

Numerical Control (CNC)

User's Manual

Data Acquisition Unit

Introduction

This manual covers the items required for installing, connecting and setting up the data acquisition unit to be connected to the MITSUBISHI CNC.

Data acquisition unit is supported by the following NC series.

| Applicable NC |
|--|
| M700VW/M700VS/M70V/M700/M70/E70 Series |
| M800W/M800S/M80/M80W/E80 Series |
| C80 Series |

Read this manual thoroughly and understand the product's functions and performance before starting to use.

This manual is written on the assumption that all optional functions are added, but the actually delivered device may not have all functions.

The unit names, cable names and various specifications are subject to change without notice. Please confirm these before placing an order.

Be sure to keep this manual always at hand.

This product is commercially available encryption device and commercially available encryption program.








In this manual, the following abbreviations might be used.

MTB: Machine tool builder

Notes on Reading This Manual

- (1) This manual is intended to contain as much descriptions as possible even about special operations. The operations to which no reference is made in this manual should be considered "impossible".
- (2) This manual is for the machine tool builders who set up the NC system.
- (3) Do not connect to the pin described as "NC" on the pin assignment table of the connector.
- (4) The characteristic values and numerical values without tolerances mentioned in this manual are representative values.

CAUTION

-  If the descriptions relating to the "restrictions" and "allowable conditions" conflict between this manual and the machine tool builder's instruction manual, the latter has priority over the former.
-  Items that are not described in this manual must be interpreted as "not possible".
-  This manual is written on the assumption that all the applicable functions are included. Some of them, however, may not be available for your NC system. Refer to the specifications issued by the machine tool builder before use.
-  For information about each machine tool, refer to manuals issued from the machine tool builder.
-  Some screens and functions may differ depending on each NC system (or version), and some functions may not be possible. Please confirm the specifications before starting to use.
-  To protect the availability, integrity and confidentiality of the NC system against cyber-attacks including unauthorized access, denial-of-service (Dos) (*1) attack, and computer virus from external sources via a network, take security measures such as firewall, VPN, and anti-virus software.
(*1) Denial-of-service (Dos) refers to a type of cyber-attack that disrupts services by overloading the system or by exploiting a vulnerability of the system.
-  Mitsubishi Electric assumes no responsibility for any problems caused to the NC system by any type of cyber-attacks including DoS attack, unauthorized access and computer virus.

The numerical control unit is configured of the control unit, display unit, personal computer unit, operation board (operation panel I/O unit), servo drive unit, spindle drive unit, power supply unit + driver, servomotor, spindle motor, etc.

In this manual, the following items are generically called "controller".

- Control unit
- Display unit
- Personal computer unit
- Operation board (operation panel I/O unit)
- Numerical control unit peripheral devices (input/output unit, safety unit)

In this manual, the following items are generically called "drive unit".

- Servo drive unit
- Spindle drive unit
- Power supply unit + driver

In this manual, the following items are generically called "motor".

- Servo motor
- Spindle motor

Also refer to the manuals on "Manual List" as necessary.

Manual List

Manuals related to M800/M80/E80/C80 Series are listed as follows.

These manuals are written on the assumption that all optional functions are added to the targeted model.

Some functions or screens may not be available depending on the machine or specifications set by MTB. (Confirm the specifications before use.)

The manuals issued by MTB take precedence over these manuals.

| Manual | IB No. | Purpose and Contents |
|--|------------|---|
| M800/M80/E80 Series Instruction Manual | IB-1501274 | <ul style="list-style-type: none"> ◆ Operation guide for NC ◆ Explanation for screen operation, etc. |
| C80 Series Instruction Manual | IB-1501453 | <ul style="list-style-type: none"> ◆ Operation guide for NC ◆ Explanation for screen operation, etc. |
| M800/M80/E80/C80 Series Programming Manual (Lathe System) (1/2) | IB-1501275 | <ul style="list-style-type: none"> ◆ G code programming for lathe system ◆ Basic functions, etc. |
| M800/M80/E80/C80 Series Programming Manual (Lathe System) (2/2) | IB-1501276 | <ul style="list-style-type: none"> ◆ G code programming for lathe system ◆ Functions for multi-part system, high-accuracy function, etc. |
| M800/M80/E80/C80 Series Programming Manual (Machining Center System) (1/2) | IB-1501277 | <ul style="list-style-type: none"> ◆ G code programming for machining center system ◆ Basic functions, etc. |
| M800/M80/E80/C80 Series Programming Manual (Machining Center System) (2/2) | IB-1501278 | <ul style="list-style-type: none"> ◆ G code programming for machining center system ◆ Functions for multi-part system, high-accuracy function, etc. |
| M800/M80/E80 Series Alarm/Parameter Manual | IB-1501279 | <ul style="list-style-type: none"> ◆ Alarms ◆ Parameters |
| C80 Series Alarm/Parameter Manual | IB-1501560 | <ul style="list-style-type: none"> ◆ Alarms ◆ Parameters |

