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MITSUBISHI ELECTRIC

CNC

MELDAS MAGIC 64

CONNECTION MANUAL

BNP-B2203D(ENG)

Introduction

This manual is the MELDASMAGIC64 Connection Manual.
MELDASMAGIC64 installation and connection methods are explained centered on the NC Card.
Refer to the materials below for explanations concerning functions.

MELDASMAGIC64 Setup Instruction Manual BNP-B2191
MELDASMAGIC64 Maintenance Manual BNP-B2207
MELDAS AC Servo and Spindle MDS-A/B Series Specifications Manual BNP-B3759
MELDAS AC Servo and Spindle MDS-C1 Series Specifications Manual BNP-C3000
MELDAS AC Servo and Spindle MDS-CH Series Specifications Manual BNP-C3016
MELDAS AC Servo MDS-B-SVJ2 Series Specification Manual BNP-B3937
MELDAS AC Servo MDS-B-SPJ2 Series Specification Manual BNP-B2164

General items

(1) Read this manual carefully before using MELDASMAGIC64. Please have a full understanding of product functions and performance, and use this product correctly.

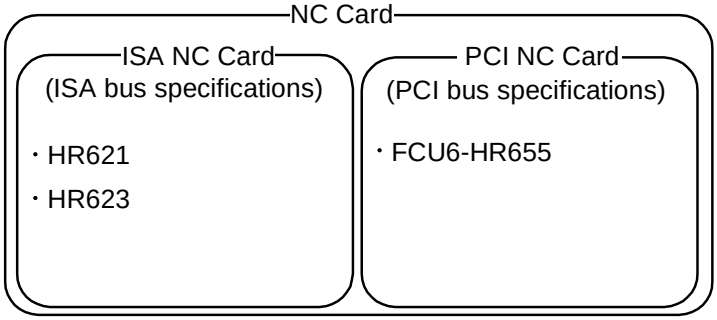
(2) All efforts possible have been made to describe any special handling in this manual. Items not described in this manual must be interpreted as "Not Possible".

(3) When the details described in this instruction manual change, the sub-No. of the cover page instruction manual No. (*, A, B) will be changed.

(4) The details described in this manual may change without notice. Mitsubishi may not be held responsible for errors in the contents described.

About MELDASMAGIC64

(1) MELDASMAGIC64 includes the ISA NC Card compatible with the ISA bus, and the PCI NC Card compatible with the PCI bus. Either card can be selected. The user can structure a custom-made NC unit by inserting the NC Card supplied from Mitsubishi into the selected personal computer's expansion slot (ISA bus or PCI bus).



(2) The NC Card supplied by Mitsubishi realizes the equivalent environmental resistance (ambient temperature, noise resistance and vibration resistance) as conventional NC units. However, some environmental resistance equivalent to conventional NC units is not always guaranteed regarding personal computers presumed to be normally used in an office. Therefore, when selecting a personal computer, study this manual well and select an appropriate model responding to the required uses and applications. When required, execute the appropriate countermeasures.

(3) Take care to the working environment when using MELDASMAGIC64.

Working environment

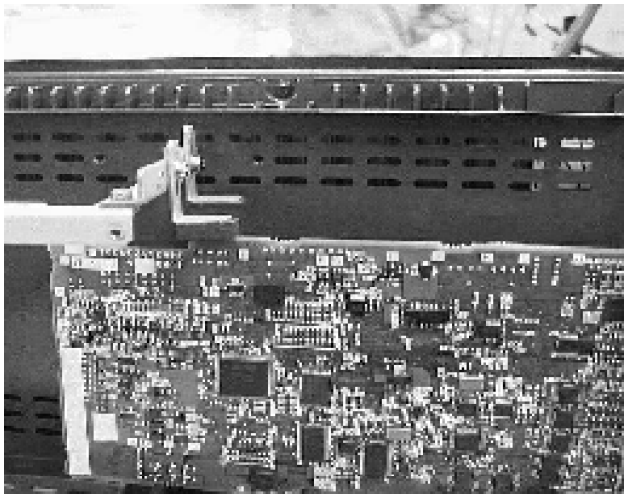
		PCI NC Card	ISA NC Card
Applicable personal computer		IBM PC/AT or compatible machine	
Compatible OS		• Windows 98SE • Windows 2000 • Windows XP	• Windows 95 • Windows 98 • Windows 98SE • Windows NT Workstation 4.0
CPU		• For Windows 95 Pentium 100MHz or faster (Pentium 150MHz or faster recommended) • For Windows 98, Windows 98SE, Windows NT Workstation 4.0 Pentium 200MHz or faster (Pentium 233MHz or faster recommended) • For Windows 2000, Windows XP Pentium 300MHz or faster	
Memory		• For Windows 95, Windows 98 16MB or larger (24MB or larger recommended) • For Windows 98SE, Windows NT Workstation 4.0 24MB or larger (32MB or larger recommended) • For Windows 2000 64MB or larger (128MB or larger recommended) • For Windows XP 128MB or larger	
Hard disk		20MB or more open space recommended	
Floppy disk		One 3.5-type 1.44MB drive	
Expansion slot		PCI bus (PCI bus Standards 2.0 or higher)	ISA bus
Electric characteristics	+3.3V (*1)	0.2A or more	
	+5.0V	2.5A or more	
	+12.0V	0.7A or more	0.5A or more
Power drop characteristics		Time for +5.0V power voltage to drop from +4.5V to +4.0V when the power is turned OFF takes 1ms or more.	

(*1) When using the PCI NC Card, always use a personal computer that supplies +3.3V power to the PCI bus.

(4) Heat radiation-countermeasures for personal computer
A rise in the personal computer's internal temperature could cause NC Card damage or malfunction. Select a personal computer with a fan for circulating the heat in the personal computer, or a personal computer to which a fan can be mounted.

(5) Personal computer vibration
If the expansion slot on the personal computer vibrates greatly, a connector connection fault could occur and result in incorrect operations. Select a personal computer with a fitting for fixing the NC Card, or a personal computer that can be fixed.

<Fixing example>



Precautions for Safety

Always read the specifications issued by the machine maker, this manual, related manuals and enclosed documents before starting installation, operation, programming, maintenance or inspection to ensure correct usage. 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

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.

1. Items related to prevention of electric shocks

⚠ WARNING
⚠ Do not open the front cover while the power is ON or during operation. Failure to observe this could result in electric shocks.
⚠ Do not operate the device with the front cover removed. The high voltage terminals and charged sections will be exposed, and could result in electric shocks.
⚠ Do not remove the front cover even when the power is OFF except for wiring work or periodic inspections. The controller and servo drive unit are charged internally and could result in electric shocks.
⚠ Always wait at least 15 minutes after turning the power OFF and check the voltage with a tester, etc., before starting wiring work or inspections. Failure to observe this could result in electric shocks.
⚠ Ground the 200V Series input controller, servo drive unit and servomotor with Class C or higher protective grounding, and the 400V Series input with Class D or higher protective grounding.
⚠ All wiring work and inspections must be carried out by a qualified electrician.
⚠ Wire the controller, servo drive unit and servomotor after installation. Failure to observe this could result in 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.

2. Items related to prevention of fires

⚠ CAUTION
⚠ Install the controller, servo drive unit, servomotor and regenerative resistor on non-combustible material. Installation directly on or near combustible materials could result in fires.
⚠ If trouble occurs in the servo drive unit, shut off the power at the servo drive unit's input power side. Fires could result if large current continues to flow.
⚠ When using the regenerative resistor, shut off the power with an error signal. The regenerative resistor could abnormally overheat and cause fires due to a regenerative transistor fault, etc.
⚠ Incorrect wiring or connections could damage the device.

3. Items related to prevention of damage

⚠ CAUTION
⚠ Do not apply voltages other than those indicated in the Controller Connection Manual or Specifications Manual for Servo Drive Unit. Failure to observe this could lead to rupture, or damage, etc.
⚠ Do not mistake the terminal connections. Failure to observe this could lead to rupture, or damage, etc.
⚠ Do not mistake the polarity (+, –). Failure to observe this could lead to rupture, or damage, etc.
⃠ Persons wearing medical devices, such as pacemakers, must not be near this unit. The medical device could be affected by electromagnetic waves.
⚠ The servo drive unit fins, regenerative resistor and servomotor, etc., will be hot during operation and for a while after operation is stopped. Touching these sections could result in burns.

4. General Precautions

Always observe the following precautions. Incorrect handling could result in faults, injuries, or electric shocks, etc.

(1) Transportation and installation

⚠ CAUTION
⚠ Correctly transport the product according to its weight.
❗ Use servomotor's suspension bolts only to transport the servomotor.
⃠ Do not use suspension bolts of the servomotor on the machine to transport the machine.
⚠ Do not stack products above the indicated limit.
⚠ Do not hold cables, shaft or detector when transporting the servomotor.
⚠ Do not suspend or hold the controller or servo drive unit by the connected wires or cables when transporting.
⚠ Do not hold the front cover when transporting the controller or servo drive unit. The device could drop.
⚠ When installing, always observe the installation direction and install on a place which can withstand the weight.
⚠ Do not get on the product, or place heavy objects on it.
⚠ Provide the specified distance between the controller, servo drive unit and inner surface of the control panel and between other devices.
⚠ Do not install or operate a controller, servo drive unit or servomotor that is damaged or that has missing parts.
⚠ Take care not to cut hands on the heat radiating fins or metal edges.
⚠ Do not block the intake/outtake ports of the servomotor with cooling fan.
⚠ Do not allow conductive foreign matter such as screws or metal chips or combustible foreign matter such as oil enter the controller, servo drive unit or servomotor.
⚠ The controller, servo drive unit and servomotor are precision devices so do not drop or apply strong impacts on them.
⚠ Do not install the controller operation board where it may be subject to cutting oil.

(2) Wiring

⚠ CAUTION
⚠ Correctly wire this product. Failure to do so could result in servomotor runaway, etc.
⚠ Do not install a phase advancing capacitor, surge absorber or radio noise filter on the output side of the servo drive unit.
⚠ Correctly connect the output side (terminals U, V, W). The servomotor will not operate if incorrectly connected.
⚠ Do not directly connect a commercial power supply to the servomotor. Failure to observe this could lead to faults.
❗ When using an inductive load such as relays, always connect a diode in parallel to the load as a noise measure.
❗ When using a capacitive load such as a lamp, always connect a protective resistor serially to the load to suppress rush currents.
⚠ Do not mistake the direction of the surge absorption diode installed on the DC relay for the control output signal. The signal will not be output due to fault and the protective circuit, such as emergency stop, will be disabled.
⃠ Do not connect or disconnect the connection cables between each unit while the power is ON.
⚠ Securely tighten the cable connector fixing screw or fixing mechanism. Insufficient fixing could result in dislocation during operation.
⏚ Always treat the shield cables indicated in this manual with grounding measures such as cable clamps.
⚠ Separate the signal wire from the drive line/power line when wiring.
⚠ Use wires and cables having a wire diameter, heat resistance level and bending capacity that match the system.
⏚ Ground the device according to the requirements of the country where the device is to be used.
⚠ Wire the heat radiating fins and wires so that they do no contact.

(3) Adjustments

⚠ CAUTION
⚠ Check and adjust each parameter before staring operation. Unpredictable operations could occur depending on the machine.
⚠ Do not make marked adjustments or changes as the operation could become unstable.

(4) Usage methods

⚠ CAUTION
Install an external emergency stop circuit so that the operation can be stopped and the power turns OFF immediately. A contactor, etc., must be used in addition to the shutoff function in the controller.
Turn OFF the power immediately if any smoke, abnormal noise or odor is generated from the controller, servo drive unit or servomotor.
Only a qualified technician may disassemble or repair this product.
Do not modify this product.
Use a noise filter, etc., to reduce the effect of electromagnetic disturbances. Electronic devices used near the servo drive unit could be affected by the electromagnetic disturbances.
Use the controller, servo drive unit, servomotor and regenerative resistor in the designated combination. Failure to observe this could result in fires or faults.
The brakes (magnetic brakes) assembled in the servomotor are used for holding, and must not be used for normal braking.
There may be cases when the magnetic brakes cannot hold the state because of the life or machine structure (when ball screw and servomotor are coupled via a timing belt, etc.). Install a stopping device on the machine side so that safety can be ensured.
After maintenance or inspection, always carry out a trial operation before starting actual operation.
Do not move the machine's movable range during automatic operation. Do not place hands, feet or face near the spindle during rotation.
Use the power (input voltage, input frequency, tolerable instantaneous power failure time) under the power specification conditions given in the Specifications.
Turn the NC Card's power ON before turning the base I/O unit's power ON. If the base I/O unit's power is turned ON first, the current will be led to the NC Card from the connection cable. This will prevent the personal computer or the cards in the personal computer from starting up properly.

(5) Measures during a fault

⚠ CAUTION
If a hazardous situation could arise during a power failure or product fault, use the servomotor with magnetic brakes or provide an external brake mechanism for holding purposes.
Use a double circuit structure for the magnetic brake's operation circuit so that the brakes will activate even when the external emergency stop signal is issued.
If an alarm occurs, remove the cause, and secure surrounding safety before resetting the alarm and restarting operation.
The machine could suddenly restart when power is restored after an instantaneous power failure. Do not near the machine in this case. (Design the machine so that operator safety can be ensured even if the machine restarts.)

(6) Maintenance, inspection and part replacement

⚠ CAUTION
⚠ The electrolytic capacitor's capacity will drop due to deterioration. To prevent secondary damage due to capacitor's faults, Mitsubishi recommends replacing the electrolytic capacitor after approx. five years when used in a general environment. Contact the Service Center or Service Station for replacements.
⚠ Do not perform a megger test (insulation resistance measurement) during inspection.
❗ Save the machining programs, tool data and parameters with an input/output device before replacing the battery.
⚠ Do not short-circuit, charge, overheat, incinerate or disassemble the battery.
⚠ The hard disk unit has a service life, and must be replaced when the life is reached.
⚠ Always back up the customer's data stored on the hard disk unit. The customer's data stored on the hard disk unit cannot be guaranteed.

(7) Disposal

⚠ CAUTION
⚠ Handle this product as general industrial waste. Note that some of the MDS Series products use alternate Freon. These corresponding models must not be handled as general industrial waste and must always be returned to the Service Center or Service Station. (Corresponding models have heat radiating fins on the back of the unit.)
⚠ Do not disassemble the controller, servo drive unit or servomotor parts.
⚠ Collect and dispose of the spent batteries according to local laws.

(8) General precautions

⚠ CAUTION
To explain the details, drawings given in this instruction manual, etc., may show the unit with the cover or safety partition removed. When operating the product, always install the cover or partitions at their original position, and operate as indicated in the instruction manual, etc.

CONTENTS

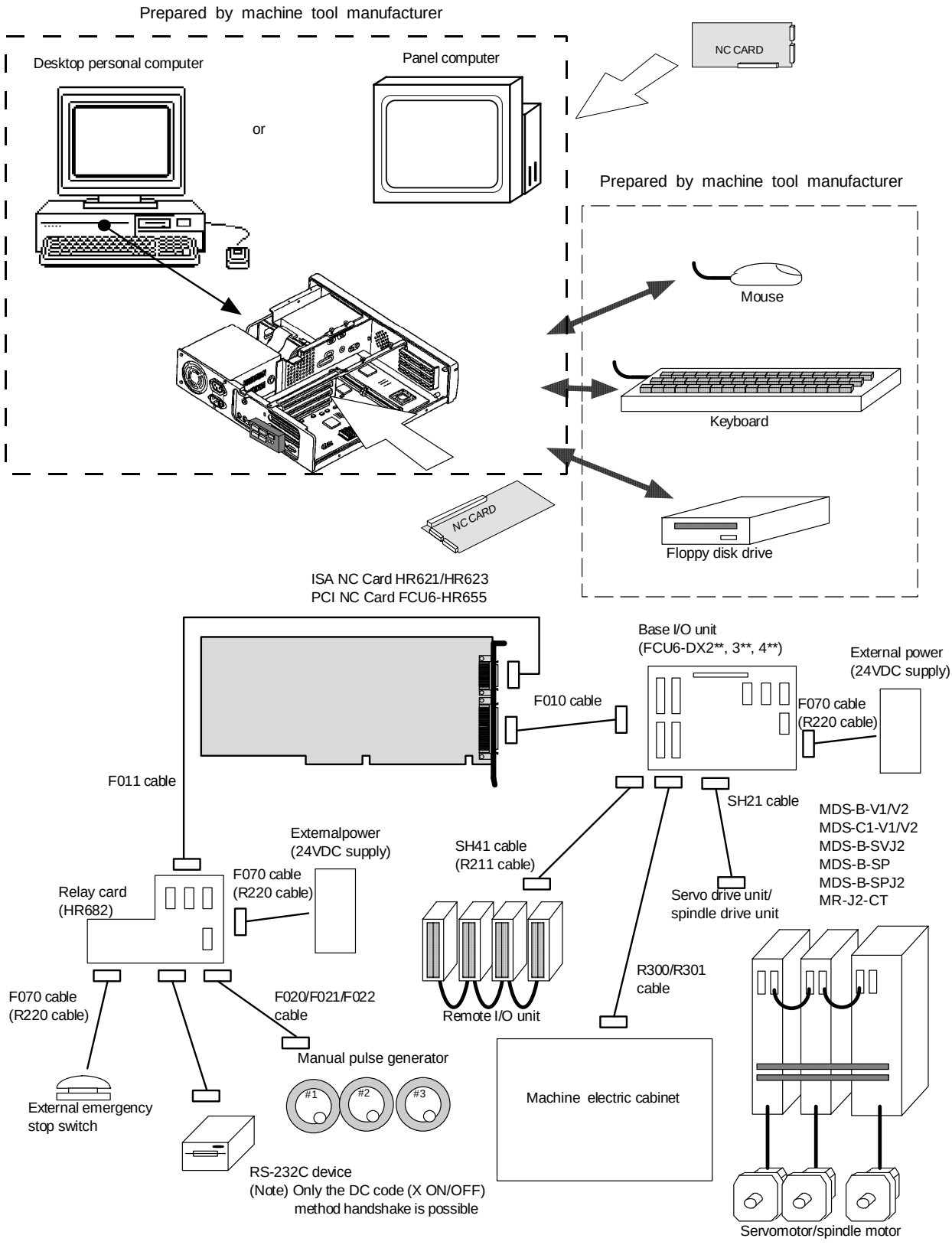
1. Outline

This manual explains MELDASMAGIC64 installation and connection methods centered on the NC Card.
By installing this NC Card in a personal computer expansion slot (ISA bus or PCI bus), and connecting a servo drive unit, servomotor, etc., a custom-made NC unit can be constructed.
This manual assumes that all functions are added, but the actually delivered device may not have all functions.
Refer to the following documents for explanations on the functions.

MELDASMAGIC64 Setup Instruction Manual BNP-B2191
MELDASMAGIC64 Maintenance Manual BNP-B2207
MELDAS AC Servo and Spindle MDS-A/B Series Specifications Manual BNP-B3759
MELDAS AC Servo and Spindle MDS-C1 Series Specifications Manual BNP-C3000
MELDAS AC Servo and Spindle MDS-CH Series Specifications Manual BNP-C3016
MELDAS AC Servo MDS-B-SVJ2 Series Specification Manual BNP-B3937
MELDAS AC Servo MDS-B-SPJ2 Series Specification Manual BNP-B2164

2. Configuration

2.1 System Configuration



2.2 List of Configuration Units

1. NC Card

Type		Configuration elements	Details
HR621	NC Card installed in an ISA bus personal computer	HR621	CPU PCB
HR623	NC Card installed in an ISA bus personal computer	HR623	CPU PCB
FCU6-HR655	NC Card installed in an PCI bus personal computer	HR183	CPU PCB
		HR655	I/F PCB

2. I/O unit (1)

Type		Configuration elements	Details
HR682	HANDLE, ENC, RS-232C, emergency stop switch input I/F RS-232C uses only the DC code (X ON/OFF) method handshake.	HR682	With metal spacers. Add-on to FCU6-DX2** possible.
FCU6-DX210	DI (sink/source)/DO (sink) = 48/48 With servo, RIO, SKIP, ENC I/F	HR325 Aluminum die cast	
FCU6-DX310	DI (sink/source)/DO (sink) = 80/64 With servo, RIO, SKIP, ENC I/F	HR325 RX323-1 Aluminum die cast	Base PCB: DI (sink/source)/DO (sink) = 48/48 Add-on PCB: DI (sink/source)/DO (sink) = 32/16
FCU6-DX320	DI (sink/source)/DO (sink) = 80/64 With servo, RIO, SKIP, ENC I/F Analog output 1 point	HR325 RX323 Aluminum die cast	Base PCB: DI (sink/source)/DO (sink) = 48/48 Add-on PCB: DI (sink/source)/DO (sink) = 32/16 Analog output 1 point
FCU6-DX330	DI (sink/source)/DO (sink) = 48/48 With servo, RIO, SKIP, ENC I/F Manual pulse 2ch	HR325 RX331 Aluminum die cast	Base PCB: DI (sink/source)/DO (sink) = 48/48 Add-on PCB: Manual pulse generator 2ch
FCU6-DX340	DI (sink/source)/DO (sink) = 48/48 With servo, RIO, SKIP, ENC I/F Analog input 4 points, analog output 1 point	HR325 RX341 Aluminum die cast	Base PCB: DI (sink/source)/DO (sink) = 48/48 Add-on PCB: Analog input 4 points, analog output 1 point
FCU6-DX220	DI (sink/source)/DO (sink) = 64/64 With servo, RIO, SKIP, ENC I/F	HR327 Aluminum die cast	
FCU6-DX410	DI (sink/source)/DO (sink) = 96/80 With servo, RIO, SKIP, ENC I/F	HR327 RX323-1 Aluminum die cast	Base PCB: DI (sink/source)/DO (sink) = 64/64 Add-on PCB: DI (sink/source)/DO (sink) = 32/16
FCU6-DX420	DI (sink/source)/DO (sink) = 96/80 With servo, RIO, SKIP, ENC I/F Analog output 1 point	HR327 RX323 Aluminum die cast	Base PCB: DI (sink/source)/DO (sink) = 64/64 Add-on PCB: DI (sink/source)/DO (sink) = 32/16 Analog output 1 point
FCU6-DX430	DI (sink/source)/DO (sink) = 64/64 With servo, RIO, SKIP, ENC I/F Manual pulse 2ch	HR327 RX331 Aluminum die cast	Base PCB: DI (sink/source)/DO (sink) = 64/64 Add-on PCB: Manual pulse generator 2ch
FCU6-DX440	DI (sink/source)/DO (sink) = 64/64 With servo, RIO, SKIP, ENC I/F Analog input 4 points, analog output 1 point	HR327 RX341 Aluminum die cast	Base PCB: DI (sink/source)/DO (sink) = 64/64 Add-on PCB: Analog input 4 points, analog output 1 point
FCU6-DX211	DI (sink/source)/DO (source) = 48/48 With servo, RIO, SKIP, ENC I/F	HR335 Aluminum die cast	
FCU6-DX311	DI (sink/source)/DO (source) = 80/64 With servo, RIO, SKIP, ENC I/F	HR335 RX324-1 Aluminum die cast	Base PCB: DI (sink/source)/DO (source) = 48/48 Add-on PCB: DI (sink/source)/DO (source) = 32/16
FCU6-DX321	DI (sink/source)/DO (source) = 80/64 With servo, RIO, SKIP, ENC I/F Analog output 1 point	HR335 RX324 Aluminum die cast	Base PCB: DI (sink/source)/DO (source) = 48/48 Add-on PCB: DI (sink/source)/DO (source) = 32/16 Analog output 1 point
FCU6-DX331	DI (sink/source)/DO (source) = 48/48 With servo, RIO, SKIP, ENC I/F Manual pulse 2ch	HR335 RX331 Aluminum die cast	Base PCB: DI (sink/source)/DO (source) = 48/48 Add-on PCB: Manual pulse generator 2ch
FCU6-DX341	DI (sink/source)/DO (source) = 48/48 With servo, RIO, SKIP, ENC I/F Analog input 4 points, analog output 1 point	HR335 RX341 Aluminum die cast	Base PCB: DI (sink/source)/DO (source) = 48/48 Add-on PCB: Analog input 4 points, analog output 1 point
FCU6-DX221	DI (sink/source)/DO (source) = 64/64 With servo, RIO, SKIP, ENC I/F	HR337 Aluminum die cast	
FCU6-DX411	DI (sink/source)/DO (source) = 96/80 With servo, RIO, SKIP, ENC I/F	HR337 RX324-1 Aluminum die cast	Base PCB: DI (sink/source)/DO (source) = 64/64 Add-on PCB: DI (sink/source)/DO (source) = 32/16
FCU6-DX421	DI (sink/source)/DO (source) = 96/80 With servo, RIO, SKIP, ENC I/F Analog output 1 point	HR337 RX324 Aluminum die cast	Base PCB: DI (sink/source)/DO (source) = 64/64 Add-on PCB: DI (sink/source)/DO (source) = 32/16 Analog output 1 point
FCU6-DX431	DI (sink/source)/DO (source) = 64/64 With servo, RIO, SKIP, ENC I/F Manual pulse 2ch	HR337 RX331 Aluminum die cast	Base PCB: DI (sink/source)/DO (source) = 64/64 Add-on PCB: Manual pulse generator 2ch
FCU6-DX441	DI (sink/source)/DO (source) = 64/64 With servo, RIO, SKIP, ENC I/F Analog input 4 points, analog output 1 point	HR337 RX341 Aluminum die cast	Base PCB: DI (sink/source)/DO (source) = 64/64 Add-on PCB: Analog input 4 points, analog output 1 point

2. I/O unit (2)

Type		Configuration elements	Details
RX323-1	DI (sink/source)/DO (sink)=32/16	RX323-1	Add-on PCB
RX323	DI (sink/source)/DO (sink)=32/16 Analog output 1 point	RX323	Add-on PCB
RX324-1	DI (sink/source)/DO (source)=32/16	RX324-1	Add-on PCB
RX324	DI (sink/source)/DO (source)=32/16 Analog output 1 point	RX324	Add-on PCB
RX331	Manual pulse generator 2ch	RX331	Add-on PCB
RX341	Analog input 4 points, Analog output 1 point	RX341	Add-on PCB
FCUA-DX100	DI (sink/source)/DO (sink)=32/32	RX311	Base PCB: DI (sink/source)/DO (sink)=32/32
		Case	
FCUA-DX110	DI (sink/source)/DO (sink)=64/48	RX311	Base PCB: DI (sink/source)/DO (sink)=32/32
		RX321-1	Add-on PCB: DI (sink/source)/ DO (sink)=32/16
		Case	
FCUA-DX120	DI (sink/source)/DO (sink)=64/48 Analog output 1 point	RX311	Base PCB: DI (sink/source)/DO (sink)=32/32
		RX321	Add-on PCB: DI (sink/source)/ DO (sink)=32/16 Analog output 1 point
		Case	
FCUA-DX130	DI (sink/source)/DO (sink)=32/32 Manual pulse 2ch	RX311	Base PCB: DI (sink/source)/DO (sink)=32/32
		RX331	Add-on PCB: Manual pulse generator 2ch
		Case	
FCUA-DX140	DI (sink/source)/DO (sink)=32/32 Analog input 4 points, Analog output 1 point	RX311	Base PCB: DI (sink/source)/DO (sink)=32/32
		RX341	Add-on PCB: Analog input 4 points, analog output 1 point
		Case	
FCUA-DX101	DI (sink/source)/ DO (source)=32/32	RX312	Base PCB: DI (sink/source)/DO (source)=32/32
		Case	
FCUA-DX111	DI (sink/source)/ DO (source)=64/48	RX312	Base PCB: DI (sink/source)/DO (source)=32/32
		RX322-1	Add-on PCB: DI (sink/source)/ DO (source)=32/16
		Case	
FCUA-DX121	DI (sink/source)/ DO (source)=64/48 Analog output 1 point	RX312	Base PCB: DI (sink/source)/DO (source)=32/32
		RX322	Add-on PCB: DI (sink/source)/ DO (source)=32/16 Analog output 1 point
		Case	
FCUA-DX131	DI (sink/source)/ DO (source)=32/32 Manual pulse 2ch	RX312	Base PCB: DI (sink/source)/DO (source)=32/32
		RX331	Add-on PCB: Manual pulse generator 2ch
		Case	
FCUA-DX141	DI (sink/source)/ DO (source)=32/32 Analog input 4 points, Analog output 1 point	RX312	Base PCB: DI (sink/source)/DO (source)=32/32
		RX341	Add-on PCB: Analog input 4 points, analog output 1 point
		Case	

3. Peripheral devices

Type		Configuration elements	Details
HD60C	Manual pulse generator		Without MELDAS logo
HD60C-1	Manual pulse generator		With MELDAS logo
Grounding plate D			Grounding plate D set
Grounding plate E			Grounding plate E set

4. Operation unit options

Type		Configuration elements	Details
FCU6-HR211	I/O branch plate	HR211 card	
FCU6-HR251	IC card interface	HR251 card	

3. Installation

3.1 General Specifications

NC Card peripheral environment conditions

Type name			HR621/HR623	FCU6-HR655	HR682
Unit name			NC Card		Relay card
General specifications	Ambient temperature	During operation	0~55°C		
		During storage	-20~60°C		
	Ambient humidity	During operation	40~75% RH (with no dew condensation)		
		During storage	40~75% RH (with no dew condensation)		
	Working atmosphere		No corrosive gas or dust		
Power specifications	Power voltage		–	3.3VDC ± 5%	24VDC ± 5% Ripple ± 5% (P-P)
			5VDC ± 2%		
			12VDC ± 2%		
	Current consumption	3.3V	–	0.2A (max)	–
		5V	2.5A (max)		–
		12V	0.5A (max)	0.7A (max)	–
		24V	–		0.5A (max)
	Power drop characteristics		Personal computer 5V: 4.5V →4.0V is 1ms or more (*1)		–
Heating value			19W	22W	12W
Unit size			248.9×107.6×20 (mm)	174.63×106.68×21 (mm)	115×156×30 (mm) (*2)

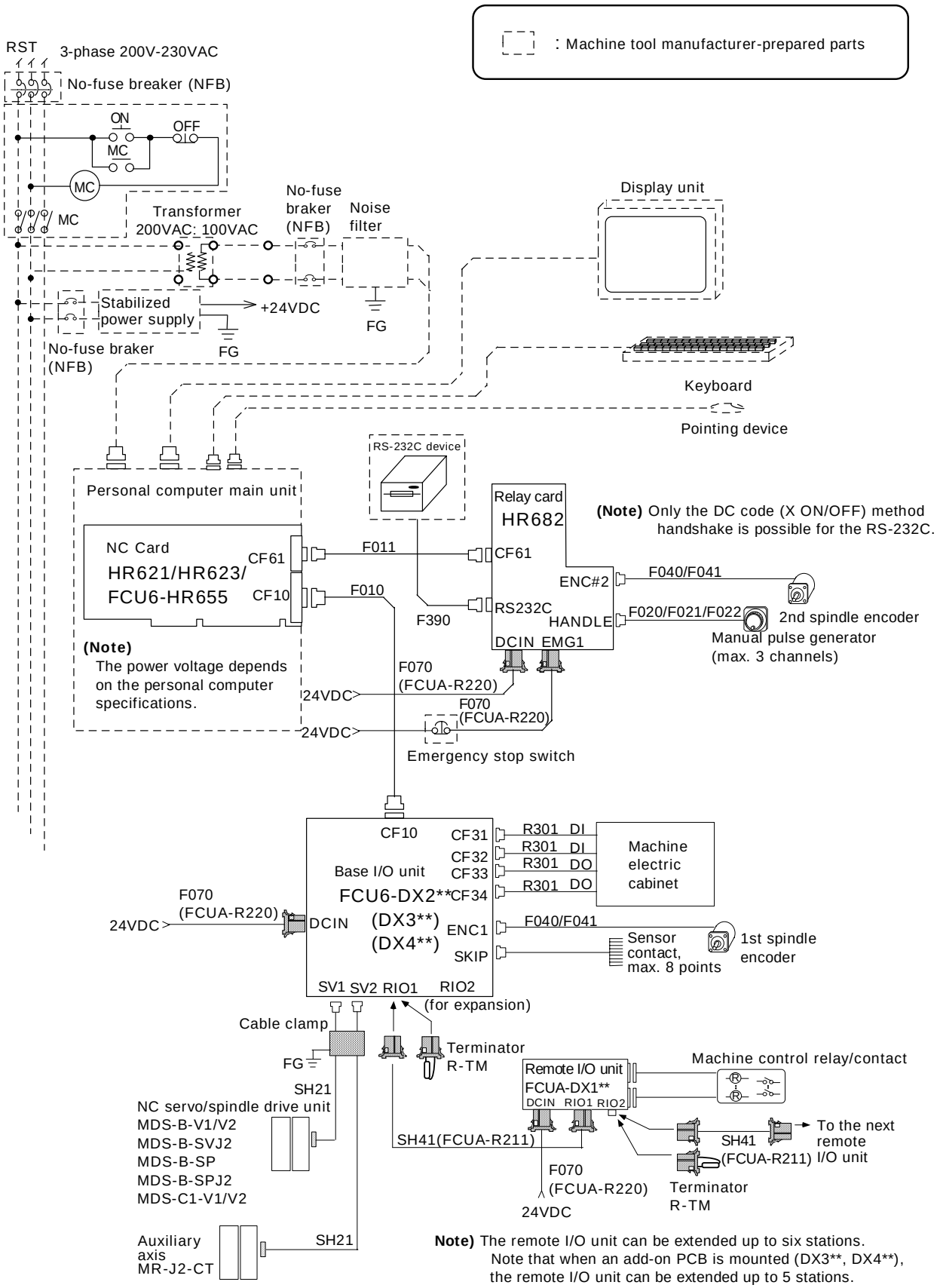
(*1) If these characteristics are not satisfied, the NC Card cannot back up the absolute position information of the machine position when the power is turned OFF.
(*2) Excluding spacers

Environmental conditions in electric cabinet

Type name			FCU6-DX210, FCU6-DX211	FCU6-DX220, FCU6-DX221
Unit name			Base I/O unit	
General specifications	Ambient temperature	During operation	0~55°C	
		During storage	-20~60°C	
	Ambient humidity	During operation	45~75% RH (with no dew condensation)	
		During storage	45~80% 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 gas or dust	
Power specifications	Power voltage		24VDC ± 5% Ripple ± 5% (P-P)	
	Current consumption		5V 1A (max), 24V 3.6A (max) (*3)	5V 1A (max), 24V 4.8A (max) (*3)
Heating value			90W (*3)	110W (*3)
Mass			2.0kg	
Unit size			220×168×35 (mm)	

(*3) When all DO points are ON

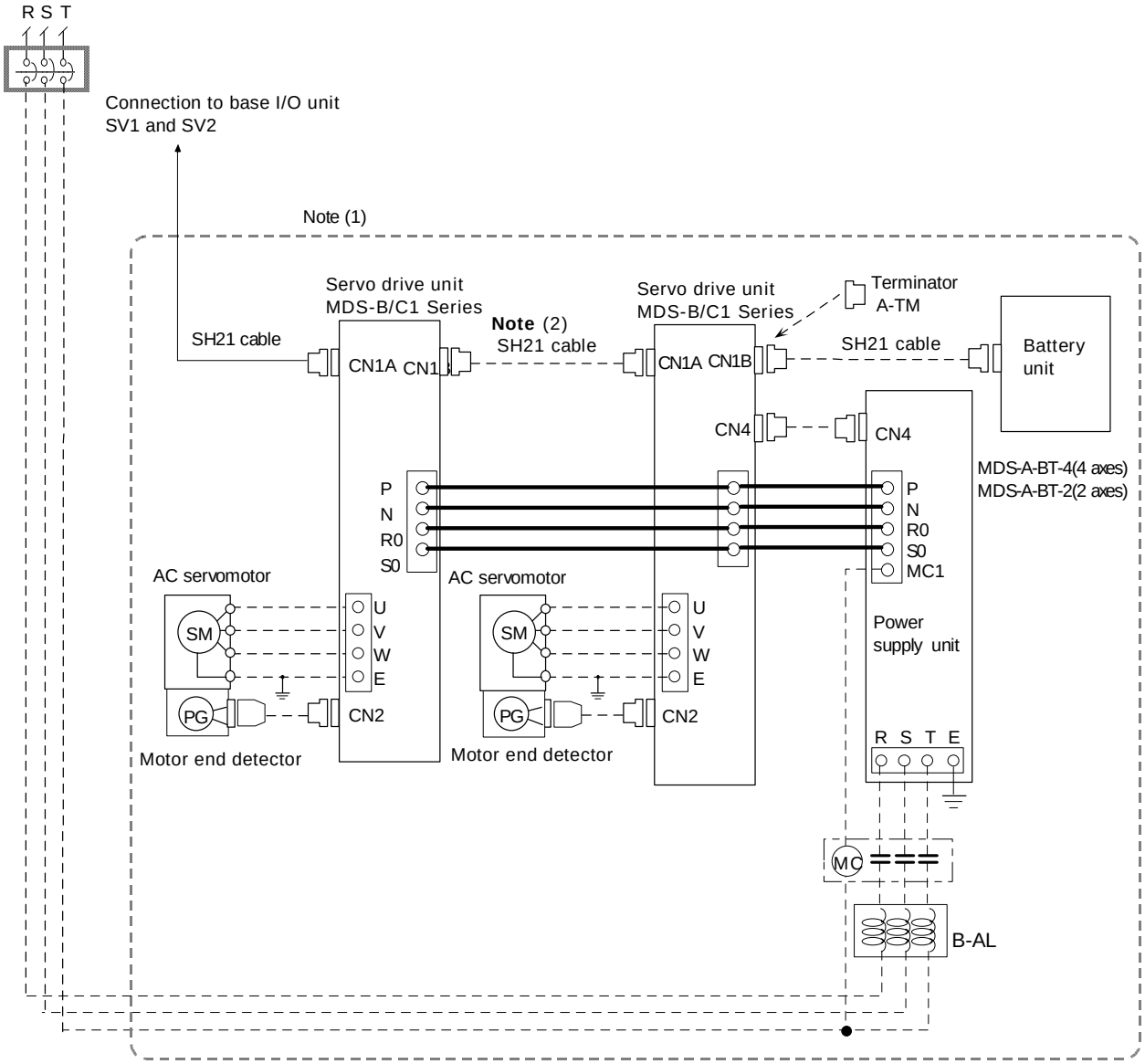
3.2 General System Diagram



⚠ CAUTION

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

Example of connection when using V1/V2 in the drive section



(Note) (1) Drive section connections differ according to the configuration of the servo drive unit and motor used.
(2) When connecting the spindle drive unit, set the axis No. to the value after the last servo axis.
(3) Connect the last axis (the axis to be connected to the battery unit) to the power supply unit.
(4) When using a terminator, connect to the last axis.
(5) Always wire the control unit's signal wire away from the drive section's drive lines/power lines.

⚠CAUTION

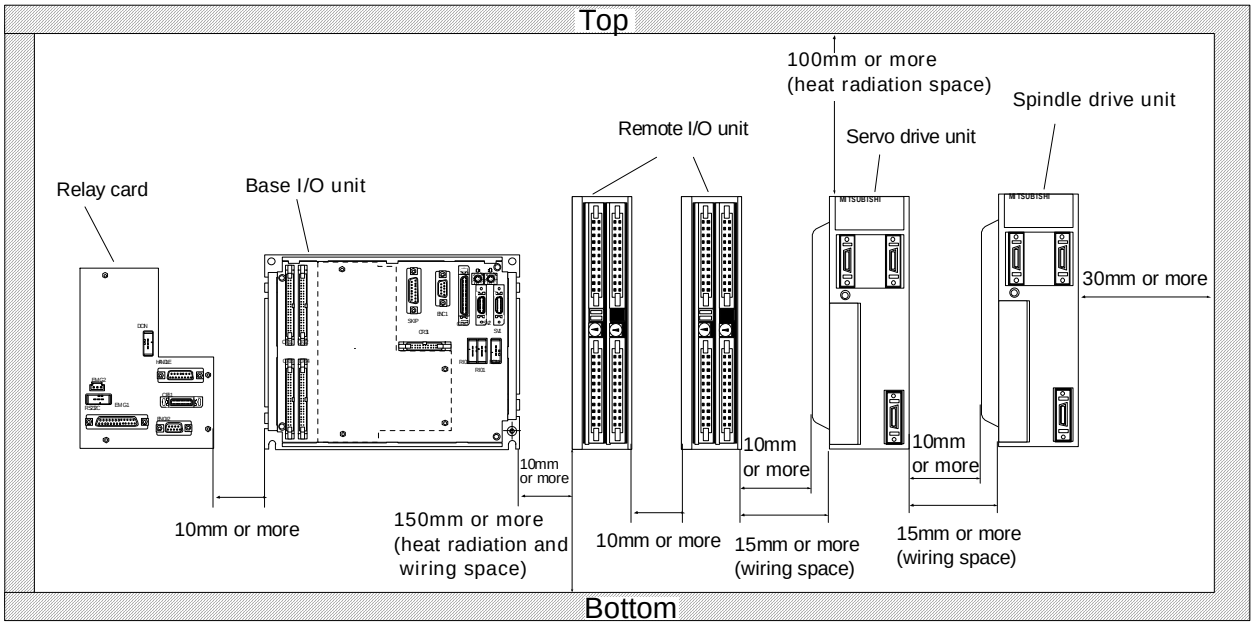
⚠ **Separate the signal wire from the drive line/power line when wiring.**

3.3 Installation

3.3.1 Installation Direction and Spacing

Each unit is installed in a sealed structure electric cabinet as a principle. Observe the following points when installing into the electric cabinet.

(1) Install each unit vertically, so that it is visible from the front.
(2) Consider the heat radiation and wiring of each unit. Refer to the following drawing, and secure space for ventilation.
(3) Install the personal computer main unit paying particular attention to the specification conditions of the selected personal computer.



(Note) The relay card can be added on to the base I/O unit. Refer to "6.6 Installation to the Base I/O Unit" for the installation method when adding on.

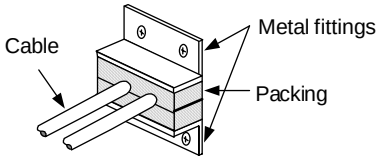
⚠CAUTION

⚠ **Always observe the direction of installation.**

3.3.2 Prevention of Foreign Matter Entry

(1) The inside of each unit is densely mounted, and is sensitive to dust, etc. Always design a sealed structure electric cabinet, and execute the following measures.

- Carry out dust-proofing and oil-proofing measures such as sealing the cable inlets with packing.
- Be particularly careful that outside air does not enter the electric cabinet through heat radiation holes, etc.
- Seal all gaps.
- Securely install the door packing.
- Always install packing around any back cover (when present).
- Oil can easily accumulate in screw holes on top of the electric cabinet and penetrate into the electric cabinet. Therefore, carry out special countermeasures such as using oil-proof packing.



Cable inlet (example)

(2) After installing each unit, avoid any tool machining in the area surrounding those units. Cutting chips, etc., may adhere to electronic parts and cause a failure.

(3) Design the electric cabinet so the internal temperature will rise no more than 10°C (target value 5°C or less) over the ambient temperature, and will stay within the temperature conditions of the personal computer, NC Card, etc. (Refer to "3.3.3 Heat Radiation Countermeasures" for details.) Use a panel cooler when required.

