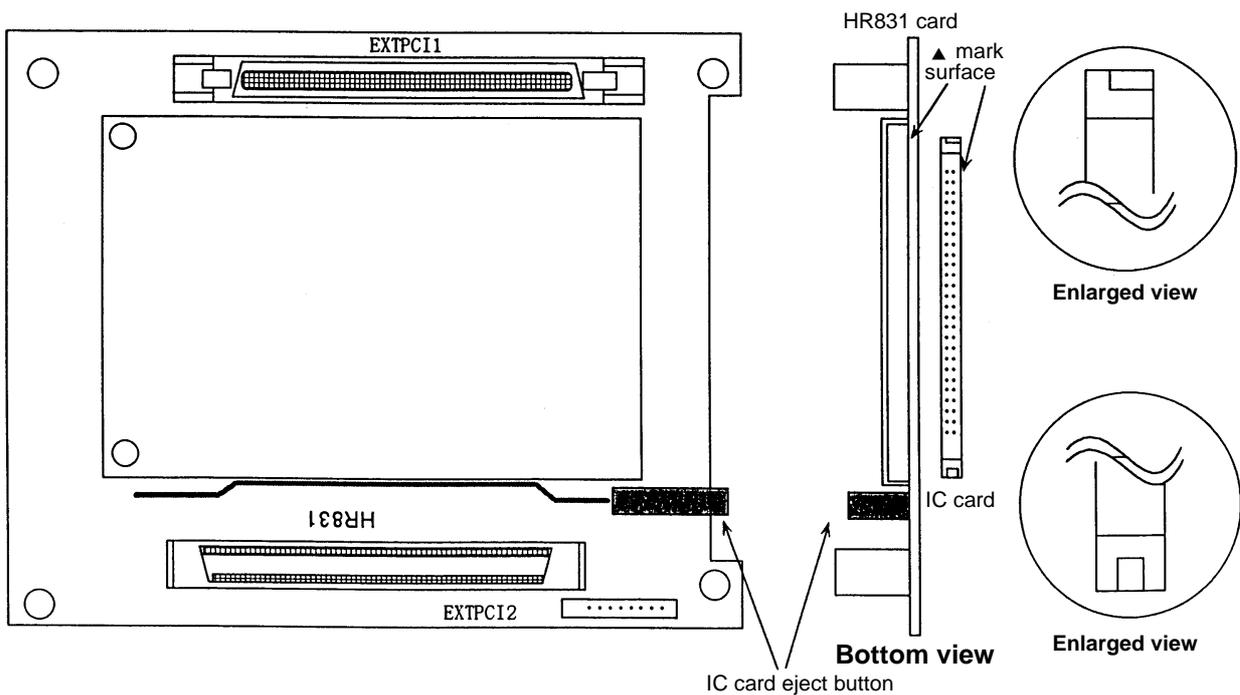
12. OPTION CARD
12.3 Connection of High-speed Program Server Unit

12.3.2 Inserting the IC Card

The SanDisk ATA type flash ROM can be used for the IC card. There are cases when brands other than SanDisk cannot be used. Always turn the control unit power OFF before inserting or ejecting the IC card. Take care to the orientation of the ▲ mark on the IC card, and insert it from the top of the control unit.



View of control unit lid side with cover removed

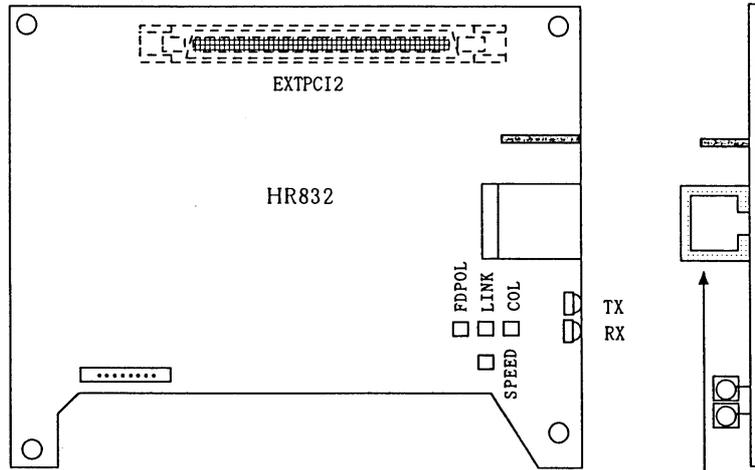


12. OPTION CARD
12.3 Connection of High-speed Program Server Unit

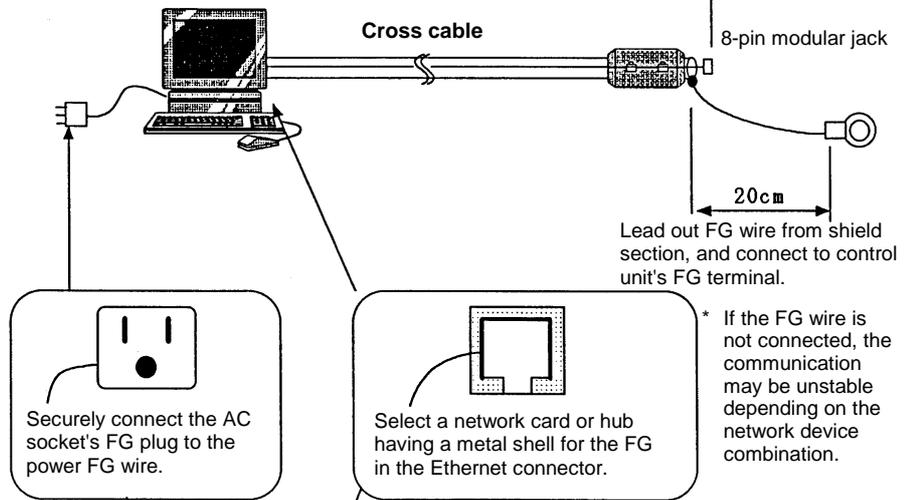
12.3.3 Connection of Ethernet Cable

Select a shielded cable for the Ethernet cable, and connect both ends to the FG. For the high-speed program server, refer to the following drawing, lead out the FG wire from the cable and connect to the control unit's FG terminal.

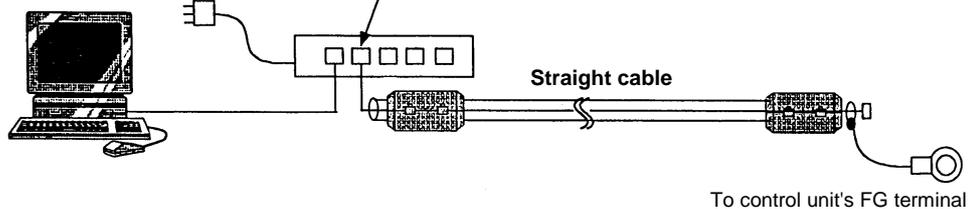
Confirm that the server side or hub side shield cable's FG is connected to the power supply line's FG terminal.



Example 1
When connecting one-on-one with server



Example 2
Connecting via a hub



Caution

When the AC/DC adaptor power is externally installed to the hub, the hub could malfunction due to noise if the cable shield is not connected to the power FG. When using a hub, install a ferrite also on the hub side.

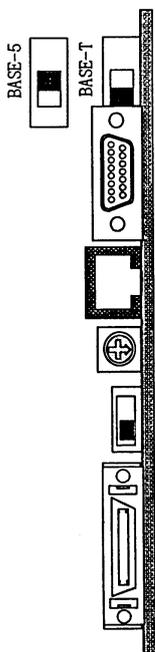
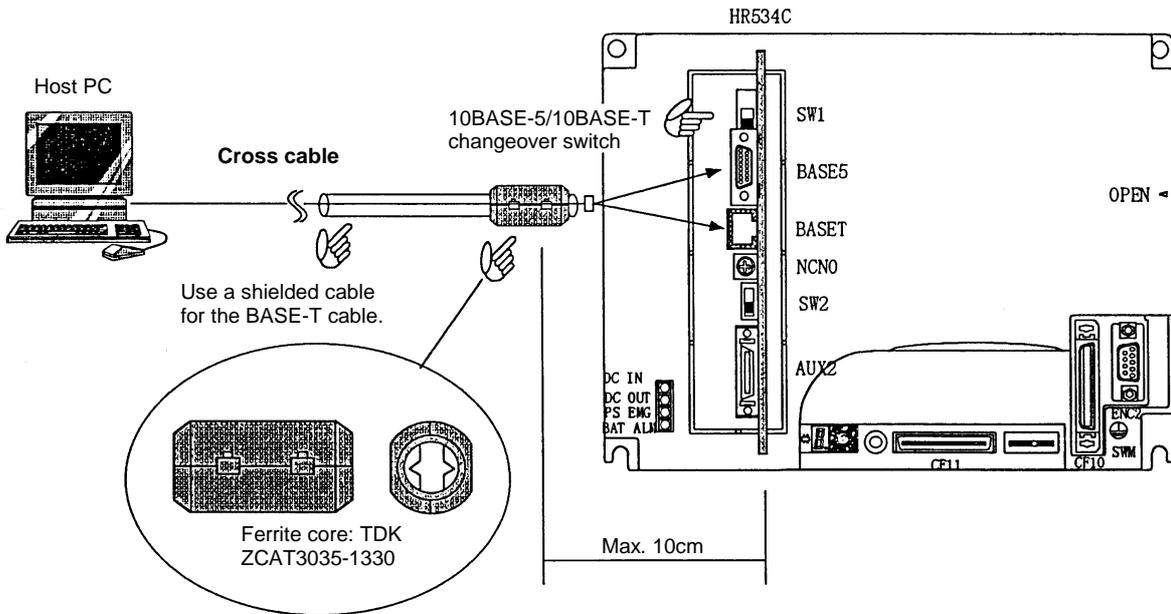
12. OPTION CARD

12.4 Connection of Ethernet Function

12.4 Connection of Ethernet Function

The HR534 card is used to use Ethernet communication. Either the 10BASE-T or 10BASE-5 Ethernet can be selected for HR534. When using 10BASE-5, set the changeover switch SW1 shown below up, and when using the 10BASE-T, set SW1 down. The BASE-5 and BASE-T connectors cannot be used simultaneously.

As there are many environment types and varieties in which the Ethernet communication is used, install a ferrite on the communication cable's NC side connector end to stabilize the NC operation.



SW1 : BASE-5/BASE-T connector changeover
 Set up : Select BASE-5 connector
 Set down : Select BASE-T connector

BASE5 : 10BASE-5 connector

BASE-T : 10BASE-T connector

NCNO : When multiple control units are connected, set the control unit's station No.
 When not using the I/O link, set "0".
 When using the I/O link, set the master side to "0" and the slave side to "1".

SW2 : Turns the terminator ON or OFF.
 When the I/O link function is used by two units, set the master station side and slave station side terminator ON/OFF switch SW2 to ON (down).
 The setting is invalid if the I/O link function is not used.

AUX2 : I/O link connector.
 Connect an R000 cable, SH21 cable or equivalent.

Precautions for use

- 1) Install the ferrite within 10cm from the end of the NC side connector.
- 2) Use a shielded cable for the 10BASE-T cable.
- 3) Do not wire the Ethernet cable in parallel with the drive line. Pass the cable through a dedicated duct, or separate to at least 10cm away from other wiring.
- 4) Correctly set the BASE-5/BASE-T changeover switch.

12. OPTION CARD

12.5 Connection of I/O device by CC-link

12.5 Connection of I/O device by CC-link

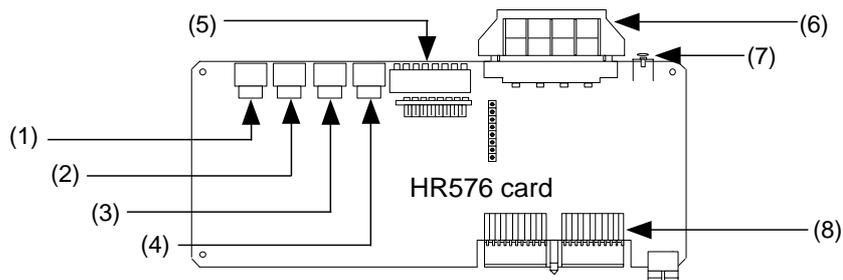
When connecting I/O device by CC-Link, HR576 card is required to be mounted in the expansion slot of the control unit.

Connect a dedicated cable for CC-Link cable to a terminal block of HR576 card.

Always connect a terminator (accessory) to the unit which serves as the final station.

This card functions as CC-Link system master/local station. Refer to the respective NC specifications manual and "MELSEC AJ61QBT11/A1SJ61QBT11 Control & Communication Link System Master/Local Module User's Manual" etc. for details on CC-Link system.

12.5.1 Names and Functions of Each Sections



No.	Connector name	Function explanation
(1)	SW1	Station No. setting rotary switch (Ten's place)
(2)	SW2	Station No. setting rotary switch (One's place)
(3)	SW3	Baud rate setting rotary switch
(4)	SW4	Operation mode setting rotary switch (Normally: 0)
(5)	SW5	Condition setting DIP switch
(6)	TE1	CC-Link connection terminal
(7)	FG	FG connection terminal
(8)	RTBUS	NC dedicated bus connection connector

Accessories

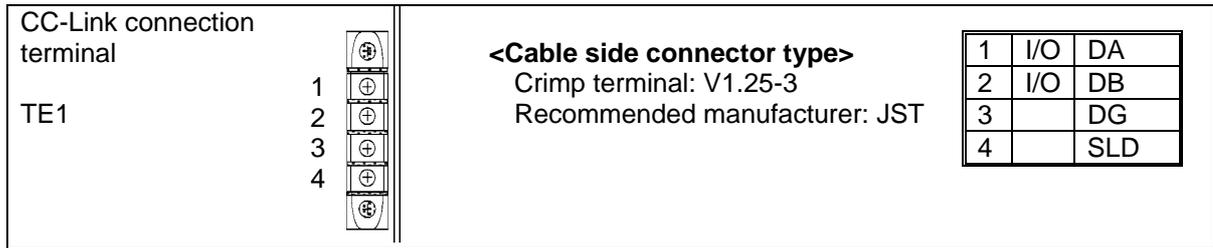
Terminator

This card is mounted in the control unit's extension slot.

12. OPTION CARD

12.5 Connection of I/O device by CC-link

12.5.2 Connector Pin Assignment

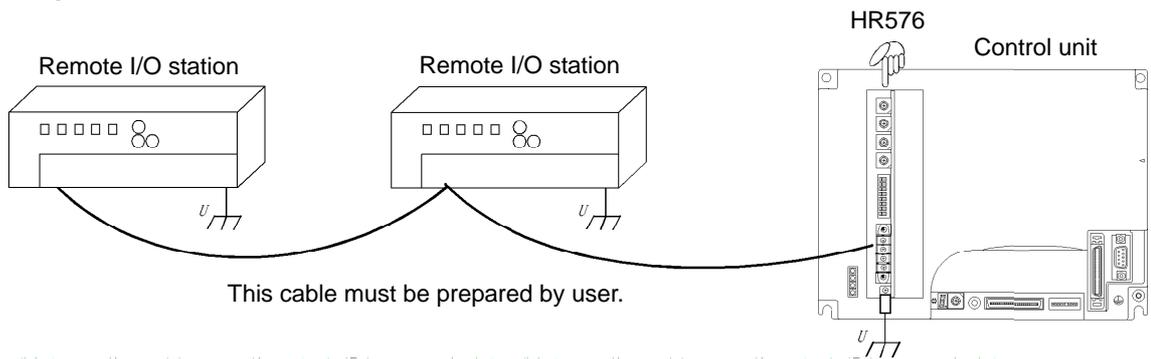


CAUTION

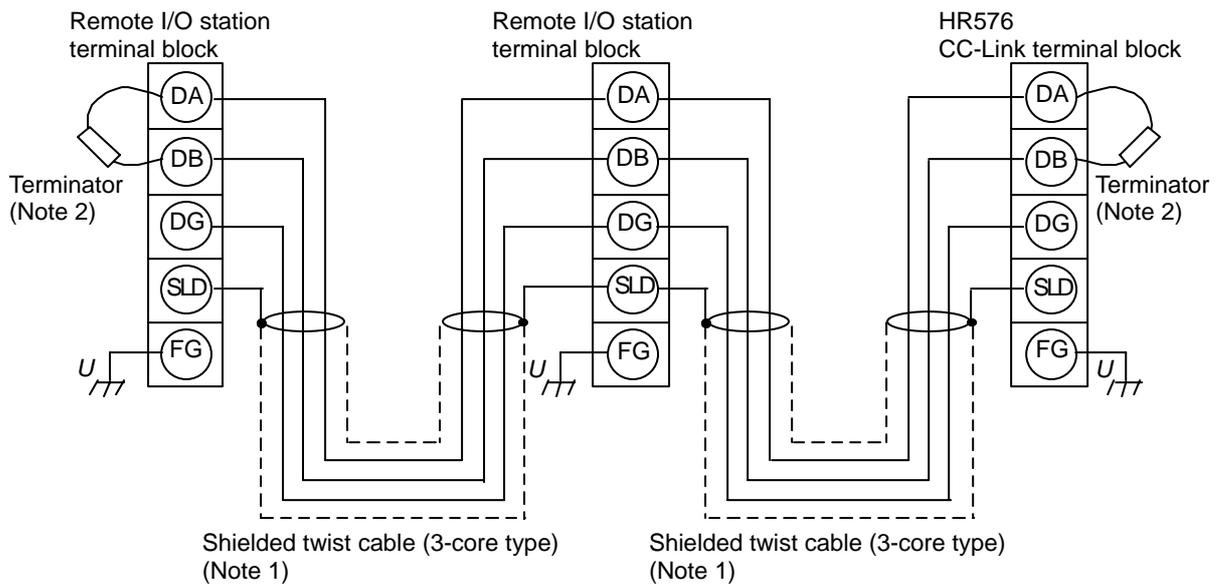
- ⚠ Incorrect connections could damage the device, so always connect the cable to the designated connector.
- ⊘ Do not connect or disconnect the connection cables between each unit while the power is ON.

12.5.3 Connection with I/O device

Example of unit connection



Example of cable connection



12. OPTION CARD

12.5 Connection of I/O device by CC-link

Correspondence of terminal name and cable color

	Terminal name	Cable color
1	DA	Blue
2	DB	White
3	DG	Yellow
4	SLD	Grounding cable (shielded)

(Note 1) In the CC-Link system, when a cable other than a dedicated cable for CC-Link is used, the performance cannot be assured. Refer to the CC-Link Partner Association home page (<http://www.cc-link.org/>) for specifications of the CC-Link dedicated cable and for further inquiry.

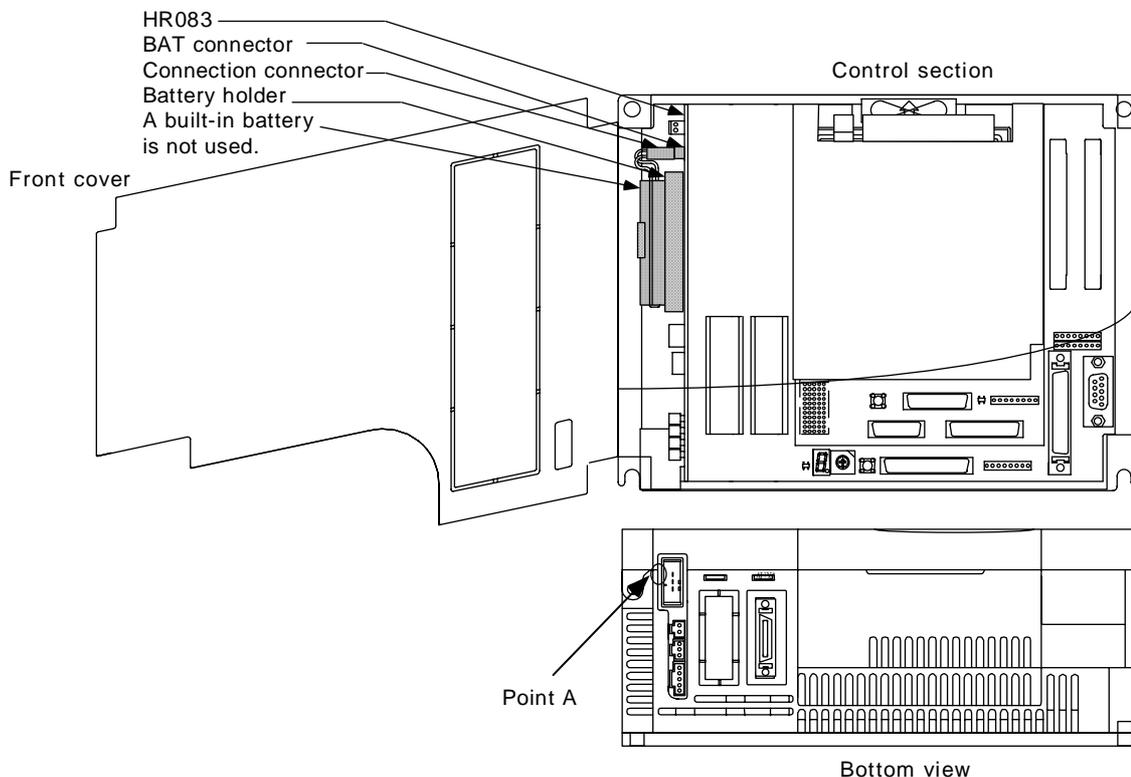
(Note 2) Connect terminators only to the station located at both ends of the network. Value of terminator varies depending on the cable to be used. 110 Ω is used for dedicated cable for CC-Link. 130 Ω is used for dedicated high performance cable for CC-Link. Use the terminators prepared as accessories. (Two kinds of terminators are attached.)



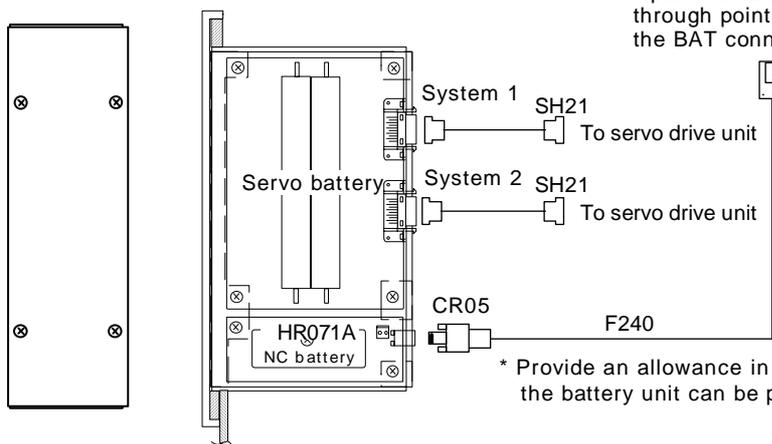
- Incorrect connections could damage the device, so always connect the cable to the designated connector.**
- Do not connect or disconnect the connection cables between each unit while the power is ON.**
- Separate the signal wire and drive line/power line when wiring.**

13. CONNECTION OF EXTERNAL BATTERY UNIT

This battery unit is installed in each unit as the NC data backup and servo (feed axis and auxiliary axis) absolute position backup. It can be replaced from outside the electric cabinet. The NC data backup battery is used with the F240 cable connected to the control unit power supply card battery connection BAT connector, and the CF05 connector on the external battery unit.



Battery unit: FCU6-BT4D1



Open the lid on the control unit, pass the F240 cable through point A on the base and connect with the BAT connector.

* Provide an allowance in the cable wiring so that the battery unit can be pulled out during replacement.

Unit type : FCU6-BT4D1

Replacement part type : For NC control unit ER6 BKO-NC2157H01 (single battery replacement)
 For servo ER6-B4D-01 BKO-NC2151H06 (PCB unit replacement)



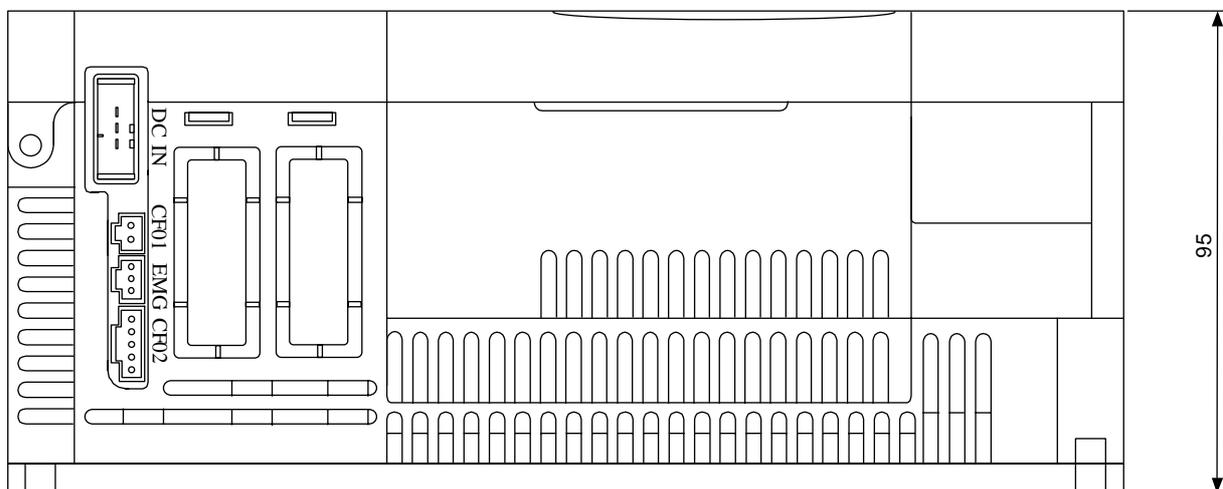
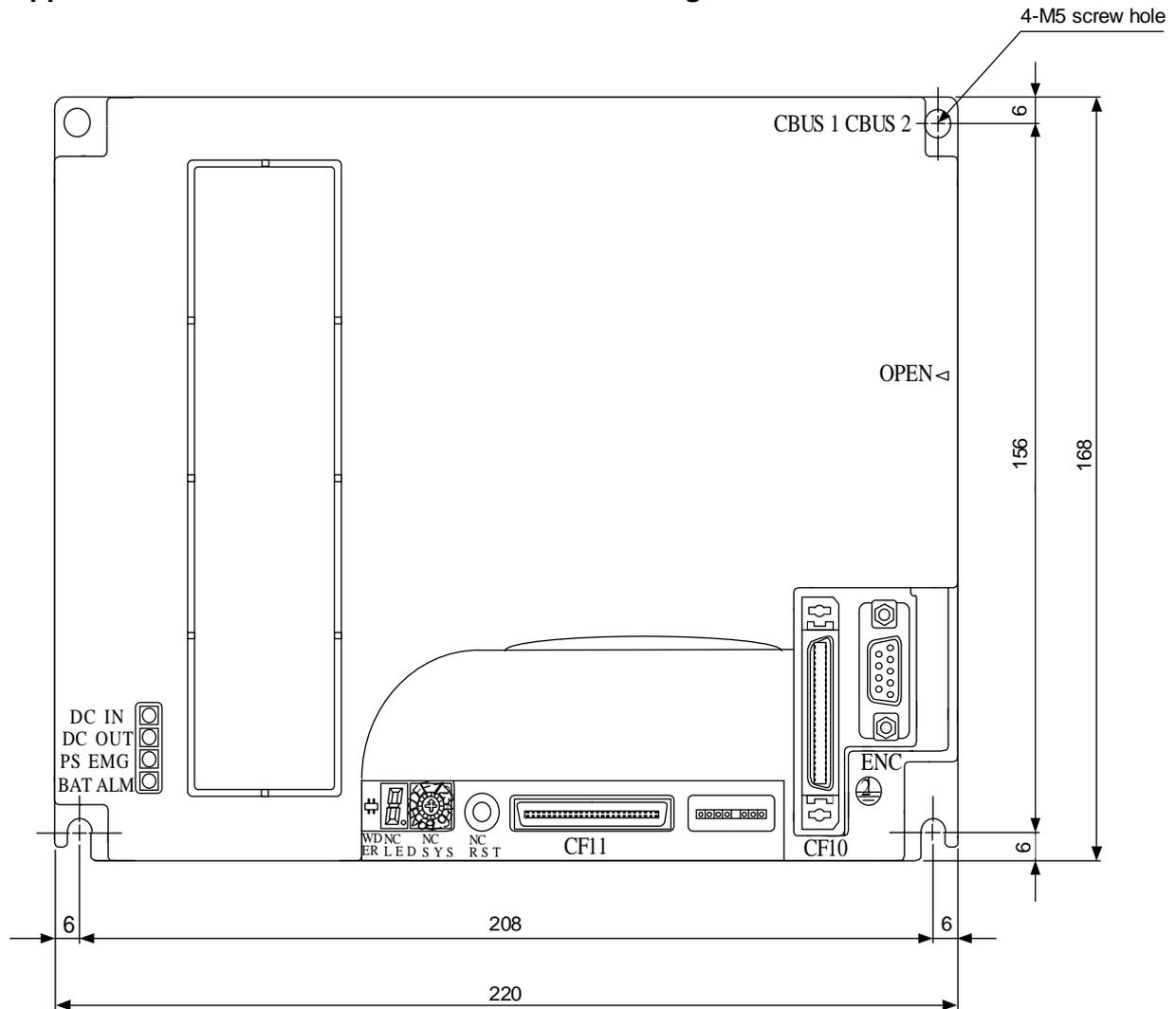
- ⚠ If the battery voltage drop warning alarm occurs, the programs, tool data and parameters could be damaged. Thus, reload each data with the input/output device after replacing the battery.
- ⚠ Do not short-circuit, charge, overheat, incinerate or disassemble the battery.
- ⚠ Dispose the spent battery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

APPENDIX 1 OUTLINE DRAWING
Appendix 1.1 Control Unit Outline Drawing

APPENDIX 1 OUTLINE DRAWING

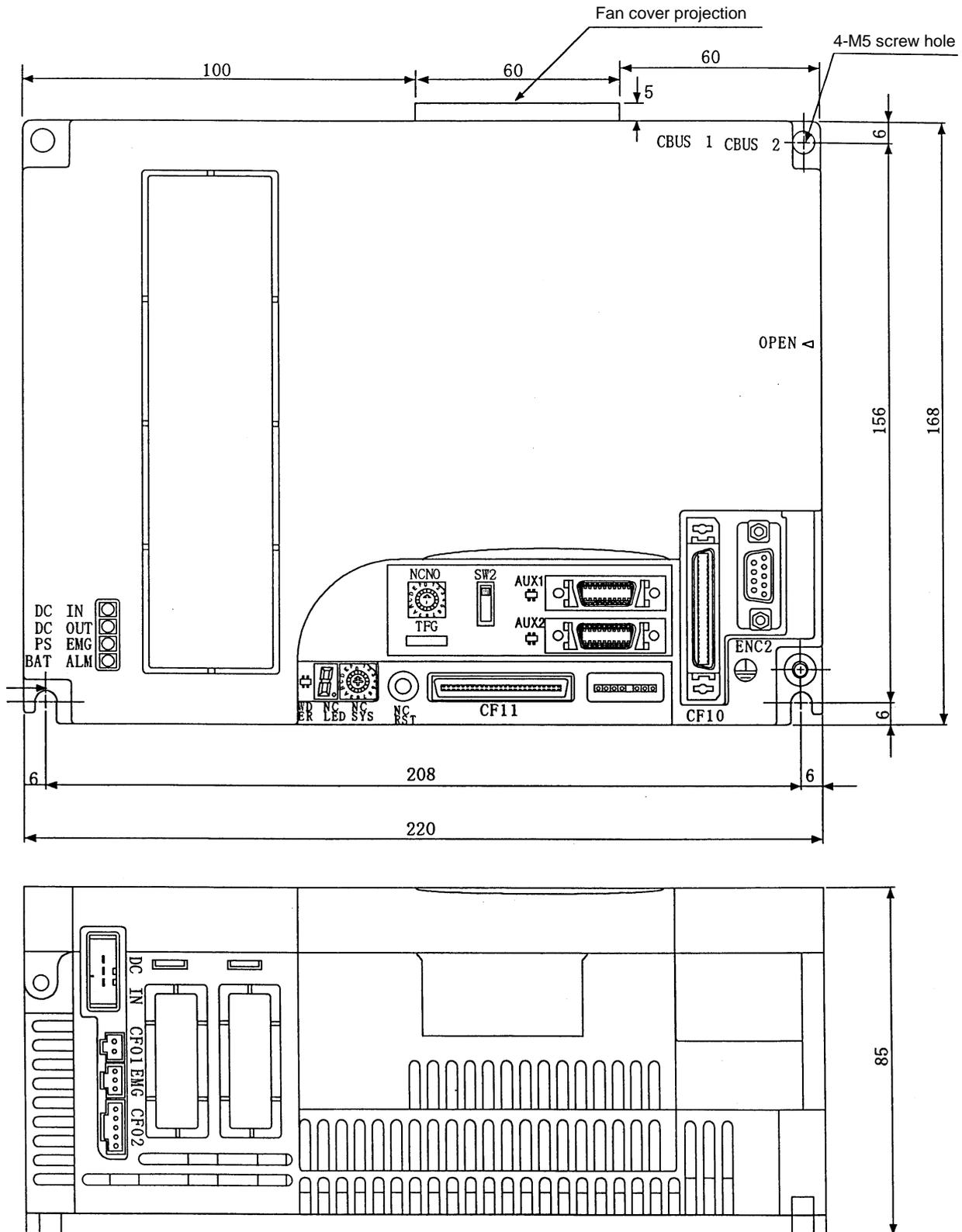
Appendix 1.1 Control Unit Outline Drawing

Appendix 1.1.1 M64A Control Unit Outline Drawing



APPENDIX 1 OUTLINE DRAWING
Appendix 1.1 Control Unit Outline Drawing

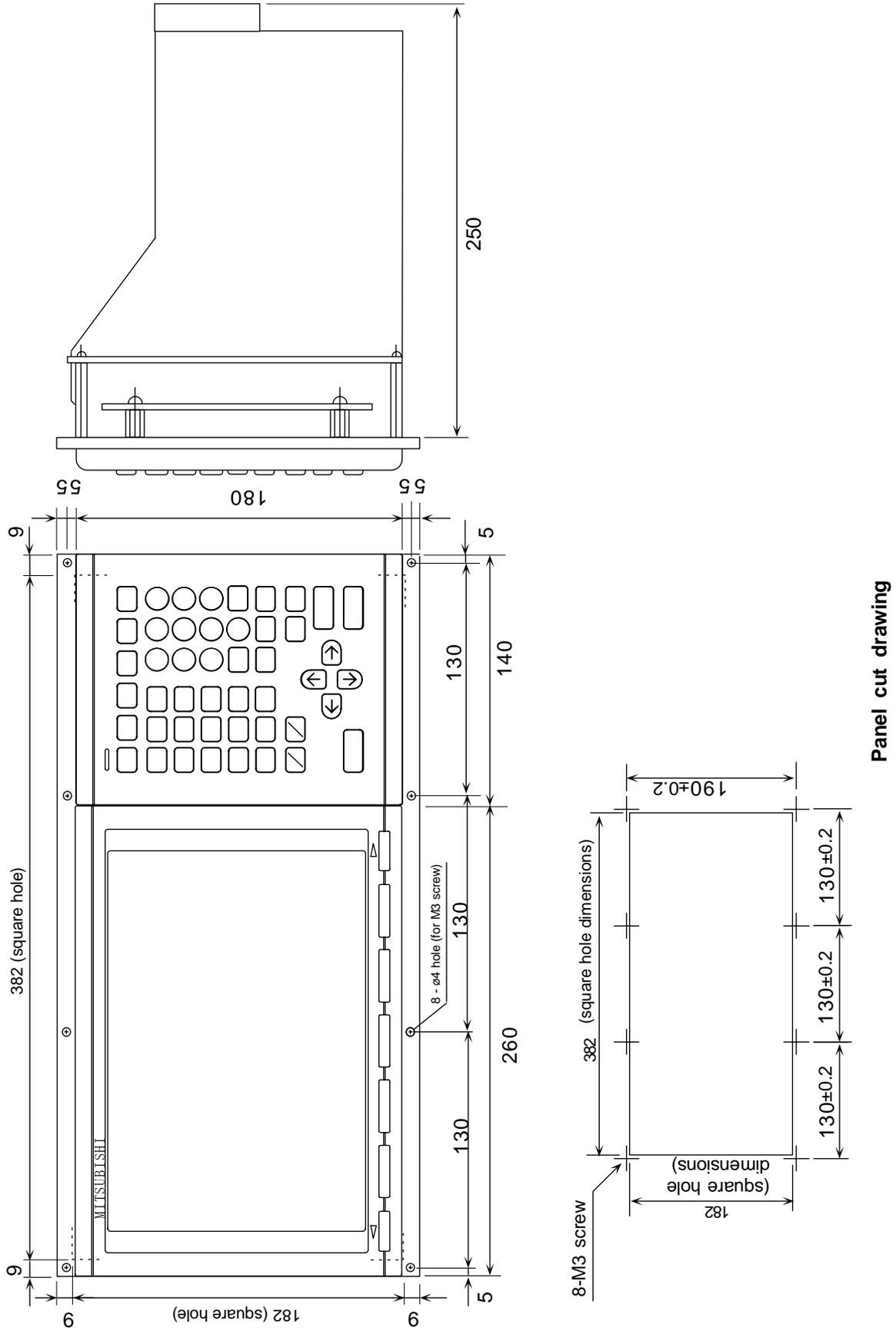
Appendix 1.1.2 M64AS/64S/65/65S/66/66S Control Unit Outline Drawing



APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

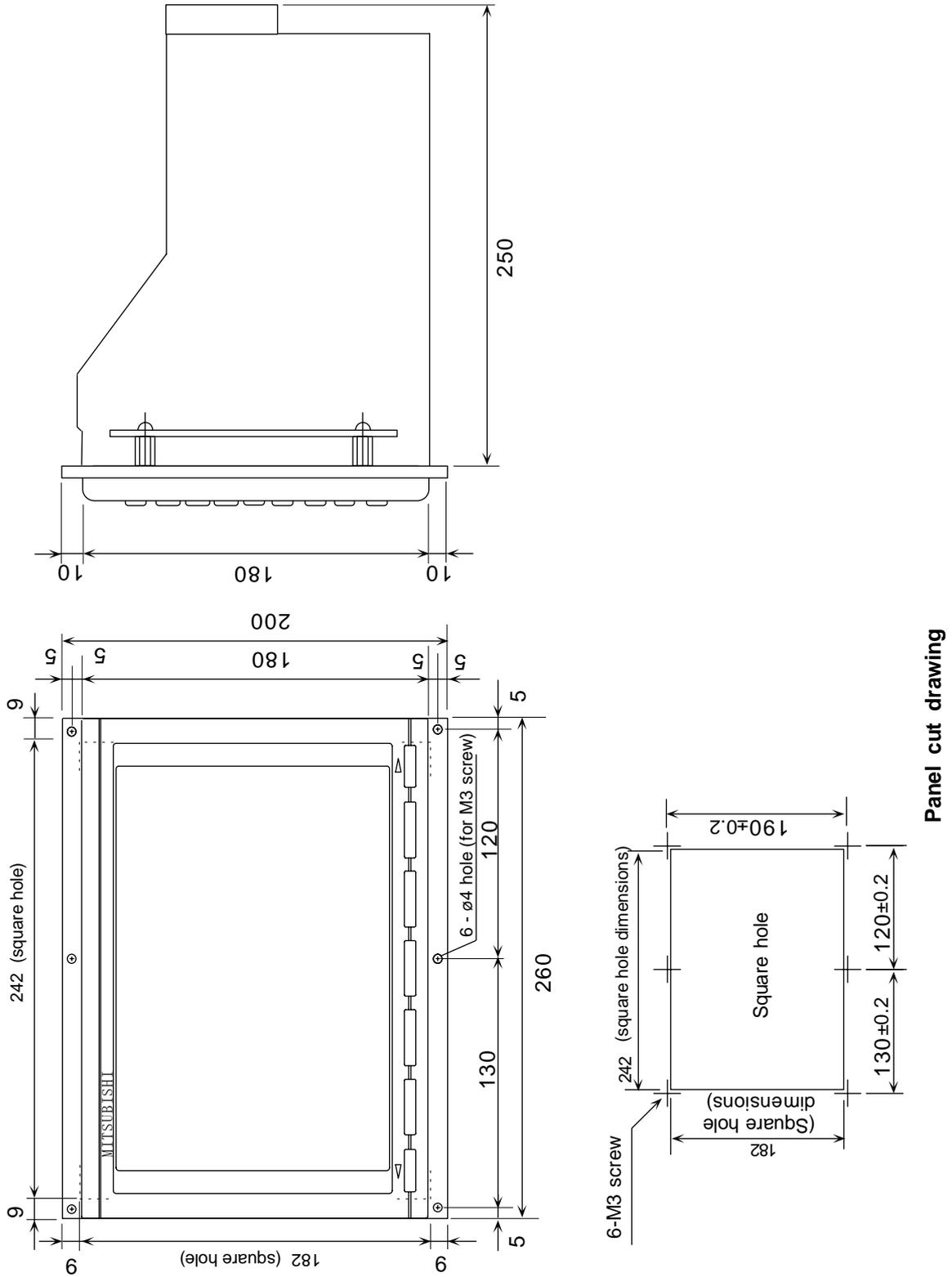
Appendix 1.2 Communication Terminal Outline Drawing

Appendix 1.2.1 FCUA-CT100/CT120



APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

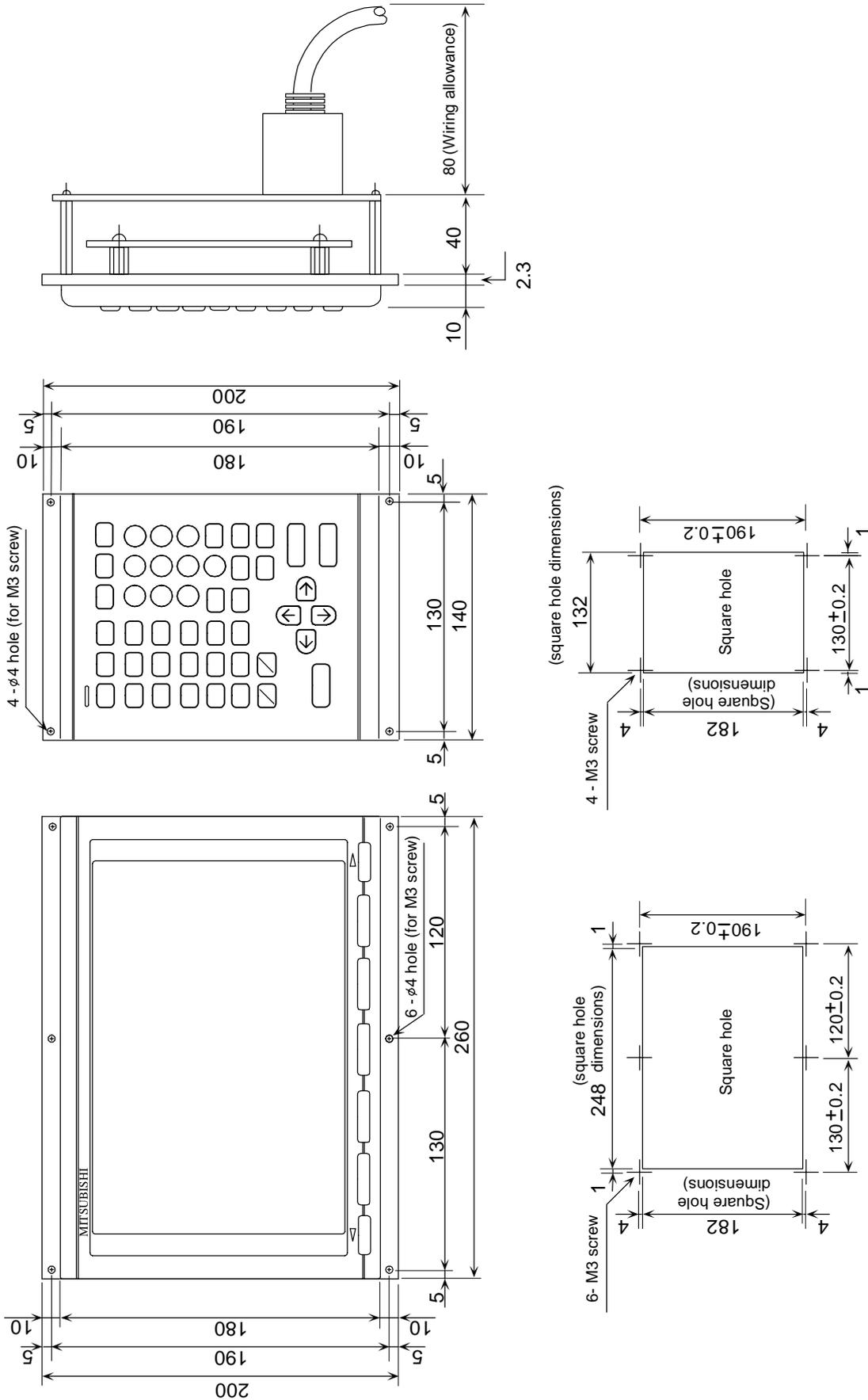
Appendix 1.2.2 FCUA-CR10



APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

Appendix 1.2.3 FCUA-KB10/KB12/EL10

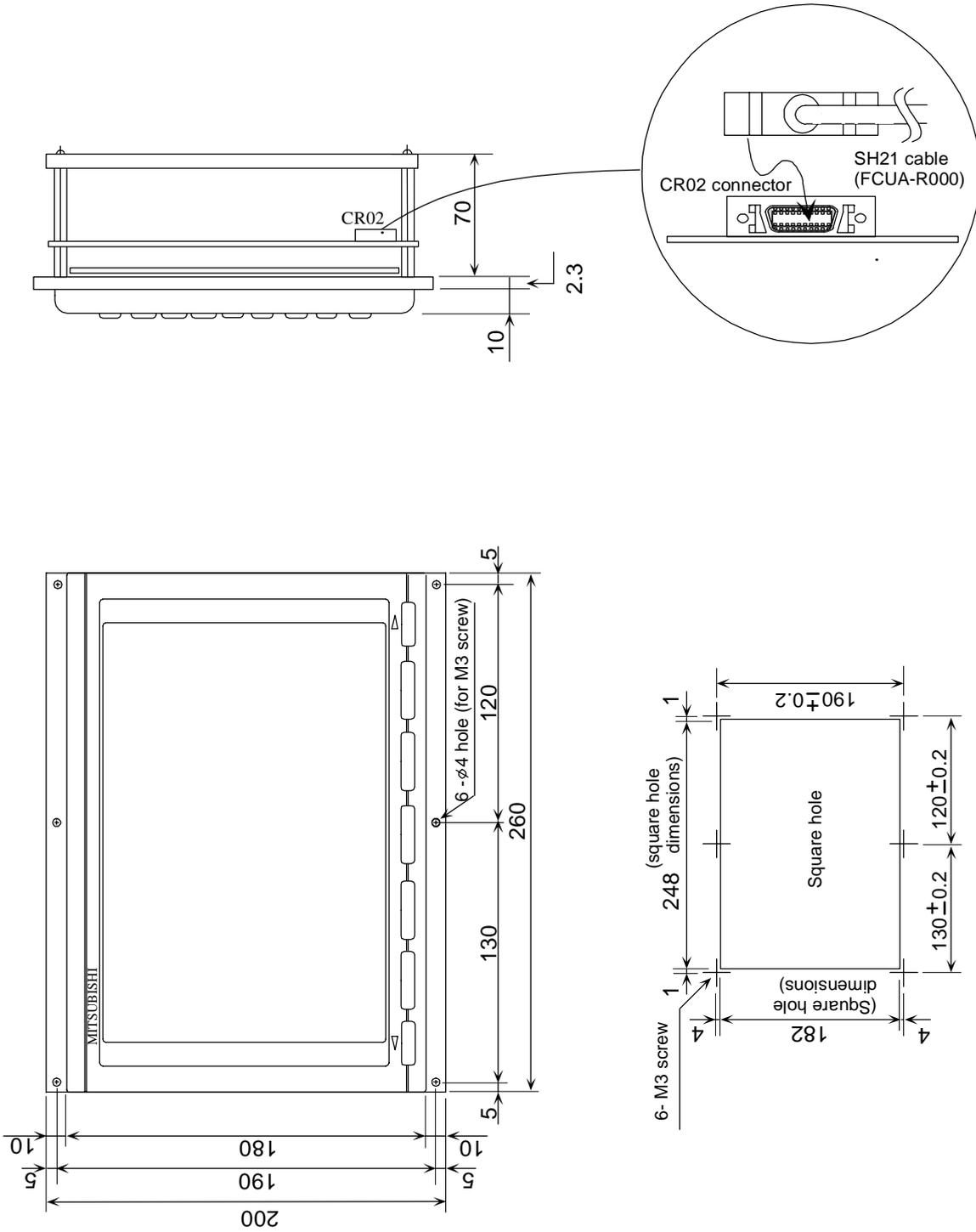
* This is a special part. Contact Mitsubishi to place an order.



Panel cut drawing

APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

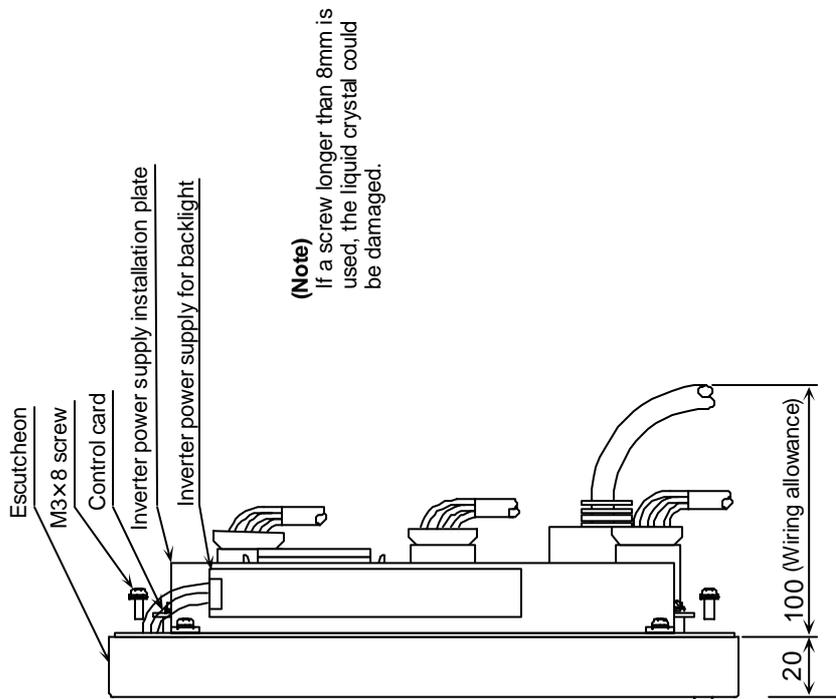
Appendix 1.2.5 FCUA-LD10



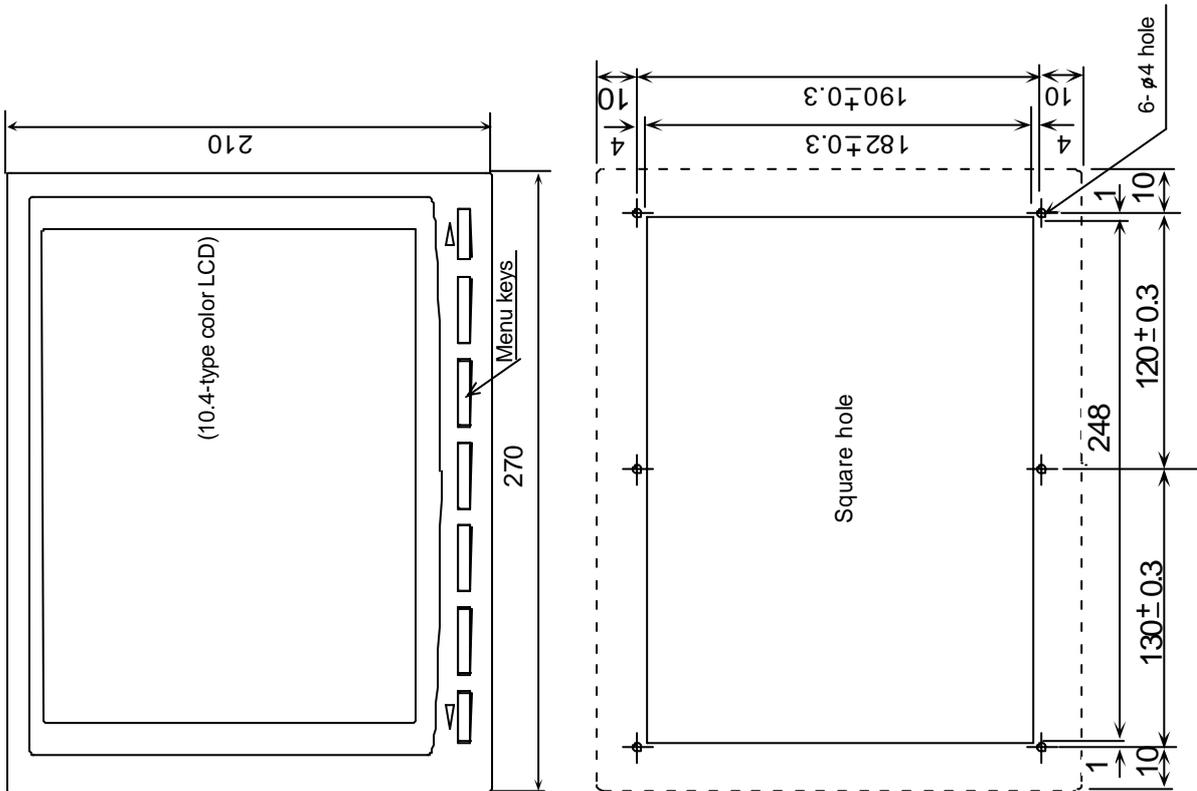
Panel cut drawing

APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

Appendix 1.2.7 FCU6-DUT33

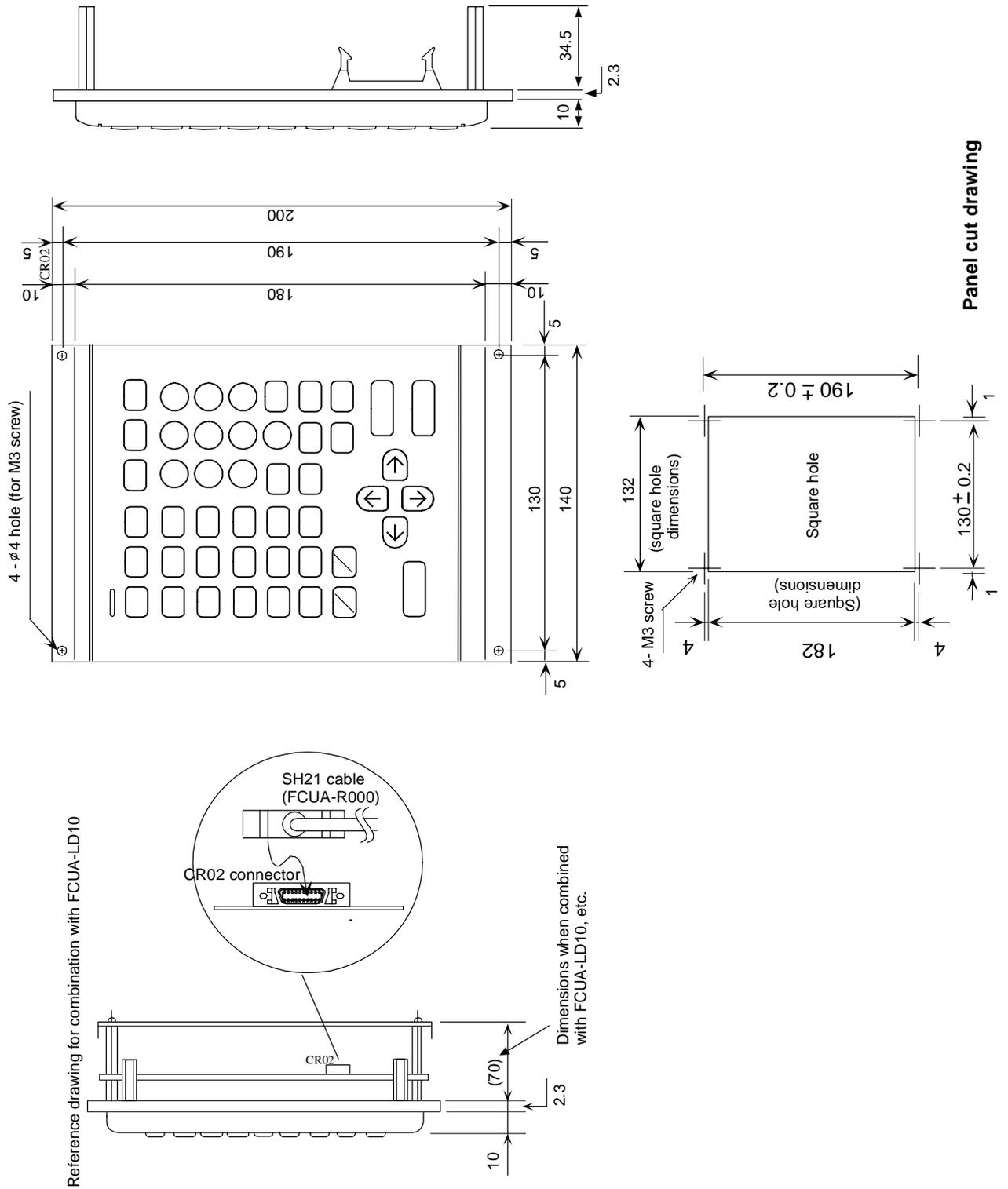


Panel cut drawing



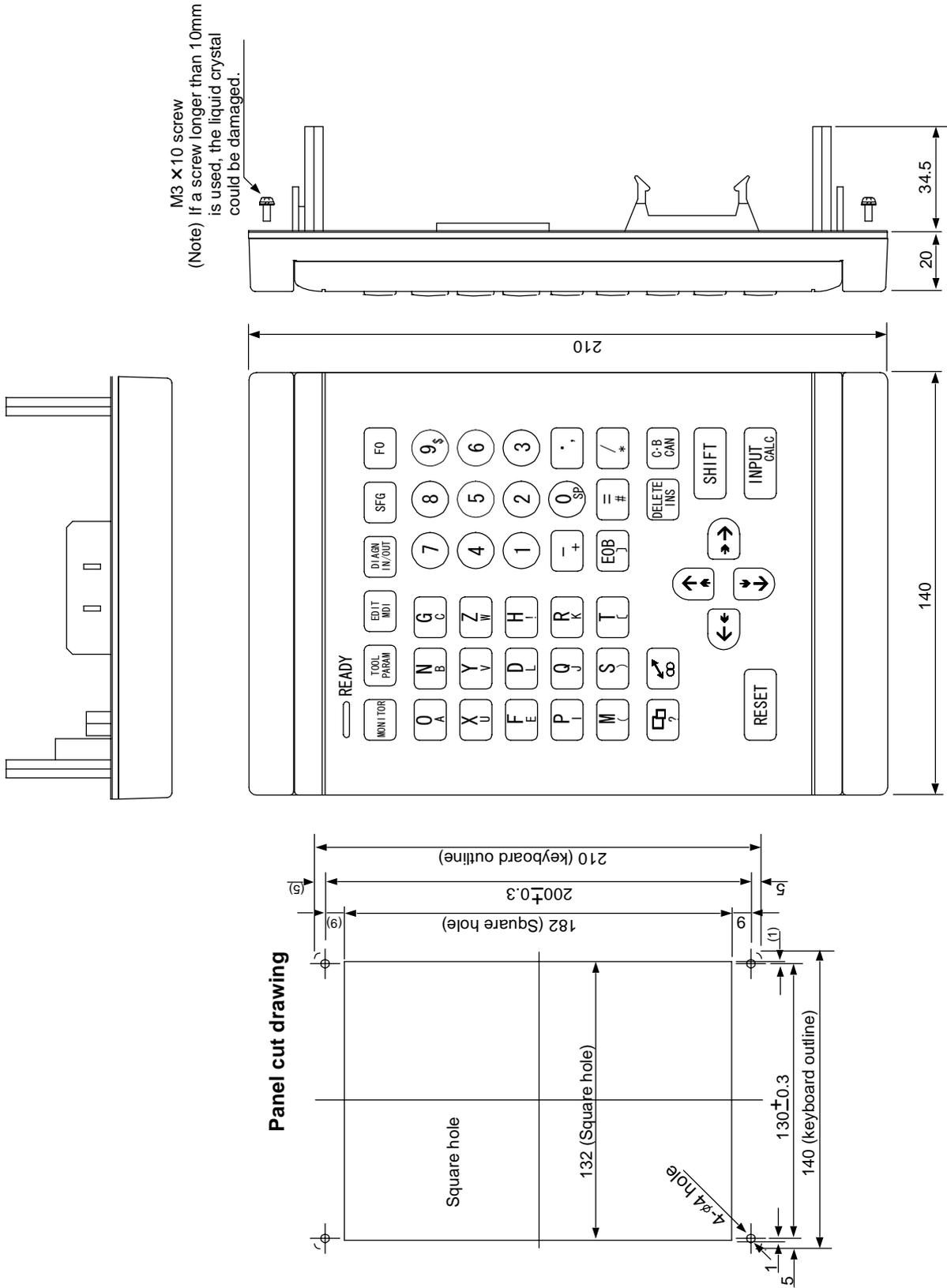
APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

Appendix 1.2.8 FCUA-KB20/KB30



APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

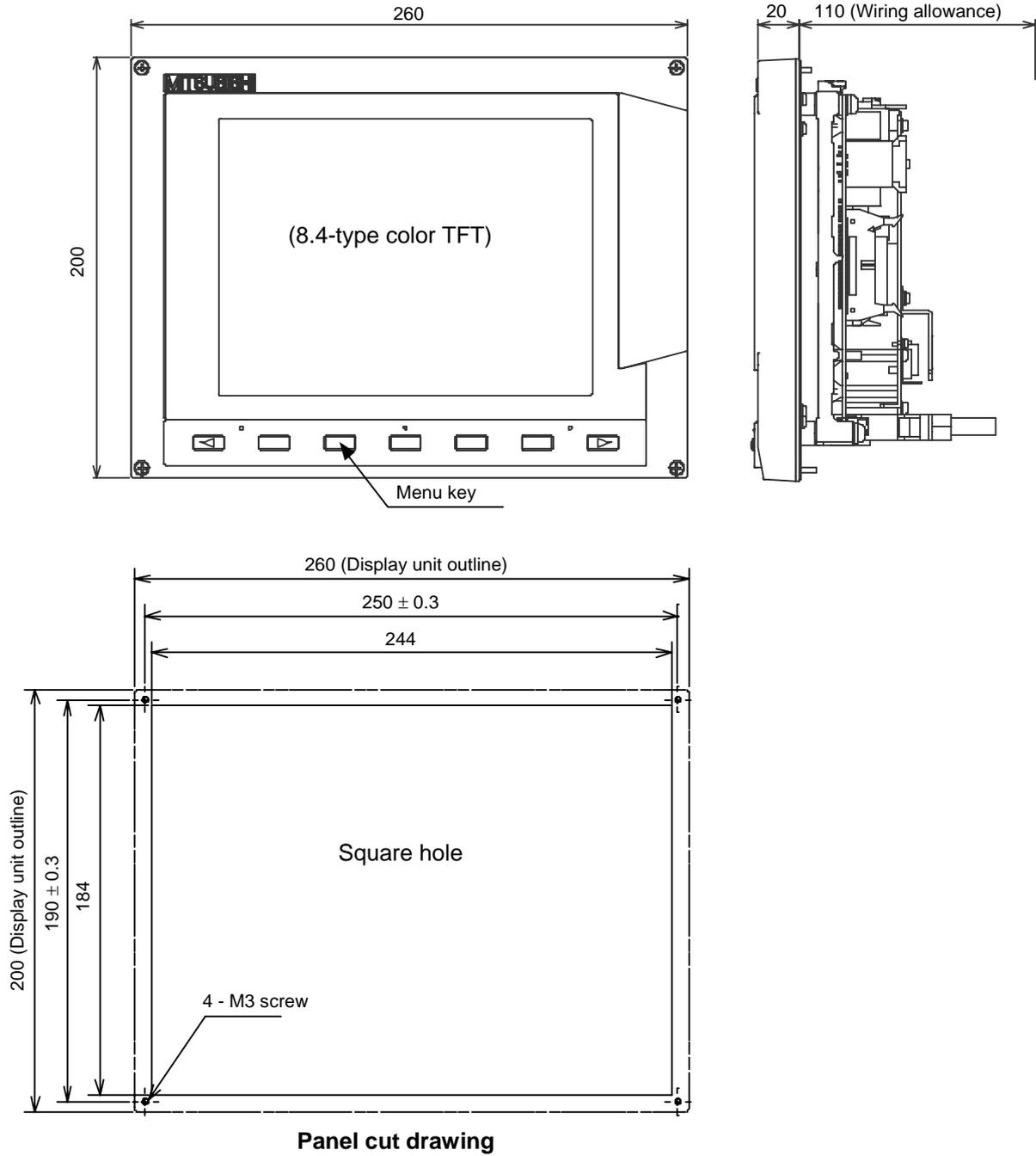
Appendix 1.2.9 FCU6-KB021/KB031



* The key layout for the FCU6-KB021 is shown in this drawing.