Manuals for MTBs (NC)

| Manual | IB No. | Purpose and Contents |
|--|------------|--|
| M800/M80/E80/C80 Series Specifications Manual (Function) | IB-1501505 | <ul style="list-style-type: none"> ♦ Model selection ♦ Outline of various functions |
| M800/M80/E80/C80 Series Specifications Manual (Hardware) | IB-1501506 | <ul style="list-style-type: none"> ♦ Model selection ♦ Specifications of hardware unit |
| M800W/M80W Series Connection and Setup Manual | IB-1501268 | <ul style="list-style-type: none"> ♦ Detailed specifications of hardware unit ♦ Installation, connection, wiring, setup (startup/adjustment) |
| M800S/M80/E80 Series Connection and Setup Manual | IB-1501269 | <ul style="list-style-type: none"> ♦ Detailed specifications of hardware unit ♦ Installation, connection, wiring, setup (startup/adjustment) |
| C80 Series Connection and Setup Manual | IB-1501452 | <ul style="list-style-type: none"> ♦ Detailed specifications of hardware unit ♦ Installation, connection, wiring, setup (startup/adjustment) |
| M800/M80/E80 Series PLC Development Manual | IB-1501270 | <ul style="list-style-type: none"> ♦ Electrical design ♦ I/O relation (assignment, setting, connection), field network ♦ Development environment (PLC on-board, peripheral development environment), etc. |
| M800/M80/E80 Series PLC Programming Manual | IB-1501271 | <ul style="list-style-type: none"> ♦ Electrical design ♦ Sequence programming ♦ PLC support functions, etc. |
| M800/M80/E80/C80 Series PLC Interface Manual | IB-1501272 | <ul style="list-style-type: none"> ♦ Electrical design ♦ Interface signals between NC and PLC |
| M800/M80/E80 Series Maintenance Manual | IB-1501273 | <ul style="list-style-type: none"> ♦ Cleaning and replacement for each unit ♦ Other items related to maintenance |
| C80 Series Maintenance Manual | IB-1501454 | <ul style="list-style-type: none"> ♦ Cleaning and replacement for each unit ♦ Other items related to maintenance |

Manuals for MTBs (drive section)

| Manual | IB No. | Contents |
|---|------------|---|
| MDS-E/EH Series Specifications Manual | IB-1501226 | <ul style="list-style-type: none"> ♦ Specifications for power supply regeneration type |
| MDS-E/EH Series Instruction Manual | IB-1501229 | <ul style="list-style-type: none"> ♦ Instruction for power supply regeneration type |
| MDS-EJ/EJH Series Specifications Manual | IB-1501232 | <ul style="list-style-type: none"> ♦ Specifications for regenerative resistor type |
| MDS-EJ/EJH Series Instruction Manual | IB-1501235 | <ul style="list-style-type: none"> ♦ Instruction for regenerative resistor type |
| MDS-EM/EMH Series Specifications Manual | IB-1501238 | <ul style="list-style-type: none"> ♦ Specifications for multi-hybrid, power supply regeneration type |
| MDS-EM/EMH Series Instruction Manual | IB-1501241 | <ul style="list-style-type: none"> ♦ Instruction for multi-hybrid, power supply regeneration type |
| DATA BOOK | IB-1501252 | <ul style="list-style-type: none"> ♦ Specifications of servo drive unit, spindle drive unit, motor, etc. |

Manuals for MTBs (Others)

| Manual | No. | Purpose and Contents |
|---|-----------|--|
| GOT2000 Series User's Manual (Hardware) | SH-081194 | ♦ Outline of hardware such as part names, external dimensions, installation, wiring, maintenance, etc. of GOTs |
| GOT2000 Series User's Manual (Utility) | SH-081195 | ♦ Outline of utilities such as screen display setting, operation method, etc. of GOTs |
| GOT2000 Series User's Manual (Monitor) | SH-081196 | ♦ Outline of each monitor function of GOTs |
| GOT2000 Series Connection Manual (Mitsubishi Electric Products) | SH-081197 | ♦ Outline of connection types and connection method between GOT and Mitsubishi Electric connection devices |
| GT Designer3 (GOT2000) Screen Design Manual | SH-081220 | ♦ Outline of screen design method using screen creation software GT Designer3 |