(4) The personal computer display unit may not operate normally due to external magnetic fields. Separate magnetism producing sources (transformers, fans, magnetic switches, solenoid relays, magnet stands, magnetic workpieces, power lines flowing a large current, etc.) from the display unit by 200mm or more.
Note that the magnetism produced by these magnetism producing sources differs individually, and will also differ according to the installation direction, etc. Therefore, the display unit may not operate properly even when separated by 200mm or more from these sources. When determining the layout of magnetism producing sources, also consider the direction, etc., of the magnetism produced, and finally confirm by actual operation of the machine.

⚠CAUTION

⚠ **Make sure that conductive foreign matter (screws, metal pieces, etc.) and flammable foreign matter (oil, etc.) does not enter inside any unit.**

3.3.3 Heat Radiation Countermeasures

In normal NC units, the electric cabinet thermal design is so the electric cabinet ambient temperature is a 0 to 45°C usage condition, and the electric cabinet internal temperature rise is 10°C. However, these conditions do not necessarily apply in MELDASMAGIC64.
This is because the operation of all Mitsubishi-supplied units, including the NC Card, is guaranteed up to 55°C, but the operation of the personal computer is not necessarily guaranteed up to 55°C.
Thus, the electric cabinet ambient temperature must first be determined as shown below.

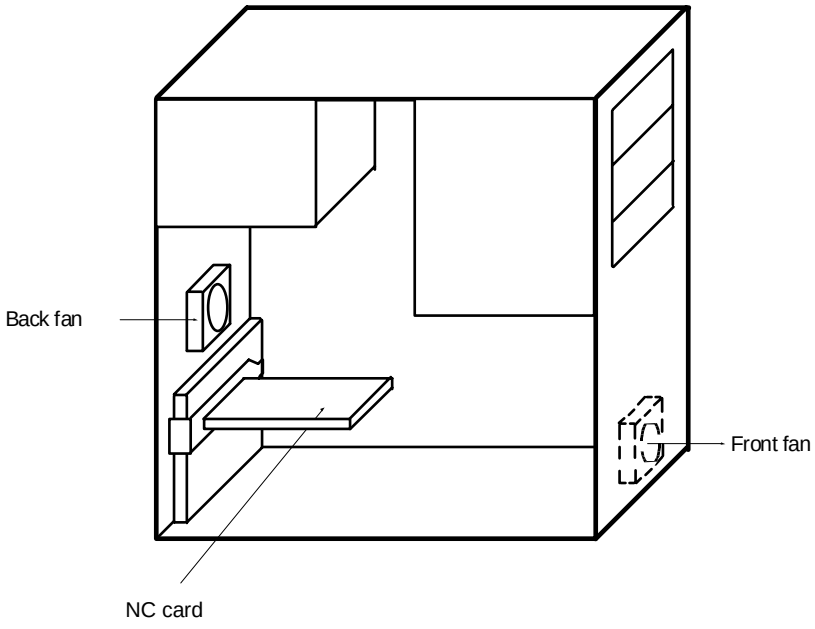
(1) Determine the electric cabinet ambient temperature T_a.
Ex. 0 to 35°C

(2) Determine the internal temperature rise ΔT.
Ex. 5°C

(3) Select a personal computer.
When T_a max. = 35°C and ΔT = 5°C, the personal computer must have a guaranteed operating temperature of 40°C or more (45°C or more for a margin of safety).

(4) In this example, the average temperature in the electric cabinet will be 40°C or less according to (1) and (2).

(Note) 1. When heat accumulates in upper areas, etc., of the unit, circulate the air inside the electric cabinet using a circulation fan.
2. Use an electric cabinet cooler when required.
Use an electric cabinet cooler type that does not take outside air into the electric cabinet.
3. If the personal computer's heat builds up in the personal computer, circulate the air in the personal computer with a fan.



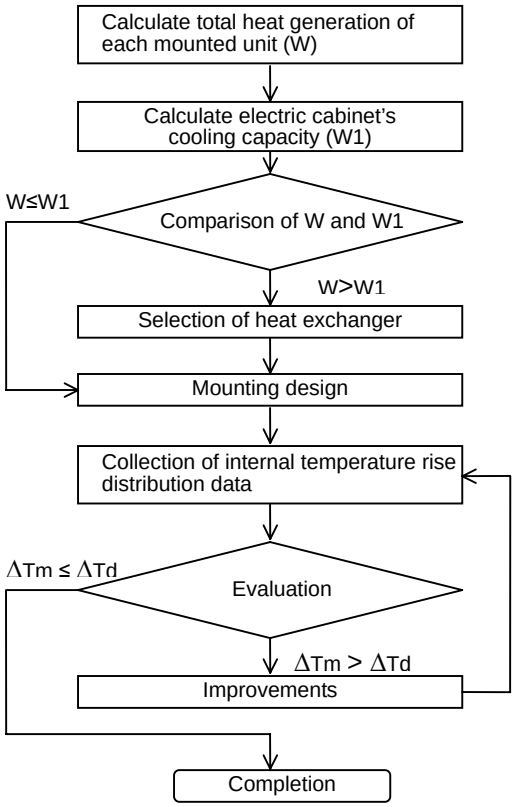
Please refer to following method for heat radiation countermeasures method.

Example of heat radiation countermeasures

<Hypothetical conditions>

(1) Electric cabinet ambient temperature : T_a
(2) Internal temperature rise value : ΔT_d
(The value for the conventional NC is 10°C, but this temperature must be set to 10°C or less (target value 5°C) for the MELDASMAGIC64.)
(3) Average temperature in electric cabinet : $T_a + \Delta T_d$

Procedures for heat design and verification



<Supplement>

(1) Refer to "3.1 General Specifications" for the heat generated by each unit.
(2) Enclosed electric cabinet (thin steel plate) cooling capacity calculation equation

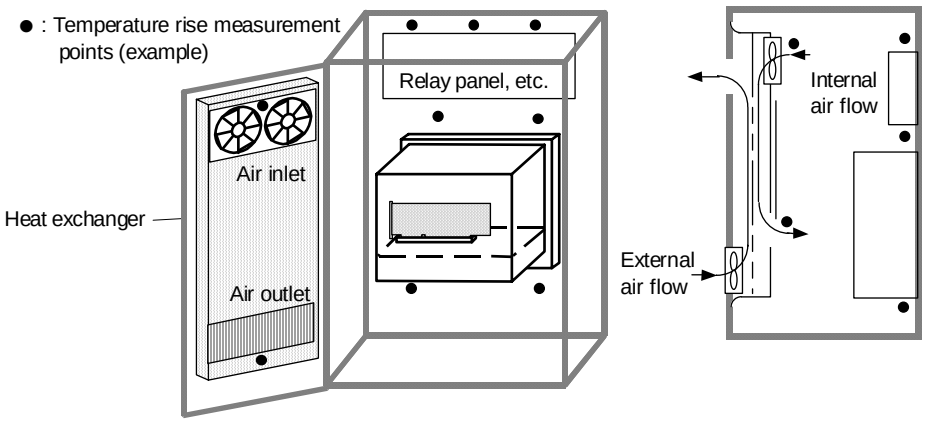
$W1 = U \times A \times \Delta T_d$
U : $6W/m^2 \times °C$ with internal circulation fan
$4W/m^2 \times °C$ without internal circulation fan
A : Effective heat radiation area (m^2)
(Area where heat can be radiated from electric cabinet)

<Caution>
When calculating the effective heat radiation area, do not include the parts that contact other objects.

(3) Points of caution for heat radiation countermeasures when designing mounting state
* Consider convection in electric cabinet (eliminate heat spots)
* Collect hot air at suction port in heat exchanger panel.

(4) Evaluation standards for internal temperature rise distribution data
ΔTm (average value) $\leq \Delta T_d$
ΔT_m max (maximum value) $\leq (\Delta T_d + 5)$ °C
R (inconsistency ΔT_m max - ΔT_m min) ≤ 6°C
(Evaluate existence of heat spots)
ΔT_m: Internal temperature rise measurement value

Mounting example and introduction to temperature (ΔT) measurement locations (reference)

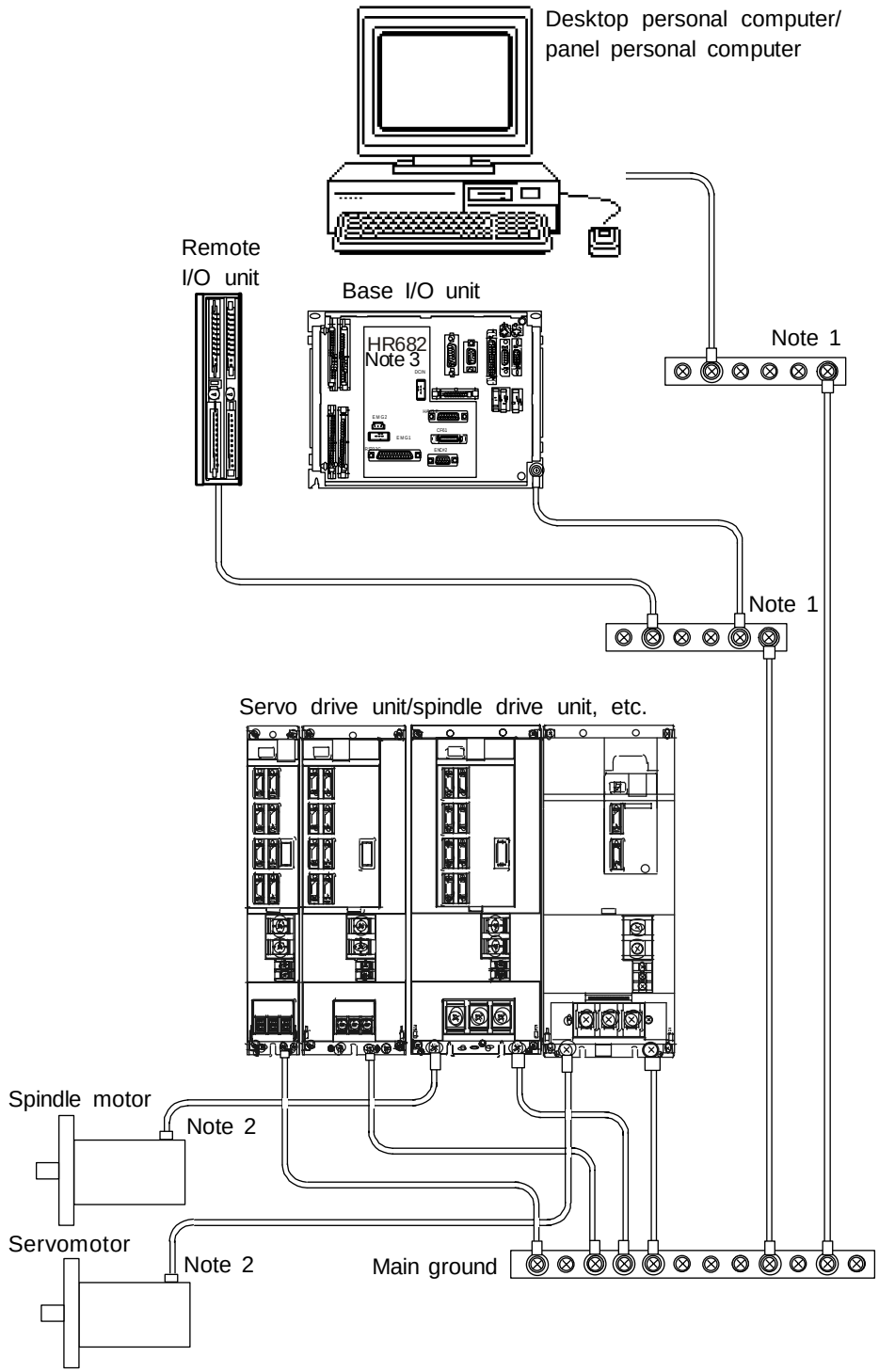


3.3.4 Noise Countermeasures

(1) Connection of frame ground (FG)

The frame should basically be grounded at one earth point. When relaying through the grounding plate in the middle of the connection route, separate the desktop personal computer/panel personal computer from the remote I/O unit, and the base I/O unit from the servo drive unit/spindle drive unit, etc.

The NC Card FG is connected to the personal computer electric cabinet with card installation metal fittings.



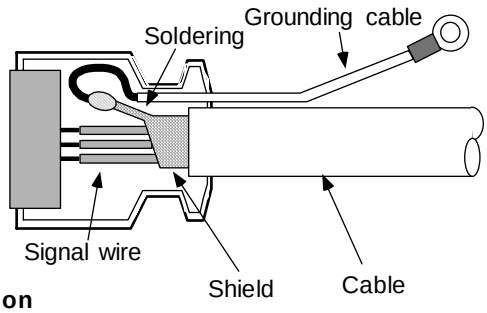
Note 1: This is not required when directly connecting to the main ground.
Note 2: Connect the motor's grounding cable to the servo drive unit and spindle drive unit.
Note 3: A spacer is used when mounting the HR682 card on the base I/O unit, but when not mounting on the base I/O unit, connect the card to the main ground using the FG terminal.

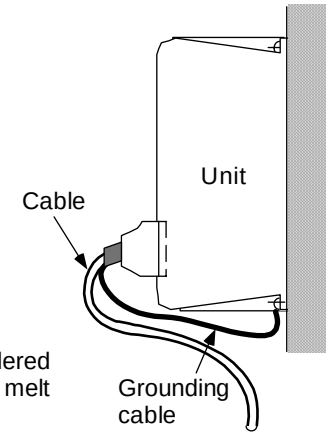
(2) Shield clamping of cables

The shield of the shield cable connected to the base I/O unit, servo drive unit and spindle drive unit must be connected to the grounding plate to stabilize operation while preventing malfunctioning due to noise.
The shield can be connected to the grounding plate with lead wires or clamp fittings. Refer to the following drawings to treat the shield cable.

Example of connection with lead wire

Example of lead wire treatment

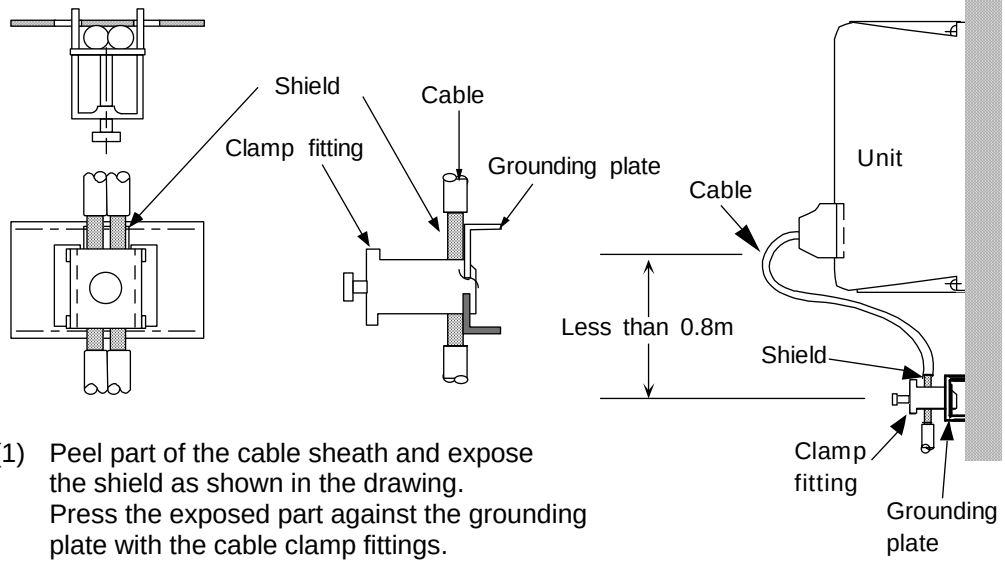




Caution

When soldering the grounding cable to the shield, if the soldered section is close to the shield, the signal wire's sheath could melt by the soldering heat resulting in a short-circuit.
Solder at a place 10 to 20mm away from the mesh section.

Example of connection with clamp fitting



(1) Peel part of the cable sheath and expose the shield as shown in the drawing. Press the exposed part against the grounding plate with the cable clamp fittings.
(2) If the cable is thin, clamp several together in a bunch.
(3) Use adequate force when tightening the cable so that the wire material is not damaged.
(4) Connect each grounding plate together and ground them at one point.

When manufacturing the clamp fittings and grounding plate, refer to "Appendix 1.10 Grounding Plate and Clamp Fitting Outline Drawings". These can also be ordered from Mitsubishi.

⚠CAUTION

- **Execute ground treatment by cable clamps, etc., for the shielded cable indicated in this instruction manual.**

Cables which require shield clamp with a connector cases are shown following table.

<Shield clamp method>

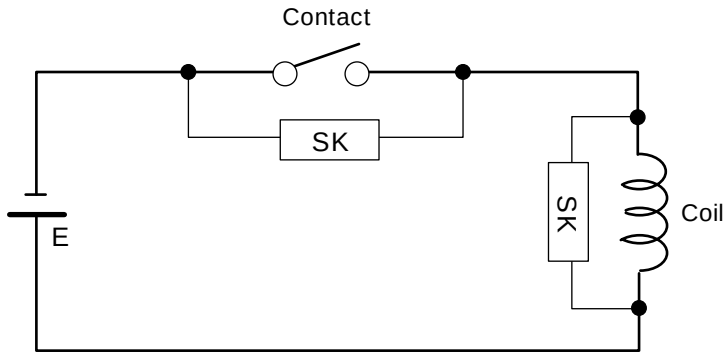
Fold the wire material shield over the sheath, and wrap copper foil tape over it. Connect the wrapped copper foil tape to the connector case GND plate.

Unit name	Connector name	Connection destination	Treatment of cable ends	
			Connection origin	Connection destination
NC Card (HR621/HR623/ FCU6-HR655)	CF10 CF61	Base I/O unit Relay card	(NC Card) Not required (NC Card) Not required	Not required Not required
Base I/O unit (FCU6-DX2**, 3**, 4**)	CF10 SV1 SV2 ENC1 SKIP PI01 PI02	NC Card Servo drive unit Servo drive unit Spindle encoder Skip Remote I/O unit Remote I/O unit	(Base I/O unit) Not required (Base I/O unit) Required (Base I/O unit) Required (Base I/O unit) Required (Base I/O unit) Required (Base I/O unit) Required (Base I/O unit) Required	Not required Not required Not required Not required Not required Not required Not required
Relay card (HR682)	CF61 ENC#2 HANDLE RS232C	NC Card Spindle encoder Manual pulse generator RS-232C (I/O device) **(Note)**	(Relay card) Not required (Relay card) Required (Relay card) Required (Relay card) Required	Not required Not required Not required Not required

(Note) RS-232C uses only the DC code (X ON/OFF) method handshake.

(3) Connecting Spark Killers

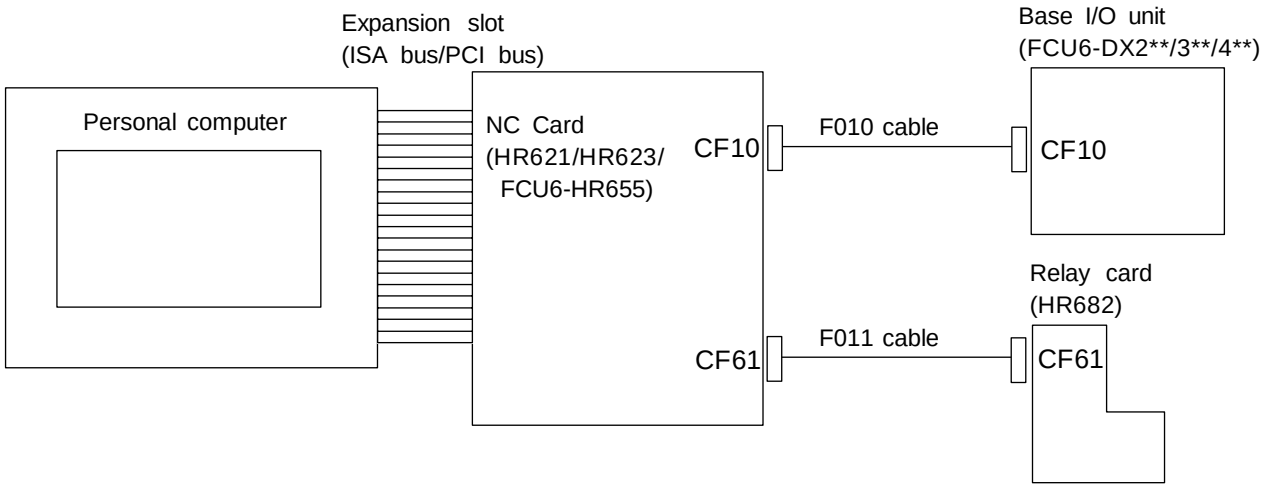
Connect a spark killer on the coil or relay contact in parallel for noise countermeasures.
Use spark killers which are 0.033~0.1µF, 10~120Ω.



4. NC Card (HR621/HR623/FCU6-HR655) Connection

4.1 NC Card Connection System Diagram

The NC Card is connected to the personal computer with the expansion slot (ISA bus or PCI bus). The base I/O unit and relay card are connected with a cable.

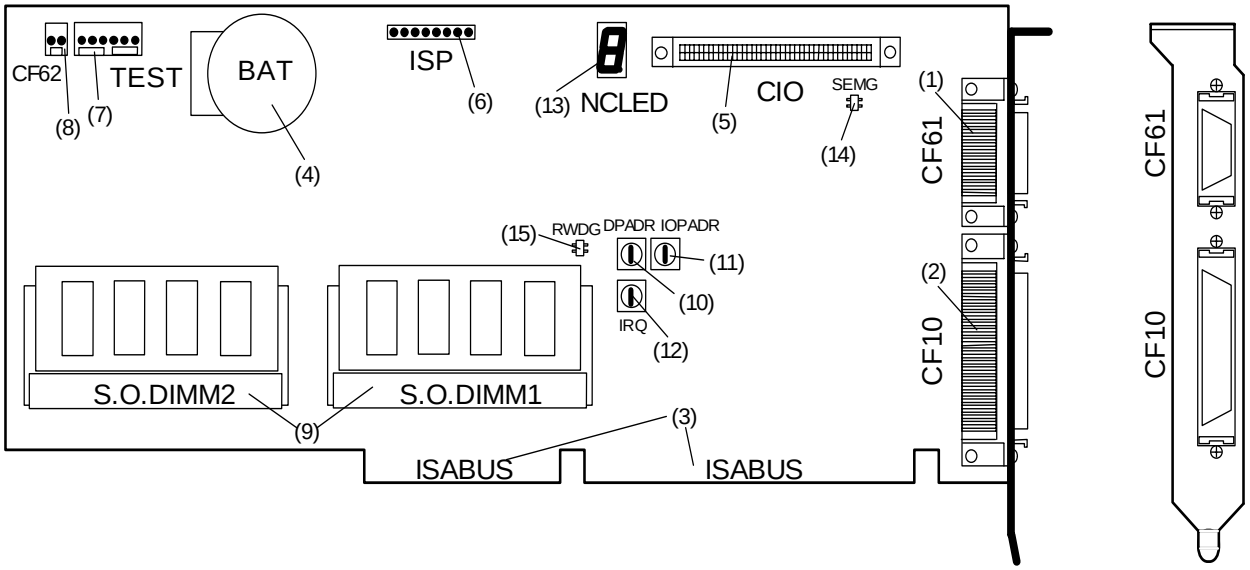


⚠ CAUTION

⚠ **Turn the NC Card's power ON before turning the base I/O unit's power ON.**
If the base I/O unit's power is turned ON first, the current will be led to the NC Card from the connection cable. This will prevent the personal computer or the cards in the personal computer from starting up properly.

4.2 NC Card Part Names

4.2.1 Names of HR621 Card Parts



List of connectors

No.	Name	Function details
(1)	CF61	This is used in the connection with the relay card (HR682). An F011 cable is connected.
(2)	CF10	This is used in the connection with the base I/O unit (DX2**, 3**, 4**). An F010 cable is connected.
(3)	ISABUS	This is connected to the personal computer expansion slot (ISA bus).
(4)	BAT	This is a battery holder. A Toshiba battery CR2450 is installed.
(5)	CIO	This is a connector for expansion.
(6)	ISP	Not used.
(7)	TEST	Not used.
(8)	CF62	Not used.
(9)	S.O. DIMM1, 2	This is the MAGIC 64 memory module connector. Do not remove the memory module.

List of rotary switches

No.	Name	Function details
(10)	DPADR	This is used in the address assignment setting of the personal computer expansion region.
(11)	IOPADR	This is used in the address assignment setting of the personal computer I/O port region.
(12)	IRQ	This is used in the level setting of the interrupt request signal to the personal computer CPU.

(Note) Refer to "4.4 ISA NC Card Mounting" for details on setting rotary switches.

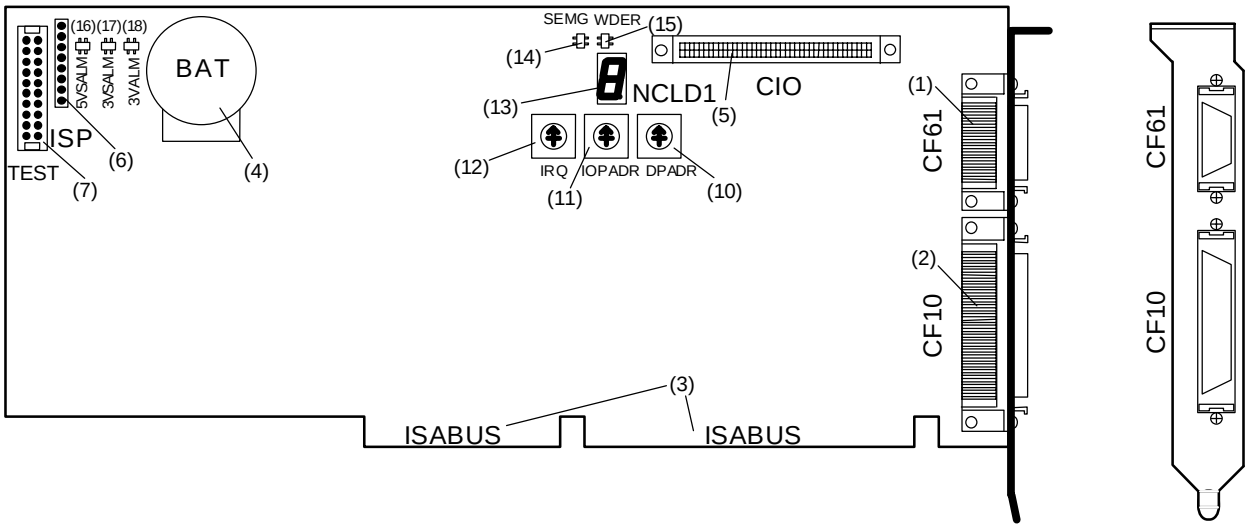
LED list

No.	Name	Function details	
(13)	NCLED	This is the 7-segment LED for the NC status display. This LED changes when at startup, during alarms, etc.	
(14)	SEMG	This is the chip LED for the NC system emergency stop display.	When lit (red) : System in emergency stop. When not lit : Normal
(15)	RWDG	This is the chip LED for the remote communication watchdog display.	When lit (red) : Watchdog alarm. When not lit : Normal

⚠CAUTION

- **Do not apply voltages on the connector other than those indicated in this manual. 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 any PCB while the power is ON.**

4.2.2 Names of HR623 Card Parts



List of connectors

No.	Name	Function details
(1)	CF61	This is used in the connection with the relay card (HR682). An F011 cable is connected.
(2)	CF10	This is used in the connection with the base I/O unit (DX2**, 3**, 4**). An F010 cable is connected.
(3)	ISABUS	This is connected to the personal computer expansion slot (ISA bus).
(4)	BAT	This is a battery holder. A Toshiba battery CR2450 is installed.
(5)	CIO	This is a connector for expansion.
(6)	ISP	Not used.
(7)	TEST	Not used.

List of rotary switches

No.	Name	Function details
(10)	DPADR	This is used in the address assignment setting of the personal computer expansion region.
(11)	IOPADR	This is used in the address assignment setting of the personal computer I/O port region.
(12)	IRQ	This is used in the level setting of the interrupt request signal to the personal computer CPU.

(Note) Refer to "4.4 ISA NC Card Mounting" for details on setting rotary switches.

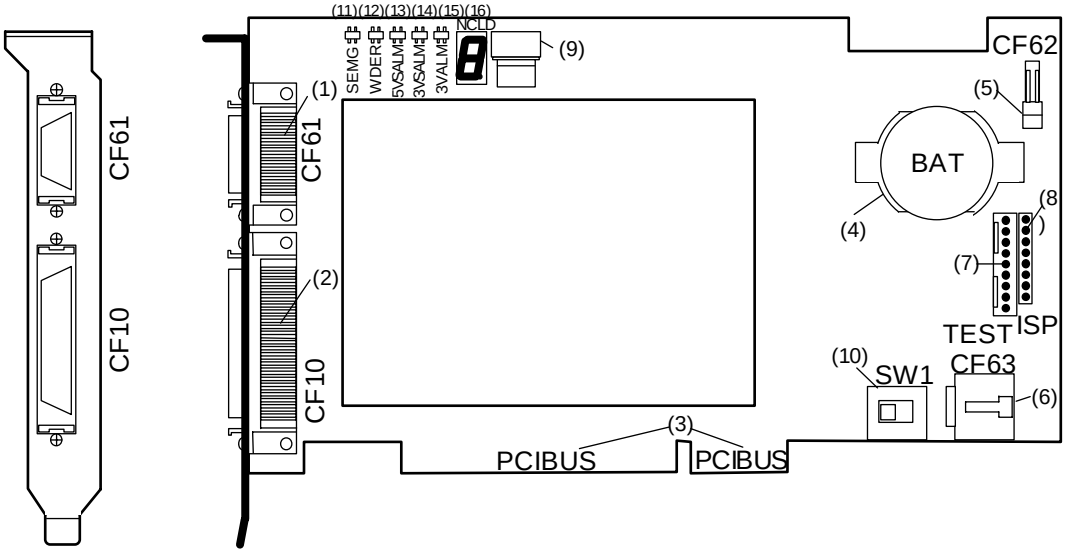
LED list

No.	Name	Function details	
(13)	NCLD1	This is the 7-segment LED for the NC status display. This LED changes when at startup, during alarms, etc.	
(14)	SEMG	This is the chip LED for the NC system emergency stop display.	When lit (red) : System in emergency stop. When not lit : Normal
(15)	WDER	This is the chip LED for the remote communication watchdog display.	When lit (red) : Watchdog alarm. When not lit : Normal
(16)	5VSALM	This is the chip LED for the circuit power 5VDC low alarm display.	When lit (red) : 5VDC low When not lit : Normal
(17)	3VSALM	This is the chip LED for the circuit power 3VDC low alarm display.	When lit (red) : 3VDC low When not lit : Normal
(18)	3VALM	This is the chip LED for the circuit power 3VDC low alarm display.	When lit (red) : 3VDC low When not lit : Normal

⚠ CAUTION

- **Do not apply voltages on the connector other than those indicated in this manual. 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 any PCB while the power is ON.**

4.2.3 Names of FCU6-HR655 Unit Parts



List of connectors

No.	Name	Function details
(1)	CF61	This is used in the connection with the relay card (HR682). An F011 cable is connected.
(2)	CF10	This is used in the connection with the base I/O unit (DX2**, 3**, 4**). An F010 cable is connected.
(3)	PCIBUS	This is connected to the personal computer expansion slot (PCI bus).
(4)	BAT	This is a battery holder. A Toshiba battery CR2032 is installed.
(5)	CF62	This is used to input AC FAIL from an external source. **(Note 1)**
(6)	CF63	This is used to supply power from an external source. **(Note 1)**
(7)	TEST	Not used.
(8)	ISP	Not used.

(Note 1) When multiple FCU6-HR655 cards are inserted, the power supplied from the personal computer or panel computer may be insufficient. Supply the power from an external source to CF63 in this case. Input a FAIL signal to CF62 when using an external power supply.

List of switches

No.	Name	Function details
(9)	CDNO	This is used to set the PCI NC Card's station No.
(10)	SW1	This sets the power supply method. Set "L" when supplying from the PCI bus, and set "M" when supplying power to CF63 from an external power supply.

(Note 2) Refer to "4.5 PCI NC Card Mounting" for details on setting rotary switches.

LED list

No.	Name	Function details	
(11)	SEMG	This is the chip LED for the NC system emergency stop display.	When lit (red) : System in emergency stop. When not lit : Normal
(12)	WDER	This is the chip LED for the remote communication watchdog display.	When lit (red) : Watchdog alarm. When not lit : Normal
(13)	5VSALM	This is the chip LED for the circuit power 5VDC low alarm display.	When lit (red) : 5VDC low When not lit : Normal
(14)	3VSALM	This is the chip LED for the circuit power 3VDC low alarm display.	When lit (red) : 3VDC low When not lit : Normal
(15)	3VALM	This is the chip LED for the circuit power 3VDC low alarm display.	When lit (red) : 3VDC low When not lit : Normal
(16)	NCLD	This is the 7-segment LED for the NC status display. This LED changes when at startup, during alarms, etc.	

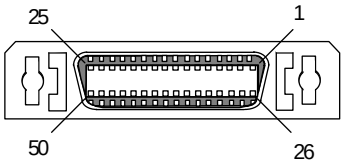
⚠CAUTION

- **Do not apply voltages on the connector other than those indicated in this manual. 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 any PCB while the power is ON.**

4.3 NC Card Connector Pin Assignment

Base I/O unit

CF10



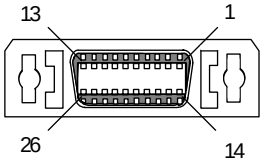
<Cable side connector type>
Plug: 10150-6000EL
Shell: 10350-3210-000
Recommended manufacturer: Sumitomo 3M

1	I/O	TXRX1	26	I/O	TXRX1*	RIO1
2	I/O	TXRX2	27	I/O	TXRX2*	RIO2
3		GND	28		GND	
4	I	SKIP1	29	I	SKIP1*	SKIP
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*	ENC1
14	I	ENC1B	39	I	ENC1B*	
15	I	ENC1Z	40	I	ENC1Z*	
16		GND	41		GND	
17	O	SVTXD2	42	O	SVTXD2*	SV2
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*	SV1
23	I	SVALM1	48	I	SVALM1*	
24	I	SVRXD1	49	I	SVRXD1*	
25	O	SVEMG1	50	O	SVEMG1*	

(Note) I/O in the table is from the viewpoint of the NC Card.

Relay card

CF61



1	O	TD0	14	I	RD0	RS-232C
2	O	LED1	15	O	LED2	LED (for debugging)
3	O	LED3	16	O	EMGOUT*	Emergency stop
4	I	EMGIN	17	I	EMGIN*	
5		GND	18		GND	
6	I	HA1A	19	I	HA1B	HANDLE
7	I	HA2A	20	I	HA2B	
8	I	HA3A	21	I	HA3B	
9	O	DR0	22	I	DC0	RS-232C
10		GND	23		GND	
11	I	EN2A	24	I	EN2A*	ENC#2
12	I	EN2B	25	I	EN2B*	
13	I	EN2Z	26	I	EN2Z*	

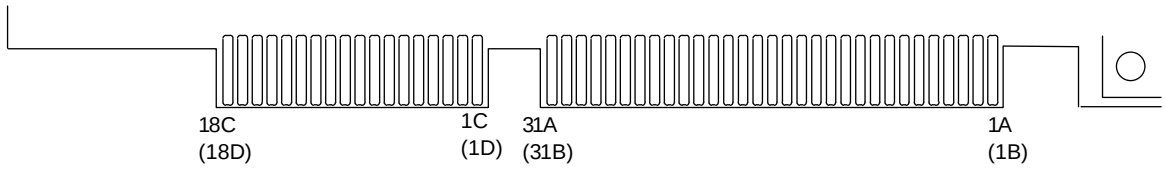
<Cable side connector type>
Plug: 10126-6000EL
Shell: 10326-3210-000
Recommended manufacturer: Sumitomo 3M

(Note) I/O in the table is from the viewpoint of the NC Card.

⚠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.**

ISA bus (NC Card side)



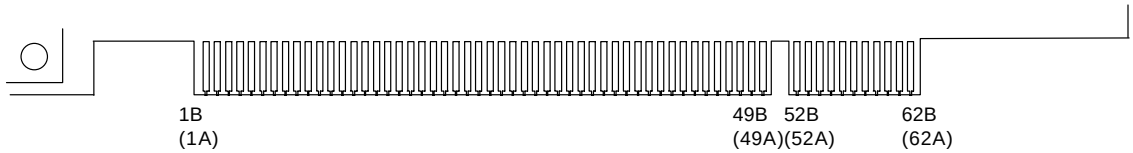
* Pin Nos. inside the ( ) are rear side pin Nos.

1A		NC	1B		GND
2A	I/O	SD7	2B	I	RSTDRV
3A	I/O	SD6	3B		+5V
4A	I/O	SD5	4B	O	IRQ9
5A	I/O	SD4	5B		NC
6A	I/O	SD3	6B		NC
7A	I/O	SD2	7B		NC
8A	I/O	SD1	8B		NC
9A	I/O	SD0	9B		+12V
10A	O	IOCHRDY	10B		GND
11A	I	AEN*	11B		NC
12A		NC	12B		NC
13A		NC	13B	I	IOW*
14A		NC	14B	I	IOR*
15A	I	SA16	15B		NC
16A	I	SA15	16B		NC
17A	I	SA14	17B		NC
18A	I	SA13	18B		NC
19A	I	SA12	19B		NC
20A	I	SA11	20B		NC
21A	I	SA10	21B	O	IRQ7
22A	I	SA9	22B		NC
23A	I	SA8	23B	O	IRQ5
24A	I	SA7	24B		NC
25A	I	SA6	25B		NC
26A	I	SA5	26B		NC
27A	I	SA4	27B		NC
28A	I	SA3	28B	I	BALE
29A	I	SA2	29B		+5V
30A	I	SA1	30B		NC
31A	I	SA0	31B		GND

1C	I	SBHE*	1D	O	MEMCS16*
2C	I	LA23	2D		NC
3C	I	LA22	3D	O	IRQ10
4C	I	LA21	4D		NC
5C	I	LA20	5D		NC
6C	I	LA19	6D		NC
7C	I	LA18	7D		NC
8C	I	LA17	8D		NC
9C	I	MEMR*	9D		NC
10C	I	MEMW*	10D		NC
11C	I/O	SD8	11D		NC
12C	I/O	SD9	12D		NC
13C	I/O	SD10	13D		NC
14C	I/O	SD11	14D		NC
15C	I/O	SD12	15D		NC
16C	I/O	SD13	16D		+5V
17C	I/O	SD14	17D		NC
18C	I/O	SD15	18D		GND

(Note) I/O in the table is from the viewpoint of the NC Card.

PCI bus (NC Card side)



* Pin Nos. inside the ( ) are rear side pin Nos.

1A	I	TRST*	1B		N.C.
2A		12V	2B	I	TCK
3A	I	TMS	3B		GND
4A	I	TDI	4B	O	TDO
5A		+5V	5B		5V
6A	O	INTA*	6B		5V
7A		N.C.	7B		N.C.
8A		+5V	8B		N.C.
9A		N.C.	9B	O	PRSNT1*
10A		—	10B		N.C.
11A		N.C.	11B	O	PRSNT2*
12A		GND	12B		GND
13A		GMD	13B		GND
14A		N.C.	14B		N.C.
15A	I	RST*	15B		GND
16A		—	16B	I	PCLK
17A		N.C.	17B		GND
18A		GND	18B		N.C.
19A		N.C.	19B		N.C.
20A	I/O	AD30	20B	I/O	AD31
21A		+3.3V	21B	I/O	AD29
22A	I/O	AD28	22B		GND
23A	I/O	AD26	23B	I/O	AD27
24A		GND	24B	I/O	AD25
25A	I/O	AD24	25B		+3.3V
26A	I	IDSEL	26B	I	C/BE3*
27A		+3.3V	27B	I/O	AD23
28A	I/O	AD22	28B		GND
29A	I/O	AD20	29B	I/O	AD21
30A		GND	30B	I/O	AD19
31A	I/O	AD18	31B		+3.3V
32A	I/O	AD16	32B	I/O	AD17
33A		+3.3V	33B	I	C/BE2*
34A	I	FRAME*	34B		GND
35A		GND	35B	I	IRDY*
36A	O	TRDY*	36B		+3.3V
37A		GND	37B	O	DEVSEL*
38A	O	STOP*	38B		GND
39A		+3.3V	39B	I	LOCK*
40A		N.C.	40B	O	PERR*
41A		N.C.	41B		+3.3V
42A		GND	42B	O	SERR*
43A	I/O	PAR	43B		+3.3V
44A	I/O	AD15	44B	I	C/BE1*
45A		+3.3V	45B	I/O	AD14
46A	I/O	AD13	46B		GND
47A	I/O	AD11	47B	I/O	AD12
48A		GND	48B	I/O	AD10
49A	I/O	AD9	49B		GND

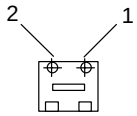
50A		Connector key	50B		Connector key
51A		Connector key	51B		Connector key
52A	I	C/BE0	52B	I/O	AD8
53A		+3.3V	53B	I/O	AD7
54A	I/O	AD6	54B		+3.3V
55A	I/O	AD4	55B	I/O	AD5
56A		GND	56B	I/O	AD3
57A	I/O	AD2	57B		GND
58A	I/O	Ad0	58B	I/O	AD1
59A		N.C.	59B		N.C.
60A		N.C.	60B		N.C.
61A		+5V	61B		+5V
62A		+5V	62B		+5V

(Note 1) 10A and 16A are for +5V (for I/O).

(Note 2) I/O in the table is from the viewpoint of the NC Card.

AC FAIL

CF62

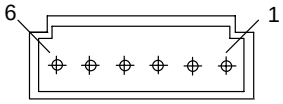


1	I	AC FAIL*
2		GND

(Note) I/O in the table is from the viewpoint of the NC Card.

External power supply

CF63



1		+5V
2		+5V
3		GND
4		GND
5		+12V
6		GND

(Note) I/O in the table is from the viewpoint of the NC Card.

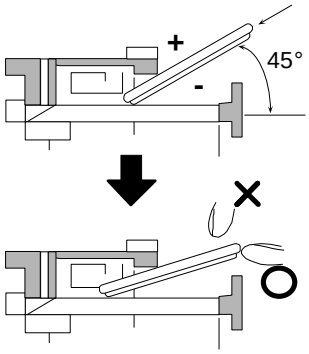
4.4 ISA NC Card Mounting

4.4.1 Before Mounting the ISA NC Card

(1) Before mounting the ISA NC Card, confirm that the control section items below are present.

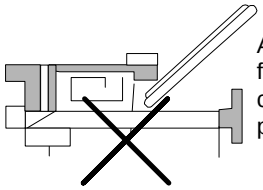
- HR621/623 card (ISA bus-compatible NC Card): 1 pc.
- FCU6-DX2**, DX3** or DX4** unit
  (Base I/O unit: with aluminum die cast): 1 pc.
- HR682 card (relay card: L-shaped PCB, with metal spacers): 1 pc.
- CR2450 (Toshiba button battery): 1 pc.
- F010 cable (half-pitch 50-pole shielded cable): 1 pc.
- F011 cable (half-pitch 26-pole shielded cable): 1 pc.

(2) Insert a battery to the ISA NC Card as shown below.

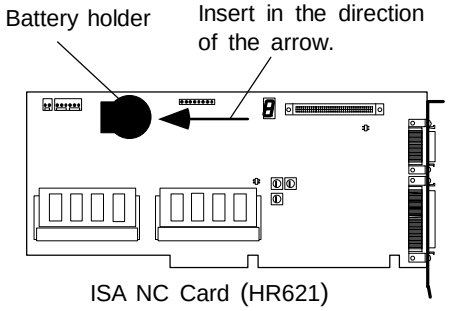


Insert at a 45° angle.
The positive (+) polarity side should face up.