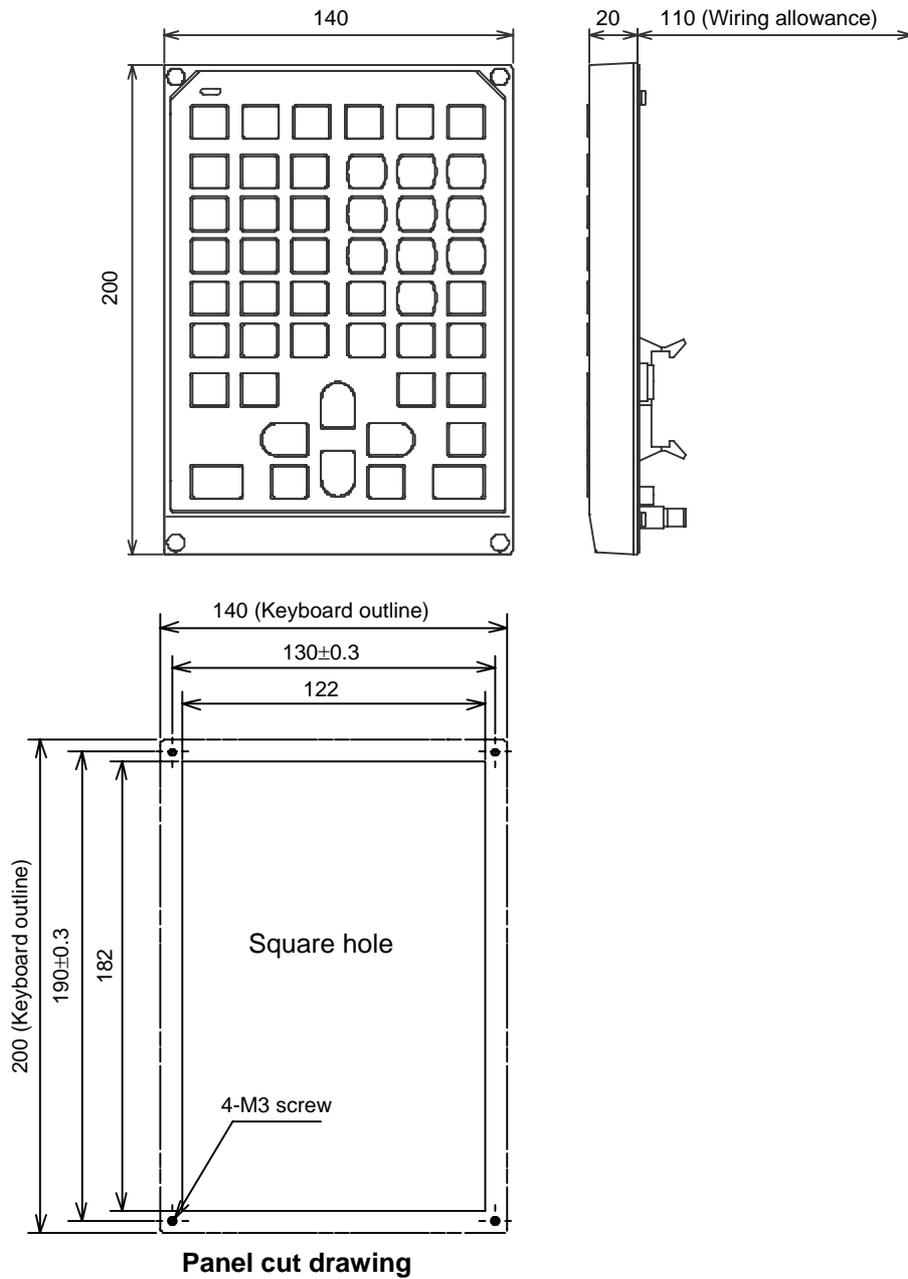
APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

Appendix 1.2.10 FCU6-DUN22



APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

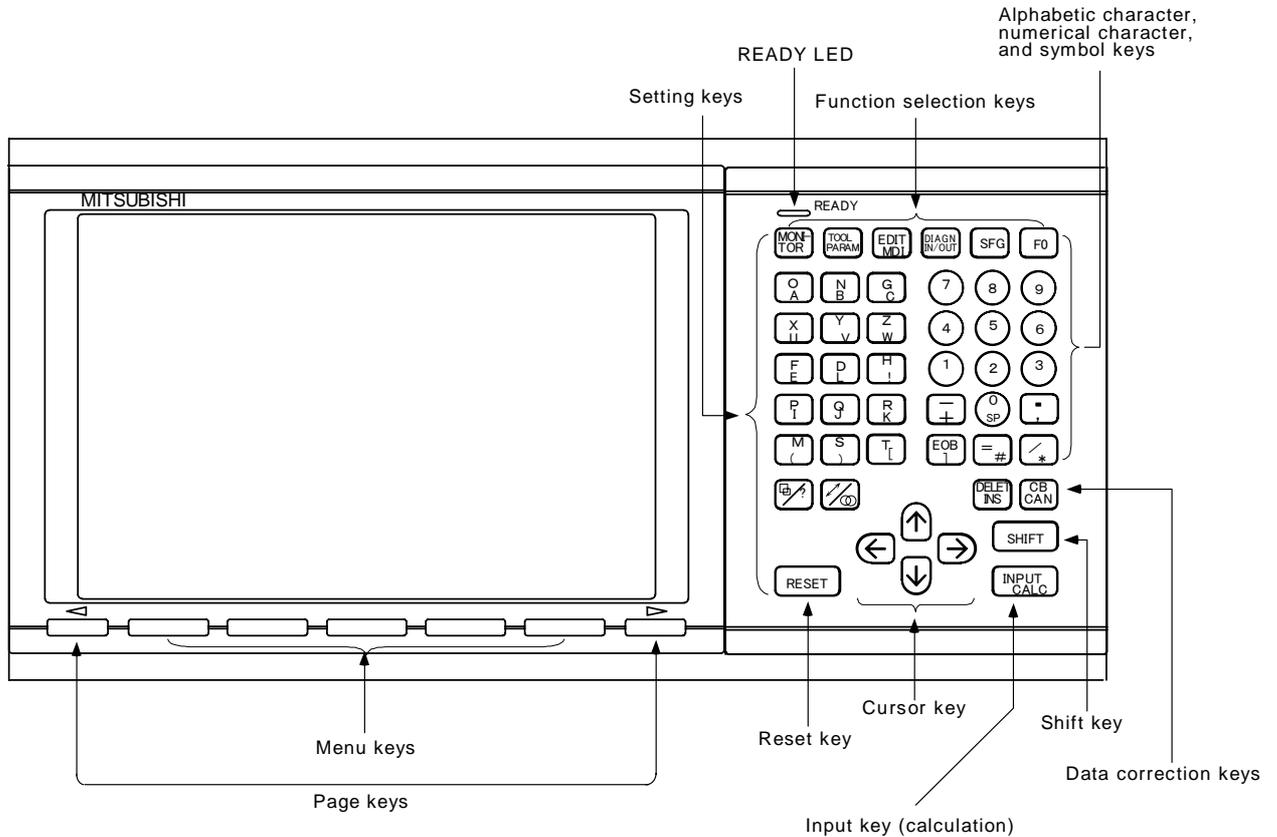
Appendix 1.2.11 FCU6-KB022



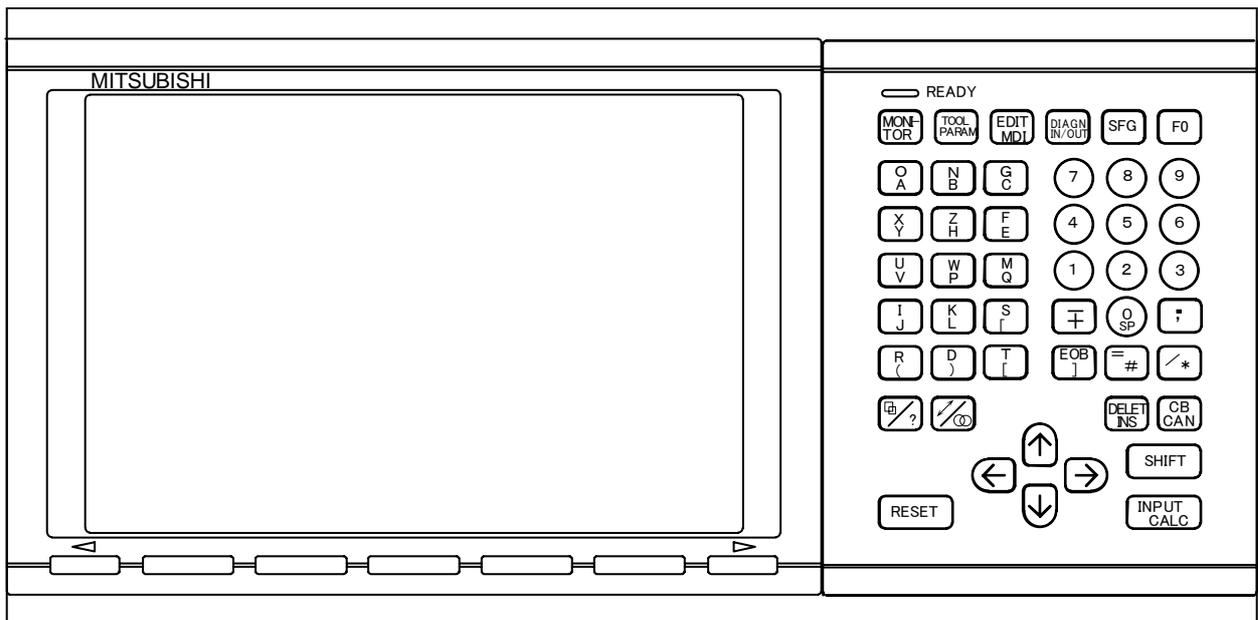
APPENDIX 1 OUTLINE DRAWING
Appendix 1.2 Communication Terminal Outline Drawing

Appendix 1.2.12 Key Arrangement

(1) Appearance of CT100/LD100/separate type FCUA-CR10 + KB10/KB12 and FCUA-EL10 + KB10/KB12



(2) Appearance of CT120/separate type FCUA-LD10 + FCUA-KB30

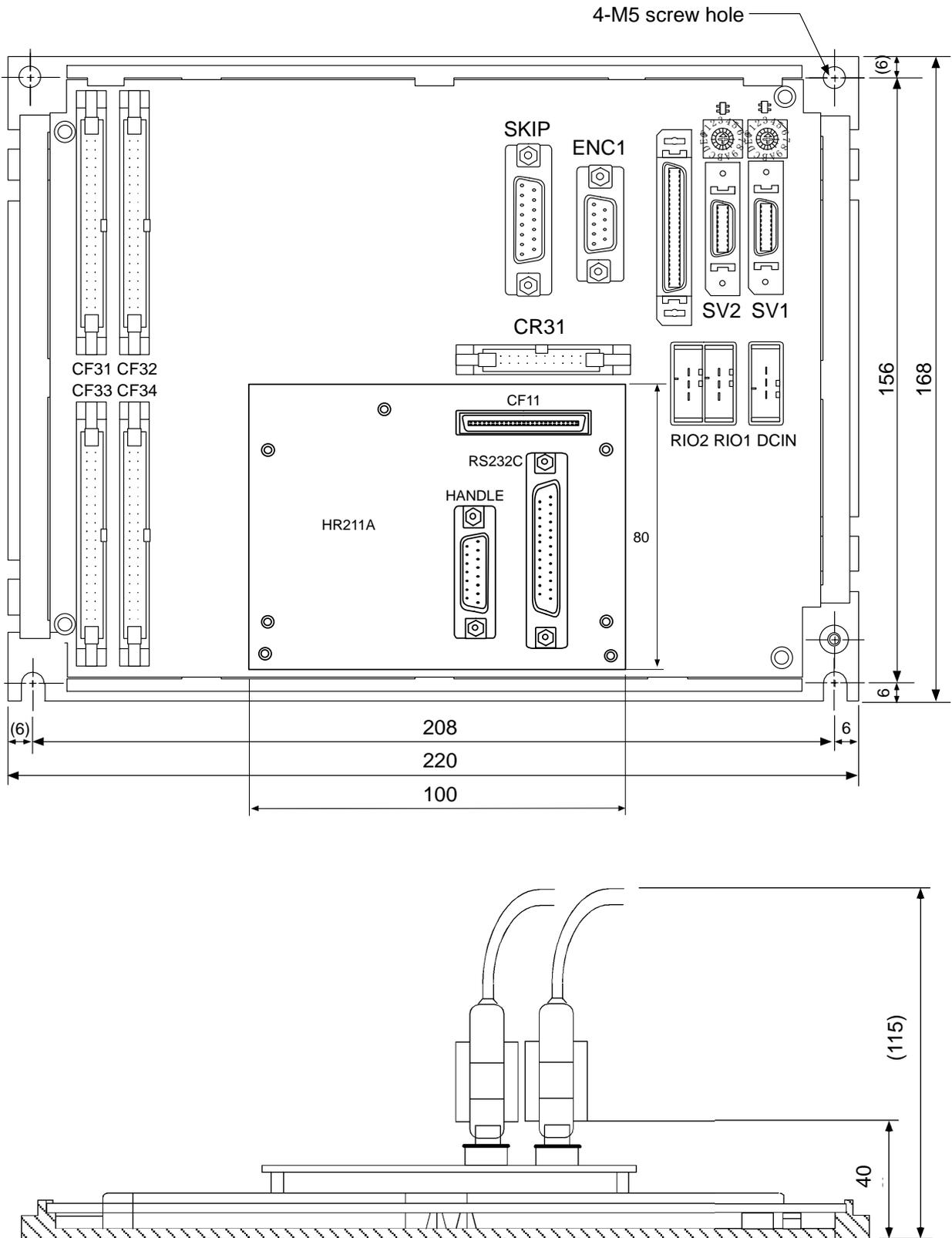


(Note) To input the alphabetic characters or symbols on the lower of the alphabetic character and symbol keys, press **SHIFT** key, then press the corresponding key.

(Example) "A" is input by pressing **SHIFT**, **O A**.

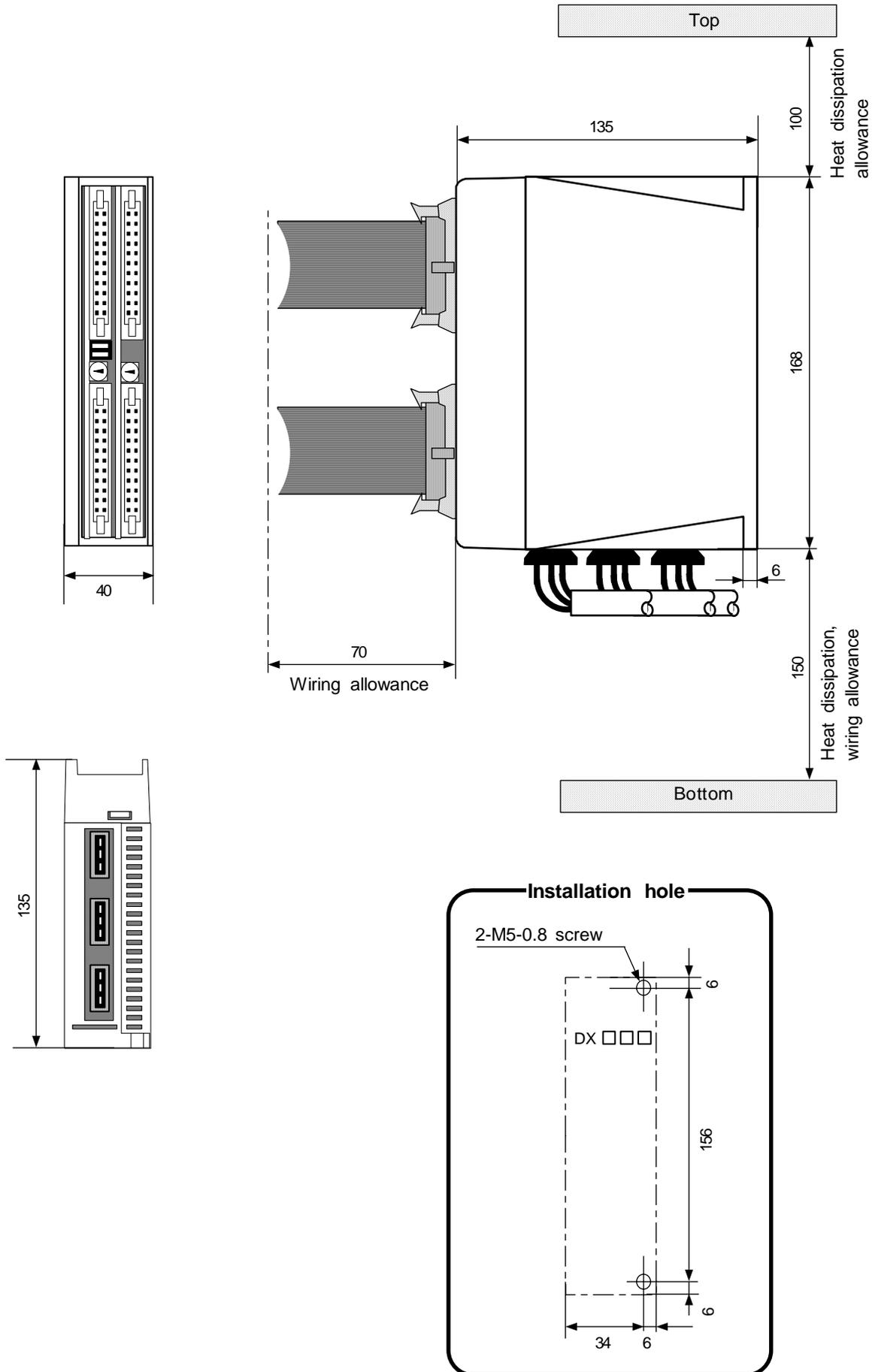
APPENDIX 1 OUTLINE DRAWING
 Appendix 1.3 Base I/O Unit Outline Drawing

Appendix 1.3 Base I/O Unit Outline Drawing



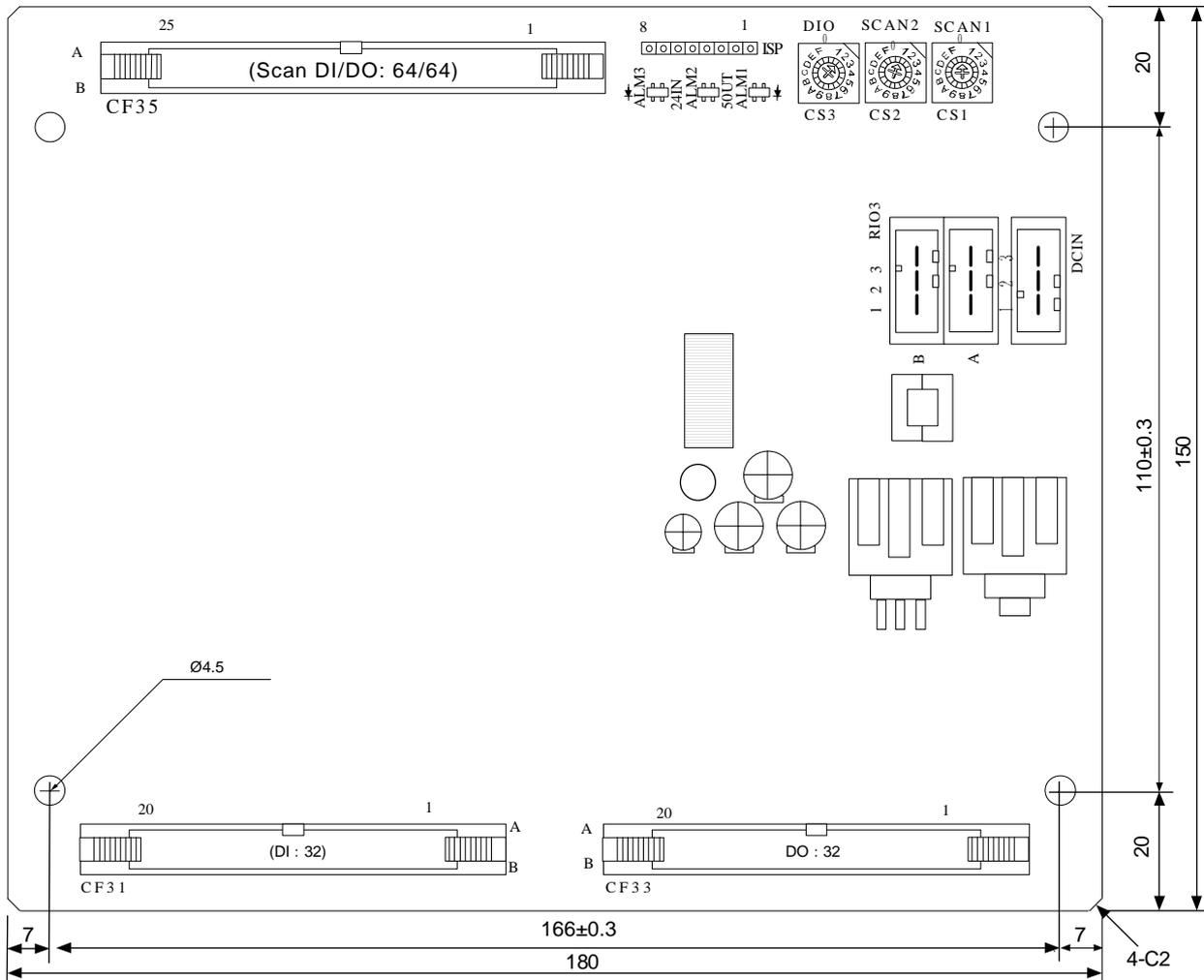
APPENDIX 1 OUTLINE DRAWING
Appendix 1.4 Remote I/O Unit Outline Drawing

Appendix 1.4 Remote I/O Unit Outline Drawing



APPENDIX 1 OUTLINE DRAWING
Appendix 1.5 HR347/357 (Scan I/O) Card Outline Drawing

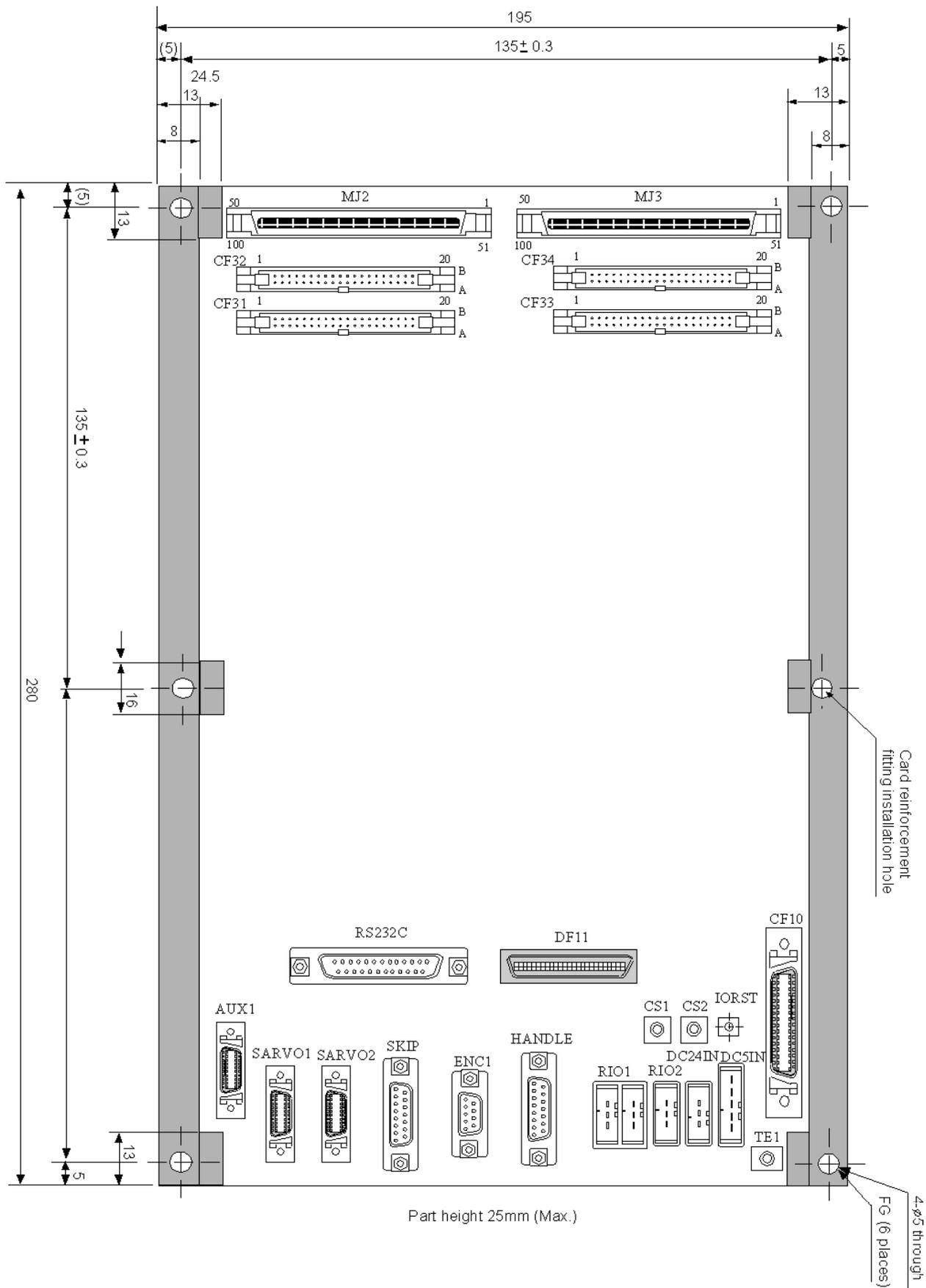
Appendix 1.5 HR347/357 (Scan I/O) Card Outline Drawing



* The PCB height (depth) will be approx. 40mm when the connector is inserted, so secure a space larger than that during installation.

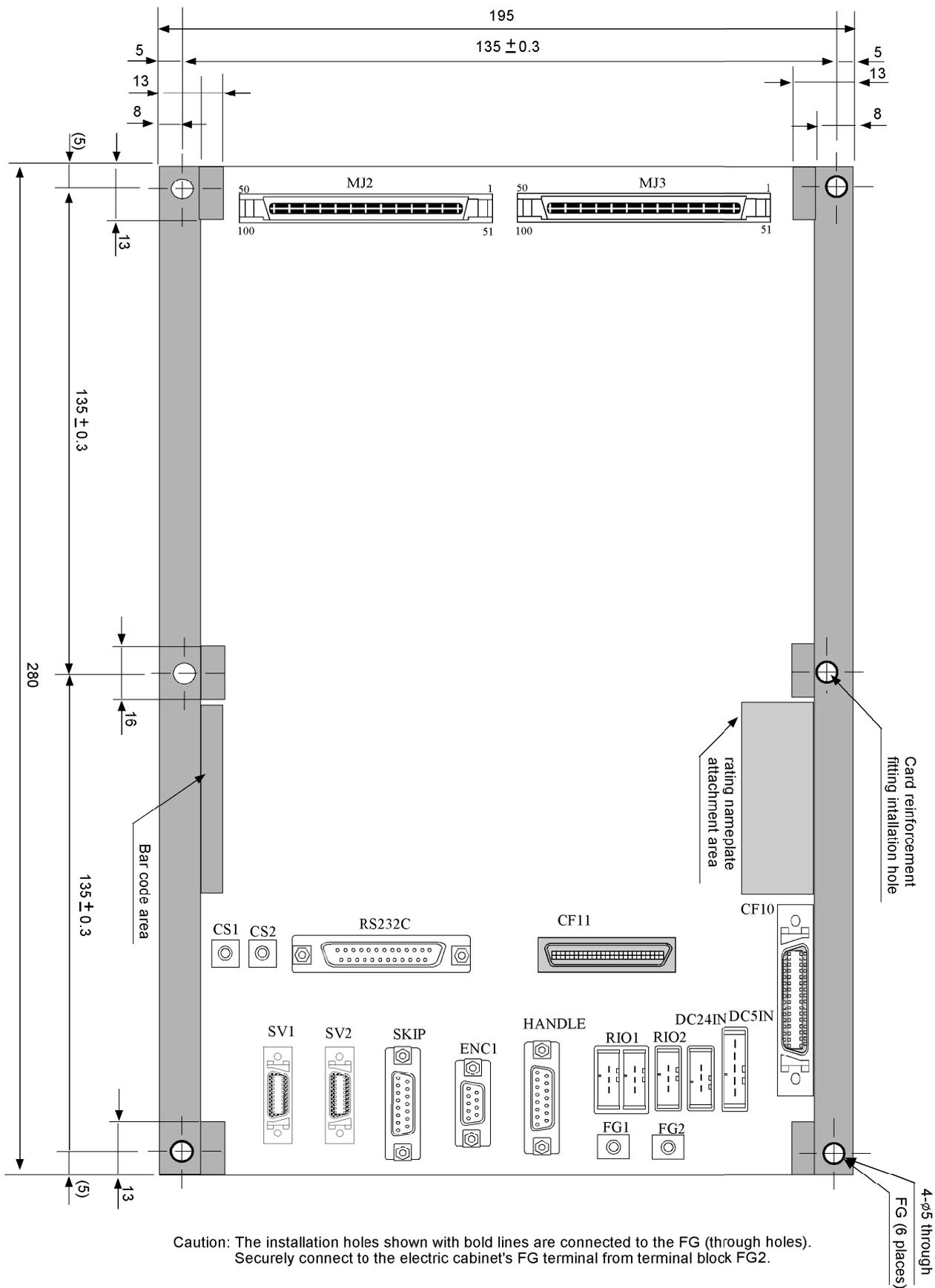
APPENDIX 1 OUTLINE DRAWING
Appendix 1.6 FCU6-HR377 Unit Outline Drawing

Appendix 1.6 FCU6-HR377 Unit Outline Drawing



APPENDIX 1 OUTLINE DRAWING
 Appendix 1.7 FCU6-HR378 Unit Outline Drawing

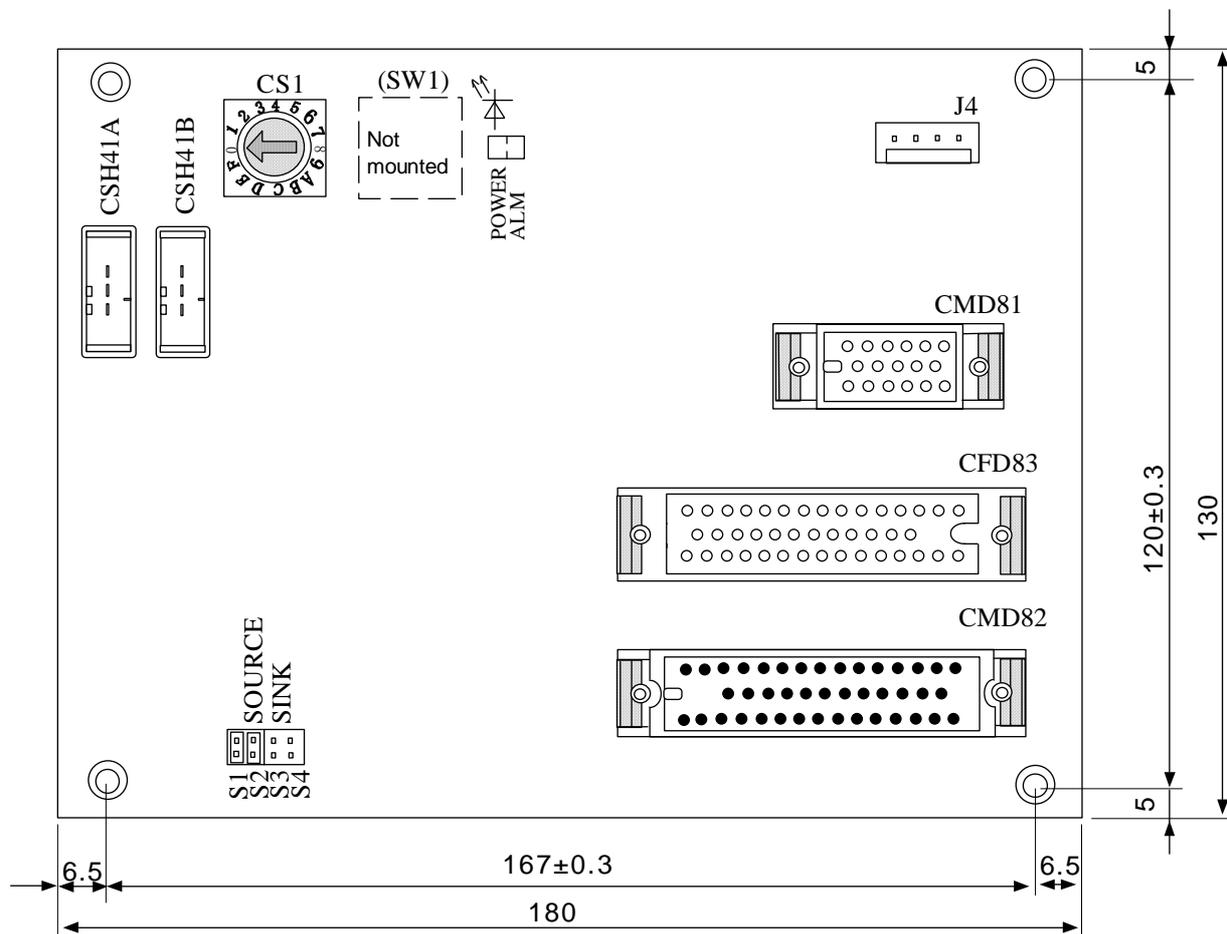
Appendix 1.7 FCU6-HR378 Unit Outline Drawing



Caution: The installation holes shown with bold lines are connected to the FG (through holes).
 Securely connect to the electric cabinet's FG terminal from terminal block FG2.

APPENDIX 1 OUTLINE DRAWING
Appendix 1.8 QY231 Card Outline Drawing

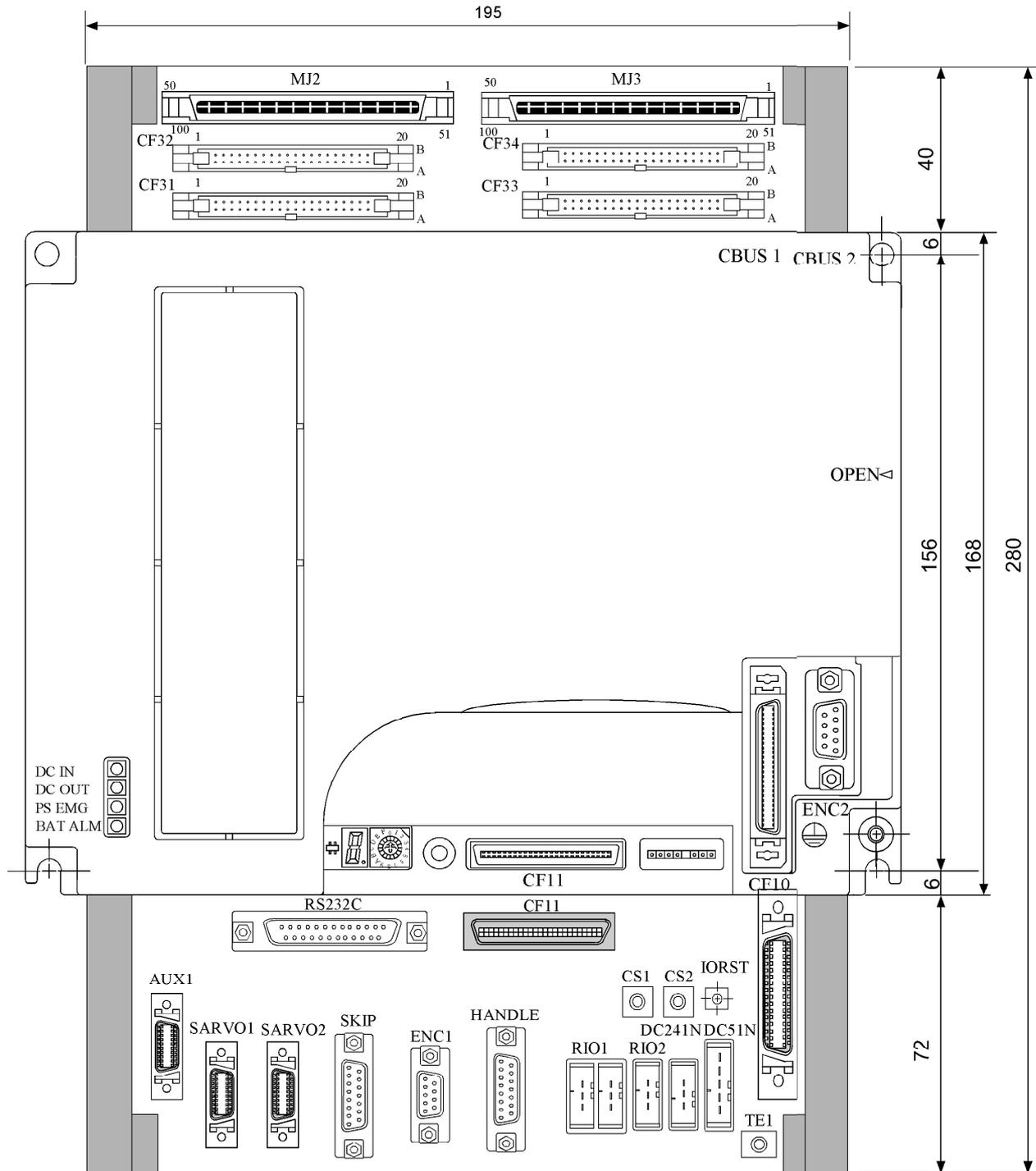
Appendix 1.8 QY231 Card Outline Drawing



* The PCB height (depth) will be approx. 40mm when the connector is inserted, so secure a space larger than that during installation.

APPENDIX 1 OUTLINE DRAWING
Appendix 1.9 Example of Control Unit and FCU6-HR377 Layout

Appendix 1.9 Example of Control Unit and FCU6-HR377 Layout

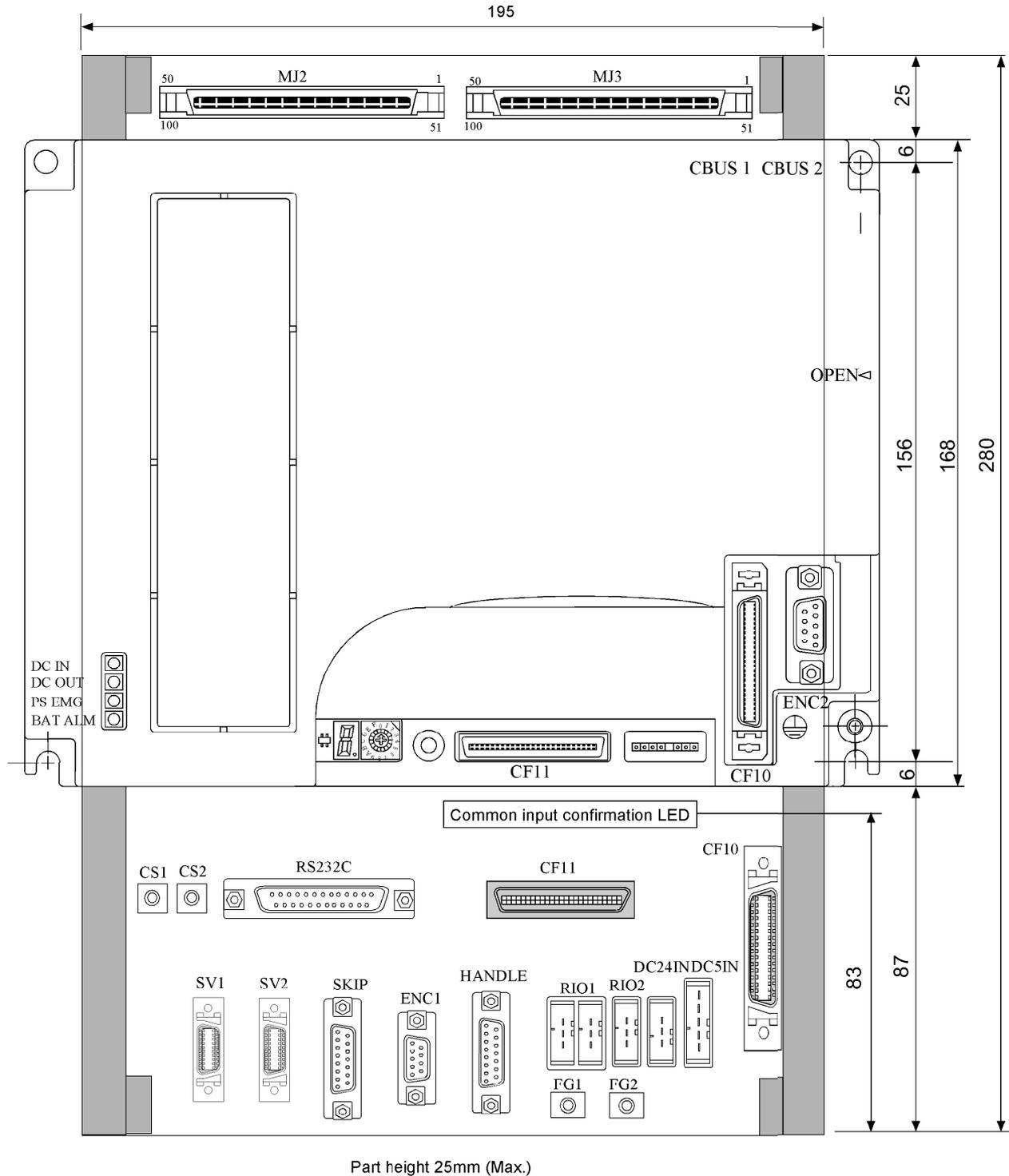


Part height 25mm (Max.)

The FCU6-HR377 part height is max. 25mm. When overlaying the FCU6-HR377 and control unit as shown in the drawing, arrange the control unit 30mm or more away from the FCU6-HR377 PCB surface.

APPENDIX 1 OUTLINE DRAWING
Appendix 1.10 Example of Control Unit and FCU6-HR378 Layout

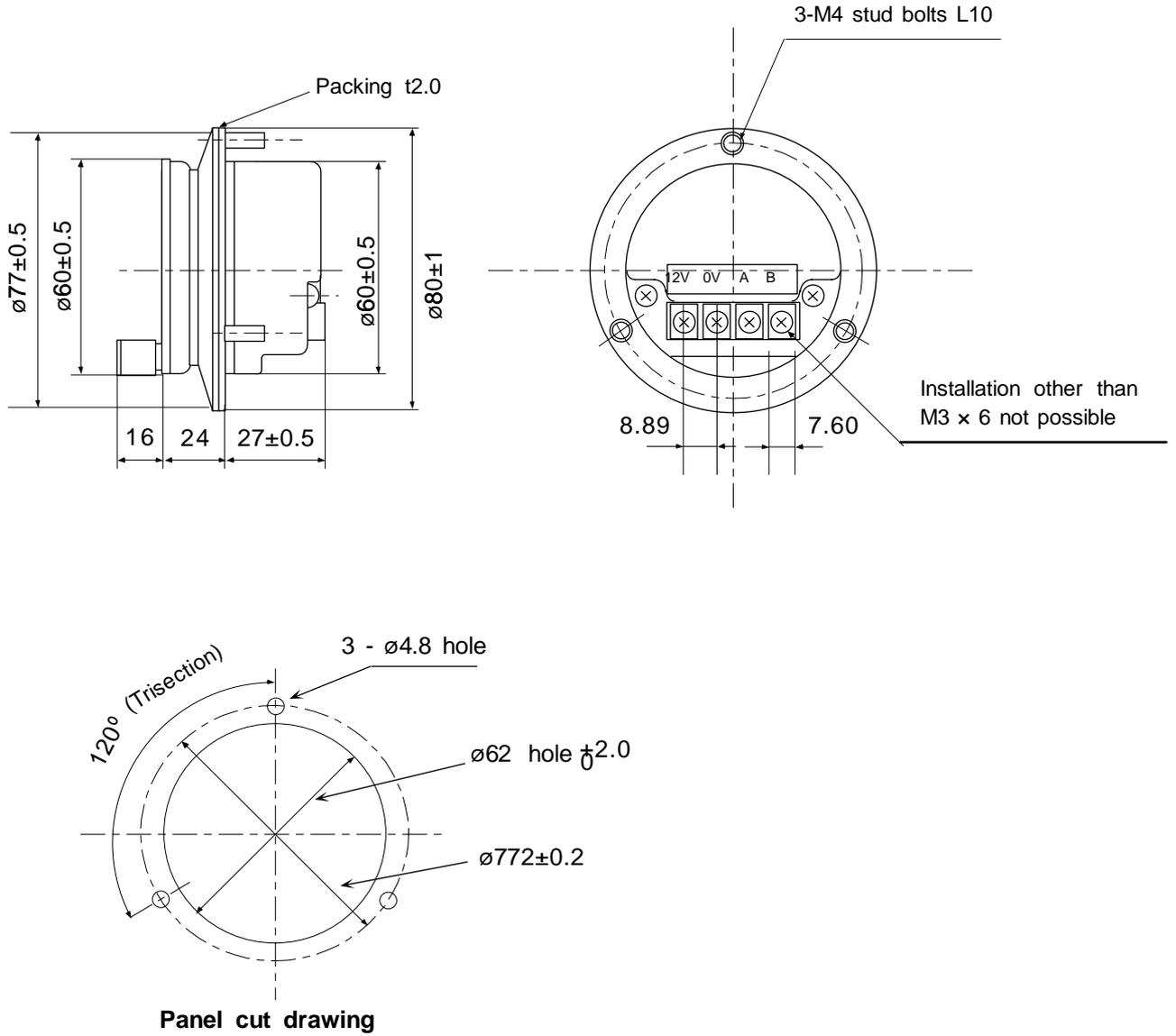
Appendix 1.10 Example of Control Unit and FCU6-HR378 Layout



The FCU6-HR377 part height is max. 25mm. When overlaying the FCU6-HR377 and control unit as shown in the drawing, arrange the control unit 30mm or more away from the HR FCU6-377 PCB surface.

APPENDIX 1 OUTLINE DRAWING
Appendix 1.11 Manual Pulse Generator (HD60) Outline Drawing

Appendix 1.11 Manual Pulse Generator (HD60) Outline Drawing

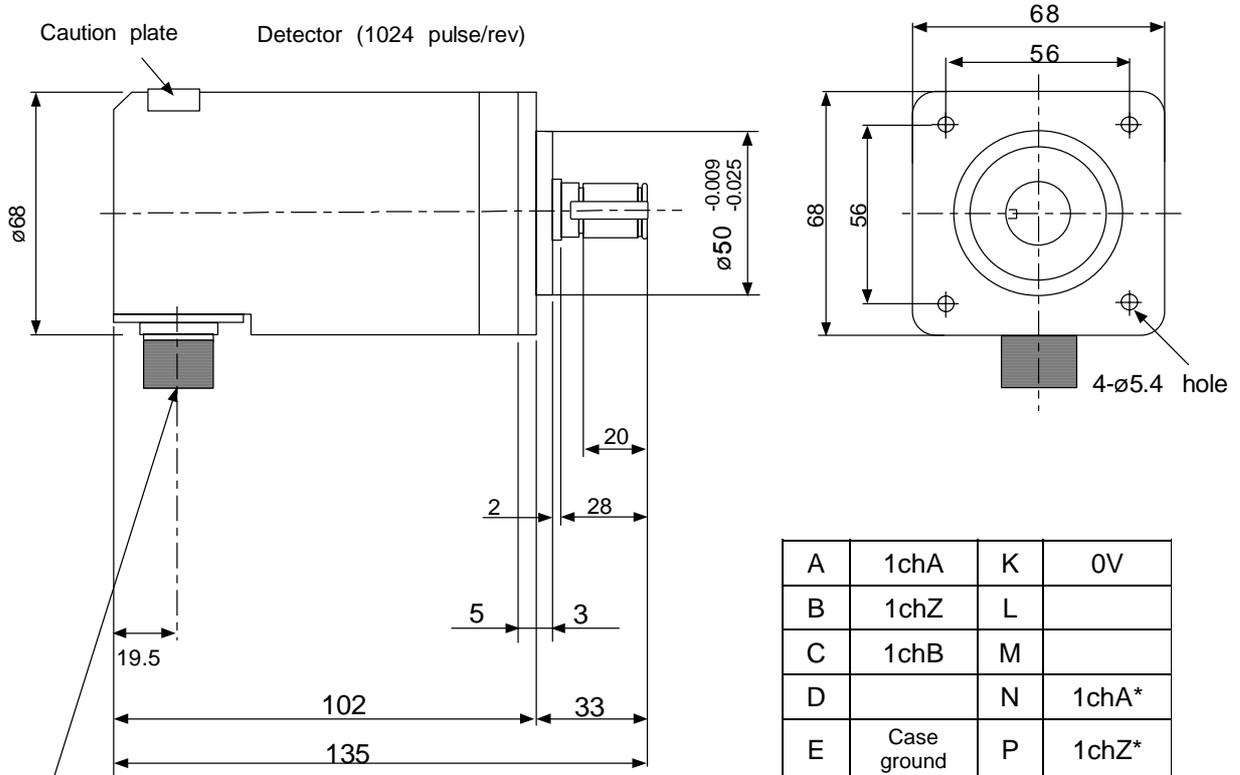


(Note) Use the 25 pulse/rev type.

APPENDIX 1 OUTLINE DRAWING

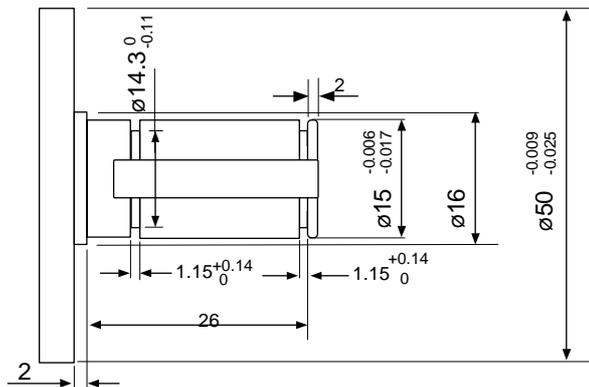
Appendix 1.12 Synchronous Feed Encoder (OSE-1024-3-15-68) Outline Drawing

Appendix 1.12 Synchronous Feed Encoder (OSE-1024-3-15-68) Outline Drawing

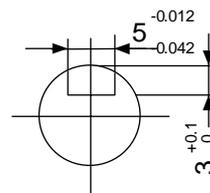


Synchronous feed encoder side
97F3102E20-29P (or equivalent)

A	1chA	K	0V
B	1chZ	L	
C	1chB	M	
D		N	1chA*
E	Case ground	P	1chZ*
F		R	1chB*
G		S	
H	+5V	T	
J			



Enlarged view of key

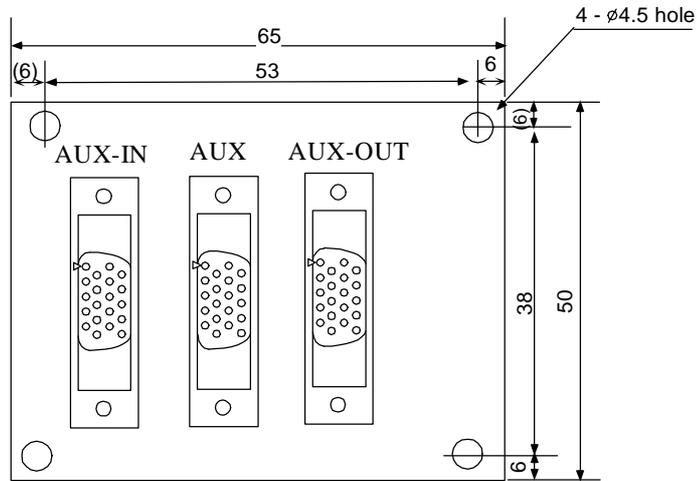


Cross-section BB

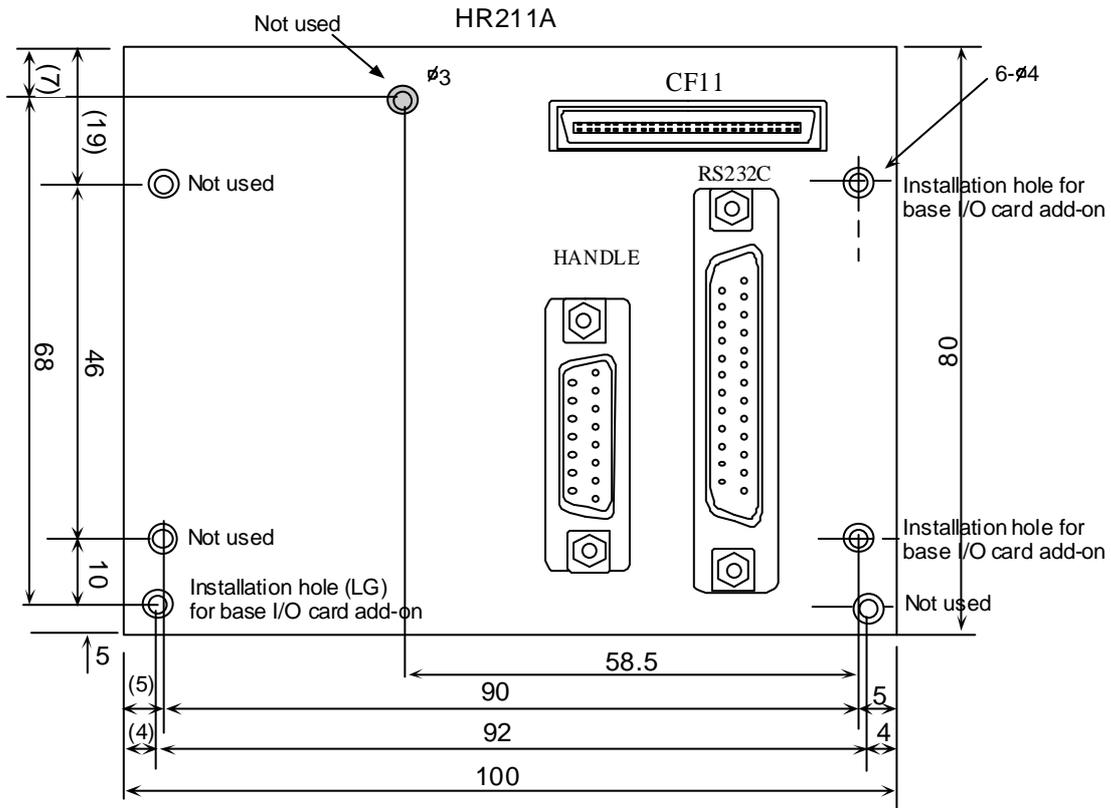
The effective depth of the key way is 21mm.