■ For M800/M80/E80 Series

| Manual | No. | Purpose and Contents |
|--|----------------|---|
| GOT2000/GOT1000 Series CC-Link Communication Unit User's Manual | IB-0800351 | ♦ Explanation for handling CC-Link communication unit (for GOT2000 series/GOT1000 series) |
| GX Developer Version 8 Operating Manual (Startup) | SH-080372E | ♦ Explanation for system configuration, installation, etc. of PLC development tool GX Developer |
| GX Developer Version 8 Operating Manual | SH-080373E | ♦ Explanation for operations using PLC development tool GX Developer |
| GX Converter Version 1 Operating Manual | IB-0800004E | ♦ Explanation for operations using data conversion tool GX Converter |
| GX Works2 Installation Instructions | BCN-P5999-0944 | ♦ Explanation for the operating environment and installation method of GX Works2 |
| GX Works2 Version 1 Operating Manual (Common) | SH-080779ENG | ♦ Explanation for the system configuration of GX Works2 and the functions common to Simple project and Structured project such as parameter setting, operation method for the online function |
| GX Works2 Version 1 Operating Manual (Simple Project) | SH-080780ENG | ♦ Explanation for methods for such as creating and monitoring programs in Simple project of GX Works2 |
| GX Works2 Version 1 Operating Manual (Simple Project, Function Block) | SH-080984ENG | ♦ Explanation for methods for such as creating function blocks, pasting function blocks to sequence programs, and operating FB library in Simple project of GX Works2 |
| GX Works2 Version 1 Operating Manual (Structured Project) | SH-080781ENG | ♦ Explanation for methods for such as creating and monitoring programs in Structured project of GX Works2 |
| GX Works3 Installation Instructions | BCN-P5999-0391 | ♦ Explanation for the operating environment and installation method of GX Works3 |
| MELSEC-Q CC-Link System Master/Local Module User's Manual | SH-080394E | ♦ Explanation for system configuration, installation, wiring, etc. of master/local modules for CC-Link system |
| GOT2000 Series Connection Manual (Non-Mitsubishi Electric Products 1) | SH-081198ENG | ♦ Explanation for connection types and connection method between GOT and other company's devices |
| GOT2000 Series Connection Manual (Non-Mitsubishi Electric Products 2) | SH-081199ENG | |
| GOT2000 Series Connection Manual (Microcomputers, MODBUS/Fieldbus Products, Peripherals) | SH-081200ENG | ♦ Explanation for connection types and connection method between GOT and microcomputers, MODBUS/fieldbus products, peripherals |
| GT SoftGOT2000 Version1 Operating Manual | SH-081201ENG | ♦ Explanation for system configuration, screen configuration and operation method of monitoring software GT SoftGOT2000 |

■ For C80 Series

| Manual | No. | Purpose and Contents |
|--|-----------|---|
| MELSEC iQ-R Module Configuration Manual | SH-081262 | ♦ Outline of system configuration, specifications, installation, wiring, maintenance, etc. |
| MELSEC iQ-R CPU Module User's Manual (Startup) | SH-081263 | ♦ Outline of specifications, procedures before operation, troubleshooting, etc. for CPU module |
| MELSEC iQ-R CPU Module User's Manual (Application) | SH-081264 | ♦ Outline of memory, functions, devices, parameters, etc. for CPU module |
| MELSEC iQ-R CC-Link IE Field Network User's Manual (Application) | SH-081259 | ♦ Explanation for functions, parameter settings, programming, troubleshooting, etc. of the CC-Link IE Field Network function |
| QCPU User's Manual (Hardware Design, Maintenance and Inspection) | SH-080483 | ♦ Outline of specifications, necessary knowledge to configure the system and maintenance-related descriptions for Q series CPU module, etc. |
| GX Works3 Operating Manual | SH-081215 | ♦ Outline of functions, programming, etc. |




Reference Manual for MTBs


| Manual | No. | Purpose and Contents |
|--|--------------------|---|
| M800/M80 Series Smart safety observation Specification manual | BNP-C3072-022 | ♦ Explanation for smart safety observation function |
| C80 Series Smart safety observation Specification manual | BNP-C3077-022 | |
| M800/M80 Series CC-Link (Master/Local) Specification manual | BNP-C3072-089 | ♦ Explanation for CC-Link |
| M800/M80 Series PROFIBUS-DP Specification manual | BNP-C3072-118 | ♦ Explanation for PROFIBUS-DP communication function |
| M800/M80 Series Interactive cycle insertion (Customization) Specification manual | BNP-C3072-121-0003 | ♦ Explanation for interactive cycle insertion |
| M800/M80 Series EtherNet/IP Specifications manual | BNP-C3072-263 | ♦ Explanation for EtherNet/IP |
| M800/M80 Series CC-Link IE Field (Master/local) Specifications manual | BNP-C3072-283 | ♦ Explanation for CC-Link IE Field |
| M800/M80 Series GOT Connection Specifications manual | BNP-C3072-314 | ♦ Explanation for GOT connection |
| M800/M80 Series CC-Link IE Field Basic Specifications manual | BNP-C3072-337 | ♦ Explanation for CC-Link IE Field Basic |
| M800/M80 Series FL-net Specifications manual | BNP-C3072-368 | ♦ Explanation for FL-net |
| M800/M80 Series Synchronous Control Specifications manual | BNP-C3072-074 | ♦ Explanation for synchronous control |
| M800/M80 Series Multiple-Axis Synchronization Control Specifications manual | BNP-C3072-339 | ♦ Explanation for multiple-axis synchronization control |

Precautions for Safety





Always read this manual and enclosed documents before installation, operation, maintenance and inspection to ensure correct usage. Thoroughly understand the basics, safety information and precautions of the devices before using.

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











| |
|--|
|  DANGER When the user could be subject to imminent 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 may be subject to medium or minor injuries or when property damage may occur, if handling is mistaken. |

Note that the items under "  CAUTION" could lead to serious consequences as well depending on the situation. All the items are important and must always be observed.