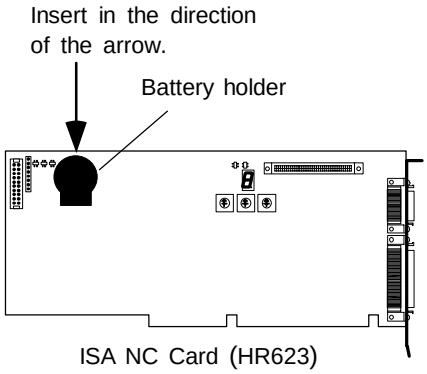
Press in horizontally.
The insertion should complete smoothly.
Do not press in from above.



A reverse insertion prevention function is attached so the battery can only be inserted with the proper polarity in the holder.



ISA NC Card (HR621)



ISA NC Card (HR623)

⚠CAUTION

⚠ Do not short-circuit, charge, overheat, incinerate or disassemble the battery.

⚠ Dispose of the spent battery according to local laws.

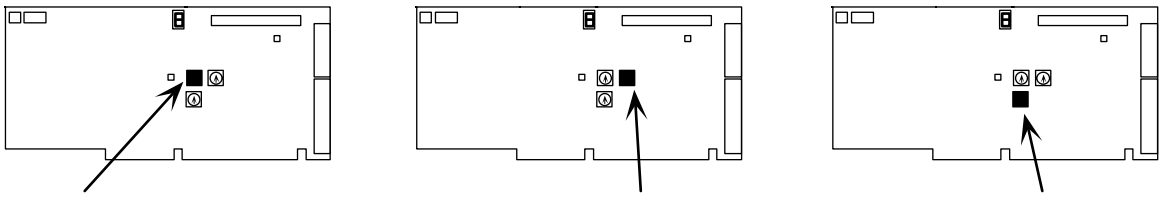
4.4.2 ISA NC Card Mounting Procedure

Install the software and mount the NC Card following the Setup Instruction Manual (BNP-B2191).
The software will not be installed correctly if the software installation and NC Card mounting procedure are mistaken.
Mount the NC Card onto the personal computer with the following procedures.

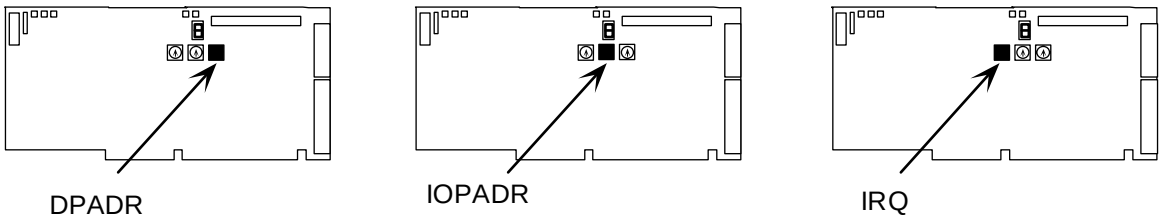
(1) Set the DPADR, IOPADR and IRQ rotary switches according to the personal computer memory region, I/O port region and interrupt request signals designated when installing the software.

(Note) Before touching the NC Card, touch an exposed metal section of the personal computer to discharge any static electricity.
Pay attention not to touch the NC Card, personal computer chip or circuit.

Location of ISA NC Card (HR621) rotary switches



Location of ISA NC Card (HR623) rotary switches



Roles of each rotary switch

- DPADR : This is used in the address setting of the personal computer expansion region.
- IOPADR : This is used in the address setting of the personal computer I/O port region.
- IRQ : This is used in the level setting of the interrupt request signal to the personal computer CPU.

DPADR setting

Switch	Expansion region
0	h0D_8000~h0D_FFFF
1	h0D_0000~h0D_7FFF
2	h0C_8000~h0C_FFFF
3	h0C_0000~h0C_7FFF
4	RESERVED
5	RESERVED
6	RESERVED
7	RESERVED
8	RESERVED
9	RESERVED
A	RESERVED
B	RESERVED
C	RESERVED
D	RESERVED
E	RESERVED
F	RESERVED

IOPADR setting

Switch	I/O port region
0	h0120-h0123
1	h0140-h0143
2	h0160-h0163
3	h0180-h0183
4	h01A0-h01A3
5	h01C0-h01C3
6	h01E0-h01E3
7	h0200-h0203
8	h0220-h0223
9	h0240-h0243
A	h0260-h0263
B	h0280-h0283
C	h02A0-h02A3
D	h02C0-h02C3
E	h02E0-h02E3
F	h0300-h0303

IRQ setting

Switch	Interrupt request signal
0	None
1	IRQ5
2	IRQ7
4	IRQ9
8	IRQ10

(2) Following the instructions in the personal computer manual, remove the personal computer cover.

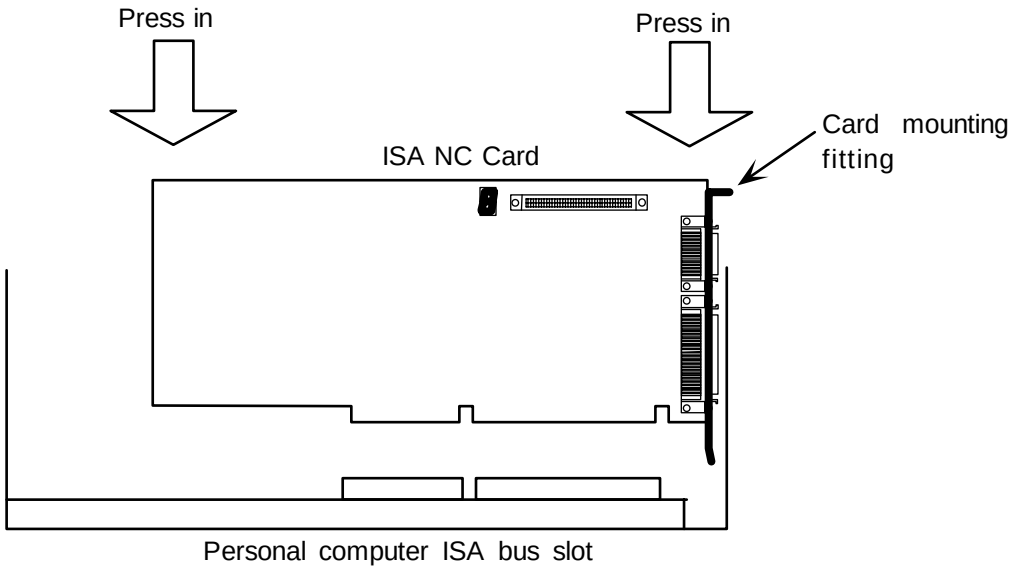
(Note) Follow the precautions instructed in the personal computer manual. Confirm that the personal computer power is OFF, and that the power cable is disconnected.

(3) After confirming that there is a vacant ISA bus slot, remove the slot cover of the selected ISA bus slot.

(Note) Do not misplace the slot cover screw as it is used to fix the ISA NC Card onto the personal computer.

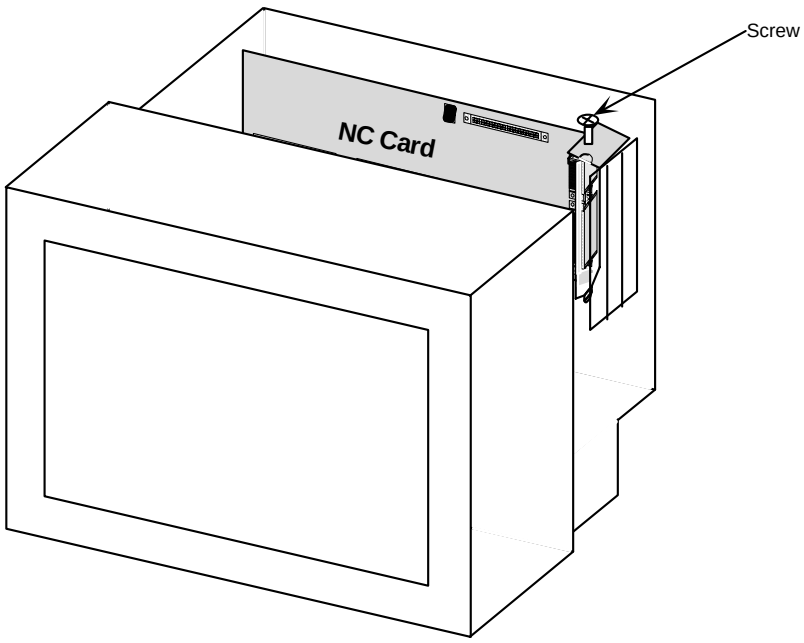
(4) Holding the card installation metal fittings and the ends of the ISA NC Card, so as to push in the NC Card upper end, insert the card all the way into the personal computer ISA bus slot.

(Note) The ISA BUS slot insertion orientation is predetermined. Insert the card so that the card mounting fitting comes to the slot cover position.



(5) Using the fixing screw of the slot cover removed in mounting step 3, fix the ISA NC Card to the personal computer.

(Note) Securely tighten the screw.



(6) Following the instructions in the personal computer manual, install the personal computer cover removed in mounting step 2.

(7) Reconnect the personal computer power cables.
(Note) Do not turn the personal computer ON yet.

(8) Connect the two relay cables (F010 and F011) to the two connectors (CF10 and CF61) on the card installation metal fitting section of the ISA NC Card.
(Note) Connect the F010 cable to the CF10 connector, and the F011 cable to the CF61 connector.

(9) Connect the F010 and F011 cables to the base I/O unit and relay card.
(Note) Connect the F010 cable to the CF10 connector on the base I/O unit, and the F011 cable to the CF61 connector on the relay card.

This completes the ISA NC Card (HR621/623) mounting.

(10) Install the MELDASMAGIC64 software into the personal computer while the ISA NC Card is mounted.
(Note) Install the software and mount the NC Card following the Setup Instruction Manual (BNP-B2191).

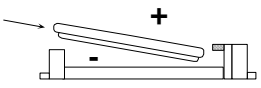
4.5 PCI NC Card Mounting

4.5.1 Before Mounting the PCI NC Card

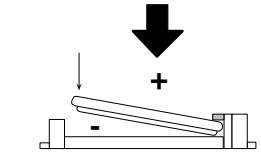
(1) Before mounting the PCI NC Card, confirm that the control section items below are present.

- FCU6-HR655 unit (PCI bus-compatible NC Card): 1 pc.
- FCU6-DX2**, DX3** or DX4** unit
  (Base I/O unit: with aluminum die cast): 1 pc.
- HR682 card (relay card: L-shaped PCB, with metal spacers): 1 pc.
- CR2032 (Toshiba button battery): 1 pc.
- F010 cable (half-pitch 50-pole shielded cable): 1 pc.
- F011 cable (half-pitch 26-pole shielded cable): 1 pc.

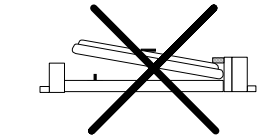
(2) Insert a battery to the PCI NC Card as shown below.



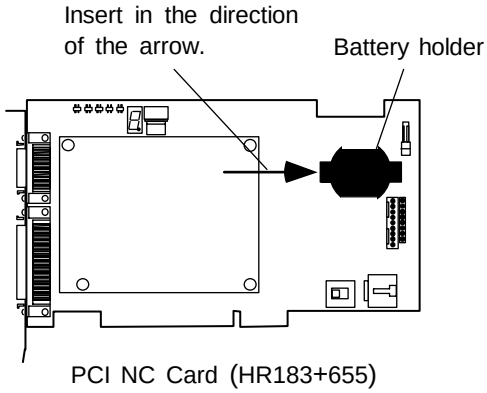
Insert with the + polarity facing upward, and catch with the hook.



Press in vertically.



Check the battery's polarity indicated on the holder's metal section before inserting.



PCI NC Card (HR183+655)

CAUTION

⚠ **Do not short-circuit, charge, overheat, incinerate or disassemble the battery.**

⚠ **Dispose of the spent battery according to local laws.**

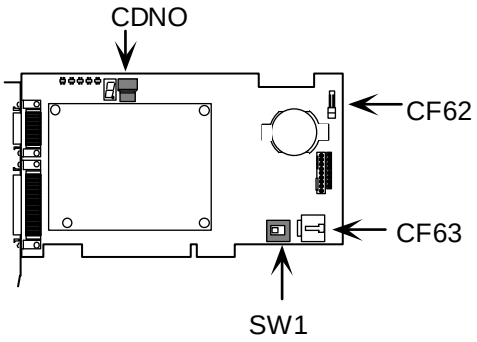
4.5.2 PCI NC Card Mounting Procedure

Install the software and mount the NC Card following the Setup Instruction Manual (BNP-B2191).
The software will not be installed correctly if the software installation and NC Card mounting procedure are mistaken.
Mount the NC Card onto the personal computer with the following procedures.

(1) Set the rotary switch CDNO and slide switch SW1.

(Note) Before touching the NC Card, touch an exposed metal section of the personal computer to discharge any static electricity.
Pay attention not to touch the NC Card, personal computer chip or circuit.

Location of PCI NC Card (FCU6-HR655) switches



Roles of each switch

- CDNO (rotary switch): Use to set the PCI NC Card's station No.
- SW1 (slide switch): Use to set the PCI NC Card's power supply (internal/external).

CDNO setting

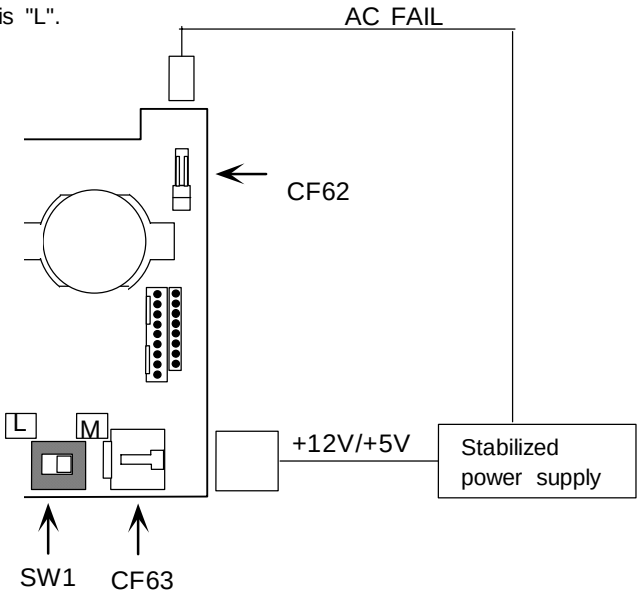
Switch	Card
0	1st card
1	2nd card
2	3rd card
3	4th card
4	5th card
5	6th card
6	7th card
7	8th card
8	9th card
9	10th card
A	11th card
B	12th card
C	13th card
D	14th card
E	15th card
F	16th card

The default setting is "0".

SW1 setting

Switch	Supply method	Details
L	Internal supply	+5V/+12V is supplied by PCI bus.
M	External supply	+5V/+12V is supplied by stabilized power supply.

The default setting is "L".



Connect a stabilized power supply to the CF62 and CF63 connectors when using an external power supply.

(2) Following the instructions in the personal computer manual, remove the personal computer cover.

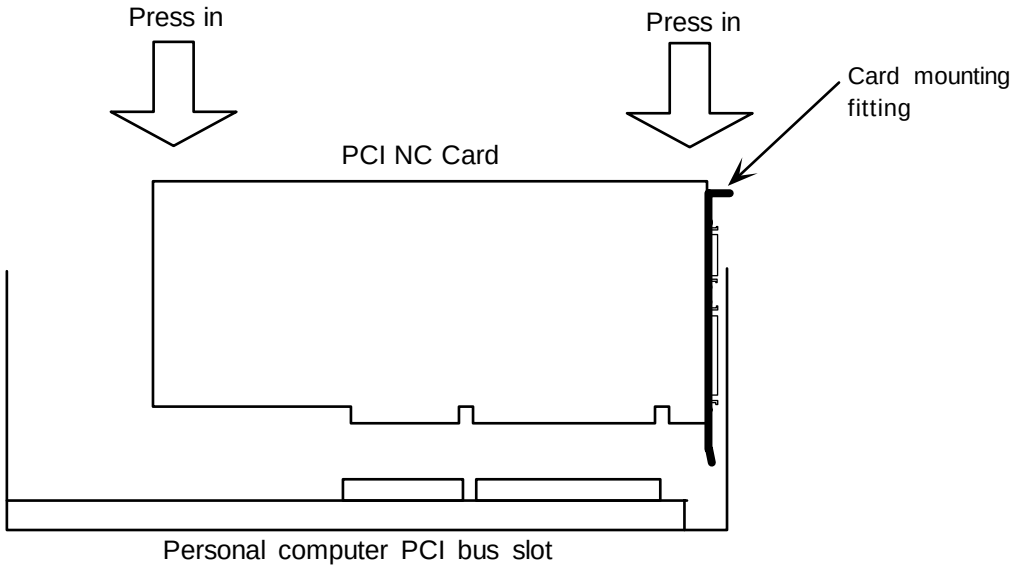
(Note) Follow the precautions instructed in the personal computer manual. Confirm that the personal computer power is OFF, and that the power cable is disconnected.

(3) After confirming that there is a vacant PCI bus slot, remove the slot cover of the selected PCI bus slot.

(Note) Do not misplace the slot cover screw as it is used to fix the PCI NC Card onto the personal computer.

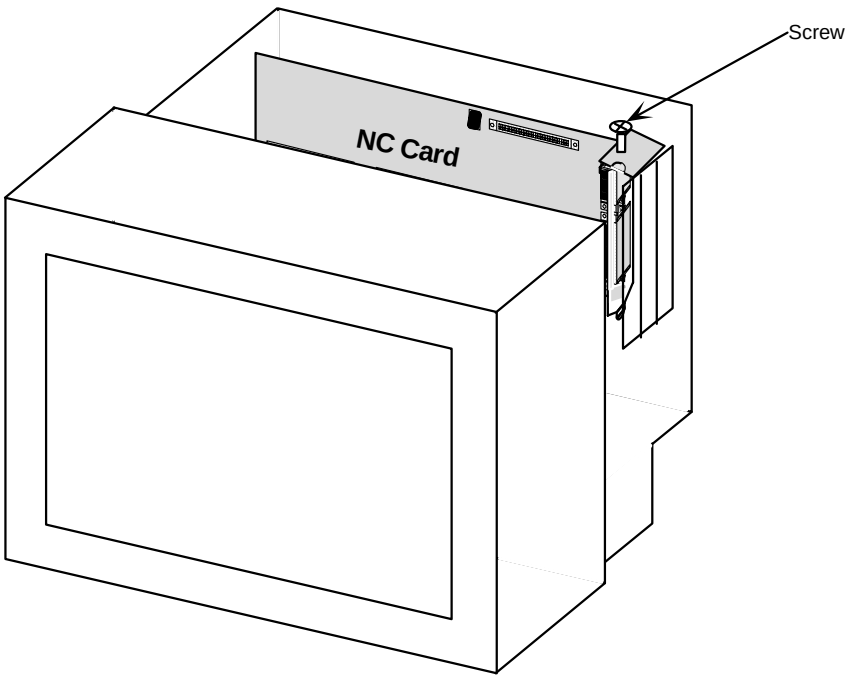
(4) Holding the card installation metal fittings and the ends of the PCI NC Card, so as to push in the NC Card upper end, insert the card all the way into the personal computer PCI bus slot.

(Note) There is a set orientation for inserting the PCI NC Card into the PCI bus slot. Insert the card so that the card installation fitting comes to the slot cover's position.



(5) Using the fixing screw of the slot cover removed in mounting step 3, fix the PCI NC Card to the personal computer.

(Note) Securely tighten the screw.



(6) Following the instructions in the personal computer manual, install the personal computer cover removed in mounting step 2.

(7) Reconnect the personal computer power cables.
(Note) Do not turn the personal computer ON yet.

(8) Connect the two relay cables (F010 and F011) to the two connectors (CF10 and CF61) on the card installation metal fitting section of the PCI NC Card.
(Note) Connect the F010 cable to the CF10 connector, and the F011 cable to the CF61 connector.

(9) Connect the F010 and F011 cables to the base I/O unit and relay card.
(Note) Connect the F010 cable to the CF10 connector on the base I/O unit, and the F011 cable to the CF61 connector on the relay card.

This completes the PCI NC Card (FCU6-HR655) mounting.

(10) Install the MELDASMAGIC64 software into the personal computer while the PCI NC Card is mounted.
(Note) Do not change the personal computer's station No. or the power supply method while installing the software.
Install the software and mount the NC Card following the Setup Instruction Manual (BNP-B2191).

5. Base I/O Unit (FCU6-DX2**/3**/4**) Connection

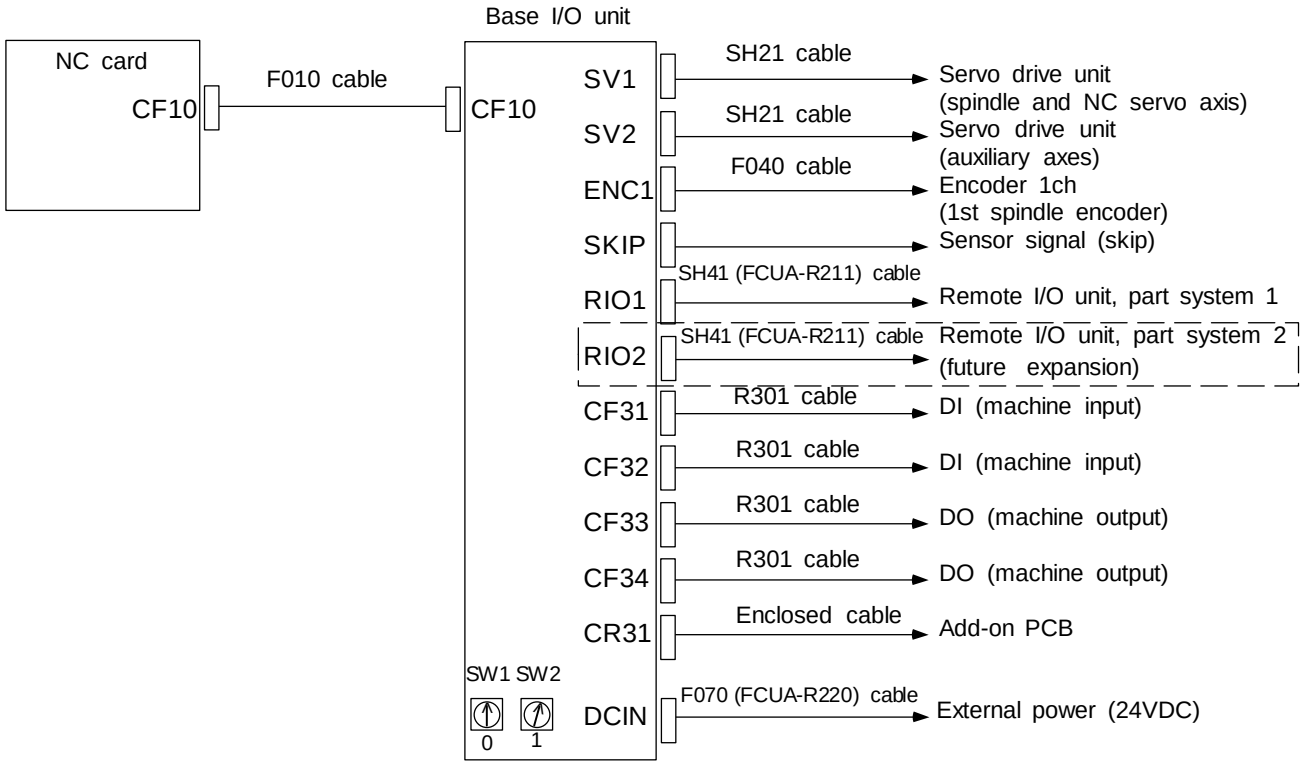
5.1 Base I/O Unit Outline

The base I/O unit is used in the connection of the machine input/output (DI/DO), servo drive unit, spindle encoder, skip and remote I/O unit. There must be one base I/O unit for each NC Card.
Depending on the base I/O unit type, connection is possible with analog input, analog output and a manual pulse generator.
The following shows a list of base I/O units and add-on PCBs.

Name	Type	No. of machine input/ output points	Other interfaces
Base I/O unit	FCU6-DX210	DI (sink/source)/DO (sink)=48/48	SV1, SV2, ENC1, SKIP, RIO1, RIO2, CR31 (for add-on PCB)
	FCU6-DX211	DI (sink/source)/DO (source)=48/48	
	FCU6-DX220	DI (sink/source)/DO (sink)=64/64	
	FCU6-DX221	DI (sink/source)/DO (source)=64/64	
	FCU6-DX310	DI (sink/source)/DO (sink)=80/64	SV1, SV2, ENC1, SKIP, RIO1, RIO2 Add-on PCB: RX323-1 (DO is sink type) : RX324-1 (DO is source type)
	FCU6-DX311	DI (sink/source)/DO (source)=80/64	
	FCU6-DX410	DI (sink/source)/DO (sink)=96/80	
	FCU6-DX411	DI (sink/source)/DO (source)=96/80	
	FCU6-DX320	DI (sink/source)/DO (sink)=80/64	SV1, SV2, ENC1, SKIP, RIO1, RIO2, Analog output 1 point Add-on PCB: RX323 (DO is sink type) : RX324 (DO is source type)
	FCU6-DX321	DI (sink/source)/DO (source)=80/64	
	FCU6-DX420	DI (sink/source)/DO (sink)=96/80	
	FCU6-DX421	DI (sink/source)/DO (source)=96/80	
	FCU6-DX330	DI (sink/source)/DO (sink)=48/48	SV1, SV2, ENC1, SKIP, RIO1, RIO2, HANDLE2ch Add-on PCB: RX331
	FCU6-DX331	DI (sink/source)/DO (source)=48/48	
	FCU6-DX430	DI (sink/source)/DO (sink)=64/64	
	FCU6-DX431	DI (sink/source)/DO (source)=64/64	
	FCU6-DX340	DI (sink/source)/DO (sink)=48/48	SV1, SV2, ENC1, SKIP, RIO1, RIO2, Analog input 4 points, analog output 1 point Add-on PCB: RX341
	FCU6-DX341	DI (sink/source)/DO (source)=48/48	
	FCU6-DX440	DI (sink/source)/DO (sink)=64/64	
	FCU6-DX441	DI (sink/source)/DO (source)=64/64	
Add-on PCB	RX323-1	DI (sink/source)/DO (sink)=32/16	None
	RX323	DI (sink/source)/DO (sink)=32/16	Analog output 1 point
	RX324-1	DI (sink/source)/DO (source)=32/16	None
	RX324	DI (sink/source)/DO (source)=32/16	Analog output 1 point
	RX331	None	HANDLE2ch
	RX341	None	Analog input 4 points, analog output 1 point

(Note) Refer to "7. Remote I/O Unit Connection" for add-on PCB connections.

5.2 Base I/O Connection System Drawing

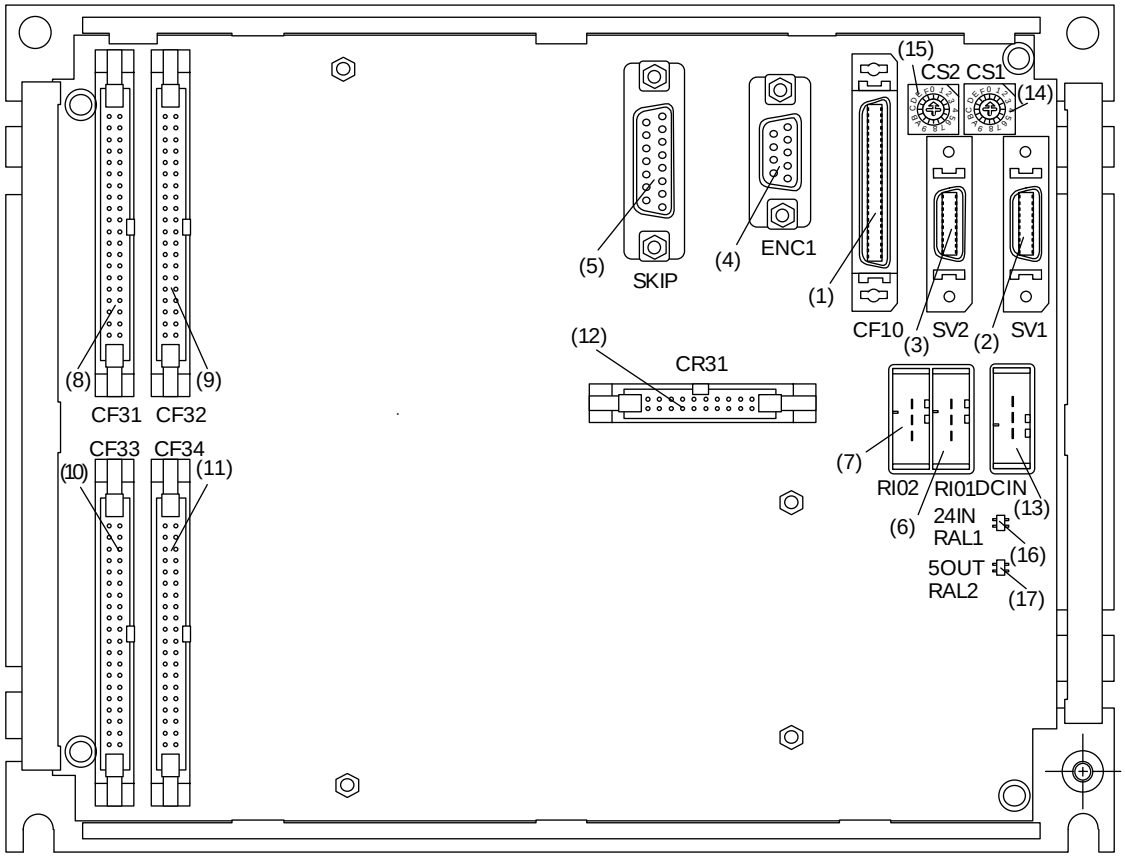


(Note) Refer to "7. Remote I/O Unit Connection" for add-on PCB connections.

⚠CAUTION

⚠ **Turn the NC Card's power ON before turning the base I/O unit's power ON.**
If the base I/O unit's power is turned ON first, the current will be led to the NC Card from the connection cable. This will prevent the personal computer or the cards in the personal computer from starting up properly.

5.3 Base I/O Unit Part Names



List of connectors

		Unit name			
		FCU6-DX210	FCU6-DX211	FCU6-DX220	FCU6-DX221
No.	Name	Function			
(1)	CF10	This is used in the connection with the NC Card. An F010 cable is connected.			
(2)	SV1	This is connected to the servo drive unit 1st part system (for spindles and NC servo axes).			
(3)	SV2	This is connected to the servo drive unit 2nd part system (for auxiliary axes).			
(4)	ENC1	This is connected to the encoder 1st channel (1st spindle encoder).			
(5)	SKIP	This is the sensor signal (skip) input connection. Up to eight points can be used.			
(6)	RIO1	This is connected to the remote I/O unit 1st part system. The max. No. of occupied stations is eight. Because two stations are occupied in the base I/O unit, the remaining six occupied stations can be used. Note that when an add-on PCB is used, the remaining five occupied stations can be used.			
(7)	RIO2	This is connected to the remote I/O unit 2nd part system. The max. No. of occupied stations is eight. Eight occupied stations can be used. For future expansion.			
(8)	CF31	This is used in the connection of the station No. (normally station No. 0) machine input signal set by the CS1 rotary switch.			
		DI: 32 (sink/source)	DI: 32 (sink/source)	DI: 32 (sink/source)	DI: 32 (sink/source)
(9)	CF32	This is used in the connection of the station No. (normally station No. 1) machine input signal set by the CS2 rotary switch.			
		DI: 16 (sink/source)	DI: 16 (sink/source)	DI: 32 (sink/source)	DI: 32 (sink/source)
(10)	CF33	This is used in the connection of the station No. (normally station No. 0) machine output signal set by the CS1 rotary switch.			
		DO: 32 (sink type)	DO: 32 (source type)	DO: 32 (sink type)	DO: 32 (source type)
(11)	CF34	This is used in the connection of the station No. (normally station No. 1) machine output signal set by the CS2 rotary switch.			
		DO: 16 (sink type)	DO: 16 (source type)	DO: 32 (sink type)	DO: 32 (source type)
(12)	CR31	This is a connector for an add-on PCB. It cannot be used unless using an add-on PCB.			
(13)	DCIN	24VDC must be supplied by external power. Refer to "3.1 General Specifications" for power specifications.			

⚠CAUTION

- **Do not apply voltages on the connector other than those indicated in this manual. 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 any PCB while the power is ON.**

List of rotary switches

No.	Name	Function
(14)	CS1	This is used in the station No. setting of the CF31 and CF33 machine input/output signals.
(15)	CS2	This is used in the station No. setting of the CF32 and CF34 machine input/output signals.

Rotary switch setting value	Station No.	Device assignment	
		DI	DO
0	0	X00~X1F	Y00~Y1F
1	1	X20~X3F	Y20~Y3F
2	2	X40~X5F	Y40~Y5F
3	3	X60~X7F	Y60~Y7F
4	4	X80~X9F	Y80~Y9F
5	5	XA0~XBF	YA0~YBF
6	6	XC0~XDF	YC0~YDF
7	7	XE0~XFF	YE0~YFF
8~F	Cannot be used		

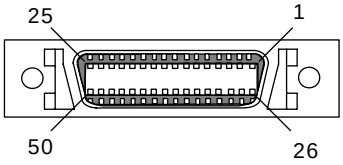
LED list

No.	Name	Function	
(16)	24IN	This is the LED for the 24VDC input display.	When lit (green) : 24VDC being supplied. When not lit : 24VDC supply OFF.
	RAL1	This is the LED for the onboard remote I/O 1st station (CS1 setting station No.) communication alarm display.	When lit (red) : Communication alarm. When not lit : Normal
(17)	5OUT	This is the LED for the circuit power 5VDC output display.	When lit (green) : Outputting 5VDC. When not lit : 5VDC output OFF.
	RAL2	This is the LED for the onboard remote I/O 2nd station (CS2 setting station No.) communication alarm display.	When lit (red) : Communication alarm. When not lit : Normal

5.4 Base I/O Unit Connector Pin Assignment

NC Card

CF10

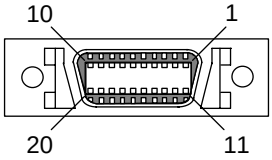


Connector pin assignment:
Refer to "4.3 NC Card Connector Pin Assignment" (Base I/O unit: CF10).

<Cable side connector type>
Plug : 10150-6000EL
Shell : 10350-3210-000
Recommended manufacturer: Sumitomo 3M

Servo drive unit

SV1



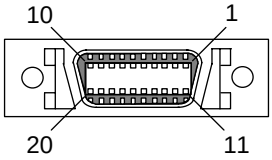
<Cable side connector type>
Plug : 10120-6000EL
Shell : 10320-3210-000
Recommended manufacturer: Sumitomo 3M

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		

(Note) I/O in the table is from the viewpoint of the base I/O unit.

Servo drive unit

SV2



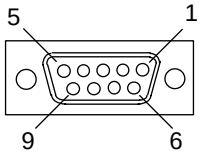
<Cable side connector type>
Plug : 10120-6000EL
Shell : 10320-3210-000
Recommended manufacturer: Sumitomo 3M

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		

(Note) I/O in the table is from the viewpoint of the base I/O unit.

Spindle encoder

ENC1



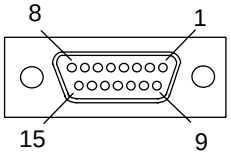
<Cable side connector type>
Connector : CDE-9PF
Contact : CD-PC-111
Case : HDE-CTH
Recommended manufacturer: Hirose Electric

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			

(Note) I/O in the table is from the viewpoint of the base I/O unit.

Sensor signal

SKIP



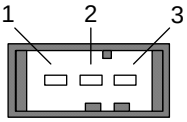
<Cable side connector type>
Connector : CDA-15P
Contact : CD-PC-111
Case : HDA-CTH
Recommended manufacturer: Hirose Electric

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			

(Note) I/O in the table is from the viewpoint of the base I/O unit.

Remote I/O unit

RIO1



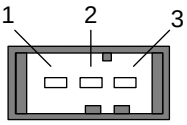
<Cable side connector type>
Connector : 1-178288-3
Contact : 1-175218-5
Recommended manufacturer: Tyco Electronics AMP

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

(Note) I/O in the table is from the viewpoint of the base I/O unit.

Remote I/O unit

RIO2



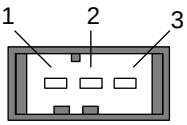
<Cable side connector type>
Connector : 1-178288-3
Contact : 1-175218-5
Recommended manufacturer: Tyco Electronics AMP

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

(Note) I/O in the table is from the viewpoint of the base I/O unit.

+24VDC input

DCIN



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

1	I	+24V
2		GND
3		FG

(Note) I/O in the table is from the viewpoint of the base I/O unit.

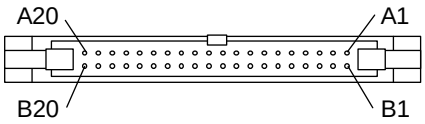
⚠CAUTION

⚠ **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.**

DI/DO

CF31, 32, 33, 34



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

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	I	+24V	2		GND
1	I	+24V	1		GND

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	I	+24V	2		GND
1	I	+24V	1		GND

The values in parentheses are used only for DX220 and DX221.

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	I	+24V	2	I	GND
1	I	+24V	1	I	GND

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	I	+24V	2	I	GND
1	I	+24V	1	I	GND

The values in parentheses are used only for DX220 and DX221.

(Note) I/O in the table is from the viewpoint of the base I/O unit.

5.5 Base I/O Unit Input/Output Specifications

5.5.1 Rotary Switch (CS1 and CS2) Settings

- Normal settings

CS1	0
CS2	1

The base I/O unit No. of occupied stations is two (when an add-on PCB is not used).

(Note) Also refer to "7.14 Setting of Channel No. When Using Multiple Remote I/O Units" for rotary switch (CS1 and CS2) settings of the base I/O unit.

- Relation between rotary switches and DI/DO connectors

CS1	DI: CF31, DO: CF33
CS2	DI: CF32, DO: CF34

- Relation between rotary switches and device assignments

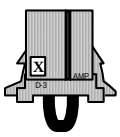
Setting value	Station No.	Device assignment		No. of I/O points (max)
		DI	DO	
0	0	X00~X1F	Y00~Y1F	32 points
1	1	X20~X3F	Y20~Y3F	32 points
2	2	X40~X5F	Y40~Y5F	32 points
3	3	X60~X7F	Y60~Y7F	32 points
4	4	X80~X9F	Y80~Y9F	32 points
5	5	XA0~XBF	YA0~YBF	32 points
6	6	XC0~XDF	YC0~YDF	32 points
7	7	XE0~XFF	YE0~YFF	32 points
8~F	Cannot be used			

- Station No. settings of add-on PCBs
  When using an add-on PCB, set the station No. using the rotary switch on the add-on PCB. This rotary switch corresponds to connectors CR21 and CR22 of the add-on PCB.
  The setting values, station Nos. and device assignments are as shown in the table above.

  (Note) Refer to "5.1 Base I/O Unit Outline" for types of add-on PCBs.
  One station is occupied when using RX331 (manual pulse generator) and RX341 (analog input/output) also.

5.5.2 RIO1 Terminator

Connect a terminator to the final end of the remote I/O unit connected to the RIO1.
When not using any remote I/O unit, connect a terminator to the base I/O unit RIO1.
Terminator type: R-TM
Recommended manufacturer: Tyco Electronics AMP



5.5.3 CF31, CF32 Input Circuit

Refer to "7.4 Outline of Digital Signal Input Circuit" for the base I/O unit CF31 and CF32 input circuits.

1	Unit name	FCU6-DX210	FCU6-DX211	FCU6-DX220	FCU6-DX221
2	Card name	HR325	HR335	HR327	HR337
3	Input type	Sink/source	Sink/source	Sink/source	Sink/source
4	COM pin connection	+24V/GND	+24V/GND	+24V/GND	+24V/GND
5	No. of input points	48 points	48 points	64 points	64 points
6	Pin used for input	X00~X2F	X00~X2F	X00~X3F	X00~X3F

5.5.4 CF33, CF34 Output Circuit

Refer to "7.5 Outline of Digital Signal Output Circuit" for the base I/O unit CF33 and CF34 output circuits.

1	Unit name	FCU6-DX210	FCU6-DX211	FCU6-DX220	FCU6-DX221
2	Card name	HR325	HR335	HR327	HR337
3	Output type	Sink type	Source type	Sink type	Source type
4	Output current	60mA/point	60mA/point	60mA/point	60mA/point
5	No. of output points	48 points	48 points	64 points	64 points
6	Pin used for output	Y00~Y2F	Y00~Y2F	Y00~Y3F	Y00~Y3F

5.5.5 Specifications of ADD ON PCB Connected to CR31

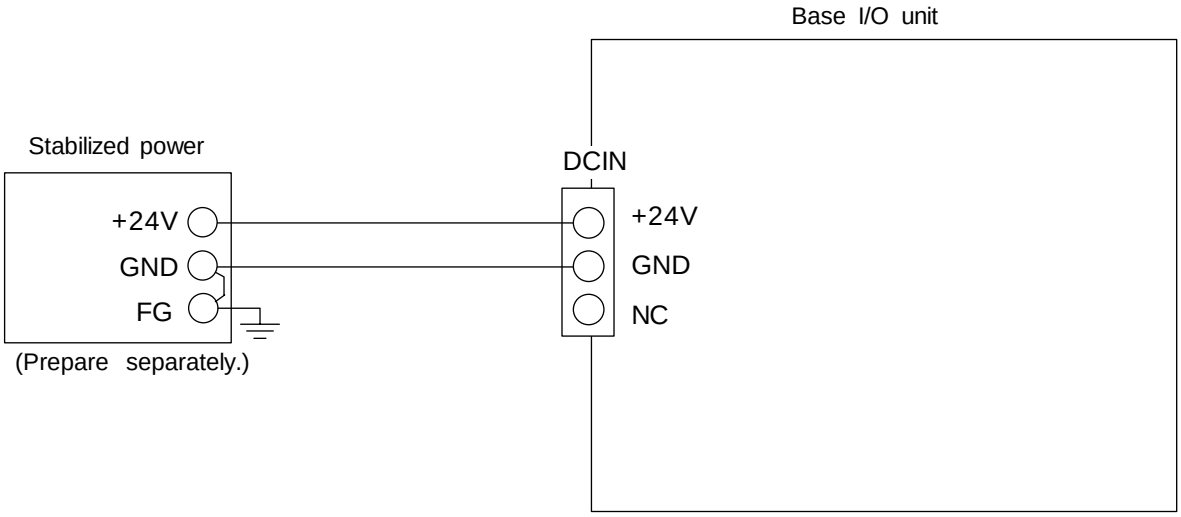
Refer to "7. Remote I/O Unit Connection" for add-on PCB specifications. One add-on PCB can be installed on the base I/O unit, and it occupies one station. Reference items are as in the following table.

	Name	Reference item	Reference connector name
1	RX323-1	7.9 Connection of FCUA-DX11* unit and machine control signal	FCUA-DX110: DI-R, DO-R
2	RX323	7.10 Connection of FCUA-DX12* unit and machine control signal	FCUA-DX120: DI-R, DO-R
3	RX324-1	7.9 Connection of FCUA-DX11* unit and machine control signal	FCUA-DX111: DI-R, DO-R
4	RX324	7.10 Connection of FCUA-DX12* unit and machine control signal	FCUA-DX121: DI-R, DO-R
5	RX331	7.11 Connection of FCUA-DX13* unit and handle	FCUA-DX13*: HANDLE
6	RX341	7.13 Connection of FCUA-DX14* unit and analog input/output signal	FCUA-DX14*: AIO

Refer to "7.6 Outline of Analog Signal Output Circuit" for the analog output specifications.
Refer to "7.7 Outline of Analog Signal Input Circuit" for the analog input specifications.