APPENDIX 1 OUTLINE DRAWING
Appendix 1.13 HR591 (I/O link relay branching wire) Card Outline Drawing

Appendix 1.13 HR591 (I/O link relay branching wire) Card Outline Drawing

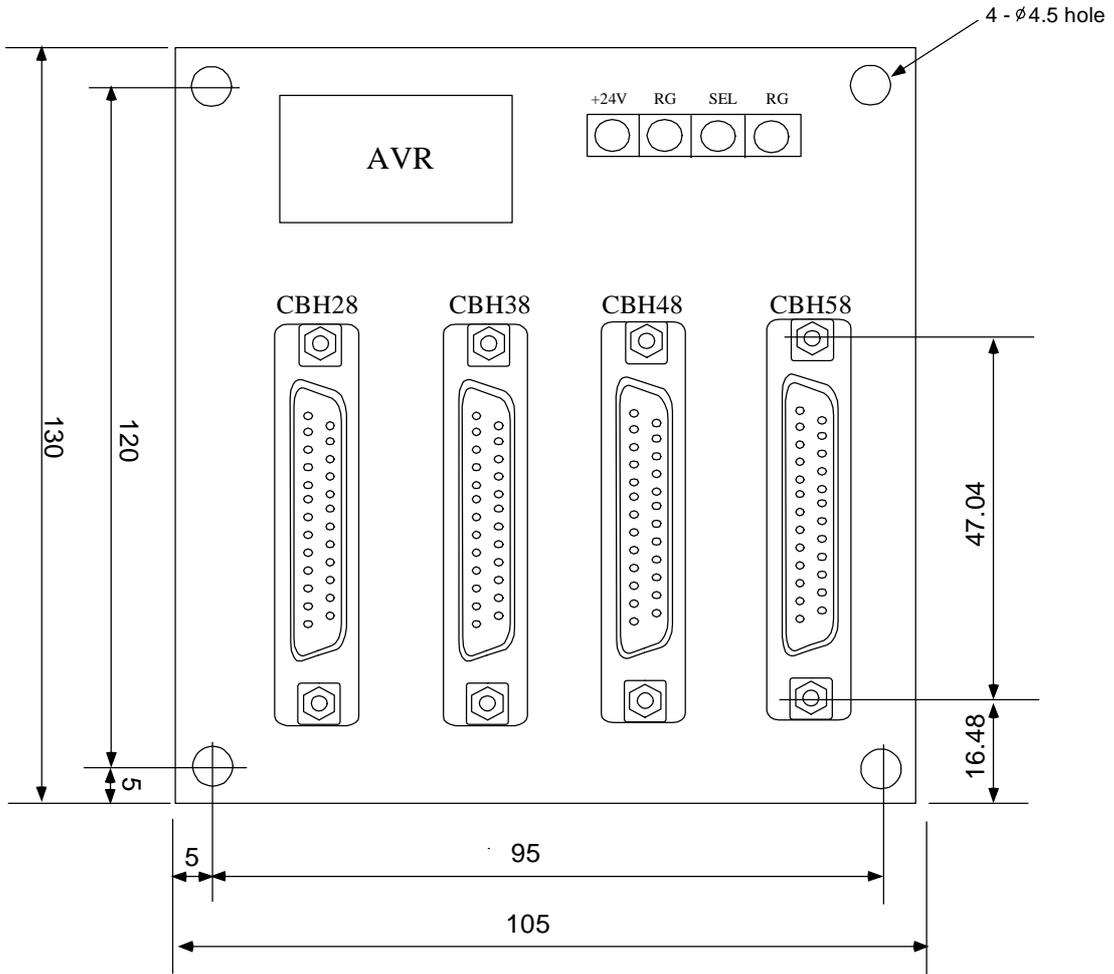


Appendix 1.14 HR211 Card Outline Drawing



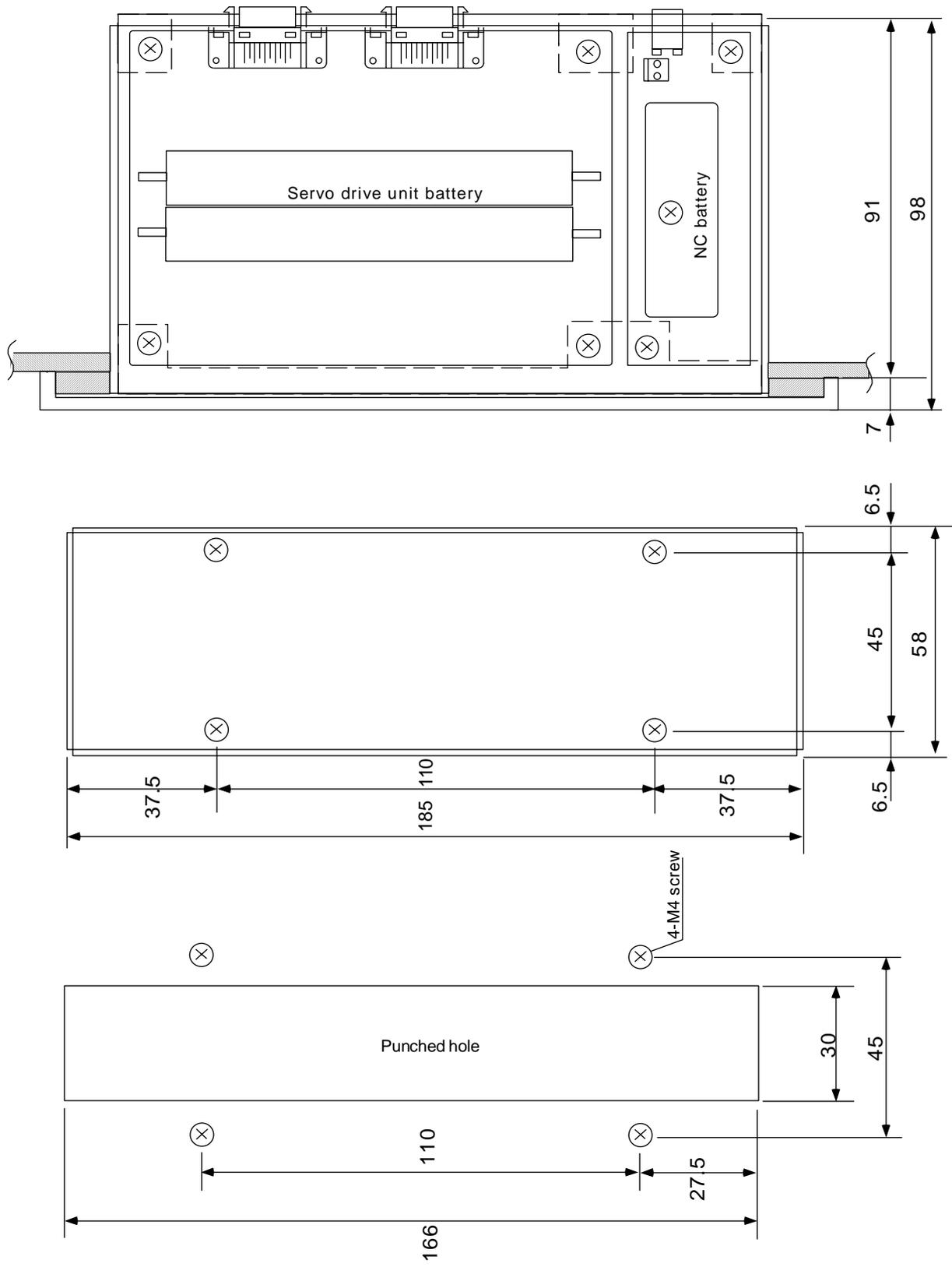
APPENDIX 1 OUTLINE DRAWING
Appendix 1.15 QY261 Card Outline Drawing

Appendix 1.15 QY261 Card Outline Drawing



APPENDIX 1 OUTLINE DRAWING
Appendix 1.16 External Battery Unit Outline Drawing

Appendix 1.16 External Battery Unit Outline Drawing



APPENDIX 1 OUTLINE DRAWING

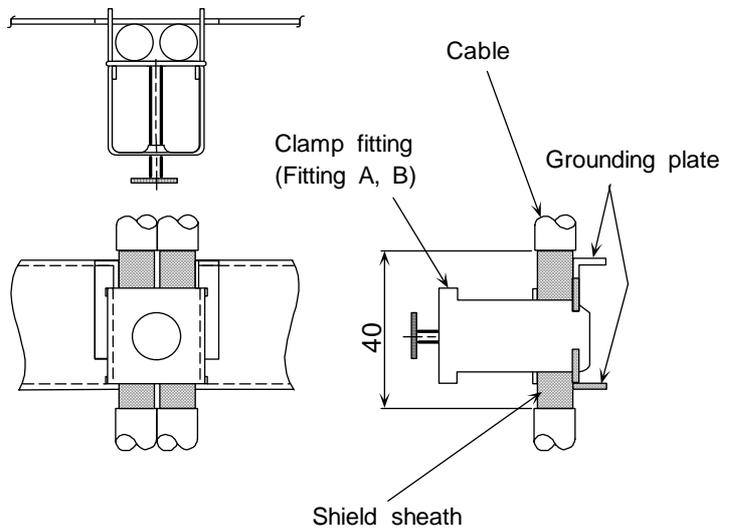
Appendix 1.17 Outline and Installation Outline Drawing for Grounding Plate and Clamp Fitting

Appendix 1.17 Outline and Installation Outline Drawing for Grounding Plate and Clamp Fitting

The shield wire generally only needs to be grounded to the connector's case frame. However, the effect can be improved by directly grounding to the grounding plate as shown on the right. Install the grounding plate near each unit. Peel part of the cable sheath as shown on the right to expose the shield sheath. Press that section against the grounding plate with the clamp fitting. Note that if the cable is thin, several can be clamped together.

Install the grounding plate directly onto the cabinet or connect a grounding wire so that sufficient frame grounding is achieved.

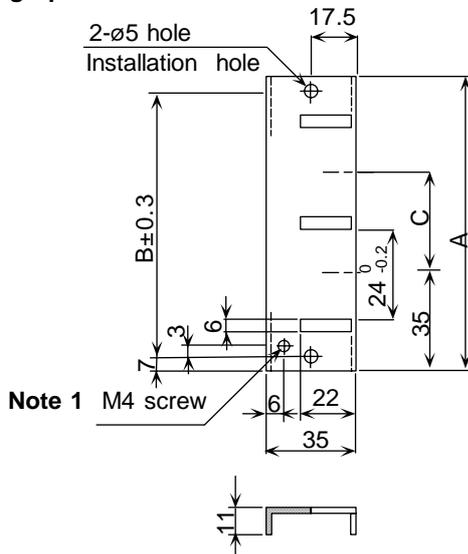
If the AERSBAN-□ SET, containing the grounding plate and clamp fitting, is required, please contact Mitsubishi.



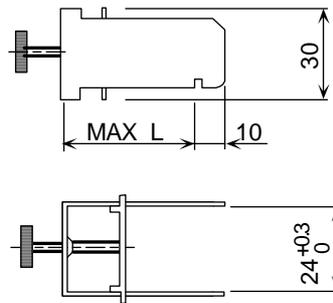
Clamp section drawing

Outline drawing

Grounding plate



Clamp fitting



Note 1) Screw hole for wiring to cabinet's grounding plate

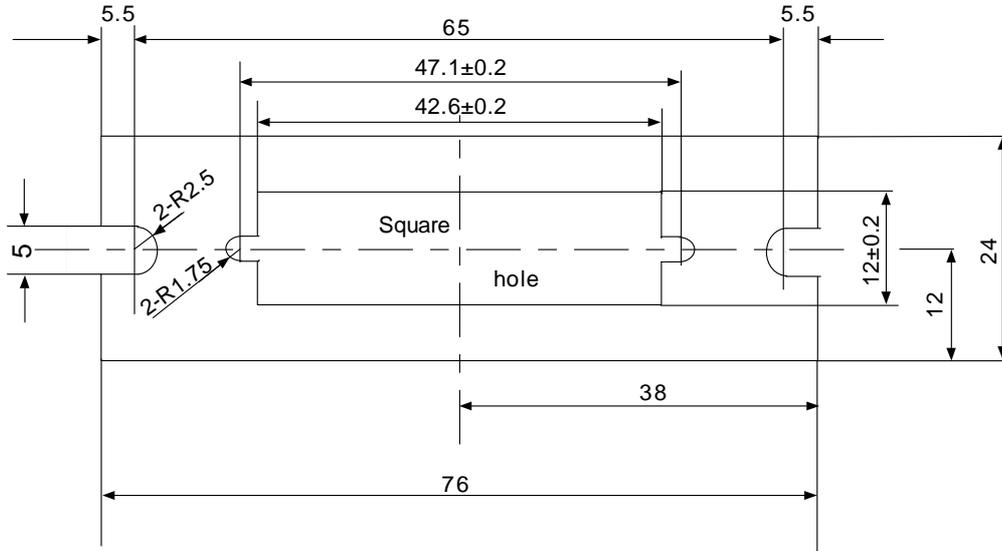
Note 2) The grounding plate thickness is 1.6mm

	A	B	C	Enclosed fittings
AERSBAN-DSET	100	86	30	Two clamp fittings A
AERSBAN-ESET	70	56	—	One clamp fitting B

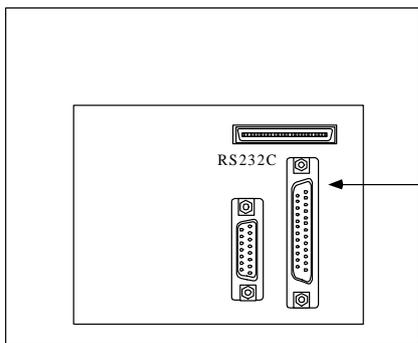
	L
Clamp fitting A	70
Clamp fitting B	45

APPENDIX 1 OUTLINE DRAWING
Appendix 1.18 F Installation Plate Outline Drawing

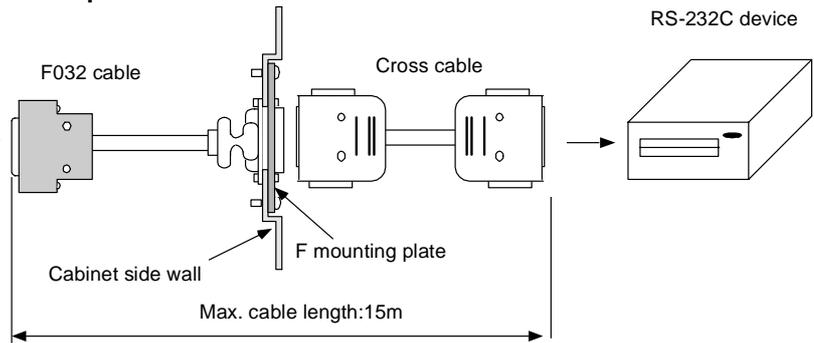
Appendix 1.18 F Installation Plate Outline Drawing



Base I/O unit

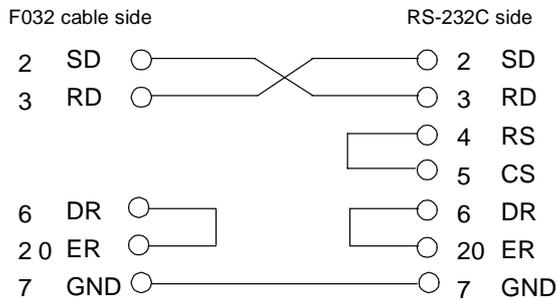


Example of use with RS-232C devices

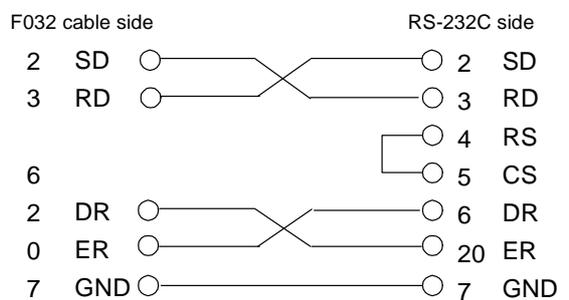


Cross cable connection

For DC code control



For DR/ER control



<Caution>

- Do not connect anything to the open pins.
- Keep the overall cable length to less than 15m.

Recommended applicable connector

Connector: HDBB-25PF(05) (Hirose Electric)
 Case: HDB-CTF (Hirose Electric)

APPENDIX 2 CABLE DRAWINGS

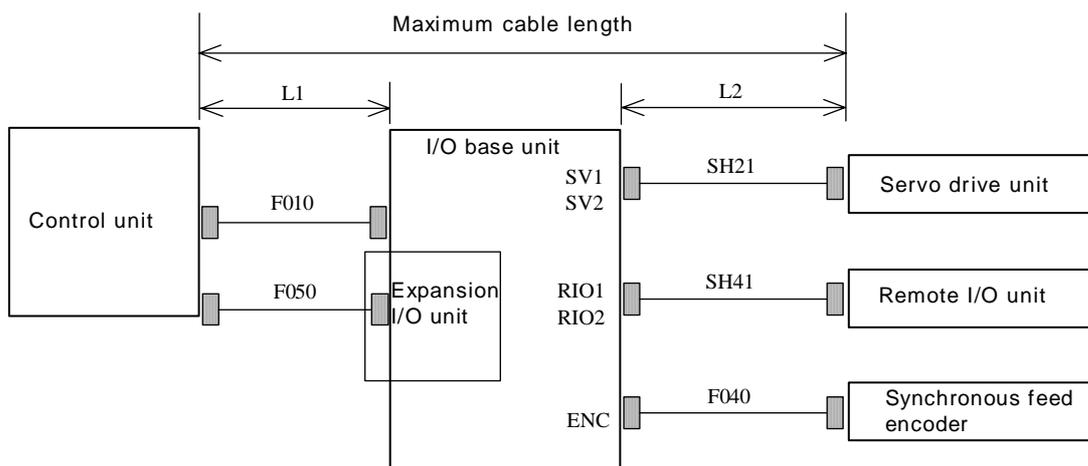
APPENDIX 2 CABLE DRAWINGS

List of cable type

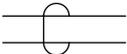
Appendix No.	Cable type	Application	Max. length	Standard cable length
Appendix 2.1	SH21 cable	MC link A communication (servo/display)	(Note 1) 30m	
Appendix 2.2	SH41 cable	MC link B communication (Remote I/O communication)	0.5m	
Appendix 2.3	R301 cable	DI/DO	50m	
Appendix 2.4	F010 cable	Connection between control unit and base I/O unit	20m	
Appendix 2.5	F020 cable	Connects one manual pulse generator	50m	
Appendix 2.5	F021 cable	Connects two manual pulse generators	50m	
Appendix 2.5	F022 cable	Connects three manual pulse generators	50m	
Appendix 2.6	F030 cable	Connects RS-232-C device to port No. 1	15m	
Appendix 2.6	F031 cable	Connects RS-232-C device to port No. 1 and port No. 2	15m	
Appendix 2.6	F032 cable	Connects RS-232-C device to port No. 2	15m	
Appendix 2.7	F040 cable	Synchronous feed encoder (straight type connector)	(Note 1) 50m	
Appendix 2.7	F041 cable	Synchronous feed encoder (right angle type connector)	(Note 1) 50m	
Appendix 2.8	F050 cable	Connection between control unit and base I/O unit	0.5m	
Appendix 2.9	F070 cable	24VDC input	3m	
Appendix 2.10	F120 cable	External emergency stop	30m	
Appendix 2.11	F190 cable	RS-232-C device (for Mitsubishi maintenance/service personnel)	15m	
Appendix 2.12	F240 cable	External battery unit	30m	
Appendix 2.13	R031 cable	Analog signal input/output	30m	
Appendix 2.14	R211 cable	Communication terminal communication /remote I/O communication	(Note 1) 50m	
Appendix 2.15	R220 cable	24VDC power supply for remote I/O unit	50m	
Appendix 2.16	R500 cable	External PLC link II (A1C type)	6m	
Appendix 2.17	R501 cable	External PLC link II (A3N type)	6.6m	
Appendix 2.18	ENC-SP1 cable	Spindle drive unit	50m	
Appendix 2.19	ENC-SP2 cable	FR-TK	50m	
Appendix 2.20	M-TM terminator	CRT changeover	–	
Appendix 2.21	R-TM terminator	Remote I/O communication terminator	–	

(Note 1) The max. length is the sum (L1 + L2) of the cable length (L1) from the control unit to the base I/O unit and the cable length (L2) from the base I/O unit to each unit.

APPENDIX 2 CABLE DRAWINGS



(Note 2) Symbols for writing cable drawings
 The following symbols are used in the cable drawings.

1.  indicates twist.

2.  indicates the shield sheath.

3.  indicates shield clamping to the grounding plate.

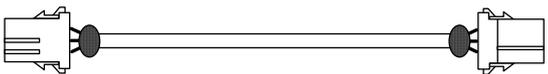
4. In the cable drawings, the partner of the twisted pair cable is given a priority, so the pin No. of the connectors at both ends are not necessary in number of order.
5. Equivalent parts can be used for the connector, contact and wire material.

APPENDIX 2 CABLE DRAWINGS
Appendix 2.1 SH21 cable

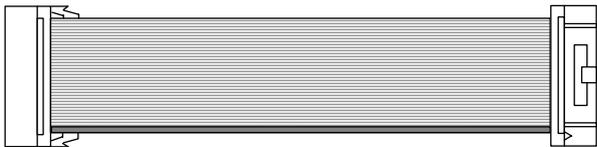
Appendix 2.1 SH21 cable (Servo drive unit)

Cable type: SH21 cable	Usage: MC link A communication (servo/display)	Appendix 2.1
<p align="center">Connector name : SV1, SV2 (SH21/R000) Servo drive unit</p>  <p>SV1, SV2 (CSH21) Plug : 10120-6000EL Shell : 10320-3210-000 Recommended manufacturer: 3M</p> <p align="center">Wire material: UL20276 AWG28 × 10P Recommended manufacturer: Toyokuni Electric Cable</p> <p align="right">Plug : 10120-6000EL Shell : 10320-3210-000 Recommended manufacturer: 3M</p> <p>(Note) Fold the wire material shield over the sheath, and wrap copper foil tape over it. Clamp with the connector's GND plate. The SH21 cable is the same as the FCUA-R000 cable used with the MELDAS 50 series.</p>		

Appendix 2.2 SH41 cable (Remote I/O)

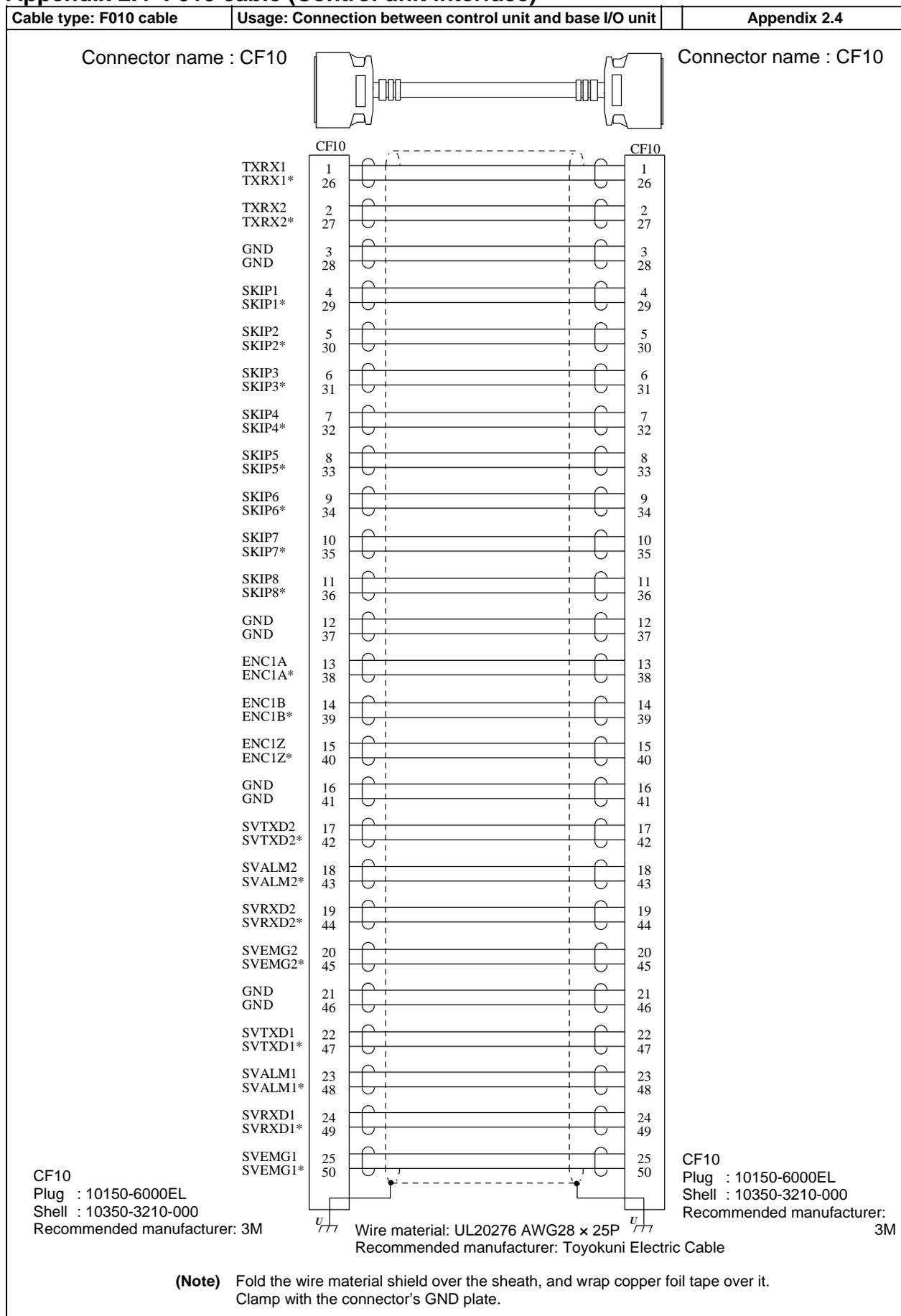
Cable type: SH41 cable	Usage: MC link B communication (Remote I/O communication)	Appendix 2.2													
<p align="center">Connector name : RIO1, RIO2, RIO3 (CSH41) Connector name : (CSH41)</p>  <p>RIO1, RIO2, RIO3 (CSH41) (CSH41)</p> <table border="0"> <tr> <td>TXRX</td> <td>1</td> <td rowspan="3">-----</td> <td>1</td> <td>TXRX</td> </tr> <tr> <td>TXRX*</td> <td>2</td> <td>2</td> <td>TXRX*</td> </tr> <tr> <td>GND</td> <td>3</td> <td>3</td> <td>GND</td> </tr> </table> <p>RIO1, RIO2, RIO3 (CSH41) Connector : 1-178288-3 Contact : 1-175218-2 Recommended manufacturer: Tyco Electronics AMP</p> <p align="center">Wire material: MVVS 3C × 0.5mm² (MIC 3C × 0.5mm²) Recommended manufacturer: Takeuchi Densen</p> <p>(CSH41) Connector : 1-178288-3 Contact : 1-175218-2 Recommended manufacturer: Tyco Electronics AMP</p> <p>Note: 1. Protect both ends of cable by insulation bushing. 2. RIO1, RIO2, RIO3 can be used as common.</p> <p>The SH41 cable is the RIO communication cable for internal wiring. Use this for connecting the adjacently arranged RIO units in the electric cabinet. For the wiring outside the electric cabinet, use the R211 cable described in Appendix 2.15, having reinforced cable material and FG treatment.</p>			TXRX	1	-----	1	TXRX	TXRX*	2	2	TXRX*	GND	3	3	GND
TXRX	1	-----	1	TXRX											
TXRX*	2		2	TXRX*											
GND	3		3	GND											

Appendix 2.3 R301 cable (DI/DO)

Cable type: R301 cable	Usage: DI/DO	Appendix 2.3
<p align="center">Connector name : DI-L/DO-L, DI-R/DO-R CF31, CF32, CF33, CF34</p>  <p>Connector : 7940-6500SC Recommended manufacturer: 3M</p> <p align="center">Wire material: B40-S Recommended manufacturer: Oki Electric Cable</p> <p>Connector : 7940-6500SC Relief : 3448-7940 Recommended manufacturer: 3M</p>		

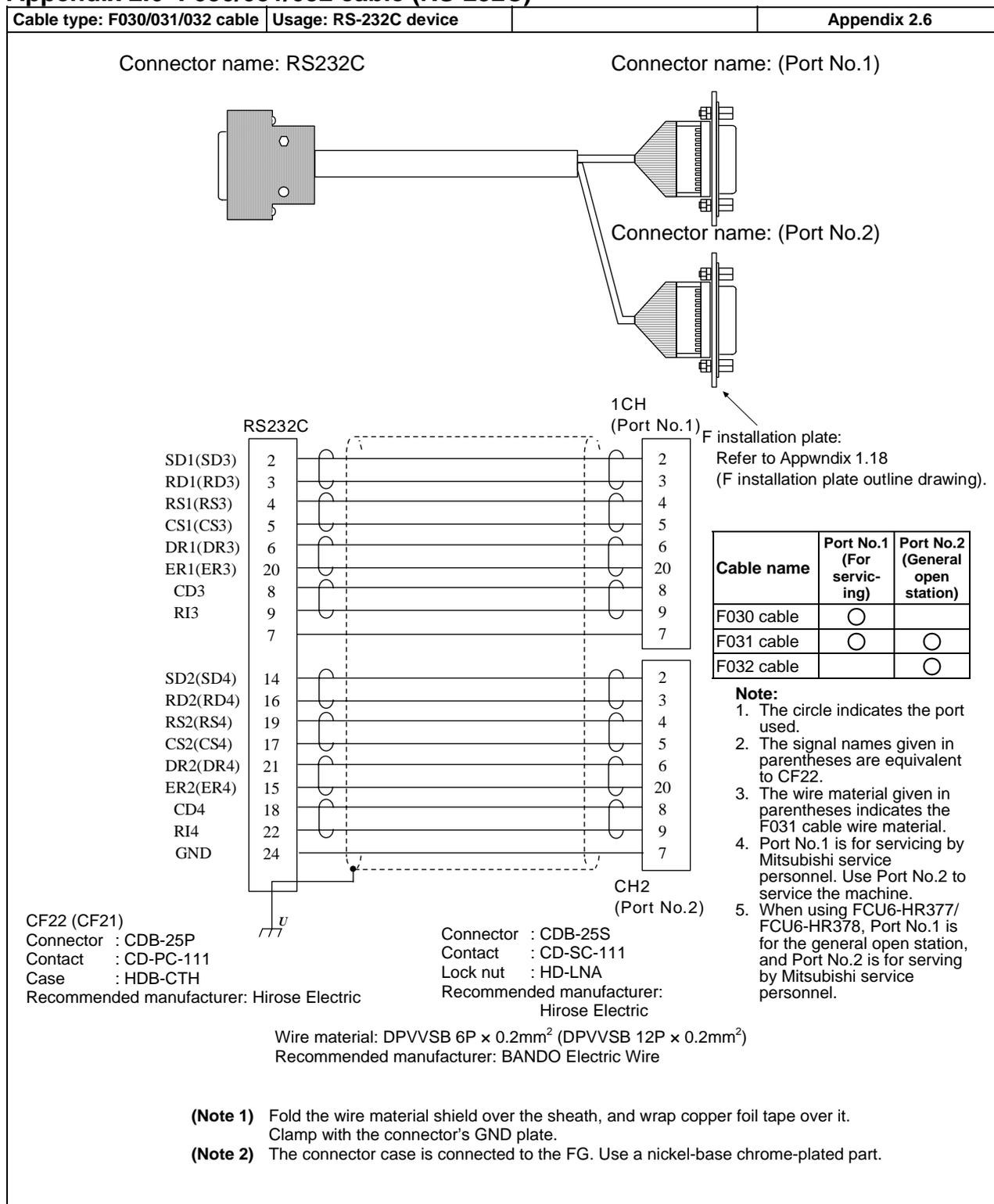
APPENDIX 2 CABLE DRAWINGS
Appendix 2.4 F010 cable

Appendix 2.4 F010 cable (Control unit interface)



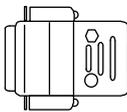
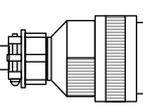
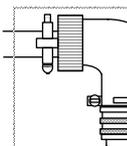
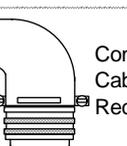
APPENDIX 2 CABLE DRAWINGS
Appendix 2.6 F030/031/032 cable

Appendix 2.6 F030/031/032 cable (RS-232C)

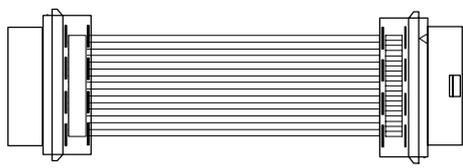


APPENDIX 2 CABLE DRAWINGS
Appendix 2.7 F040/041 cable

Appendix 2.7 F040/041 cable (Synchronous feed encoder)

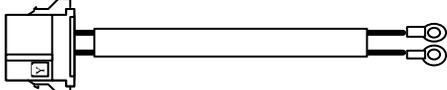
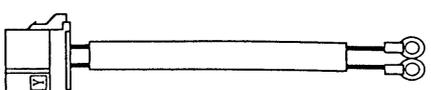
Cable type: F040/041 cable	Usage: Synchronous feed encoder	Appendix 2.7																												
<p>Connector name : ENC1 (ENC2)</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="font-size: small;"> <p>Connector : MS3106B20-29S Cable clamp: MS3057-12A Recommended manufacturer: ITT Canon</p> </div> <div style="font-size: small; align-self: center;"> <p>} F040 cable</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="font-size: small;"> <p>Connector : MS3106B20-29S Cable clamp: MS3057-12A Recommended manufacturer: ITT Canon</p> </div> <div style="font-size: small; align-self: center;"> <p>} F041 cable</p> </div> </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>ENC1 (ENC2)</p> <table style="width:100%; border-collapse: collapse; font-size: small;"> <tr><td>ENC1A (ENC2A)</td><td>1</td><td rowspan="6" style="text-align: center; vertical-align: middle;">Twist</td><td>A</td></tr> <tr><td>ENC1A*(ENC2A*)</td><td>6</td><td>N</td></tr> <tr><td>ENC1B (ENC2B)</td><td>2</td><td>C</td></tr> <tr><td>ENC1B*(ENC2B*)</td><td>7</td><td>R</td></tr> <tr><td>ENC1Z (ENC2Z)</td><td>3</td><td>B</td></tr> <tr><td>ENC1Z*(ENC2Z*)</td><td>8</td><td>P</td></tr> <tr><td>GND</td><td>4</td><td>K</td></tr> <tr><td>GND</td><td>5</td><td>E</td></tr> <tr><td>+5V</td><td>9</td><td>H</td></tr> </table> <p style="text-align: center; margin-top: 5px;">\varnothing</p> </div> <div style="width: 45%; font-size: small;"> <p>Note: The signal names given in parentheses are equivalent to ENC2.</p> </div> </div> <div style="font-size: x-small;"> <p>ENC1 (ENC2) Connector : CDE-9PF Contact : CD-PC-111 Case : HDE-CTH Recommended manufacturer: Hirose Electric</p> <p style="margin-left: 150px;">Wire material: DPVVS8 6P × 0.2mm² Recommended manufacturer: BANDO Electric Wire</p> </div> <p align="center" style="font-size: x-small; margin-top: 10px;"> (Note) Fold the wire material shield over the sheath, and wrap copper foil tape over it. Clamp with the connector's GND plate. </p>			ENC1A (ENC2A)	1	Twist	A	ENC1A*(ENC2A*)	6	N	ENC1B (ENC2B)	2	C	ENC1B*(ENC2B*)	7	R	ENC1Z (ENC2Z)	3	B	ENC1Z*(ENC2Z*)	8	P	GND	4	K	GND	5	E	+5V	9	H
ENC1A (ENC2A)	1	Twist	A																											
ENC1A*(ENC2A*)	6		N																											
ENC1B (ENC2B)	2		C																											
ENC1B*(ENC2B*)	7		R																											
ENC1Z (ENC2Z)	3		B																											
ENC1Z*(ENC2Z*)	8		P																											
GND	4	K																												
GND	5	E																												
+5V	9	H																												

Appendix 2.8 F050 cable (Control unit interface)

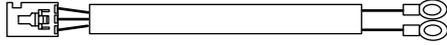
Cable type: F050 cable	Usage: Control unit interface	Appendix 2.8
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Connector name : CF11</p> </div> <div style="width: 45%; text-align: right;"> <p>Connector name : CF11</p> </div> </div> <div style="text-align: center; margin: 10px 0;">  </div> <div style="display: flex; justify-content: space-between; font-size: small;"> <div style="width: 45%;"> <p>CF11 Connector : DHD-RB50-20AN Recommended manufacturer: DDK</p> </div> <div style="width: 45%; text-align: right;"> <p>CF11 Connector : DHD-RB50-20AN Recommended manufacturer: DDK</p> </div> </div> <p align="center" style="font-size: x-small; margin-top: 10px;"> Cable name : K/S DHD-RB50-20AN × 2 (Recommended maker: DDK) Wire material : UL20528-50 × 28AWG (7/0.127) Recommended manufacturer: Fujikura </p>		

APPENDIX 2 CABLE DRAWINGS
Appendix 2.9 F070 cable

Appendix 2.9 F070 cable (24VDC input)

Cable type: F070 cable	Usage: 24VDC input	Reference: For HR377/378 5VDC input	Appendix 2.9																																
<p>Connector name : DC24IN</p>  <p>DC24IN</p> <table border="0"> <tr> <td>+24V</td> <td>1</td> <td></td> <td>+24V</td> </tr> <tr> <td>GND</td> <td>2</td> <td></td> <td>GND</td> </tr> <tr> <td>FG</td> <td>3</td> <td></td> <td>FG</td> </tr> </table> <p>Wire material : B-18 (19) U x 2SJ-1 x 9 Recommended manufacturer: Sumitomo Electric Industries</p> <p>Connector : 2-178288-3 Crimp terminal: V1.25-3 Contact : 1-175218-5 Recommended manufacturer: JST Recommended manufacturer: Tyco Electronics AMP</p>		+24V	1		+24V	GND	2		GND	FG	3		FG	<p>Connector name: DC5IN</p>  <p>DC5IN</p> <table border="0"> <tr> <td>+5V</td> <td>1</td> <td></td> <td>+5V</td> </tr> <tr> <td>GND</td> <td>2</td> <td></td> <td>GND</td> </tr> <tr> <td>FG</td> <td>3</td> <td></td> <td>FG</td> </tr> <tr> <td></td> <td>4</td> <td></td> <td></td> </tr> <tr> <td></td> <td>5</td> <td></td> <td></td> </tr> </table> <p>Connector : 2-178288-5 Contact : 1-175218-5 Recommended manufacturer: Tyco Electronics AMP Reference description</p>		+5V	1		+5V	GND	2		GND	FG	3		FG		4				5		
+24V	1		+24V																																
GND	2		GND																																
FG	3		FG																																
+5V	1		+5V																																
GND	2		GND																																
FG	3		FG																																
	4																																		
	5																																		
Caution: If the cable is 15m or longer, use 16AWG (1.25mm ²).																																			

Appendix 2.10 F120 cable (Emergency stop)

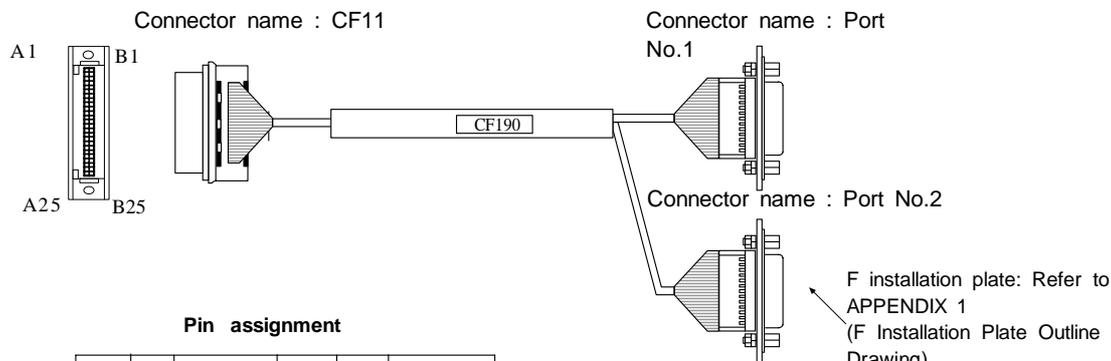
Cable type: F120 cable	Usage: Emergency stop	Appendix 2.10												
<p>Connector name : EMG</p>  <p>EMG</p> <table border="0"> <tr> <td>FG</td> <td>1</td> <td>B22-9</td> <td></td> </tr> <tr> <td>EMG IN</td> <td>2</td> <td></td> <td>EMG IN</td> </tr> <tr> <td>COM</td> <td>3</td> <td></td> <td>COM</td> </tr> </table> <p>Connector : 51030-0330 Crimp terminal: V1.25-3 Contact : 50084-8160 Recommended manufacturer: JST Recommended manufacturer: MOLEX</p> <p>Wire material : B-22 (19) U x 2SJ-1 x 9 Recommended manufacturer: Sumitomo Electric Industries</p>			FG	1	B22-9		EMG IN	2		EMG IN	COM	3		COM
FG	1	B22-9												
EMG IN	2		EMG IN											
COM	3		COM											

APPENDIX 2 CABLE DRAWINGS
Appendix 2.11 F190 cable

Appendix 2.11 F190 cable (RS-232C device)

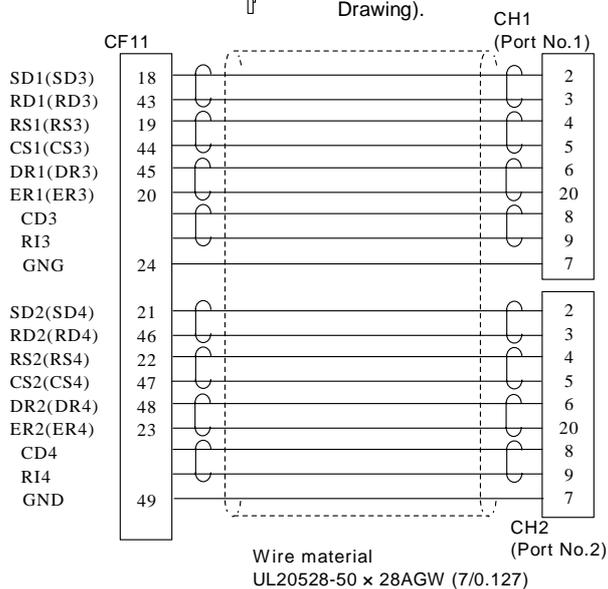
Cable type: F190 cable	Usage: RS-232C device	Appendix 2.11
-------------------------------	------------------------------	----------------------

Connection between M6 control unit (CF11) and RS-232C (Maintenance-dedicated cable)



Pin assignment

	A1		B1		GND	
RIO3	A2	I/O	RIOD2	B2	I/O	RIOD2*
	A3		GND	B3		GND
HANDLE	A4	I	HA1A	B4	I	HA1B
	A5	I	HA2A	B5	I	HA2B
	A6	I	HA3A	B6	I	HA3B
	A7		+12V	B7		+12V
	A8		GND	B8		GND
SCAN	A9	I	KBD0	B9	I	KBADCS0
	A10	I	KBD1	B10	I	KBADCS1
	A11	I	KBD2	B11	I	KBADCS2
	A12	I	KBD3	B12	I	KBADCS3
	A13	O	KBAD0	B13	O	BUZ
	A14	O	KBAD1	B14	O	RDY
	A15	O	KBAD2	B15	O	SP
	A16	I	KBEMG	B16	I	KBRES
	A17		GND	B17		GND
SERIAL1	A18	O	SD1	B18	I	RD1
	A19	O	RS1	B19	I	CS1
	A20	O	ER1	B20	I	DR1
	A21	O	SD2	B21	I	RD2
SERIAL2	A22	O	RS2	B22	I	CS2
	A23	O	ER2	B23	I	DR2
	A24		GND	B24		GND
	A25		+5V	B25		+5V



CF11	CH1,CH2
Connector : DHD-RB50-20A	Connector : CDB-25S
Recommended: DDK	Contact : CD-SC-111
manufacturer	Lock nut : HD-LNA
	Recommended: Hirose Electric
	manufacturer

Cable name	Port No.1 (For servicing)	CH2 (General open station)
F190 cable	○	
F191 cable	○	○
F192 cable		○

Note:
The circle indicates the port number used.

Precautions for manufacturing

- (1) The wire material is equivalent to the UL20528 Standards AWG28 (0.08mm²) cable.
- (2) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (3) Attach the nameplate (with protective cover stamped with the cable name) in the position designated in the assembly drawing.
- (4) Fold the wire material shield over the sheath, and wrap copper foil tape over it. Connect the wrapped copper foil tape to the connector's GND plate.

APPENDIX 2 CABLE DRAWINGS
Appendix 2.12 F240 Cable Manufacturing Drawing

Appendix 2.12 F240 Cable Manufacturing Drawing (External battery unit)

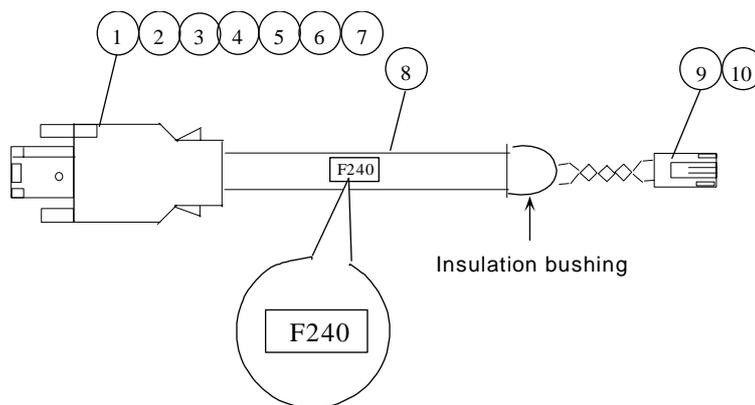
Application: Connection between external battery unit FCU6-BT4D1 and NC control unit

List of parts used

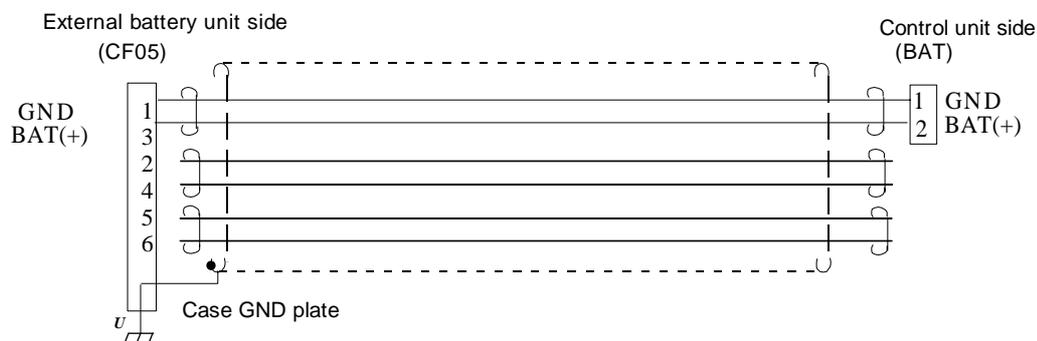
* Refer to section 13. Connection of External Battery Unit for details on the external battery unit

No.	Part name/type	Manufacturer	Qty.
1	Connector 54180-0611	MOLEX	1
2	Case A 54181-0615	MOLEX	1
3	Case B 54182-0605	MOLEX	1
4	Connector retainer A 58300-0600	MOLEX	1
5	Connector retainer B 58299-0600	MOLEX	1
6	Connector retainer 58303-0000	MOLEX	1
7	Fixing screw M2 screw		1
8	Cable DPVUSB 3P × 0.2mm ²	Product equivalent to left	(1)
9	Connector IL-2S-S3L-(N)	Japan Aviation Electronics	1
10	Contact IL-C2-1-10000	Japan Aviation Electronics	2

Assembly drawing



Connection diagram



Manufacturing precautions

- (1) The wire material shall be a shielded, 3-pair stranded cable equivalent to DPVUSB3P × 0.2SQ (0.2mm²).
- (2) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (3) Attach the nameplate (with protective cover stamped with the cable name) in the position designated in the assembly drawing.
- (4) On the external battery unit side, fold the wire material shield over the sheath, and wrap copper foil tape over it. Connect the copper foil tape wrapped around the sheath to the GND plate of the connector case.
- (5) Protect the control unit side of the wire with insulation bushing.

APPENDIX 2 CABLE DRAWINGS
Appendix 2.13 FCUA-R031 Cable Manufacturing Drawing

Appendix 2.13 FCUA-R031 Cable Manufacturing Drawing (Analog signal input/output)

Application: Analog signal input/output

Option (compatible connector set)

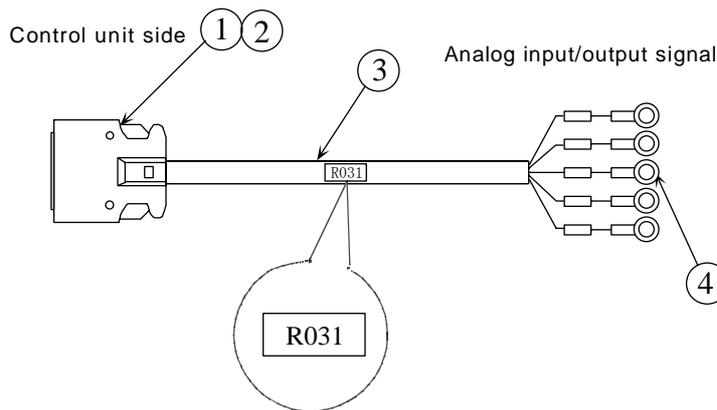
FCUA-CS000

(Note that only the control unit side connector is compatible.)

List of parts used

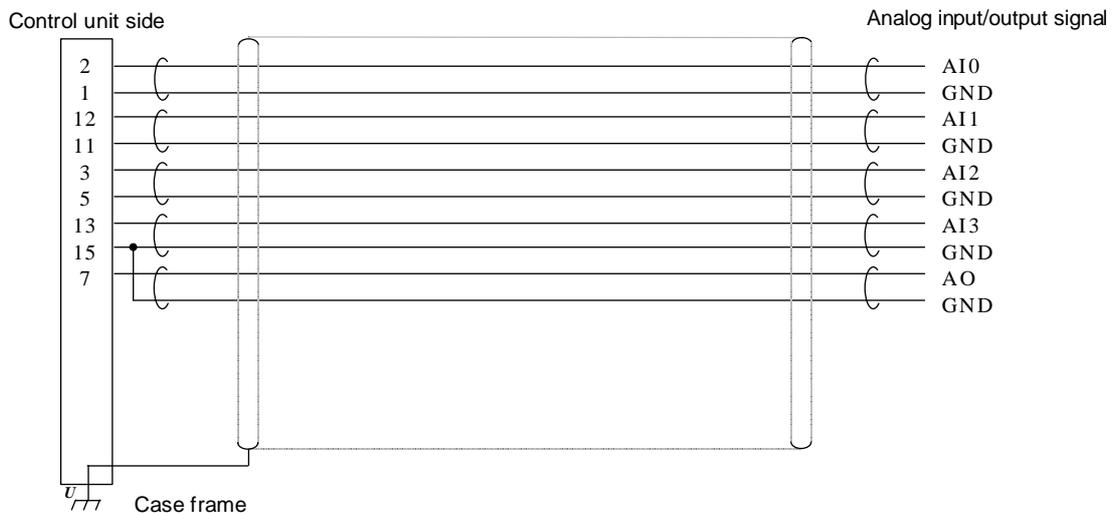
No.	Part name/model	Manufacturer	Q'ty
1	Connector 10120-3000VE	3M	1
2	Connector case 10320-52F0-008	3M	1
3	Wire material UL1061-2464 AWG22 x 6P	Product equivalent to left	(1)
4	Crimp terminal V1.25-4	JST	12

Assembly drawing



Connection diagram

Max. cable length: 30m



Manufacturing precautions

- (1) The wire material shall be a shielded, 6-pair stranded cable equivalent to UL1061-2464 Standard AWG22 (0.3mm²).
- (2) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (3) Attach the nameplate (with protective cover stamped with the cable name) in the position designated in the assembly drawing.
- (4) On the control unit side, fold the wire material shield over the sheath, and wrap copper foil tape over it. Connect the copper foil tape wrapped around the sheath to a connector case GND plate.
- (5) Stamp the name of each signal on the crimp terminal side mark tube and install.
- (6) Insulate the crimp terminals of unused signal wires with vinyl tape, etc.
- (7) Part 1 (connector) is usually used for wire material of AWG 24 (0.2mm²) or less in the catalog specifications, but AWG 22 (0.3mm²) can also be used.

Appendix 2.14 FCUA-R211 Cable Manufacturing Drawing (Communication terminal communication)

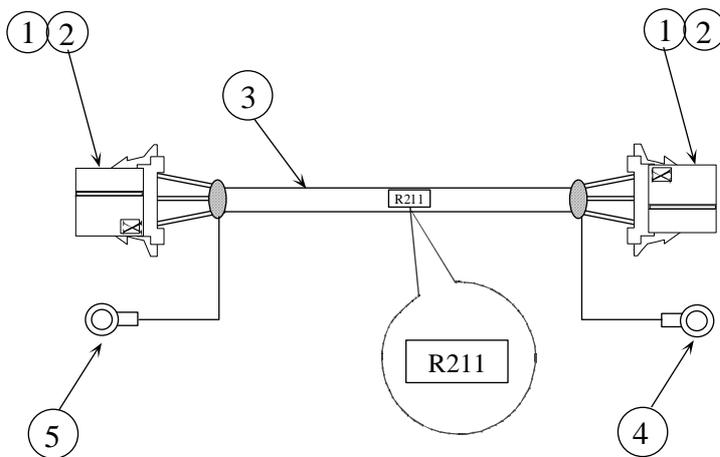
Application: Connection between control unit and remote I/O unit
 Connection between remote I/O unit and remote I/O unit
 Connection between remote I/O unit and communication terminal

Option (corresponding connector set)
 FCUA-CN211 (Note that when a one-end connector and contact are used, there is no crimp terminal)

List of parts used

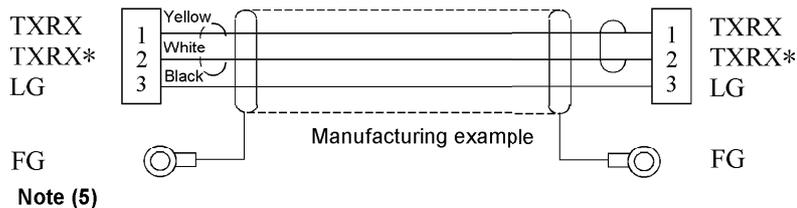
No.	Part name/type	Manufacturer	Q'ty
1	Connector 1-178288-3	Tyco Electronics AMP	2
2	Contact 1-175218-2	Tyco Electronics AMP	6
3	Wire material MIX3CHR-V-SV-SB Twisted pair cable with compound 3-core shield. (TOA Electric Industrial)	Product equivalent to left	(1)
4	Crimp terminal V1.25-3	JST	1
5	Crimp terminal V1.25-5	JST	1

Assembly drawing



Max. cable length: 50m

Connection diagram



Manufacturing precautions

- (1) The wire material shall be a shielded, 3-core twisted pair cable equivalent to AWG20 (0.5mm²).
- (2) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (3) Attach the nameplate (with protective cover stamped with the cable name) in the position designated in the assembly drawing.
- (4) Install each crimp terminal side after stamping the name of each signal on the mark tube.
- (5) Protect both ends of the wire material with insulation bushing.
- (6) Use AWG18 (0.75mm²) or equivalent for the shield treatment wire material.
- (7) Ground the crimp terminal connected to the shield to the control unit or communication terminal frame ground.