The following signs indicate prohibition and compulsory.

| | |
|---|---|
|  | This sign indicates prohibited behavior (must not do). For example,  indicates "Keep fire away". |
|  | This sign indicated a thing that is pompously (must do). For example,  indicates "it must be grounded". |

The meaning of each pictorial sign is as follows.

| | | | | |
|--|---|--|--|--|
|  CAUTION |  CAUTION rotated object |  CAUTION HOT |  Danger Electric shock risk |  Danger explosive |
|  Prohibited |  Disassembly is prohibited |  KEEP FIRE AWAY |  General instruction |  Earth ground |










For Safe Use

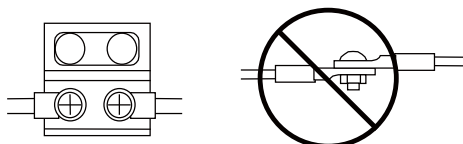
MITSUBISHI CNC is designed and manufactured solely for applications to machine tools to be used for industrial purposes.



Do not use this product in any applications other than those specified above, especially those which are substantially influential on the public interest or which are expected to have significant influence on human lives or properties.

1. Items related to prevention of electric shocks

WARNING






-  Do not open or remove the front cover while the power is ON or during operation. The high voltage terminals and charged sections will be exposed, and this could result in electric shocks.
-  Do not remove the front cover even when the power is OFF, except for the wiring works or periodic inspections. The inside of the controller and drive unit are charged, and this could result in electric shocks.
-  Always wait at least 15 minutes after turning the power OFF. Then, check the voltage with a tester, etc., before wiring works, inspections or connecting with peripheral devices. Failure to observe this could result in electric shocks.
-  Earth ground the controller, drive unit and motor according to the local laws. (In Japan, ground the 200V Series input products with Class C or higher protective grounding and the 400V Series input with Class D or higher protective grounding.)
-  All wiring works, maintenance and inspections must be carried out by a qualified technician. Failure to observe this could result in electric shocks. Contact your nearby Service Center for replacing parts and servicing.
-  Wire the controller, drive unit and motor after installation. Failure to observe this could result in electric shocks.
-  Do not operate the switches with wet hands. Failure to observe this could result in electric shocks.
-  Do not damage, apply excessive stress, place heavy things on or sandwich the cables. Failure to observe this could result in electric shocks.
-  Insulate the power lead using a fixed terminal block. Failure to observe this could result in electric shocks.



-  Completely turn off the all lines of the power supply externally before wiring. Not completely turning off all power could result in electric shock or damage to the product.
-  When turning on the power supply or operating the module after wiring, be sure that the module's terminal covers are correctly attached. Not attaching the terminal cover could result in electric shock.


2. Items related to prevention of fire

CAUTION







-  Install the controller, drive unit, motor and regenerative resistor on non-combustible material Installation directly on or near combustible materials could result in fires.
-  If any malfunction in the unit is observed, shut off the power at the unit's power supply side. Continuous flow of large current could result in fires.
-  Install an appropriate no fuse breaker (NFB) and contactor (MC) on the power input section of the drive unit and configure the sequence that shuts the power off upon drive unit's emergency stop or alarm.
-  When a breaker is shared for multiple power supply units, the breaker may not function upon short-circuit failure in a small capacity unit. Do not share a breaker for multiple units as this is dangerous
-  Incorrect wiring and connections could cause the devices to damage or burn.

3. Items related to prevention of bodily injury or property damage

DANGER

-  **When transporting or installing a built-in IPM spindle or linear servomotor, be careful so that your hand or property will not be trapped in the motors or other metal objects. Also keep the devices with low magnetic tolerance away from the product.**

CAUTION









-  **Do not apply voltages to the connectors or terminals other than voltages indicated in the connection and setup manual for the controller or specifications manual for the drive unit. Failure to observe this could cause bursting, damage, etc.**
-  **Incorrect connections could cause the devices to rupture or damage, etc Always connect the cables to the indicated connectors or terminals.**
-  **Make sure to mount in a correct polarity (+ -). Failure to observe this could cause bursting, damage, etc.**
-  **Persons wearing medical devices, such as pacemakers, must stay away from this unit.**
-  **The electromagnetic waves could adversely affect the medical devices. Fins on the rear of the unit, regenerative resistor and motor, etc., will be hot during operation and for a while after the power has been turned OFF. Failure to observe this could result in burns.**
-  **Do not enter the machine's movable range during automatic operation. Keep your hands, feet or face away from the spindle during rotation.**

4. General precautions

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
















(1) Items related to product and manual

| |
|--|
|  CAUTION |
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









-  If the descriptions relating to the "restrictions" and "allowable conditions" conflict between this manual and the machine tool builder's instruction manual, the latter has priority over the former.
-  Items that are not described in this manual must be interpreted as "not possible".
-  This manual is written on the assumption that all the applicable functions are included. Some of them, however, may not be available for your NC system. Refer to the specifications issued by the machine tool builder before use.
-  For information about each machine tool, refer to manuals issued from the machine tool builder.
-  Some screens and functions may differ depending on each NC system (or version), and some functions may not be possible. Please confirm the specifications before starting to use.
-  Refer to "Smart safety observation" (BNP-C3072-022) for details about the connection with safety observing I/O device.
-  To protect the availability, integrity and confidentiality of the NC system against cyber-attacks including unauthorized access, denial-of-service (Dos) (*1) attack, and computer virus from external sources via a network, take security measures such as firewall, VPN, and anti-virus software.
(*1) Denial-of-service (Dos) refers to a type of cyber-attack that disrupts services by overloading the system or by exploiting a vulnerability of the system.
-  Mitsubishi Electric assumes no responsibility for any problems caused to the NC system by any type of cyber-attacks including DoS attack, unauthorized access and computer virus.