5.5.6 Connection of Base I/O Unit Power Supply

Supply the +24V power to the base I/O unit from the DCIN connector.



(Note) A +24V power supply must be input for both the sink type and source type.

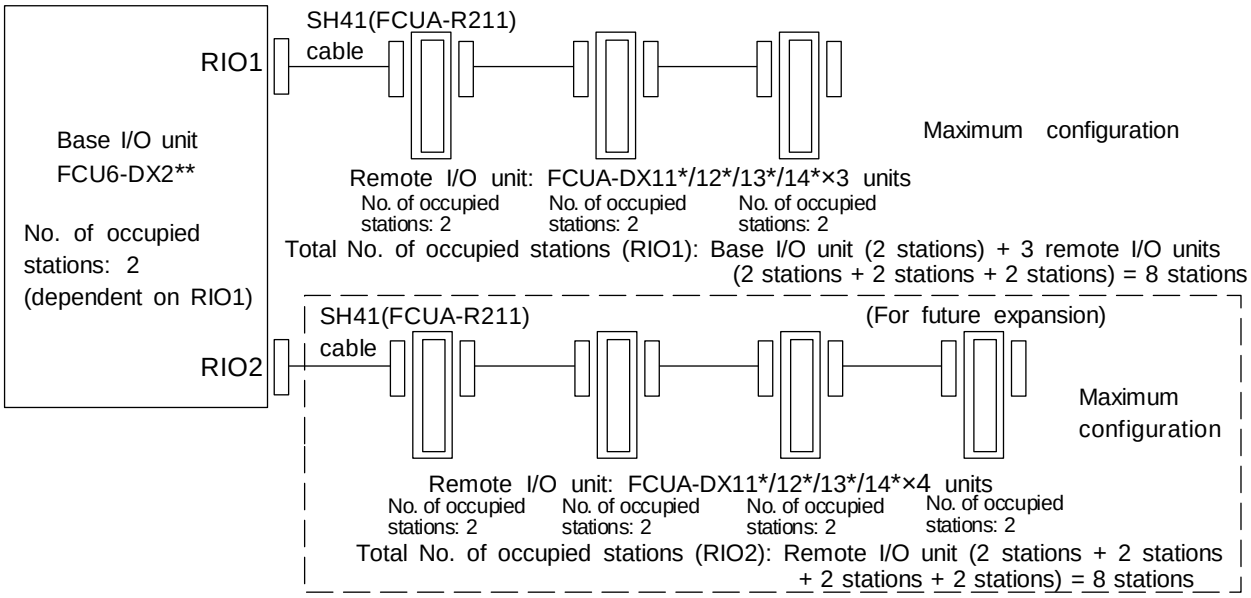
⚠CAUTION

- **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.**

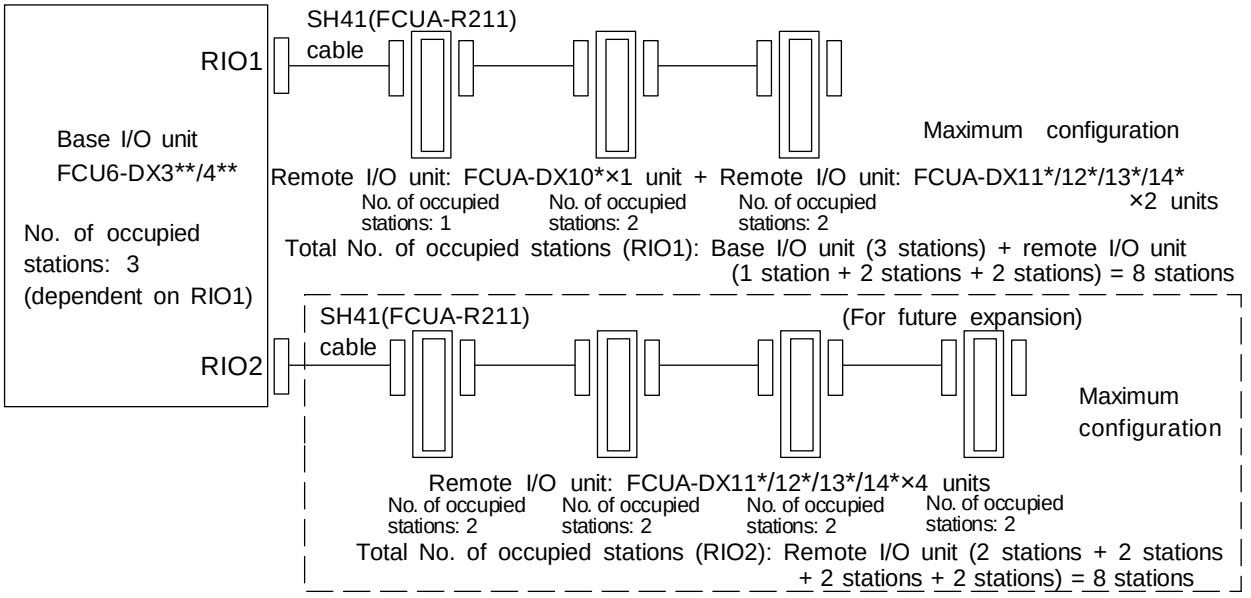
5.5.7 Examples of DI/DO Connection

There are two types of MELDASMAGIC64 DI/DO; the base I/O unit and remote I/O unit. Normally, one base I/O unit is used, a remote I/O unit is connected to RIO1 or RIO2 (for future expansion), and the No. of I/O points is configured in combination with the user specifications.
Refer to "7. Remote I/O Unit Connection" for information about remote I/O units.

<Connection example 1> When not using an add-on PCB



<Connection example 2> When using an add-on PCB

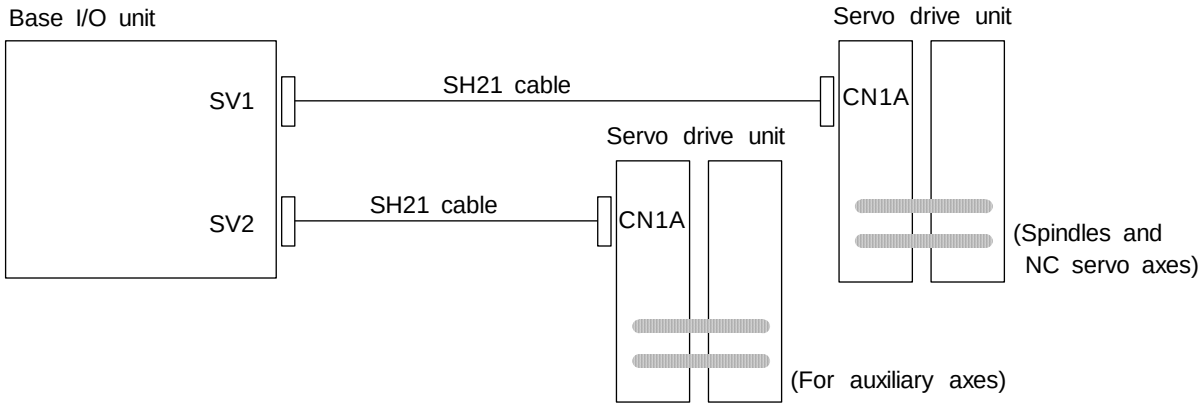


⚠CAUTION

- **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.**

5.5.8 Connection of Servo Drive Unit

Connect the servo drive unit to the base I/O unit SV1 (for spindles and NC servo axes) and SV2 (for peripheral axes).



Refer to "MELDAS AC Servo and Spindle MDS-A/B Series Specifications Manual (BNP-B3759) MDS-C1 Series Specifications Manual (BNP-C3000)" for servo drive unit details.

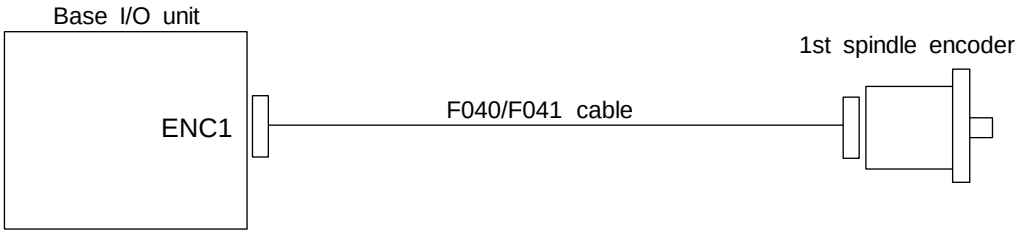
<Related sections>

Cable manufacturing drawing: “Appendix 2.1 SH21 cable”
Connector pin assignment: “5.4 Base I/O unit connector pin assignment” - servo drive unit (SV1, SV2)

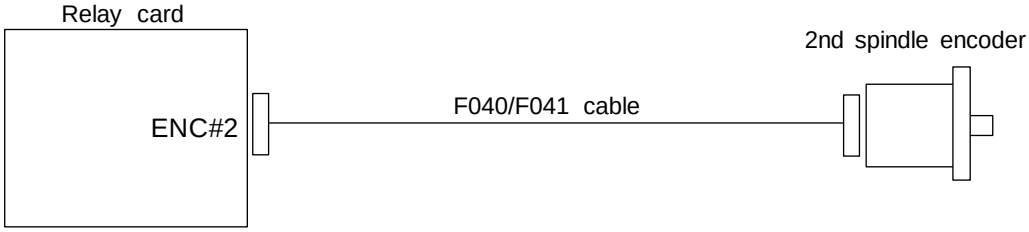
5.5.9 Connection of Spindle Encoder

Connect the spindle encoder to ENC1 on the base I/O unit. When connecting two channels, connect the second channel to ENC#2 on the relay card (HR682).

(Channel 1)



(Channel 2)



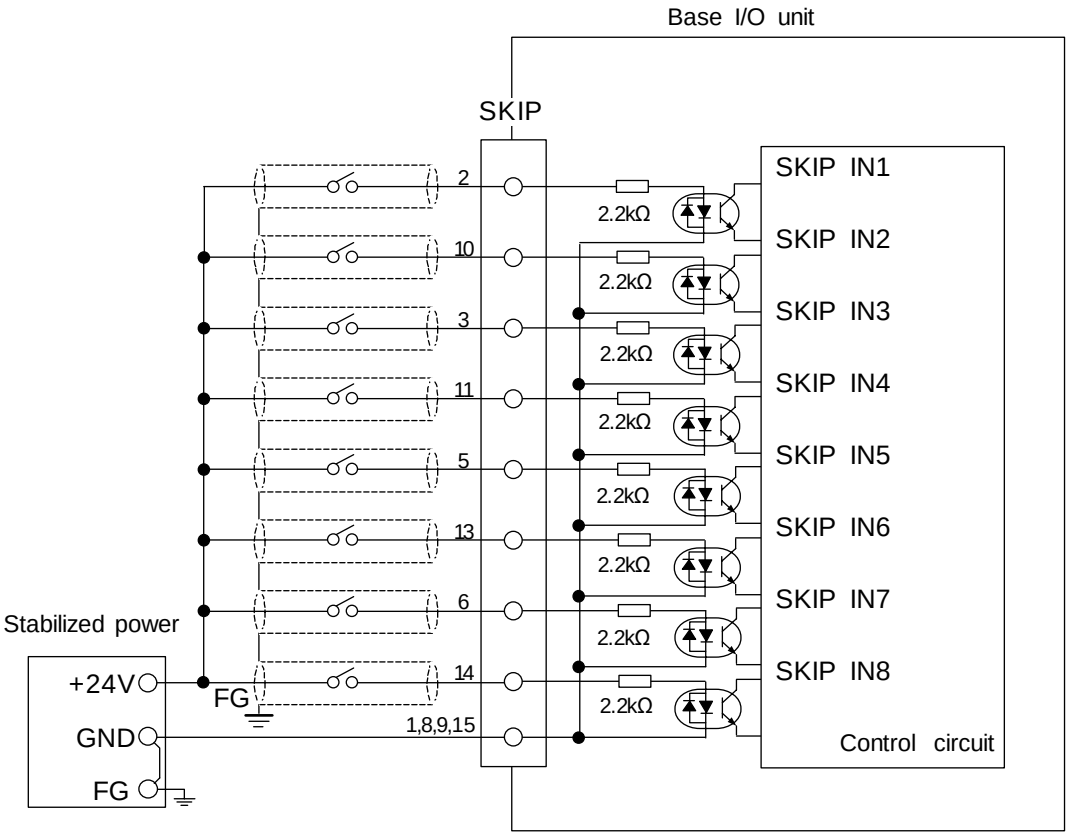
<Related sections>

Outline drawing: Appendix 1
Cable manufacturing drawing: “Appendix 2.15 F040 cable”, “Appendix 2.16 F041 cable”
Connector pin assignment: “5.4 Base I/O unit connector pin assignment” - encoder (ENC1)
“6.4 Relay card connector pin assignment” - encoder (ENC#2)

5.5.10 Connection of Sensor Signal (skip)

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

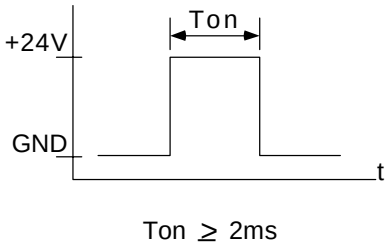
(1) Sensor signal (skip) cable



(2) Input conditions

Use the input signal within the following condition range.

1	Input voltage when external contact is ON	25.2V or more
2	Input current when external contact is ON	9mA or more
3	Input voltage when external contact is OFF	4V or less
4	Input current when external contact is 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



Ton ≥ 2ms

<Related section>

Connector pin assignment: “5.4 Base I/O unit connector pin assignment” – sensor signal (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.**

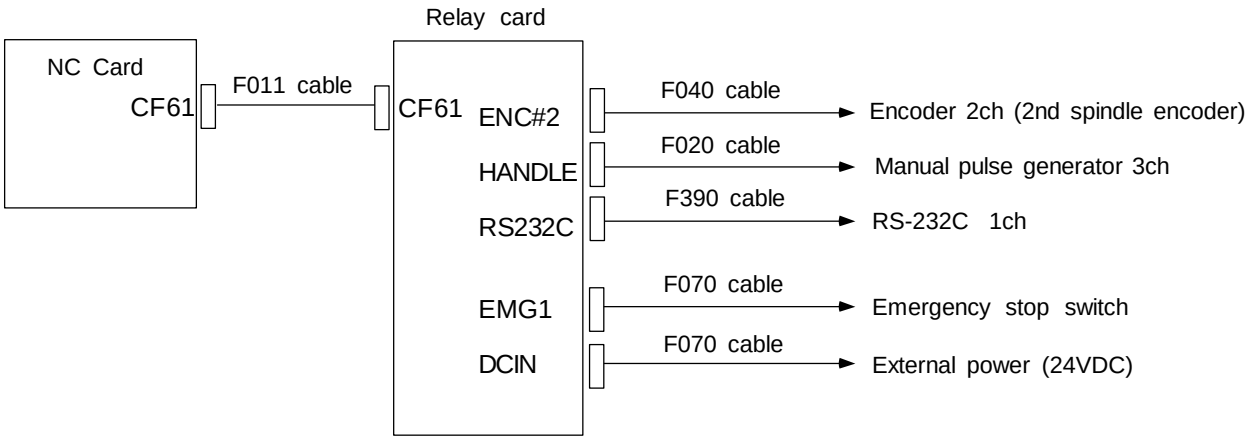
6. Relay Card (HR682) Connection

6.1 Relay Card Outline

The relay card is used in the connection of the spindle encoder, manual pulse generator, RS-232C and external emergency stop.
There must be one relay card for each NC Card.

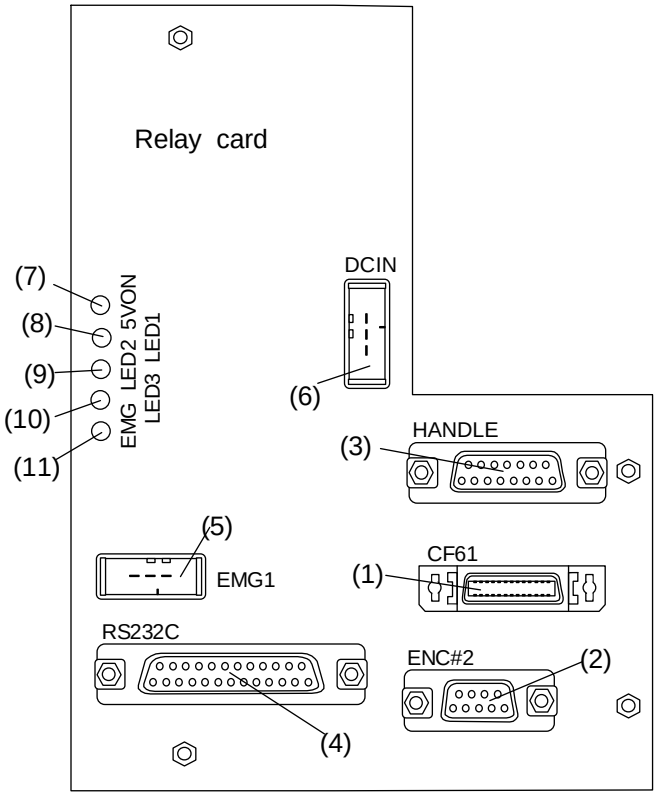
Name	Type	No. of machine input/ output points	Other interfaces
Relay card	HR682	No DI/DO	EMG, ENC#2, HANDLE 3ch and RS-232C. With metal spacers. Add-On to FCU6-DX2** possible. RS-232C uses only the DC code (X ON/OFF) method handshake.

6.2 Relay Card Connection System Diagram



(Note) RS-232C uses only the DC code (X ON/OFF) method handshake.

6.3 Relay Card Part Names



List of connectors

No.	Name	Function details
(1)	CF61	This is used in the connection with the NC Card. An F011 cable is connected.
(2)	ENC#2	This is connected to the encoder 2nd channel (2nd spindle encoder).
(3)	HANDLE	This is connected to the manual pulse generator. Up to 3 channels can be connected.
(4)	RS232C	This is connected to the RS-232C. One channel can be connected. Note that only the DC code (X ON/OFF) method handshake is possible.
(5)	EMG1	This is connected to the external emergency stop switch.
(6)	DCIN	24VDC is supplied by external power. Refer to "3.1 General Specifications" for power specifications.

LED list

No.	Name	Function details	
(7)	5VON	This is the LED for the circuit power 5VDC output display.	When lit (green): Outputting 5VDC. When not lit: 5VDC output OFF.
(8)	LED1	Not in use	
(9)	LED2	Not in use	
(10)	LED3	Not in use	
(11)	EMG	This is the LED for the NC system emergency stop display.	When lit (red): System in emergency stop When not lit: Normal

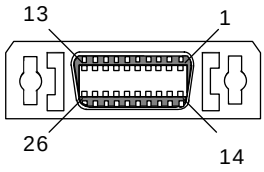
⚠CAUTION

- **Do not apply voltages on the connector other than those indicated in this manual. 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 any PCB while the power is ON.**

6.4 Relay Card Connector Pin Assignment

NC Card

CF61

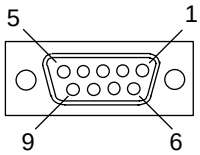


Connector pin assignment: Refer to "4.3 NC Card connector pin assignment" (Relay card: CF61).

<Cable side connector type>
Plug : 10126-6000EL
Shell : 10326-3210-000
Recommended manufacturer: Sumitomo 3M

Spindle encoder

ENC#2



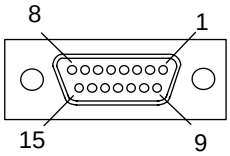
1	I	ENC2A	6	I	ENC2A*
2	I	ENC2B	7	I	ENC2B*
3	I	ENC2Z	8	I	ENC2Z*
4		GND	9	O	+5V
5		GND			

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

(Note) I/O in the table is from the viewpoint of the relay card.

Manual pulse generator

HANDLE



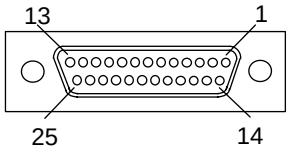
1	I	HA1A	9		GND
2	I	HA1B	10		+12V
3	I	HA2A	11		GND
4	I	HA2B	12		+12V
5	I	HA3A	13		GND
6	I	HA3B	14		+12V
7			15		
8					

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

(Note) I/O in the table is from the viewpoint of the relay card.

RS-232C device

RS232C



1		FG
2	O	TD
3	I	RD
4		
5		
6	O	DR
7		GND
8		
9		
10		
11		
12		
13		

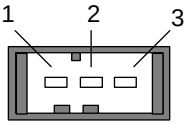
14		
15		
16		
17		
18		
19		
20	I	DC
21		
22		
23		
24		
25		

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

(Note) I/O in the table is from the viewpoint of the relay card. This connector shows the minimum required pin assignment for the RS-232C interface. Refer to "Appendix 2.18 F390 Cable" for details on manufacturing the cable.

+24VDC input

DCIN



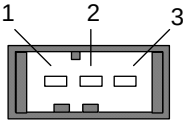
1		+24V
2		GND
3		FG

(Note) I/O in the table is from the viewpoint of the relay card.

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

Emergency stop

EMG1



1	I	EMG
2		GND
3		FG

(Note) I/O in the table is from the viewpoint of the relay card.

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

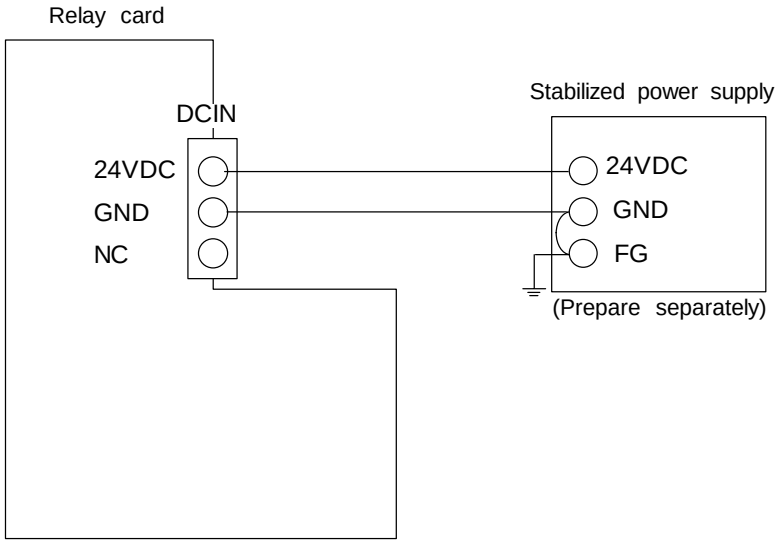
⚠CAUTION

- **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.**

6.5 Relay Card Input/Output Specifications

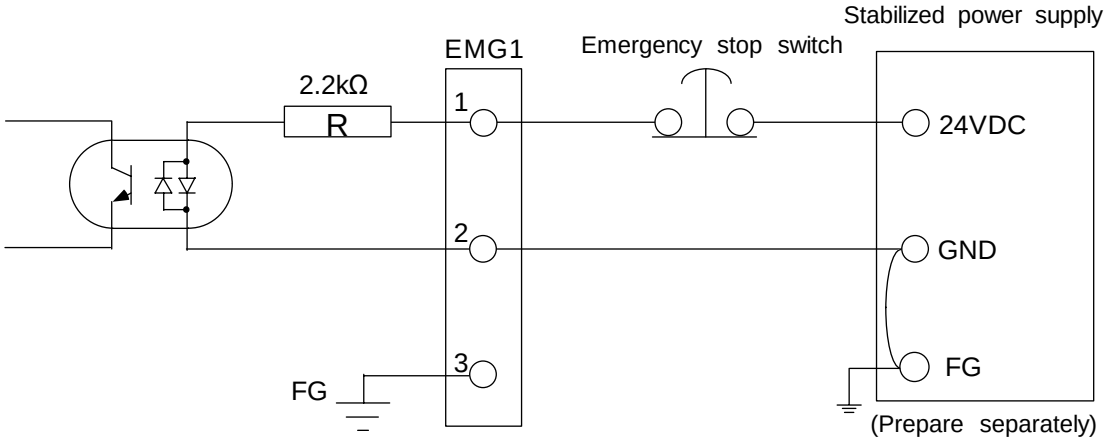
6.5.1 Relay Card Power Connection

Supply the external power (24VDC) input by the DCIN connector.



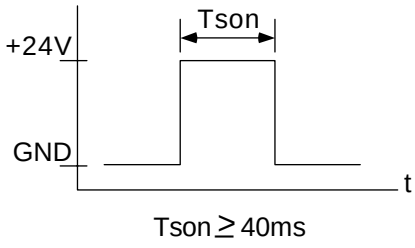
6.5.2 Emergency Stop Connection

The emergency stop input is connected to the EMG1 connector.



- **Input conditions**

Input voltage when external contact is ON	18V or more
Input current when external contact is ON	9mA or more
Input voltage when external contact is OFF	4V or more
Input current when external contact is OFF	1mA or more
Input signal hold time (Tson)	40ms or more
Machine side contact capacity	+30V or more, 16mA or more



⚠CAUTION

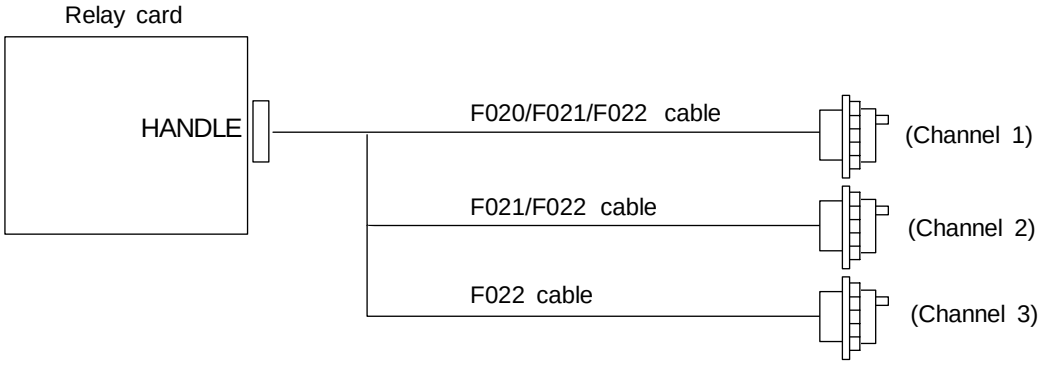
- **Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.**
- **Incorrect connections may damage the devices, so connect the cables to the specified connectors.**

6.5.3 Connection of Spindle Encoder

Refer to "5.5.9 Connection of Spindle Encoder" for details.

6.5.4 Manual Pulse Generator Connection

Connect the manual pulse generator to the relay card HANDLE connector. The manual pulse generator can be connected to a max. of three channels.



• Manual pulse generator connection cables

Cable name	Channel		
	1	2	3
F020 cable	○		
F021 cable	○	○	
F022 cable	○	○	○

○: Connection possible

<Related sections>

Outline drawing: "Appendix 1.8 Manual Pulse Generator (HD60) Outline Drawing"
Cable manufacturing drawing: "Appendix 2.12 F020 Cable", "Appendix 2.13 F021 Cable" and "Appendix 2.14 F022 Cable"
Connector pin assignment: "6.4 Relay Card Connector Pin Assignment"
- Manual Pulse Generator (HANDLE)

6.5.5 RS-232C Device Connection

Connect the RS-232C device to the RS-232C connector on the relay card using an F390 cable.
The pin assignment for the RS-232C connector differs from a commercially-available RS-232C cable.
Refer to the following related sections for details on manufacturing the cable.
Note that only the DC code (X ON/OFF) method handshake is possible.

<Related sections>

Cable manufacturing drawing: "Appendix 2.18 F390 Cable"
Connector pin assignment: "6.4 Relay Card Connector Pin Assignment"
- RS-232C Device (RS232C)

⚠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.**

6.6 Installation on the Base I/O Unit

A relay card (HR682) can be added on to the base I/O unit. When adding on, install the card using the following procedure.
Adding on is only possible with the FCU6-DX2** base I/O unit.
Note that adding on is not possible with the FCU6-DX3** and 4**.

1. Remove screw 1 from the base I/O unit. (Fig. 1)
2. Remove screw 2 of the relay card and spacer 1 (screw holes at both ends are female). (Fig. 2)
3. Install the attached spacer 2 (screw holes on one side are male) to the hole of screw 1 that was removed from the base I/O unit. (Fig. 3)
4. Mount the relay card on the base I/O unit, and fix with screw 1 that was removed in step 1. (Fig. 4)
5. Turn the unit over, and fix the screws at the three holes to the three spacer locations. (Fig. 5)

This completes the installation of the relay card to the base I/O unit.

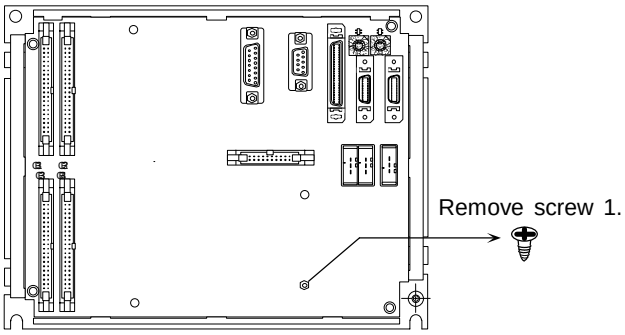


Fig. 1

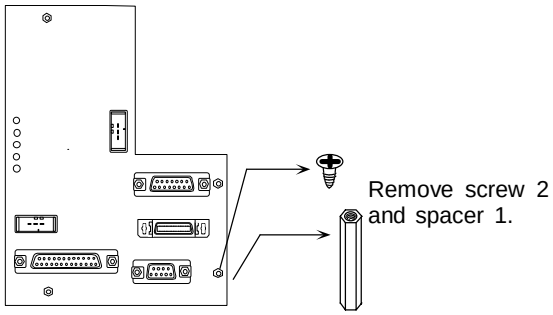


Fig. 2

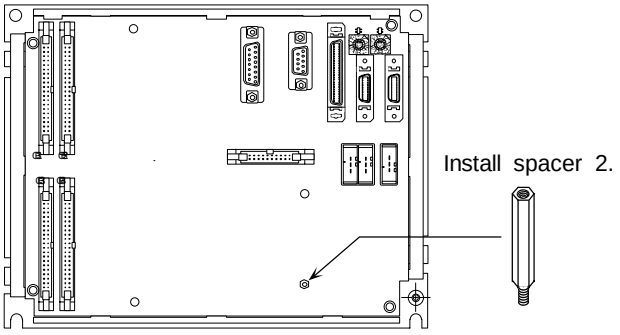


Fig. 3

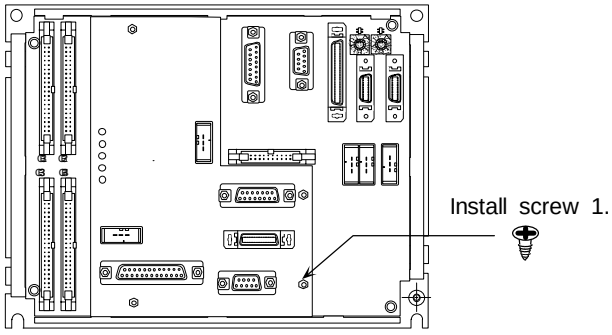


Fig. 4

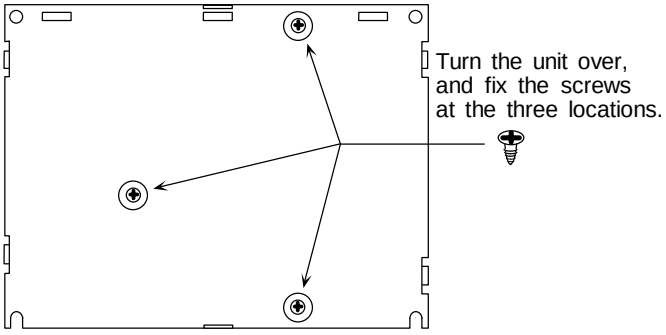


Fig. 5

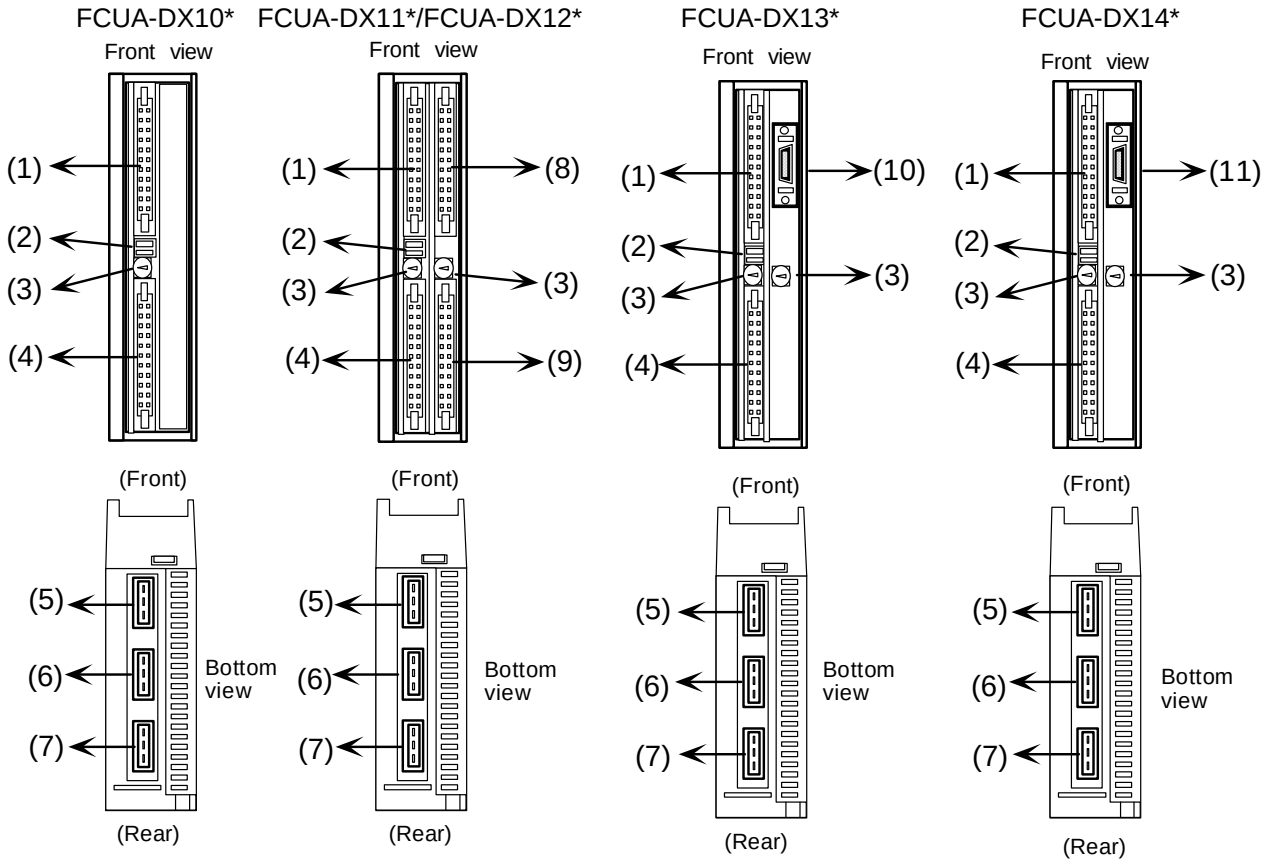
7. Remote I/O Unit Connection (FCUA-DX1**)

7.1 Outline of Remote I/O Unit

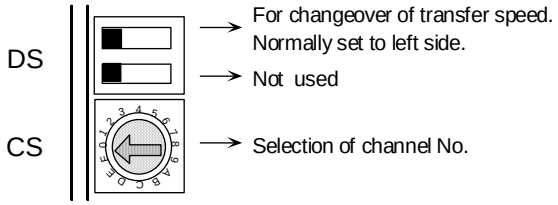
The eight types of signals that can be input/output from the remote I/O unit (FCUA-DX1**) are shown below according to the type and No. of contacts. Use with serial link connections (MC link B) to the NC Card.
When the remote I/O unit is connected with serial links, multiple units can be used as long as the total No. of occupied stations (channels) is within 8 channels. (Refer to "7.14 Setting of Channel No. When Using Multiple Remote I/O Units" for station No. setting details.)

Unit name	Machine control signals that can be input/output	No. of occupied serial link channels
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-DX130	Digital input signal (DI) : 32 points (photo coupler insulation) sink/source type Digital output signal (DO) : 32 points (non-insulation) sink type Handle input : 2 channels	2
FCUA-DX131	Digital input signal (DI) : 32 points (photo coupler insulation) sink/source type Digital output signal (DO) : 32 points (non-insulation) source type Handle input : 2 channels	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

7.2 Names of Each Remote I/O Unit Section



(1) DI-L (machine input signal connector)
(2) DS (transfer speed changeover switch)
(3) CS (channel 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) HANDLE (manual pulse generator signal input connector)
(11) AIO (analog signal input/output connector)



Enlarged drawing of DS and CS

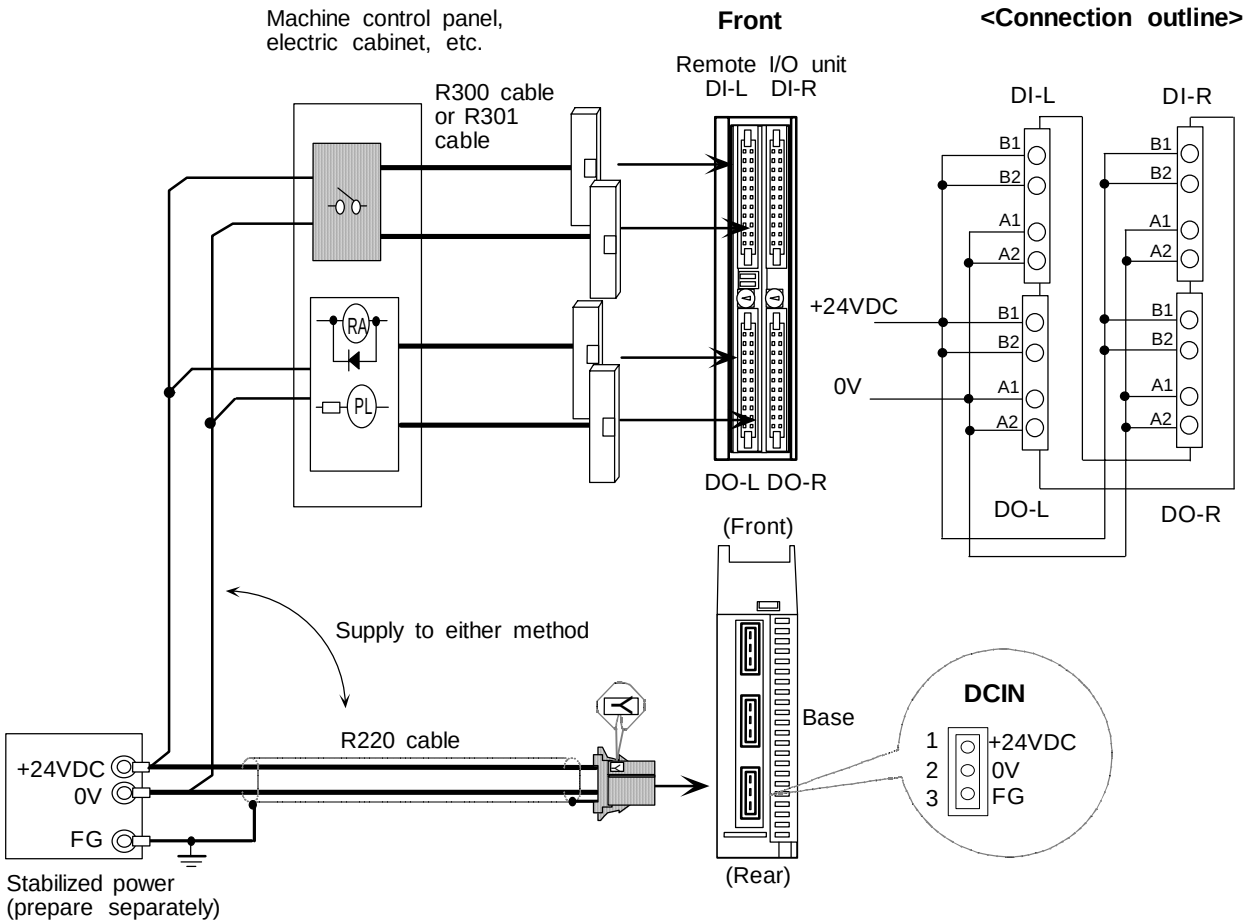
(Note) Baud rate changeover
Left side : 2.8Mbps
Right side: 1.4Mbps

7.3 Connection of Remote I/O Power

+24VDC is required to run the remote I/O unit. Prepare a stabilized power supply that satisfies the following conditions.

Output voltage	+24V ±5%	
Ripple	±5% (P-P)	
Max. output current	FCUA-DX10*	2.4A or more
	FCUA-DX11*	3.8A or more
	FCUA-DX12*	3.8A or more
	FCUA-DX13*	3.4A or more
	FCUA-DX14*	3.4A or more

The +24VDC power for the control circuit is supplied from the connector DCIN on the bottom of the unit or from connectors DI-L, DI-R, DO-L or DO-R on the front. When supplying from the front connector, supply to all corresponding pins.
When manufacturing the R300 cable, use the single-end connector CN300 (optional, with one end), and when manufacturing the R301 cable, use the connector set CS301 (optional, with two ends).