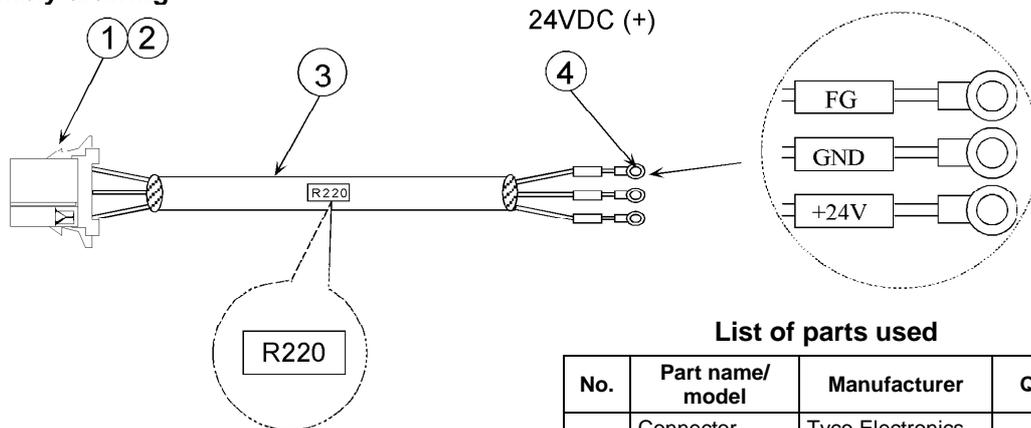
Note that to improve the noise resistance, there may be cases when only one end is connected, both ends are connected, or neither end is connected.

APPENDIX 2 CABLE DRAWINGS
Appendix 2.15 FCUA-R220 Cable Manufacturing Drawing

Appendix 2.15 FCUA-R220 Cable Manufacturing Drawing (24VDC input)

Application: Supply of 24VDC to remote I/O unit and communication terminal. Option (compatible connector set) FCUA-CN220
 (Note that this corresponds only to the connector on the control unit side.)

Assembly drawing

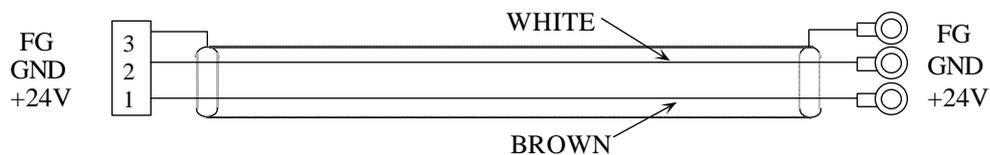


List of parts used

No.	Part name/ model	Manufacturer	Q'ty
1	Connector 2-178288-3	Tyco Electronics AMP	1
2	Contact 1-175218-5	Tyco Electronics AMP	3
3	Wire material JPVV-SB 1P × 0.75mm ²	BANDO Electric Wire	(1)
4	Crimp terminal V1.25-3	JST	3

Connection diagram

Max. cable length: 30m



Manufacturing precautions

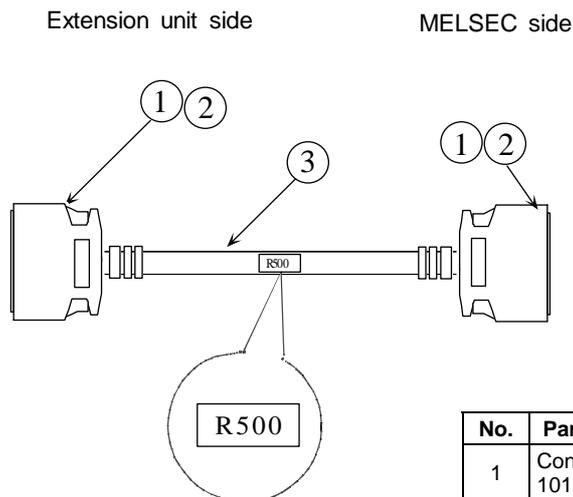
- (1) The wire material shall be a shielded, 1-pair stranded cable equivalent to AWG18 (0.75mm²). If the cable is 15m or longer, select AWG16 (1.25mm²) wire material or equivalent.
- (2) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (3) Attach the nameplate (with protective cover stamped with the cable name) in the position designated in the assembly drawing.
- (4) Install each crimp terminal side after stamping the name of each signal on the mark tube.
- (5) Protect both ends of the wire material with insulation bushing.
- (6) Use AWG18 (0.75mm²) or equivalent for the shield treatment wire material.

**Appendix 2.16 FCUA-R500 Cable Manufacturing Drawing [External PLC link II
(MELSEC bus connection) A1S type]**

Application: Connection between extension unit and MELSEC
(connector A1S type)
Connection between extension unit and extension unit

Option (compatible connector set)
FCUA-CS500

Assembly drawing



List of parts used

No.	Part name/model	Manufacturer	Q'ty
1	Connector 10150-6000EL	3M	2
2	Connector case 10350-3210-000	3M	2
3	Wire material UL20276 AWG28 × 30P	Product equivalent to left	(1)

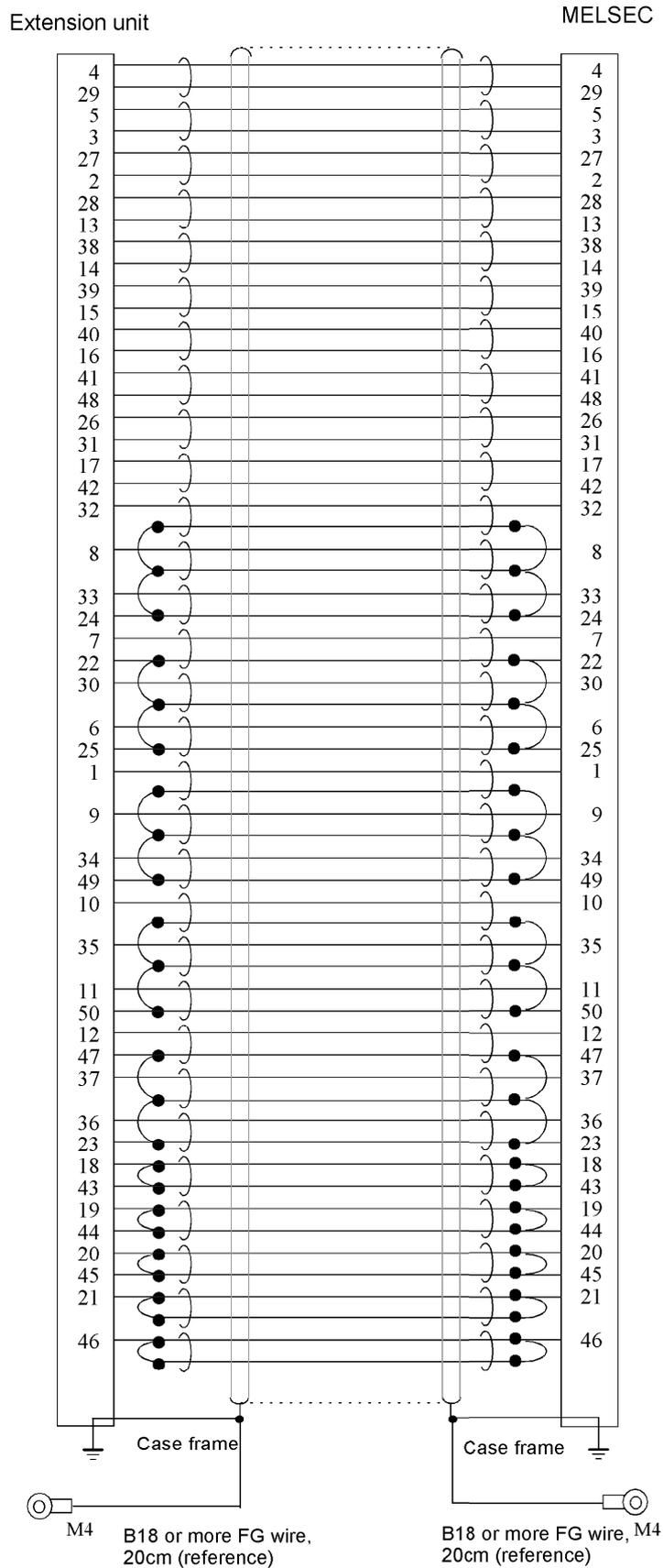
Connection diagram : Refer to the next page.

Manufacturing precautions

- (1) The wire material shall be a shielded, 30-pair stranded cable equivalent to UL20276 Standard AWG28 (0.08mm²).
- (2) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (3) Attach the nameplate (with protective cover stamped with the cable name) in the position designated in the assembly drawing.
- (4) Fold the wire material shield over the sheath, and wrap copper foil tape over it. Then clamp with the connector case frame.
- (5) Part 1 (connector) and part 2 (connector case) are solderless types. If soldering types are required, use parts 10150-3000VE for the connector and 10350-52F0-008 for the connector case (both parts manufactured by 3M).

APPENDIX 2 CABLE DRAWINGS
Appendix 2.16 FCUA-R500 Cable Manufacturing Drawing

Connection diagram

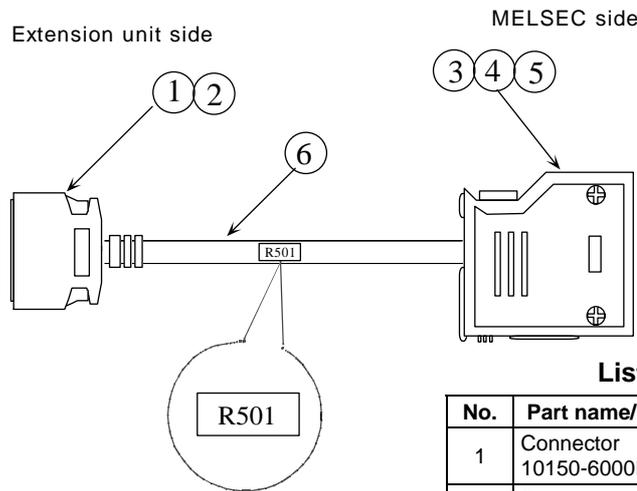


**Appendix 2.17 FCUA-R501 Cable Manufacturing Drawing [External PLC link II
(MELSEC bus connection) A3N type]**

Application: Connection between extension unit and MELSEC (connector A3N type)

Option (compatible connector set)
FCUA-CS501

Assembly drawing



List of parts used

No.	Part name/model	Manufacturer	Q'ty
1	Connector 10150-6000EL	3M	1
2	Connector case 10350-3210-000	3M	1
3	Connector PC-1645	Hirose Electric	1
4	Connector case P-1645A-CA (20)	Hirose Electric	1
5	Contact PC-1600-211	Hirose Electric	45
6	Wire material UL20276 AWG28 x 30P	Product equivalent to left	(1)

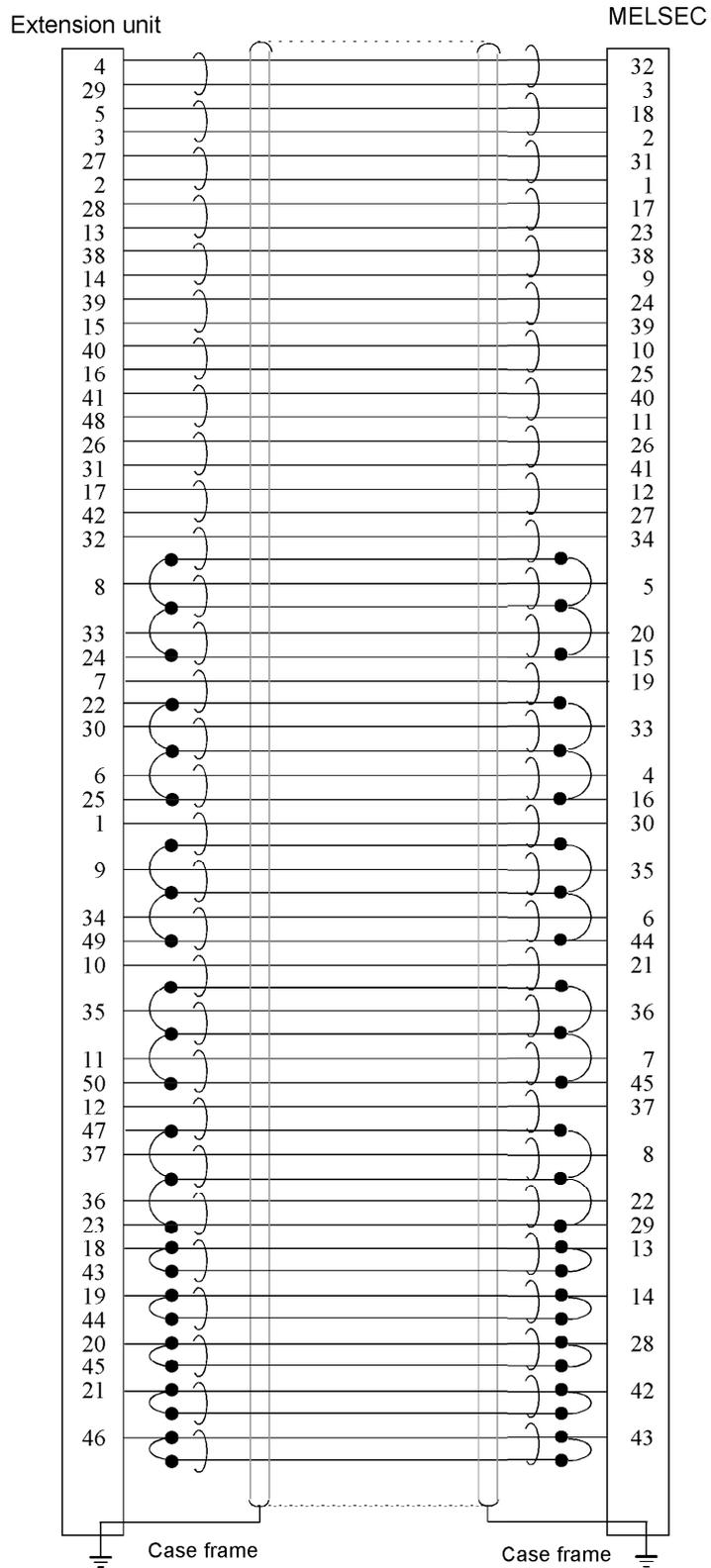
Connection diagram : Refer to the next page.

Manufacturing precautions

- (1) The wire material shall be a shielded, 30-pair stranded cable equivalent to UL20276 Standard AWG28 (0.08mm²).
- (2) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (3) Attach the nameplate (with protective cover stamped with the cable name) in the position designated in the assembly drawing.
- (4) Fold the wire material shield over the sheath, and wrap copper foil tape over it. Then clamp with the connector case frame.
- (5) Part 1 (connector) and part 2 (connector case) are solderless types. If soldering types are required, use parts 10150-3000VE for the connector and 10350-52F0-008 for the connector case (both parts manufactured by 3M).

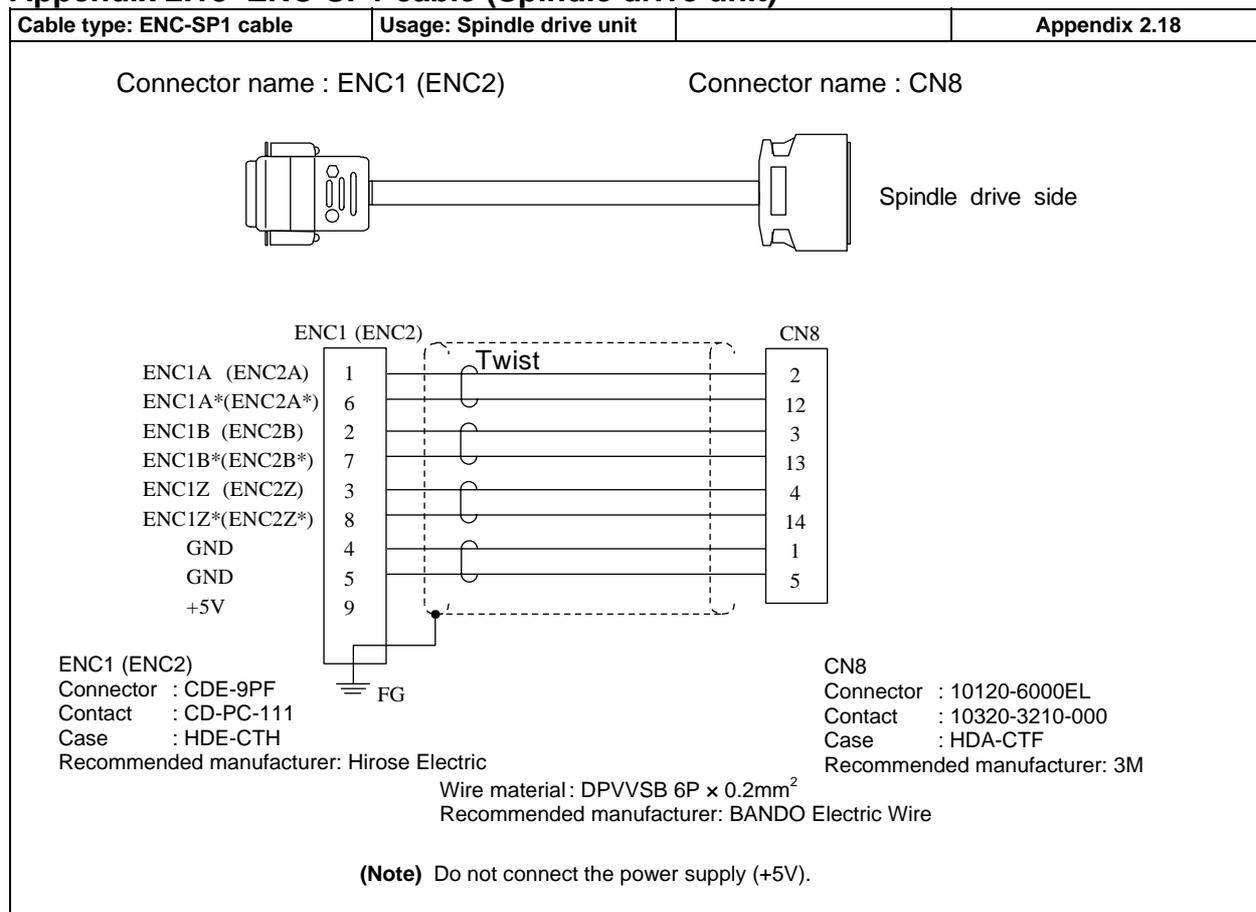
APPENDIX 2 CABLE DRAWINGS
Appendix 2.17 FCUA-R501 Cable Manufacturing Drawing

Connection diagram

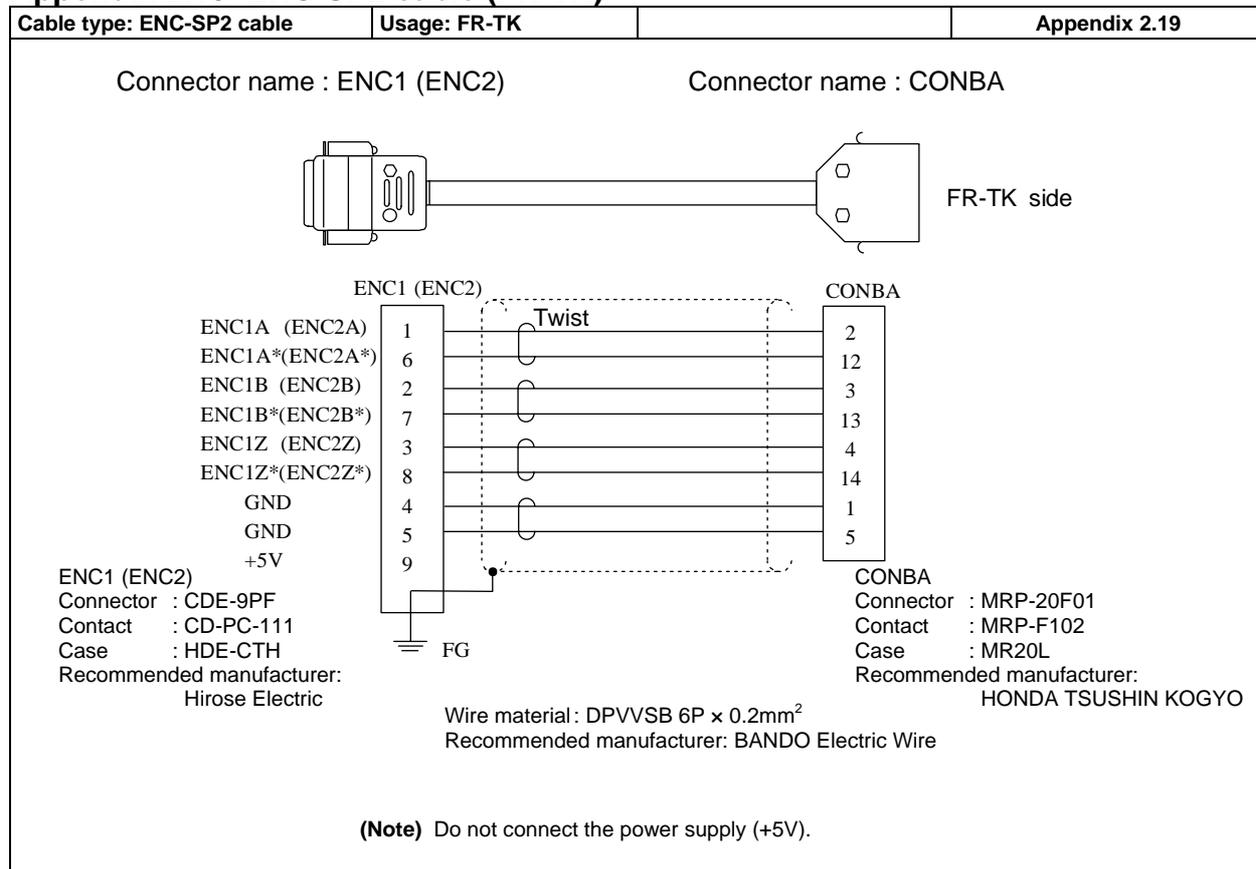


APPENDIX 2 CABLE DRAWINGS
Appendix 2.18 ENC-SP1 cable

Appendix 2.18 ENC-SP1 cable (Spindle drive unit)



Appendix 2.19 ENC-SP2 cable (FR-TK)

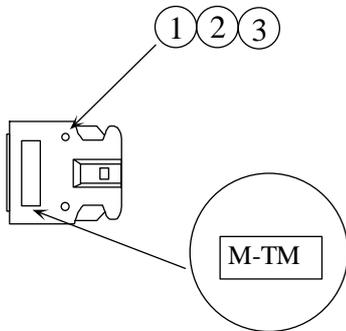


APPENDIX 2 CABLE DRAWINGS
Appendix 2.20 M-TM Terminator

Appendix 2.20 M-TM Terminator

Application: Control unit – Final control unit terminator when multiple units are connected

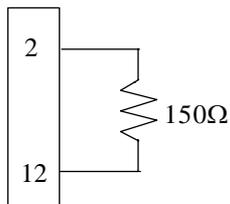
Assembly drawing



List of parts used

No.	Part name/model	Manufacturer	Q'ty
1	Connector 10120-3000VE	3M	1
2	Connector case 10320-52F0-008	3M	1
3	Resistor 150Ω 1/4W	Product equivalent to left	1

Connection diagram



Manufacturing precautions

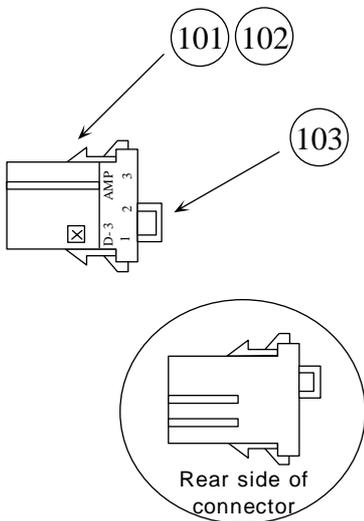
- (1) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (2) Part 1 (connector) is usually used for wire material of AWG24 (0.2mm²) or less in the catalog specifications, but AWG22 (0.3mm²) can also be used.

APPENDIX 2 CABLE DRAWINGS
Appendix 2.21 R-TM Terminator

Appendix 2.21 R-TM Terminator

Application: Remote I/O unit (MC link B communication) terminator

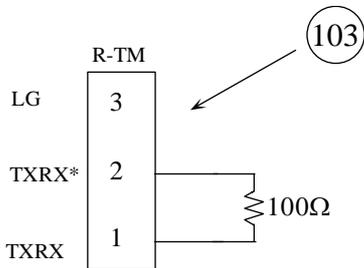
Assembly drawing



List of parts used

No.	Part name/model	Manufacturer	Q'ty
101	Connector 1-178288-3 (X type)	Tyco Electronics AMP	1
102	Connector case 1-175216-2	Tyco Electronics AMP	2
103	Resistor 100Ω 1/4W	KOA	1

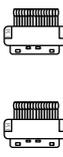
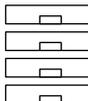
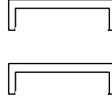
Connection diagram



Manufacturing precautions

- (1) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
- (2) Cover the 100Ω terminator with a black insulation tube.
- (3) Stamp the connector name "R-TM" in white on the rear of the connector.

APPENDIX 3 LIST OF CONNECTOR SETS

Connector type	Application	Package contents			
CS000	Control unit - CT100 Control unit - SVJ SVJ - SVJ SVJ - SPJ	Connector (3M) 10120-3000VE x 2 pcs. 	Connector case (3M) 10230-52F0-008 x 2 pcs. 		
CS301	Remote I/O unit - terminal block	Connector (3M) 7940-6500SC x 4 pcs. 	Strain relief (3M) 3448-7940 x 2 pcs. 		
CN211	I/O communication connector	Connector (Tyco Electronics AMP) 1-178288-3 x 1 pc. 	Gold contact (Tyco Electronics AMP) 1-175218-2 x 3 pcs. 		
CN220	24VDC power connector	Connector (Tyco Electronics AMP) 2-178288-3 x 1 pc. 	Tin contact (Tyco Electronics AMP) 1-175218-5 x 3 pcs. 		
CN300	DIO connector	Connector (3M) 7940-6500SC x 2 pcs. 			

APPENDIX 4 EMC INSTALLATION GUIDELINES

Appendix 4.1 Introduction

EMC Directives became mandatory as of January 1, 1996. The subject products must have a CE mark attached indicating that the product complies with the Directives.

As the NC unit is a component designed to control machine tools, it is believed that it is not a direct EMC Directives subject. However, we would like to introduce the following measure plans to back up EMC Directives compliance of the machine tool as the NC unit is a major component of the machine tools.

- (1) Methods of installation in control/operation panel
- (2) Methods of wiring cables to outside of panel
- (3) Introduction of members for measures

Mitsubishi is carrying out tests to confirm the compliance to the EMC Directives under the environment described in this manual. However, the level of the noise will differ according to the equipment type and layout, control panel structure and wiring lead-in, etc. Thus, we ask that the final noise level be confirmed by the machine manufacturer.

This section corresponds to the following Series.

M60/60S Series

APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.2 EMC Directives

Appendix 4.2 EMC Directives

The EMC Directives largely regulate the following two items.

- Emission Capacity to prevent output of obstructive noise that adversely affects external devices.
- Immunity Capacity to not malfunction due to obstructive noise from external source.

The details of each level are classified in the table below.

It is assumed that the Standards and test details required for a machine tool are the same as these.

Class	Name	Details	EMC	Standard
Emission	Radiated noise	Restriction of electromagnetic noise radiated through the air	EN50081-2 EN61800-3 (Industrial environment)	EN55011 (CLASS: A)
	Conductive noise	Restriction of electromagnetic noise discharged from power supply line		
Immunity	Static electricity electrical discharge	Example) Regulation of withstand level of static electricity electrical discharge accumulated in human body	EN50082-2 EN61800-3 (Industrial environment)	IEC61000-4-2
	Radiation immunity	Example) Simulation of immunity from digital wireless telephones		IEC61000-4-3
	Burst immunity	Example) Regulation of withstand level of noise from relay or plug and play		IEC61000-4-4
	Conductive immunity	Example) Regulation of withstand level of noise flowed from power supply wires, etc.		IEC61000-4-6
	Power supply frequency magnetic field	Example) Regulation of electromagnetic noise of 50/60Hz power supply frequency		IEC61000-4-8
	Power supply dip (fluctuation)	Example) Regulation of power voltage drop withstand level		IEC61000-4-11
	Surge	Example) Regulation of withstand level of noise caused by lightning		IEC61000-4-5

Appendix 4.3 EMC Measures

The main items relating to EMC measures include the following.

- (1) Store the device in a sealed metal panel.
- (2) Ground all conductors that are floating electrically. Decrease the impedance.
- (3) Increase the distance between the drive line and signal wire.
- (4) Shield the cables wired outside of the panel.
- (5) Install a noise filter.

Take care to the following items to suppress the noise radiated outside of the panel.

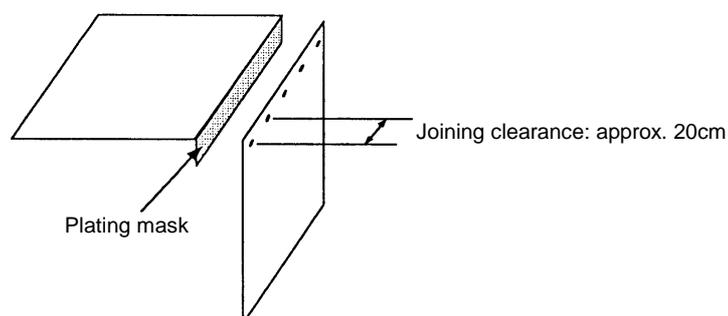
- (1) Accurately ground the devices.
- (2) Use shielded cables.
- (3) Increase the electrical seal of the panel. Reduce the gaps and holes.

Appendix 4.4 Panel Structure

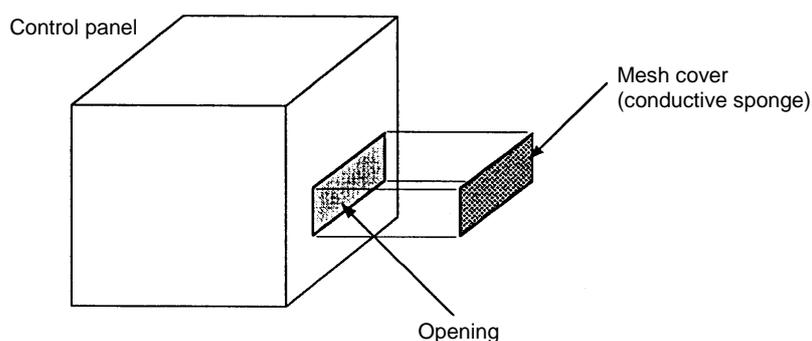
The design of the panel is a very important factor for the EMC measures, so take the following measures into consideration.

Appendix 4.4.1 Measures for Control Panel Body

- (1) Use metal for all members configuring the panel.
- (2) When joining the metal plate, treat the welded or contacting sections so that the impedance is reduced, and then fix with screws.



- (3) Note that if the plate warps due to the screw fixing, etc., by that creating a clearance, noise could leak from that place.
- (4) Plate (nickel, tin) the metal plate surface at the grounding plate, and connect the connections with a low impedance.
- (5) If there is a large opening, such as ventilation holes, make sure to close the hole.

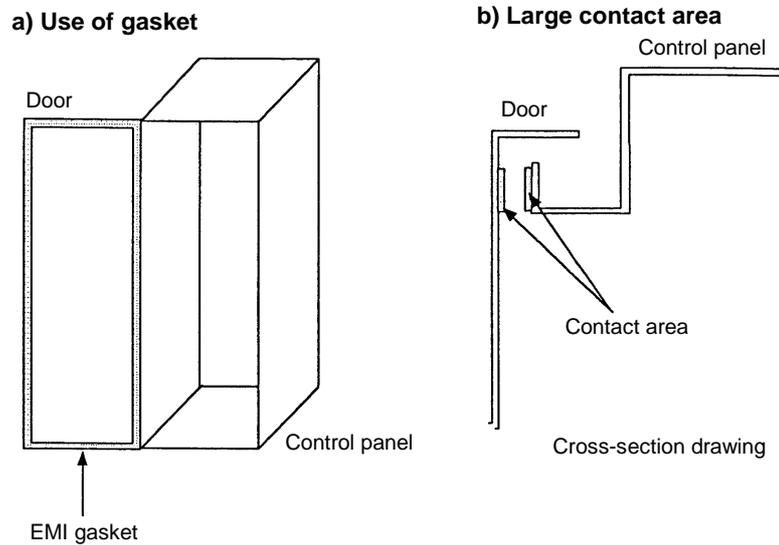


(Note) Using screws to fix the plates that have been painted is the same as an insulated state. Peel the paint and fix the screws.

APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.4 Panel Structure

Appendix 4.4.2 Measures for Door

- (1) Use metal for all members configuring the door.
- (2) When joining the door, use a gasket to lower the impedance of the contacting sections, or use a structure with a large contact area as shown below.



- The EMI gasket or conductive packing must contact the metal surface uniformly and at the correct position.
- When not using a gasket, ground the control panel grounding with a grounding wire to lower the door's impedance.

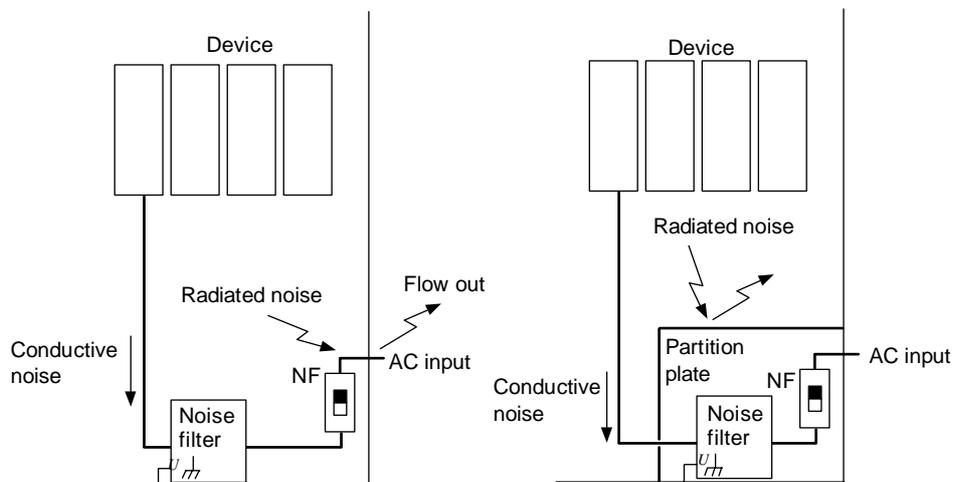
(Note) Using screws to fix the plates that have been painted (attachment of packing) is the same as an insulated state. Peel the paint and fix the screws.

APPENDIX 4 EMC INSTALLATION GUIDELINES

Appendix 4.4 Panel Structure

Appendix 4.4.3 Measures for Power Supply

Shield the power supply section and insert a filter to prevent the noise from flowing in or out.



- The conductive noise can be suppressed just by inserting a noise filter, but the radiated noise will flow out.
- The conductive and radiated noise can both be suppressed by adding a partition plate to the noise filter.

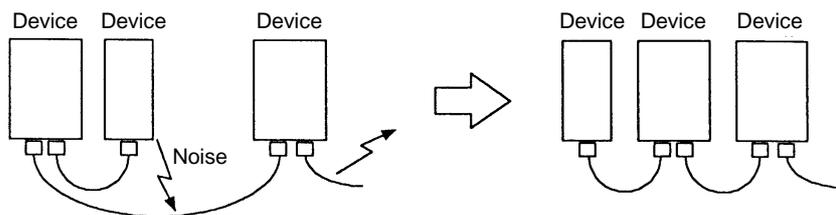
(Note) Selection of the noise filter capacity will differ according to the drive amplifier and devices being used.
Refer to the "EMC Installation Guidelines" NC Servo Drive Unit Section [BNP-B8582-45].

Appendix 4.5 Measures for Wiring in Panel

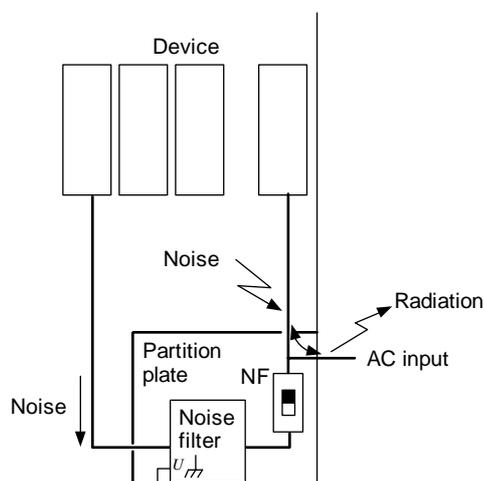
Cables act as antennas to propagate unnecessary noise, and thus must be appropriately shielded and treated. The following measures must be sufficiently considered for the cables (SH21/F010/FCUA-R211) that carry out high-speed communication.

Appendix 4.5.1 Precautions for Wiring in Panel

- (1) If the cables are led unnecessary in the panel, they will pick up noise. Thus, keep the wiring length as short as possible.

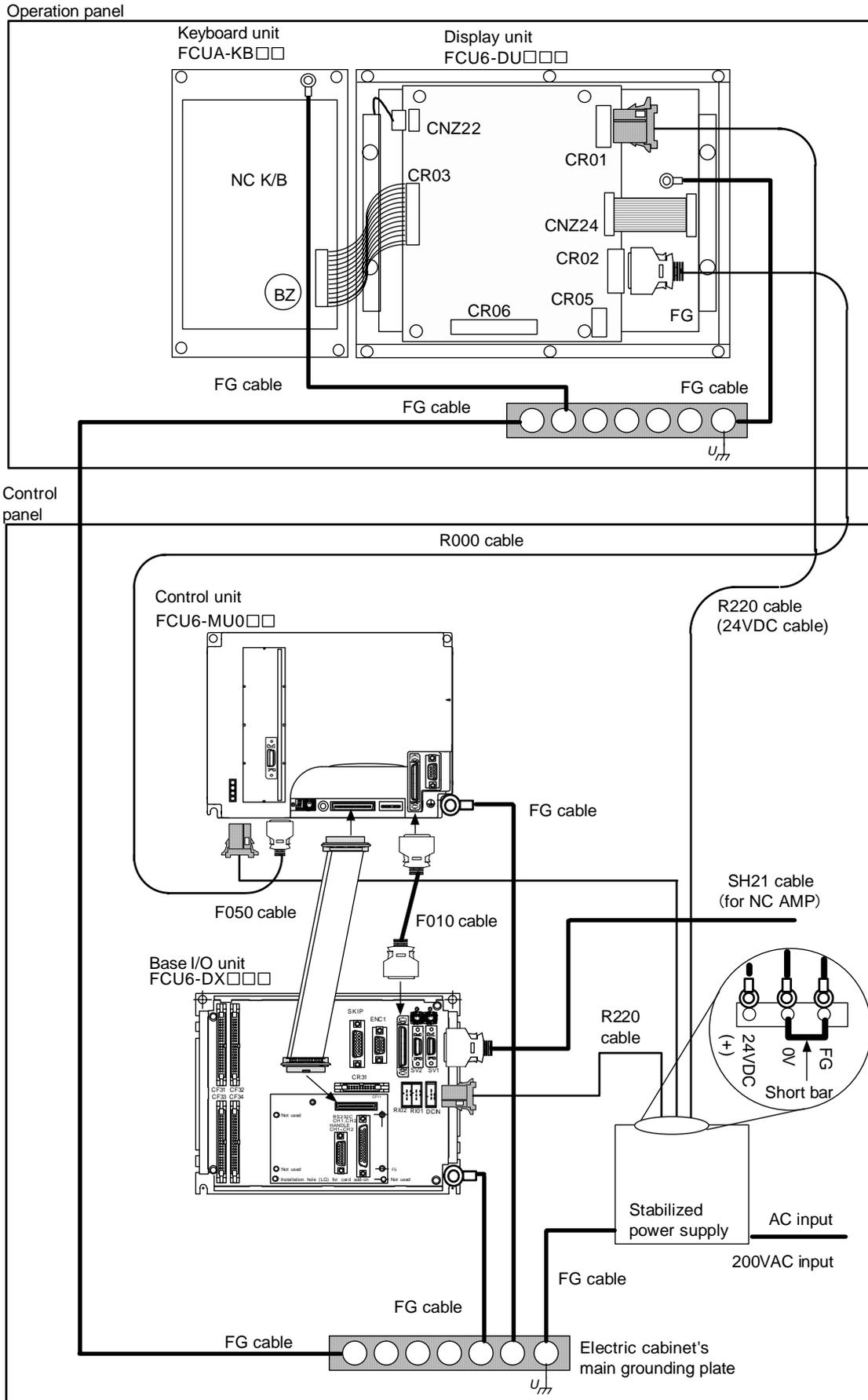


- (2) Always connect the grounding wire to the FG terminal indicated on the device.
- (3) Keep the distance between the drive line and detector cable to the drive section motor as far apart as possible when wiring.
- (4) Do not lead the power supply wire around the panel without using a filter.



APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.5 Measures for Wiring in Panel

Appendix 4.5.2 NC Unit Grounding Wire

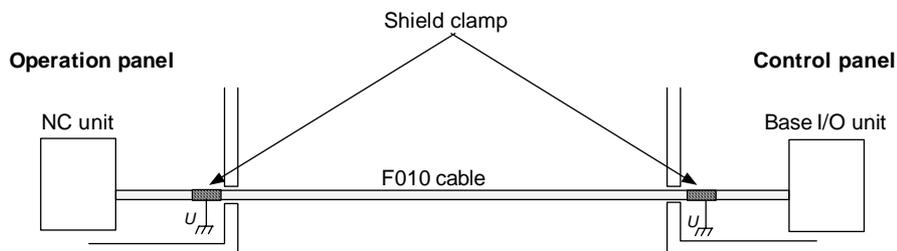


APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.5 Measures for Wiring in Panel

Appendix 4.5.3 Shield Treatment of Cables

Use shielded cables for the cables wired outside the panel in the M60/60S Series.
 Use a shield clamp within 10cm of the lead-out port from the panel.

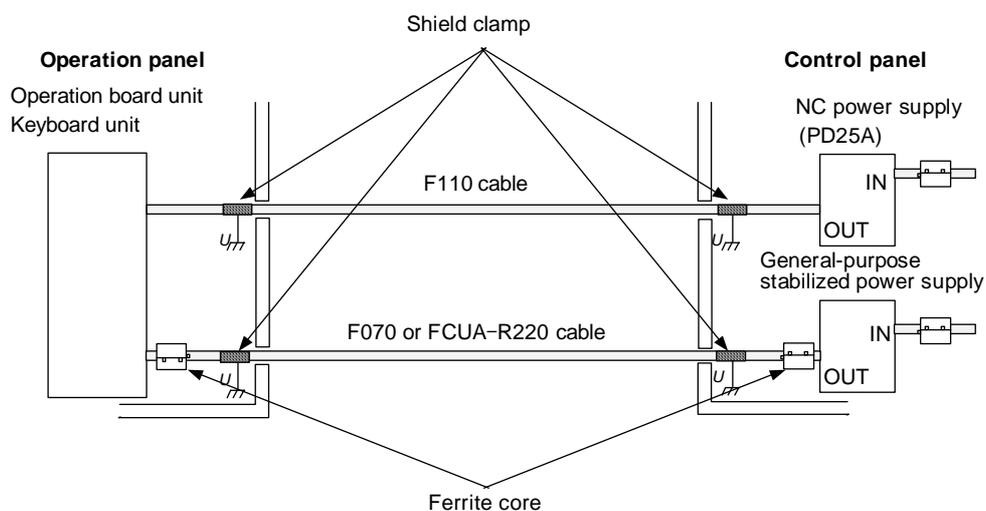
(1) I/O interface cable [F010 cable]



- Always use the shield clamp on both ends of the connected units.

(Note) The shield clamp is not required if the control unit and base I/O unit are wired in the same panel.

(2) DC power supply cable [F110/F070/FCUA-R220 cable]



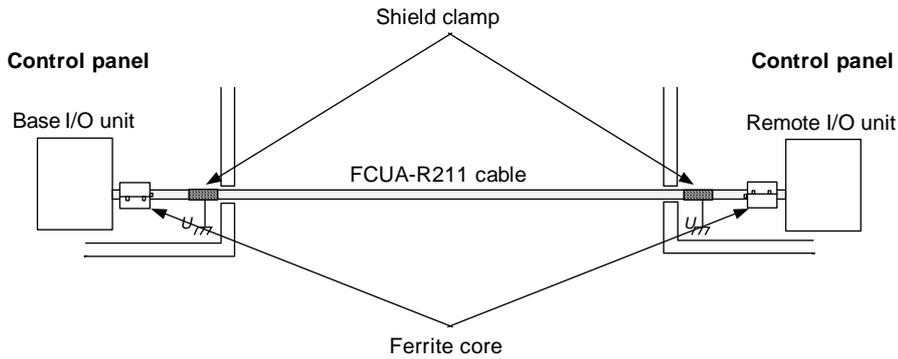
- Use a shield clamp within 10cm from the panel's inlet/outlet.
- Install a ferrite core on both ends of the connected units.

(Note1) Always install a ferrite core on the general-purpose stabilized power supply.
 (The ferrite core may not be required depending on the selected power supply.)

(Note2) Install a ferrite core on the input side of the NC power supply (PD25A).

APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.5 Measures for Wiring in Panel

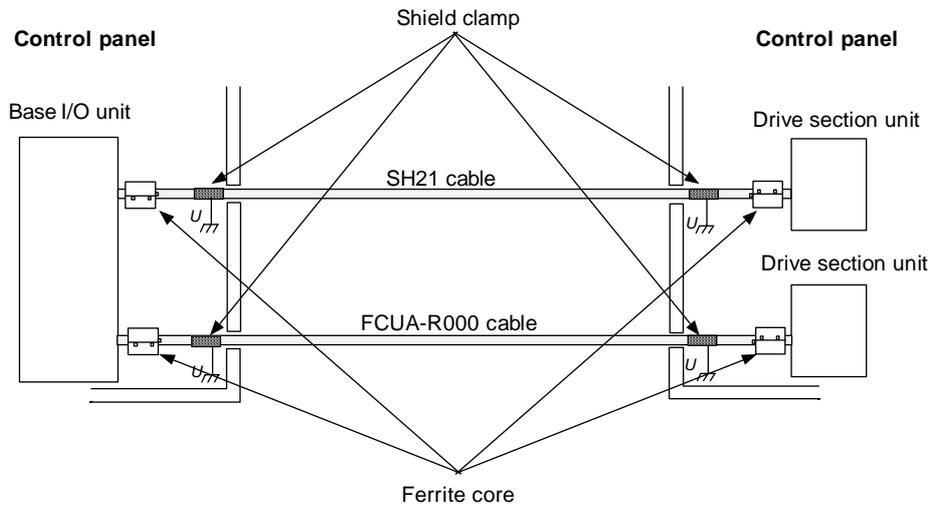
(3) Remote I/O cable [FCUA-R211 cable]



- Use a shield clamp within 10cm from the panel's inlet/outlet.
- Install a ferrite core on both ends of the connected units.

(Note) The shield clamp and ferrite core are not required if the control unit and base I/O unit are wired in the same panel.

(4) Servo communication cable [SH21/FCUA-R000 cable]



- Use a shield clamp within 10cm from the panel's inlet/outlet.
- Install a ferrite core on both ends of the connected units.

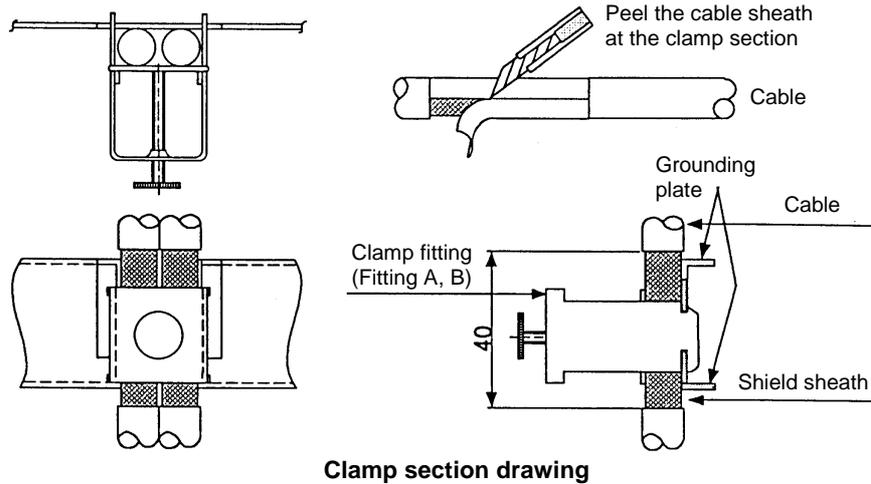
(Note) The shield clamp and ferrite core are not required if the drive section unit and base I/O unit are wired in the same panel.

APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.6 Parts for EMC Measures

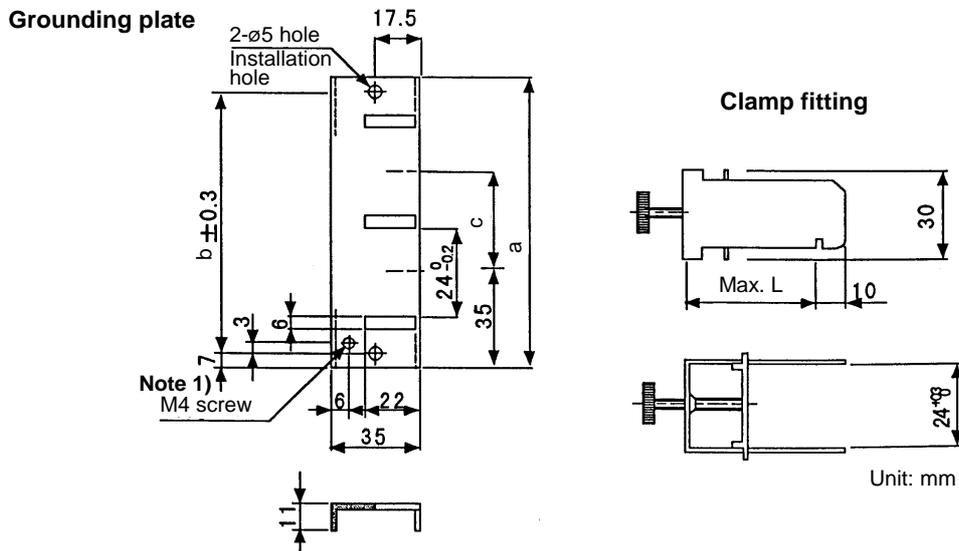
Appendix 4.6 Parts for EMC Measures

Appendix 4.6.1 Shield Clamp Fitting

The ground can be directly connected to the grounding plate as shown below to increase the effect. Install the grounding plate near the outlet (within 10cm) of each panel, and press against the grounding plate with the clamp fitting. If the cables are thin, several can be bundled and clamped together. To provide sufficient frame ground, install the grounding plate directly on the cabinet or connect with a grounding wire. If the grounding plate and clamp fitting set AERSBAN-DSET is required, please contact Mitsubishi.



• Outline drawing



(Note 1) Screw hole for wiring to cabinet's grounding plate.
 (Note 2) The grounding plate thickness is 1.6mm.

	a	b	c	Enclosed fitting
AERSBAN-DSET	100	86	30	Two A clamp fittings
AERSBAN-ESET	70	56	–	One B clamp fitting

	L
A clamp fitting	70
B clamp fitting	45

APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.6 Parts for EMC Measures

Appendix 4.6.2 Ferrite Core

The ferrite core is mounted integrally with the plastic case.
 This can be installed with one touch without cutting the interface cable or power supply cable.
 This ferrite core is effective against common mode noise, allowing measures against noise without affecting the quality of the signal.

Recommended ferrite core

TDK ZCAT Series

Shape and dimensions
 ZCAT type

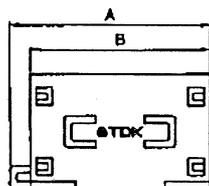


Fig. 1

ZCAT-A type

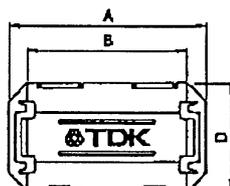


Fig. 2

ZCAT-B type

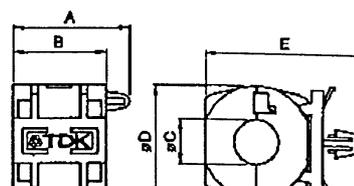


Fig. 3

ZCAT-C type

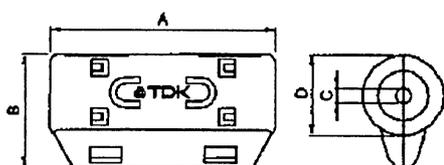


Fig. 4

◎ Recommended ferrite core

Unit: mm

Part Name	Fig.	A	B	øC	øD	E	Applicable cable outer diameter	Weight (g)
ZCAT1518-0730-M(-BK) *1	1	22±1	18±1	7±1	15±1	-	7max.	6
ZCAT1518-0730(BK) *2	1	22±1	18±1	7±1	15±1	-	7max.	6
ZCAT2017-0930-M(-BK)	1	21±1	17±1	9±1	20±1	-	9max.	11
ZCAT2032-0930-M(-BK) *1	1	36±1	32±1	9±1	19.5±1	-	9max.	22
ZCAT2032-0930(-BK) *2	1	36±1	32±1	9±1	19.5±1	-	9max.	22
ZCAT2132-1130-M (-BK) *1	1	36±1	32±1	11±1	20.5±1	-	11max.	22
ZCAT2132-1130 (-BK) *2	1	36±1	32±1	11±1	20.5±1	-	11max.	22
ZCAT3035-1330-M (-BK) *1	1	39±1	34±1	13±1	30±1	-	13max.	63
ZCAT3035-1330 (-BK) *2	1	39±1	34±1	13±1	30±1	-	13max.	63
ZCAT1325-0530A-M (-BK) *1	2	25±1	20±1	5±1	12.8±1	11.2±1	3-5 (USB)	7
ZCAT1325-0530A (-BK)	2	25±1	20±1	5±1	12.8±1	11.2±1	3-5 (USB)	7
ZCAT1730-0730A-M (-BK)	2	30±1	23±1	7±1	16.5±1	15±1	4-7 (USB/IEE1394)	12
ZCAT2035-0930A-M (-BK) *1	2	35±1	28±1	9±1	19.5±1	17.4±1	6-9	22
ZCAT2035-0930A (-BK)	2	35±1	28±1	9±1	19.5±1	17.4±1	6-9	22
ZCAT2235-1030A-M (-BK)	2	35±1	28±1	10±1	21.5±1	20±1	8-10	27
ZCAT2436-1330A-M (-BK)	2	36±1	29±1	13±1	23.5±1	22±1	10-13	29
ZCAT2017-0930B-M (-BK)	3	21±1	17±1	9±1	20±1	28.5±1	9max.	12
ZCAT2749-0430-M (-BK)	4	49±1	27±1	4.5±1	19.5±1	-	4.5max.	26

*1 The M stamp is attached.

*2 A fixing band is attached at shipment.

- ZCAT-B type: Cabinet fixing type installation hole ø4.8 to 4.9mm, plate thickness 0.5 to 2mm
- ZCAT-C type: Structure that prevents easy opening after case is closed.

APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.6 Parts for EMC Measures

Appendix 4.6.3 Surge Protector

(1) Surge absorber

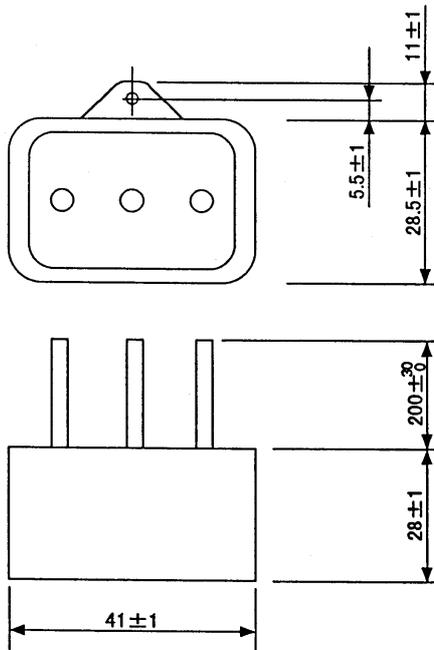
Make sure that surge does not directly enter the AC line supplying the general-purpose stabilized power supply (prepared by user) to the control unit, base I/O unit, remote I/O unit and communication terminal.

The following product or equivalent is recommended for the surge killer.

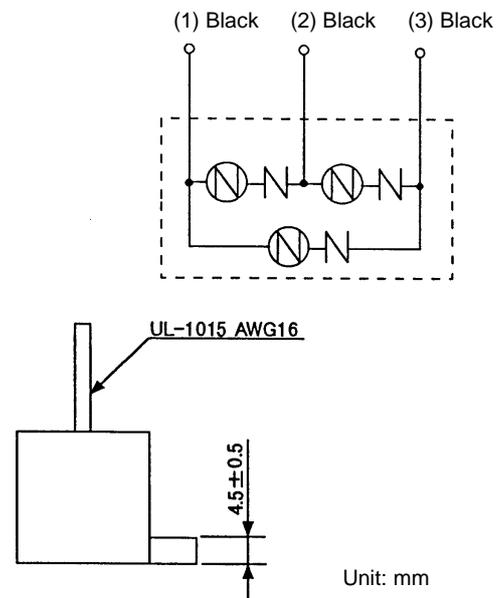
- 1) Part name : RAV-781BYZ-2
 Manufacturer : Okaya Electric Industries

Circuit voltage 50/60Hz Vrms	Max. tolerable circuit voltage	Clamp voltage V ± 10%	Surge resistance level 8/20µs	Surge withstand voltage 1.2/50µs	Electro- static capacity	Working temperature range
250V 3ø	300V	783V	2500A	20kV	75pF	-20°C to +70°C

Outline drawing



Circuit drawing



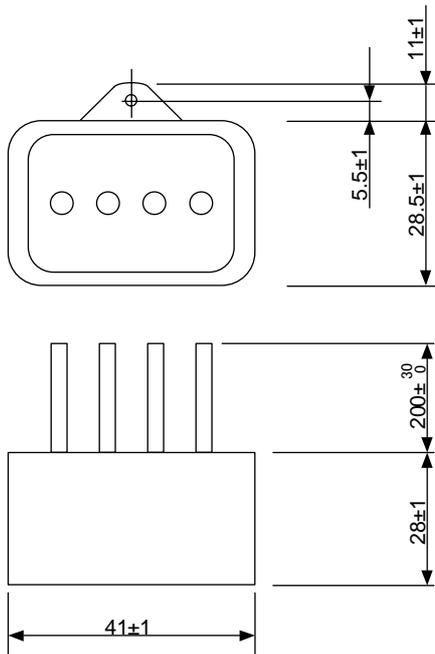
* Refer to the manufacturer's catalog for detailed characteristics, outline and connection methods of the surge absorber.

APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.6 Parts for EMC Measures

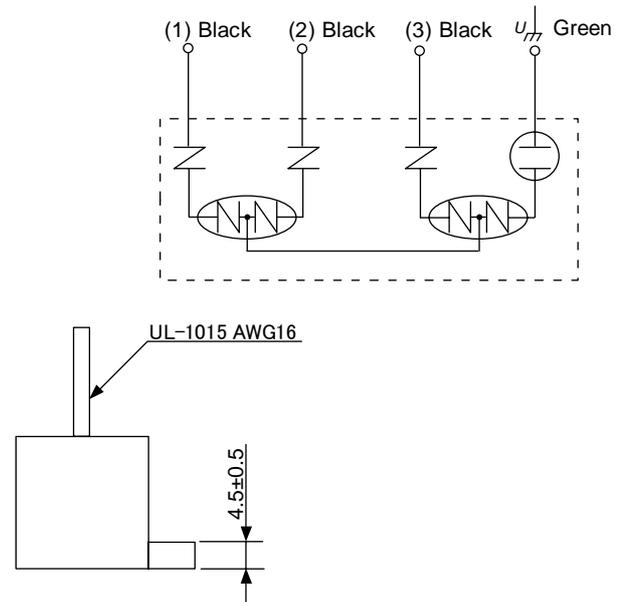
2) Part name : RAV-781BXZ-4
 Manufacturer : Okaya Electric Industries

Circuit voltage 50/60Hz Vrms	Max. tolerable circuit voltage	Clamp voltage V ± 10%	Surge resistance level 8/20µs	Surge withstand voltage 1.2/50µs	Electro- static capacity	Working temperature range
250V 3ø	300V	700V	2500A	2kV	75pF	-20°C to +70°C

Outline drawing



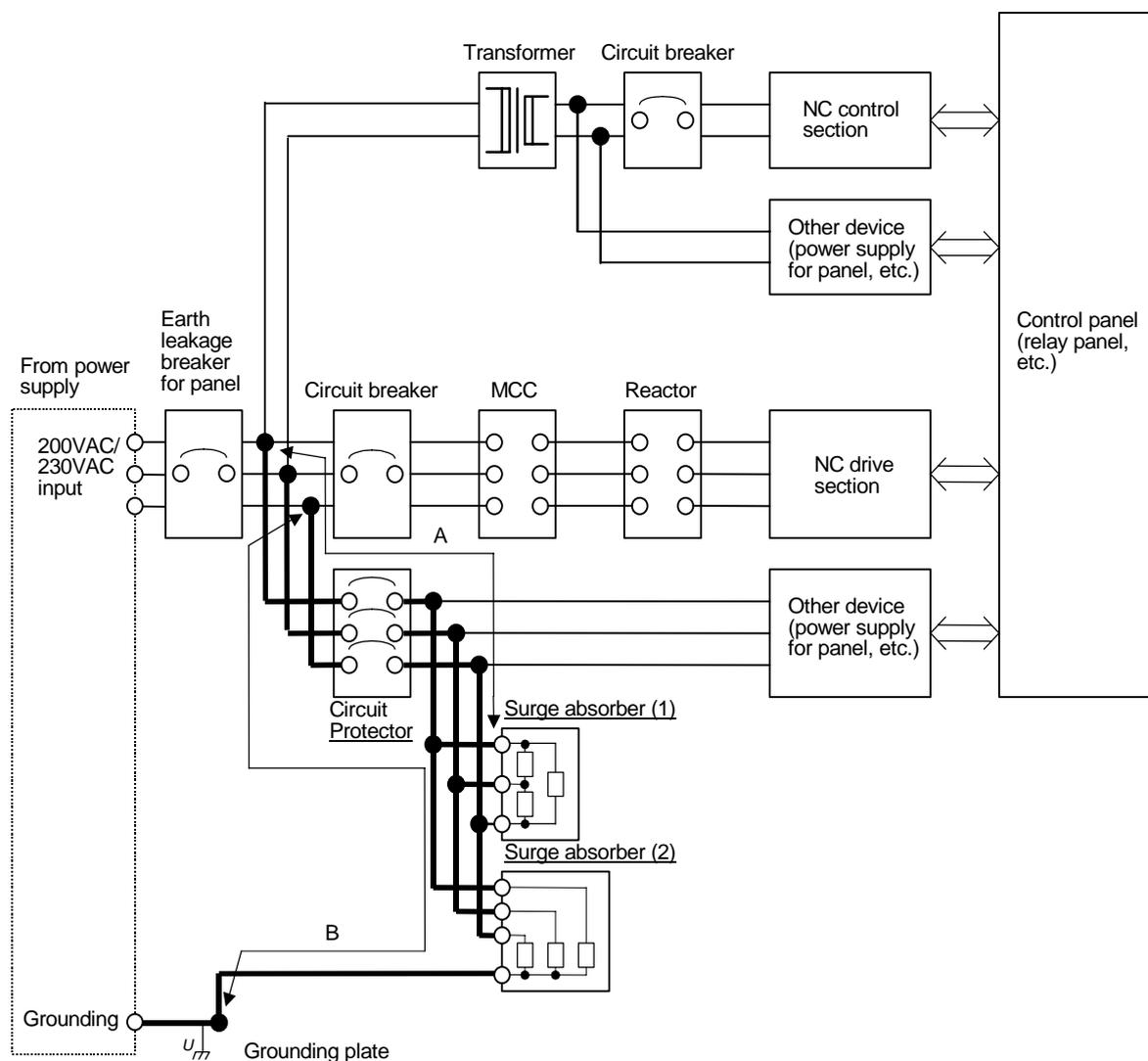
Circuit drawing



Unit: mm

* Refer to the manufacturer's catalog for detailed characteristics, outline and connection methods of the surge absorber.

(2) Example of surge absorber installation



Surge absorber installation method

Precautions

- (1) Thick wires enhance the lightning surge absorption effect, so use as thick and short a wire as possible.
 Wire material : Wire diameter 2mm² or more
 Wire length : Connection wire length A to surge absorber (1): 2m or less.
 Connection wire length B to surge absorber (2): 2m or less.
- (2) When carrying out an insulation withstand voltage test by applying an overvoltage (100VAC, 1500VAC) on the power supply line, remove surge absorber (2) as it will activate with the applied voltage.
- (3) A short-circuit fault will occur if a surge exceeding the tolerance is applied on the surge absorber. Thus, always insert a circuit protector to protect the power supply line.
 A current does not flow to surge absorber (1) and (2) during normal use, so the circuit protector can be shared with other devices.

APPENDIX 4 EMC INSTALLATION GUIDELINES
Appendix 4.6 Parts for EMC Measures

Appendix 4.6.4 Selection of Stabilized Power Supply

Consider the following characteristics when selecting the stabilized power supply (prepared by user). Use a power supply that complies with CE Marking or that follows the Safety Standards given below.

Stabilized power supply selection items

Item		Unit		Conditions
Output fluctuation	Voltage fluctuation	%	±5max	±5% or less of 24VDC output
	Ripple noise	mV	120max.	±5% or less of 24VDC output
	Spike noise	mV	500max.	
Output current		A	–	Refer to the Connection Manual.
Output holding time		ms	20min.	Instantaneous OFF time

Standards

Safety Standards : UL1950, CSA C22.2 No. 234 approved, IEC950 compliant
Noise Terminal Voltage : FCC Class A, VCCI-1 Class
Higher Harmonics Current Restrictions : IEC1000-3-2

APPENDIX 5 PRECAUTIONS FOR COMPLIANCE TO UL/c-UL STANDARDS

Observe the following matters to comply with UL/c-UL Standards.

(1) Selection of external 24VDC power supply unit

The M60/60S Series numerical control unit complies with the UL Standards on the condition that the external power supply unit supplying 24VDC to each unit is a UL-approved part.

Use a UL-approved part for the power supply unit supplying 24VDC to each unit.

(2) Unit ambient temperature

The M60/60S Series numerical control unit complies with the UL Standards on the condition that the unit is used at a temperature less than the maximum ambient temperature given in "3.1 General Specification".

Make sure that the maximum ambient temperature of each unit does not exceed the temperature given in "3.1 General Specification".

APPENDIX 6 TRANSPORTATION RESTRICTIONS FOR LITHIUM BATTERIES

Appendix 6.1 Restriction for Packing

The United Nations Dangerous Goods Regulations "Article 12" became effective from 2003. When transporting lithium batteries with means subject to the UN Regulations, such as by air transport, measures corresponding to the Regulations must be taken. The UN Regulations classify the batteries as dangerous goods (Class 9) or not dangerous goods according to the lithium content.

To ensure safety during transportation, lithium batteries (battery unit) directly exported from Mitsubishi are packaged in a dedicated container (UN package) for which safety has been confirmed. When the customer is transporting these products with means subject to the UN Regulations, such as air transport, the shipper must follow the details explained in the section "6.1.2 Handling by User".

Appendix 6.1.1 Target Products

The following Mitsubishi NC products use lithium batteries. The UN Regulations classify the batteries as dangerous goods (Class 9) or not dangerous goods according to the lithium content. (Refer to the battery unit's rating nameplate or section "4-1-2 Battery option" for details on the lithium content.) If the batteries subjected to hazardous materials are incorporated in a device and shipped, a dedicated packaging (UN packaging) is not required. However, the item must be packed and shipped following the Packing Instruction 912 specified in the IATA DGR (Dangerous Goods Regulation) book.

Also, all lithium battery products incorporated in a machinery or device must be fixed securely in accordance with the Packing Instruction 900 and shipped with protection in a way as to prevent damage or short-circuits.

(1) Products requiring dedicated packaging (Materials falling under Class 9)

Mitsubishi type	Battery type	Lithium metal content	Battery manufacturer	Battery class
MDS-A-BT-4	ER6-B4-11	2.6g	Toshiba Battery	Battery
MDS-A-BT-6	ER6-B6-11	3.9g		
MDS-A-BT-8	ER6-B8-11	5.2g		
FCU6-BT4-D1	Combination of ER6-B4D-11 and ER6	2.6g+0.65g		
(built-in battery)	CR23500SE-CJ5	1.52g	Sanyo Battery	Battery cell

(2) Products not requiring dedicated packaging (Materials not falling under Class 9)

Mitsubishi type	Battery type	Lithium metal content	Battery manufacturer	Battery class
MDS-A-BT-2	ER6-B2-12	1.3g	Toshiba Battery	Battery
FCU6-BTBOX	2CR5	1.96g		
(built-in battery)	CR2032	0.067g		Battery cell
(built-in battery)	CR2450	0.173g		
(built-in battery)	ER6, ER6V	0.7g		
MR-BAT	MR-BAT	0.48g		
Q6BAT	Q6BAT	0.49g	Mitsubishi Electric Battery	

(Note 1) Dedicated packaging is required if the shipment exceeds 12 batteries/24 battery cells. Package the batteries so that this limit is not exceeded.

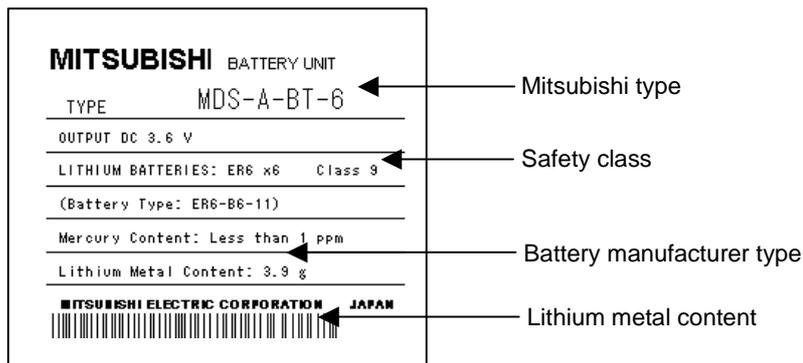
(Note 2) The battery units labeled as "FCUA-" instead of "MDS-A-" also use the same battery.

(Note 3) Always use the cell battery (MR-BAT) in combination with the dedicated case (MDS-BTCASE). Maximum 8 (either 2, 4, 6 or 8) cell batteries can be installed to the dedicated case (MDS-BTCASE).

APPENDIX 6 TRANSPORTATION RESTRICTIONS FOR LITHIUM BATTERIES

Appendix 6.1 Restriction for Packing

(Example) Rating nameplate for battery units



Appendix 6.1.2 Handling by User

The following technical opinion is solely Mitsubishi's opinion. The shipper must confirm the latest IATA Dangerous Goods Regulations, IMDG Codes and laws and orders of the corresponding export country. These should be checked by the company commissioned for the actual transportation.

- IATA : International Air Transport Association
- IMDG Code : A uniform international code for the transport of dangerous goods by seas determined by IMO (International Maritime Organization).

When shipping isolated lithium battery products (Packing Instruction 903)

(1) Reshipping in Mitsubishi UN packaging

The isolated battery's safety test and packaging specifications comply with the UN Regulations (Packing Instruction 903). Thus, the user only needs to add the following details before shipping. (Consult with the shipping company for details.)

- (a) Indication of container usage mark on exterior box (Label with following details recorded.)
 - Proper shipping name (Lithium batteries)
 - UN NO. (UN3090 for isolated battery, UN3091 for battery incorporated in a device or included)
 - Shipper and consignee's address and name

Example of completing form		
SHIPPER:	CONSIGNEE:	
Shipper information	Consignee information	
PROPER SHIPPING NAME LITHIUM BATTERIES		
UN NO. : UN3090	CLASS : 9	SUBSIDIARY RISK
PACKING GROUP : II	PACKING INST. : 903	

- (b) Preparation of shipping documents (Declaration of dangerous goods)

APPENDIX 6 TRANSPORTATION RESTRICTIONS FOR LITHIUM BATTERIES
Appendix 6.1 Restriction for Packing

(2) When packaged by user

The user must follow UN Regulations when packing, preparing for shipping and preparing the indications, etc.

(a) Packing a lithium battery falling under Class 9

- Consult with The Ship Equipment Inspection Society of Japan for details on packaging.
- Prepare for shipping as explained in "(1) Reshipping in Mitsubishi UN packaging".

The Ship Equipment Inspection Society of Japan
Headquarters Telephone: 03-3261-6611 Fax: 03-3261-6979

(b) Packing a lithium battery not falling under Class 9

- Cells and batteries are separated so as to prevent short circuits and are stored in a strong outer packaging. (12 or less batteries, 24 or less cells.)
- Certificates or test results showing compliance to battery safety test. The safety test results have been obtained from the battery manufacturer. (Consult with Mitsubishi when the safety test results are required.)
- Prepare for shipping as explained in "(1) Reshipping in Mitsubishi UN packaging".

**When shipping lithium batteries upon incorporating in a machinery/device
(Packing Instruction 900)**

Pack and prepare for shipping the item in accordance with the Packing Instruction 900 specified in the IATA DGR (Dangerous Goods Regulation) book. (Securely fix the batteries that comply with the UN Manual of Tests and Criteria to a machinery or device, and protect in a way as to prevent damage or short-circuit.)

Note that all the lithium batteries provided by Mitsubishi have cleared the UN recommended safety test; fixing the battery units or cable wirings securely to the machinery or device will be the user's responsibility.

Check with your shipping company for details on packing and transportation.

When shipping a device with lithium batteries incorporated (Packing Instruction 912)

A device incorporating lithium batteries does not require a dedicated packaging (UN packaging). However, the item must be packed, prepared for shipping and labeled following the Packing Instruction 912 specified in the IATA DGR (Dangerous Goods Regulation) book.

Check with your shipping company for details on packing and transportation.

The outline of the Packing Instruction 912 is as follows:

- All the items in the packing instructions for shipping the isolated lithium battery products (Packing Instruction 903) must be satisfied, except for the items related to container, short-circuit, and fixation.
- A device incorporating lithium batteries has to be stored in a strong water-proofed outer packaging.
- To prevent an accidental movement during shipment, securely store the item in an outer packaging.
- Lithium content per device should be not more than 12g for cell and 500g for battery.
- Lithium battery mass per device should be not more than 5kg.

APPENDIX 6 TRANSPORTATION RESTRICTIONS FOR LITHIUM BATTERIES
Appendix 6.1 Restriction for Packing

Appendix 6.1.3 Reference

Refer to the following materials for details on the regulations and responses.

Guidelines regarding transportation of lithium batteries and lithium ion batteries (Edition 2)
..... Battery Association of Japan

Appendix 6.2 Issuing Domestic Law of the United States for Primary Lithium Battery Transportation

Federal Aviation Administration (FAA) and Research and Special Programs Administration (RSPA) announced an additional regulation (interim final rule) for the primary lithium batteries transportation restrictions item in "Federal Register" on Dec.15, 2004. This regulation became effective from Dec.29, 2004.

This law is a domestic law of the United States, however it also applies to the domestic flight and international flight departing from or arriving in the United States. Therefore, when transporting lithium batteries to the United State, or within the United State, the shipper must take measures required to transport the lithium battery. Refer to the Federal Register and the Code of Federal Regulation ("6.2.4 Reference") for details.

Appendix 6.2.1 Outline of Regulation

- (1) Transporting primary lithium battery by passenger aircraft is forbidden.
 - Excluding primary lithium battery for personal use in a carry-on or checked luggage (Lithium metal content should be not more than 5g for cell and 25g for battery. For details on the lithium metal content, refer to the table in the section "6.1.1 Target Products".)
- (2) When transporting primary lithium battery by cargo aircraft, indicate that transportation by passenger aircraft is forbidden on the exterior box.

Appendix 6.2.2 Target Products

All NC products for which the lithium batteries are used are subject to the regulation. (Refer to the table in the section "6.1.1 Target Products".)

Appendix 6.2.3 Handling by User

What is described in the section "6.2.1 Outline of Regulation" is solely Mitsubishi's opinion. The shipper must confirm orders indicated in the section "6.2.4 Reference" for transportation method corresponding the regulation. Actually, these should be checked by the company commissioned for the actual lithium battery transportation.

(1) Indication of exterior box

When transporting primary lithium battery by cargo aircraft, indicate that transportation by passenger aircraft is forbidden on the exterior box.

Display example

PRIMARY LITHIUM BATTERIES FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT.

- The character color must be displayed with contrast. (black characters against white background, black characters against yellow background, etc.)
- The height (size) of characters to be displayed is prescribed depending on the packaging weight.
 - When the total weight is over 30kg : at least 12mm
 - When the total weight is less than 30kg : at least 6mm

Appendix 6.2.4 Reference

- (1) Federal Register (Docket No. RSPA-2004-19884 (HM-224E)) PDF format
<http://www.regulations.gov/fredpdfs/05-11765.pdf>
- (2) 49CFR (Code of Federal Regulation, Title49) (173.185 Lithium batteries and cells.)
http://www.access.gpo.gov/nara/cfr/waisidx_00/49cfr173_00.html
- (3) DOT regulation body (Department of Transportation)
<http://hazmat.dot.gov/regs/rules/final/69fr/docs/69fr-75207.pdf>

**APPENDIX 7 PRECAUTIONS FOR USE OF PERIPHERAL DEVICES AND
COMMERCIALLY AVAILABLE DEVICES**

**APPENDIX 7 PRECAUTIONS FOR USE OF PERIPHERAL DEVICES
AND COMMERCIALLY AVAILABLE DEVICES**

Peripheral device	Precautions
CF card	<p>Commercially available CF cards may not be compatible with MITSUBISHI units or suitable for FA environment for temperature- or noise-wise. In the case of using it, careful performance check must be required by the machine tool builder.</p>
	<p>When inserting/removing a commercially available CF card, preferably, turn the MITSUBISHI device's power OFF to avoid any troubles. When inserting/removing a card while the power is ON, make sure to have sufficient time (approx. ten seconds or more) in between.</p>
	<p>Do not pull out the card or turn OFF the power during access to the CF card. Failure to observe this could cause the memory contents to be erased. In case of emergency, always perform backups by having your important data duplicated, etc. as MITSUBISHI will not guarantee the broken or lost data. Be sure to inform this matter to the end users.</p>
	<p>Recommended products are the SanDisk products listed below: 64MB SDCFB-64-J60 (JAN: 4523052000294) 128MB SDCFB-128-J60 (JAN: 4523052000300) 256MB SDCFB-256-J60 (JAN: 4523052000317) 512MB SDCFB-512-J60 (JAN: 4523052000324) 1.0GB SDCFB-1024-J60 (JAN: 4523052000331) PCCARD adapter SDAD-38-J60 (JAN: 4523052000645)</p> <p>The performance of the above recommended products were checked under given conditions. The same performance may not be attained at the end-user side because of the difference in system environment. Also, no absolute performance guarantee can be provided even for the same type name as its constituent parts may differ. Some products may have been discontinued. Contact the respective manufacturer or distributor for inquiries about orders.</p>
PCMCIA card	Same as above

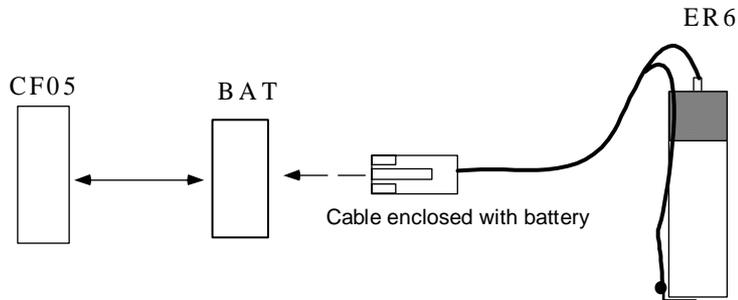
II. MAINTENANCE MANUAL

1. EXPLANATION OF MODULE FUNCTIONS
1.1 HR071 Card

1. EXPLANATION OF MODULE FUNCTIONS

1.1 HR071 Card

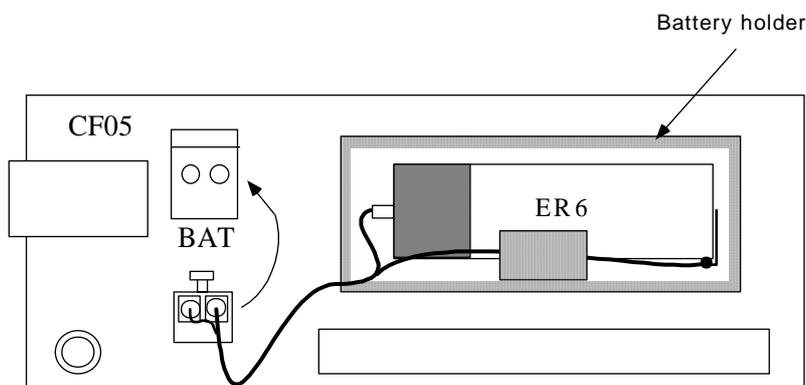
[Block diagram]



[Explanation of functions]

The HR071 card is used in the external battery unit for holding the contents of the control section memory. The BAT connector on the power supply card (HR081/082/083) in the control unit and the CF05 connector on the HR071 card are connected with an F240 cable. The battery mounted at shipment on the power supply card in the control unit is used to hold the memory contents, such as the parameters, until machine assembly. It is not used after the external battery unit is assembled into the machine.

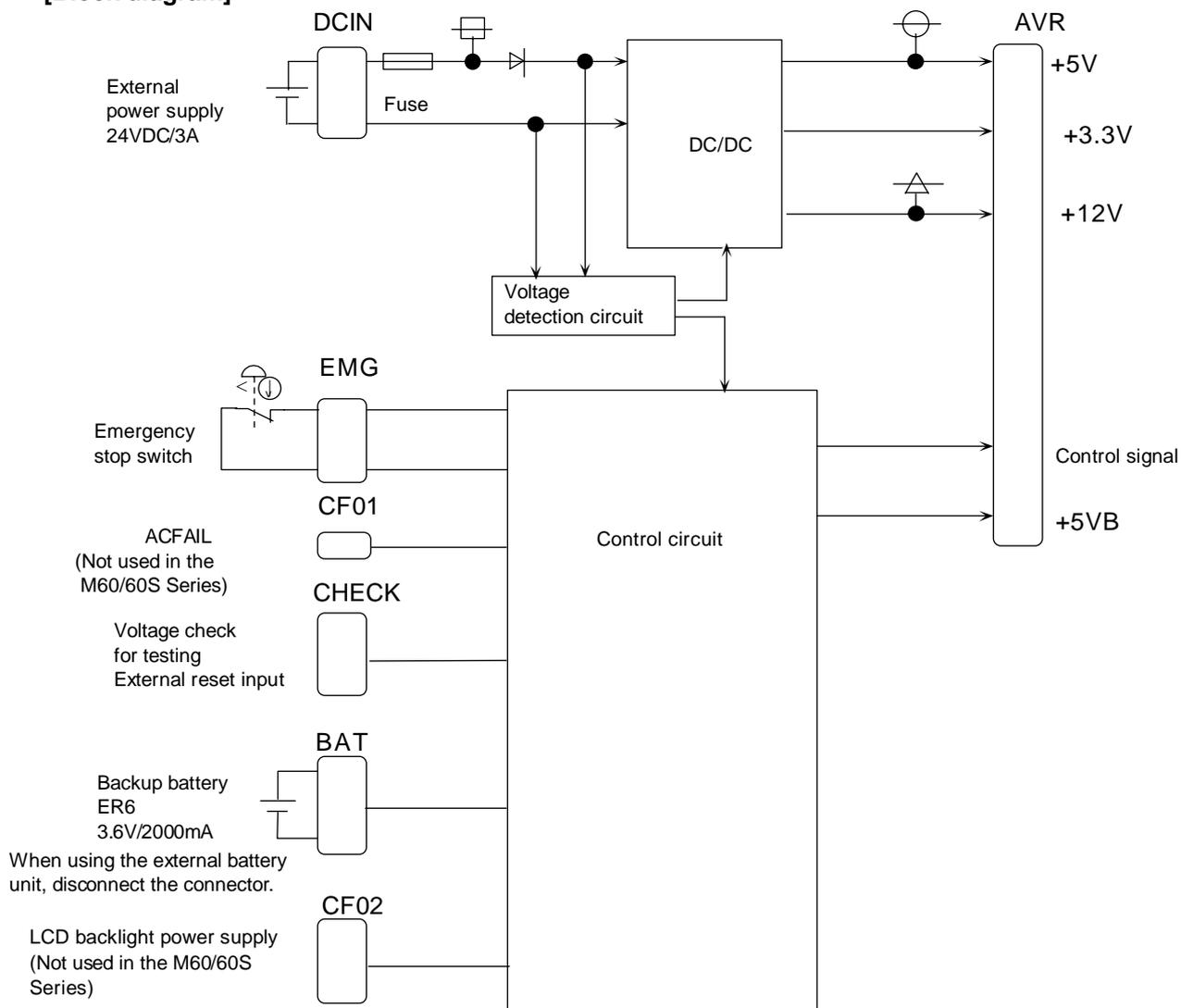
[Connector layout diagram]



1. EXPLANATION OF MODULE FUNCTIONS
1.2 HR081/082/083 Card

1.2 HR081/082/083 Card

[Block diagram]



[Explanation of functions]

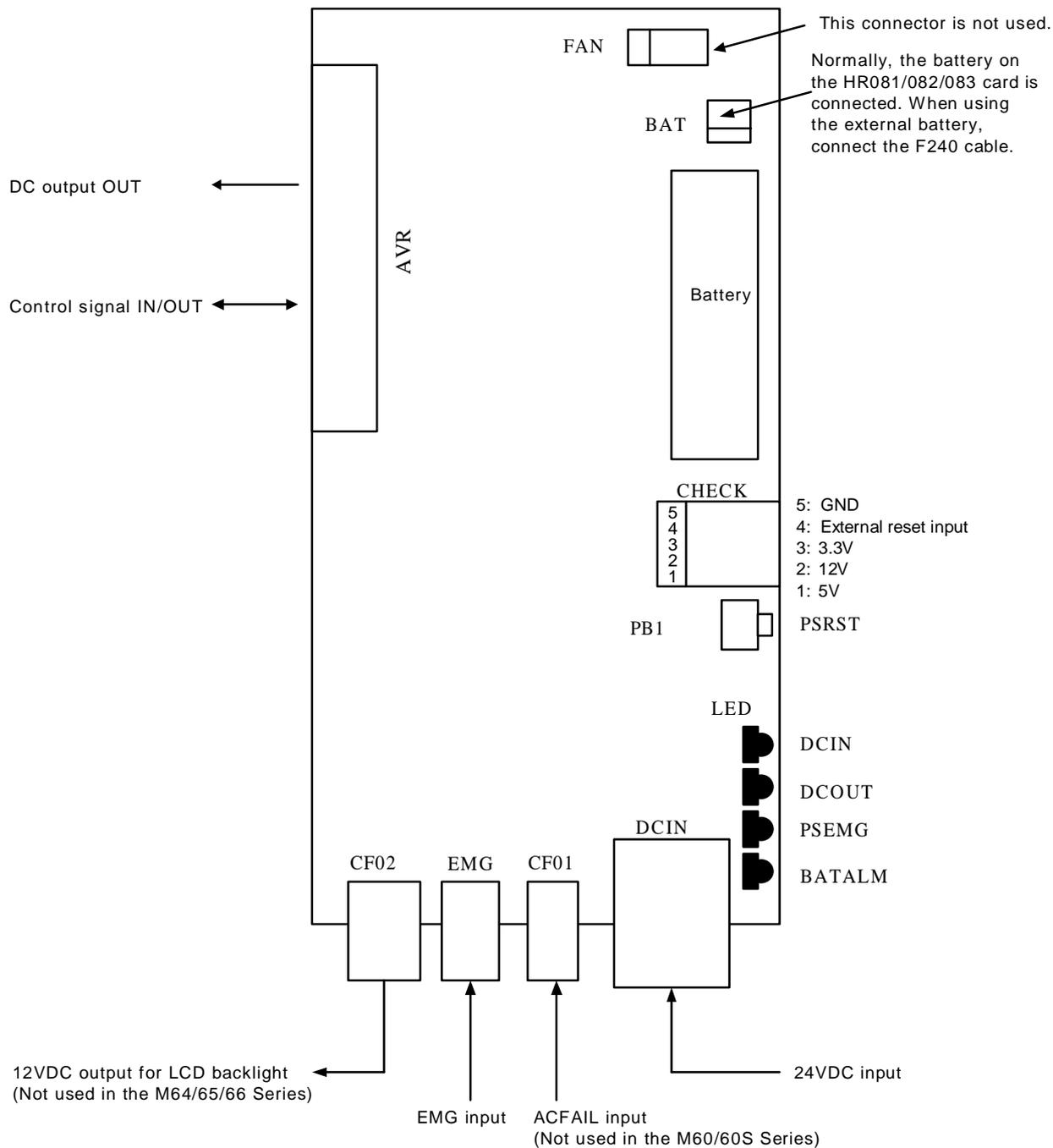
The HR081/082/083 card is the multi-power supply for the control unit, and has the following specifications.

Function	Specification	Supplement
Input voltage/current	24VDC±5% : 3A	DCIN connector
Output voltage/current	3.3VDC/5VDC/12VDC	
Emergency stop input	Emergency stop at 18V or less	EMG connector
Input control signal	ACFAIL signal	CF01 connector (Not used in the M60/60S Series)
Output control signal	Backlight ON/OFF, backlight power supply, brightness	CF02 connector (Not used in the M60/60S Series)
Backup battery	Lithium battery 3.6VDC: 2000mAh	BAT connector, primary battery

1. EXPLANATION OF MODULE FUNCTIONS

1.2 HR081/082/083 Card

[Connector layout diagram]



PSRST: System reset (do not press during normal system operation)

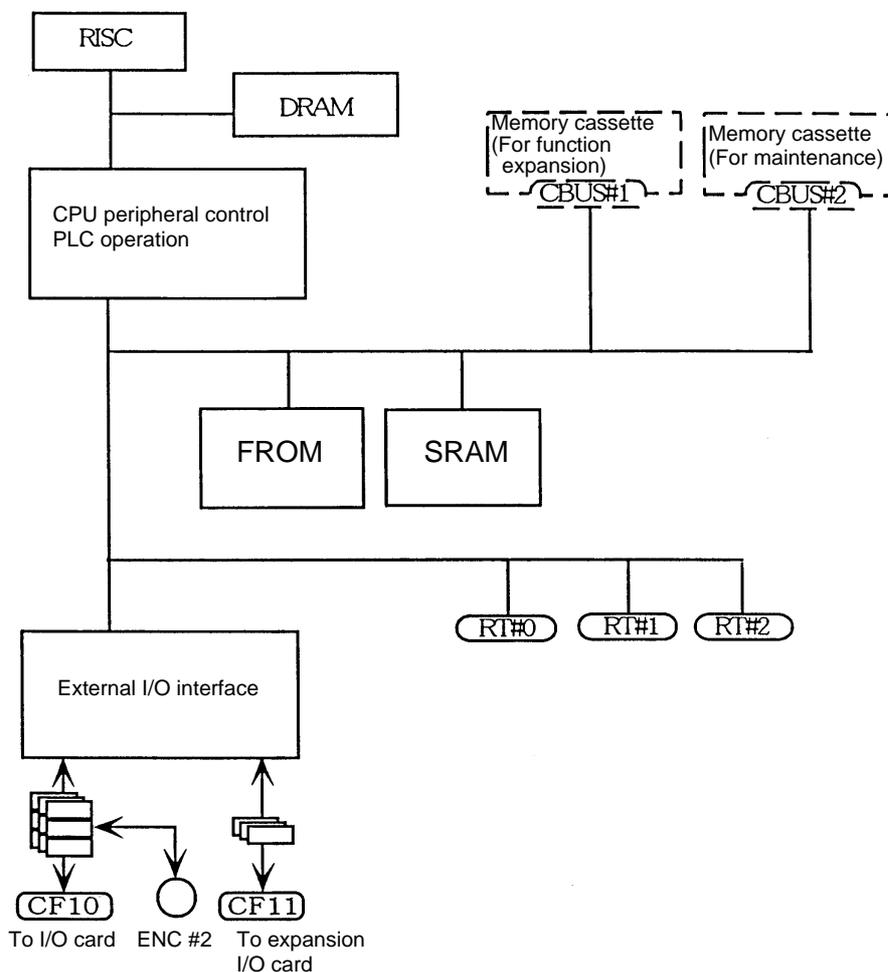
[Explanation of LEDs]

Name	Function	Color	Status		Correspondence for error
			When normal	During error	
DCIN	24VDC input check	Green	Lit	Not lit	Check 24VDC voltage
DCOUT	Internal output voltage check	Green	Lit	Not lit	Replace power supply or control unit
PSEMG	External emergency stop status display	Red	Not lit	Lit	Check cause of emergency stop
BATALM	Battery voltage drop (alarm)	Red	Not lit	Lit	Replace battery

1. EXPLANATION OF MODULE FUNCTIONS
1.3 HR111/113/114/146 Card

1.3 HR111/113/114/146 Card

[Block diagram]



[Explanation of functions]

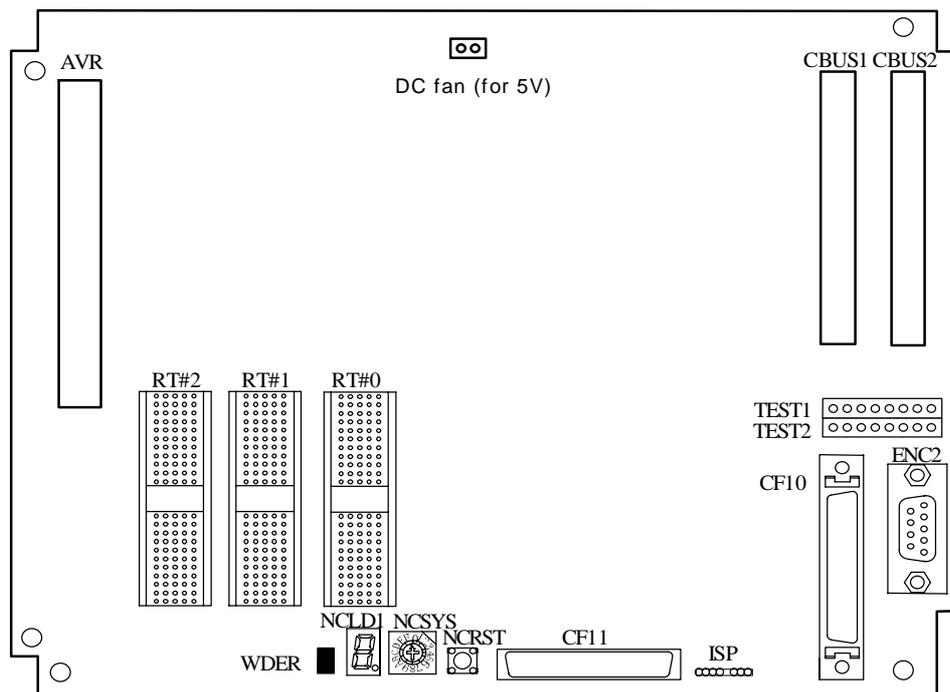
The HR113/114/116/146 card is the main CPU card, and has the following specifications. The HR146 is a CPU card subject to the Export Trade Control Ordinance and Foreign Trade Ordinance.

Function	Specification	Supplement
CPU	64-bit RISC chip	
ASIC	CPU peripheral control & PLC operation External I/O interface	
Memory	DRAM FROM SRAM	For system working For system ROM & BootROM For processing program and parameter backup
Memory cassette I/F	CBUS #1 connector CBUS #2 connector	For memory cassette (for function expansion) For memory cassette (for maintenance)
Expansion bus	RTBUS	RT1, RT2
Expansion I/O interface	Base I/O interface Expansion I/O interface	CF10 connector CF11 connector
Power supply	HR081/082/083	Connect to AVR connector

1. EXPLANATION OF MODULE FUNCTIONS

1.3 HR111/113/114/146 Card

[Connector layout diagram]



TEST 1 & 2 : Test pins for maintenance and service
 NCRST : NC reset (do not press during normal system operation)

[Explanation of settings]

NCSYS: System mode selection rotary switch

Switch	Mode	Details
0	Standard mode	Operation of system 1
1	PLC stop	The system is started while the PLC is stopped.
2	Maintenance mode	
3		
4		
5		
6		
7	Maintenance mode *	
8		
9		
A		
B		
C		
D		
E		
F		

* The memory cassette must be connected to the CBUS #1/#2 connector.

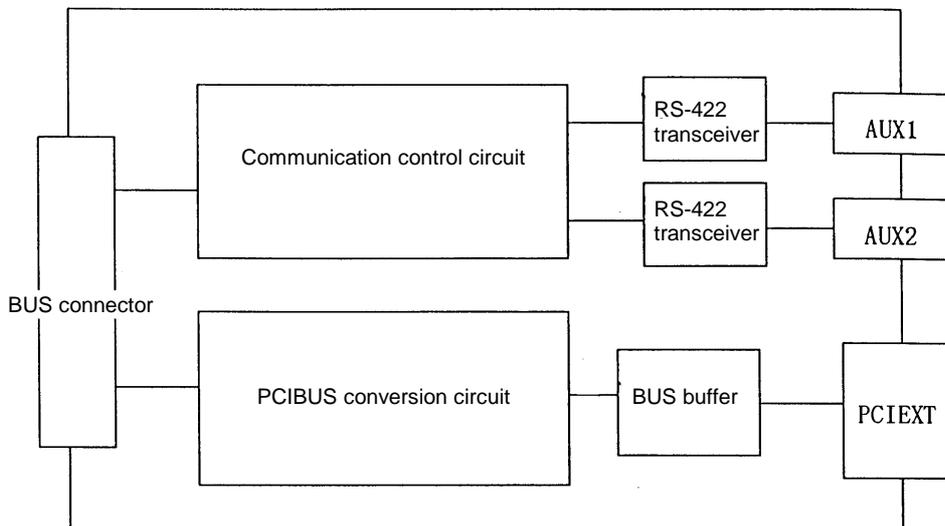
[Explanation of LEDs]

Name	Function	Color	Status		Correspondence for error
			When normal	During error	
NCLD1	System status display (7-segment software status)	-	-	-	Contact the Mitsubishi Service Center
WDER	System error display	Red	Not lit	Lit	

1. EXPLANATION OF MODULE FUNCTIONS
1.4 HR171 Card

1.4 HR171 Card

[Block diagram]



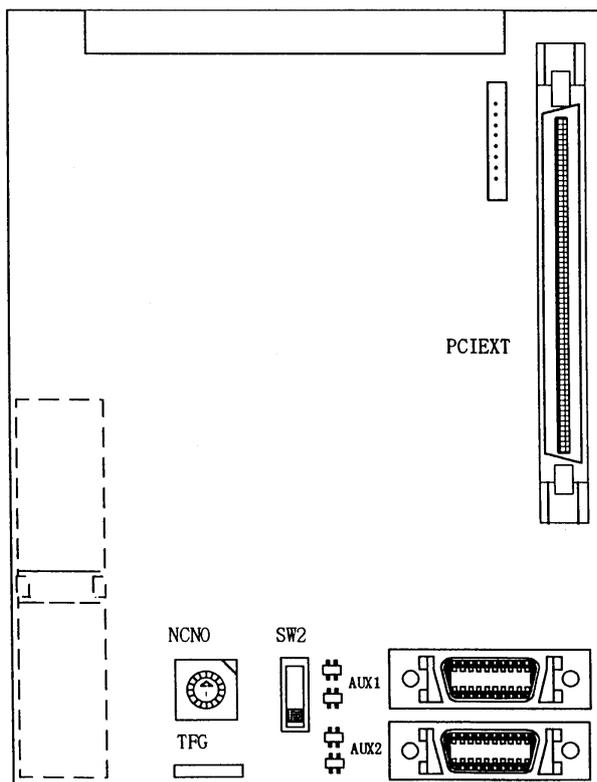
[Explanation of functions]

The HR171 card has an M64AS, M64S, M65, M65S, M66 or M66S Series operation board interface, I/O link interface and PCI bus conversion circuit and interface for adding a high-speed program server function.

The I/O link's master/slave and slave station numbers are set with the rotary switch.

This card is not used with the M64A.

[Connector layout diagram]



1. EXPLANATION OF MODULE FUNCTIONS
1.4 HR171 Card

[Explanation of LEDs]

Name	Function	Color	Status		Correspondence for error
			When normal	During error	
TX1	Indicates the AUX1 transmission state	Green	Flickers	ON or OFF	Contact the Mitsubishi Service Center
RX1	Indicates the AUX1 reception state	Green	Flickers	ON or OFF	Check communication cable connection
TX2	Indicates the AUX2 transmission state (Only when using I/O link function)	Green	Flickers	ON or OFF	Check each remote I/O unit's rotary switch station No.
RX2	Indicates the AUX2 reception state (Only when using I/O link function)	Green	Flickers	ON or OFF	Check each remote I/O unit's rotary switch station No. Check communication cable connection

[Explanation of settings]

Rotary switch (NCNO) settings

Setting position	Explanation of functions	Supplement
0	Master station when multiple control sections are connected.	This is the I/O link's master station.
1	1st station for normal use or when multiple control sections are connected.	A setting higher than "1" is the I/O link's slave station.
2	2nd station for normal use or when multiple control sections are connected.	
:	:	
F	15th station for normal use or when multiple control sections are connected.	

SW2: I/O link terminator ON/OFF switch

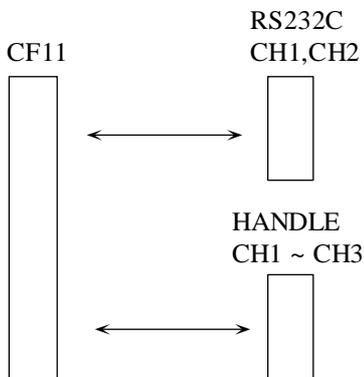
Slide switch (SW2) setting

Setting position	Explanation of functions
ON	Terminator (150Ω) connected
OFF	Terminator not connected

1. EXPLANATION OF MODULE FUNCTIONS
1.5 HR211 Card

1.5 HR211 Card

[Block diagram]

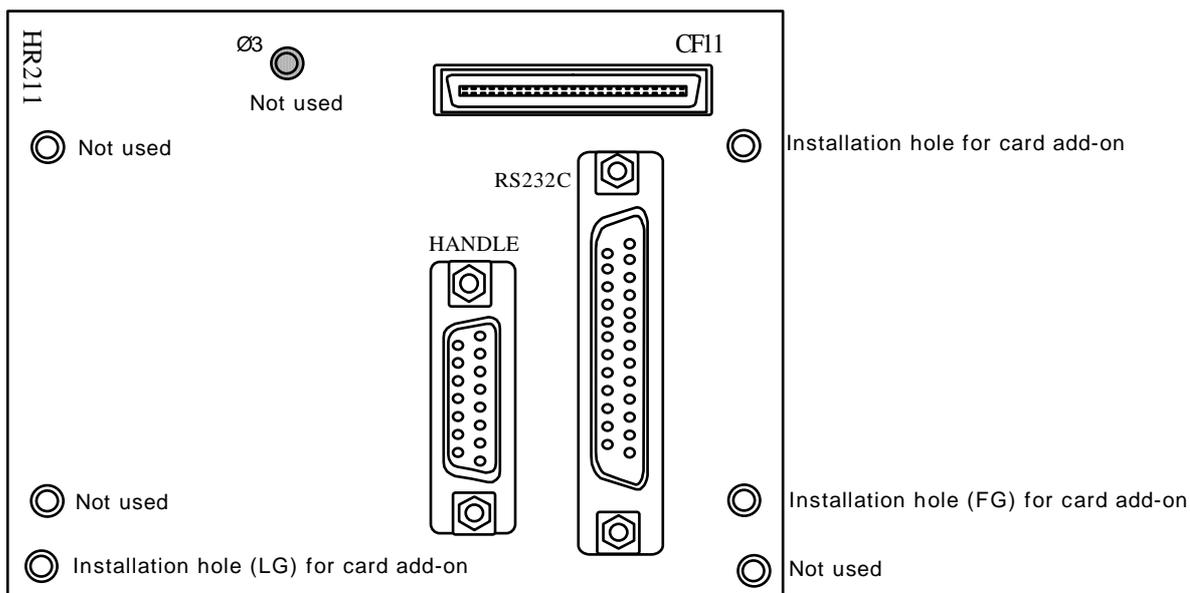


[Explanation of functions]

The HR211 card is the I/O expansion card for the RS-232C and manual pulse generator. Use the card by connecting the control unit CF11 connector to the HR211 card CF11 connector with an F050 cable. The card is used as an add-on to the base I/O unit HR325, 327, 335 and 337.

Function	Specification	Supplement
RS-232-C interface	Two channels: port No. 1 and port No. 2	RS-232C connector and port No. 1 are for maintenance by service personnel
Manual pulse generator interface	Up to three can be mounted	HANDLE connector

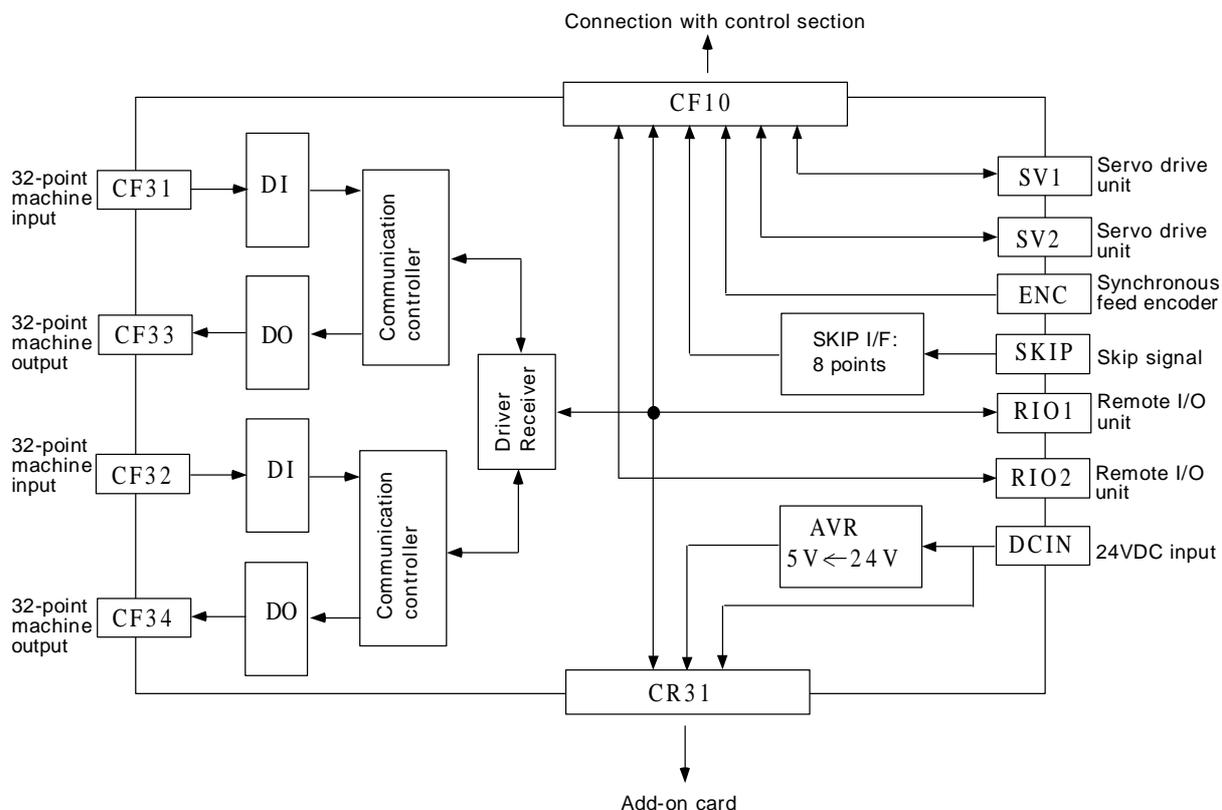
[Connector layout diagram]



1. EXPLANATION OF MODULE FUNCTIONS
1.6 HR325, 327, 335, 337 Cards

1.6 HR325, 327, 335, 337 Cards

[Block diagram]



[Explanation of functions]

The HR325/327/335/337 card is connected in the base I/O unit to the control section CF10 connector by an F010 cable.

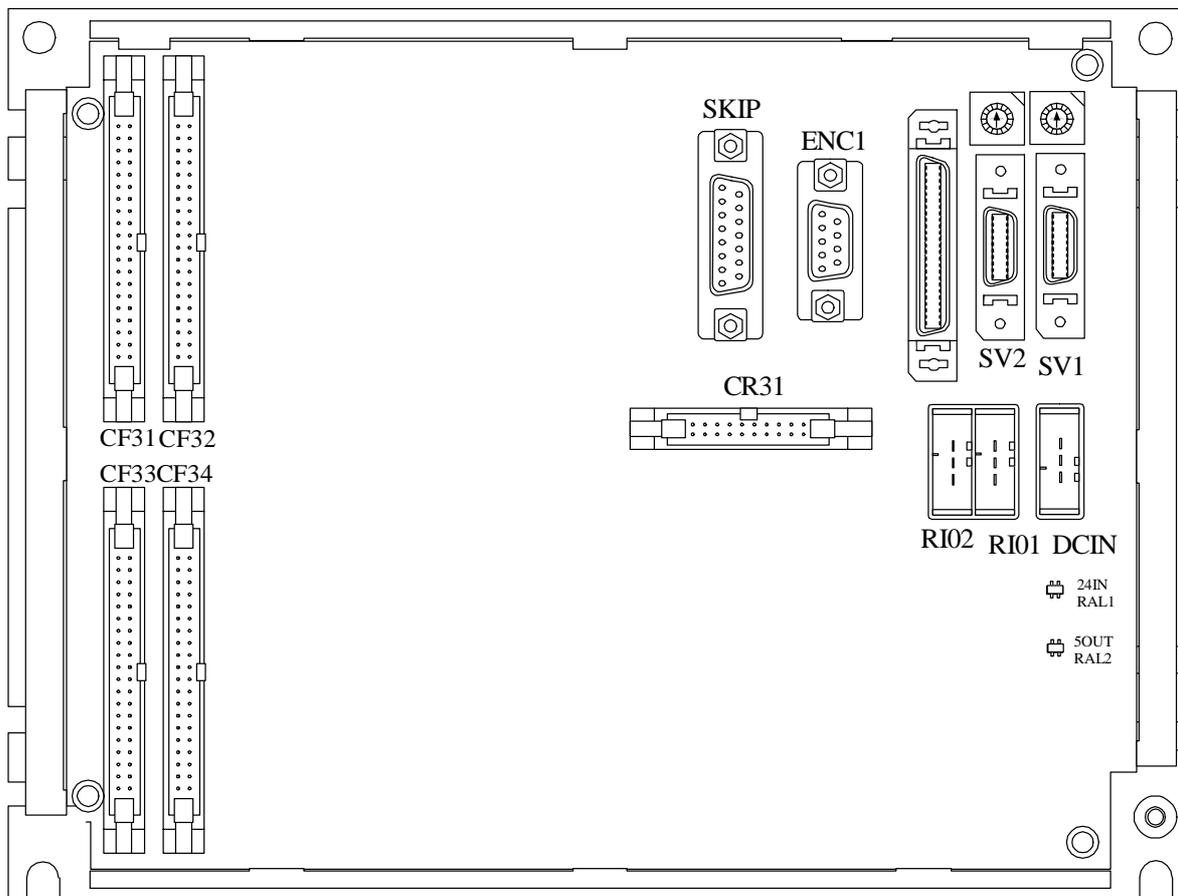
The HR325 and 327 have the sink specifications, and the HR335 and 337 have the source specifications. The card with "5" as the last digit have a 48-point machine input and 48-point machine output.

Function	Specification	Supplement
Remote I/O communication	Occupies 2 stations	Set with the rotary switches CS1 and CS2.
Remote I/O communication interface	Two interfaces	RIOA1 connector, RIO2 connector
Machine input interface	HR325/335: Insulated type : 48 points HR327/337: Insulated type : 64 points	CF31/32 connector
Machine output interface	HR325/335: Non-insulated type: 48 points HR327/337: Non-insulated type: 64 points	CF33/34 connector, 60mA output
Skip signal input interface	Insulated type: 48 points	SKIP connector
Servo drive unit interface	Two interfaces	SV1, SV2 connector, MC link A communication
Synchronous feed encoder interface	One interface	ENC1 connector
Input voltage/current	24VDC ± 5%, 6Amax	Maximum current is the value for when all machine input/output signal points are ON

1. EXPLANATION OF MODULE FUNCTIONS

1.6 HR325, 327, 335, 337 Cards

[Connector layout diagram]



[Explanation of settings]

- Rotary switch CS1: Set the CF31/CF33 side devices of the machine input/output (DI/DO) connected to the remote I/O communication.
- Rotary switch CS2: Set the CF32/CF34 side devices of the machine input/output (DI/DO) connected to the remote I/O communication.

<Setting method>

0 to 7 : Corresponds to station Nos. 0 to 7

(Note) 8 or higher: Cannot be set

- * The CS1 and CS2 settings must always be different for the HR325, 327, 335 and 337 cards. Set all the remote I/O units and add-on cards connected in the same system to differing station Nos. in the range from 0 to 7. Up to 8 stations can be connected in one system.

[Explanation of LEDs]

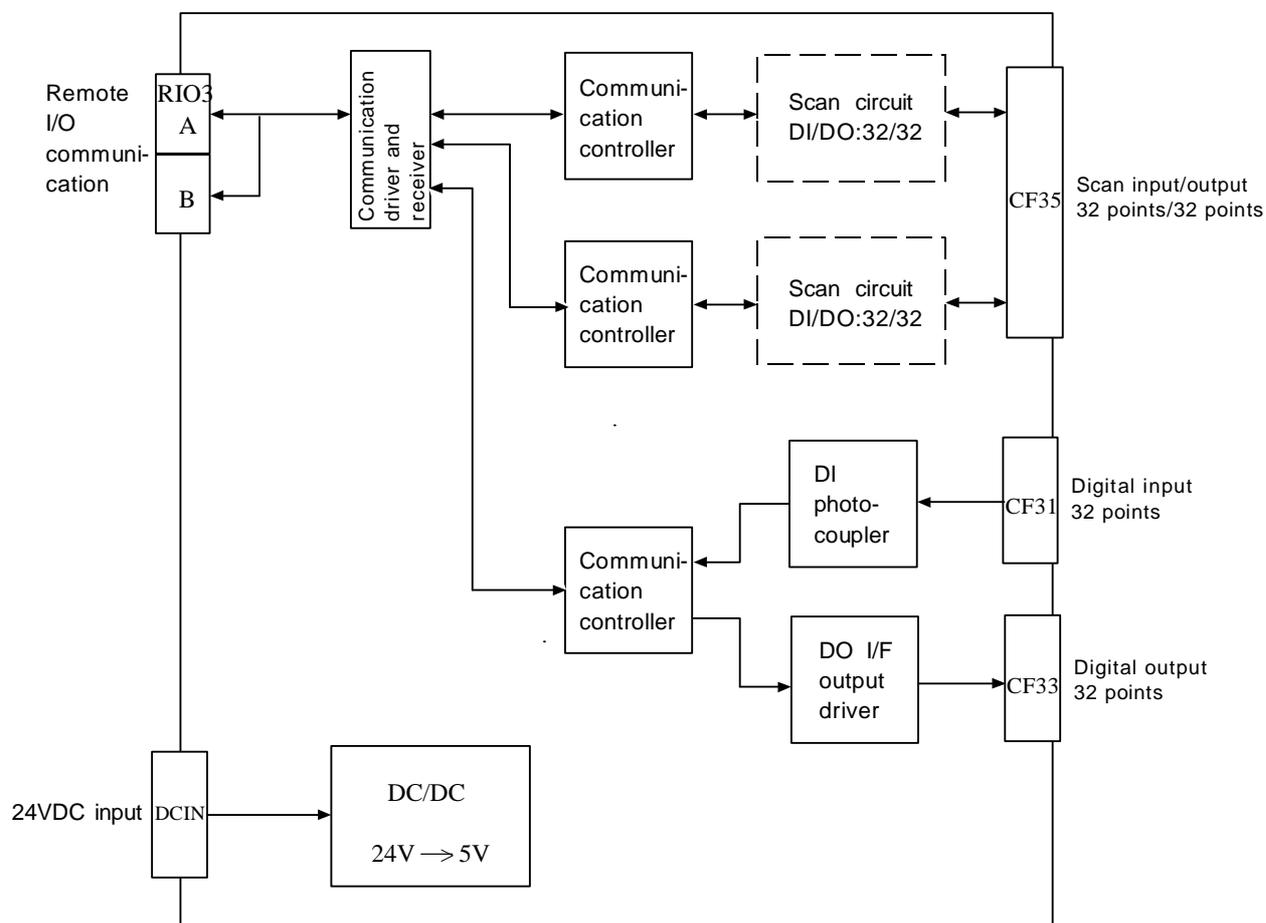
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
LED 1 (two-color LED)	24IN	Green	Lit	Not lit	Check 24VDC voltage
	RI01	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
LED 2 (two-color LED)	5OUT	Green	Lit	Not lit	Contact the Mitsubishi Service Center
	RI02	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.

1. EXPLANATION OF MODULE FUNCTIONS

1.7 HR357 Card

1.7 HR357 Card

[Block diagram]



[Explanation of functions]

The HR357 card is the machine operation board input/output card. It has a digital input/output and scan input/output, and is connected to the operation board or other device.