(2) Transportation and installation

CAUTION

-  Correctly transport the products according to the mass.
-  Use motor's suspension bolts to transport the motor itself. Do not use it to transport the motor after installation onto the machine.
-  Do not stack the products exceeding the indicated limit.
-  Do not hold the cables, shaft or encoder when transporting the motor.
-  Do not transport the controller or drive unit by suspending or holding the connected wires or cables.
-  Do not hold the front cover when transporting the unit, or the front cover could come off, causing the unit to drop.
-  Install on a non-combustible place where the unit's or motor's mass can be withstood according to the instruction manual.
-  The motor does not have a complete water-proof (oil-proof) structure. Do not allow oil or water to contact or enter the motor. Prevent the cutting chips from being accumulated on the motor as they easily soak up oil.
-  When installing the motor facing upwards, take measures on the machine side so that gear oil, etc., will not enter the motor shaft.
-  Do not remove the encoder from the motor. (The encoder installation screw is treated with sealing.)
-  Do not allow foreign matters, especially, conductive foreign matters such as screws or metal chips, or combustible foreign matters such as oil, to enter the controller, drive unit or motor. Failure to observe this could result in rupture or damage.
-  Do not get on the product or place heavy objects on it.
-  Provide prescribed distance between the controller/drive unit and inner surface of the control panel/other devices.
-  Do not install or operate the controller, drive unit or motor that is damaged or has missing parts.
-  Take care not to cut hands, etc. with the heat radiating fins or metal edges.

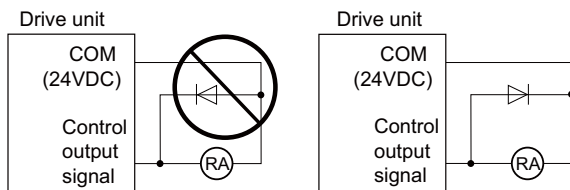
CAUTION

-  Do not block the intake/outtake ports of the motor with the cooling fan.
-  Install the controller's display section and operation board section on the spot where cutting oil will not reach.
-  The controller, drive unit and motor are precision devices, so do not drop or apply thumping vibration and strong impacts on them.
-  The controller and drive unit are precision devices, so do not drop or apply strong impacts on them.
-  Store and use the units according to the environment conditions indicated in each specifications manual.
-  When disinfectants or insecticides must be used to treat wood packaging materials, always use methods other than fumigation (for example, apply heat treatment at the minimum wood core temperature of 56 °C for a minimum duration of 30 minutes (ISPM No. 15 (2009))).
If products such as units are directly fumigated or packed with fumigated wooden materials, halogen substances (including fluorine, chlorine, bromine and iodine) contained in fumes may contribute to the erosion of the capacitors. When exporting the products, make sure to comply with the laws and regulations of each country.
-  Do not use the products in conjunction with any components that contain halogenated flame retardants (bromine, etc). Failure to observe this may cause the erosion of the capacitors.
-  Securely fix the motor to the machine. The motor could come off during operation if insecurely fixed.
-  Always install the motor with reduction gear in the designated direction. Failure to observe this could result in oil leaks.
-  Always install a cover, etc., over the shaft so that the rotary section of the motor cannot be touched during motor rotation.
-  When installing a coupling to the servomotor shaft end, do not apply impacts by hammering, etc. The encoder could be damaged.
-  Use a flexible coupling when connecting with a ball screw, etc., and keep the shaft core deviation smaller than the tolerable radial load of the shaft.
-  Do not use a rigid coupling as an excessive bending load will be applied on the shaft and could cause the shaft to break.
-  Do not apply a load exceeding the tolerable level onto the motor shaft. The shaft or bearing could be damaged.
-  Before using this product after a long period of storage, please contact the Service Center.
-  Following the UN recommendations, battery units and batteries should be transported based on the international regulations such as those determined by International Civil Aviation Organization (ICAO), International Air Transport Association (IATA), International Maritime Organization (IMO) and U.S. Department of Transportation (DOT).