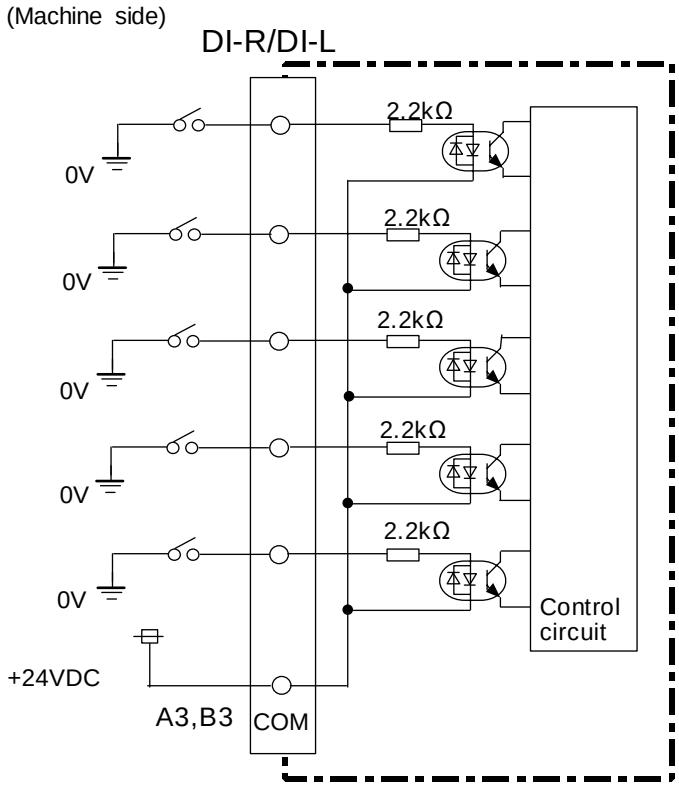
⚠CAUTION

- **Do not apply voltages other than those indicated in this manual on the connector. Doing so may lead to destruction or damage.**
- **Incorrect connections could damage the device, so always connect the cable to the designated connector.**

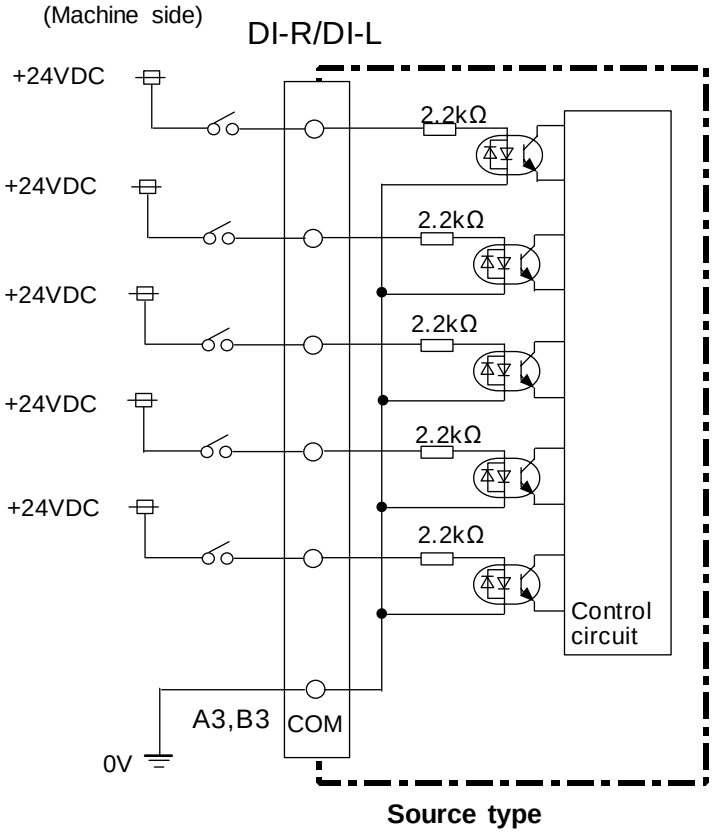
7.4 Outline of Digital Signal Input Circuit

The input circuit can be selected from sink type or source type in card units.

Input circuit



Sink type



Source type

Input conditions

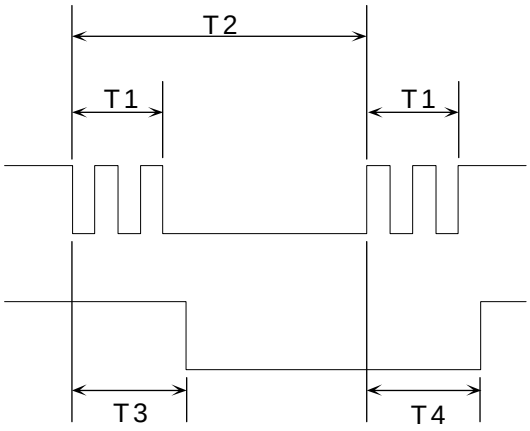
The input signals must be used within the following condition ranges.

Sink type

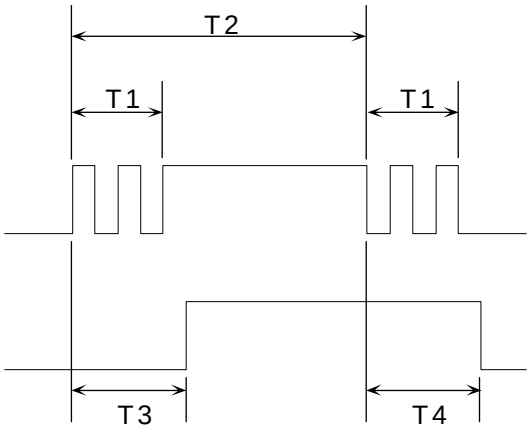
Input voltage at external contact ON	6V or less
Input current at external contact ON	9mA or more
Input voltage at external contact OFF	20V or more, 25.2V or less
Input current at external contact OFF	2mA or less
Tolerable chattering time (T1)	3ms or less
Input signal hold time (T2)	40ms or more
Input circuit operation delay time (T3, T4)	3ms ≤ T3 ≒ T4 ≤ 16ms
Machine side contact capacity	+30V or more, 16mA or more

Source type

Input voltage at external contact ON	18V or more, 25.2V or less
Input current at external contact ON	9mA or more
Input voltage at external contact OFF	4V or less
Input current at external contact OFF	2mA or less
Tolerable chattering time (T1)	3ms or less
Input signal hold time (T2)	40ms or more
Input circuit operation delay time (T3, T4)	3ms ≤ T3 ≒ T4 ≤ 16ms
Machine side contact capacity	+30V or more, 16mA or more



Sink type

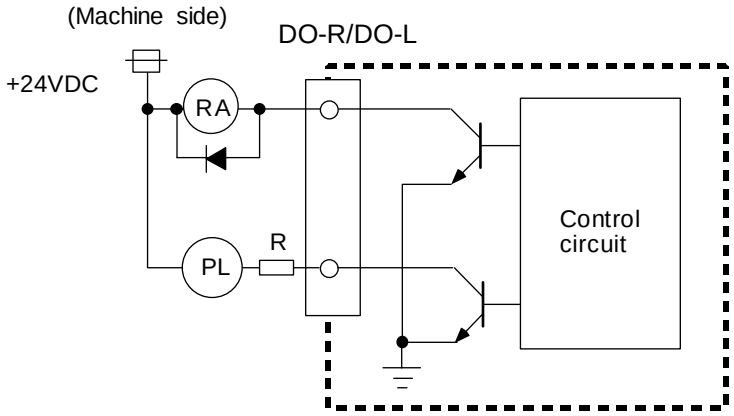


Source type

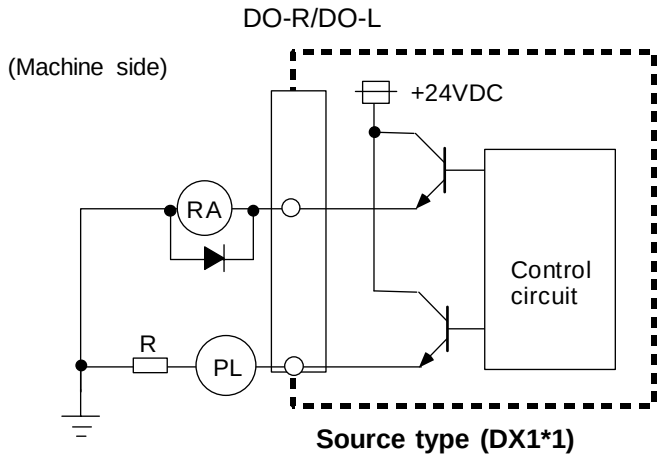
7.5 Outline of Digital Signal Output Circuit

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



Sink type (DX1*0)



Source type (DX1*1)

Output conditions

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

(Note) An output voltage of more than 60mA per point cannot be flowed.

<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 capacity load such as a ramp, 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.)

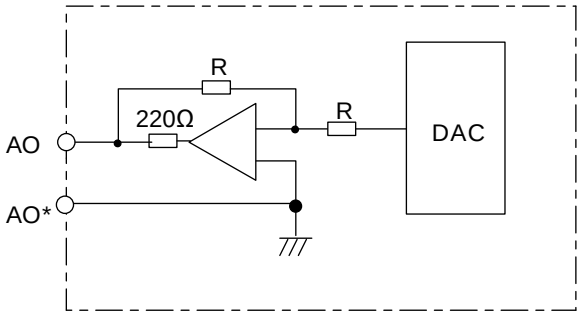
⚠CAUTION

- **When using an inductive load such as a relay, always connect a diode in parallel to the load.**
- **When using a capacity load such as a ramp, always connect a protective resistor serially to the load to suppress rush currents.**

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



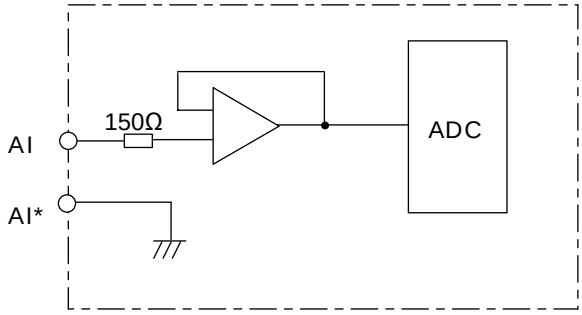
Output conditions

Output voltage	0V~±10V (±5%)
Resolution (polarity included)	12 bit (±10V × n/4096) (n = 2^0 to 2^{11})
Load conditions	10kΩ load resistance
Output impedance	220Ω

7.7 Outline of Analog Signal Input Circuit

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

Input circuit

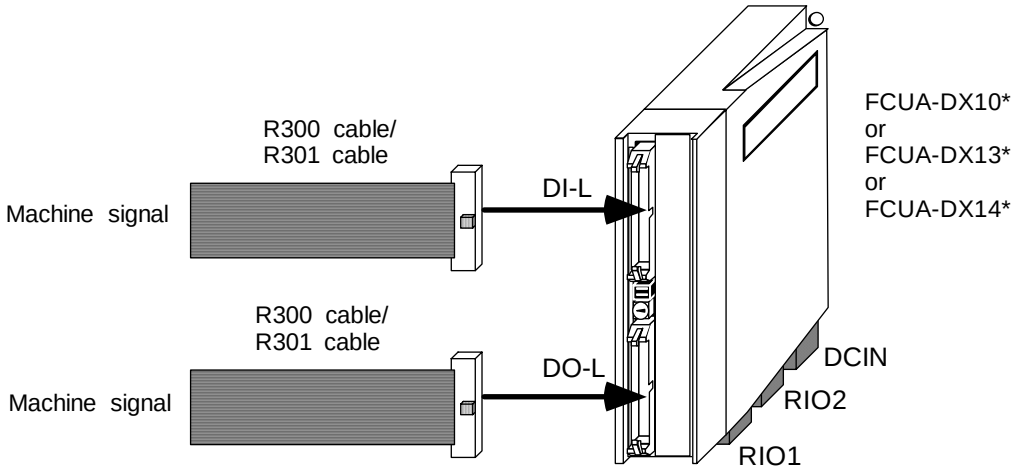


Input conditions

Max. input voltage rating	±15V
Resolution (polarity included)	12 bit (±10V × n/2048) (n = 2^0 to 2^{11})
Precision	Within ±25mV
AD input sampling time (conversion delay)	14.2ms (AI0)/42.6ms (AI1~3)

7.8 Connection of FCUA-DX10*/13*/14* Unit and Machine Control Signal

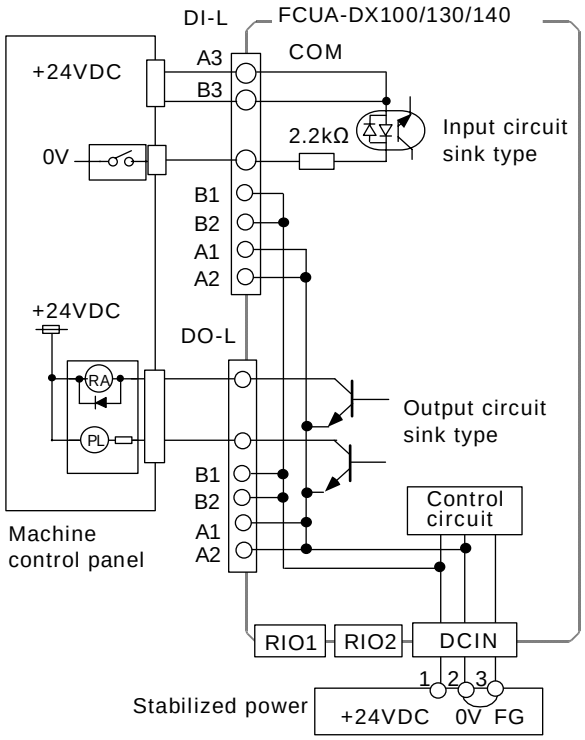
Type of machine input/output signal and No. of points	Input	Output
	32 points	32 points

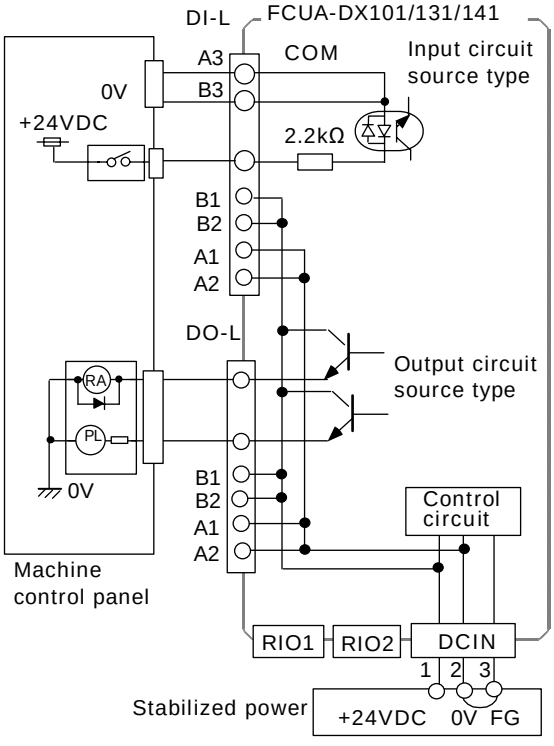


The single-end connector CN300 (optional, with one end) includes the DI-L and DO-L connectors. The connector set CS301 (optional) includes the DI-L and DO-L connectors, and two connectors for connection with the terminal block *.

* IDEC IZUMI Corporation I/O terminal BX1F-T40

<Outline of connection>



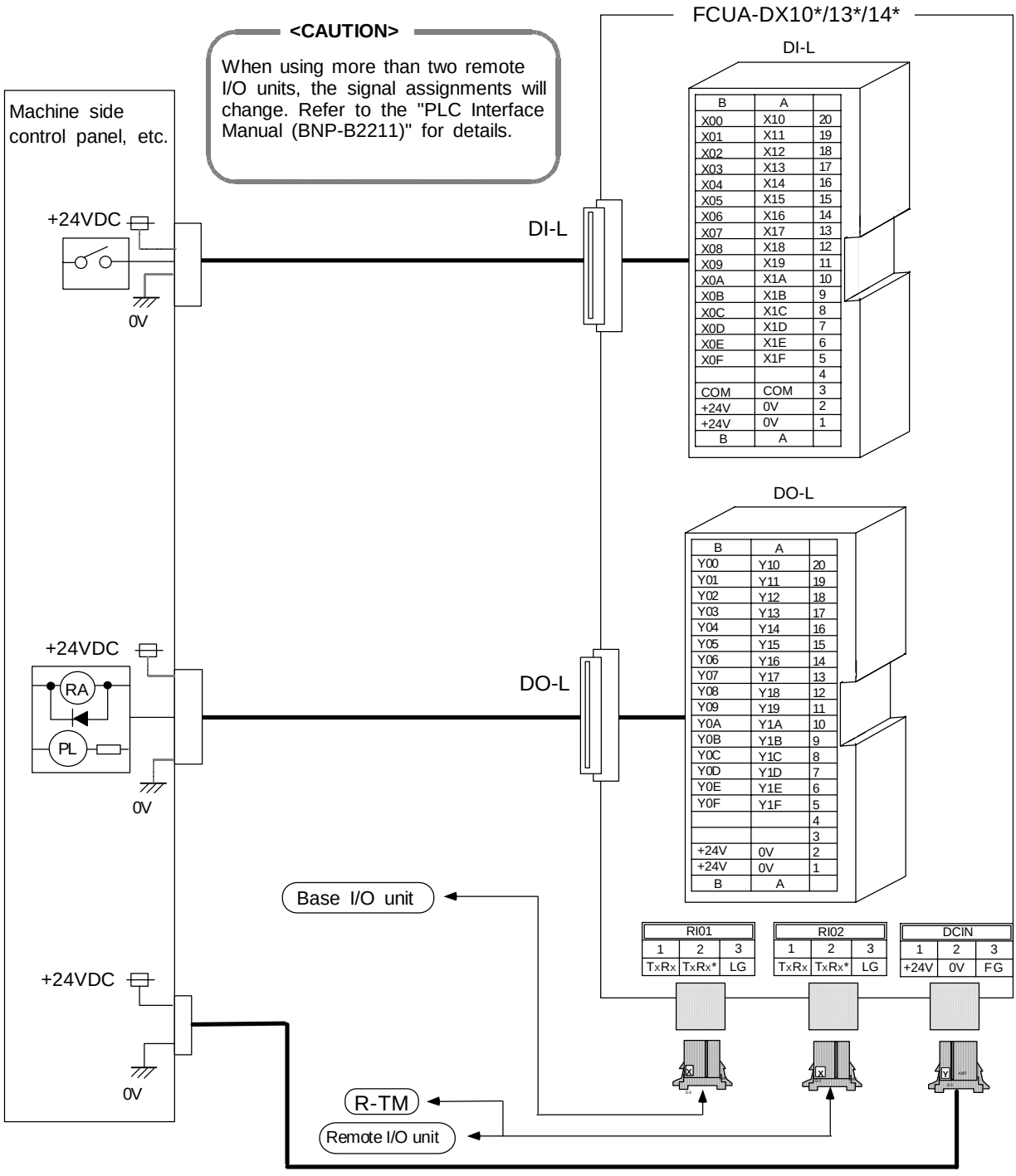


⚠CAUTION

⚠ 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.

<Signal assignment table>



B	A	
X00	X10	20
X01	X11	19
X02	X12	18
X03	X13	17
X04	X14	16
X05	X15	15
X06	X16	14
X07	X17	13
X08	X18	12
X09	X19	11
X0A	X1A	10
X0B	X1B	9
X0C	X1C	8
X0D	X1D	7
X0E	X1E	6
X0F	X1F	5
		4
COM	COM	3
+24V	0V	2
+24V	0V	1
B	A	

B	A	
Y00	Y10	20
Y01	Y11	19
Y02	Y12	18
Y03	Y13	17
Y04	Y14	16
Y05	Y15	15
Y06	Y16	14
Y07	Y17	13
Y08	Y18	12
Y09	Y19	11
Y0A	Y1A	10
Y0B	Y1B	9
Y0C	Y1C	8
Y0D	Y1D	7
Y0E	Y1E	6
Y0F	Y1F	5
		4
		3
+24V	0V	2
+24V	0V	1
B	A	

<Adaptive connection>

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)

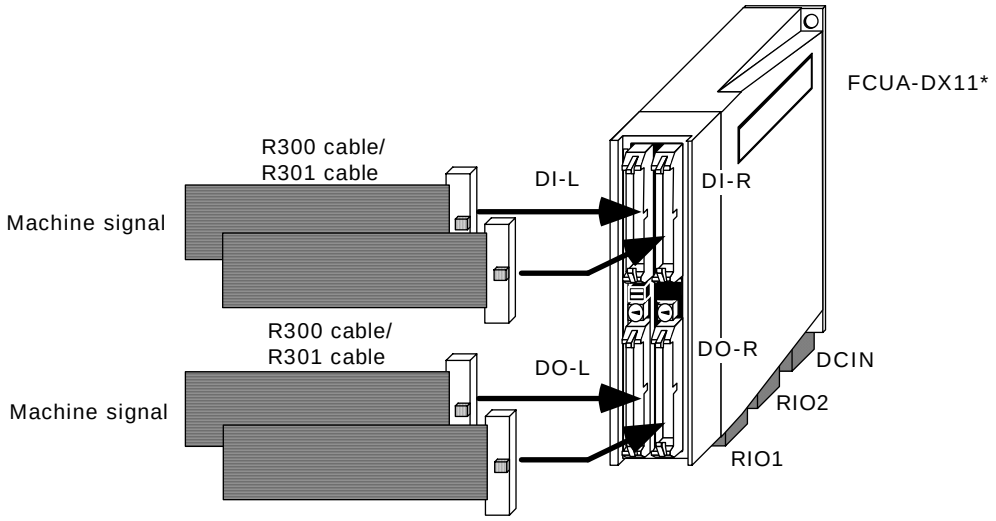
Crimp type connector:
7940-6500SC
Manufacturer:
Sumitomo 3M

Terminator (R-TM)

Manufacturer:
Tyco Electronics AMP

7.9 Connection of FCUA-DX11* Unit and Machine Control Signal

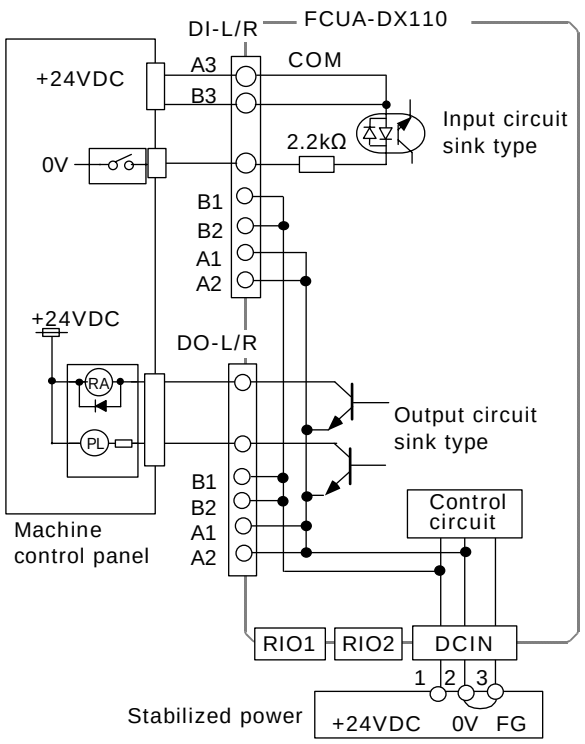
Type of machine input/output signal and No. of points	Input	Output
	64 points	48 points

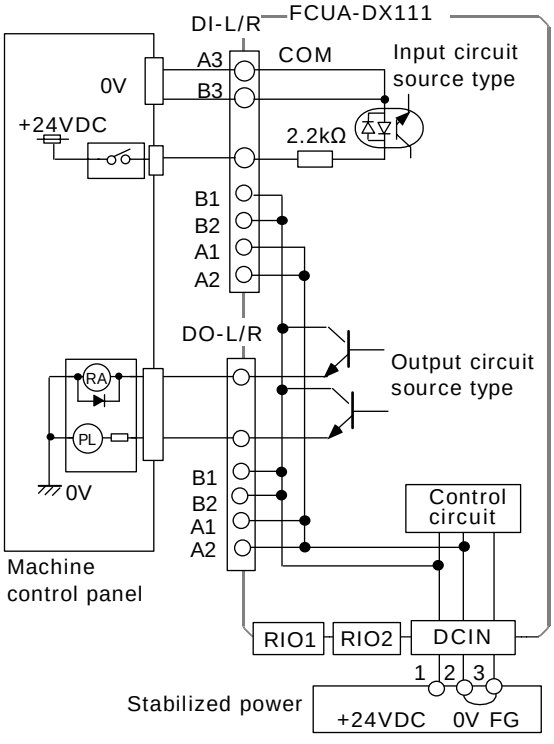


The single-end connector CN300 (optional, with one end) includes the DI-L (DI-R) and DO-L (DO-R) connectors. The connector set CS301 (optional) includes the DI-L (DI-R) and DO-L (DO-R) connectors, and two connectors for connection with the terminal block *.

* IDEC IZUMI Corporation I/O terminal BX1F-T40

<Outline of connection>



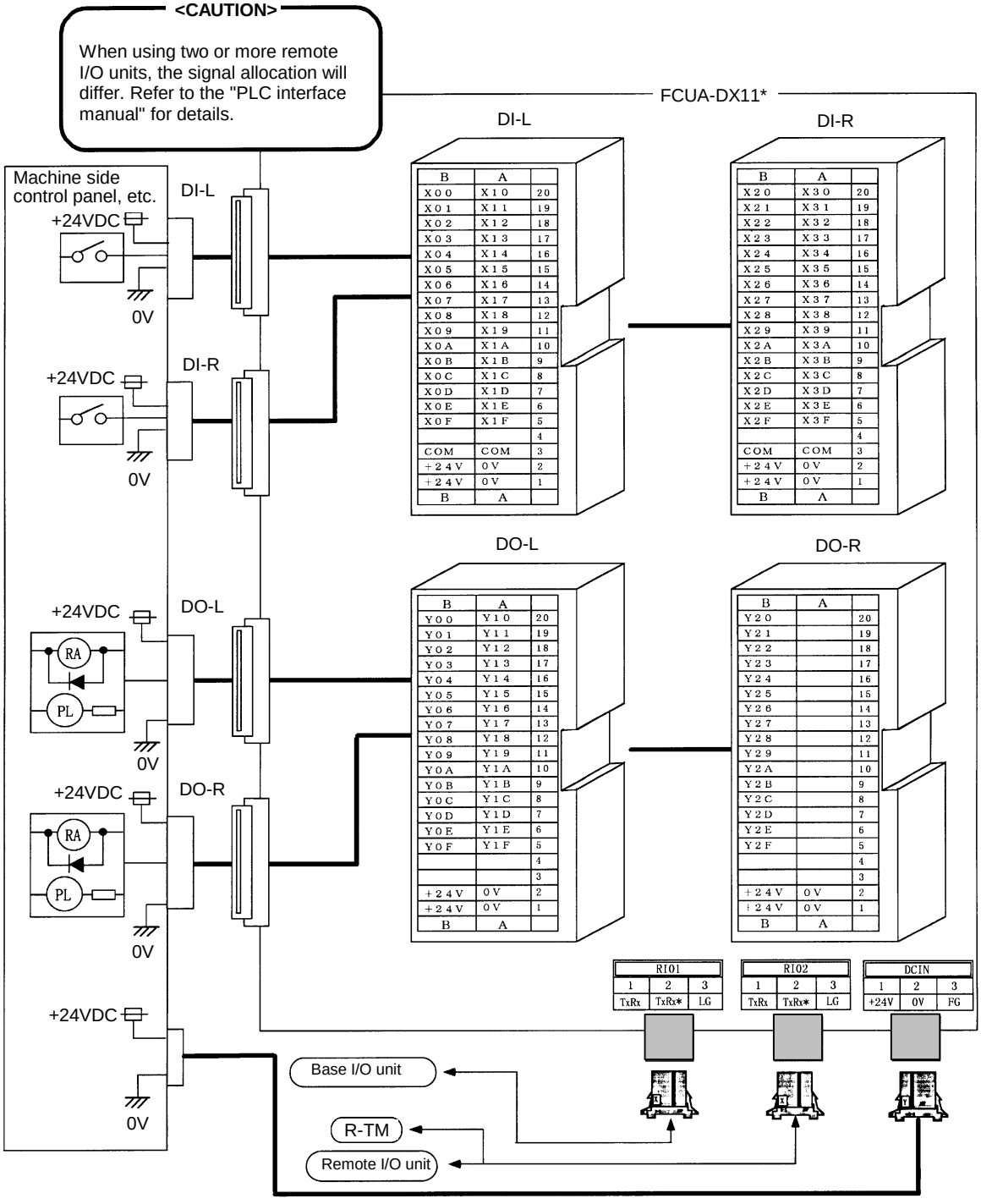


⚠CAUTION

⚠ 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.

<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)

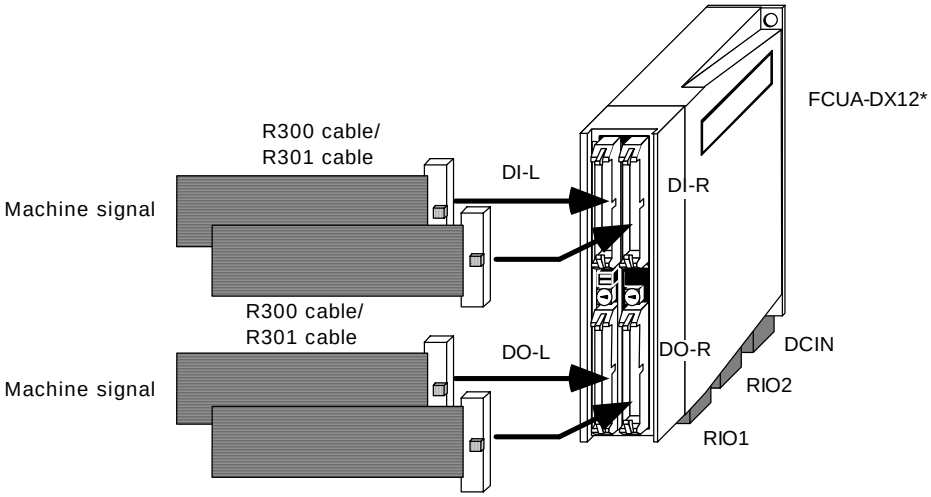
Crimp type connector:
7940-6500SC
Manufacturer:
Sumitomo 3M

Terminator (R-TM)

Manufacturer:
Tyco Electronics AMP

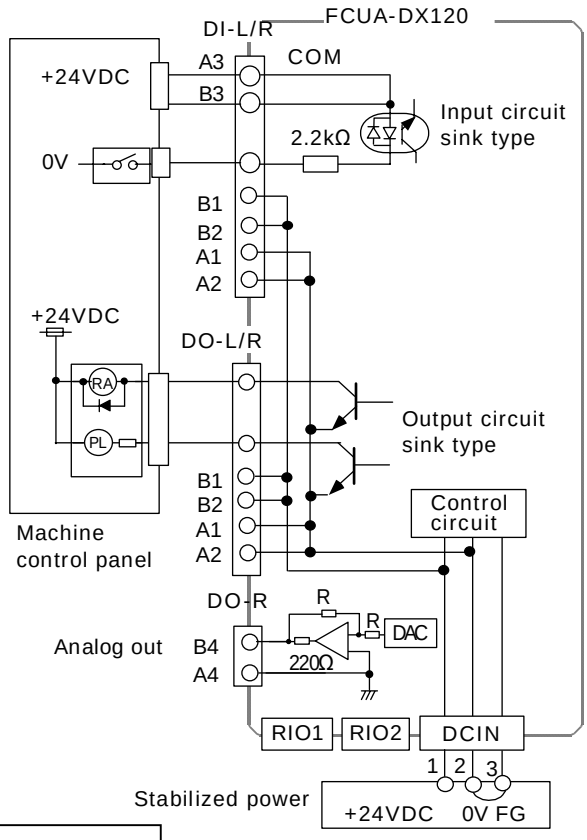
7.10 Connection of FCUA-DX12* Unit and Machine Control Signal

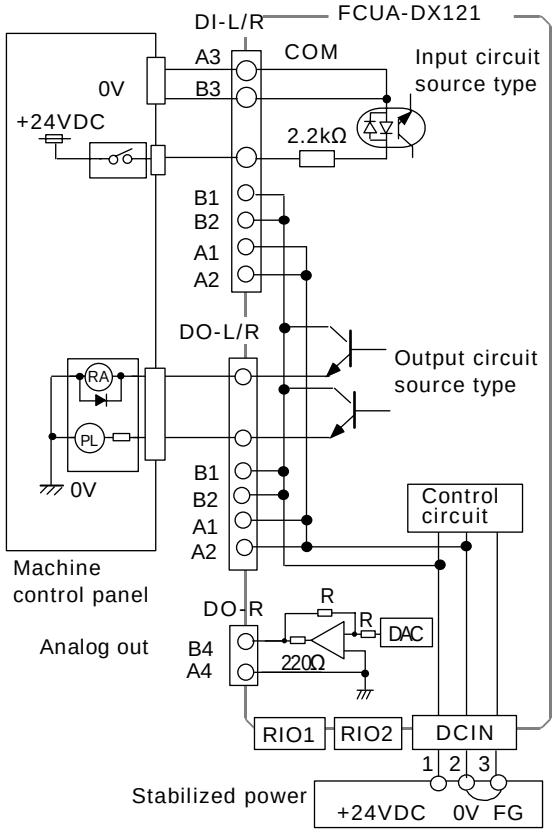
Type of machine input/output signal and No. of points	Input	Output	Analog output
	64 points	48 points	1 point



The single-end connector CN300 (optional, with one end) includes the DI-L (DI-R) and DO-L (DO-R) connectors.
The connector set CS301 (optional) includes the DI-L (DI-R) and DO-L (DO-R) connectors, and two connectors for connection with the terminal block*.
* IDEC IZUMI Corporation I/O terminal BX1F-T40

<Outline of connection>



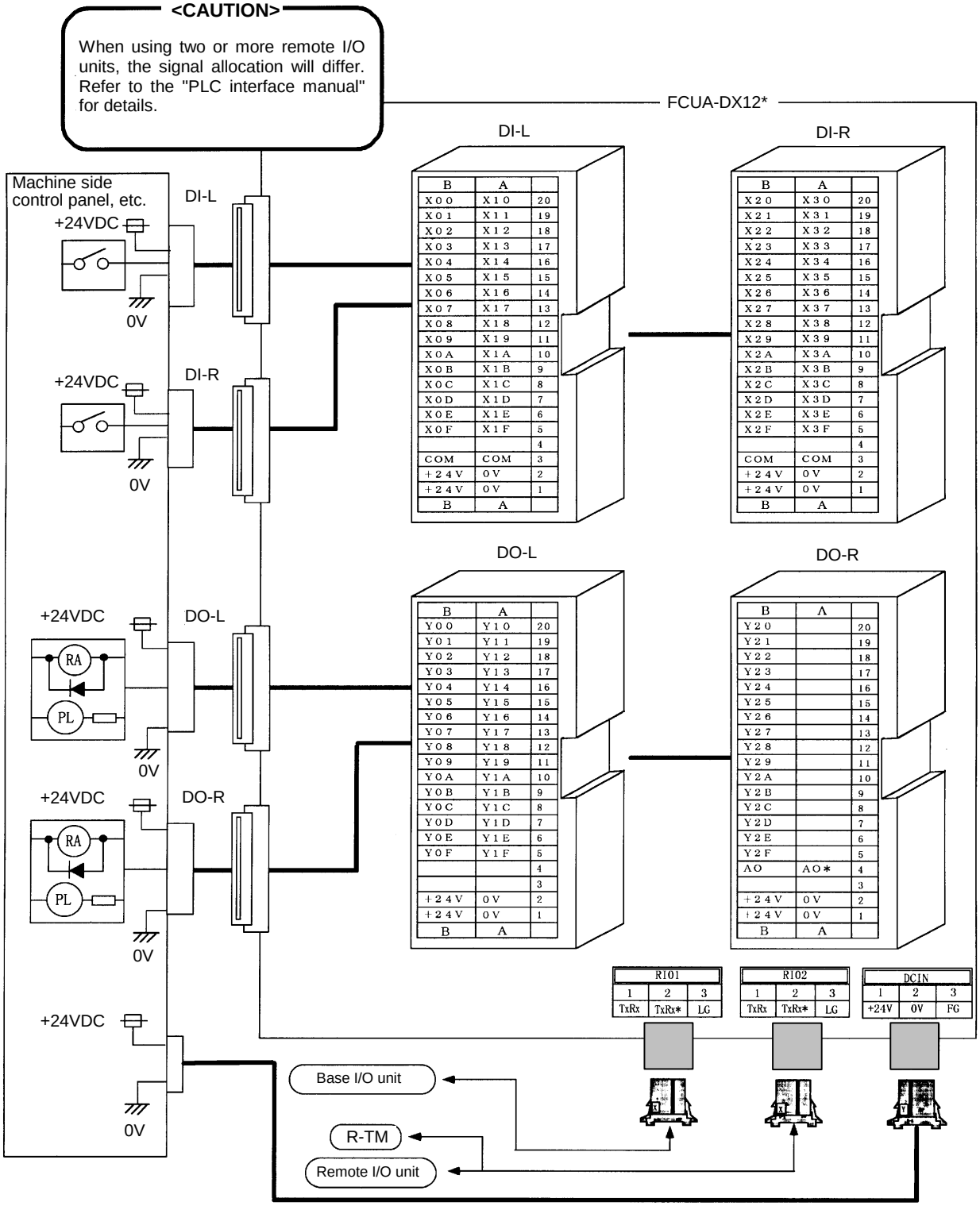


⚠CAUTION

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.

<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)

Crimp type connector:
7940-6500SC
Manufacturer:
Sumitomo 3M

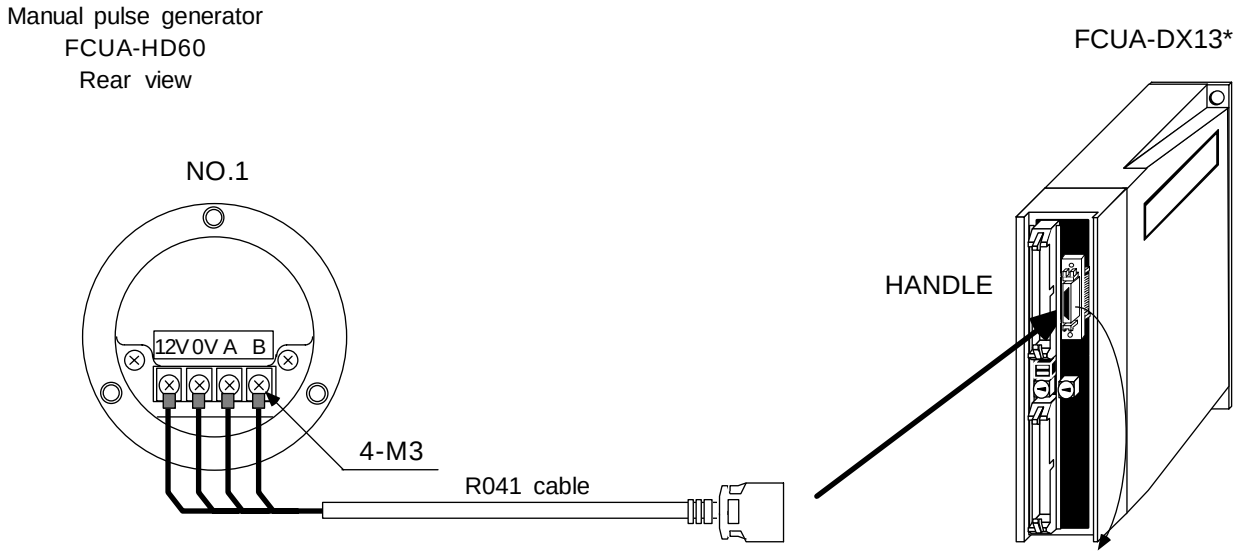
Terminator (R-TM)

Manufacturer:
Tyco Electronics AMP

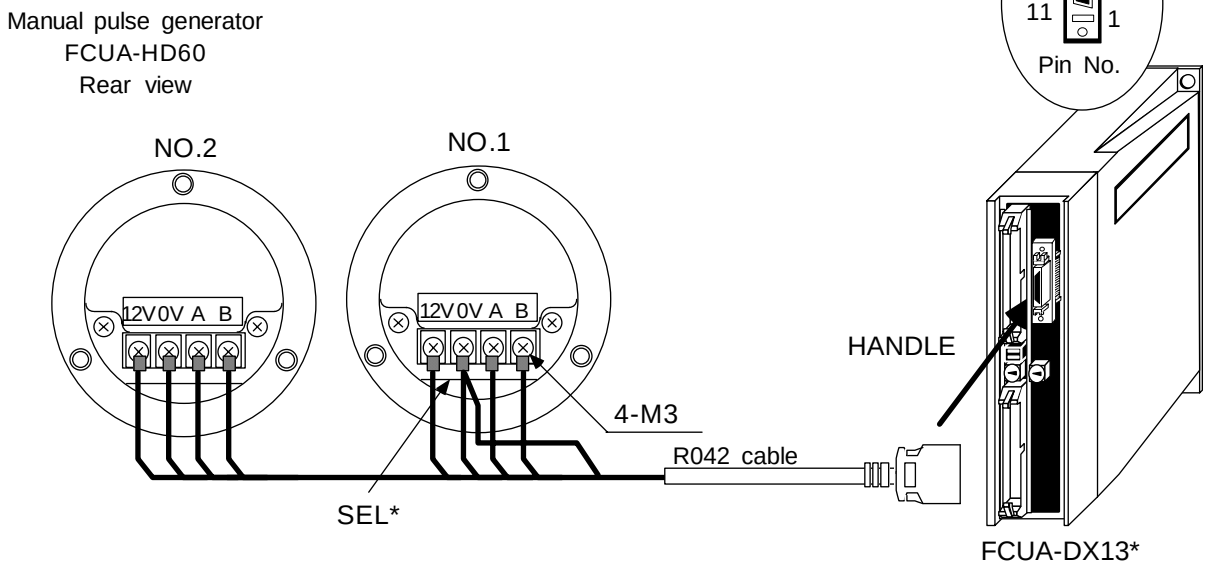
7.11 Connection of FCUA-DX13* Unit and Handle

To connect the manual pulse generator, the R041 or R042 cable is connected to "HANDLE". Up to two manual pulse generators can be connected. When manufacturing the R041 or R042 cable, use the connector set CS000 (optional, with two ends). (Refer to Appendix 2.4 R041 Cable, and Appendix 2.5 R042 Cable for cable details.)

To Connect one manual pulse generator



To connect two manual pulse generators



When connecting the second manual pulse generator, connect the SEL* signal to the No. 1's 0V.

⚠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.**

7.12 Outline of FCUA-DX13* Unit Pulse Input Circuit

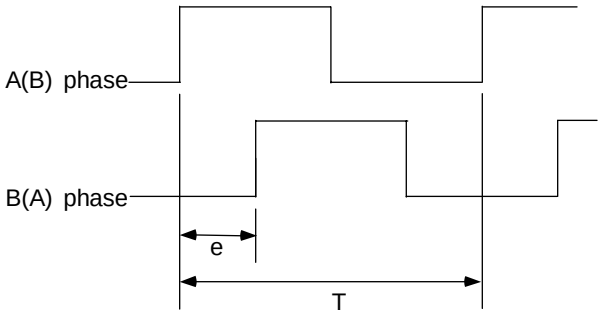
When connecting a device (pulse generator) other than the manual pulse generator to the FCUA-DX13* unit, use within the following specifications.