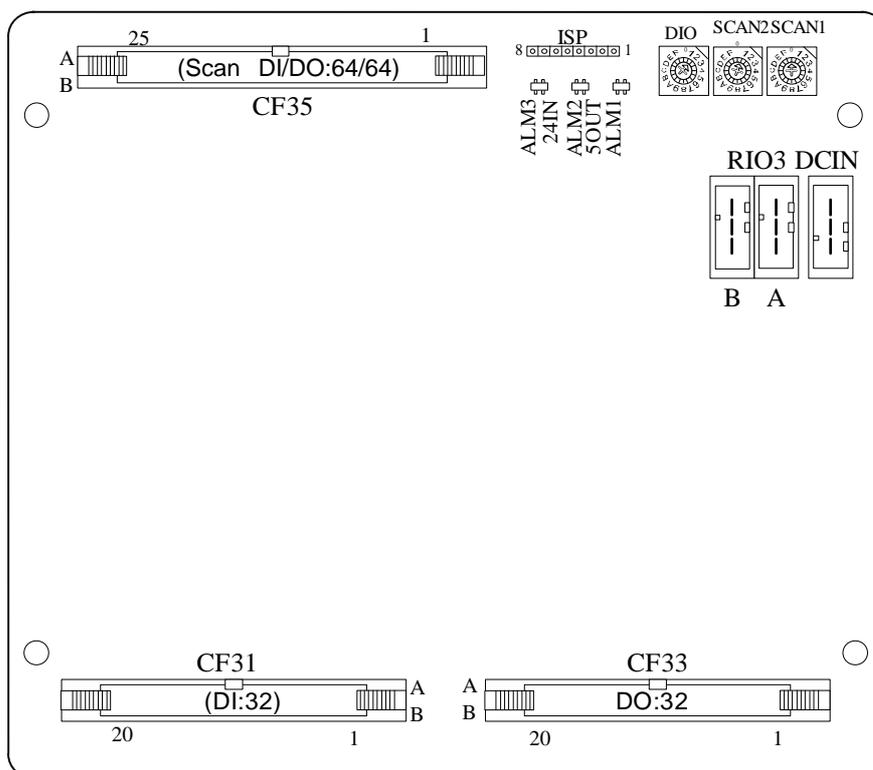
		HR357	Remarks
Scan	No. of input points	64	5V system
	No. of output points	64	
Digital	No. of input points	32	24V system
	No. of output points	32	
	Input	Sink/source	
	Output	Source	

Function	Specification	Supplement
Remote I/O communication	Occupies 3 stations	Set with CSAN1 and CSAN2 rotary switches and DIO
Remote I/O communication interface	One interface	RIOA3 connector
Scan input/output interface	Input/output configured of common signal × data signal matrix 64 points/64 points.	5V system, CF35 connector
Machine input interface	32 points	CF31 connector, insulated type
Machine output interface	32 points	CF33 connector, non-insulated type
Input voltage	24VDC ± 5%	DCIN connector

1. EXPLANATION OF MODULE FUNCTIONS

1.7 HR357 Card

[Connector layout]



[Explanation of settings]

Rotary switch	Explanation
SCAN1	Scan input/output station No. setting 32 pts. /32 pts. (Normally set to 0)
SCAN2	Scan input/output station No. setting 32 pts. /32 pts. (Normally set to 1)
DIO	Digital input/output station No. setting 32 pts./32 pts. (Normally set to 2)

* SCAN 1, SCAN 2 and DIO must be set to differing station Nos. Up to 8 stations can be connected in one system. Set in a range from 0 to 7.

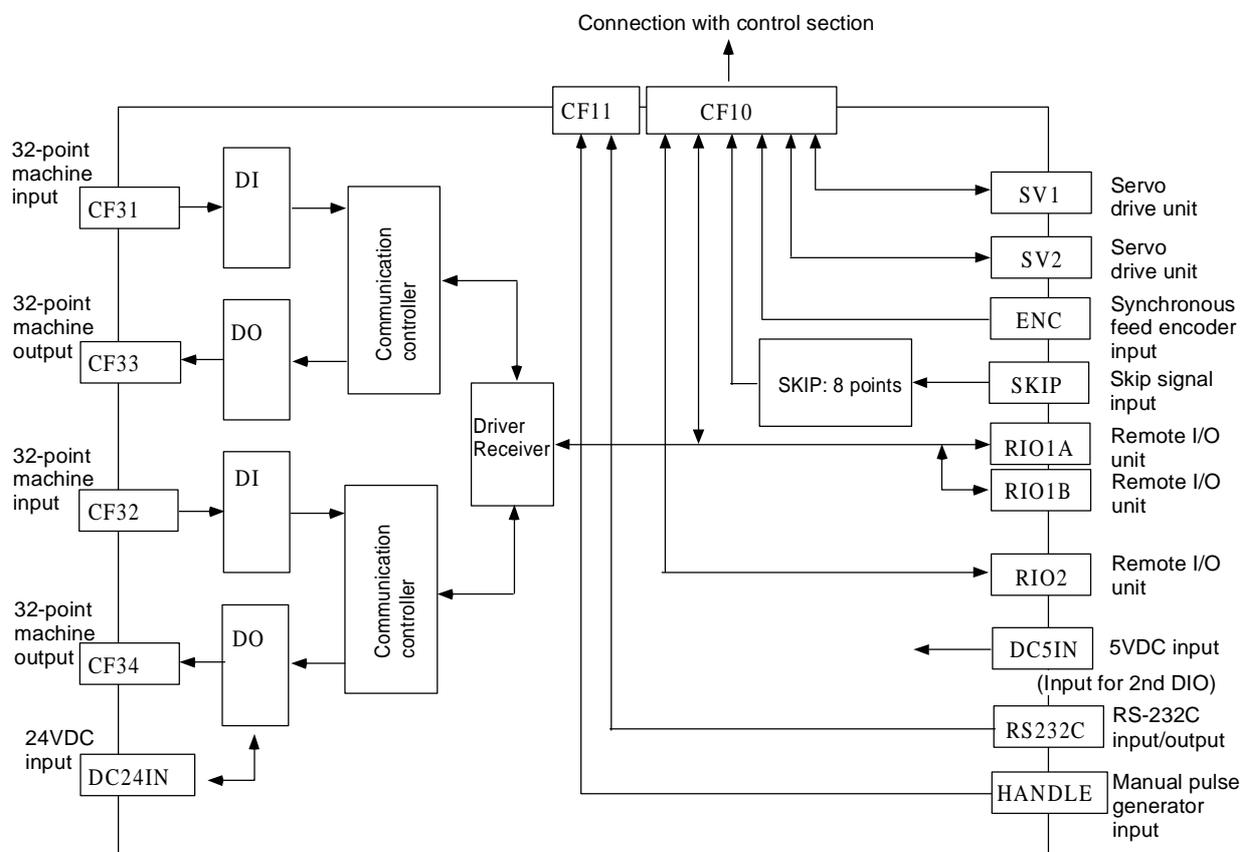
[Explanation of LED]

Name	Function	Color	Status		Correspondence for error
			When normal	During error	
24IN	24VDC input check	Green	Lit	Not lit	Check 24VDC voltage
5OUT	Internal output voltage check	Green	Lit	Not lit	Contact the Mitsubishi Service Center
ALM1	Rotary switch [SCAN1] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
ALM2	Rotary switch [SCAN2] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
ALM3	Rotary switch [DIO] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.

1. EXPLANATION OF MODULE FUNCTIONS
1.8 HR377 Card

1.8 HR377 Card

[Block diagram]



[Explanation of functions]

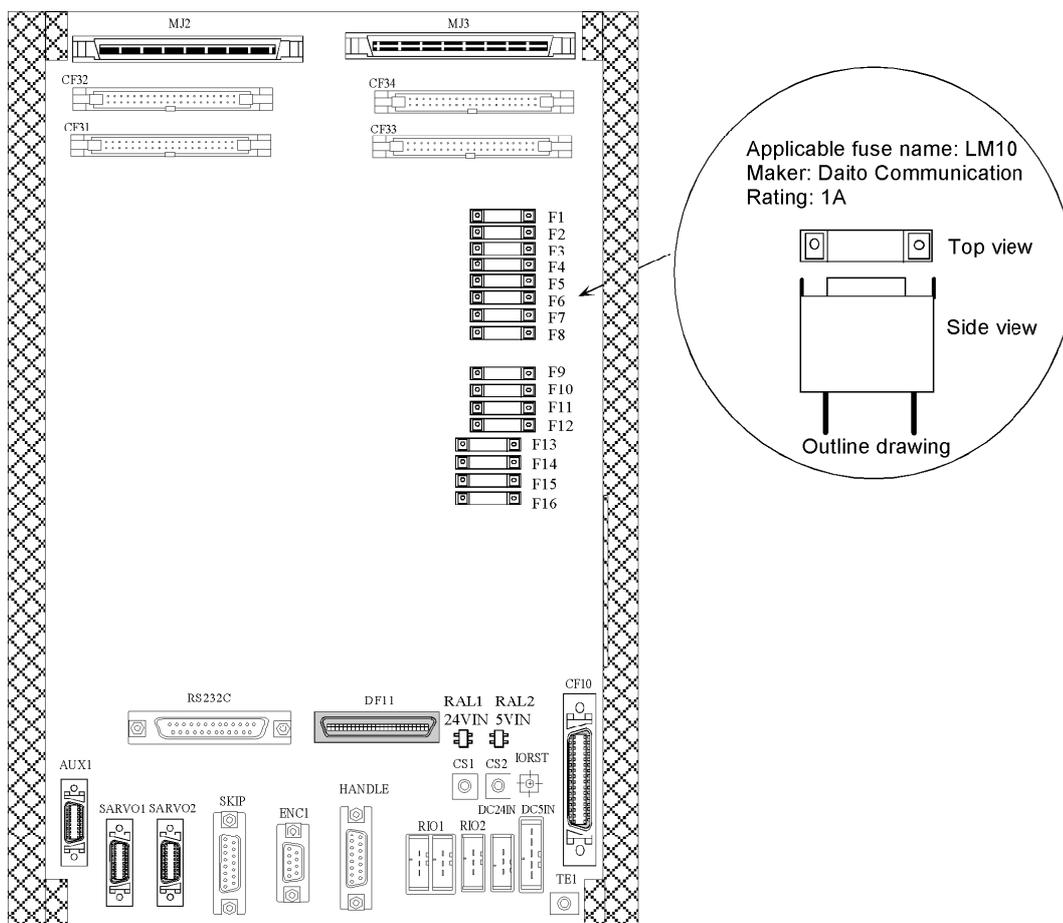
The HR377 is the base I/O unit, featuring a 200mA/point DO output. This card is used when connected by an F010 and an F050 cable to the CF10 and CF11 connectors at the control section. The 5VDC power type and 12VDC power type manual pulse generator can be used. By connecting with a remote I/O from the RIO1A/B connector using an SH41/R211 cable, two or more HR377 cards can be connected.

Function	Specification	Supplement
Remote I/O communication	Occupies 2 stations	Set with the rotary switches CS1 and CS2.
Remote I/O communication interface	Two interfaces	RIOA/B connector, RIO2 connector
Machine input interface	Insulated type: 64 points	CF31/32 connector
Machine output interface	Non-insulated type: 64 points	CF33/34 connector, 200mA output
Skip signal input interface	Insulated type: 8 points	SKIP connector
Servo drive unit interface	Two interfaces	SARV01, 2 connector, MC link A communication
Synchronous feed encoder interface	One interface	ENC1 connector
RS-232-C interface	One interface Two channels: port No. 1 and port No. 2	RS-232-C connector and port No. 1 are for maintenance by service personnel
Manual pulse generator interface	Up to three can be mounted	HANDLE connector
Input voltage/current	24VDC \pm 5%, 13Amax 5VDC \pm 5%, 1Amax	Maximum current is the value for when all machine input/output signal points are ON 5VDC is supplied when this card is connected to the remote I/O communication system.

1. EXPLANATION OF MODULE FUNCTIONS

1.8 HR377 Card

[Connector layout diagram]



[Explanation of settings]

Rotary switch CS1: Set the CF31/CF32 side devices of the machine input/output (DI/DO) connected to the remote I/O communication.

Rotary switch CS2: Set the CF33/CF34 side devices of the machine input/output (DI/DO) connected to the remote I/O communication.

<Setting method>

0 to 7 : Corresponds to remote I/O unit station Nos. 0 to 7

(Note) 8 or higher: Cannot be set

* Set all the remote I/O units and add-on cards connected in the same system to differing station Nos. in the range from 0 to 7. Up to 8 stations can be connected in one system.

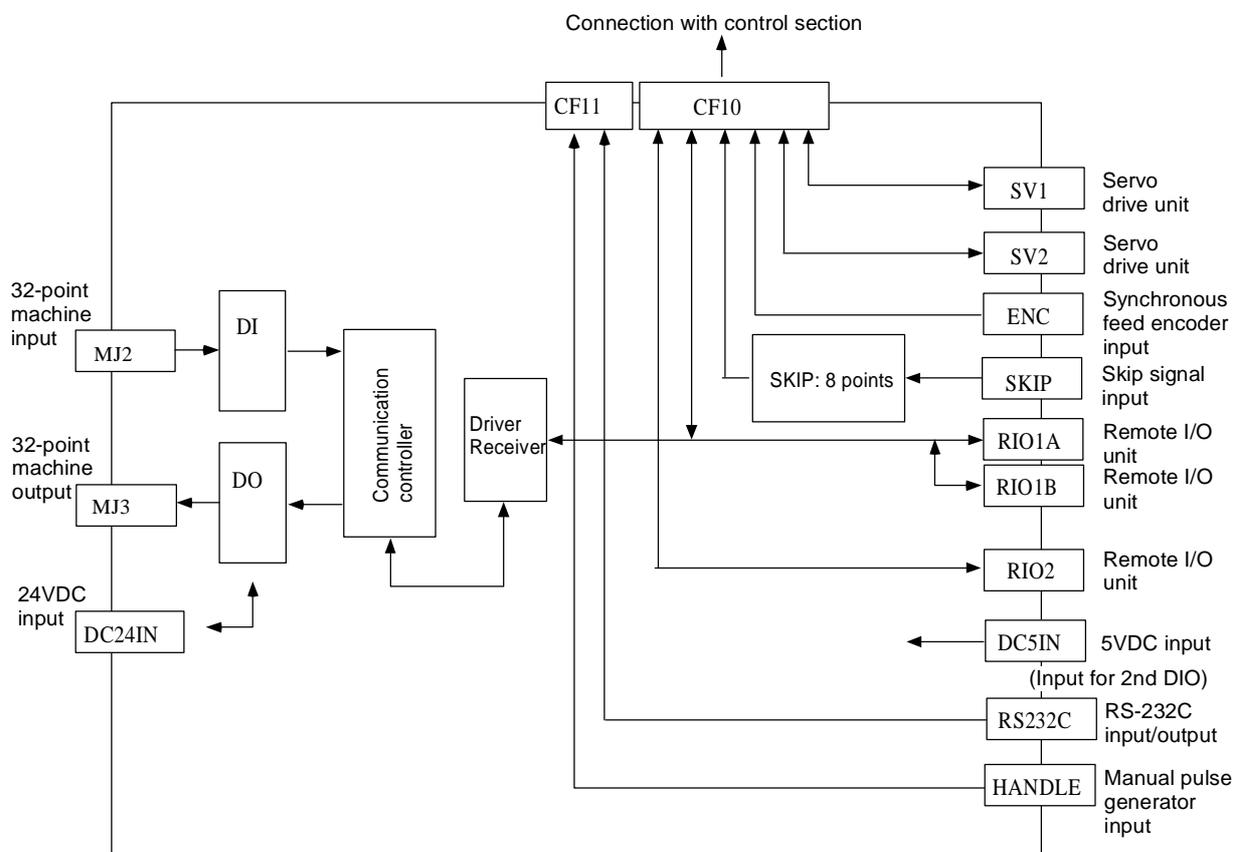
[Explanation of LEDs]

Name	Function	Color	Status		Correspondence for error	
			When normal	During error		
LED 1 (two-color LED)	24IN	24VDC input check	Green	Lit	Not lit	Check 24VDC voltage
	RIO1	Rotary switch [CS1] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
LED 2 (two-color LED)	5VIN	Internal output voltage check	Green	Lit	Not lit	Contact the Mitsubishi Service Center
	RIO2	Rotary switch [CS2] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.

1. EXPLANATION OF MODULE FUNCTIONS
1.9 HR378 Card

1.9 HR378 Card

[Block diagram]



[Explanation of functions]

The HR378 is the base I/O unit, featuring a 200mA/point DO output. While the HR377 uses the MELDAS standard flat cable type DI/DO connector, the HR378 uses a half-pitch type DI/DO connector, allowing the DO output common to be separated in groups of four points (per point in some sections) and control to be carried out. This card is used when connected by an F010 and an F050 cable to the CF10 and CF11 connectors at the control section. The 5VDC power type and 12VDC power type manual pulse generator can be used.

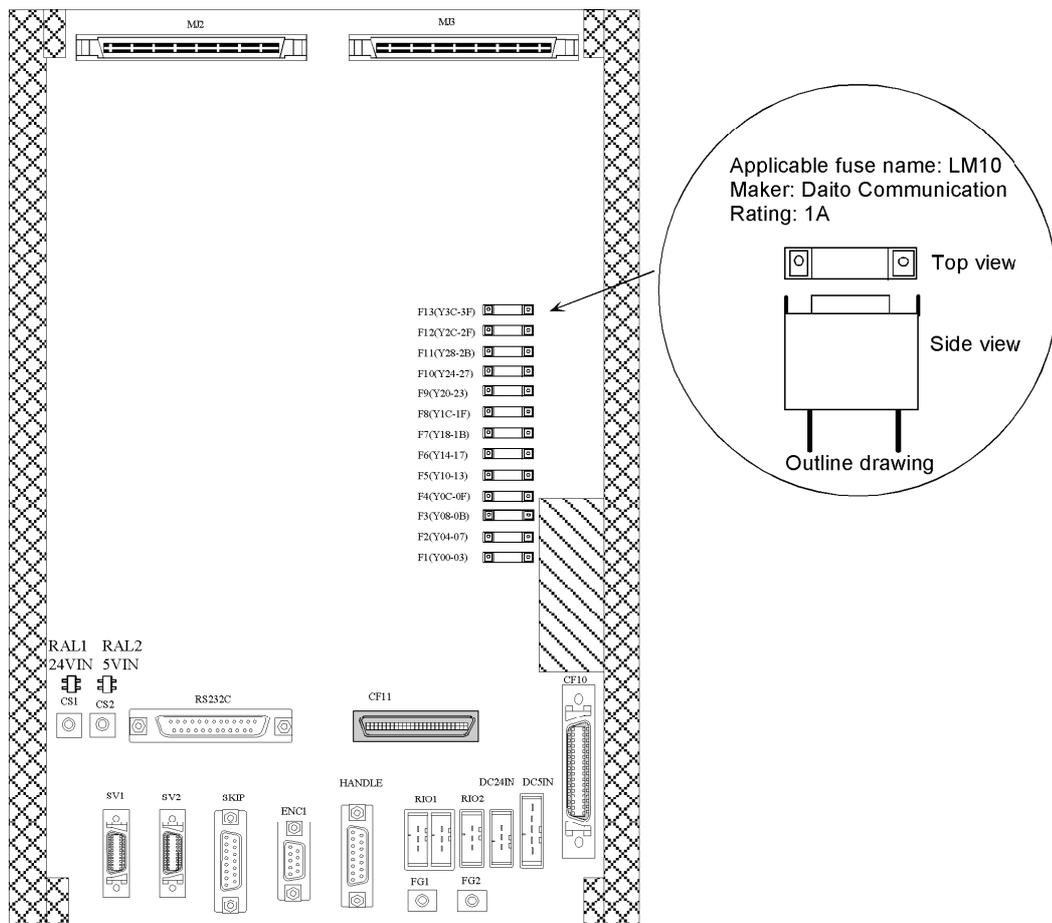
By connecting with a remote I/O communication from the RIO1A/B connector using an SH41/R211 cable, two or more FCU6-HR378 cards can be connected.

Function	Specification	Supplement
Remote I/O communication	Occupies 2 stations	Set with the rotary switches CS1 and CS2.
Remote I/O communication interface	Two interfaces	RIOA/B connector, RIO2 connector
Machine input interface	Insulated type: 64 points	MJ2 connector
Machine output interface	Insulated type: 64 points	MJ3 connector
Skip signal input interface	Insulated type: 8 points	SKIP connector
Servo drive unit interface	Two interfaces	SV1, SV2 connector, MC link A communication
Synchronous feed encoder interface	One interface	ENC1 connector
RS-232-C interface	One interface Two channels: port No. 1 and port No. 2	RS-232-C connector and port No. 1 are for maintenance by service personnel
Manual pulse generator interface	Up to three can be mounted	HANDLE connector
Input voltage/current	24VDC \pm 5%, 13Amax 5VDC \pm 5%, 1Amax	Maximum current is the value for when all machine input/output signal points are ON 5VDC is supplied when this card is connected to the remote I/O communication system.

1. EXPLANATION OF MODULE FUNCTIONS

1.9 HR378 Card

[Connector layout diagram]



[Explanation of settings]

- CS1: 0th station setting rotary switch of remote I/O No. 1 system (normally set to 0)
- CS2: 1st station setting rotary switch of remote I/O No. 1 system (normally set to 1)

<Setting method>

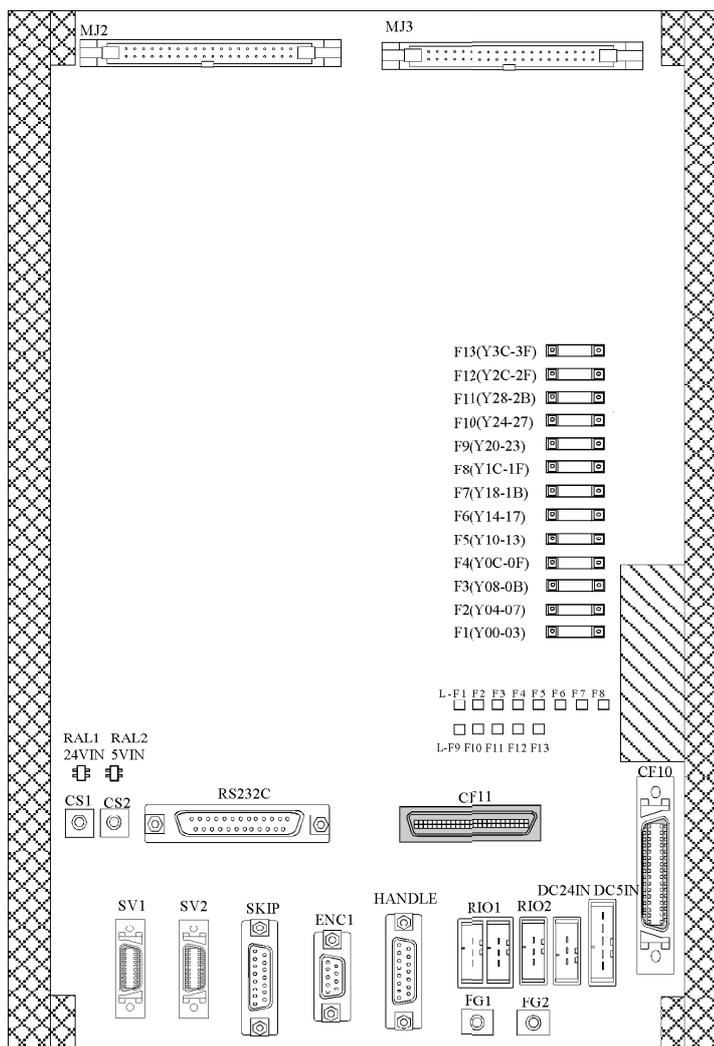
0 to 7 : Corresponds to remote I/O station Nos. 0 to 7
(Note) 8 or higher: Cannot be set

- * Set all the remote I/O units connected in the same system to differing station Nos. in the range from 0 to 7. Up to 8 stations can be connected in one system.

1. EXPLANATION OF MODULE FUNCTIONS

1.9 HR378 Card

[Explanation of LEDs]

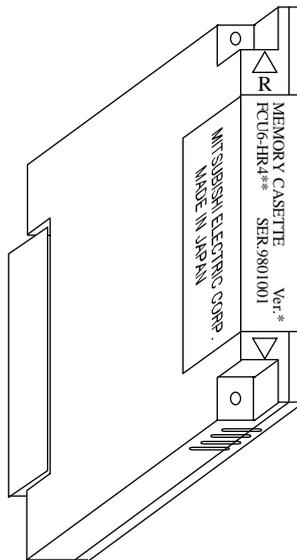


Name	Function	Color	Status		Correspondence for error	
			When normal	During error		
LED 1 (two-color LED)	24IN	24VDC input check	Green	Lit	Not lit	Check 24VDC voltage
	RIO1	Rotary switch [CS1] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
LED 2 (two-color LED)	5OUT	Internal output voltage check	Green	Lit	Not lit	Contact the Mitsubishi Service Center
	RIO2	Rotary switch [CS2] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
L-F1	Y00 to 03	Continuity to fuse F1	Green	Lit	Not lit	Check CO0003 voltage
L-F2	Y04 to 04	Continuity to fuse F2	Green	Lit	Not lit	Check CO0407 voltage
L-F3	Y08 to 0B	Continuity to fuse F3	Green	Lit	Not lit	Check CO080B voltage
L-F4	Y0C to 0F	Continuity to fuse F4	Green	Lit	Not lit	Check CO0C0F voltage
L-F5	Y10 to 13	Continuity to fuse F5	Green	Lit	Not lit	Check CO1013 voltage
L-F6	Y14 to 17	Continuity to fuse F6	Green	Lit	Not lit	Check CO1417 voltage
L-F7	Y18 to 1B	Continuity to fuse F7	Green	Lit	Not lit	Check CO181B voltage
L-F8	Y1C to 1F	Continuity to fuse F8	Green	Lit	Not lit	Check CO1C1F voltage
L-F9	Y20 to 23	Continuity to fuse F9	Green	Lit	Not lit	Check CO2023 voltage
L-F10	Y24 to 27	Continuity to fuse F10	Green	Lit	Not lit	Check CO2427 voltage
L-F11	Y28 to 2B	Continuity to fuse F11	Green	Lit	Not lit	Check CO282B voltage
L-F12	Y2C to 2F	Continuity to fuse F12	Green	Lit	Not lit	Check CO2C2F voltage
L-F13	Y3C to 3F	Continuity to fuse F13	Green	Lit	Not lit	Check CO3C3F voltage

1. EXPLANATION OF MODULE FUNCTIONS

1.10 Memory Cassette HR4□□

1.10 Memory Cassette HR4□□



[Explanation of functions]

The HR4□□ memory cassette is a cassette-type memory card used for maintenance and function expansion, etc.

There are SRAM cassettes and FROM cassettes with separate functions. Order parts separately from Mitsubishi.

CBUS#1 is used for function expansion, and CBUS#2 is used for maintenance.

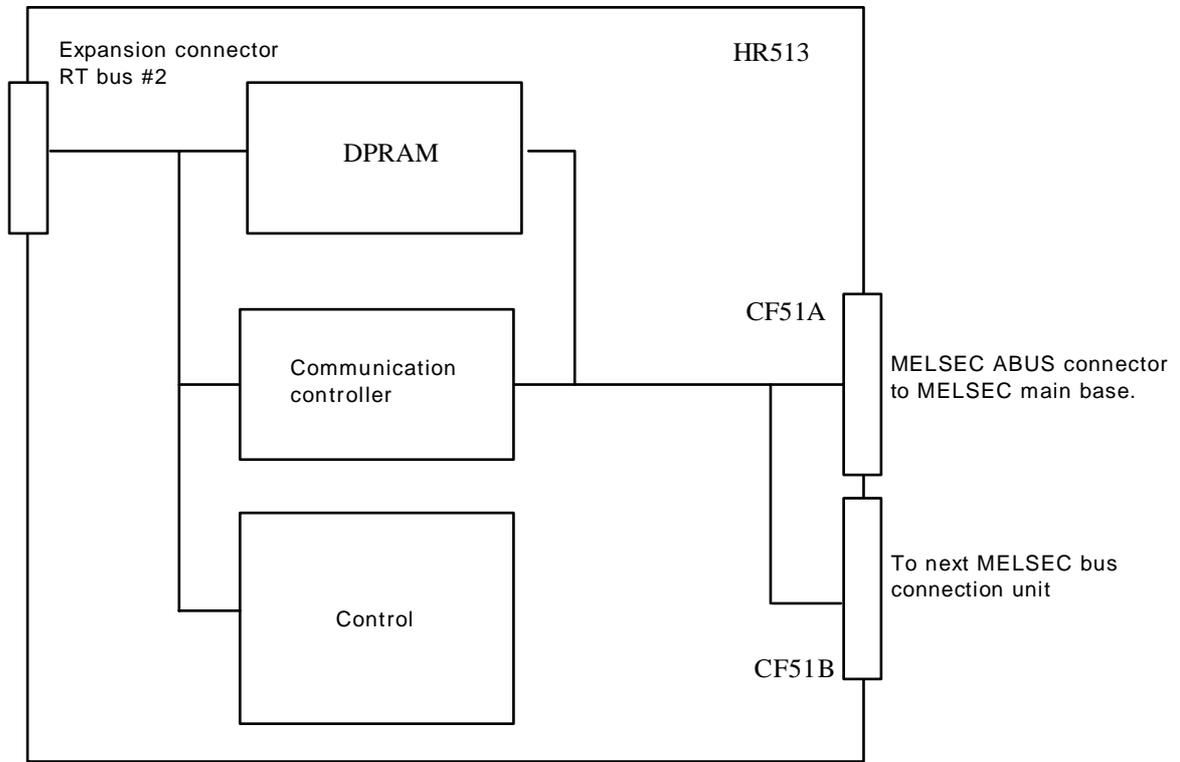
HR410	For maintenance
HR411	For maintenance
HR412	For maintenance
HR415	For APLC memory cassette and maintenance
HR437	For APLC/program capacity expansion

1. EXPLANATION OF MODULE FUNCTIONS

1.11 HR513 Card

1.11 HR513 Card

[Block diagram]



[Explanation of functions]

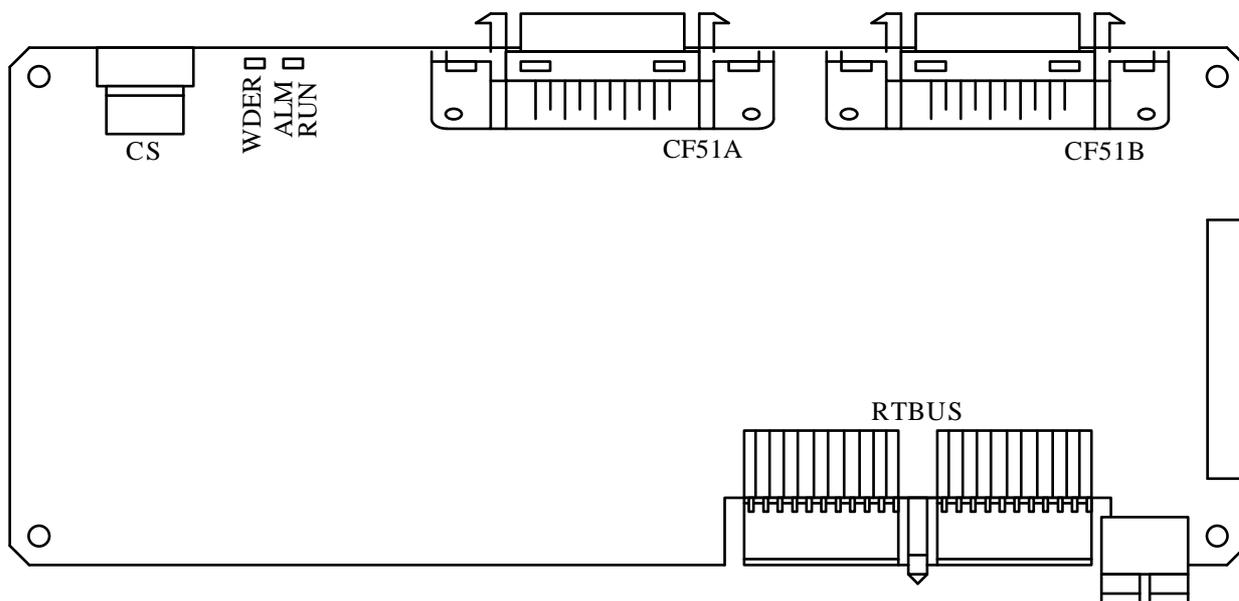
The HR513 card functions as the bus connection interface with the MELSEC mounted as an option on the RT bus. The NC control unit is recognized as a 32-point special unit mounted in slot 0 on the top of the MELSEC expansion base section.

(The No. of expansion stages is restricted by the type of MELSEC connected, total cable length, etc.)

1. EXPLANATION OF MODULE FUNCTIONS

1.11 HR513 Card

[Connector layout diagram]



[Explanation of settings]

CS: Rotary switch for unit No. setting

<Setting method>

Rotary switch: CS setting

Setting position	Function explanation	Supplement
0	Not used	
1 to 7	Correspond to units 1 to 7 (Reset signal to the PLC valid)	
8	Not used	
9 and following	Correspond to units 1 to 7 (Reset signal to the PLC invalid)	

* The settings in which the reset signal to the PLC is invalid are used to prevent the PLC side from resetting when the M60/60S Series control unit side has not started.

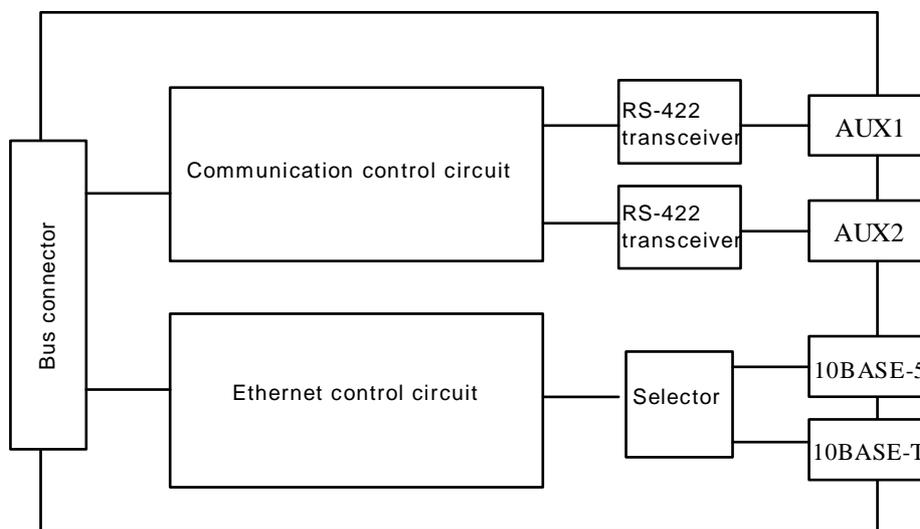
[Explanation of LEDs]

Name	Function	Color	Status		Correspondence for error
			When normal	During error	
WDER	System error display	Red	Not lit	Lit	Contact the Mitsubishi Service Center
ALM	System error display	Red	Not lit	Lit	
RUN	Software operation check	Green	Flickers	ON or OFF	

1. EXPLANATION OF MODULE FUNCTIONS
1.12 HR531/534 Cards

1.12 HR531/534 Cards

[Block diagram]



[Explanation of functions]

The HR53□ card has an M60 Series communication terminal interface, I/O link interface and Ethernet 10BASE-5 and 10BASE-T interface. The I/O link master/slave and slave station Nos. are set with the rotary switch. The BASE-5/T changeover is set with the slide switch.

This is used only for M64.

The card name for each function is shown below.

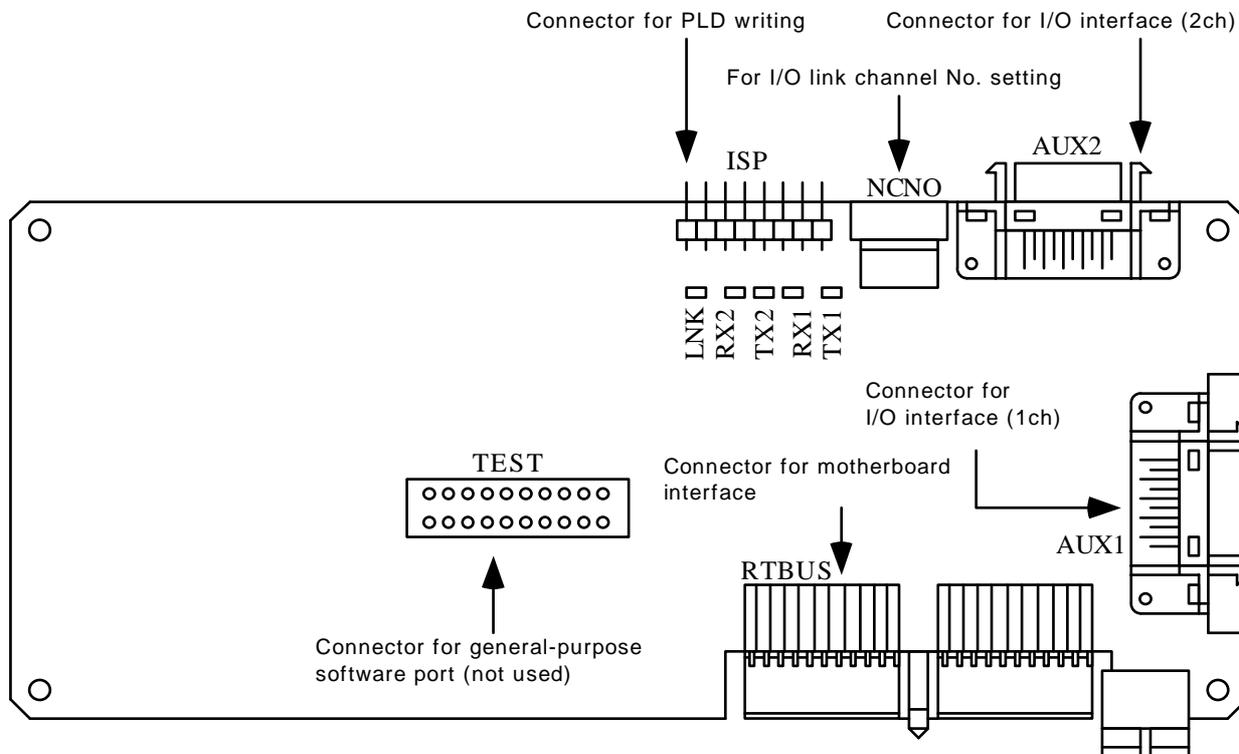
Card name	Function		Ethernet
	AUX1	AUX2	
HR531 A/B/C	I/O interface (Used for operation board connection)	I/O interface (Used in the I/O link) (Master/slave changeover) Terminator ON/OFF switch (C only)	Not available
HR534 A/B/C	I/O interface (Used for operation board connection)	I/O interface (Master/slave changeover) Terminator ON/OFF switch (C only)	10BASE-5/10BASE-T

1. EXPLANATION OF MODULE FUNCTIONS
1.12 HR531/534 Cards

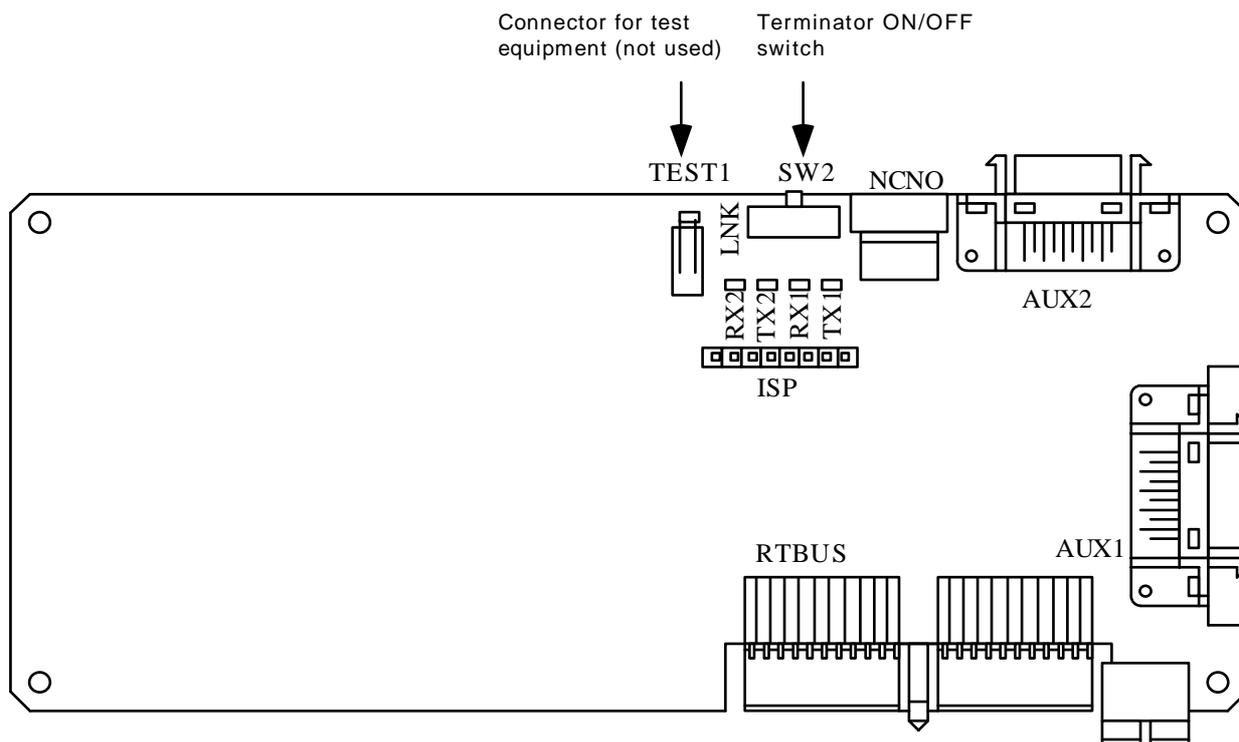
[Connector layout diagram]

• HR531 card

A and B cards



C card



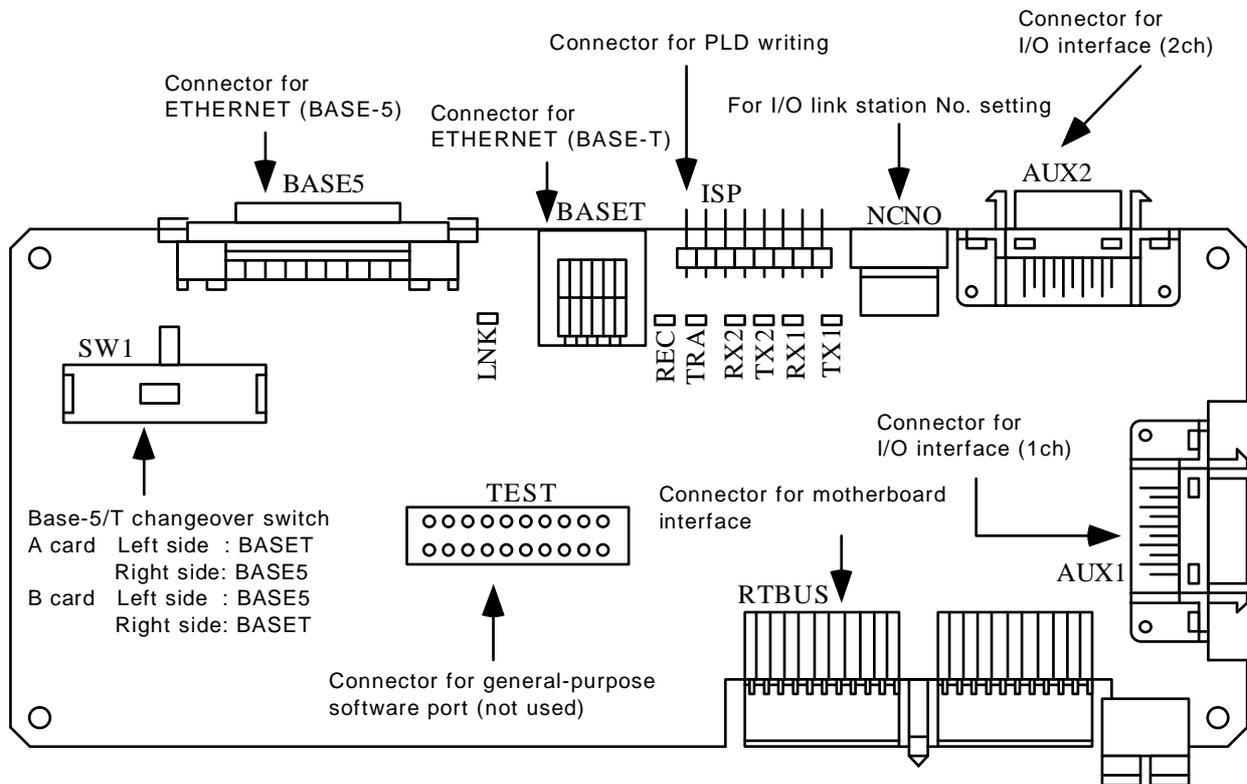
1. EXPLANATION OF MODULE FUNCTIONS

1.12 HR531/534 Cards

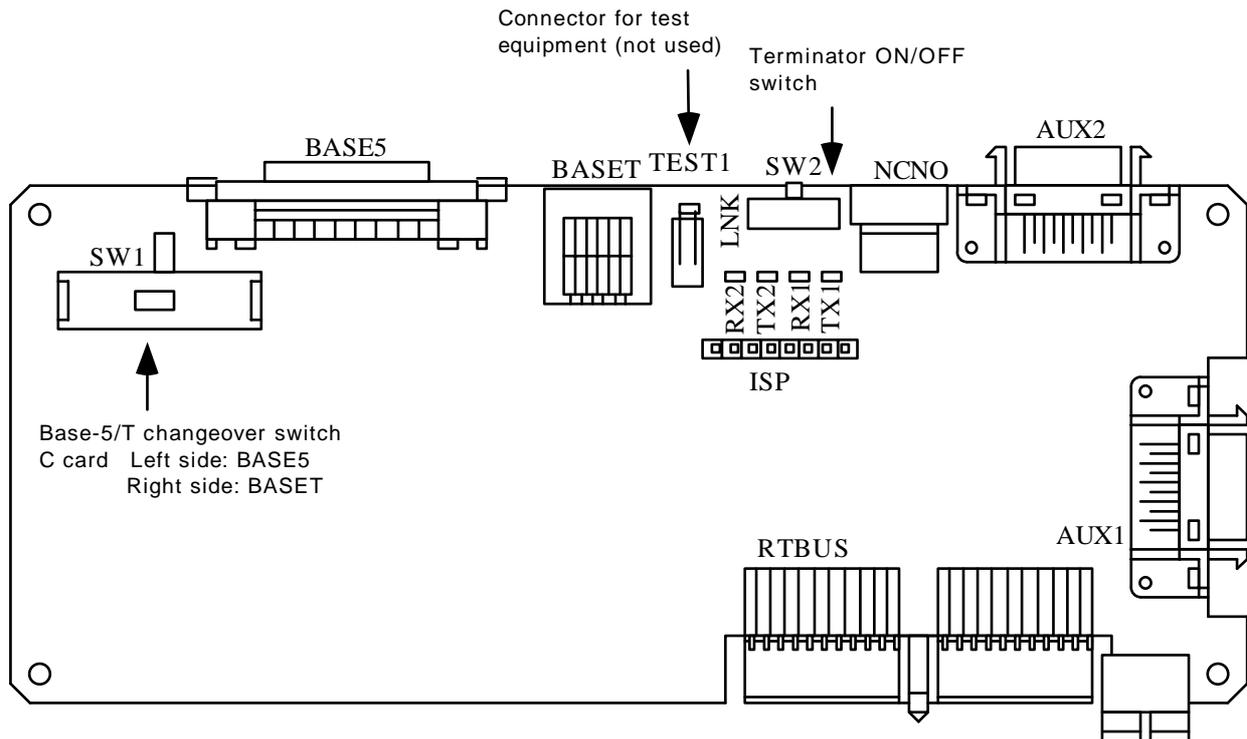
[Connector layout diagram]

• HR534 card

A and B cards



C card



1. EXPLANATION OF MODULE FUNCTIONS

1.12 HR531/534 Cards

[Explanation of LEDs]

Name	Function	Color	Status		Correspondence for error
			When normal	During error	
TX1	AUX1 transmission status display	Green	Flickers	ON or OFF	Contact the Mitsubishi Service Center
RX1	AUX1 reception status display	Green	Flickers	ON or OFF	Check communication cable connection
TX2	AUX2 transmission status display (Only when using IO link function)	Green	Flickers	ON or OFF	Check each remote I/O unit's rotary switch station No.
RX2	AUX2 reception status display (Only when using IO link function)	Green	Flickers	ON or OFF	Check each remote I/O unit's rotary switch station No. Check communication cable connection
LNK*	Ethernet connection status display	Green	Lit	Not lit	Check Ethernet cable connection Check network settings

[Explanation of settings]

Rotary switch: (NCNO) setting

Setting position	Explanation of functions	Supplement
0	Master station when multiple control sections are connected. *	This is the I/O link's master station.
1	1st station during normal use/when multiple control sections are connected.	A setting higher than "1" is the I/O link's slave station. Refer to the instruction manual for details on the number of connected units and the usage methods.
2	2nd station during normal use/when multiple control sections are connected.	
:	:	
F	15th station during normal use/when multiple control sections are connected.	

* With the A card, 0th station during normal use/when multiple control sections are connected.

Slide switch (SW1) setting

Setting position	Explanation of functions	Supplement
BASE5	ETHERNET 10BASE-5 interface selection	
BASET	ETHERNET 10BASE-T interface selection	

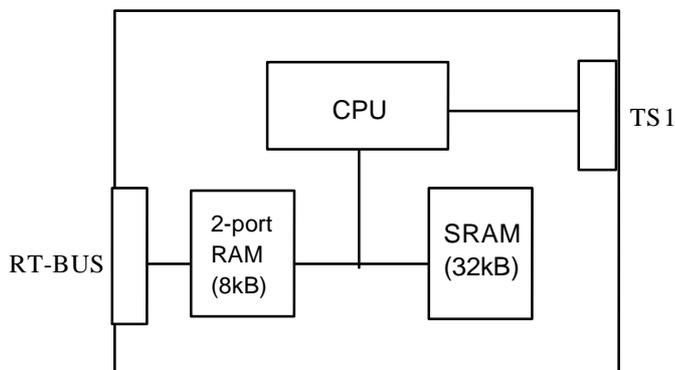
Slide switch (SW2) setting

Setting position	Explanation of functions	Supplement
ON	Terminator (150Ω) connection	I/O link terminator
OFF	Terminator (150Ω) not connected	

1. EXPLANATION OF MODULE FUNCTIONS
1.13 HR571 Card

1.13 HR571 Card

[Block diagram]



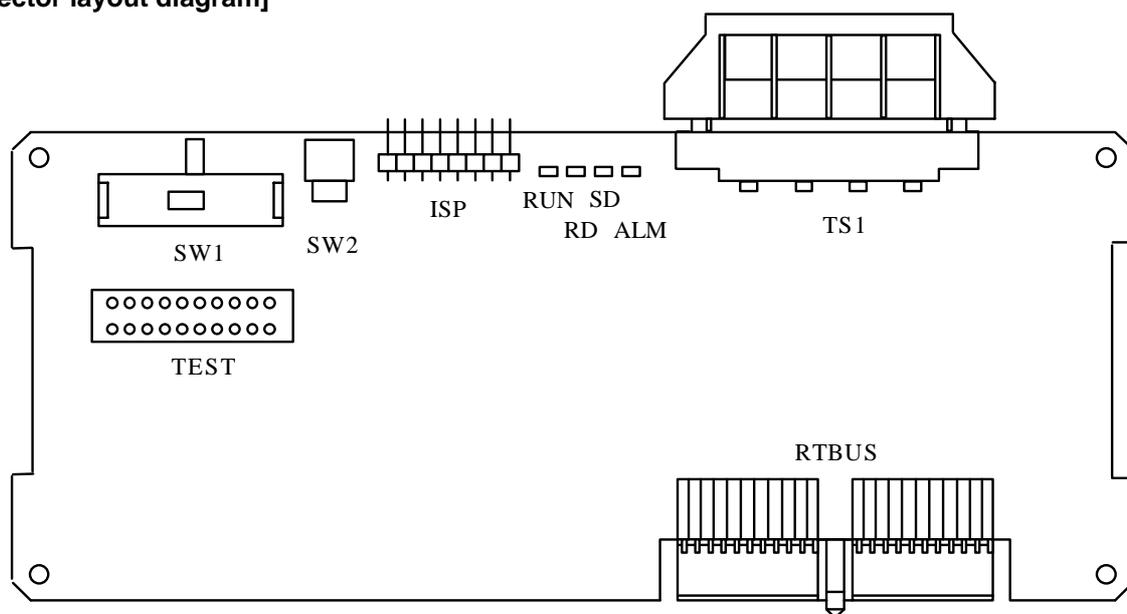
[Explanation of functions]

This is used in the M-NET interface which is one of interface with the sequencer.

TS1 M-NET (RS-422 multidrop)

(Note) The ISP connector and TEST connector on the HR571 card cannot be used.

[Connector layout diagram]



[Explanation of settings]

Setting	Explanation
SW1 (R-TERMINAL)	Terminator (Down: Terminator ON)
SW2	Rotary switch (Normal: 0. Refer to the Operation Manual.)

[Explanation of LEDs]

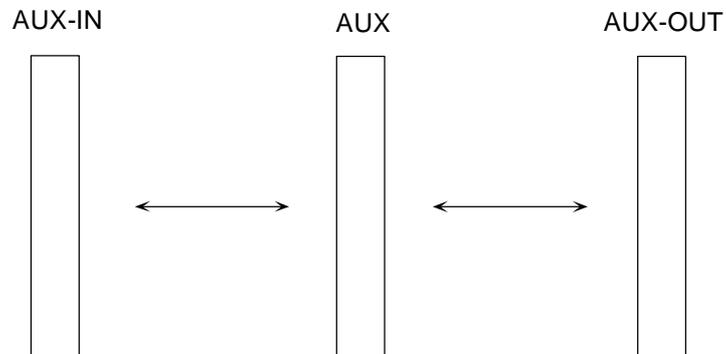
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
RUN	Software operation check	Green	Flickers	ON or OFF	Contact the Mitsubishi Service Center
RD	Reception status check	Green	Lit	Not lit	Check communication cable connection Check rotary switch setting No.
SD	Transmission status check	Green	Lit	Not lit	Check rotary switch setting No.
ALM	Communication error display	Red	Not lit	Lit	Contact the Mitsubishi Service Center

1. EXPLANATION OF MODULE FUNCTIONS

1.14 HR591 Card

1.14 HR591 Card

[Block diagram]



[Explanation of functions]

The HR591 card is the relay branch board used when connecting (I/O linking) three or more control units.

Refer to section I-22 "4.2.7 Connection of I/O Link" in the Connection Manual for details on connecting.

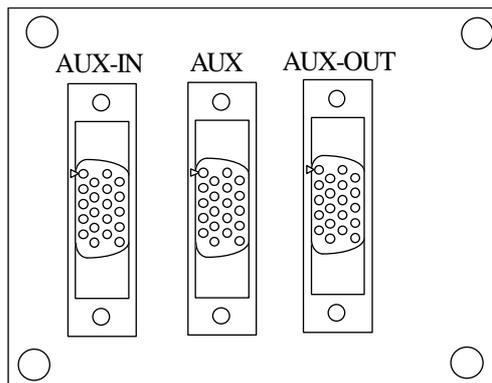
AUX-IN The cable W from the master station side is connected.

AUX The intermediate station control unit is connected.

AUX-OUT The cable to the final station direction is connected.

(AUX-IN, AUX, and AUX-OUT are connected 1:1, so the wiring in the electric cabinet can be interchanged without problem if required.)

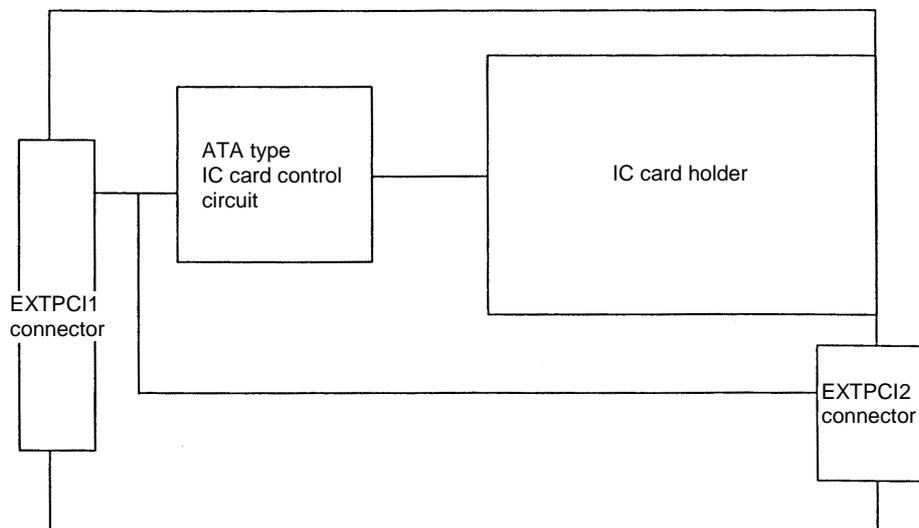
[Connector layout diagram]



1. EXPLANATION OF MODULE FUNCTIONS
1.15 HR831 Card

1.15 HR831 Card

[Block diagram]



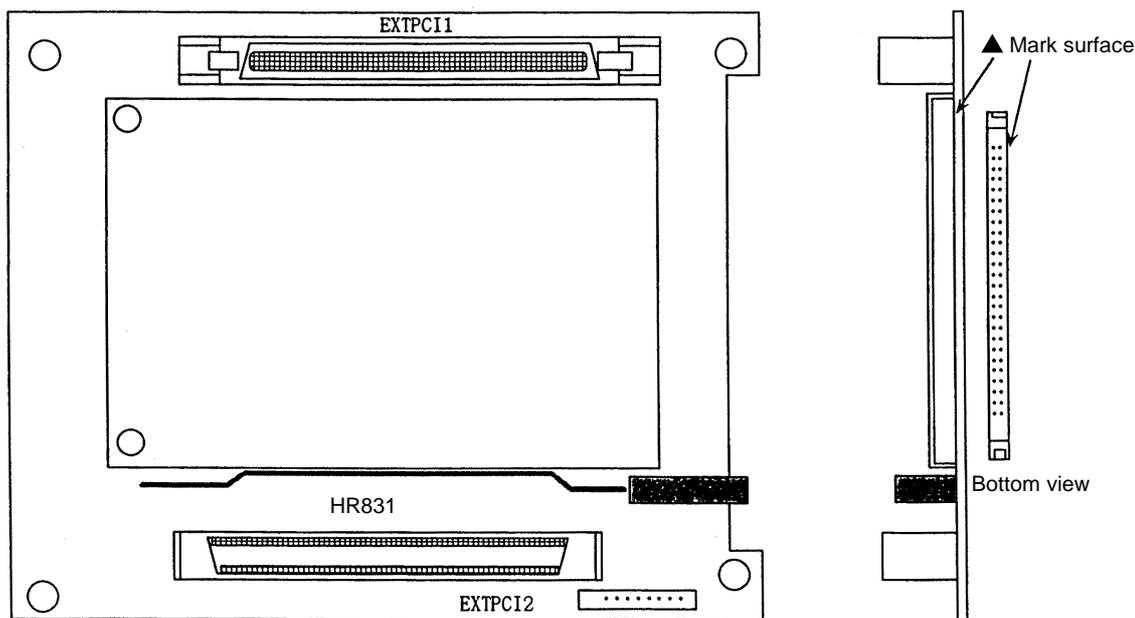
[Expansion of functions]

The HR831 card has an IC card interface for the M65/66 Series' high-speed program server function. This card is combined with the Ethernet I/F HR832 and used by the high-speed program server unit (FCU6-EP203-1).