(3) Items related to wiring

⚠ CAUTION

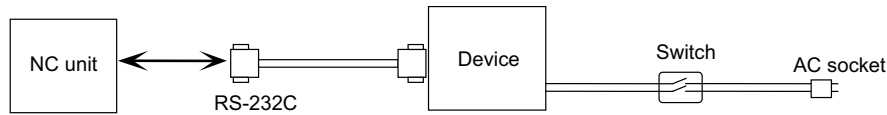
- ⚠ Correctly wire this product. Failure to observe this could result in motor runaway, etc.
- ⚠ Incorrect terminal connections could cause the devices to rupture or damage, etc. Always connect the cables to the indicated connectors or terminals.
- ⚠ Do not install a phase advancing capacitor, surge absorber or radio noise filter on the output side of the drive unit.
- ⚠ Correctly connect the output side (terminal U, V, W). The motor will not run properly if incorrectly connected.
- ⚠ Always install an AC reactor per each power supply unit.
- ⚠ Always install an appropriate breaker per each power supply unit. A breaker cannot be shared for multiple power supply units.
- ⚠ Do not directly connect a commercial power supply to the motor. Failure to observe this could result in faults.
- ❗ When using an inductive load such as relays, always connect a diode in parallel to the load as a noise countermeasure.
- ❗ 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 to be installed on the DC relay for the control output signal. If mistaken, the signal will not be output due to fault in the drive unit, and consequently the protective circuit, such as emergency stop, could be disabled.



- ⊘ Do not connect or disconnect the cables between units while the power is ON.
- ⚠ Do not connect or disconnect the PCBs while the power is ON.
- ⚠ Do not pull the cables when connecting/disconnecting them.
- ⚠ Securely tighten the cable connector fixing screw or fixing mechanism. The motor could come off during operation if insecurely fixed.
- ⚡ Always treat the shield cables indicated in the Connection Manual with grounding measures such as cable clamps.
- ⚠ Separate the signal wire from the drive line or power line when wiring.
- ⚠ Carry out wiring so that there is no possibility of short circuit between wires, nor of dangerous state.
- ⚠ Use wires and cables whose wire diameter, heat resistance level and bending capacity are compatible with the system.
- ⚡ Ground the device according to the requirements of the country where the device is to be used.

⚠ CAUTION

- ⚠ Wire the heat radiating fins and wires so that they do not contact.
- ⚠ When using the RS-232C device as a peripheral device, caution must be paid for connector connection/disconnection. Always use a double-OFF type AC power supply switch on the device side, and connect/disconnect the connector with the AC power supply on the device side OFF.



- ⚠ Using a stabilized power supply without overcurrent protection may cause the unit's failure due to miswiring of 24V.
- ⚠ 12V, 5V, and 3.3V output from connectors are to supply the power for dedicated peripheral devices. Do not use for other equipment to supply the power since we do not guarantee the NC operation by voltage down or noise sneaking.
- ⚠ When using an inductive load such as relays, always connect a diode in parallel to the load to prevent a counter-electromotive force.
- ⚠ When the rush current exceeds the maximum output current, always connect a protective resistor serially to the load to suppress rush currents.
- ⚠ The wires from the surge absorber should be connected without extensions.

(4) Set up

⚠ WARNING






- ⚠ Do not cancel the emergency stop before confirming the basic operation.
- ⚠ Always set the stroke end and stroke limit. Failure to set this could result in collision with the machine end.

⚠ CAUTION

- ⚠ If the descriptions relating to the "restrictions" and "allowable conditions" conflict between this manual and the machine tool builder's instruction manual, the latter has priority over the former.
- ⚠ The operations to which no reference is made in this manual should be considered "impossible".
- ⚠ This manual is written on the assumption that all the applicable functions are included. Some of them, however, may not be available for your NC system. Refer to the specifications issued by the machine tool builder before use.
- ⚠ Some screens and functions may differ depending on each NC system (or version), and some functions may not be possible. Please confirm the specifications before starting to use.
- ⚠ If the battery low warning is issued, save the machining programs, tool data and parameters in an input/output device, and then replace the battery. When the battery alarm is issued, the machining programs, tool data and parameters may have been destroyed. Replace the battery and then reload the data.
- ⚠ Do not adjust the spindle when possible risks associated with adjustment procedures are not thoroughly taken into consideration
- ⚠ Be careful when touching spindle's rotating section, or your hand may be caught in or cut.

















(5) Operation and Adjustments

CAUTION

-  If the operation start position is set in a block which is in the middle of the program and the program is started, the program before the set block is not executed. Please confirm that G and F modal and coordinate values are appropriate. If there are coordinate system shift commands or M, S, T and B commands before the block set as the start position, carry out the required commands using the MDI, etc. If the program is run from the set block without carrying out these operations, there is a danger of interference with the machine or of machine operation at an unexpected speed, which may result in breakage of tools or machine tool or may cause damage to the operators.
-  Under the constant surface speed control (during G96 modal), if the axis targeted for the constant surface speed control moves toward the spindle center, the spindle rotation speed will increase and may exceed the allowable speed of the workpiece or chuck, etc. In this case, the workpiece, etc. may jump out during machining, which may result in breakage of tools or machine tool or may cause damage to the operators.
-  Check and adjust programs and each parameter before starting operation. Failure to observe this could result in unpredictable operations depending on the machine.
-  Do not make drastic adjustments or changes in the parameters as the operation could become unstable.
-  In the explanation on bits, set all bits not used, including blank bits, to "0".