Input/output conditions

Input pulse signal format	2 signals of A-phase and B-phase potential difference 90 degrees (Refer to waveform below)
Input voltage	H level 3.5V or more, L level 1.0V or less
Max. frequency of input pulse	100kHz
Output voltage	12V ± 10%
Max. output current	300mA

Input waveform

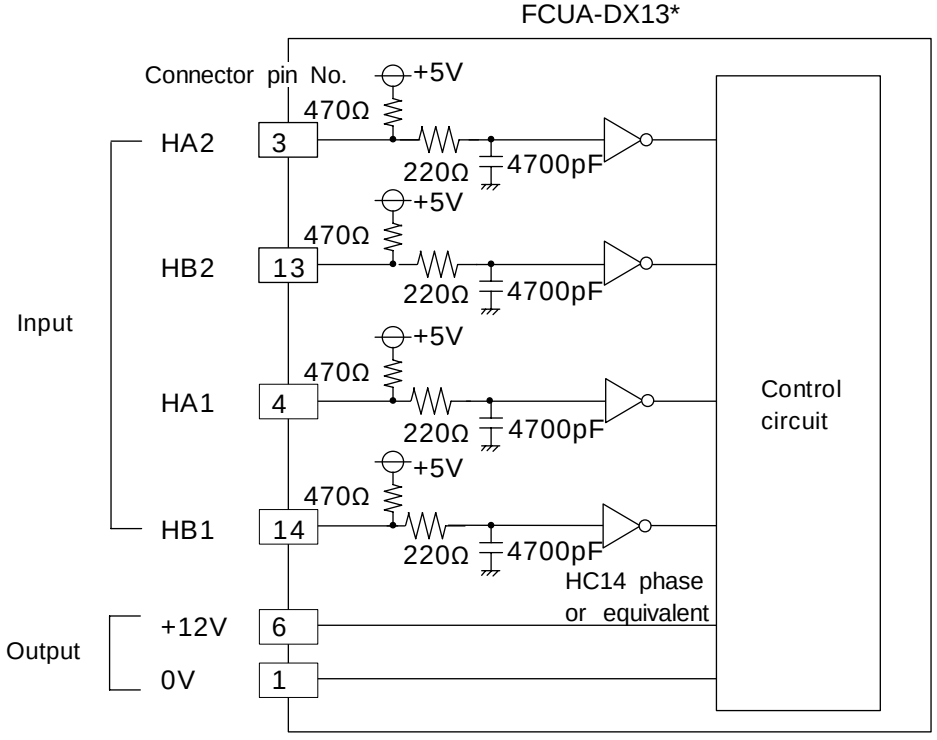
The difference of the input waveform potential must be ± 45 degrees or less.



e: Rising edge potential difference of A-phase or B-phase

T: A or B-phase cycle (min. 10μs)

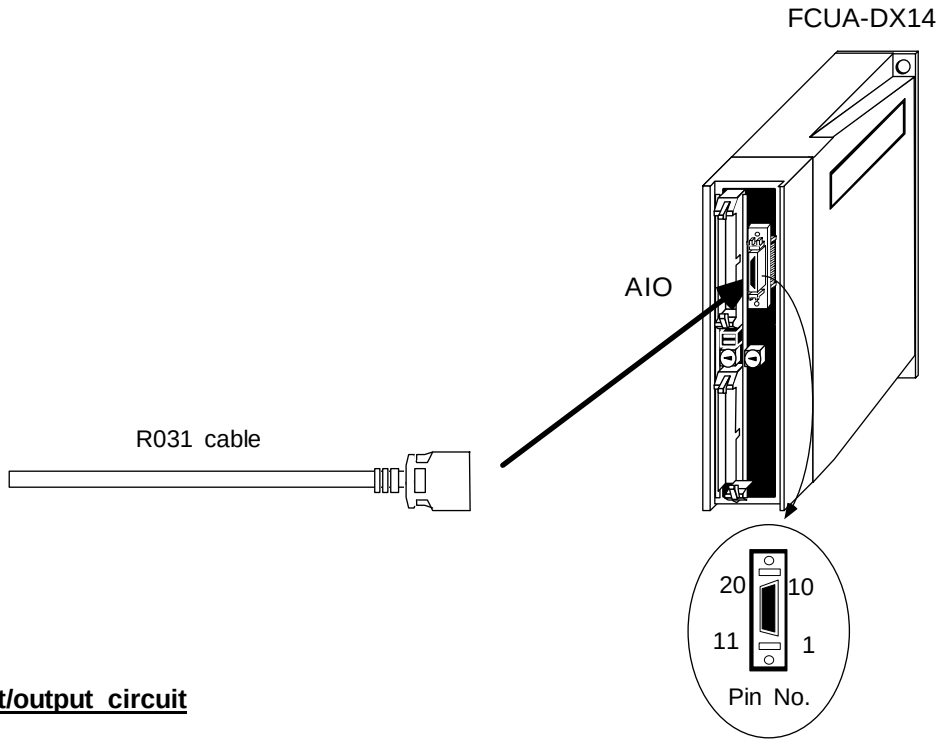
Input/output circuit



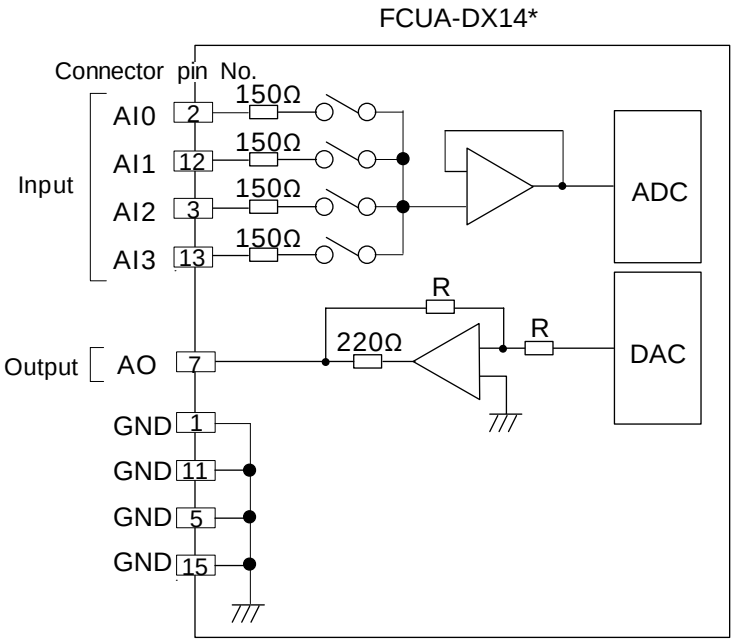
The R041-3M (for one unit) and R042-3M (for two units) are available for the handle cables.

7.13 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, use the connector set CS000 (optional, with two ends). (Refer to the Appendix 2.3. R031 cable.)



Input/output circuit



⚠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.**

7.14 Setting of Channel 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 channels is within 8 channels.

Unit name	No. of occupied serial link channels
FCUA-DX10*	1
FCUA-DX11*	2
FCUA-DX12*	2
FCUA-DX13*	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*, DX13* and DX14* units have two switches. Each of these switches must be set to a characteristic station No.
The device address in each unit is determined according to the station No. Use the station No. setting switch to set the device address.

- Relation between rotary switches and device assignments

Setting value	Station No.	Device assignment		No. of I/O points (max)
		DI	DO	
0	0	X00~X1F	Y00~Y1F	32 points
1	1	X20~X3F	Y20~Y3F	32 points
2	2	X40~X5F	Y40~Y5F	32 points
3	3	X60~X7F	Y60~Y7F	32 points
4	4	X80~X9F	Y80~Y9F	32 points
5	5	XA0~XBF	YA0~YBF	32 points
6	6	XC0~XDF	YC0~YDF	32 points
7	7	XE0~XFF	YE0~YFF	32 points
8~F	Cannot be used			

<Device assignment example 1>

Rotary switch setting value	Station No.	Device assignment	
		DI	DO
0	0	X00~X1F	Y00~Y1F
1	1	X20~X3F	Y20~Y3F
2	2	X40~X5F	Y40~Y5F
3	3	X60~X7F	Y60~Y7F
4	4	X80~X9F	Y80~Y9F

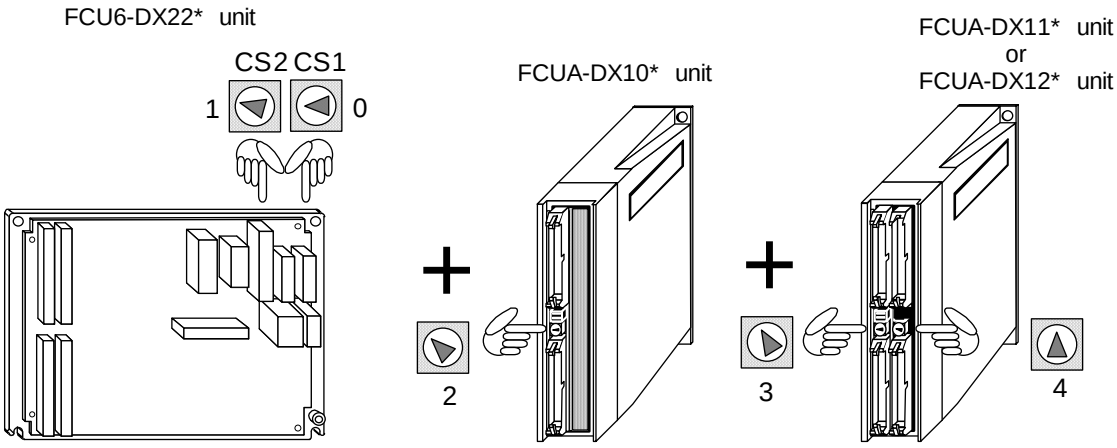
(Note) Refer to the next page for a configuration example.

<Device assignment example 2>

Rotary switch setting value	Station No.	Device assignment	
		DI	DO
0	0	X00~X1F	Y00~Y1F
1	1	X20~X3F	Y20~Y3F
2	2	X40~X5F	Y40~Y5F
3	3	X60~X7F	Y60~Y7F
4	4	X80~X9F	Y80~Y9F
5	5	XA0~XBF	YA0~YBF
6	6	XC0~XDF	YC0~YDF
7	7	XE0~XFF	YE0~YFF

(Note) Refer to the next page for a configuration example.

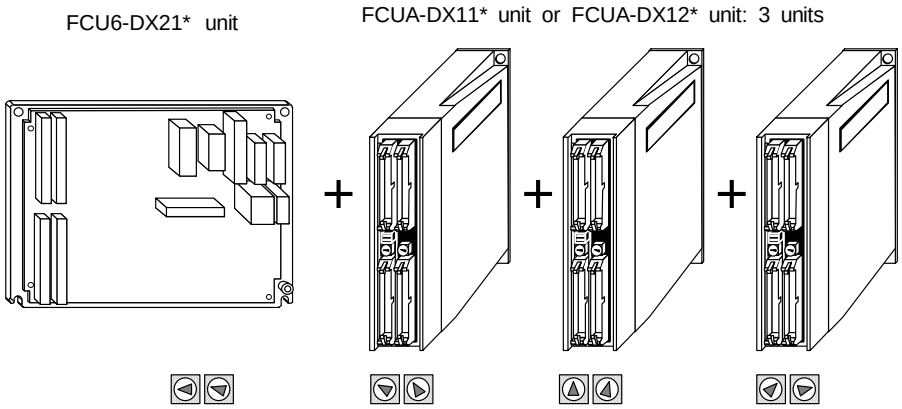
Configuration for <Device assignment example 1> on the previous page



No. of occupied channels: 2 No. of occupied channels: 1 No. of occupied channels: 2

Total No. of occupied cannels: 5

Configuration for <Device assignment example 2> on the previous page



No. of occupied channels: 2 | No. of occupied channels: 2 | No. of occupied channels: 2 | No. of occupied channels: 2

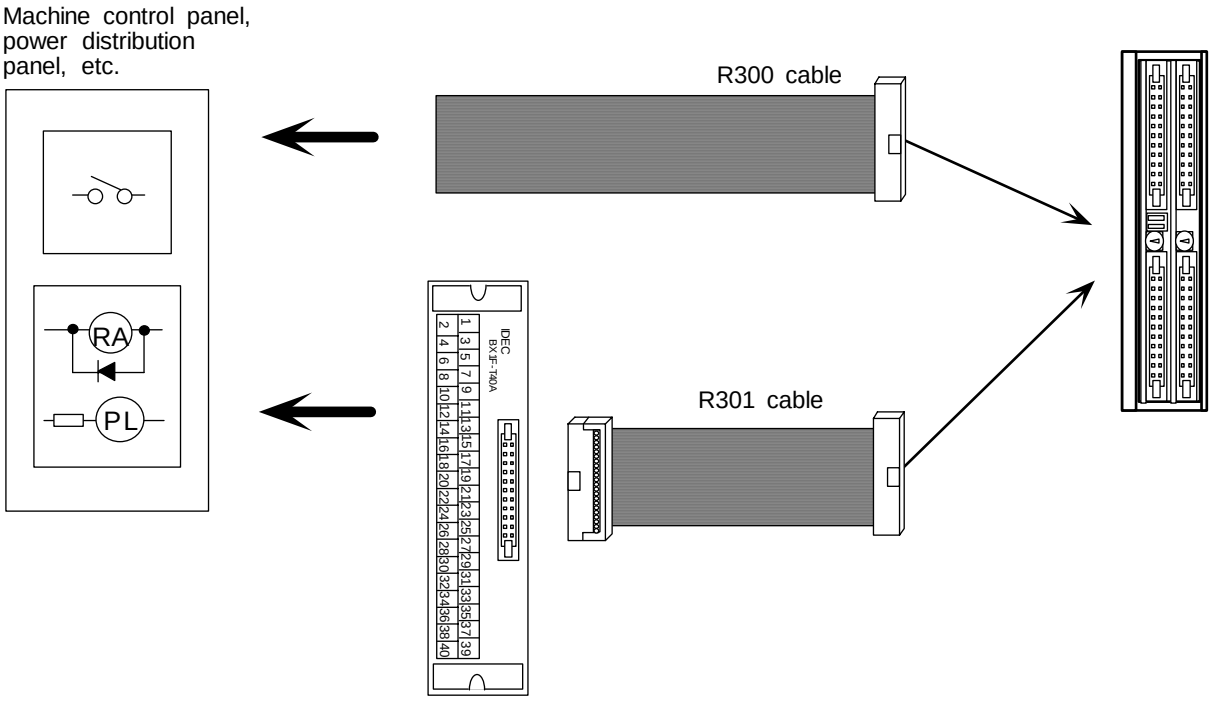
Total No. of occupied channels: 8
(Max. configuration)

(Note) In MELDASMAGIC64, the base I/O unit normally occupies station Nos. 0 and 1.
Both of the examples above are configuration examples when connected to RIO1 (Part system 1) connectors.

7.15 Remote I/O Unit Input/Output Signal Cables

There are two types of remote I/O unit digital input/output signal cables; the R300 and R301. The R300 cable has one end cut off. The R301 cable is a cable for connecting to the terminal block *.
R300-3M and R301-3M are available
If a cable longer than 3m is required, use the connector set CN300 or CS301.
The R041-3M (for one unit) and R042-3M (for two units) are available for the handle cables.
For the analog input/output cable, the R031 cable must be manufactured by the user.

* IDEC IZUMI Corporation I/O terminal BX1F-T40A

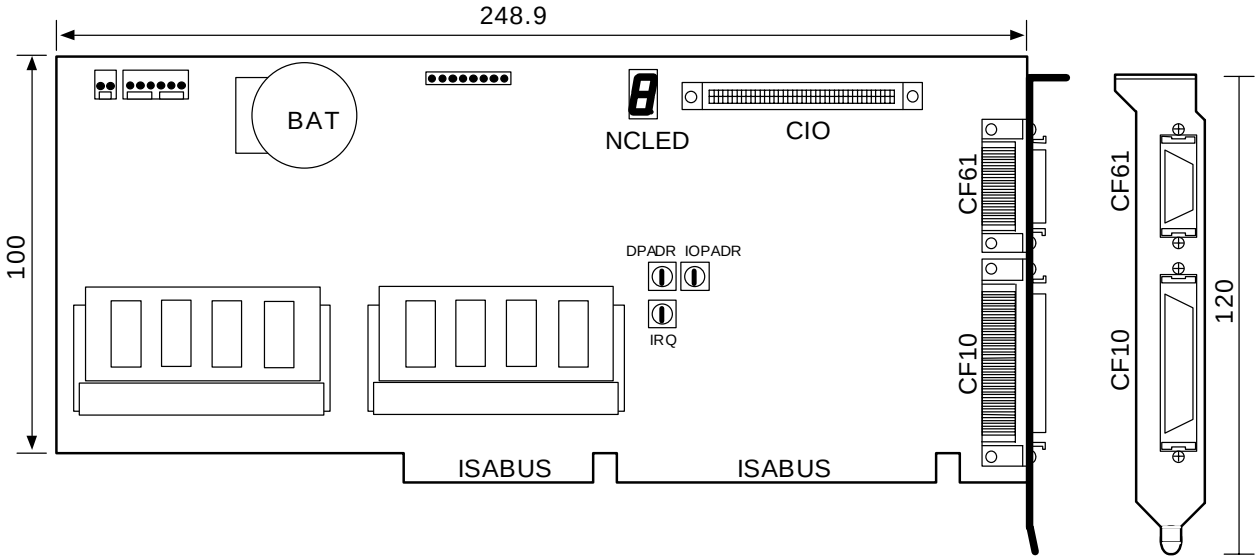


Connector pin correspondence table

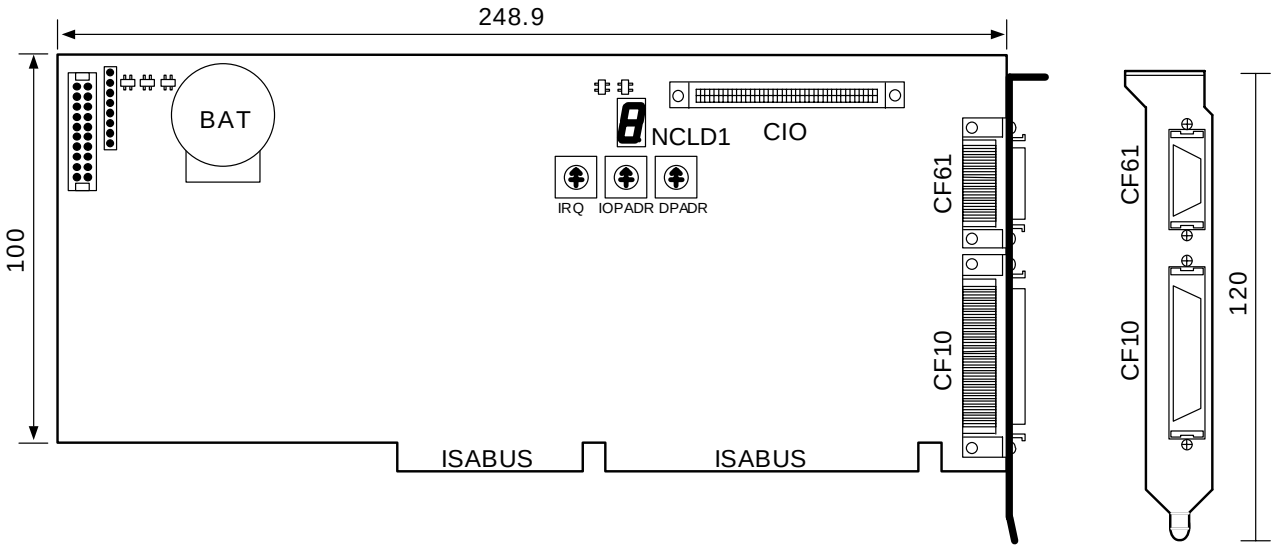
Terminal block BX1F	DX1**	Terminal block BX1F	DX1**
1	A1	2	B1
3	A2	4	B2
5	A3	6	B3
7	A4	8	B4
9	A5	10	B5
11	A6	12	B6
13	A7	14	B7
15	A8	16	B8
17	A9	18	B9
19	A10	20	B10
21	A11	22	B11
23	A12	24	B12
25	A13	26	B13
27	A14	28	B14
29	A15	30	B15
31	A16	32	B16
33	A17	34	B17
35	A18	36	B18
37	A19	38	B19
39	A20	40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

Appendix 1 Outline Drawings

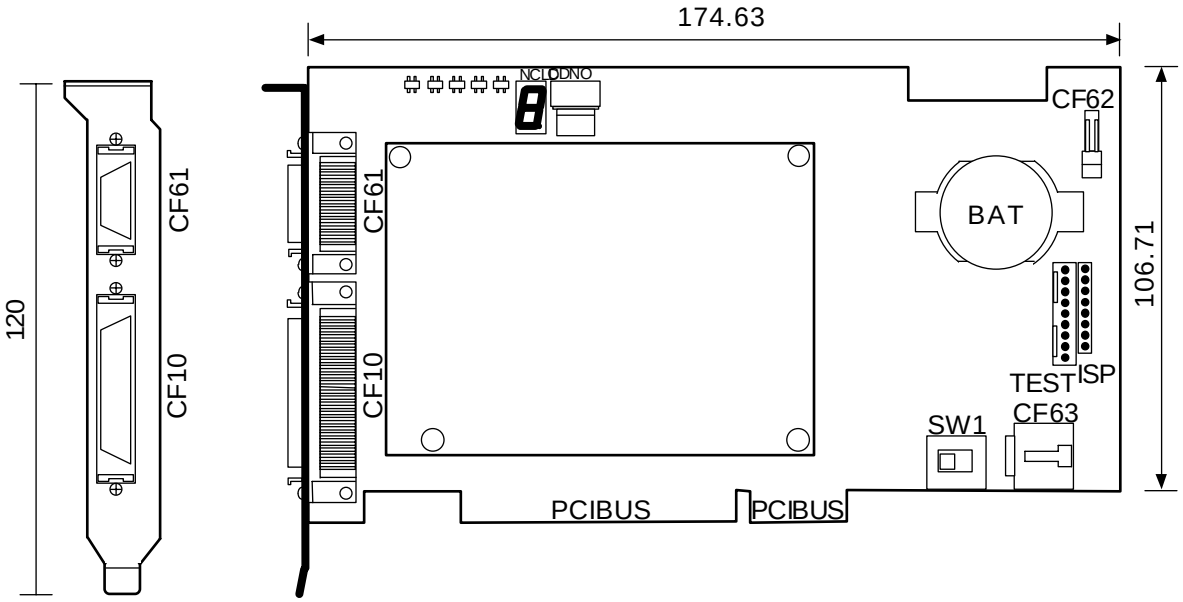
Appendix 1.1 ISA NC Card Outline Drawing (HR621)



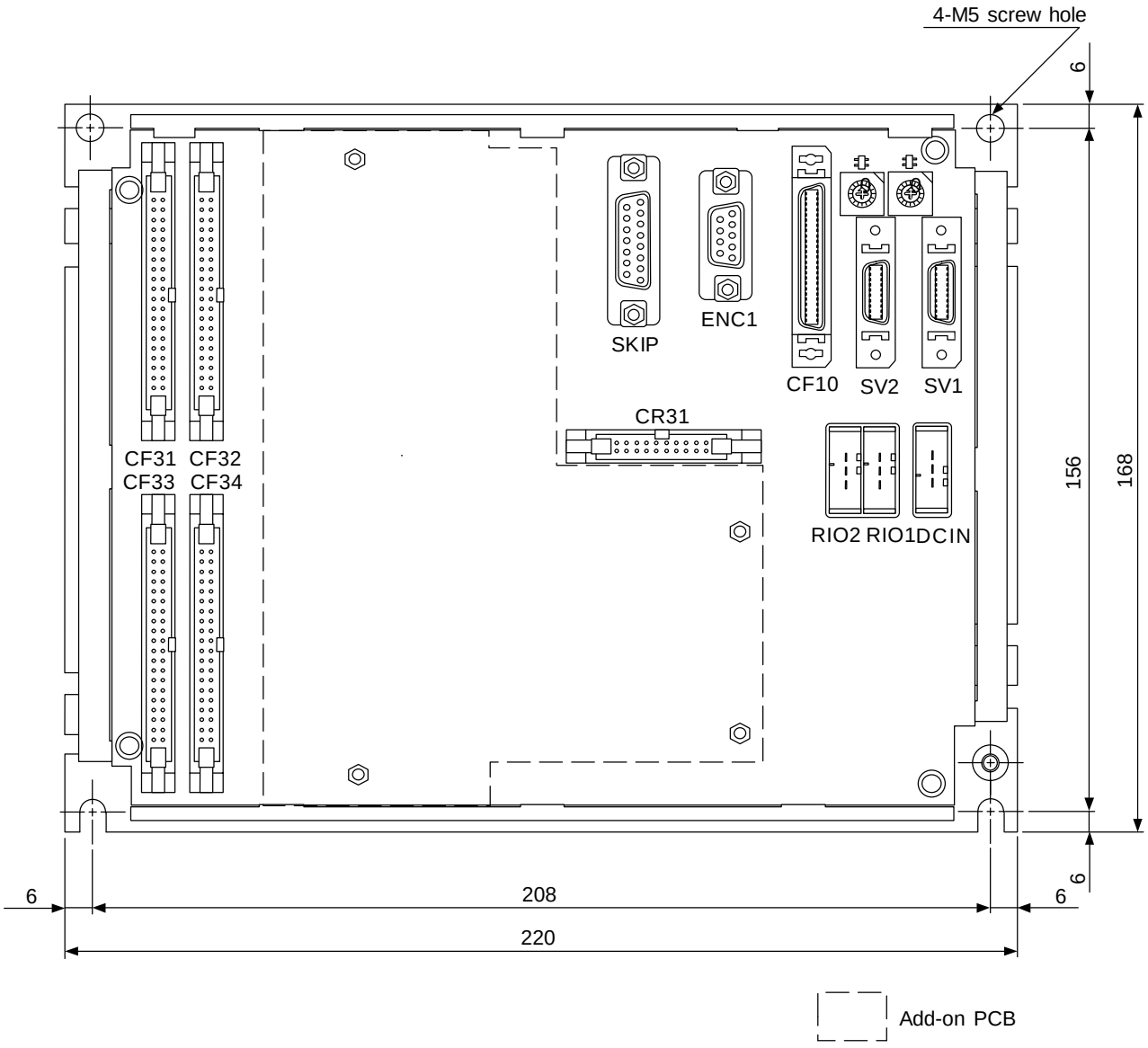
Appendix 1.2 ISA NC Card Outline Drawing (HR623)



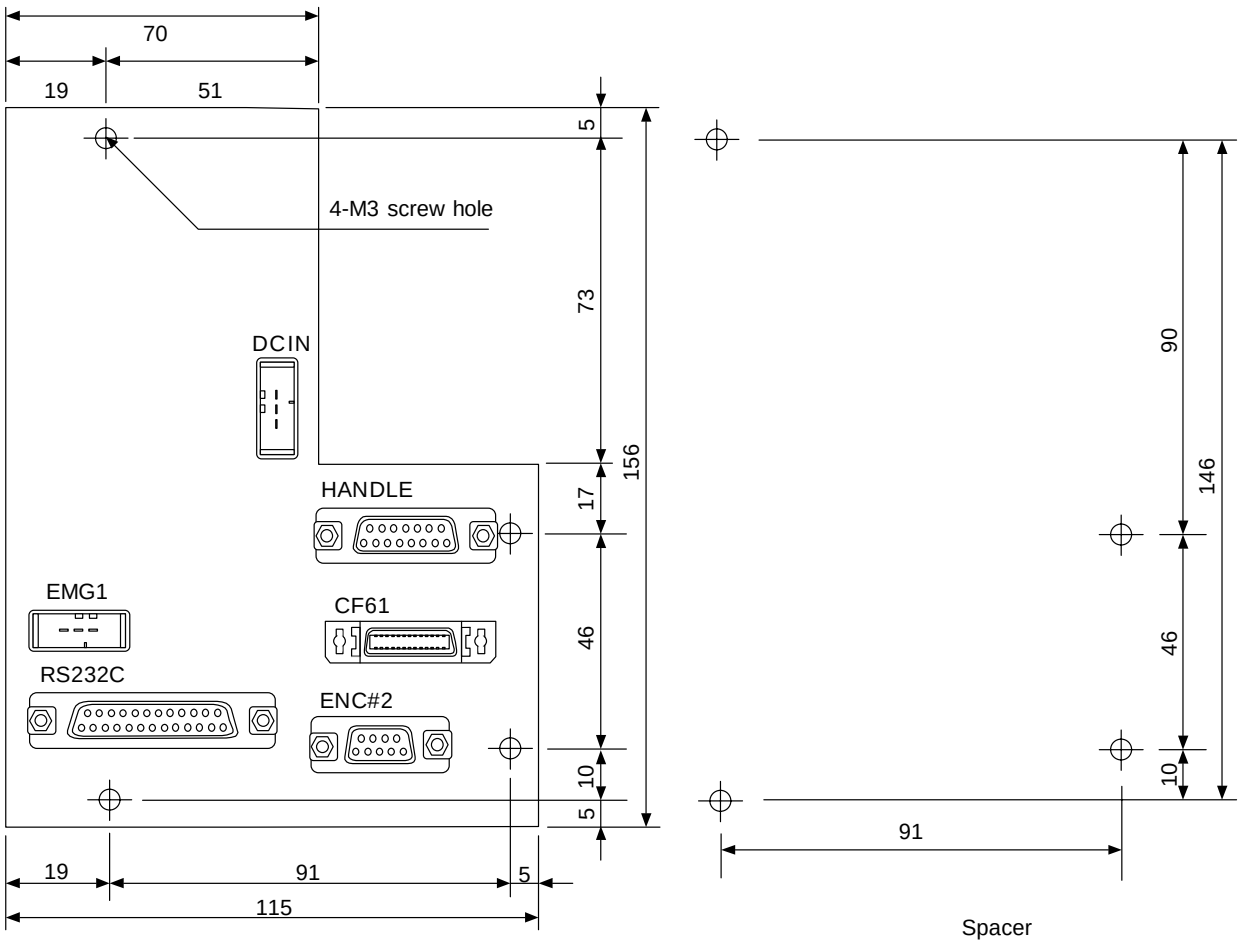
Appendix 1.3 PCI NC Card Outline Drawing (FCU6-HR655)



Appendix 1.4 Base I/O Unit Outline Drawing



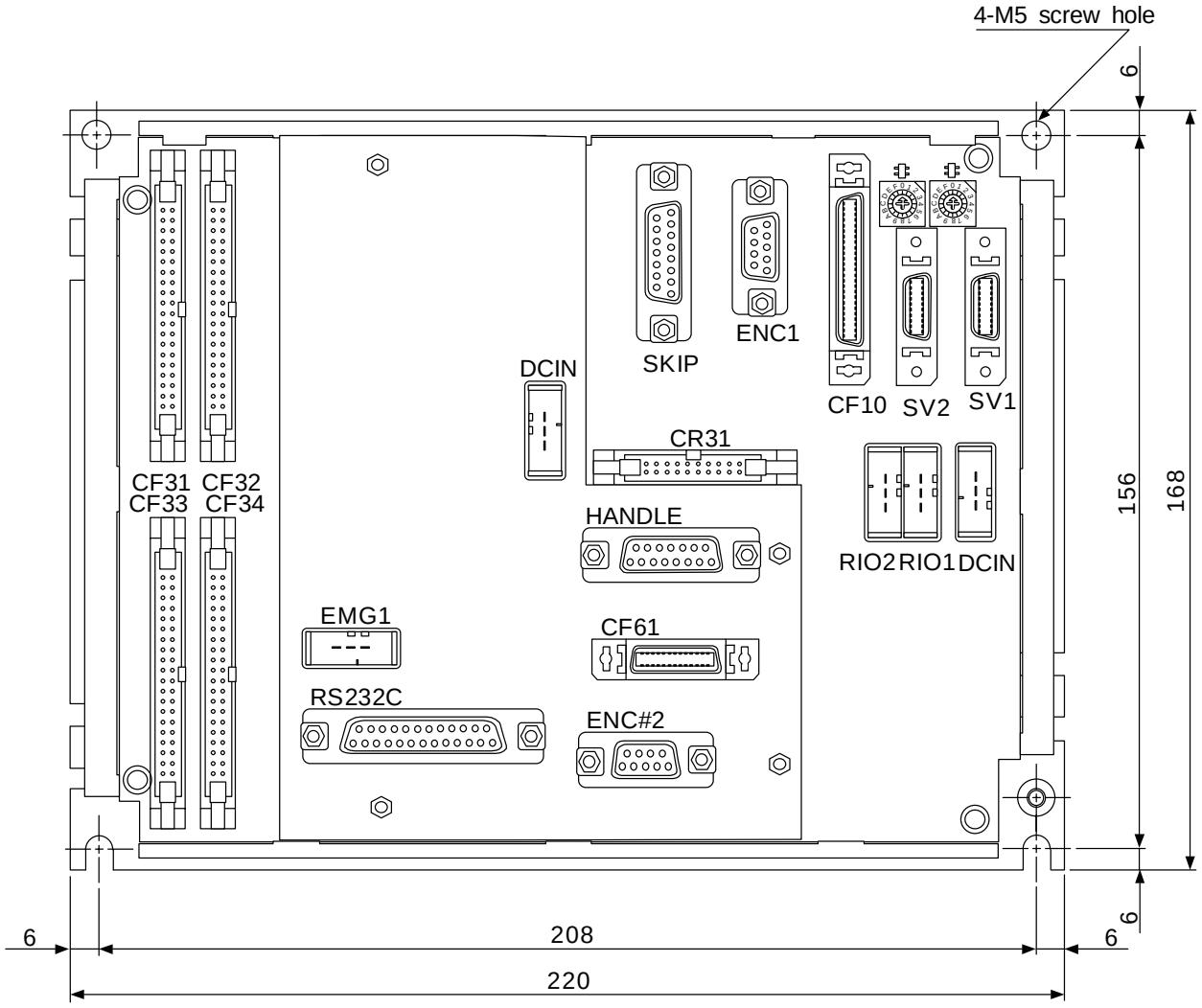
Appendix 1.5 Relay Card (independent installation) Outline Drawing



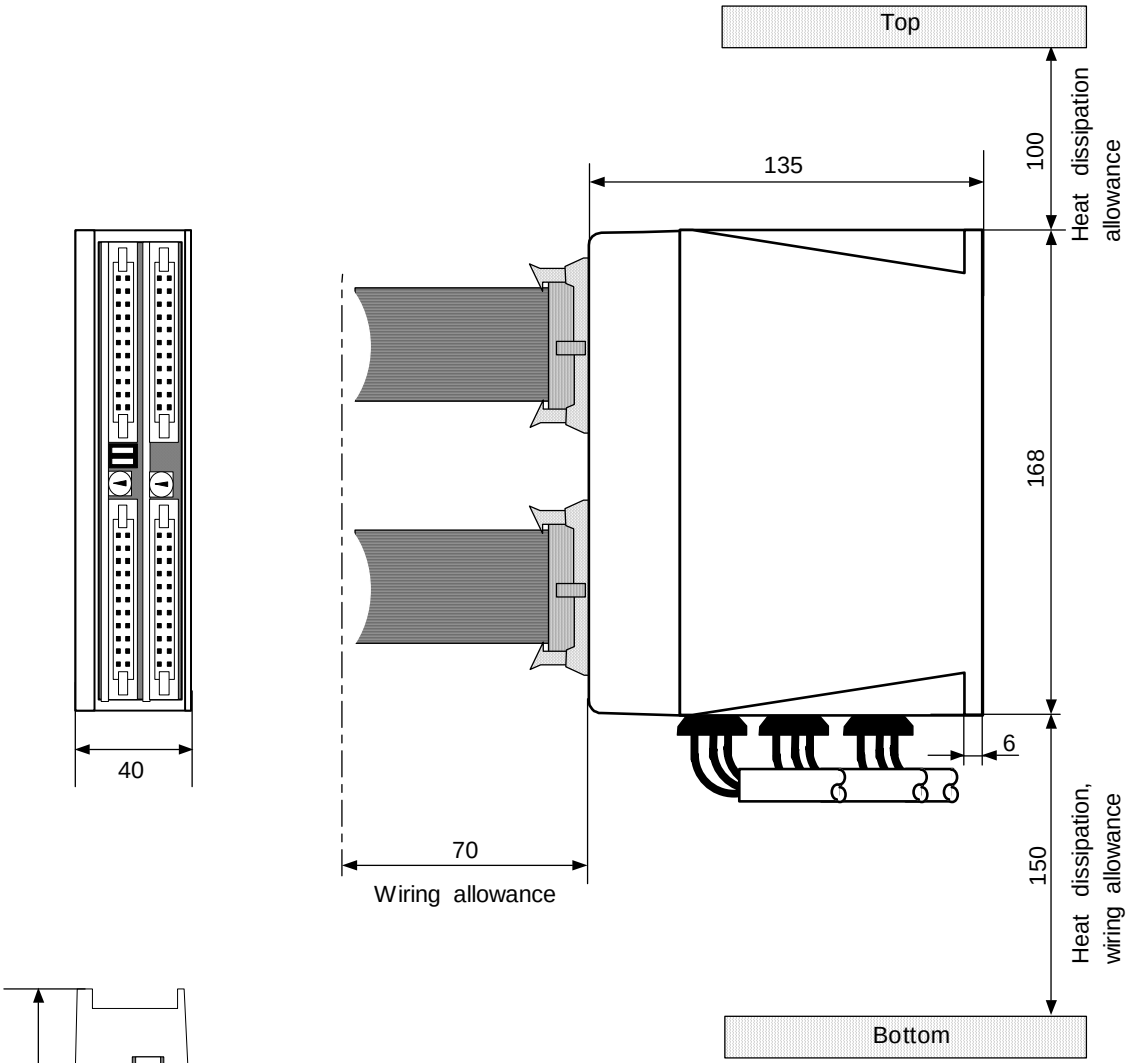
Spacer

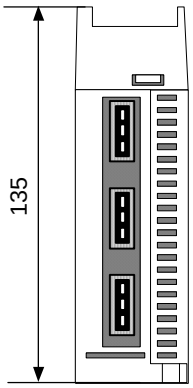
Screw diameter: M3×0.5
Outline diameter: Ø8 or less
Length: 6mm or more

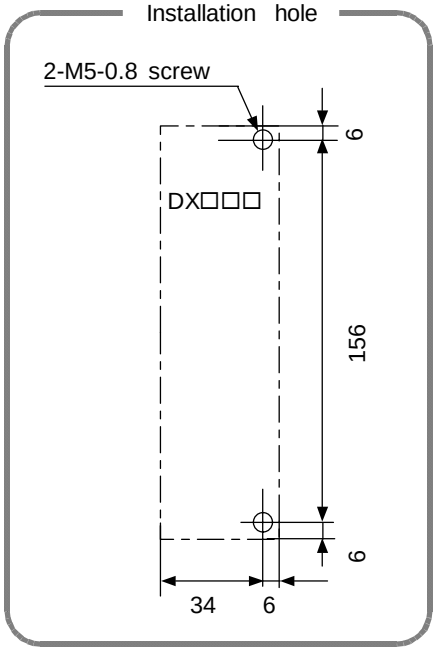
Appendix 1.6 Base I/O Unit + Relay Card (add-on) Outline Drawing



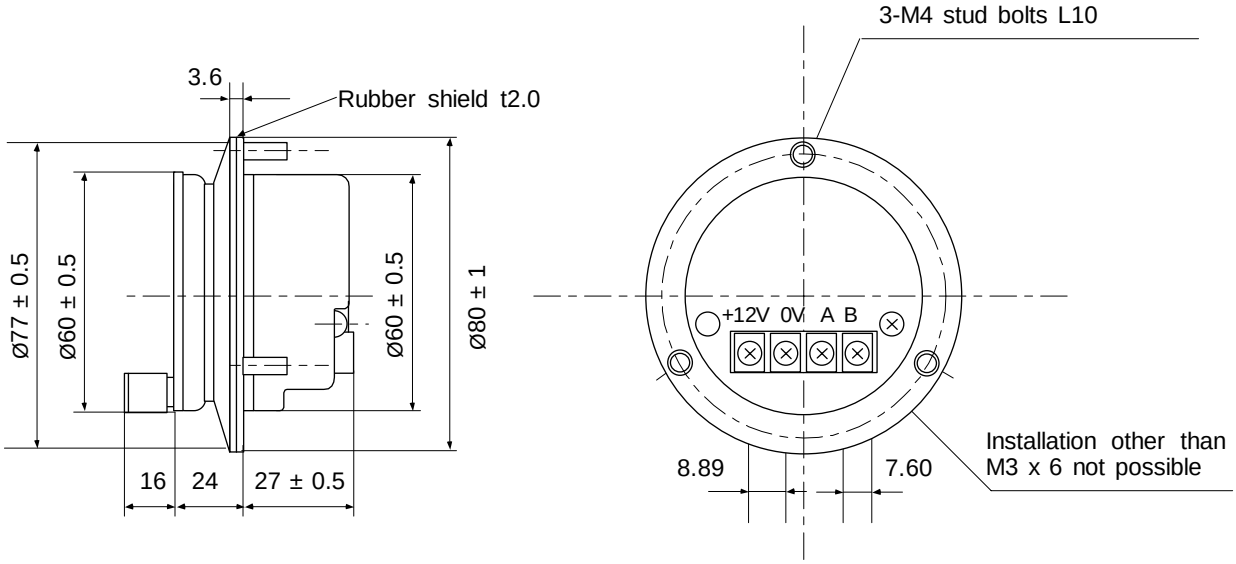
Appendix 1.7 Remote I/O Unit Outline Drawing

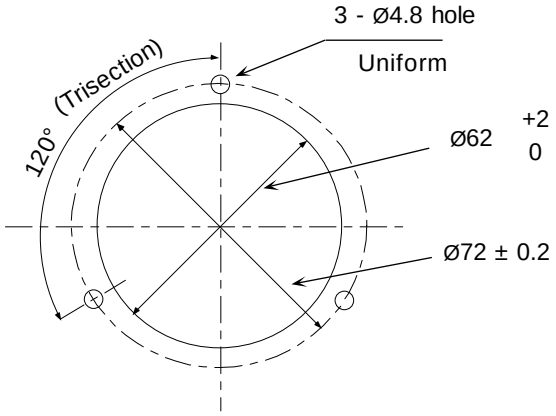






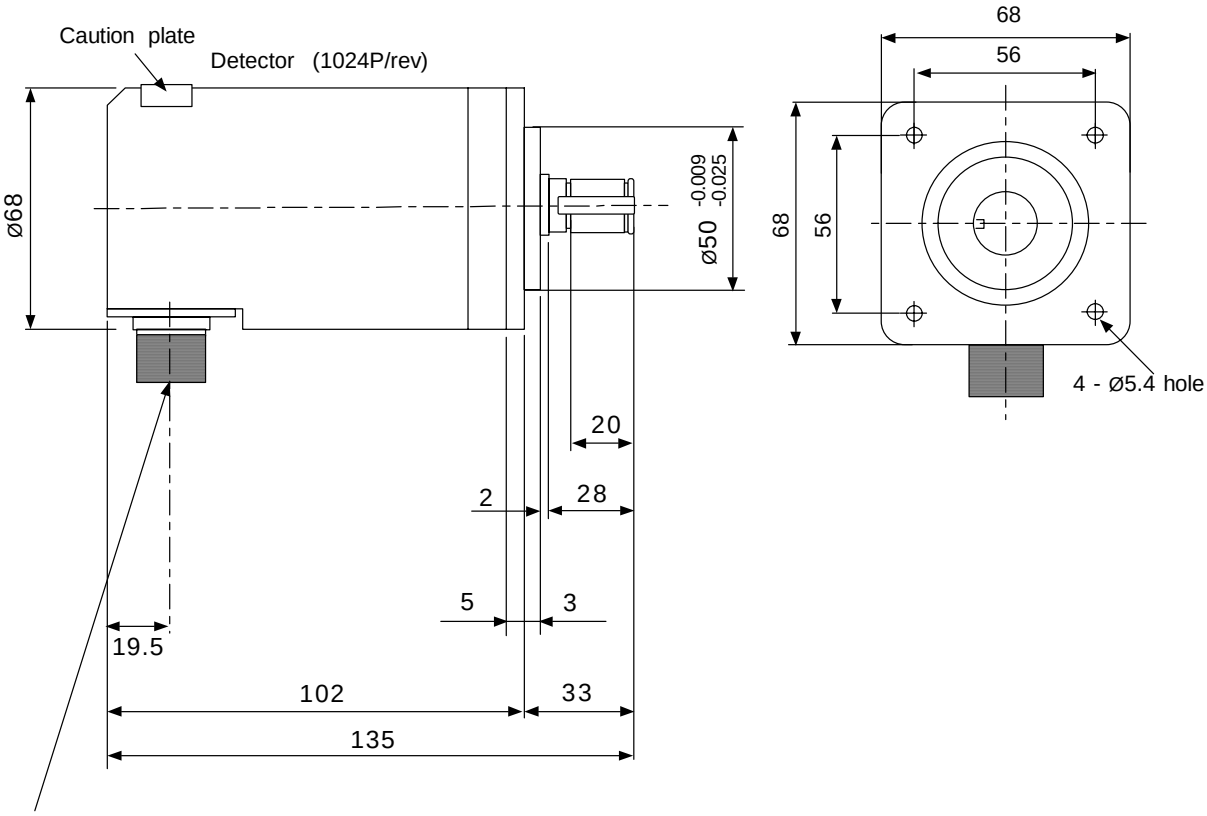
Appendix 1.8 Manual Pulse Generator (HD60) Outline Drawing



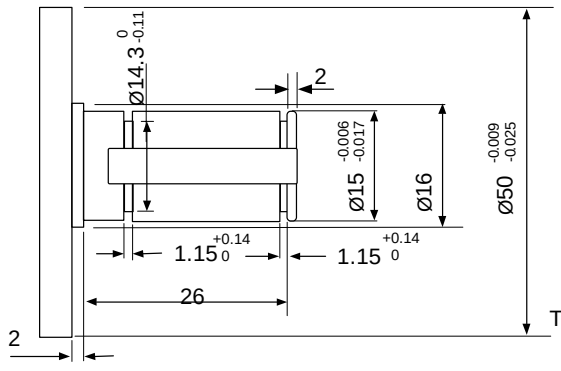


Panel cut drawing

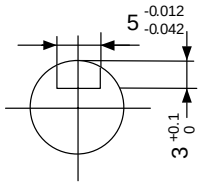
Appendix 1.9 Spindle Encoder (OSE-1024-3-15-68) Outline Drawing



Encoder side : 97F3102E20-29P (or equivalent)
Applicable cable side : MS3106A20-29S



Enlarged view of key



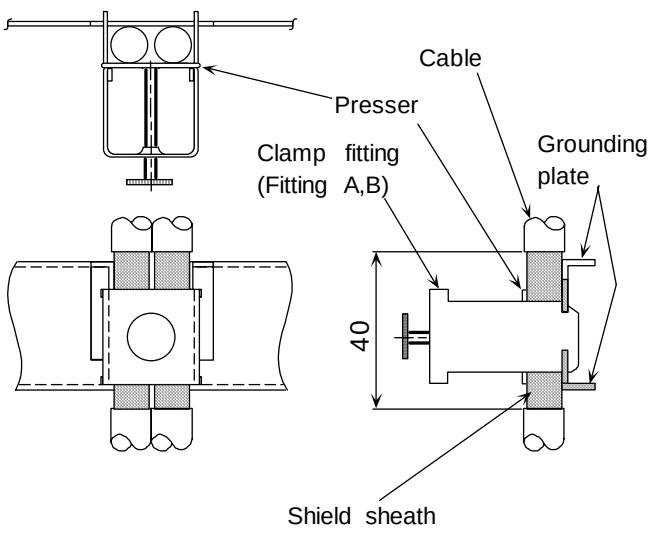
Cross-section BB

The effective depth of the key way is 21mm

A	1chA	K	0V
B	2chZ	L	
C	3chB	M	
D		N	1ch$\overline{A}$
E	Case grounding	P	2ch$\overline{Z}$
F		R	3ch$\overline{B}$
G		S	
H	+5V	T	
J			

Appendix 1.10 Grounding Plate and Clamp Fitting Outline Drawings

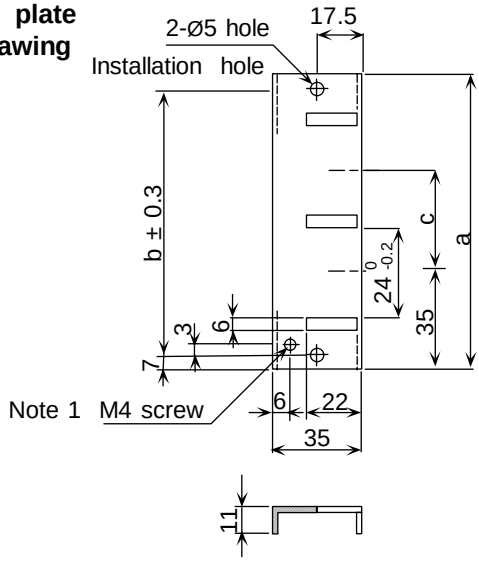
The shield wire generally only needs to be grounded to the connector's case frame. However, the effect can be improved by directly grounding to the grounding plate as shown on the right.
Install the grounding plate near each unit. Peel part of the cable sheath as shown on the right to expose the shield 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.