The ATA type SanDisk flash ROM type IC card can be used.

The flash ROM capacity is not limited by the hardware, but may be limited by the software. Refer to the Specifications Manual (BNP-B2210) for details.

[Connector layout diagram]



[Explanation of settings]

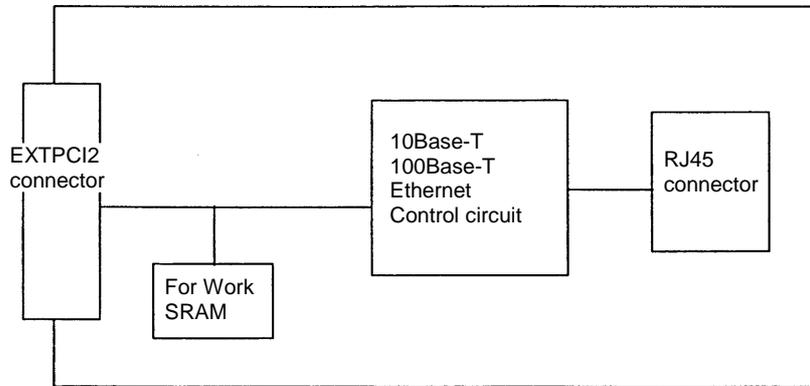
The HR831 card has no sections to be adjusted or set.

1. EXPLANATION OF MODULE FUNCTIONS

1.16 HR832 Card

1.16 HR832 Card

[Block diagram]



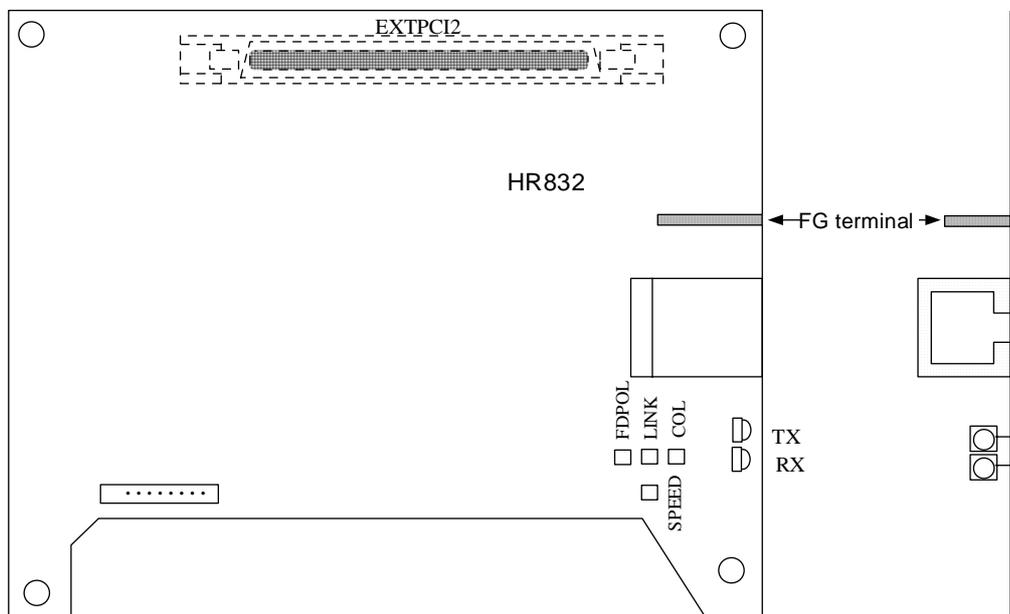
[Expansion of functions]

The HR832 card has an Ethernet interface for the M60/60S Series high-speed program server function.

This card is combined with the IC card I/F HR831 and used by the high-speed program server unit (FCU6-EP203-1).

The 10Base-T and 100Base-TX interfaces can be used with automatic recognitions.

[Connector layout diagram]



1. EXPLANATION OF MODULE FUNCTIONS

1.16 HR832 Card

[Explanation of settings]

The HR832 card has no sections to be adjusted or set.

[Explanation of LEDs]

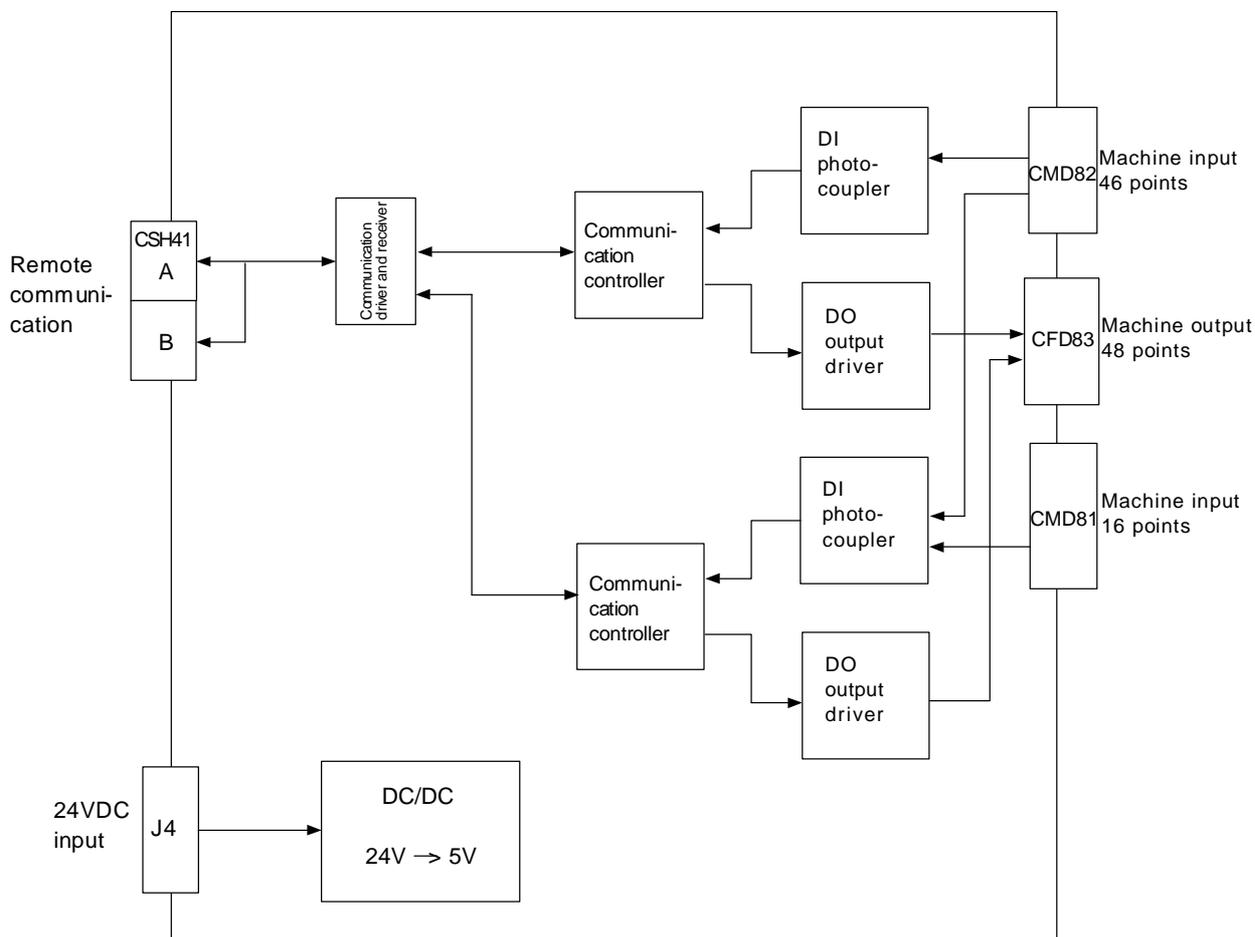
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
TX	Ethernet transmission status display	Green	Lit	Not lit	Check Ethernet cable connection Check network settings
RX	Ethernet reception status display	Green	Lit	Not lit	Check Ethernet cable connection Check network settings
FDPOL	Polarity display	Green	Not lit	Lit	Contact the Mitsubishi Service Center
LINK	Ethernet connection status display	Green	Lit	Not lit	Check Ethernet cable connection Check network settings
COL	Ethernet collision display	Green	Not lit	Lit	Check Ethernet cable connection Check network settings
SPEED	Communication speed display	Green	Lit: 100Mbps Not lit: 10Mbps	–	Check connected device

1. EXPLANATION OF MODULE FUNCTIONS

1.17 QY231 Card

1.17 QY231 Card

[Block diagram]



[Explanation of functions]

The QY231 is the machine operation board input/output card. It has a machine input/output, and is connected to the base I/O unit RIO1 connector or communication terminal RIO5 connector.

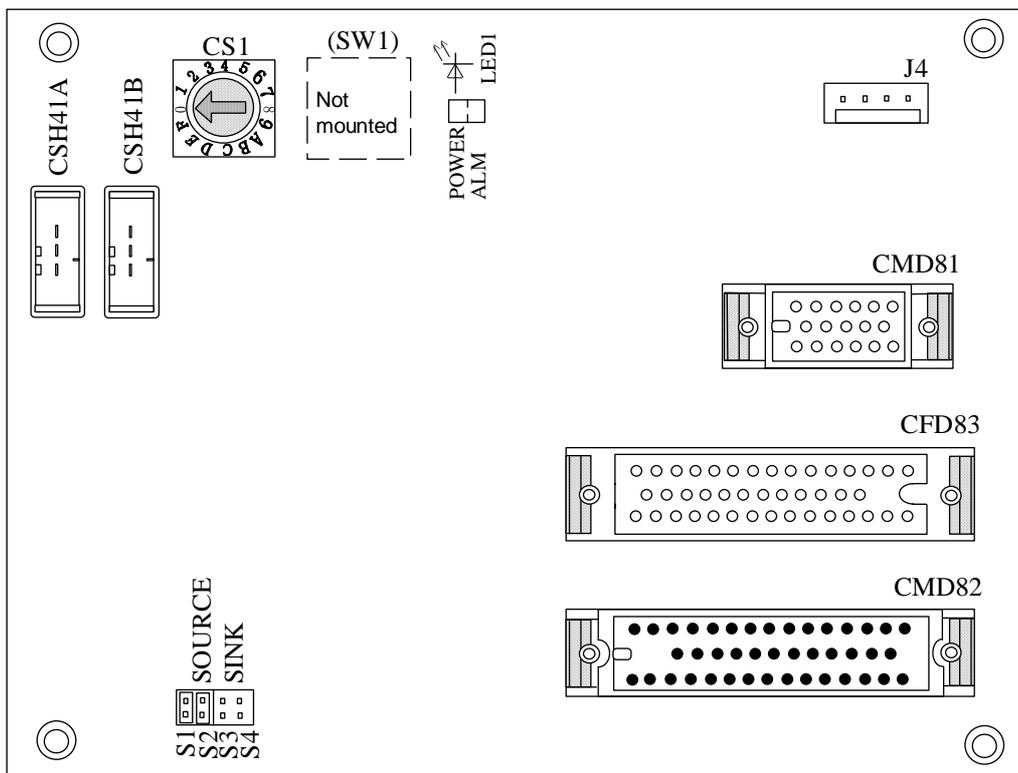
Compatible machine control signals	No. of occupied stations
Digital input signal (DI) : 64 points (photocoupler insulation) sink/source shared type	2
Digital output signal (DO) : 48 points (non-insulated) source type	

Function	Specification	Supplement
Remote I/O communication	Occupies 2 stations	Set two successive stations with rotary switch CS1
Remote I/O communication interface	One interface	CSH41A/B connector
Machine input interface	Insulated type: 64 points	CMD81/82 connector
Machine output interface	Non-insulated type: 48 points	CFD83 connector, 60mA output
Input voltage/current	24VDC \pm 5%, 3.8Amax	J4 connector Maximum current is the value for when all machine input/output signal points are ON

1. EXPLANATION OF MODULE FUNCTIONS

1.17 QY231 Card

[Connector layout diagram]



[Explanation of settings]

1) Rotary switch

CS1 : Remote I/O station No. setting rotary switch

0 to 7 : Corresponds to RIO station Nos. 0 to 7

(Note) 8 or higher: Cannot be set

* QY231 automatically sets two successive stations by setting CS1 to an even (0, 2, 4, 6) station. Set a station No. that is different from the other remote I/O units within the range of 0, 2, 4 and 6. Up to eight stations can be connected with remote I/O communication.

2) Machine input (DI) sink/source type changeover switch

Select the machine input (DI) sink type or source type with this switch.

S1, S2	S3, S4	Function
ON	OFF	Source input selection
OFF	ON	Sink input selection

[LED explanation]

Name	Function	Color	Status		Correspondence for error
			When normal	During error	
POWER	Internal output voltage check	Green	Lit	Not lit	Check 24VDC voltage Contact the Mitsubishi Service Center
ALM	Rotary switch [CS2] setting station communication error display	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.

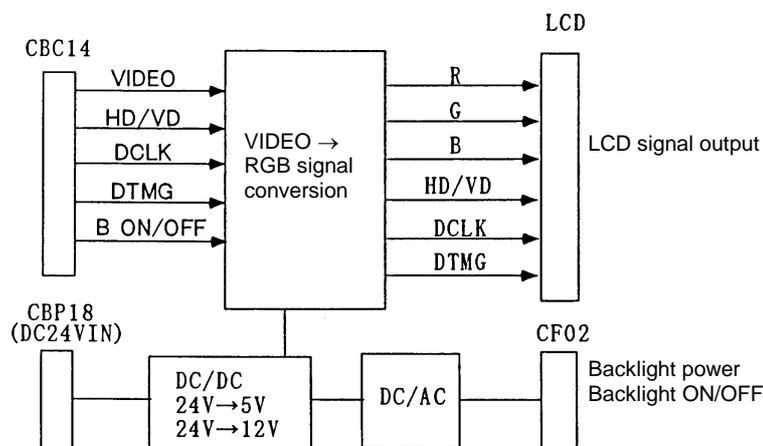
Two-color LED (two-LED set)

1. EXPLANATION OF MODULE FUNCTIONS

1.18 QY287 Card

1.18 QY287 Card

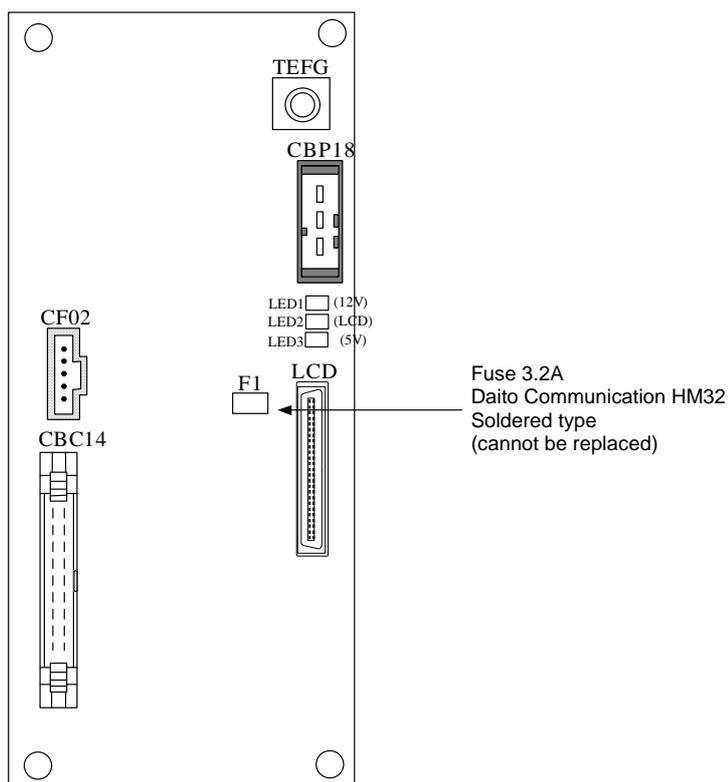
[Block diagram]



[Explanation of functions]

The QY287 card is used for the 10.4-type color LCD display. The card converts the video signals output from the RX212 card into color LCD signals. The QY287 has no sections to be set.

[Connector layout diagram]



[Explanation of LEDs]

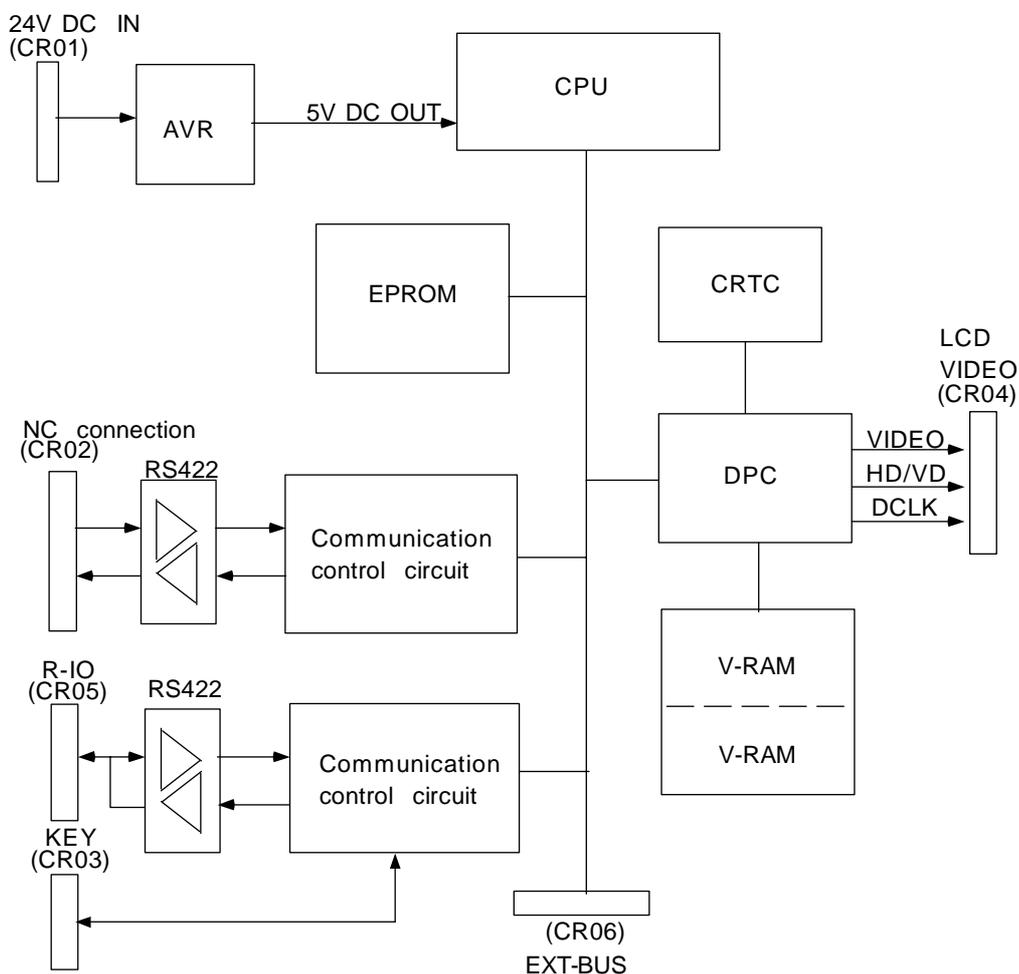
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
12V	Inverter output voltage check	Green	Lit	Not lit	Contact the Mitsubishi Service Center
LCD	LCD power voltage check	Green	Lit	Not lit	
5V	Internal output voltage check	Green	Lit	Not lit	Check 24VDC voltage Contact the Mitsubishi Service Center

1. EXPLANATION OF MODULE FUNCTIONS

1.19 RX211/RX212 Card

1.19 RX211/RX212 Card

[Block diagram]



[Explanation of functions]

The RX211 card is the control card for the 9-type monochrome CRT display used by the M60/60S Series. This is used by the FCUA-CT100/CT120.

The RX212 card is the control card for the 10.4-type color LCD display used by the M60/60S Series. This is used by the FCU6-DUN33.

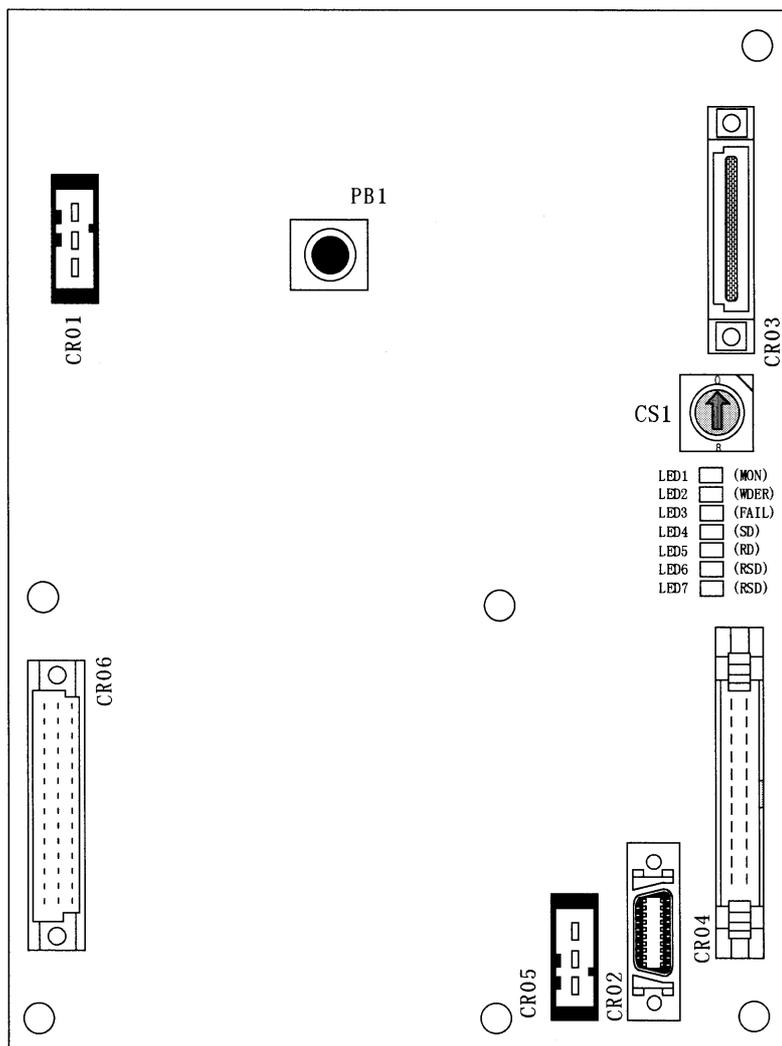
The hardware of the RX211 and RX212 cards is the same, but the font firmware is different.

Function	Specification	Supplement
Control unit interface	One interface	CR02 connector MC link A communication
Remote I/O communication interface	One interface	CR05 connector
Keyboard interface	One interface	CR03 connector Dedicated for KB20/30, KB21/31
LCD signal output interface	One interface	CNZ22 connector 10.4-type monochrome LCD signal output
Backlight power supply interface	One interface	CNZ22A connector
Contrast adjustment interface	One interface	CNZ23 connector
Input voltage	24VDC \pm 5%	CR01 connector

1. EXPLANATION OF MODULE FUNCTIONS

1.19 RX211/RX212 Card

[Connector layout diagram]



[Explanation of settings]

CS1: Rotary switch for machining center system/lathe system keyboard section.
 Machining center system keyboard KB20: "0"
 Lathe system keyboard KB30 : "1"

[Explanation of LEDs]

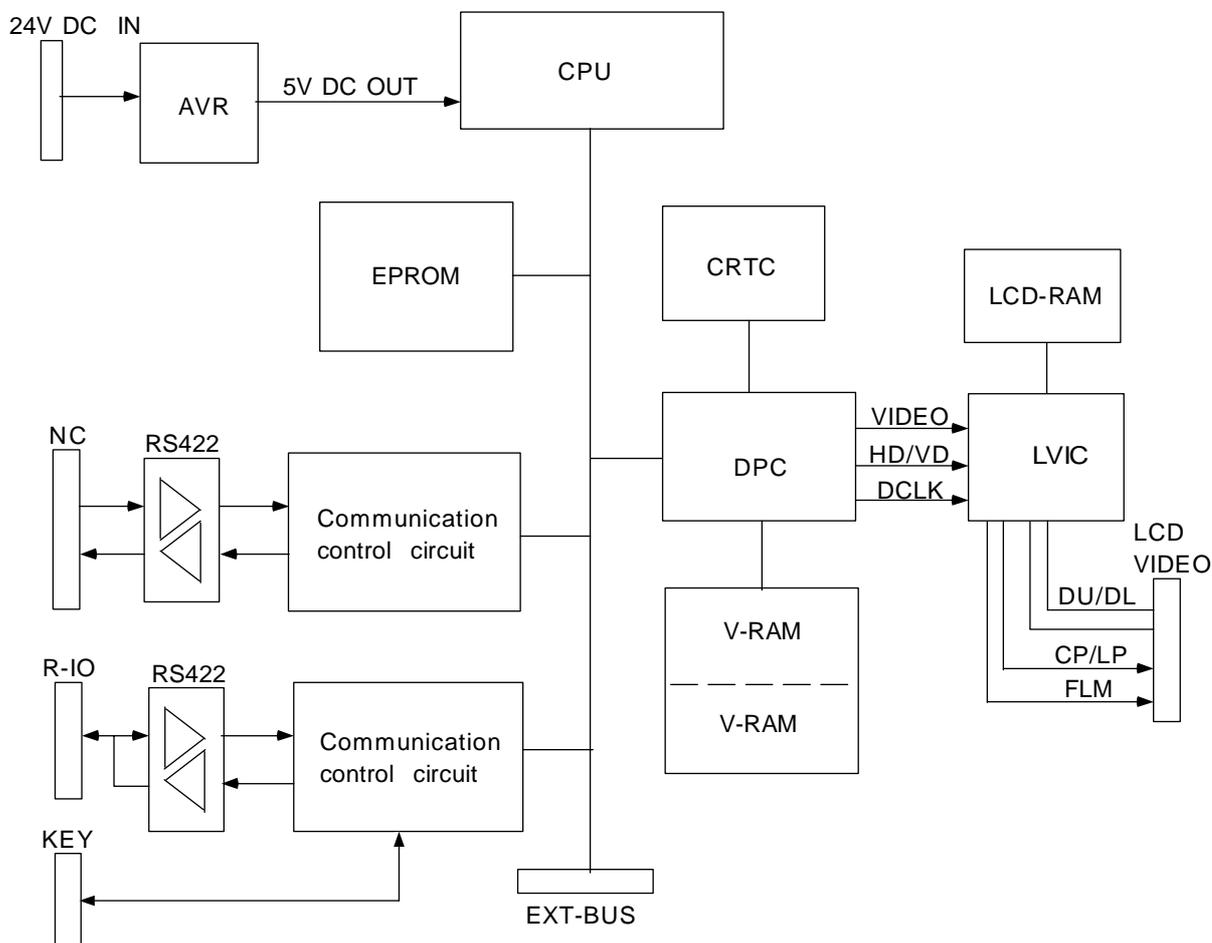
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
MON	Software operation check	Green	Flickers	ON or OFF	Check 24VDC voltage Contact the Mitsubishi Service Center
WDER	System error display	Red	Flickers	ON or OFF	Contact the Mitsubishi Service Center
FAIL	Control circuit initialization error display	Red	Not lit	Lit	
SD	Sending to NC control unit	Green	Flickers*	ON or OFF	Check communication cable connection
RD	Receiving from NC control unit	Green	Flickers*	ON or OFF	
RSD	Sending to RIO unit	Green	Flickers*	ON or OFF	Contact the Mitsubishi Service Center
RRD	Receiving from RIO unit	Green	Flickers*	ON or OFF	Check each remote I/O unit's rotary switch station No.

* The LED will appear dimmed.

1. EXPLANATION OF MODULE FUNCTIONS
1.20 RX213 Card

1.20 RX213 Card

[Block diagram]



[Explanation of functions]

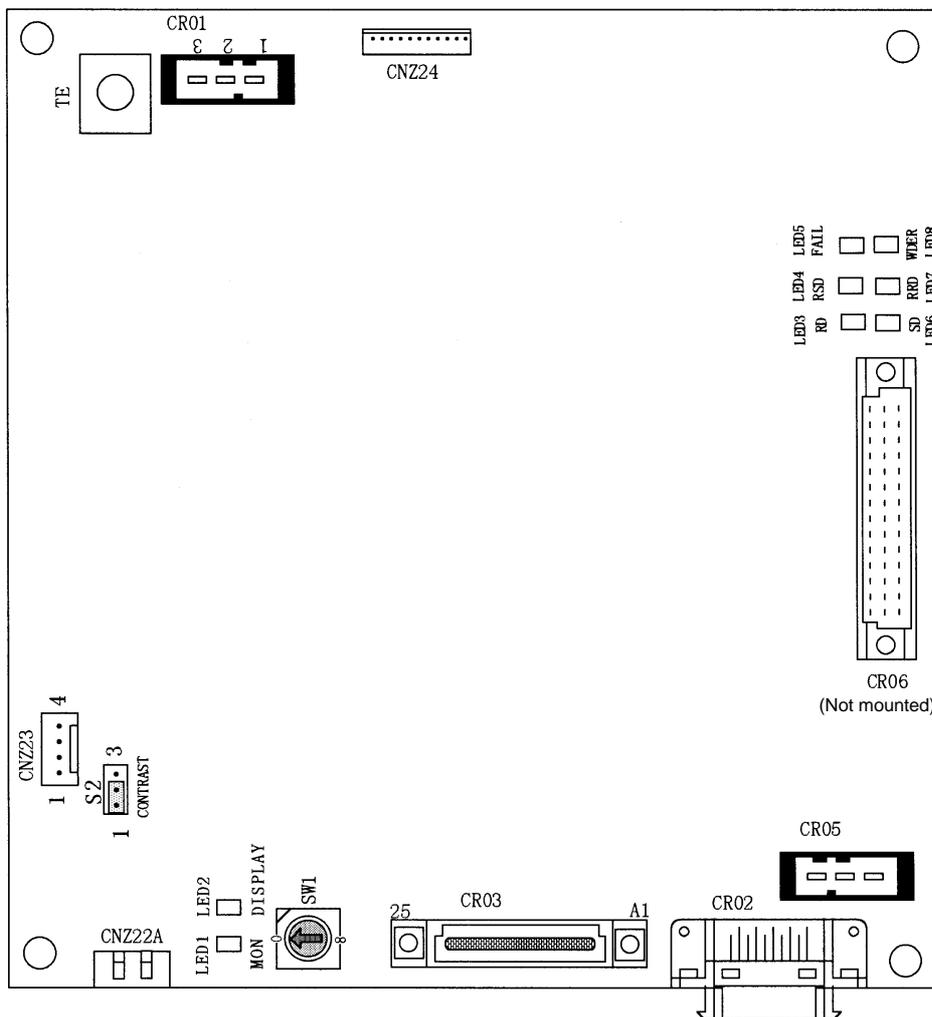
The RX213 card is the control card for the 7.2-type monochrome LCD display. This is used by the FCUA-LD10/LD100.

Function	Specification	Supplement
Control unit interface	One interface	CR02 connector MC link A communication
Remote I/O communication interface	One interface	CR05 connector
Keyboard interface	One interface	CR03 connector Dedicated for KB20/30, KB21/31
LCD signal output interface	One interface	CNZ24 connector 7.2-type monochrome LCD signal output
Backlight power supply interface	One interface	CNZ22A connector
Contrast adjustment interface	One interface	CNZ23 connector
Input voltage	24VDC ± 5%	CR01 connector

1. EXPLANATION OF MODULE FUNCTIONS

1.20 RX213 Card

[Connector layout diagram]



[Explanation of settings]

SW1: Rotary switch for machining center system/lathe system keyboard section.
 Machining center system keyboard KB20: "0"
 Lathe system keyboard KB30 : "1"

[Explanation of LEDs]

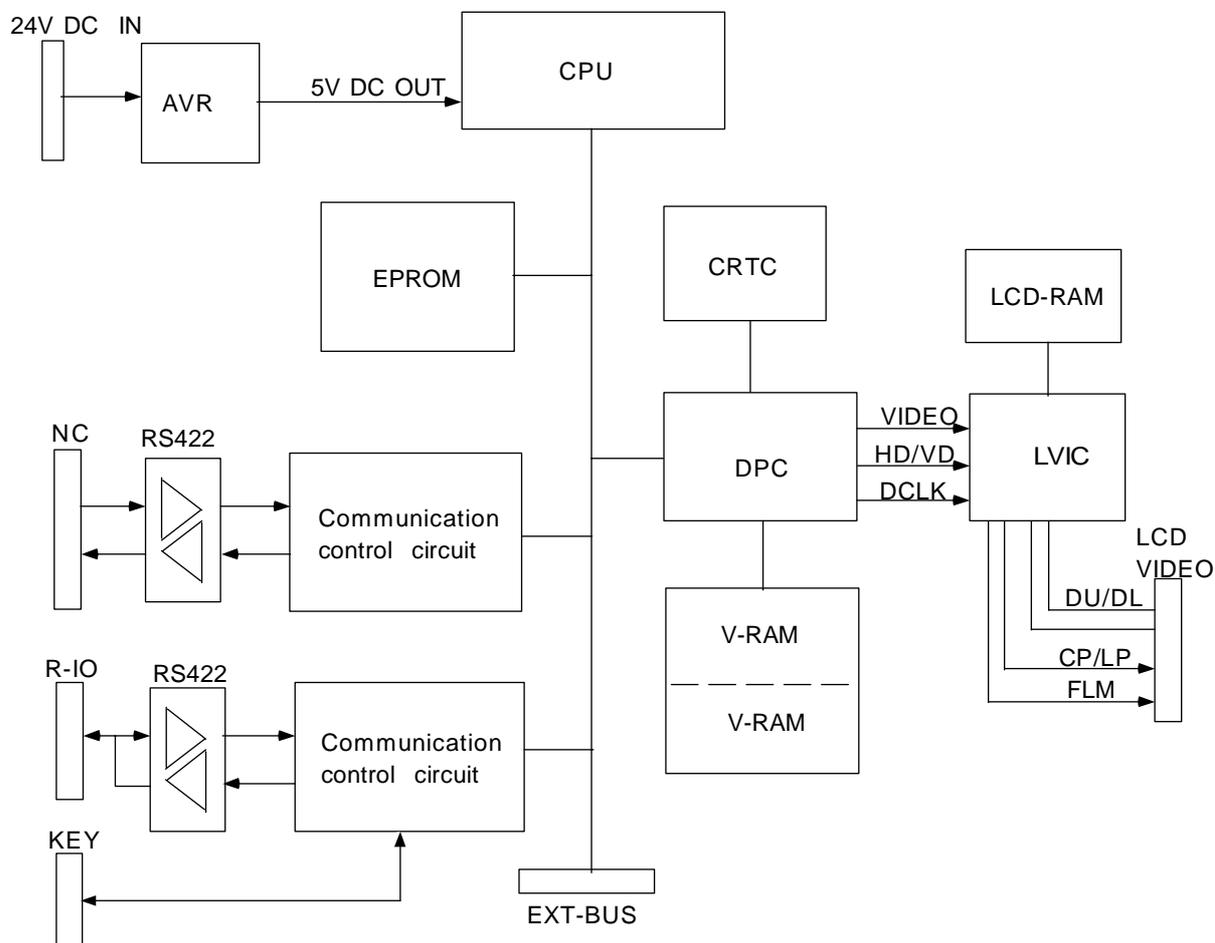
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
MON	Software operation check	Green	Flickers	ON or OFF	Check 24VDC voltage Contact the Mitsubishi Service Center
WDER	System error display	Red	Flickers	ON or OFF	Contact the Mitsubishi Service Center
FAIL	Control circuit initialization error display	Red	Not lit	Lit	
SD	Sending to NC control unit	Green	Flickers*	ON or OFF	Check communication cable connection
RD	Receiving from NC control unit	Green	Flickers*	ON or OFF	
RSD	Sending to RIO unit	Green	Flickers*	ON or OFF	Contact the Mitsubishi Service Center
RRD	Receiving from RIO unit	Green	Flickers*	ON or OFF	Check each remote I/O unit's rotary switch station No.

* The LED will appear dimmed.

1. EXPLANATION OF MODULE FUNCTIONS
1.21 RX215 Card

1.21 RX215 Card

[Block diagram]



[Explanation of functions]

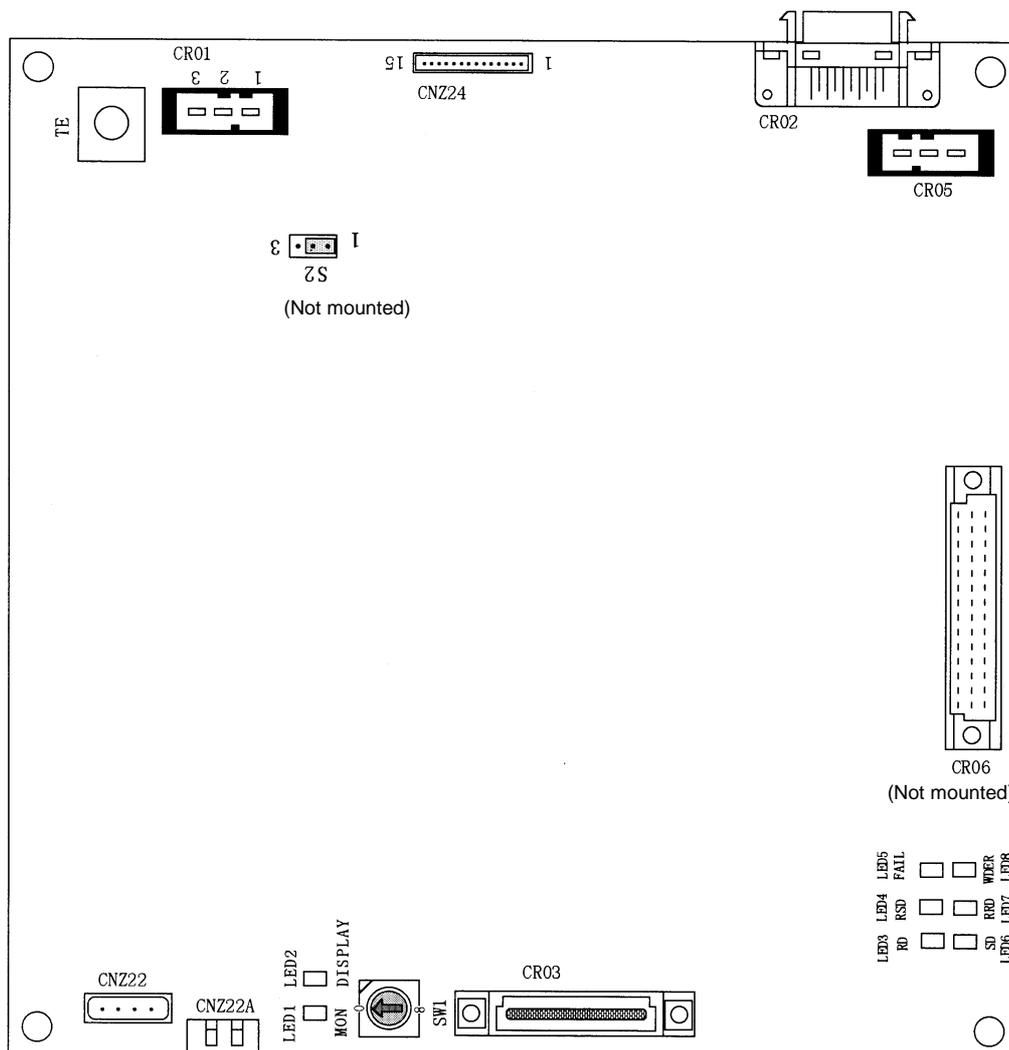
The RX215 card is the control card for the 10.4-type monochrome LCD display. This is used by the FCU6-DUT32.

Function	Specification	Supplement
Control unit interface	One interface	CR02 connector MC link A communication
Remote I/O communication interface	One interface	CR05 connector
Keyboard interface	One interface	CR03 connector Dedicated for KB20/30, KB21/31
LCD signal output interface	One interface	CN222 connector 10.4-type monochrome LCD signal output
Backlight power supply interface	One interface	CN222A connector
Contrast adjustment interface	One interface	CN223 connector
Input voltage	24VDC \pm 5%	CR01 connector

1. EXPLANATION OF MODULE FUNCTIONS

1.21 RX215 Card

[Connector layout diagram]



[Explanation of settings]

SW1: Rotary switch for machining center system/lathe system keyboard section.
 Machining center system keyboard KB20 : "0"
 Lathe system keyboard KB30 : "1"

[Explanation of LEDs]

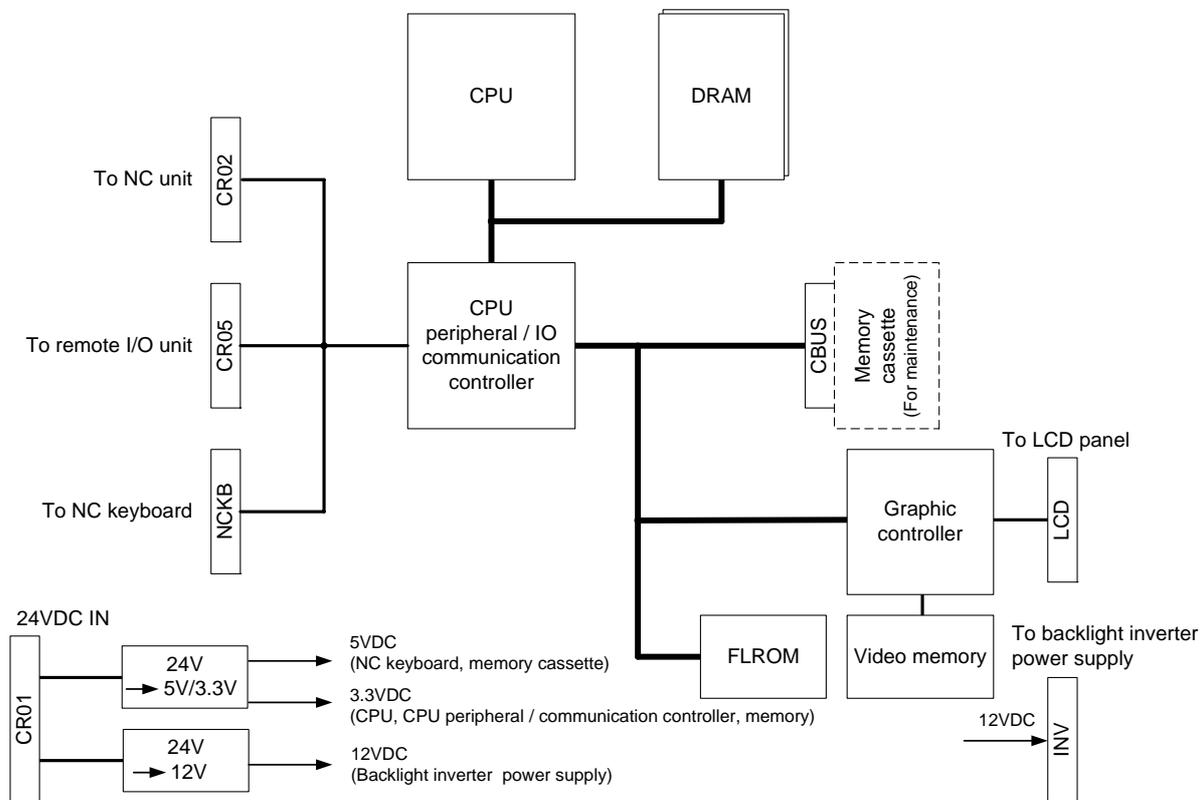
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
MON	Software operation check	Green	Flickers	ON or OFF	Check 24VDC voltage Contact the Mitsubishi Service Center
WDER	System error display	Red	Flickers	ON or OFF	Contact the Mitsubishi Service Center
FAIL	Control circuit initialization error display	Red	Not lit	Lit	
SD	Sending to NC control unit	Green	Flickers*	ON or OFF	Check communication cable connection
RD	Receiving from NC control unit	Green	Flickers*	ON or OFF	
RSD	Sending to RIO unit	Green	Flickers*	ON or OFF	Contact the Mitsubishi Service Center
RRD	Receiving from RIO unit	Green	Flickers*	ON or OFF	Check each remote I/O unit's rotary switch station No.

* The LED will appear dimmed.

1. EXPLANATION OF MODULE FUNCTIONS
1.22 HR213 Card

1.22 HR213 Card

[Block diagram]



[Explanation of functions]

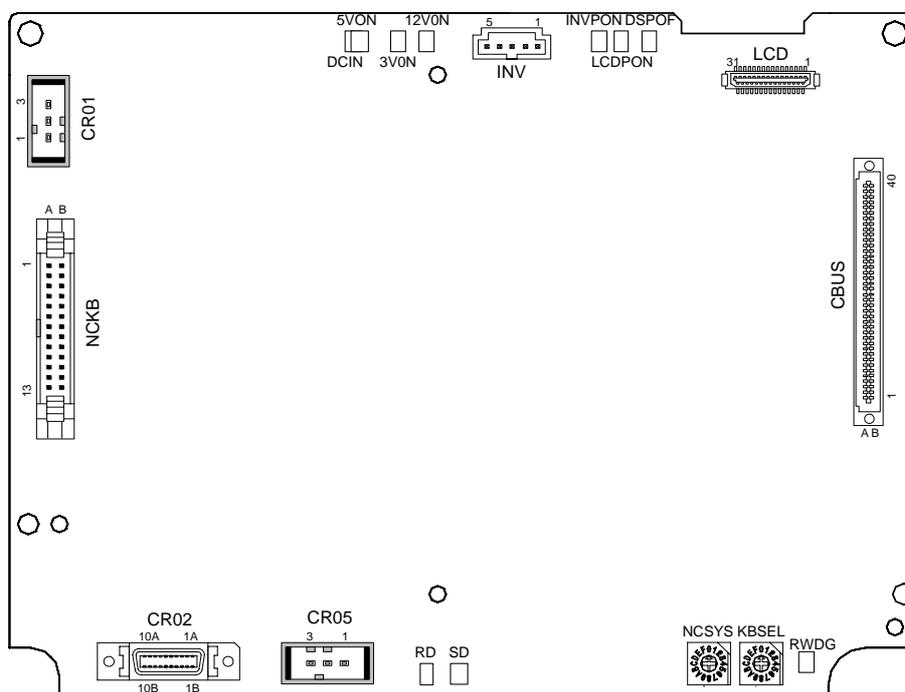
HR213 is a control card for the 8.4-type color TFT display unit and connected to FCU6-DUN22.

Function	Specification	Supplement
NC control unit interface	One interface	CR02 connector MC link A communication
Remote I/O communication interface	One interface	CR05 connector
Keyboard interface	One interface	NCKB connector (dedicated for FCU6-KB022)
LCD signal output interface	One interface	LCD connector 8.4-type color TFT signal output
Backlight power supply interface	One interface	INV connector
Input voltage	24VDC±5%	CR01 connector
Memory cassette interface	One interface	CBUS connector (for maintenance)

1. EXPLANATION OF MODULE FUNCTIONS

1.22 HR213 Card

[Connector layout diagram]



[Explanation of settings]

KBSEL: Switch for designating connection keyboard type (M system: 0)
 Machining system keyboard FCU6-KB022: "0"
 NCSYS: Internal setting switch (Use prohibited)

[Explanation of LEDs]

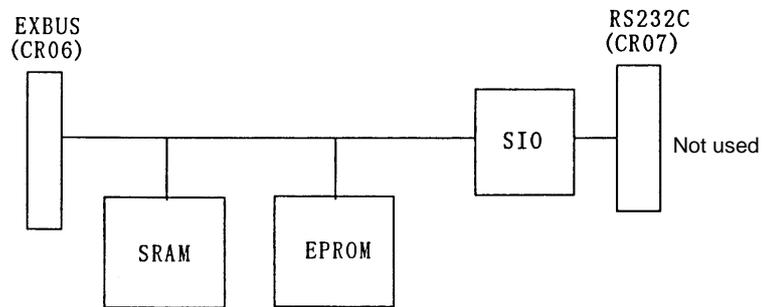
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
DCIN	24VDC input check	Green	Lit	Not lit	Check 24VDC external power supply voltage Check blowout of fuse
5VON	Internal 5VDC output check	Green	Lit	Not lit	Contact the Mitsubishi Service Center
3VON	Internal 3.3VDC output check	Green	Lit	Not lit	
12VON	Internal 12VDC output check	Green	Lit	Not lit	
INVPON	Backlight inverter power supply check	Green	Lit	Not lit	
LCDPON	LCD panel power supply check	Green	Lit	Not lit	
RWDG	System error display	Red	Not lit	Lit	
DSPOF	Debug check (Not used)				
SD	Debug check (Not used)				
RD	Debug check (Not used)				

1. EXPLANATION OF MODULE FUNCTIONS

1.23 RX291 Card

1.23 RX291 Card

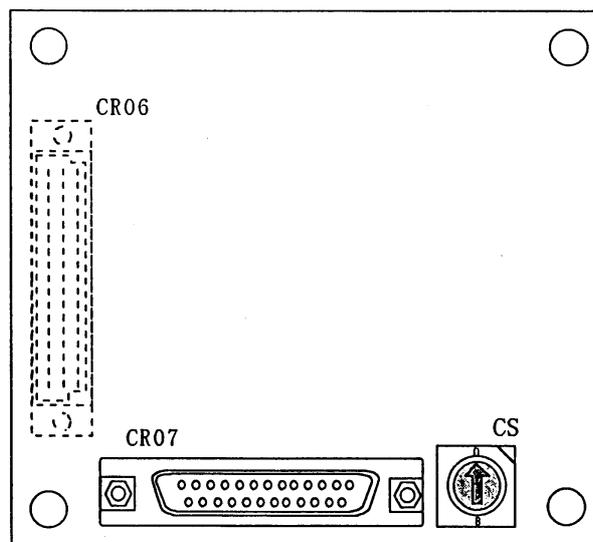
[Block diagram]



[Explanation of functions]

The RX291 card is the expansion memory card used when using the 10.4-type color LCD display. This is mounted on the RX212 card and used.

[Connector layout diagram]



[Explanation of settings]

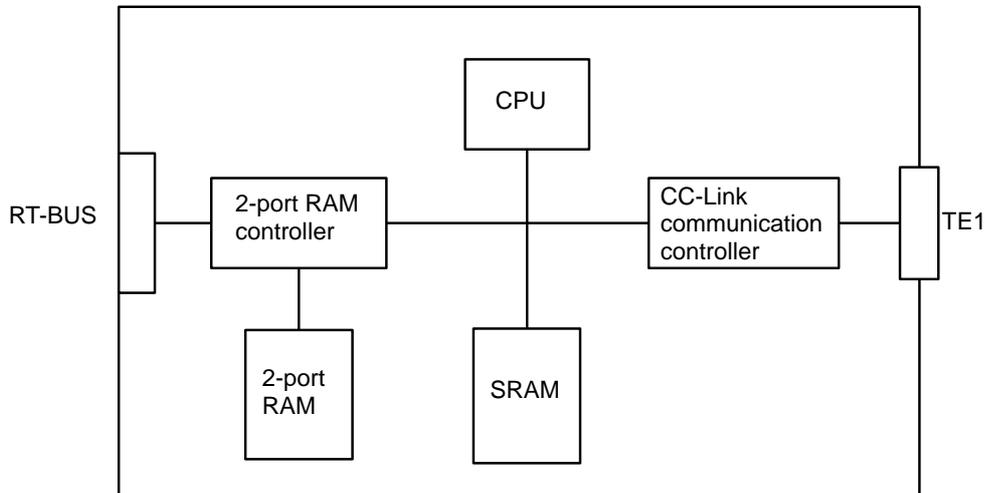
CS: Rotary switch for confirmation during Mitsubishi servicing. (This is normally set to "0".)

1. EXPLANATION OF MODULE FUNCTIONS

1.24 HR576 Card

1.24 HR576 Card

[Block diagram]

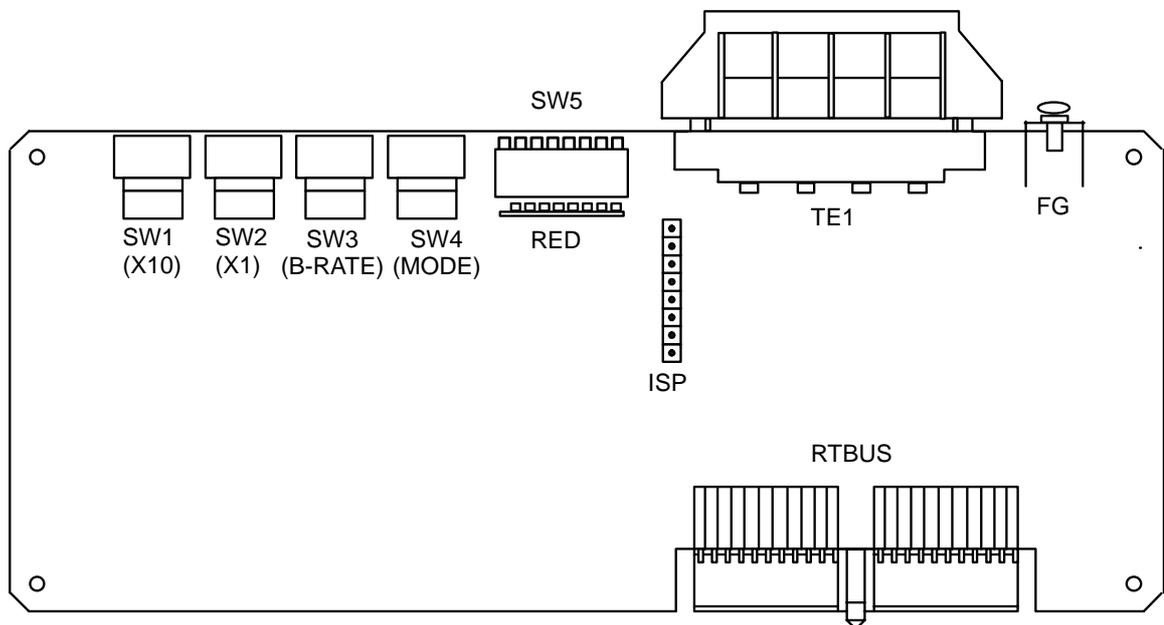


[Explanation of functions]

The HR576 card functions as master/local station of CC-Link which is one of the field networks.

(Note) The ISP connector on the HR576 card cannot be used.

[Connector layout diagram]



1. EXPLANATION OF MODULE FUNCTIONS
1.24 HR576 Card

[Explanation of settings]

SW1(X10), SW2(X1) : Station No. setting switch

SW1 : Ten's place of unit station No. is set. (Default setting : 0)
 SW2 : One's place of unit station No. is set. (Default setting : 0)

In remote net mode

Master station : 0
 Local station : 1 to 64
 Standby master station : 1 to 64
 (If a value other than from "0" to "64" is set, the LED "SW" and "L ERR" are lit.)

In remote I/O net mode

Master station : 1 to 64 (Set final station No. of remote I/O station)
 (If "0" is set, the LED "PLM" is lit.)

SW3(B-RATE) : Baud rate setting switch

Unit baud rate is set. (Default setting : 0)

0 : 156kbps
 1 : 625kbps
 2 : 2.5Mbps
 3 : 5Mbps
 4 : 10Mbps
 5 to 9 : Setting error ("SW" and "L ERR" are lit.)

SW4(MODE) : Mode setting switch

Unit operation state is set.

		Master station	Local station
0	: On-line (Remote net mode)	Possible	Possible
1	: On-line (Remote I/O net mode)	Possible	Impossible
2	: Off-line	Possible	Possible
3	: Circuit test 1	Possible	Impossible
4	: Circuit test 2	Possible	Impossible
5	: Parameter check test	Possible	Impossible
6	: Hardware test	Possible	Possible
7 to F	: Cannot be used.		