(6) Usage

CAUTION

-  Use this product within the range of environmental condition described in this manual. Using this product in an environment outside the range could result in electric shock, fire, operation failure, or damage to or deterioration of the product.
-  Install an external emergency stop circuit so that the operation can be stopped and the power turns OFF immediately when unforeseen situation occurs. A contactor, etc., is required in addition to the shutoff function mounted in the controller.
-  Turn OFF the power immediately if any smoke, abnormal noise or odor is generated from the controller, drive unit or motor.
-  Only a qualified technician may disassemble or repair this product.
-  Do not alter.
-  Use a noise filter, etc. to reduce the effect of electromagnetic disturbances in the case where electromagnetic disturbances could adversely affect the electronic devices used near the drive unit.
-  Use the drive unit, motor and each regenerative resistor with the designated combination. Failure to observe this could result in fires or faults.
-  The combination of the motor and drive unit that can be used is determined. Be sure to check the models of motor and drive unit before test operation.
-  The brakes (electromagnetic brakes) mounted in the servomotor are used for the purpose of holding, and must not be used for normal braking. Also, do not run the motor with the motor brake applied. Motor brake is used for the purpose of holding.
-  For the system running via a timing belt, install a brake on the machine side so that safety can be ensured.
-  Be sure to confirm SERVO OFF (or READY OFF) when applying the electromagnetic brake. Also, be sure to confirm SERVO ON prior to releasing the brake.
-  When using the DC OFF type electromagnetic brake, be sure to install a surge absorber on the brake terminal.
-  Do not connect or disconnect the cannon plug while the electromagnetic brake's power is ON. The cannon plug pins could be damaged by sparks.
-  After changing programs/parameters, or after maintenance/inspection, always carry out a test operation before starting actual operation.
-  Use the power that are complied with the power specification conditions (input voltage, input frequency, tolerable instantaneous power failure time) indicated in each specifications manual.
-  When making encoder cables, do not mistake connection. Failure to observe this could result in faults, motor runaway, fires, etc.

⚠ CAUTION

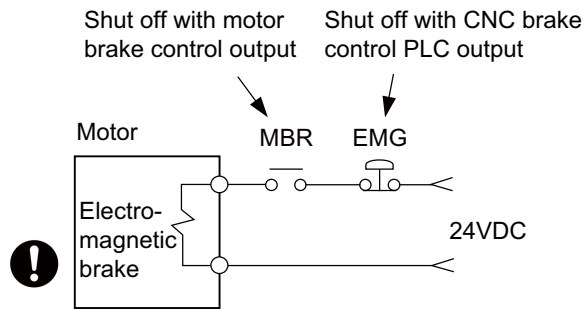
⚠ Surge absorber to be selected varies depending on input power voltage.

(7) Troubleshooting

⚠ CAUTION

⚠ Use a motor with electromagnetic brakes or establish an external brake mechanism for the purpose of holding; this serves as countermeasures for possible hazardous situation caused by power failure or product fault.

⚠ Use a double circuit structure for the electromagnetic brake's operation circuit so that the brakes will activate even when the external emergency stop signal is issued.



⚠ The machine could suddenly restart when the power is restored after an instantaneous power failure, so stay away from the machine. (Design the machine so that the operator safety can be ensured even if the machine restarts.)

⚠ To secure the absolute position, do not shut off the servo drive unit's control power supply when its battery voltage drops (warning 9F) in the servo drive unit side.

⚠ If the battery voltage drop warning alarm occurs in the controller side, make sure to back up the machining programs, tool data and parameters, etc. with the input/output device before replacing the battery. Depending on the level of voltage drop, memory loss could have happened. In that case, reload all the data backed up before the alarm occurrence.

(8) Maintenance, inspection and part replacement

⚠ CAUTION

⚠ Periodically back up the programs, tool data and parameters to avoid potential data loss. Also, back up those data before maintenance and inspections.

⚠ When replacing the battery on the controller side, the machining programs, tool data and parameters should be backed up with the input/output device beforehand. In case the memory is damaged in replacing the batteries, reload all the data backed up before replacing the battery.

⚠ The electrolytic capacitor's capacity will drop due to deterioration. To prevent secondary damage due to capacitor's faults, Mitsubishi recommends the electrolytic capacitor to be replaced approx. every five years even when used in a normal environment. Contact the Service Center for replacements.

⚠ Do not perform a megger test (insulation resistance measurement) during inspection.




⚠ Do not replace parts or devices while the power is ON.

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

⚠ There may be a unit filled with substitute Freon in the heat radiating fins of the 37kW or smaller unit. Be careful not to break the heat radiating fins during maintenance or replacement.

(9) Disposal

CAUTION

-  Take the batteries and backlights for LCD, etc., off from the controller, drive unit and motor, and dispose of them as general industrial wastes.
-  Do not alter or disassemble controller, drive unit, or motor.
-  Collect and dispose of the spent batteries and the backlights for LCD according to the local laws.

(10) General precautions

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

Treatment of waste

The following two laws will apply when disposing of this product. Considerations must be made to each law. The following laws are in effect in Japan. Thus, when using this product overseas, the local laws will have a priority. If necessary, indicate or notify these laws to the final user of the product.

- (1) Requirements for "Law for Promotion of Effective Utilization of Resources"
 - (a) Recycle as much of this product as possible when finished with use.
 - (b) When recycling, often parts are sorted into steel scraps and electric parts, etc., and sold to scrap contractors. Mitsubishi recommends sorting the product and selling the members to appropriate contractors.