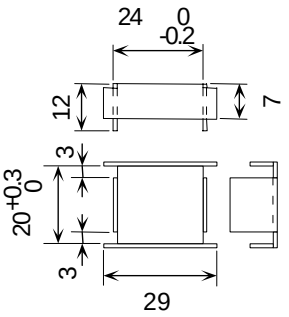
Clamp section drawing

• Outline drawing

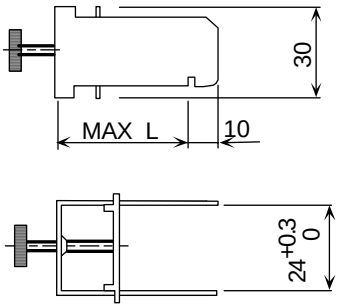
Grounding plate outline drawing



Presser outline drawing



Clamp metal fitting 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 fittings
AERSBAN-DSET	100	86	30	Two clamp fittings A
AERSBAN-ESET	70	56	–	One clamp fitting B

(Note) a, b and c in the table are symbols in the outline drawing of the grounding plate.

	L
Clamp fitting A	70
Clamp fitting B	45

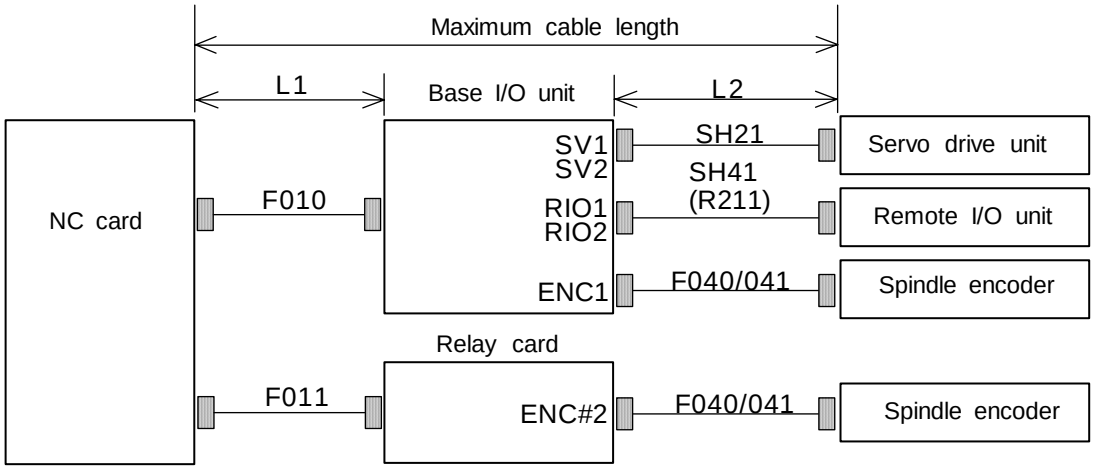
(Note) L in the table is a symbol in the outline drawing of the clamp metal fittings.

Appendix 2 Cable Manufacturing Drawings

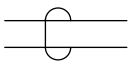
Cable type name table

No.	Appendix No.	Cable type	Application	Max. length	Remarks
1	Appendix 2.1	SH21 cable	Servo drive unit	* 30m	
2	Appendix 2.2	SH41 cable	Remote I/O	* 50m	
3	Appendix 2.3	R031 cable	Analog input/output	30m	
4	Appendix 2.4	R041 cable	Manual pulse generator: 1ch	50m	
5	Appendix 2.5	R042 cable	Manual pulse generator: 2ch	50m	
6	Appendix 2.6	R211 cable	Remote I/O	* 50m	
7	Appendix 2.7	R220 cable	DC +24V input, emergency stop	30m	
8	Appendix 2.8	R300 cable	DI/DO: Single-end connector	50m	
9	Appendix 2.9	R301 cable	DI/DO: Double-end connector	50m	
10	Appendix 2.10	F010 cable	I/O interface: Base I/O unit	20m	
11	Appendix 2.11	F011 cable	I/O interface: Relay card	15m	
12	Appendix 2.12	F020 cable	Manual pulse generator: 1ch	50m	
13	Appendix 2.13	F021 cable	Manual pulse generator: 2ch	50m	
14	Appendix 2.14	F022 cable	Manual pulse generator: 3ch	50m	
15	Appendix 2.15	F040 cable	Spindle encoder: Straight	* 50m	
16	Appendix 2.16	F041 cable	Spindle encoder: Right angle	* 50m	
17	Appendix 2.17	F070 cable	DC +24V input, emergency stop	30m	
18	Appendix 2.18	F390 cable	RS232C: 1ch	15m	
19	Appendix 2.19	ENC-SP1 cable	Spindle drive unit	50m	

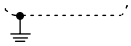
* For the cables marked with * in the Max. length column:
The cable length (L1) is the length from the NC Card to the base I/O unit and relay card. The cable length (L2) is the length from the base I/O unit and relay card to each unit. Keep the total cable length (L1 + L2) within the maximum cable length.



Symbols for writing cable manufacturing drawing
The following symbols are used in the cable manufacturing drawing.

1.  indicates twist.

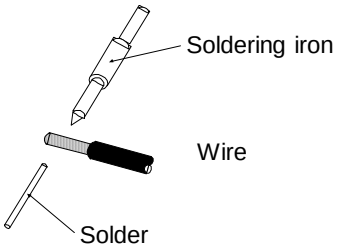
2.  indicates the shield sheath.

3.  indicates shield clamping to the ground plate.

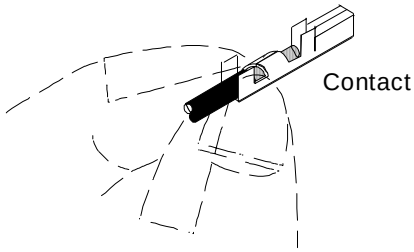
4. In the cable manufacturing drawings, the partner of the twisted pair cable is given a priority, so the pin Nos. of the connectors at both end are not necessary in number of order.
5. Equivalent parts can be used for the connector, contact and wire material.

As a rule, the cables used with this product are not available from Mitsubishi, excluding the cables connected between the Mitsubishi devices. Thus, manufacture the required cables using the cable manufacturing drawings on the following pages as a reference. Note that the cable-compatible connectors are available from Mitsubishi as the cable set (Appendix 2.20).
If crimp tools are not available when manufacturing the power supply cable (F070, R220) and RIO communication cable (SH41, R211), the cables can be manufactured by soldering a wire and connector as shown in the following procedure.

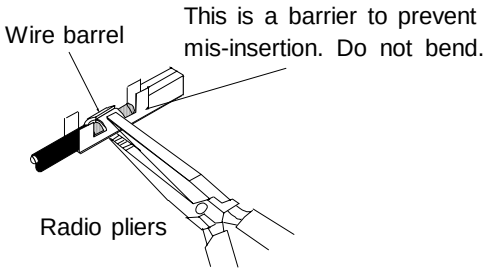
1. Carry out preparatory soldering.
   (Remove 3.5mm of the sheath.)



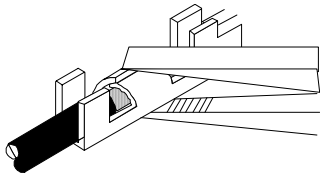
2. Insert the wire into the contact.
   Hold the sheath keep.



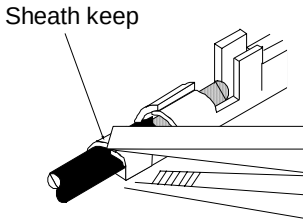
3. Lightly press down one side of
   the wire barrel using radio pliers.



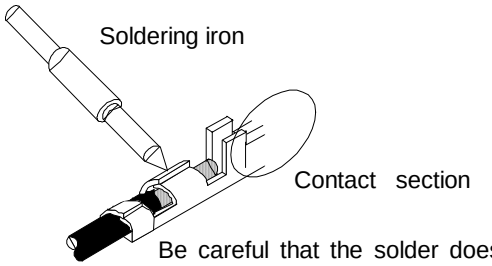
4. Firmly press down the other side of the wire barrel.
   (Press firmly enough that the wire will not come out when pulled lightly.)



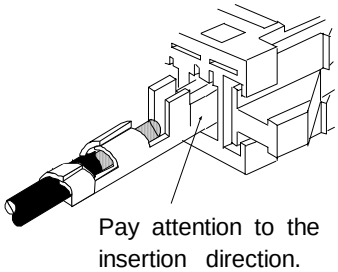
5. Firmly press down the sheath keeps in the same manner as the wire barrel.



6. Apply the soldering iron, and melt the preparatory solder inside.
   Better results will be achieved if an additional, small amount of solder is applied then.



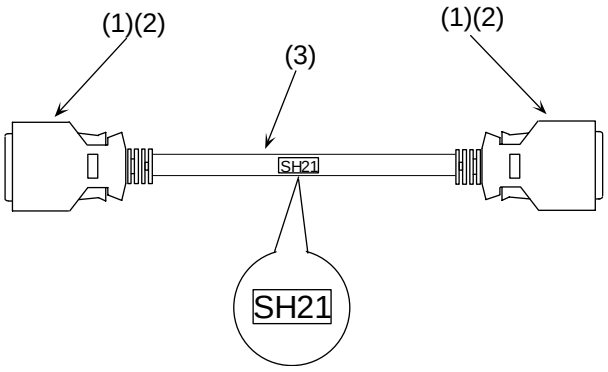
7. Lastly, insert the soldered contact into the housing.



Cable type name: SH21 cable			Appendix 2.1

Application: Base I/O unit – Servo drive unit connection
Servo drive unit – Servo drive unit connection, etc.

Assembly drawing

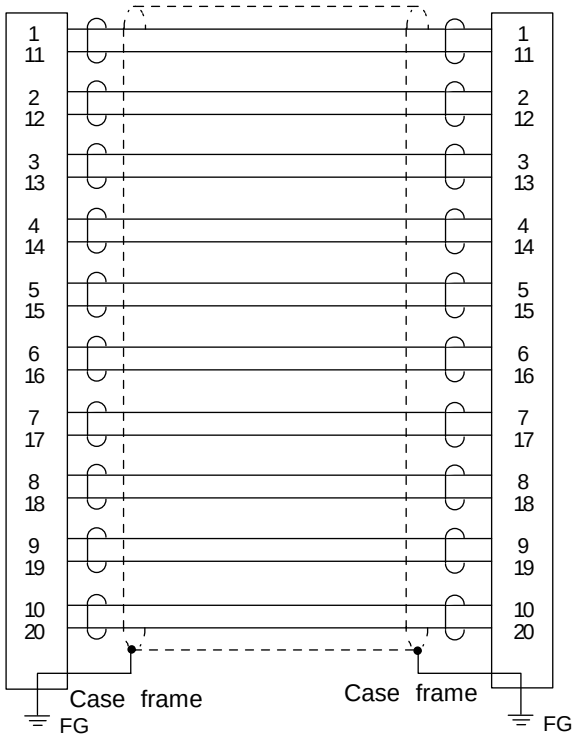


List of parts used

No.	Part name	Recommended part type	Qty
1	Plug	Sumitomo 3M 10120-6000EL	2
2	Shell	Sumitomo 3M 10320-3210-000	2
3	Wire material	Toyokuni Electric Cable UL20276 AWG28 × 10P	(1)

Connection diagram

Maximum cable length: 30m



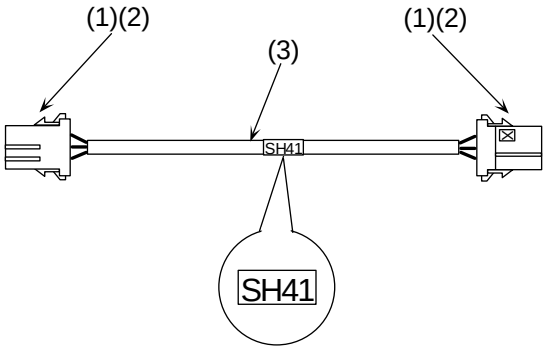
Manufacturing precautions

(1) The wire material shall be a shielded, 10-pair stranded cable equivalent to UL20276 Standard AWG28 (0.08mm^2).
(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 copper foil tape wrapped around the sheath to a connector GND plate.
(5) Part No. 1 (plug) and part No. 2 (shell) are solderless types. If soldering types are required, use parts equivalent to 10120-3000VE for the plug and 10320-52FO-008 for the shell (both parts manufactured by Sumitomo 3M).

Cable type name: SH41 cable			Appendix 2.2

Application: Base I/O unit – Remote I/O unit connection
Remote I/O unit – Remote I/O unit connection

Assembly drawing

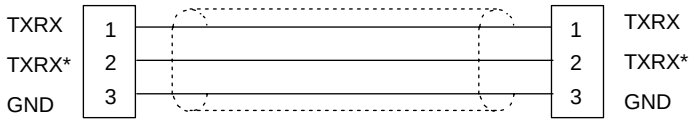


List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Tyco Electronics AMP 1-178288-3	2
2	Contact	Tyco Electronics AMP 1-175218-2	6
3	Wire material	Takeuchi Densen MVVS 3C × 0.3mm^2 (MIC 3C × 0.3 mm^2)	(1)

Connection diagram

Maximum cable length: 50m



Manufacturing precautions

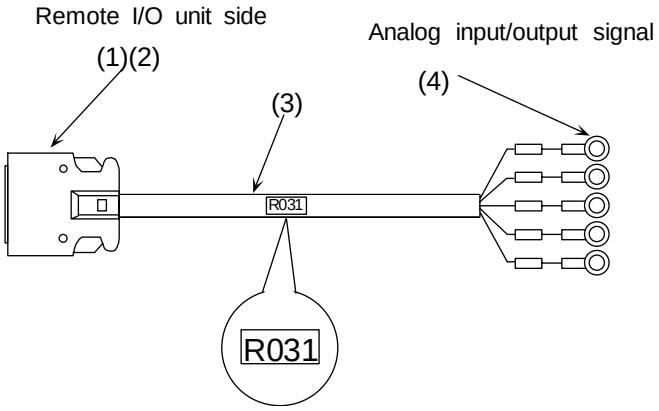
(1) The wire material shall be a shielded, 3-core cable equivalent to AWG22 (0.3mm^2).
(2) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
(3) Attach the nameplate with protective cover stamped with the cable name in the position designated in the assembly drawing.
(4) Protect both ends of the wire with an insulating bush.

Cable type name: R031 cable			Appendix 2.3

Application: Analog signal input/output

Option (compatible connector set)
FCUA-CS000
(Note that this is only compatible with the remote I/O unit side.)

Assembly drawing

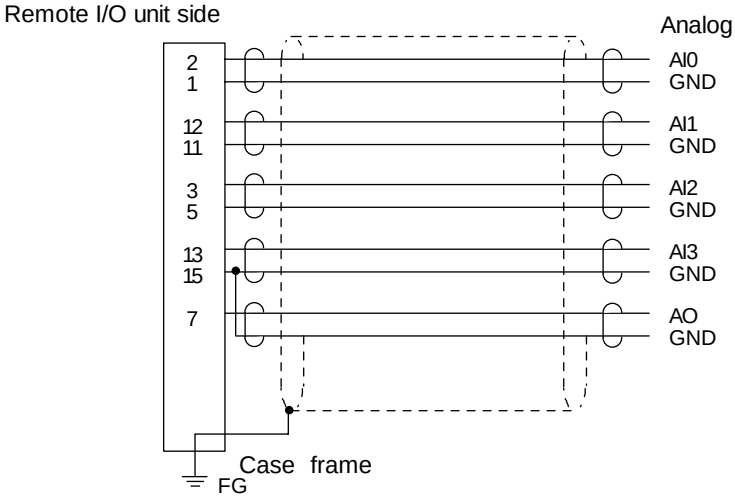


List of parts used

No.	Part name	Recommended part type	Qty
1	Plug	Sumitomo 3M 10120-3000VE	1
2	Shell	Sumitomo 3M 10320-52F0-008	1
3	Wire material	UL1061-2464 AWG22 × 6P	(1)
4	Crimp terminal	J.S.T. Mfg V1.25-4	10

Connection diagram

Maximum cable length: 30m



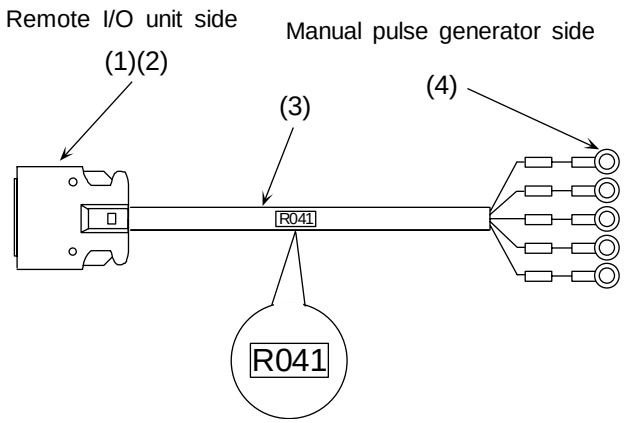
Manufacturing precautions

(1) The wire material shall be a shielded, 6-pair stranded cable equivalent to UL1061-2464 Standard AWG22 (0.3mm^2).
(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 on the remote I/O unit side over the sheath, and wrap copper foil tape over it. Connect the copper foil tape wrapped around the sheath to a connector 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 (plug) is usually used for wire material of AWG 24 (0.2mm^2) or less in the catalog specifications, but AWG 22 (0.3mm^2) can also be used.

Cable type name: R041 cable			Appendix 2.4

Application: Remote I/O unit – Manual pulse generator connection
(when one manual pulse generator is connected)

Assembly drawing



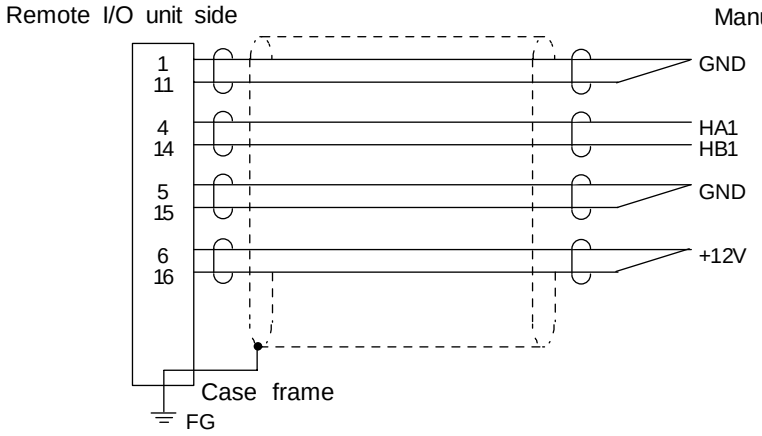
Option (compatible connector set)
FCUA-CS000
(Note that this is only compatible with the remote I/O unit side.)

List of parts used

No.	Part name	Recommended part type	Qty
1	Plug	Sumitomo 3M 10120-3000VE	1
2	Shell	Sumitomo 3M 10320-52F0-008	1
3	Wire material	UL1061-2464 AWG22 × 6P	(1)
4	Crimp terminal	J.S.T. Mfg V1.25-4	5

Connection diagram

Maximum cable length: 30m



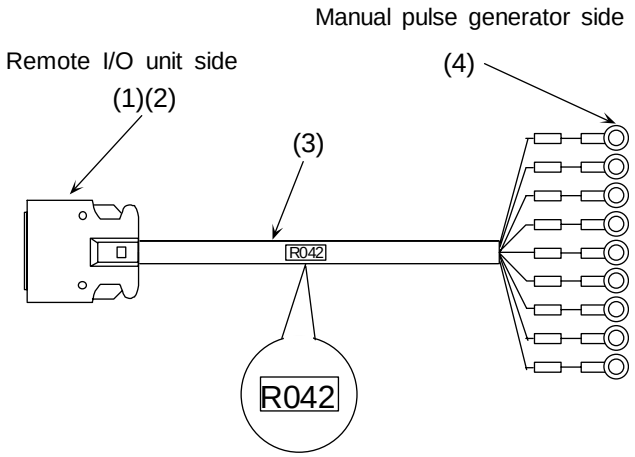
Manufacturing precautions

(1) The wire material shall be a shielded, 6-pair stranded cable equivalent to UL1061-2464 Standard AWG22 (0.3mm^2).
(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 on the remote I/O unit side over the sheath, and wrap copper foil tape over it. Connect the copper foil tape wrapped around the sheath to a connector GND plate.
(5) Stamp the name of each signal on the crimp terminal side mark tube and install.
(6) Part 1 (plug) is usually used for wire material of AWG 24 (0.2mm^2) or less in the catalog specifications, but AWG 22 (0.3mm^2) can also be used.

Cable type name: R042 cable			Appendix 2.5

Application: Remote I/O unit – Manual pulse generator connection
(when two manual pulse generator is connected)

Assembly drawing



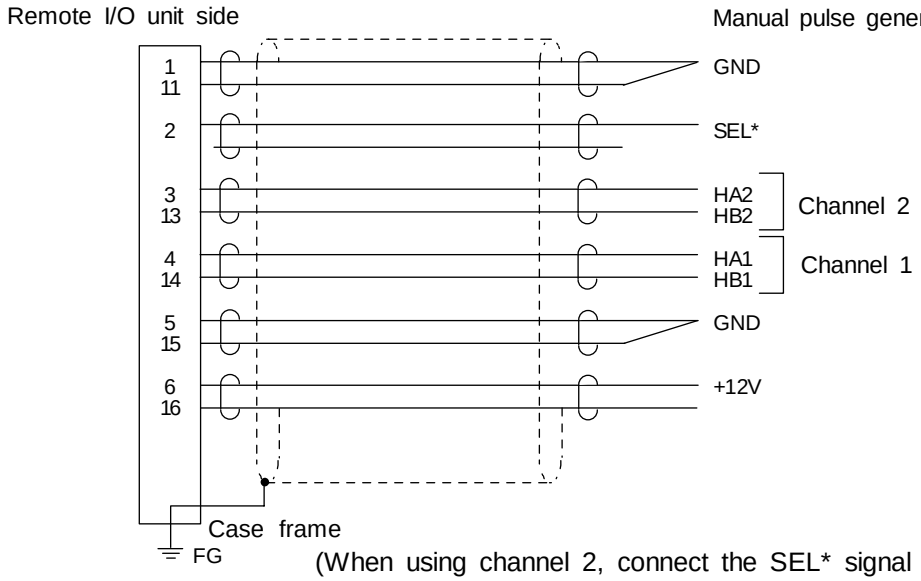
Option (compatible connector set)
FCUA-CS000
(Note that this is only compatible with the remote I/O unit side.)

List of parts used

No.	Part name	Recommended part type	Qty
1	Plug	Sumitomo 3M 10120-3000VE	1
2	Shell	Sumitomo 3M 10320-52F0-008	1
3	Wire material	Wire material UL1061-2464 AWG22 × 6P	(1)
4	Crimp terminal	J.S.T. Mfg V1.25-4	9

Connection diagram

Maximum cable length: 30m



(When using channel 2, connect the SEL* signal to the GND.)

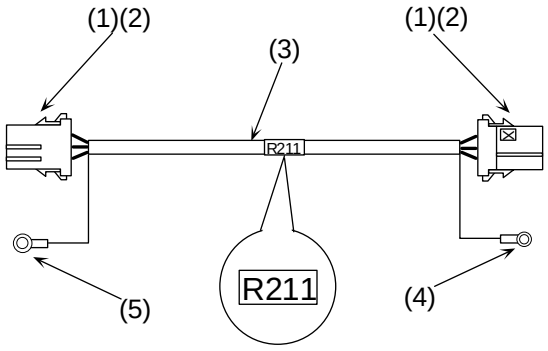
Manufacturing precautions

(1) The wire material shall be a shielded, 6-pair stranded cable equivalent to UL1061-2464 Standard AWG22 (0.3mm^2).
(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 on the remote I/O unit side over the sheath, and wrap copper foil tape over it. Connect the copper foil tape wrapped around the sheath to a connector GND plate.
(5) Stamp the name of each signal on the crimp terminal side mark tube and install.
(6) Part 1 (plug) is usually used for wire material of AWG 24 (0.2mm^2) or less in the catalog specifications, but AWG 22 (0.3mm^2) can also be used.

Cable type name: R211 cable			Appendix 2.6

Application: Base I/O unit – Remote I/O unit connection
Remote I/O unit – Remote I/O unit connection

Assembly drawing



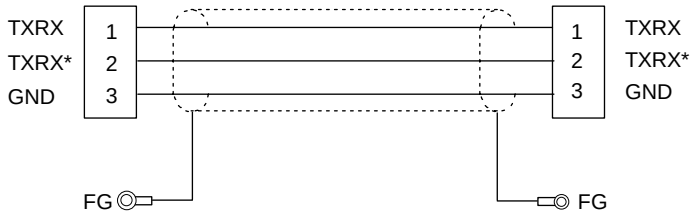
Option (compatible connector set)
FCUA-CN211
(Note that there is a single-end connector and contact, with no crimp terminal.)

List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Tyco Electronics AMP 1-178288-3	2
2	Contact	Tyco Electronics AMP 1-175218-2	6
3	Wire material	Takeuchi Densen MVVS 3C × 0.5 mm^2 (MIC 3C × 0.5 mm^2)	(1)
4	Crimp terminal	J.S.T. Mfg V1.25-3	1
5	Crimp terminal	J.S.T. Mfg V1.25-5	1

Connection diagram

Maximum cable length: 50m



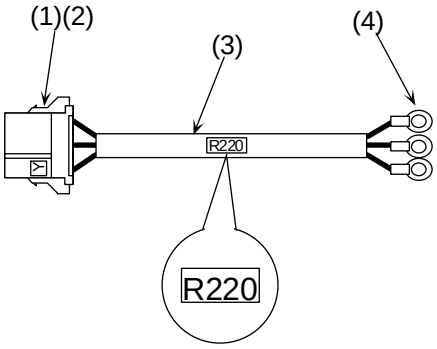
Manufacturing precautions

(1) The wire material shall be a shielded, 3-core cable equivalent to AWG20 (0.5mm^2).
(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) Protect both ends of the wire with an insulating bush.
(5) Connect the crimp terminal attached to the shield to the frame ground of the base I/O unit or remote I/O unit.
Note that for noise resistance improvement, in some cases only one end is connected, both ends are connected or neither end is connected.

Cable type name: R220 cable			Appendix 2.7

Application: +24V supply to the base I/O unit, relay card and remote I/O unit
Input of emergency stop signal to the relay card

Assembly drawing



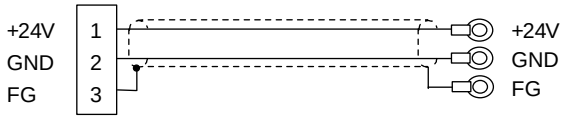
Option (compatible connector set)
FCUA-CN220
(Note that this is only compatible with the base I/O unit, relay card and remote I/O unit side connectors.)

List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Tyco Electronics AMP 1-178288-3	1
2	Contact	Tyco Electronics AMP 2-175218-5	3
3	Wire material	DDK JPVV-SB 1P × 0.5 mm^2	(1)
4	Crimp terminal	J.S.T. Mfg V1.25-3	3

Connection diagram

Maximum cable length: 30m



Manufacturing precautions

(1) The wire material shall be a shielded, 1-pair stranded cable equivalent to AWG18 (0.75mm^2). If the cable length exceeds 15m, select wire material equivalent to AWG16.
(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) Stamp the name of each signal on the crimp terminal side mark tube and install.
(5) Protect both ends of the wire with an insulating bush.
(6) Use shield processing wire material equivalent to AWG18 (0.75mm^2).

Cable type name: R300 cable			Appendix 2.8

Application: Base I/O unit and remote I/O unit
– Machine electric cabinet connection

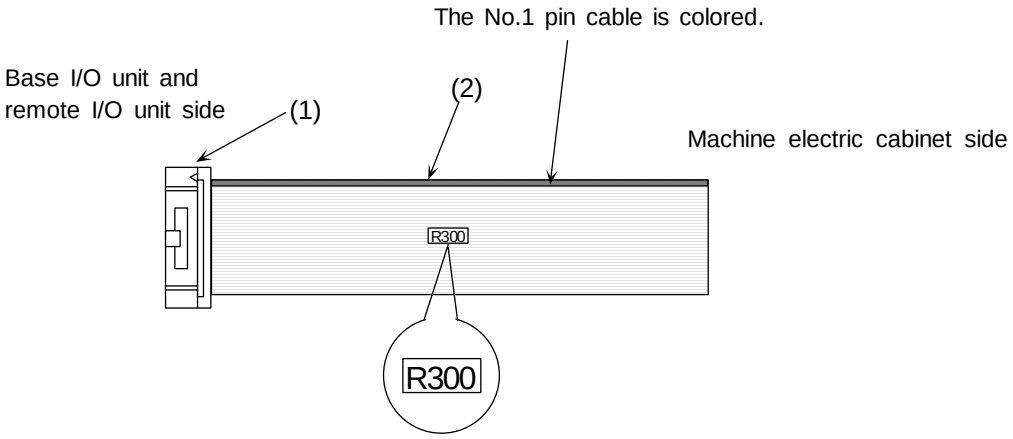
Option (compatible connector set)
FCUA-CN300
(Note that this is only compatible with the base I/O unit and remote I/O unit side connectors.)

List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Sumitomo 3M 7940-6500SC	1
2	Wire material	Oki Electric Cable B40-S	(1)

Assembly drawing

Maximum cable length: 50m



Manufacturing precautions

(1) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
(2) Attach the nameplate with protective cover stamped with the cable name in the position designated in the assembly drawing.

Cable type name: R301 cable			Appendix 2.9

Application: Base I/O unit and remote I/O unit
– Recommended terminal block

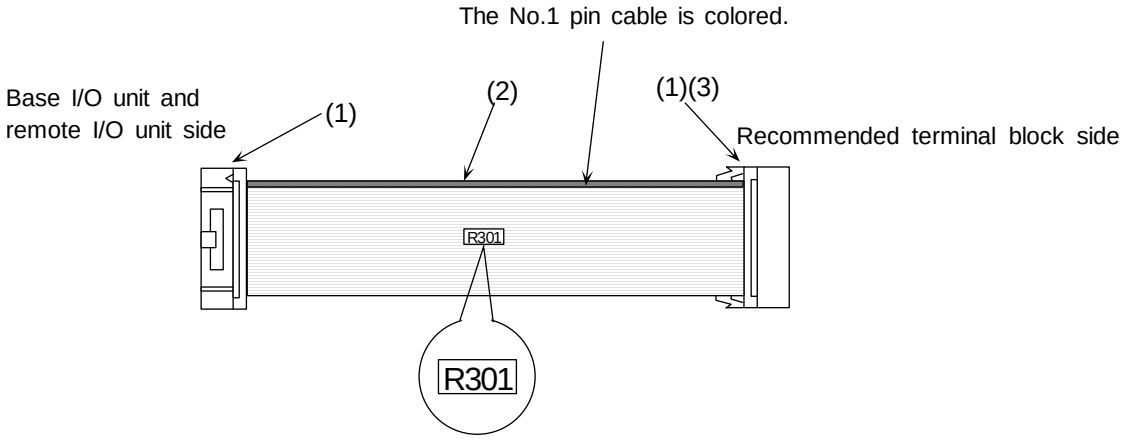
Option (compatible connector set)
FCUA-CS301

List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Sumitomo 3M 7940-6500SC	2
2	Wire material	Oki Electric Cable B40-S	(1)
3	Strain relief	Sumitomo 3M 3448-7940	1

Assembly drawing

Maximum cable length: 50m



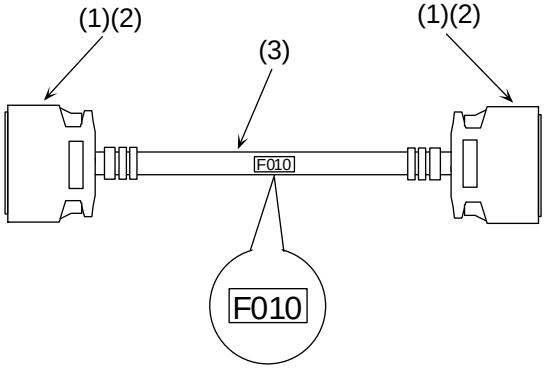
Manufacturing precautions

(1) The parts used shall be Mitsubishi recommended parts. Equivalent parts may be used providing they are compatible with the specifications.
(2) Attach the nameplate with protective cover stamped with the cable name in the position designated in the assembly drawing.
(3) The recommended terminal block is the IDEC IZUMI I/O terminal BX1F-T40.

Cable type name: F010 cable			Appendix 2.10

Application: NC Card – Base I/O unit connection

Assembly drawing

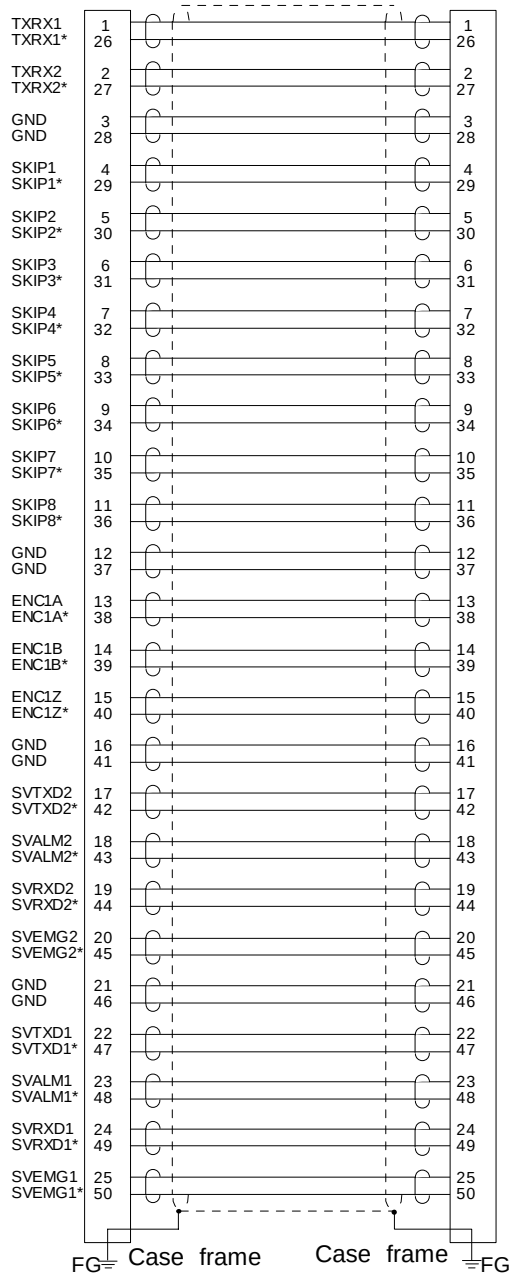


List of parts used

No.	Part name	Recommended part type	Qty
1	Plug	Sumitomo 3M 10150-6000EL	2
2	Shell	Sumitomo 3M 10350-321-000	2
3	Wire material	Toyokuni Electric Cable UL20276 AWG28 × 25P	(1)

Connection diagram

Maximum cable length: 20m



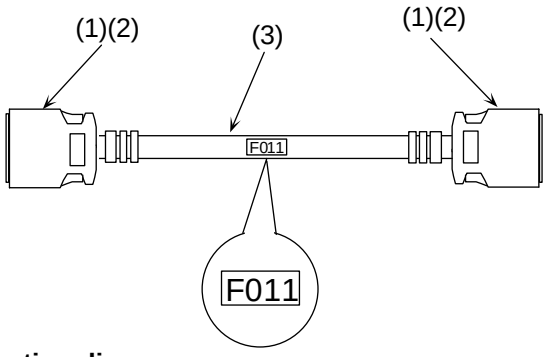
Manufacturing precautions

(1) The wire material shall be a shielded, 25-pair stranded cable equivalent to UL20276 Standard AWG28 ($0.08mm^2$).
(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 copper foil tape wrapped around the sheath to a connector GND plate.
(5) Part No. 1 (plug) and part No. 2 (shell) are solderless types. If soldering types are required, use parts equivalent to 10150-3000VE for the plug and 10350-52FO-008 for the shell (both parts manufactured by Sumitomo 3M).

Cable type name: F011 cable			Appendix 2.11

Application: NC Card – Relay card connection

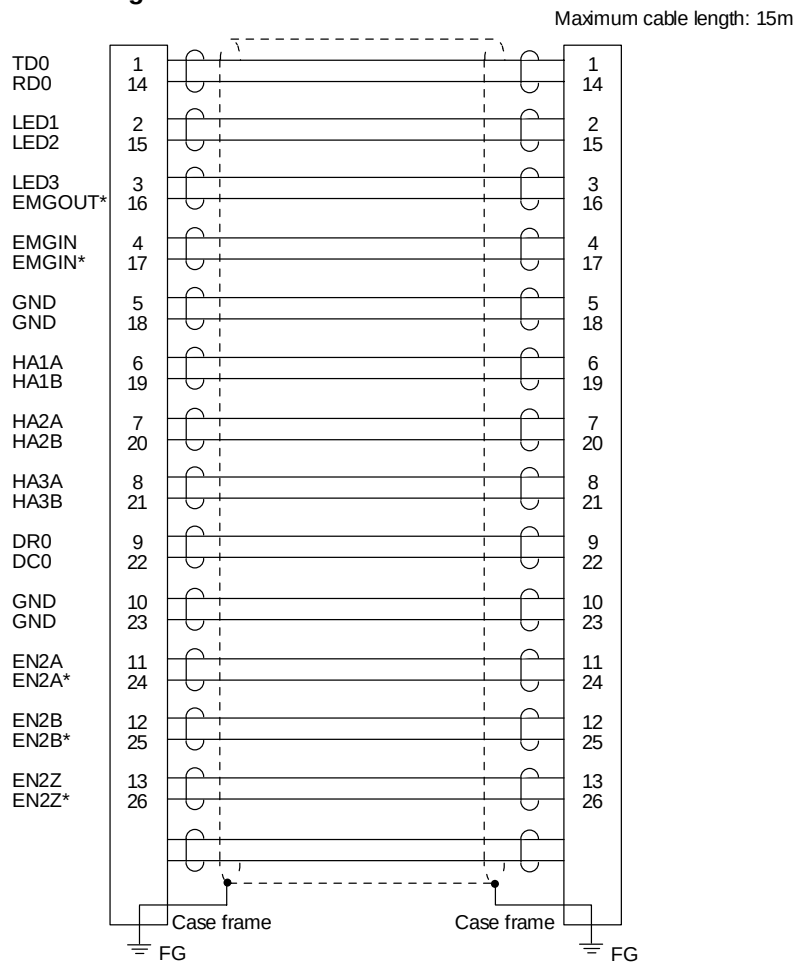
Assembly drawing



List of parts used

No.	Part name	Recommended part type	Qty
1	Plug	Sumitomo 3M 10126-6000EL	2
2	Shell	Sumitomo 3M 10326-3210-000	2
3	Wire material	Toyokuni Electric Cable UL20276 AWG28 × 15P	(1)

Connection diagram



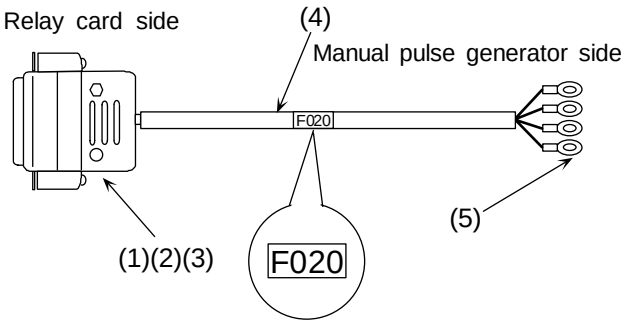
Manufacturing precautions

(1) The wire material shall be a shielded, 15-pair stranded cable equivalent to UL20276 Standard AWG28 (0.08mm^2).
(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 copper foil tape wrapped around the sheath to a connector GND plate.
(5) Part No. 1 (plug) and part No. 2 (shell) are solderless types. If soldering types are required, use parts equivalent to 10126-3000VE for the plug and 10326-52FO-008 for the shell (both parts manufactured by Sumitomo 3M).