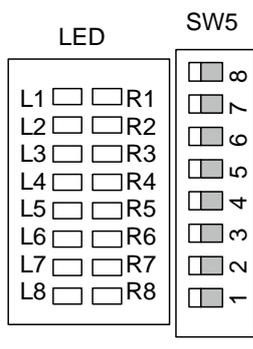
SW5 : Condition setting switch

Operation condition is set. (Default setting : All OFF)

SW5-1	Station type	OFF : Master station/local station	
		ON : Standby master station	
SW5-2	Cannot be used.	Always OFF	
SW5-3	Cannot be used.	Always OFF	
SW5-4	Input data status from the station with data link trouble	OFF : Clear	
		ON : Hold	
SW5-5, 6	No. of occupied stations	SW5 SW6	
		OFF OFF	: 1 station
		OFF ON	: 2 stations
		ON ON	: 3 stations
		ON OFF	: 4 stations
SW5-7	Cannot be used.	Always OFF	
SW5-8	Cannot be used.	Always OFF	

1. EXPLANATION OF MODULE FUNCTIONS
1.24 HR576 Card

[Explanation of LEDs]



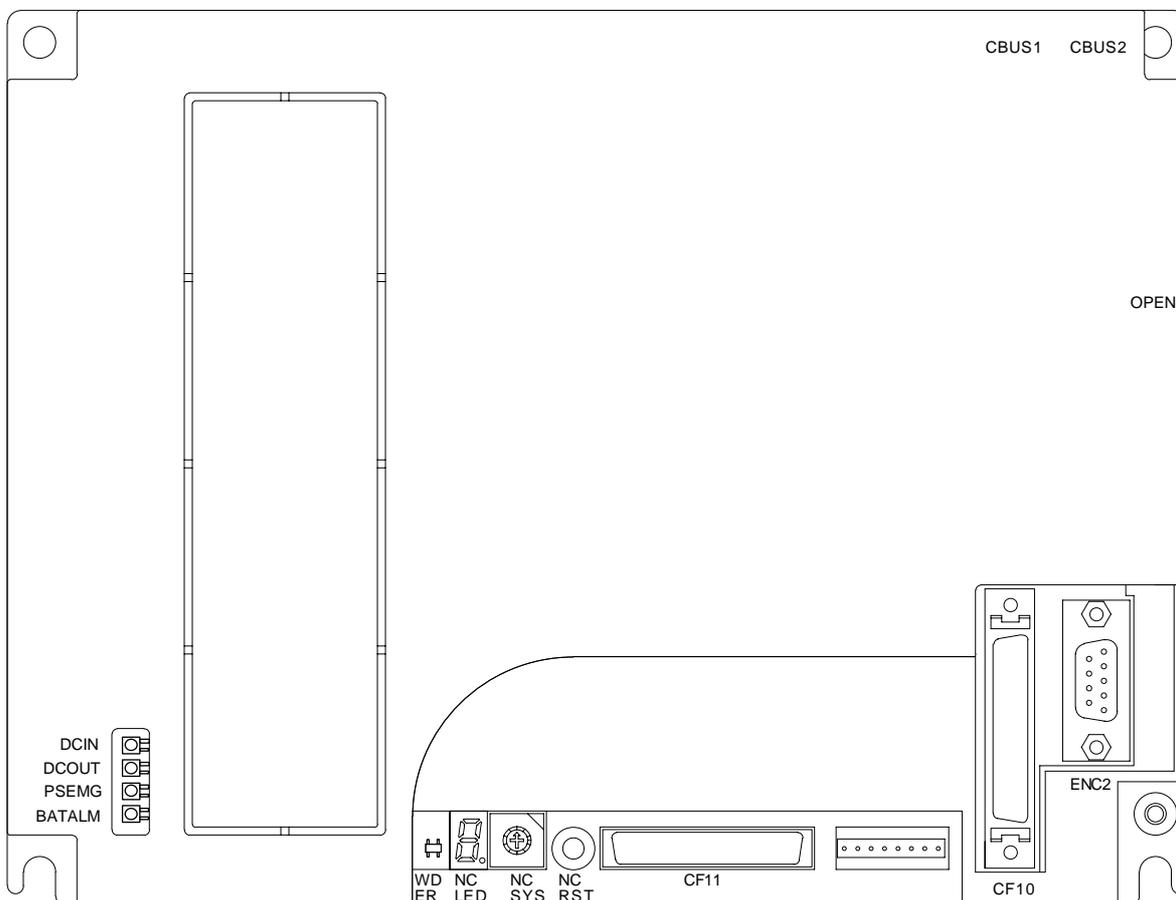
Name		Function	Status			
			Master station (Standby master station)		Local station (Standby master station)	
			When normal	During error	When normal	During error
L1	RUN	Lit : When the unit is normal Not lit : When watch dog timer error	Lit	Not lit	Lit	Not lit
L2	ERR.	Communication state between this card and the station specified with the parameter is displayed. Lit : Communication error in all stations Flickers: Communication error in some stations.	Not lit	Lit / Flickers	Not lit	Lit / Flickers
L3	MST	Lit : This card is set as master station.	Lit	-	Not lit	-
L4	S MST	Lit : This card is set as standby master station.	Lit	-	Lit	-
L5	LOCAL	Lit : This card is set as local station.	Not lit	-	Lit	-
L6	CPU R/W	Lit : This card is communicating with NC CPU. (FROM/TO)	Lit	Not lit	Lit	Not lit
L7	L RUN	Lit : Executing data link (Local station)	Lit	Not lit	Lit	Not lit
L8	L ERR.	Lit : Communication error (This station) Flickers: Setting of the switches was changed during the power ON.	Not lit	Lit / Flickers	Not lit	Lit / Flickers
R1	E R R O R	SW Lit : Setting of the switches is error.	Not lit	Lit	Not lit	Lit
R2		M/S Lit : A master station has already existed on the same circuit.	Not lit	Lit	-	-
R3		PRM Lit : Error in parameter	Not lit	Lit	-	-
R4		TIME Lit : Data link watch timer was worked.	Not lit	Lit	-	-
R5		LINE Lit : The cable has broken, or the transmission path is influenced by the noise.	Not lit	Lit	Not lit	Lit
R6			-	-	-	-
R7	SD	Lit : During data transmission	Lit	Not lit	Lit	Not lit
R8	RD	Lit : During data reception	Lit	Not lit	Lit	Not lit

2. TROUBLESHOOTING
2.1 List of Unit LEDs

2. TROUBLESHOOTING

2.1 List of Unit LEDs

(1) NC control section



[Explanation of LEDs]

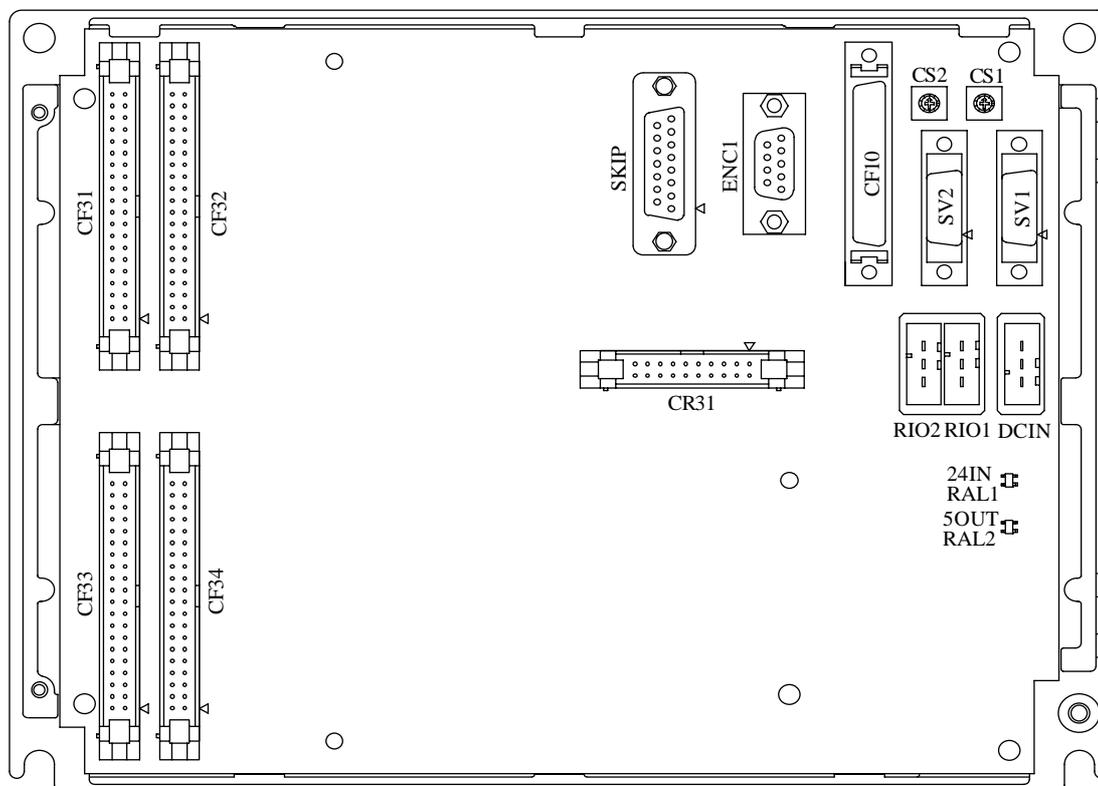
Name	Function	Color	Status		Correspondence for error
			When normal	During error	
DCIN	24VDC input check	Green	Lit	Not lit	Check 24VDC voltage
DCOUT	Internal output voltage check	Green	Lit	Not lit	Replace power supply or control unit
PSEMG	External emergency stop status display	Red	Not lit	Lit	Check cause of emergency stop
BATALM	Battery voltage drop (alarm)	Red	Not lit	Lit	Replace battery
NCLD1	System status display (7-segment software status)	—	—	—	Contact the Mitsubishi Service Center
WDER	System error display	Red	Not lit	Lit	

2. TROUBLESHOOTING

2.1 List of Unit LEDs

(2) Base I/O unit

Base I/O unit



[Explanation of LED functions]

Name	Function	Color	Status		Correspondence for error
			When normal	During error	
LED1 (Dual-color illumination)	24IN	Green	Lit	Not lit	Check 24VDC voltage
	RIO1	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.
LED2 (Dual-color illumination)	5OUT	Green	Lit	Not lit	Contact the Mitsubishi Service Center
	RIO2	Red	Not lit	Lit	Check each remote I/O unit's rotary switch station No.

2. TROUBLESHOOTING

2.2 Troubleshooting

2.2 Troubleshooting

2.2.1 Confirmation of Trouble State

Confirm "when", "when doing what", and "what kind of" trouble occurred.

(1) When?

What time did the trouble occur?

(2) When doing what?

What was the NC operation mode?

- During automatic operation Program No., sequence No. and program details when the trouble occurred.
- During manual operation What was the manual operation mode?
What was the operation procedure?
What were the previous and next steps?
- What was the setting display unit screen?
- Did the trouble occur during input/output operations?
- What was the machine side state?
- Did the trouble occur while replacing the tools?
- Did hunting occur in the control axis?

(3) What kind of trouble?

- What was displayed on the setting display unit's Alarm Diagnosis screen?
Display the Alarm Diagnosis screen, and check the alarm details.
- What was displayed for the machine sequence alarm?
- Is the CRT and LCD screen normal?

(4) How frequently?

- When did the trouble occur? What was the frequency? (Does it occur when other machines are operating?) If the trouble occurs infrequently or if it occurs during the operation of another machine, there may be an error in the power voltage or the trouble may be caused by noise, etc. Check whether the power voltage is normal (does it drop momentarily when other machines are operating?), and whether noise measures have been taken.
- Does the trouble occur during a specific mode?
- Does the trouble occur when the overhead crane is operating?
- What is the frequency in the same workpiece?
- Check whether the same trouble can be repeated during the same operation.
- Check whether the same trouble occurs when the conditions are changed.
(Try changing the override, program details, and operation procedures, etc.)
- What is the ambient temperature?
(Was there a sudden change in the temperature? Was the fan at the top of the control unit rotating?)
- Is there any contact defect or insulation defect in the cables?
(Has any oil or cutting oil splattered onto the cables?)

2. TROUBLESHOOTING

2.2 Troubleshooting

2.2.2 When in Trouble

If the system does not operate as planned or if there is any trouble in the operation, confirm the following points and then contact the Mitsubishi Service Center.

– **Examples of trouble** –

- Nothing appears in the NC screen, LED, etc., even when the power ON button is pressed.
- The power turns OFF suddenly.
- Nothing appears on the NC screen, or the screen is completely white.
- The operation keys do not function. The NC screen appears but the operation board key input does not function.
- Machining operation is not possible.

2. TROUBLESHOOTING

2.2 Troubleshooting

(1) Problems related to the power supply

The power does not turn ON.	
Cause	Remedy
The power cord is disconnected or loose.	Check the cable between the NC unit and the external power supply, and between the external power supply and socket. Make sure that the cable is inserted securely. Check that there are no wires broken in the cable. If broken, replace the cable.
The door interlock is applied.	If the control panel door is not completely closed, close it. If the door interlock is applied even when the door is closed, the door interlock circuit is damaged. Repair it.
There is a problem in the power socket.	If the socket has a switch, turn the switch ON. Make sure that the specified power voltage and power frequency is being output from the socket.
The external power supply is faulty.	Check that the power can be turned ON with just the external power supply. Note) Depending on the external power supply being used, the power may not turn ON in the no-load state, so install a slight load and check.
The ON/OFF cable is short-circuited.	Disconnect the ON/OFF cable and check that it is not short-circuited. If short-circuited, replace the cable.
The external power supply's input voltage is not as specified.	Check that the input voltage is within 200 to 230VAC +10 to -15%, 100 to 115VAC +10 to -15%, and 24VDC±5%.
The external power turns ON but the NC control power does not turn ON.	
Cause	Remedy
The external power supply output is not correct.	Disconnect the cable between the NC unit and the external power supply, and check that the external power supply output is normal. Wire the cable between the NC unit and external power supply, and check that the external power supply output is normal.
The cable connected from the NC unit to the peripheral device is short-circuited.	Disconnect the cable connected to the peripheral device one at a time and check that the power turns ON. Check that there are no short-circuited cables.
There is a short circuit in the configuration card.	Remove the removable cards one at a time and check that the power turns ON. Check that there are no short-circuited cards.

 **CAUTION**

-  **Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.**
-  **Incorrect connections may damage the devices, so connect the cables to the specified connectors.**
-  **Do not connect or disconnect the connection cables between each unit while the power is ON.**
-  **Do not connect or disconnect the PCBs while the power is ON.**

2. TROUBLESHOOTING

2.2 Troubleshooting

The power turns OFF.	
Cause	Remedy
There is a problem in the power socket.	Check whether the voltage fluctuates at certain time zones. Check whether an instantaneous power failure has occurred.
A problem occurs when the peripheral device starts operating.	Check whether the voltage drops instantaneously when the peripheral device operation starts.
The HR081/HR082/HR083 power card PSEMG (red) LED is lit.	
Cause	Remedy
The emergency stop switch connected to the EMG connector is ON (A contact), or the EMG connector is disconnected.	Set the emergency stop switch to the release (B contact) state. Check the connection to the EMG connector.
The HR081/HR082/HR083 power card BATALM (red) LED is lit.	
Cause	Remedy
The LED lights when the voltage of the battery connected to the HR081/HR082/HR083 BAT connector has dropped to $2.6V \pm 0.065V$ or less.	Refer to section 3.3.2 and replace the battery.


CAUTION

-  **Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.**
-  **Incorrect connections may damage the devices, so connect the cables to the specified connectors.**
-  **Do not connect or disconnect the connection cables between each unit while the power is ON.**
-  **Do not connect or disconnect the PCBs while the power is ON.**

2. TROUBLESHOOTING

2.2 Troubleshooting

(2) Problems when starting the system

The NC does not start up correctly.	
Phenomenon	Remedy
8 is displayed on the CPU card's 7-segment display NCLD1.	Check that the rotary switch NCSYS is set to 0. If not set to 0, set to 0 and restart.
E or F is displayed on the CPU card's 7-segment display NCLD1.	Contact the Mitsubishi Service Center.

(3) Problems related to remote I/O

The communication alarm LED RAL is lit.	
Cause	Remedy
The base I/O unit or remote I/O unit's communication cable (SH41) is not connected. The cable has broken wires or the contact is defective.	Check the connection of the NC control section and remote I/O communication cable F010 or the SH41 cable between remote I/O units.
Base I/O unit is faulty.	Contact the Mitsubishi Service Center, and then replace.
The power supply system LED is not lit.	
Phenomenon	Remedy
The 24IN LED is not lit. (The input power is not being supplied.)	Supply a +24V±5% voltage to the base I/O unit.
The 5OUT LED is not lit. (The input power is not within the tolerable range, or the internal power is faulty.)	Check that the 24VDC input voltage is not +20V or less. If the voltage is properly supplied, contact the Mitsubishi Service Center.

 **CAUTION**

-  **Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.**
-  **Incorrect connections may damage the devices, so connect the cables to the specified connectors.**
-  **Do not connect or disconnect the connection cables between each unit while the power is ON.**
-  **Do not connect or disconnect the PCBs while the power is ON.**

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE
3.1 Maintenance Tools

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.1 Maintenance Tools

(1) Measuring instruments

The following measuring instruments are used to confirm that the voltage is being supplied correctly to the NC unit, to confirm that the wiring to the NC unit is correct, and to carry out simple troubleshooting.

Table 3.1 Maintenance tools

Tool	Condition	Application
Tester		To check that the wiring to the NC unit is correct before turning the power ON.
AC voltmeter	Measure the AC power voltage. The tolerable error is $\pm 2\%$ or less.	To measures the AC power voltage being supplied to the external 24VDC power supply unit.
DC voltmeter	Max. scale 30V. The tolerable error is $\pm 2\%$ or less.	To measure the DC power voltage. External power supply 24V (control section, machine input/output interface) Battery voltage HR081/HR082/HR083 DC output
Phase rotation meter		To check the connection order of the AC 3-phase input power supply.
Synchroscope		General measurement and simple troubleshooting

Note 1) Currently, a high-accuracy digital multi-meter is commonly used as a tester. This digital multi-meter can be used as both an AC voltmeter and a DC voltmeter. When measuring a minute current, a correct measurement may not be possible because of the digital multi-meter's input impedance.

Note 2) A logic analyzer (sampling cycle 200MHz or more) is required for complicated troubleshooting.

(2) Tools

- Screwdriver (large, medium, small)
- Radio pliers

3.2 Maintenance Items

Maintenance is categorized into daily maintenance items (items to be carried at set intervals) and periodic maintenance items (replacement of parts when life is reached). Some parts will not function in a hardware manner when the life is reached, so these should be replaced before the life is reached.

Table 3.2 List of maintenance items

Class	Name	Life	Inspection/replacement	Remarks
Daily maintenance	Escutcheon		Once/two months (Accordingly when dirty)	
Periodic maintenance	Battery (lithium battery)	Cumulative data holding time 45,000 hr	When battery voltage drop caution alarm occurs (Guideline: approx. 5 years)	Refer to Section 3.3.2 (1).
	Cooling fan (control section)	30,000 hr	Refer to left.	
Other consumable parts	Operation board	1,000,000 strokes (10^6 times)	Refer to left.	

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.2 Maintenance Items

3.2.1 Escutcheon

(1) Cleaning the escutcheon

- 1) Keep the rear side of the escutcheon as clean as possible.
- 2) Wipe the escutcheon with a soft, clean, dry cloth. If cleaning is still required, put some neutral detergent on a cloth and wipe. Do not use alcohol, thinner, etc.

3.2.2 LCD Panel

(1) Handling the LCD panel

(a) Precautions for use

- 1) The polarizing plate (display surface) of the LCD panel surface can be easily scratched, so be careful during handling.
- 2) Glass is used in the LCD panel. Be careful not to drop the LCD panel or allow it to hit hard objects, as the glass may chip or break.
- 3) The polarizing plate may be stained or discolored if drops of water, etc., adhere to it for long periods, so be sure to wipe off any moisture immediately.
- 4) Wipe off any dirt, dust, etc., on the polarizing plate using absorbent cotton or other soft cloth.
- 5) A CMOS LSI is used in the LCD panel, so be careful of static electricity when handling.
- 6) Never disassemble the LCD panel. Doing so will damage the panel.

(b) Precautions for storage

- 1) Do not store the LCD panel in locations having a high temperature or humidity. (Store within the storage temperature range.)
- 2) When storing the LCD panel as an individual unit, be sure that other objects do not touch or hit the polarizing plate (display surface).
- 3) When storing the LCD panel for long periods, be sure to store in a dark place away from exposure to direct sunlight or fluorescent light.

(2) Other precautions for use

(a) Backlight life

The life of the backlight is 25,000 hours for the 7.2-type, 40,000 hours for the 8.4-type and 25,000 hours for the 10.4-type when used at 25°C. (Time for luminance to drop to 50% of the initial value.) The backlight life is dependent on the temperature. The life tends to be shorter when used continuously at lower temperatures.

If not using the screens for a long time, turn all screens off to prevent deterioration of the backlight.

(b) Luminance start

Due to the characteristics of the backlight, the luminance could drop slightly at lower temperatures. It will take approx. 10 to 15 minutes for the luminance to reach the rated value after the power is turned ON.

(c) Unevenness, luminescent spots and irregularities

Uneven brightness, small luminescent spots or small dark spots (irregularities) may appear on LCD, but this is not a fault.

(d) Contrast

The contrast of STN method LCD panels changes with temperature fluctuation. If this happens and the panel is difficult to see, open the operation box door and adjust the contrast with the contrast adjustment potentiometer on the LCD signal interface PCB.

(3) Replacing the backlight

The backlight can be replaced by the user, but replacement should be commissioned to the Mitsubishi Service Center.

3.2.3 ATA Memory Card

(1) Handling the PCMCIA card

The general handling methods for the PCMCIA card are described below. Refer to the instruction manual of the PCMCIA card used for details.

(a) Precautions for use

- 1) Insert the card in the correct direction.
- 2) Do not touch the connector area with the hands or metal.
- 3) Do not apply excessive force to the connector area.
- 4) Do not subject the card to bending or strong impacts.
- 5) Do not open the cover or disassemble the card.
- 6) Do not use the card in dusty locations.

(b) Precautions for storage

- 1) Do not store the card in locations having a high temperature or humidity.
- 2) Do not store the card in dusty locations.

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE
3.3 Replacement Methods

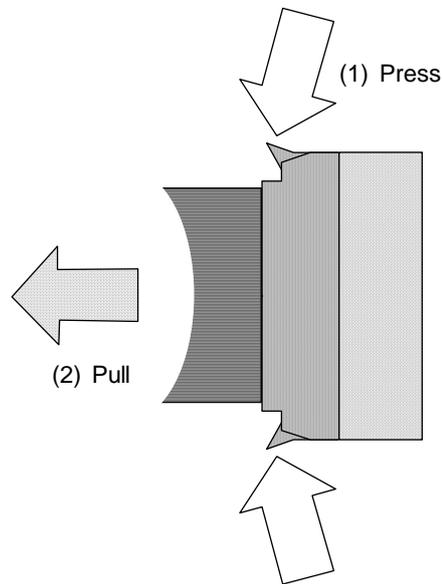
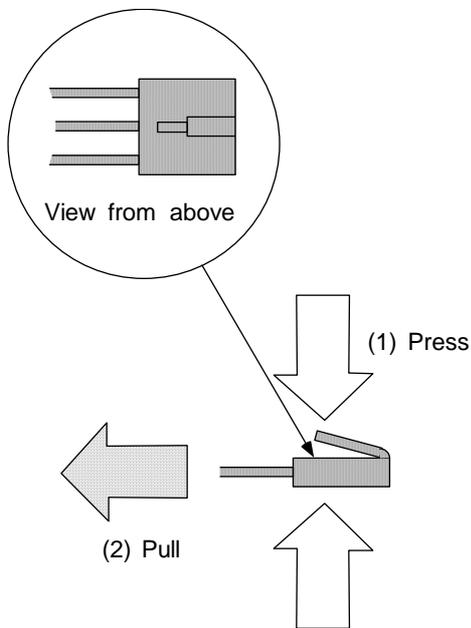
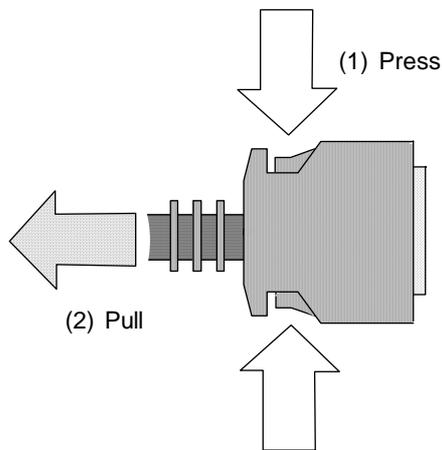
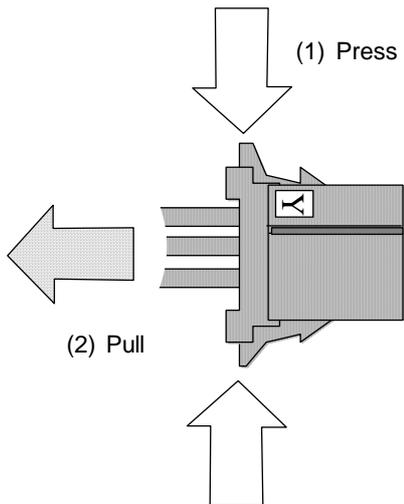
3.3 Replacement Methods

3.3.1 Cable

If the cable is replaced without turning the power OFF, the normal unit or peripheral devices could be damaged, and risks could be imposed.

Disconnect each cable with the following procedures.

- a) For the following type of connector, press the tabs with a thumb and forefinger in the direction of the arrow, and pull the connector off.



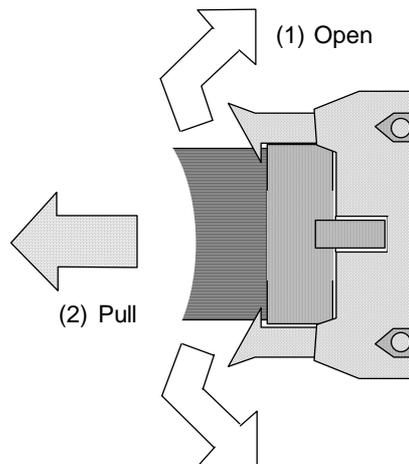
CAUTION

- ⊘ Do not connect or disconnect the connection cables between each unit while the power is ON.
- ⊘ Do not connect the cable by pulling on the cable wire.

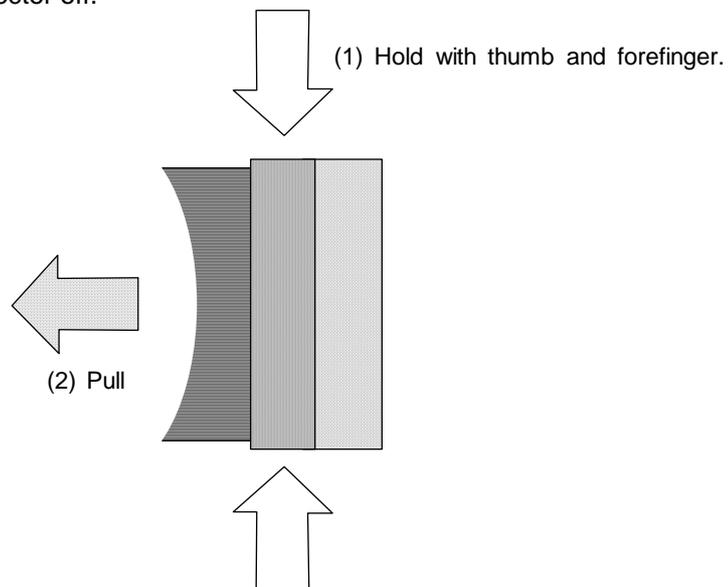
3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.3 Replacement Methods

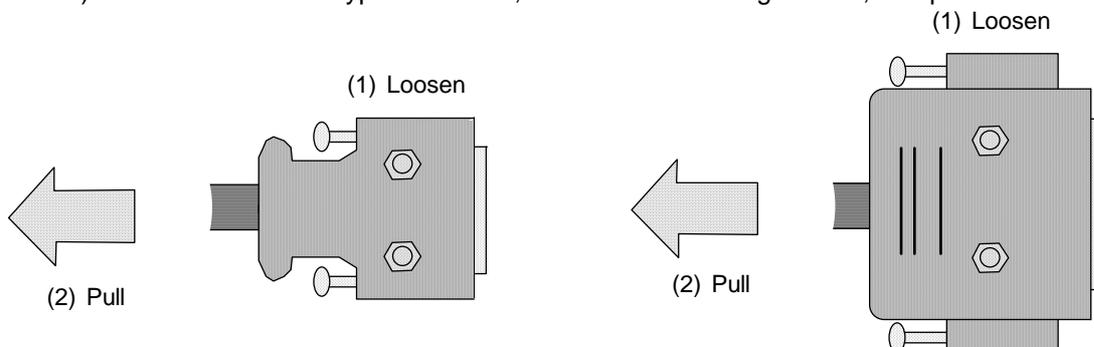
- b) For a flat cable type connector with latches, open the latches in the directions of the arrows, and pull the connector off.



- c) For a flat cable type connector without latches, hold the connector with a thumb and forefinger, and pull the connector off.



- d) For the screw fixed type connector, loosen the two fixing screws, and pull the connector off.



CAUTION

- ⊘ Do not connect or disconnect the connection cables between each unit while the power is ON.
- ⊘ Do not connect the cable by pulling on the cable wire.

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.3 Replacement Methods

3.3.2 Durable Parts

(1) Control unit battery

All data, such as the parameters and machining programs that need to be backed up when the power is turned OFF, are saved by a lithium battery installed in the control unit's battery holder.

Battery	With ER6 connector (Toshiba with Mitsubishi specifications)
Initial battery voltage	3.6V
Voltage at which voltage drop is detected	2.8V (Battery voltage drop caution alarm screen display) 2.6V (Battery voltage drop warning alarm screen display + control section LED display)
Battery cumulative data	45,000 hours (At room temperature. The life will be shorter if the holding time temperature is high.)
Battery life	Approx. 5 years (from date of battery manufacture)
Discharge current	40 μ A or less

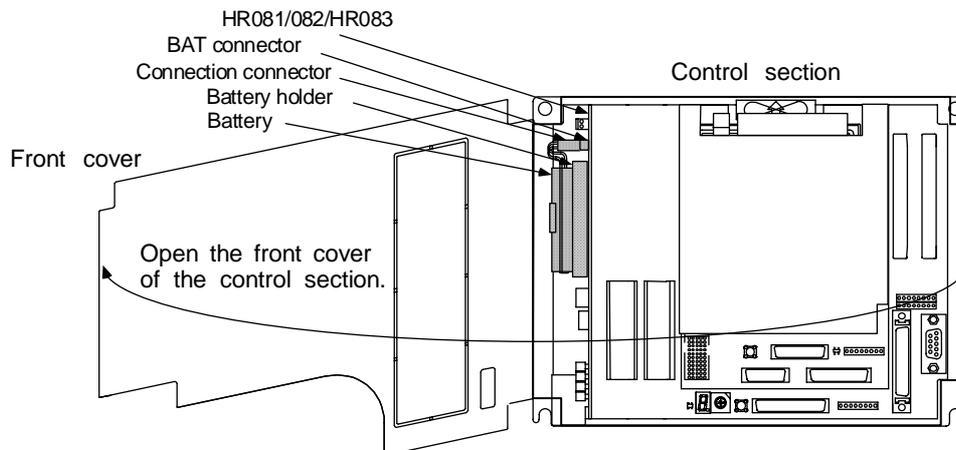
(Replace the battery when the battery voltage drop caution alarm appears on the NC screen. The internal data could be damaged if the battery voltage drop warning alarm appears.)

a) Replacement procedures

Always replace the battery with the control section (machine) power turned OFF.

Complete the replacement within 30 minutes after turning the power OFF. (If the battery is not connected within 30 minutes, the data being backed up will be destroyed.)

- 1) Turn the control section (machine) power OFF.
- 2) Open the electric cabinet door, and confirm that the control unit LED, 7-segment display, etc., are all OFF.
- 3) If an extension unit is mounted, and a cable is connected to the front of the control section, disconnect the cable.
- 4) Open the front cover of the control section by pulling on the right side of the door (the side without fixing screws).
- 5) Remove the battery from the battery holder.
- 6) Pull the connector connected to the battery out from the BAT connector on the control section HR081/HR082/HR083 power supply PCB.
- 7) Replace the battery with the new one. Insert the connector connected to the new battery into the BAT connector on the control section HR081/HR082/HR083 PCB. Pay attention to the connector orientation, being careful not to insert backwards.
- 8) Fit the battery into the battery holder.
- 9) Close the front cover of the control section. At this time, confirm that the cover is closed by listening for the "click" sound when the latch catches.
- 10) Close the door of the electric cabinet.



Precautions for handling battery

- Always replace the battery with the same type.
- Do not disassemble the battery.
- Do not place the battery in flames or water.
- Do not pressurize and deform the battery.
- This is a primary battery so do not charge it.
- Dispose of the spent battery as industrial waste.

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.3 Replacement Methods

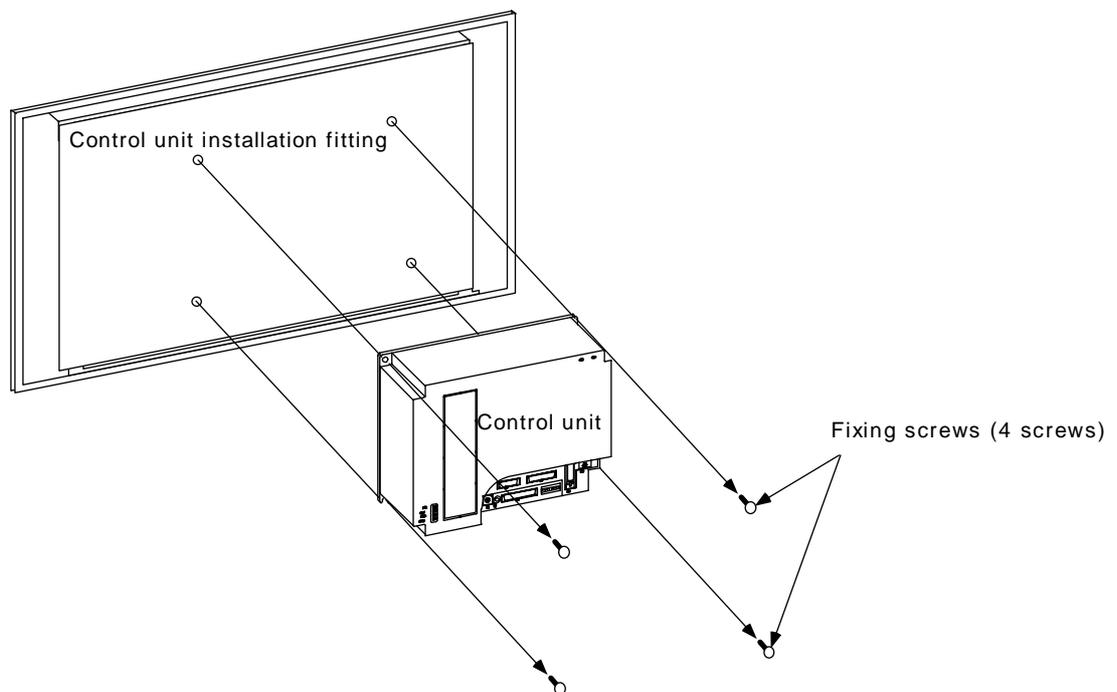
3.3.3 Control Unit

(1) Control unit

a) Replacement procedures

Always replace the control unit with the machine power turned OFF.

- 1) Check that the machine power is turned OFF. (If the power is not OFF, turn it OFF.)
- 2) Open the electric cabinet door.
- 3) Disconnect all cables connected to the control unit.
- 4) Remove the screws fixing the control unit onto the control unit installation fitting, and remove the control unit from the control unit installation fitting. (Loosen the two lower fixing screws first, and then remove the two upper fixing screws while supporting the unit with a hand. Then lift the unit upward and off. The two lower fixing screws do not need to be removed.)
- 5) Replace with a new control unit, and fix the control unit onto control section installation fitting with the fixing screws.
- 6) Connect all cables connected to the control unit. (Connect the cables to the designated connectors.)
- 7) Check the cables and wires for connection leaks, faulty connections, etc., then close the electric cabinet door.



CAUTION

-  Incorrect connections may damage the devices, so connect the cables to the specified connectors.
-  Do not replace the control unit while the power is ON.
-  Do not connect or disconnect the connection cables between each unit while the power is ON.

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.3 Replacement Methods

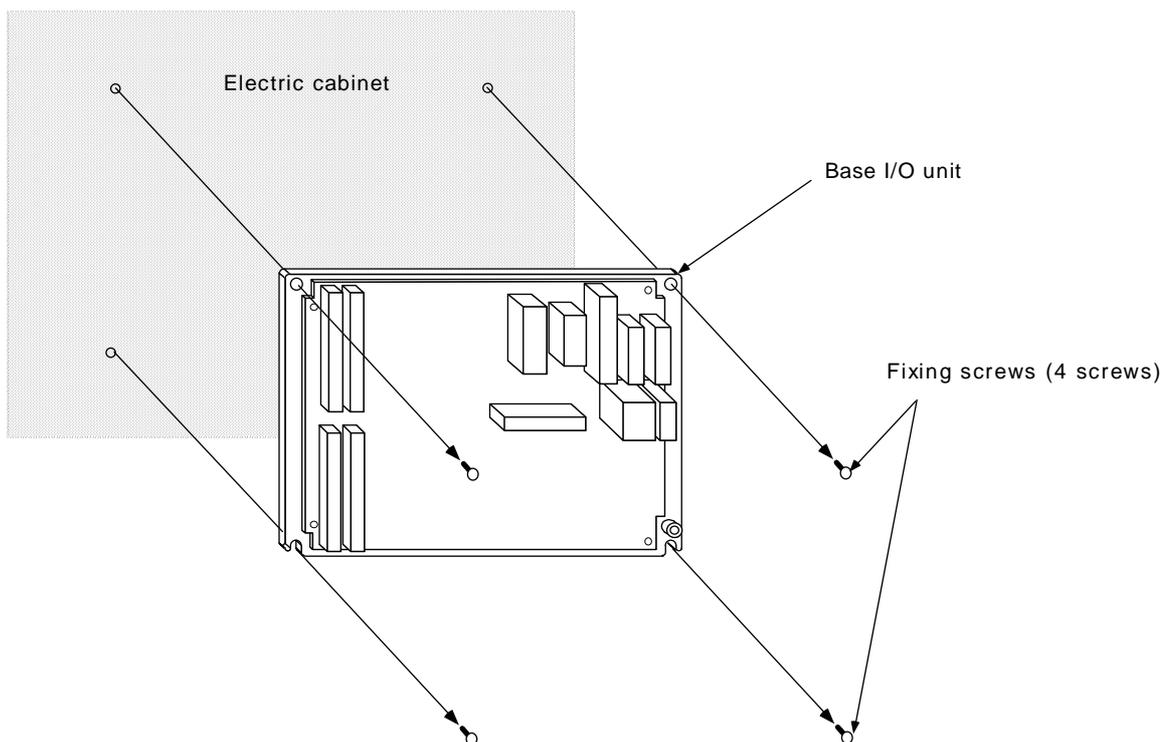
(2) Base I/O unit

The base I/O unit is generally installed on the electric cabinet side.

a) Replacement procedures

Always replace the base I/O unit with the machine power turned OFF.

- 1) Check that the machine power is turned OFF. (If the power is not OFF, turn it OFF.)
- 2) Open the electric cabinet door.
- 3) Disconnect all cables connected to the base I/O unit.
- 4) Remove the screws fixing the base I/O unit to the electric cabinet, and remove the base I/O unit from the electric cabinet.
(Loosen the two lower fixing screws first, and then remove the two upper fixing screws while supporting the unit with a hand. Then lift the unit upward and off. The two lower fixing screws do not need to be removed.)
- 5) Replace with a new base I/O unit, and fix the unit onto the electric cabinet with the fixing screws.
- 6) Connect all cables connected to the base I/O unit. (Connect the cables to the designated connectors.)
- 7) Check the cables and wires for connection leaks, faulty connections, etc., then close the electric cabinet door.



CAUTION

-  Incorrect connections may damage the devices, so connect the cables to the specified connectors.
-  Do not replace the base I/O unit while the power is ON.
-  Do not connect or disconnect the connection cables between each unit while the power is ON.

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.3 Replacement Methods

3.3.4 Control PCB

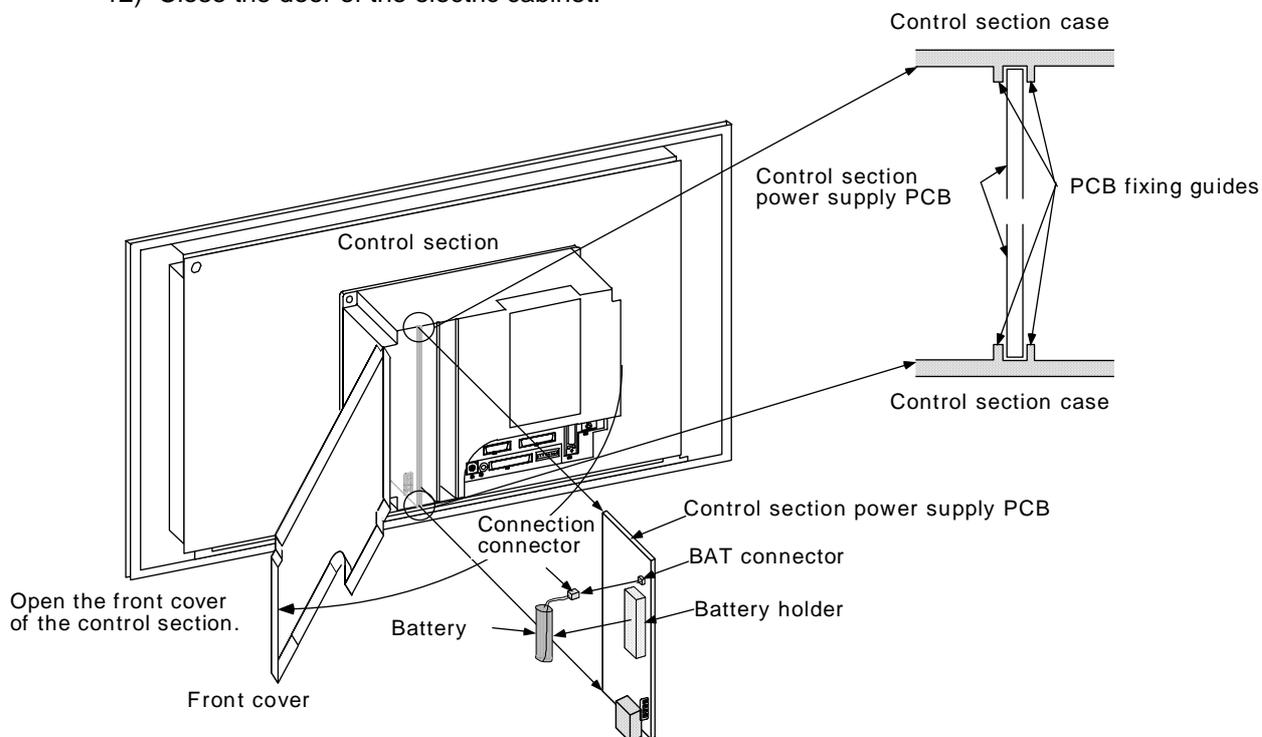
(1) Control section power supply PCB (HR081/HR082/HR083)

The control section power supply PCB is supplied with 24VDC from an external source. This PCB generates the DC voltage required for each control PCB in the control section.

a) Replacement procedures

Always replace the control section power supply PCB with the machine power turned OFF. A battery for backing up the memory is mounted on the control section power supply PCB, so as with the battery, replace the control section power supply PCB within 30 minutes.

- 1) Confirm that the machine power is OFF. (If the power is not OFF, turn it OFF.)
- 2) Open the electric cabinet door, and confirm that the control unit LED, 7-segment display, etc., are all OFF.
- 3) Disconnect all cables connected to the control section power supply PCB.
- 4) If an extension unit is mounted, and a cable is connected to the front of the control section, disconnect the cable.
- 5) Open the front cover of the control section by pulling on the right side of the door (the side without fixing screws).
- 6) While holding the front upper and lower sections of the control section power supply PCB with both hands, pull out the PCB from the control section.
- 7) Remove the battery from the control section power supply PCB that was removed from the control section.
- 8) Replace the battery with the new one. Insert the connector connected to the new battery into the BAT connector on the HR08□ control section PCB.
- 9) Install the control section power supply PCB into the control section. (Align the control section power supply PCB with the PCB fixing guides on the inner side of the control section case, and then install.)
- 10) Connect all cables that were connected to the control section power supply PCB. (Connect all cables to the designated connectors.)
- 11) Close the front cover of the control section. At this time, confirm that the cover is closed by listening for the "click" sound when the latch catches.
- 12) Close the door of the electric cabinet.



- ⚠ **Incorrect connections may damage the devices, so connect the cables to the specified connectors.**
- ⚠ **Do not replace the base I/O unit while the power is ON.**
- ⚠ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.3 Replacement Methods

(2) Expansion PCB

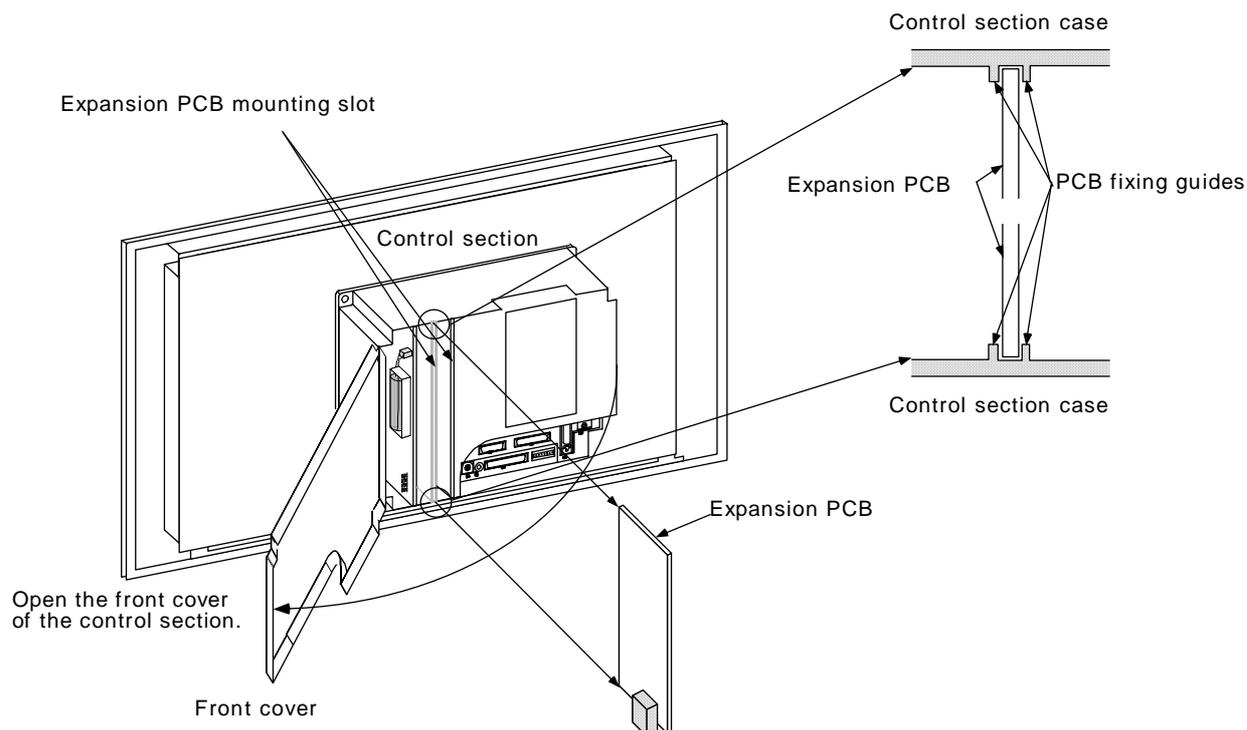
The expansion PCB is used to expand the system for adding a serial port, etc. (Refer to the I Connection Manual, Section 2.1 for information related to expansion PCB types and functions.)

Up to two expansion PCBs can be added. The PCBs are mounted in the RT #1/#2 slots on the right side of the control section power supply PCB.

a) Replacement procedures

Always replace the expansion PCB with the machine power turned OFF.

- 1) Confirm that the machine power is OFF. (If the power is not OFF, turn it OFF.)
- 2) Open the electric cabinet door, and confirm that the control unit LED, 7-segment display, etc., are all OFF.
- 3) Disconnect all cables connected to the control unit and expansion PCB.
- 4) Open the front cover of the control section as shown in the drawing below.
- 5) While holding the front upper and lower sections of the expansion PCB with both hands, pull out the PCB from the control section.
- 6) Replace with the new expansion PCB. If the PCB has setting locations, set to the same settings as the old PCB.
- 7) Install the expansion PCB into the slot in which the old PCB was mounted.
(Align the expansion PCB with the PCB fixing guides on the inner side of the control section case, and then install.)
- 8) Close the front cover of the control section.
- 9) Connect all cables that were connected to the control unit and expansion PCB.
(Connect all cables to the designated connectors.)
- 10) Close the door of the electric cabinet.



CAUTION

-  **Incorrect connections may damage the devices, so connect the cables to the specified connectors.**
-  **Do not replace the base I/O unit while the power is ON.**
-  **Do not connect or disconnect the connection cables between each unit while the power is ON.**

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.3 Replacement Methods

3.3.5 Memory Cassette

(1) HR4 □□

The memory cassette is a PCB used to store user PLC and machining programs, and is installed on the CBUS#2 connector of the control section.

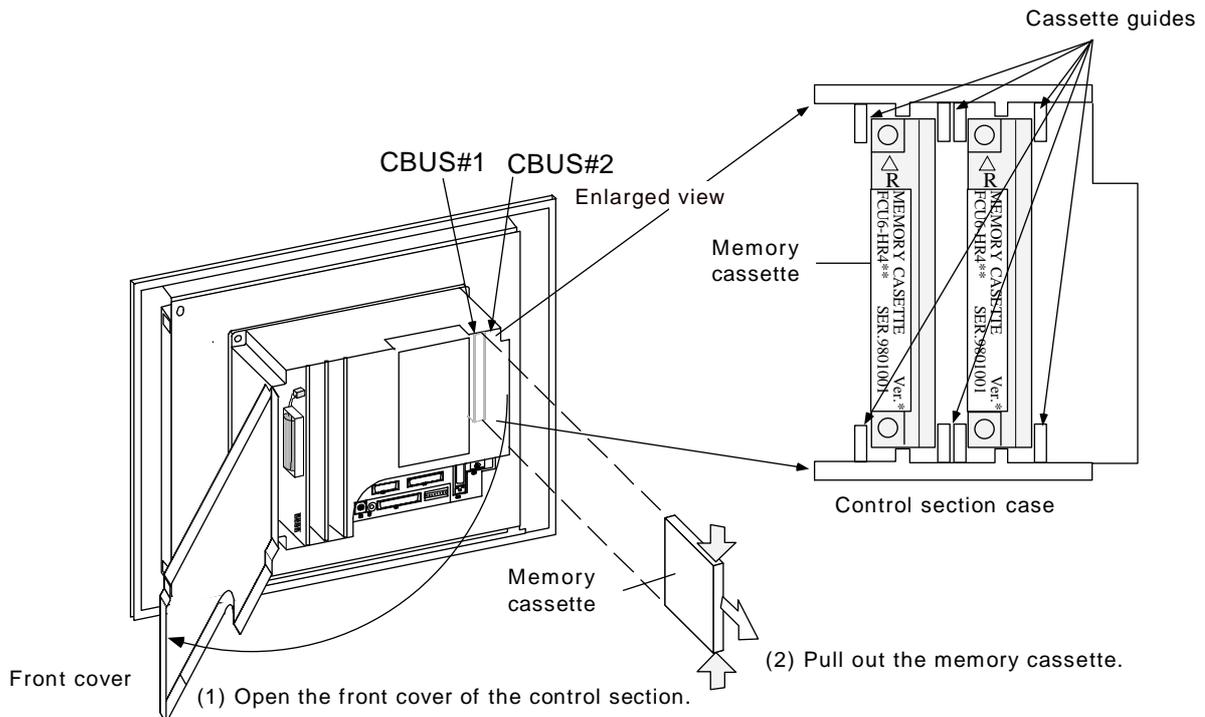
a) Replacement procedures

Always replace the memory cassette with the machine power turned OFF.

Before replacing RAM-type memory cassettes, always make a backup of the memory to be replaced using an external I/O device, etc. Then, re-input the details after replacing the memory cassette.

Confirm that the control unit power is OFF.

- (1) Open the control unit cover from the right side.
- (2) While holding the top and bottom of the memory cassette with a thumb and forefinger, pull out the memory cassette from the control section.
- (3) Install the new memory cassette in the control section.
Install by carrying out steps (1) and (2) in reverse (2) → (1) order.
(Align the memory cassette with the cassette fixing guides on the NC control case.)



CAUTION

- ⚠ Incorrect connections may damage the devices, so connect the cables to the specified connectors.
- ⚠ Do not replace the memory cassette while the power is ON.
- ⚠ Do not connect or disconnect the connection cables between each unit while the power is ON.
- ⚠ Be careful that metal cutting chips, etc., do not come into contact with the connector

3. DAILY MAINTENANCE AND PERIODIC INSPECTION AND MAINTENANCE

3.3 Replacement Methods

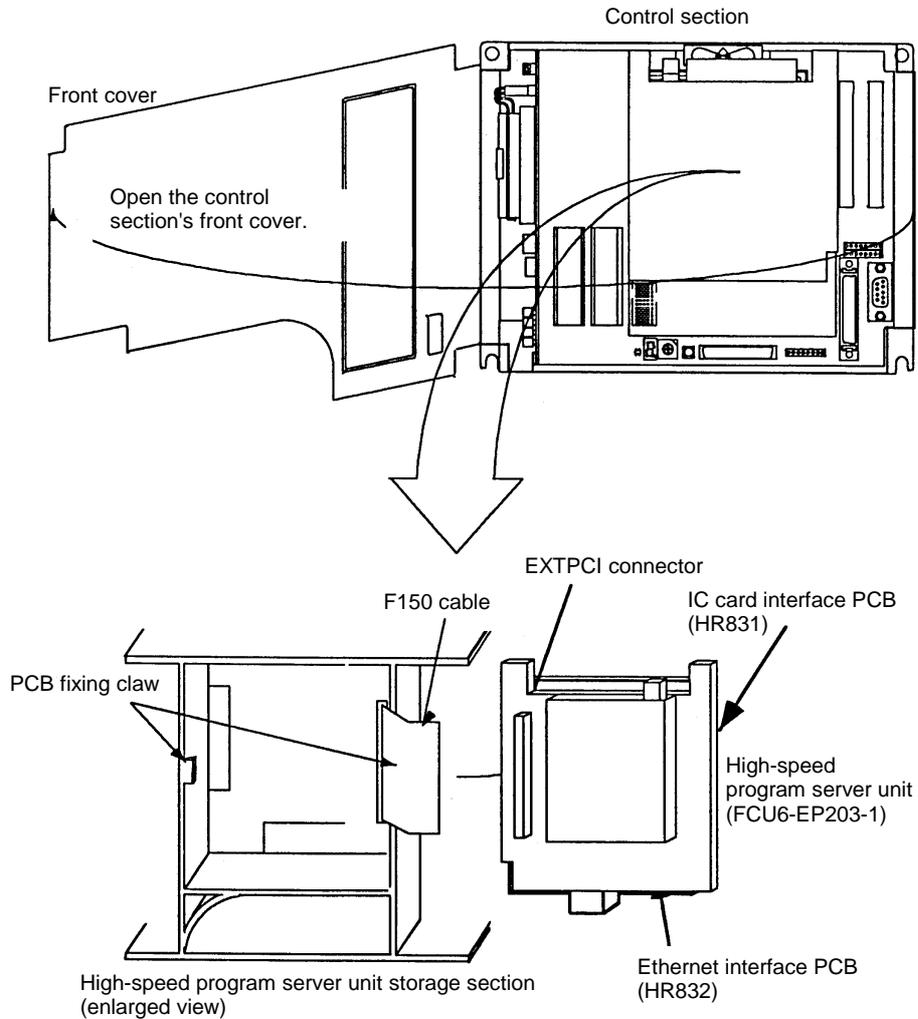
3.3.6 High-speed Program Server

(1) **High-speed program server unit (FCU6-EP203-1)**

The high-speed program server is configured of the HR831 and HR832 cards and an F150 cable. It is replaced as a unit.

a) **Replacement procedures**

Turn the machine power OFF before replacing the high-speed program server unit.



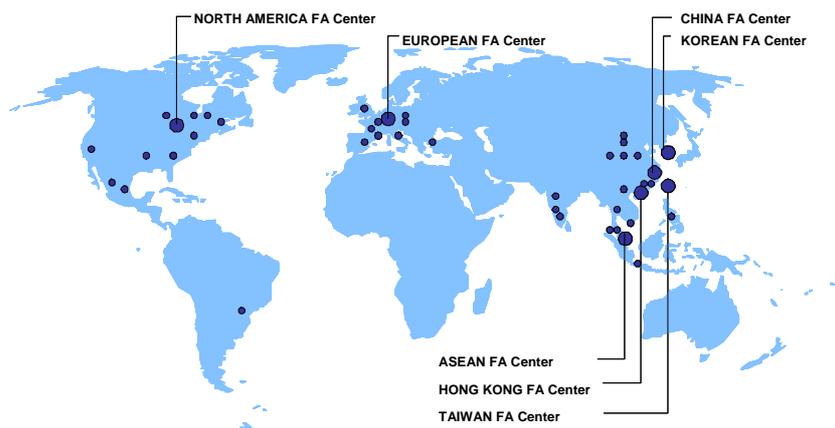
CAUTION

- ⚠ Incorrect connections will cause device damage, so always connect the cable to the specified connector.
- ⚠ Do not replace the high-speed program server unit while the power is ON.

Revision History

Date of revision	Manual No.	Revision details
Jul. 1997	BNP-B2183A	Detailed errors were corrected.
Feb. 1998	BNP-B2183B	Errors were corrected. New items were added.
Sept. 1998	BNP-B2183C	Errors were corrected. New items were added.
Oct. 1999	BNP-B2183D	M65/66 was added. EMC Directives measures were added to Appendix 4. Explanation of high-speed program server function was added. FCU6-HR378 was added. FCU6-DUN33 color LCD model was added. Units were changed to SI unit displays. The above related cards were added to the module function explanations in the maintenance explanation.
Feb. 2001	BNP-B2183E	System configuration list was added. Explanation of control unit was reviewed. Figure symbol were changed to JIS notations. DI delay time was corrected from 3 to 20ms to 2.2 to 11ms. No. of pulses per rotation was added to explanation on manual pulse generator. Explanations of communication terminals were reviewed. External battery unit punch hole dimensions were added.
Nov. 2003	BNP-B2183J	<ul style="list-style-type: none"> • Design of the cover and the back cover were changed. • Manual name changed from "MELDAS 64/65/66 Series Connection and Maintenance Manual" to "MELDAS 60/60S Series Connection and Maintenance Manual". • MODEL, MODEL CODE, and Manual No. were added on the back cover. • "Introduction" was added. • The order of chapters were changed. • MELDAS 64AS-A/64S-A/64AS/64S/65S/66S were added. • FCU6-KB021/031 were added. • "12.5 Connection of I/O device by CC-link" was added in "I CONNECTION MANUAL". • "1.23 HR576 card" was added in "II MAINTENANCE MANUAL". • Errors corrected and expressions changed.
Aug. 2005	BNP-B2183K	<ul style="list-style-type: none"> • Descriptions relating to FCU6-DUN22 and FCU6-KB022 were added. • "Appendix 6. TRANSPORTATION RESTRICTIONS FOR LITHIUM BATTERIES" was added. • "Appendix 7. PRECAUTIONS FOR USE OF PERIPHERAL DEVICES AND COMMERCIALY AVAILABLE DEVICES" was added, • "1.22 HR213 Card" was added in "II MAINTENANCE MANUAL". • "Global service network" was added. • Errors corrected and expressions changed.

Global service network



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Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible.

Please contact your Mitsubishi Electric dealer with any questions or comments regarding the use of this product.

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