Cable type name: F020 cable			Appendix 2.12

Application: Relay card – Manual pulse generator connection
(when one manual pulse generator is connected)

Assembly drawing

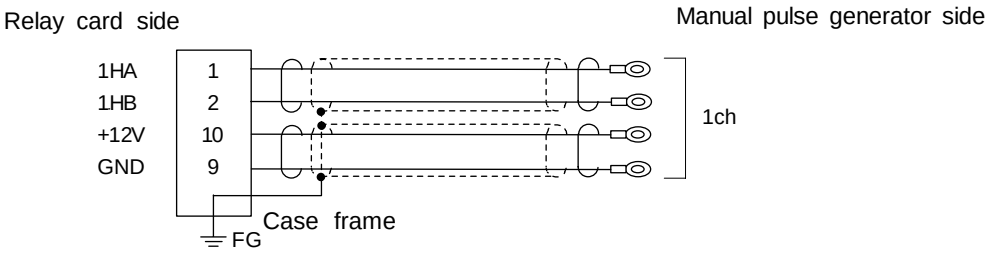


List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Hirose Electric CDA-15P	1
2	Contact	Hirose Electric CD-PC-111	4
3	Connector case	Hirose Electric HAD-CTH	1
4	Wire material	Sumitomo Electric B-22 (19) U × 2SJ-1 × 9	(2)
5	Crimp terminal	J.S.T. Mfg V1.25-3	4

Connection diagram

Maximum cable length: 50m



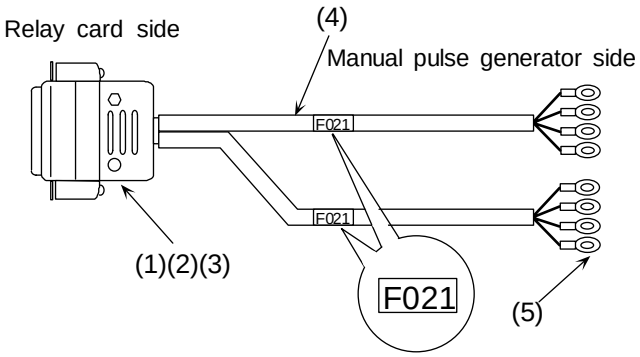
Manufacturing precautions

(1) The wire material shall be a shielded, 2-pair stranded cable equivalent to AWG22 (0.3mm^2).
(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 on the relay card side over the sheath, and wrap copper foil tape over it. Connect the copper foil tape wrapped around the sheath to a connector GND plate.
(5) Stamp the name of each signal on the crimp terminal side mark tube and install.

Cable type name: F021 cable			Appendix 2.13

Application: Relay card – Manual pulse generator connection
(when two manual pulse generators are connected)

Assembly drawing

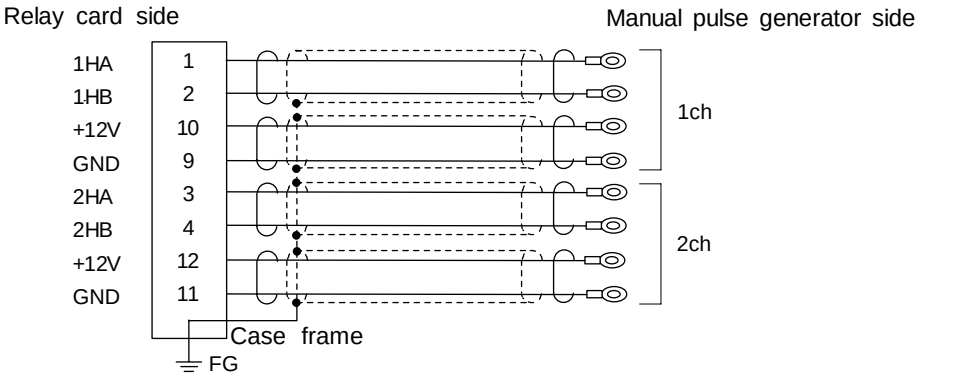


List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Hirose Electric CDA-15P	1
2	Contact	Hirose Electric CD-PC-111	8
3	Connector case	Hirose Electric HAD-CTH	1
4	Wire material	Sumitomo Electric B-22 (19) U × 2SJ-1 × 9	(4)
5	Crimp terminal	J.S.T. Mfg V1.25-3	8

Connection diagram

Maximum cable length: 50m



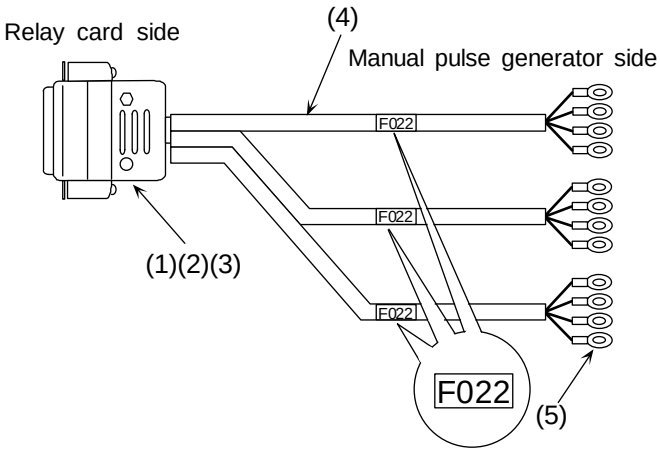
Manufacturing precautions

(1) The wire material shall be a shielded, 4-pair stranded cable equivalent to AWG22 (0.3mm^2).
(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 on the relay card side over the sheath, and wrap copper foil tape over it. Connect the copper foil tape wrapped around the sheath to a connector GND plate.
(5) Stamp the name of each signal on the crimp terminal side mark tube and install.

Cable type name: F022 cable			Appendix 2.14

Application: Relay card – Manual pulse generator connection
(when three manual pulse generators are connected)

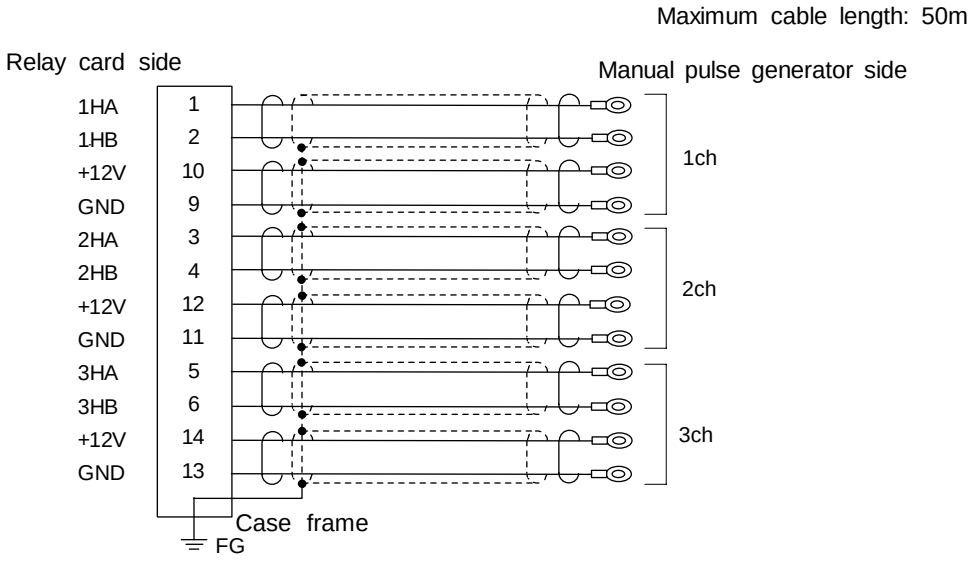
Assembly drawing



List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Hirose Electric CDA-15P	1
2	Contact	Hirose Electric CD-PC-111	12
3	Connector case	Hirose Electric HAD-CTH	1
4	Wire material	Sumitomo Electric B-22 (19) U × 2SJ-1 × 9	(6)
5	Crimp terminal	J.S.T. Mfg V1.25-3	12

Connection diagram



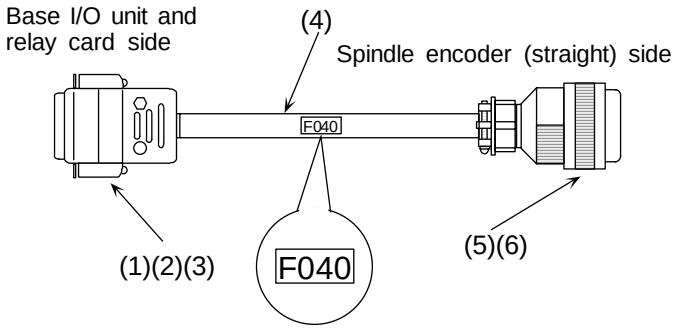
Manufacturing precautions

(1) The wire material shall be a shielded, 6-pair stranded cable equivalent to AWG22 (0.3mm^2).
(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 on the relay card side over the sheath, and wrap copper foil tape over it. Connect the copper foil tape wrapped around the sheath to a connector GND plate.
(5) Stamp the name of each signal on the crimp terminal side mark tube and install.

Cable type name: F040 cable			Appendix 2.15

Application: Base I/O unit – Spindle encoder (straight) connection
Relay card – Spindle encoder (straight) connection

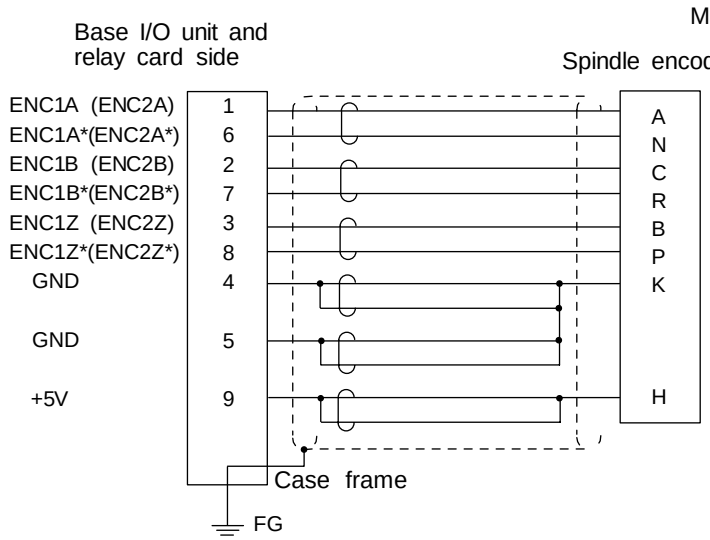
Assembly drawing



List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Hirose Electric CDE-9PF	1
2	Contact	Hirose Electric CD-PC-111	9
3	Connector case	Hirose Electric HDE-CTH	1
4	Wire material	Bando Electric Wire DPVVSB 6P × 0.2 mm^2	(1)
5	Connector	ITT Canon MS3106B20-29S	1
6	Cable clamp	ITT Canon MS3057-12A	1

Connection diagram



(Note) Signal names in parentheses are equivalent to the channel 2 signal names.

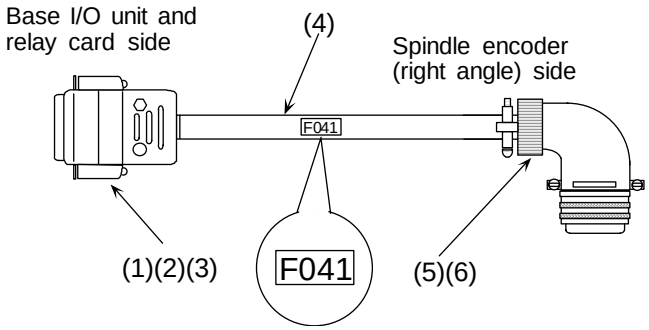
Manufacturing precautions

(1) The wire material shall be a shielded, 6-pair stranded cable equivalent to AWG24 (0.2mm^2).
(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 on the base I/O unit and relay card side over the sheath, and wrap copper foil tape over it.
Connect the wound copper foil tape to the connector's GND plate.

Cable type name: F041 cable			Appendix 2.16

Application: Base I/O unit – Spindle encoder (right angle) connection
Relay card – Spindle encoder (right angle) connection

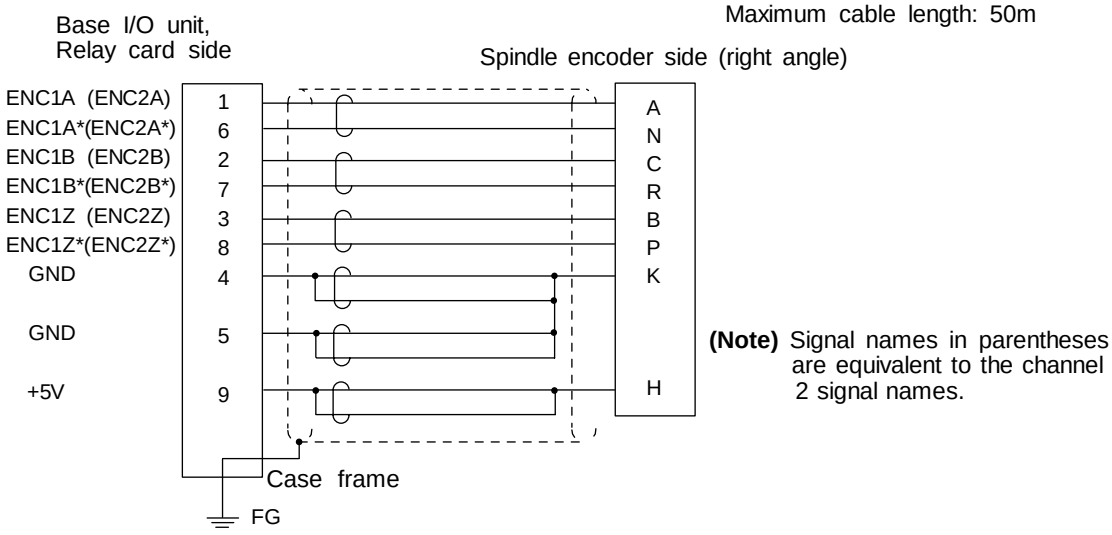
Assembly drawing



List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Hirose Electric CDE-9PF	1
2	Contact	Hirose Electric CD-PC-111	9
3	Connector case	Hirose Electric HDE-CTH	1
4	Wire material	Bando Electric Wire DPVVSB 6P × 0.2 mm^2	(1)
5	Connector	ITT Canon MS3108B20-29S	1
6	Cable clamp	ITT Canon MS3057-12A	1

Connection diagram



(Note) Signal names in parentheses are equivalent to the channel 2 signal names.

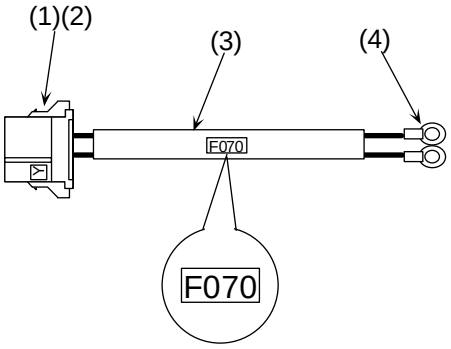
Manufacturing precautions

(1) The wire material shall be a shielded, 6-pair stranded cable equivalent to AWG24 (0.2mm^2).
(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 on the base I/O unit and relay card side over the sheath, and wrap copper foil tape over it.
Connect the wound copper foil tape to the connector's GND plate.

Cable type name: F070 cable			Appendix 2.17

Application: +24V supply to the base I/O unit, relay card and remote I/O unit
Input of emergency stop signal to the relay card

Assembly drawing



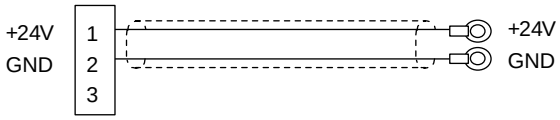
Option (compatible connector set)
FCUA-CN220
(Note that this is only compatible with the base I/O unit, relay card and remote I/O unit side connectors.)

List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Tyco Electronics AMP 1-178288-3	1
2	Contact	Tyco Electronics AMP 2-175218-5	2
3	Wire material	Sumitomo Electric B-18 (19) U × 2SJ-1 × 9	(1)
4	Crimp terminal	J.S.T. Mfg V1.25-3	2

Connection diagram

Maximum cable length: 30m



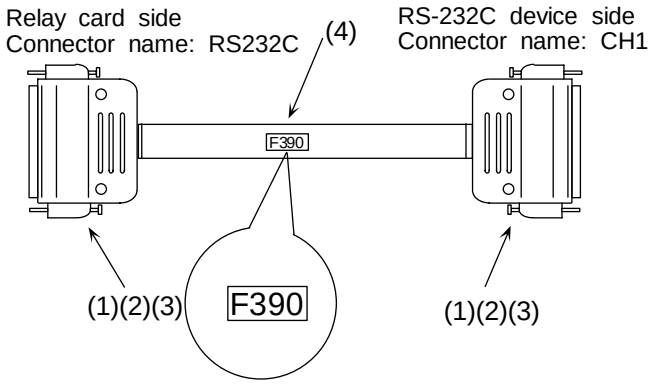
Manufacturing precautions

(1) The wire material shall be a shielded, 1-pair stranded cable equivalent to AWG18 (0.75mm^2). If the cable length exceeds 15m, select wire material equivalent to AWG16.
(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) Stamp the name of each signal on the crimp terminal side mark tube and install.
(5) Protect both ends of the wire with an insulating bush.
(6) Use shield processing wire material equivalent to AWG18 (0.75mm^2).

Cable type name: F390 cable			Appendix 2.18

Application: Relay card – RS-232C device connection (cross cable)

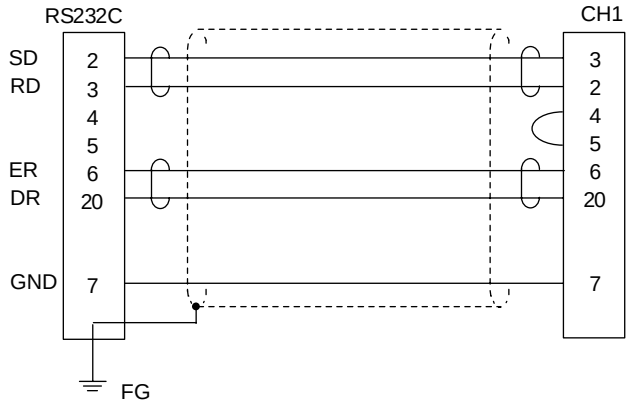
Assembly drawing



List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Hirose Electric CDB-25P	2
2	Contact	Hirose Electric CD-PC-111	14
3	Connector case	Hirose Electric HDB-CTH	2
4	Wire material	Bando Electric Wire DPVVSB 6P × 0.2 mm^2	(1)

Connection diagram



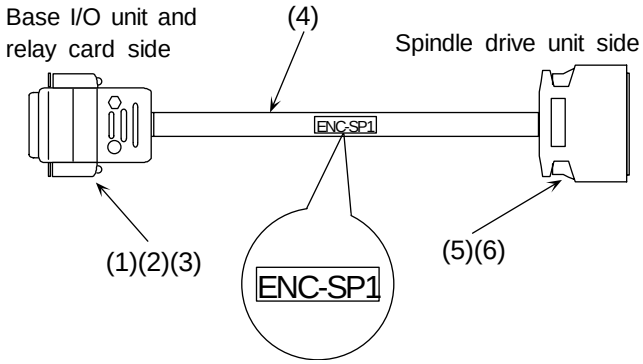
Manufacturing precautions

(1) The wire material shall be a shielded, 6-pair stranded cable equivalent to AWG24 (0.2mm^2).
(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 on the base I/O unit and relay card side over the sheath, and wrap copper foil tape over it.
Connect the wound copper foil tape to the connector's GND plate.

Cable type name: ENC-SP1 cable			Appendix 2.19

Application: Base I/O unit – Spindle drive unit connection
Relay card – Spindle drive unit connection

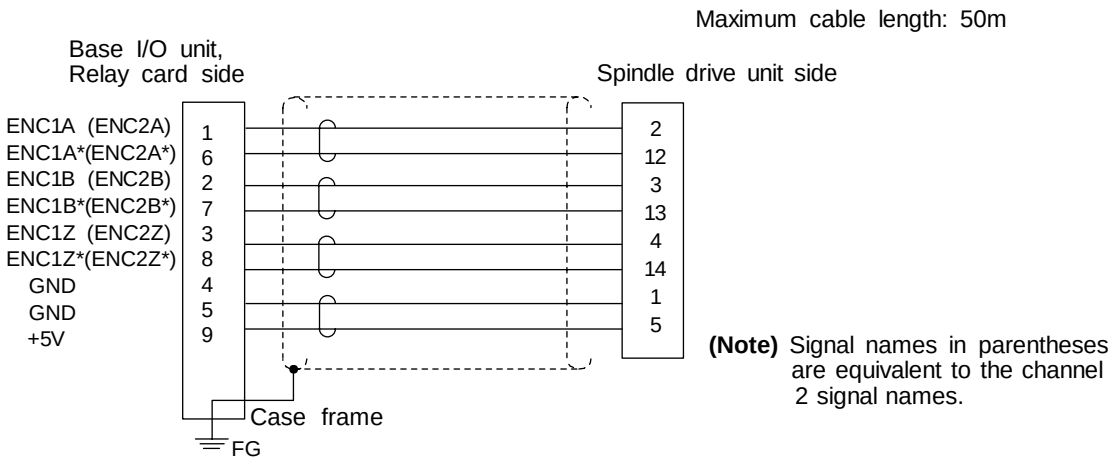
Assembly drawing



List of parts used

No.	Part name	Recommended part type	Qty
1	Connector	Hirose Electric CDE-9PF	1
2	Contact	Hirose Electric CD-PC-111	8
3	Connector case	Hirose Electric HDE-CTH	1
4	Wire material	Bando Electric Wire DPVVSB 6P × 0.2 mm^2	(1)
5	Plug	Sumitomo 3M 10120-6000EL	1
6	Shell	Sumitomo 3M 10320-3210-000	1

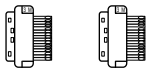
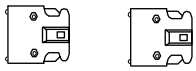
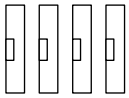
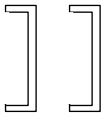
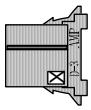
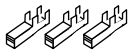
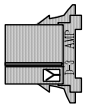
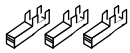
Connection diagram



Manufacturing precautions

(1) The wire material shall be a shielded, 6-pair stranded cable equivalent to AWG24 ($0.2mm^2$).
(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 on the base I/O unit and relay card side over the sheath, and wrap copper foil tape over it.
Connect the wound cooper foil tape to the connector's GND plate.
(5) Part No. 5 (plug) and part No. 6 (shell) are solderless types. If soldering types are required, use parts equivalent to 10120-3000VE for the plug and 10320-52FO-008 for the shell (both parts manufactured by Sumitomo 3M).
(6) Do not connect a +5V power supply.

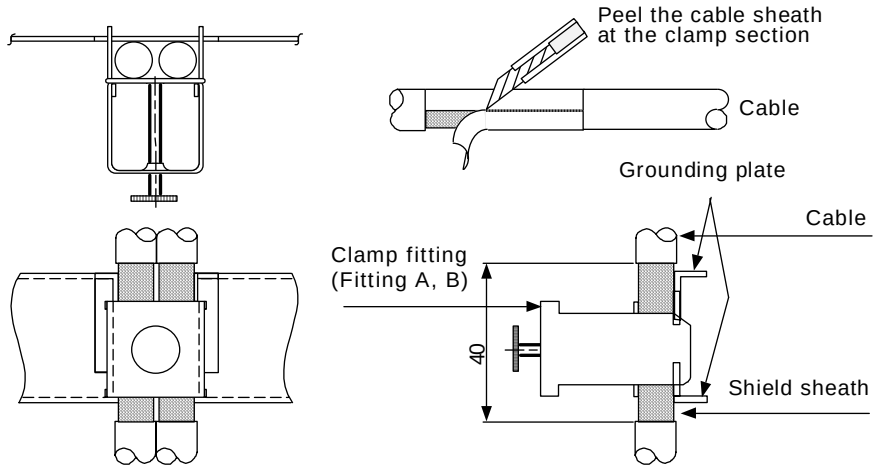
Appendix 2.20 Table of Connector Sets

Connector type	Application	Packing details	
FCUA-CS000	Double-ended: Base I/O unit – Servo drive unit Servo drive unit – Servo drive unit Single-ended (* side): Remote I/O unit (*) – Analog input/output Remote I/O unit (*) – Manual pulse generator Base I/O unit – Spindle drive unit (*) Relay card – Spindle drive unit (*)	Plug (Sumitomo 3M) 10120-3000VE × 2pcs. 	Shell (Sumitomo 3M) 10320-52F0-008 × 2pcs. 
FCUA-CS301	Remote I/O unit – terminal block Base I/O unit – terminal block	Connector (Sumitomo 3M) 7940-6500SC × 4pcs. 	Strain relief (Sumitomo 3M) 3448-7940 × 2pcs. 
FCUA-CN211	Base I/O unit - remote I/O unit Remote I/O unit - remote I/O unit	Connector (Tyco Electronics AMP) 1-178288-3 × 1pc. 	Gold contact (Tyco Electronics AMP) 1-175218-2 × 3pcs. 
FCUA-CN220	24VDC power input External emergency stop input	Connector (Tyco Electronics AMP) 2-178288-3 × 1pc. 	Tin contact (Tyco Electronics AMP) 1-175218-5 × 3pcs. 
FCUA-CN300	Base I/O unit – Machine electric cabinet Remote I/O unit – Machine electric cabinet	Connector (Sumitomo 3M) 7940-6500SC × 2pcs. 	

Appendix 3 Parts for EMC Measures

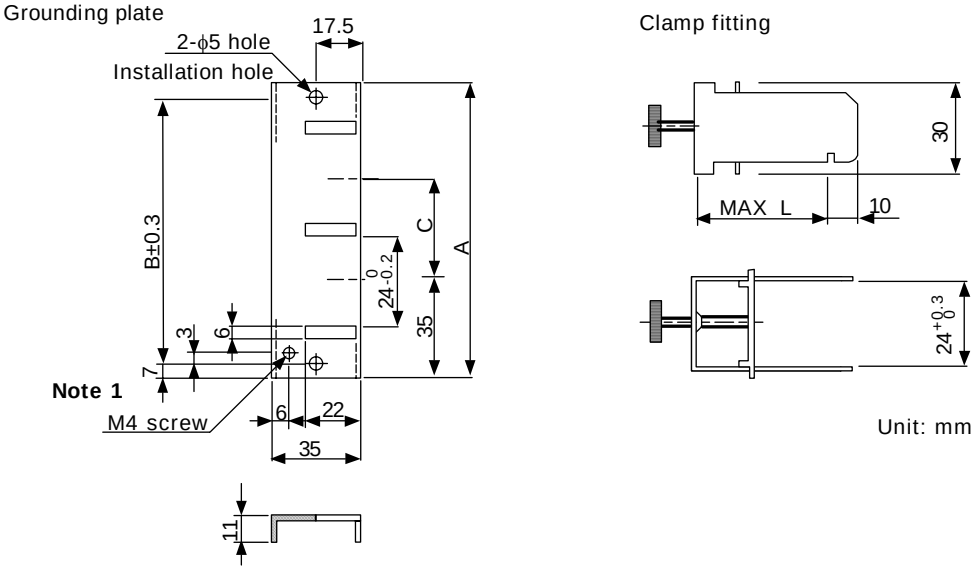
Appendix 3.1 Shield Clamp Fitting

The effect can be increased by directly connecting the cable's shield sheath to the grounding plate.
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 grounding, install the grounding plate directly on the cabinet or connect with a grounding wire.
If the AERSBAN-□SET, containing the grounding plate and clamp fitting, is required, please contact Mitsubishi.



Clamp section drawing

Outline drawing



Note 1) Screw hole for wiring to cabinet's grounding plate
Note 2) The grounding plate thickness is 1.6mm

	A (mm)	B (mm)	C (mm)	Enclosed fitting
AERSBAN-DSET	100	86	30	Two clamp fittings A
AERSBAN-ESET	70	56	–	One clamp fitting B

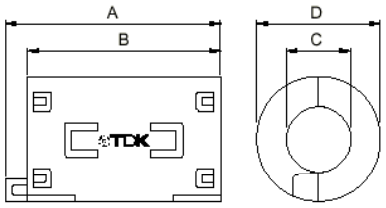
	L (mm)
Clamp fitting A	70
Clamp fitting B	45

Appendix 3.2 Ferrite Core

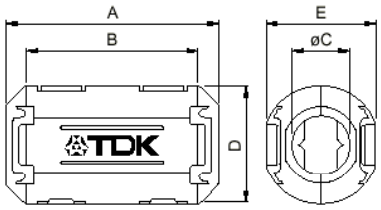
The ferrite core is mounted integrally with the plastic case.
This can be installed with one touch without cutting the interface cable or power supply cable.
This ferrite core is effective against common mode noise, allowing measures against noise without affecting the quality of the signal.

Recommended ferrite core: TDK ZCAT Series
ZCAT3035-1330 (-BK)

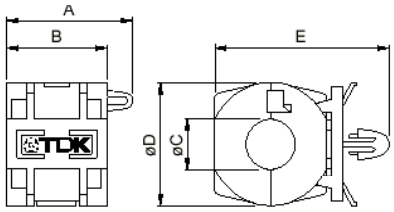
ZCAT type



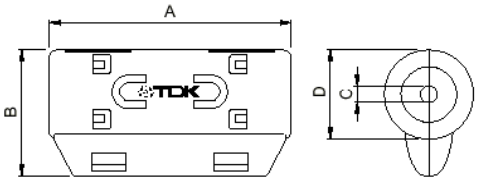
ZCAT-A, ZCAT-AP type



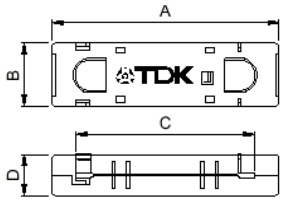
ZCAT-B type



ZCAT-C type



ZCAT-D type



Part name	A (mm)	B (mm)	øC (mm)	øD (mm)	E (mm)	Applicable cable outer diameter (mm)	Weight (g)
ZCAT1518-0730-M(-BK)*1	22±1	18±1	7±1	15±1	–	7max.	6
ZCAT1518-0730(BK)*2	22±1	18±1	7±1	15±1	–	7max.	6
ZCAT2017-0930-M(-BK)	21±1	17±1	9±1	20±1	–	9max.	11
ZCAT2032-0930-M(-BK)*1	36±1	32±1	9±1	19.5±1	–	9max.	22
ZCAT2032-0930(-BK)*2	36±1	32±1	9±1	19.5±1	–	9max.	22
ZCAT2132-1130-M(-BK)*1	36±1	32±1	11±1	20.5±1	–	11max.	22
ZCAT2132-1130(-BK)*2	36±1	32±1	11±1	20.5±1	–	11max.	22
ZCAT3035-1330-M(-BK)*1	39±1	34±1	13±1	30±1	–	13max.	63
ZCAT3035-1330(-BK)*2	39±1	34±1	13±1	30±1	–	13max.	63
ZCAT1525-0430AP-M(-BK)	25±1	20±1	4±1	15±1	11.5±1	2.5 to 4(USB)	7
ZCAT1325-0530A-M(-BK)*1	25±1	20±1	5±1	12.8±1	11.2±1	3 to 5(USB)	7
ZCAT1325-0530A(-BK)	25±1	20±1	5±1	12.8±1	11.2±1	3 to 5(USB)	7
ZCAT1730-0730A-M(-BK)	30±1	23±1	7±1	16.5±1	15±1	4 to 7(USB/IEEE1394)	12
ZCAT2035-0930A-M(-BK)*1	35±1	28±1	9±1	19.5±1	17.4±1	6 to 9	22
ZCAT2035-0930A(-BK)	35±1	28±1	9±1	19.5±1	17.4±1	6 to 9	22
ZCAT2235-1030A-M(-BK)	35±1	28±1	10±1	21.5±1	20±1	8 to 10	27
ZCAT2436-1330A-M(-BK)	36±1	29±1	13±1	23.5±1	22±1	10 to 13	29
ZCAT2017-0930B-M(-BK)	21±1	17±1	9±1	20±1	28.5±1	9max.	12
ZCAT2749-0430C-M(-BK)	49±1	27±1	4.5±1	19.5±1	–	4.5max.	26
ZCAT4625-3430D(-BK)	45.5±1	24.5±1	34±1	12±1	–	For 26 core flat cable	32
ZCAT4625-3430DT(-BK)*3	45.5±1	24.5±1	34±1	13±1	–	For 26 core flat cable	32
ZCAT6819-5230D(-BK)	67.5±1	18.5±1	52±1	16±1	–	For 40 core flat cable	58
ZCAT6819-5230DT(-BK)*3	67.5±1	18.5±1	52±1	17±1	–	For 40 core flat cable	58

- ZCAT-C type and ZCAT-D type
  *1 The M stamp is attached.
  *2 A fixing band is attached at shipment.
  *3 Double sided tape type. (Double sided tape is attached at shipment)
- ZCAT-B type: Cabinet fixing type installation hole ø4.8 to 4.9mm, plate thickness 0.5 to 2mm
- ZCAT-AP and ZCAT-C type: Structure that prevents easy opening after case is closed.

Appendix 3.3 Surge Protector

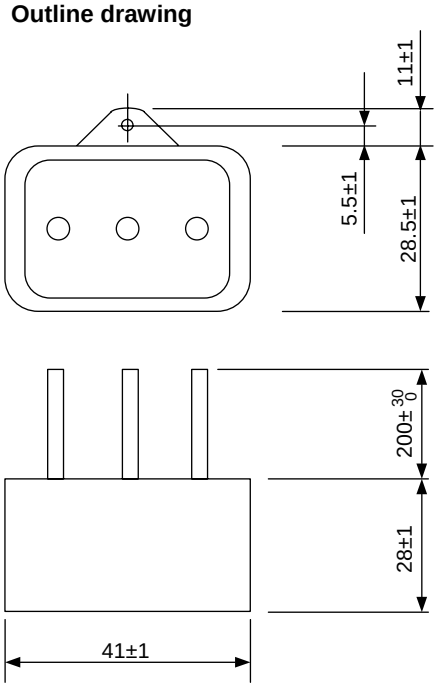
(1) Surge protector

Make sure that surge does not directly enter the AC line of the general-purpose stabilized power supply (prepared by customer) supplied to the control unit and DIO. The following product or equivalent is recommended for the surge protector.

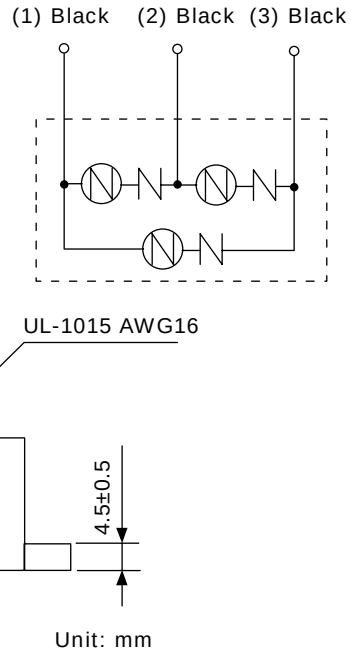
1) Part name : RAV-781BYZ-2
Manufacturer : Okaya Electric Industries

Circuit voltage 50/60Hz Vrms	Max. tolerable circuit voltage	Clamp voltage V±10%	Surge resistance level 8/20μs	Surge withstand voltage 1.2/50μs	Static capacity	Operating temperature range
250V 3ø	300V	783V	2500A	20kV	75pF	–20 to +70°C

Outline drawing



Circuit drawing



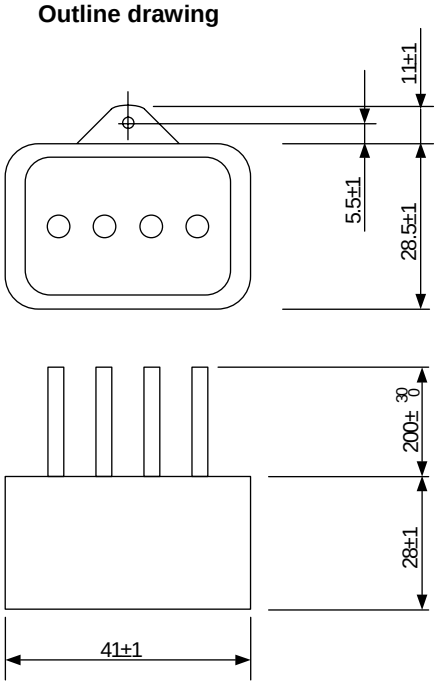
Unit: mm

* Refer to the manufacturer's catalog for detailed characteristics, outline and connection methods of the surge protector.

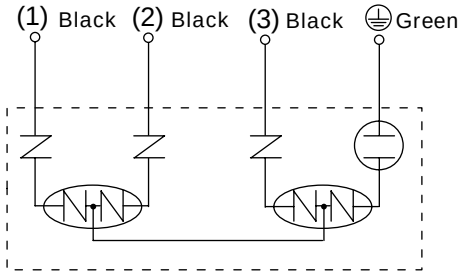
2) Part name : RAV-781BXZ-4
Manufacturer : Okaya Electric Industries

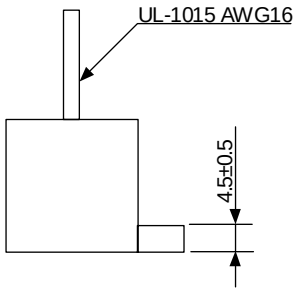
Circuit voltage 50/60Hz Vrms	Max. tolerable circuit voltage	Clamp voltage V±10%	Surge resistance level 8/20μs	Surge withstand voltage 1.2/50μs	Static capacity	Operating temperature range
250V 3ø	300V	700V	2500A	2kV	75pF	–20 to +70°C

Outline drawing



Circuit drawing

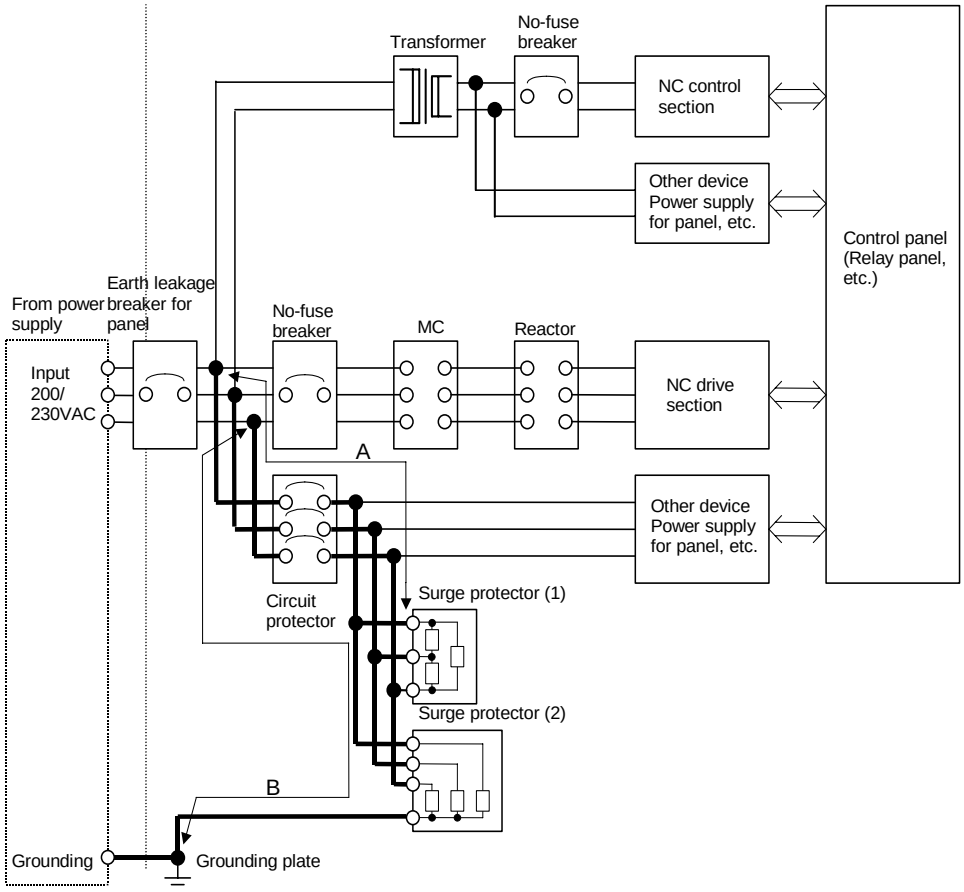




Unit: mm

* Refer to the manufacturer's catalog for detailed characteristics, outline and connection methods of the surge protector.

(2) Surge protector installation example



Surge protector installation method

<Caution>

(1) Thick wires will enhance the lighting surge absorption effect, so keep the wire as thick and short as possible.
-Wire material-
Wire diameter: $2mm^2$ or more
Wire length: Connection length (A) to surge protector (1) is 2m or less.
Connection length (B) to surge protector (2) is 2m or less.

(2) When carrying out an insulation voltage resistance test with an overvoltage (100VAC, 1500VAC) applied on the power supply line, remove the serge protector (2) since it will function under the applied voltage.

(3) A short-circuit accident will occur if a surge exceeding the tolerance is applied on the surge protector. Thus, always insert a circuit protector to protect the power supply line.
The current does not flow constantly to surge protectors (1) and (2), so the circuit protector can also be used for the other devices.

Appendix 3.4 Selection of Stabilized Power Supply

Consider the following characteristics when selecting the stabilized power supply. (prepared by customer)
Use a power supply that complies with CE Marking or that follows the standards given below.

Stabilized power supply selection items

Item			Conditions
Output fluctuation	Voltage fluctuation	±5%	±5% or less of 24VDC output
	Ripple noise	Max. 120mV	±5% or less of 24VDC output
	Spike noise	Max. 500mV	
Output current		—	Refer to this manual
Output holding time		Min. 20ms	Instantaneous off time

Standards

Safety Standards : UL1950, CSA C22.2 No. 234 approved, IEC950 compliant
Noise Terminal Voltage : FCC Class A, VCCI-1 Class
High Harmonics Current Restrictions : IEC1000-3-2

Revision History

Date of revision	Manual No.	Revision details
Feb. 1998	BNP-B2203*	First edition created.
Sept. 1999	BNP-B2203A	
Oct. 2003	BNP-B2203D	• Design of the cover and the back cover were changed. • MODEL, MODEL CODE, and Manual No. were added on the back cover. • PCI bus specifications (FCU6-HR655) card added. • Miswrite is corrected

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 a Mitsubishi business office with any questions or comments regarding the use of this product.

Duplication Prohibited

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE : MITSUBISHI DENKI BLDG., 2-2-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

MODEL	MAGIC64
MODEL CODE	008-096
Manual No.	BNP-B2203D(ENG)

(0310)MEE