- (2) Requirements for "Law for Treatment of Waste and Cleaning"
 - (a) Mitsubishi recommends recycling and selling the product when no longer needed according to item (1) above. The user should make an effort to reduce waste in this manner.
 - (b) When disposing a product that cannot be resold, it shall be treated as a waste product.
 - (c) The treatment of industrial waste must be commissioned to a licensed industrial waste treatment contractor, and appropriate measures, including a manifest control, must be taken.
 - (d) Batteries correspond to "primary batteries", and must be disposed of according to local disposal laws.

Disposal



(Note) This symbol mark is for EU countries only.
This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.

Your MITSUBISHI ELECTRIC product is designed and manufactured with high quality materials and components which can be recycled and/or reused.

This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.

If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:

Hg: mercury (0,0005%), Cd: cadmium (0,002%), Pb: lead (0,004%)

In the European Union there are separate collection systems for used batteries and accumulators.

Please, dispose of batteries and accumulators correctly at your local community waste collection/recycling centre.

Please, help us to conserve the environment we live in!

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Handling of our product

(English)

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

본 제품의 취급에 대해서

(한국어 /Korean)

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정외의 지역에서 사용하는 것을 목적으로 합니다.

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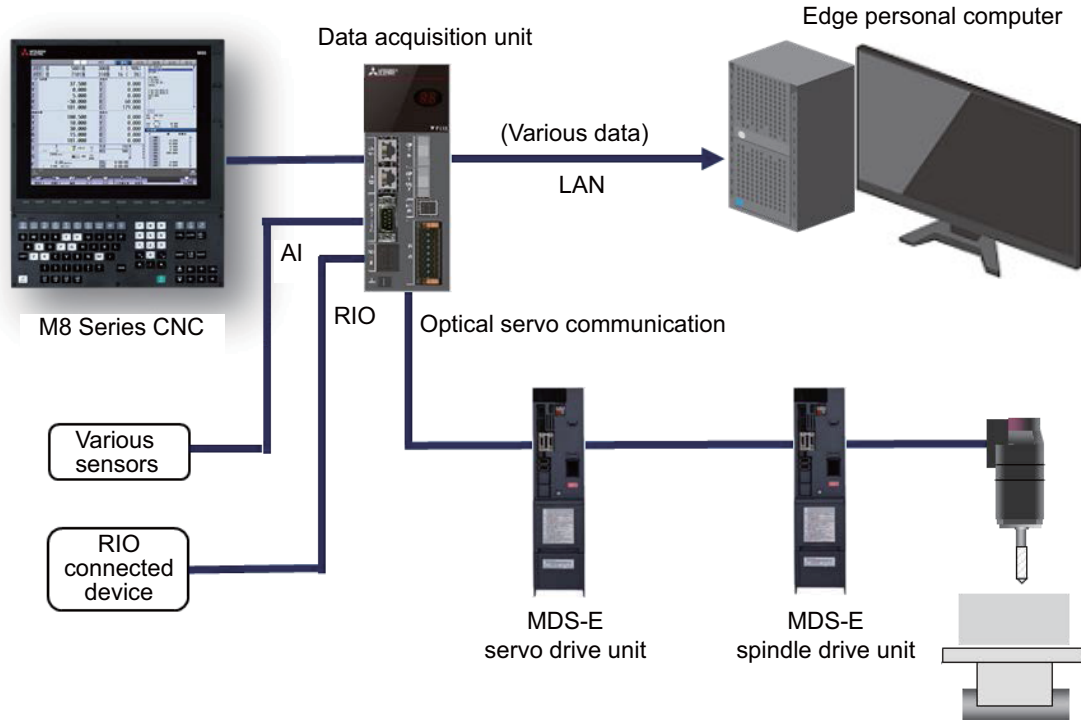


Outline

1.1 Characteristics

Data acquisition unit can automatically sample data such as servo communication data, sensor data, and RIO (remote input/output) signals at a high speed with guarantee of time synchronization between the data, and can send the data to an edge personal computer. The unit can aggregate and acquire data, which is necessary for analyzing various status of machine tools, to the edge personal computer. The data is assumed to be used for utilizing as a sensor, monitoring operation, diagnosing machining, preventive maintenance, etc.

Data acquisition unit and the edge personal computer are connected with the Ethernet, and communicates using a protocol called "MQTT" which is generally used in IoT devices. Softwares (broker and subscriber) which receive MQTT protocol for the edge personal computer help users to utilize data acquired through the data acquisition unit.



1.2 Interface

Interfaces mounted on the data acquisition unit are as follows:

| Mounted I/F | Main purposes of use | Data acquisition unit |
|-----------------------------|---|---|
| LAN | Communication with the edge personal computer Communication with the personal computer for setting | LAN: 1 channel NCLAN: 1 channel |
| Optical servo communication | Acquiring servo data | 1 channel |
| Analog input | Acquiring data such as sensor data | 4 channels |
| RIO 1.0/2.0 | Master: connection with RIO unit Slave: connection with CNC | Master: 1 channel Slave: 1 channel |
| Digital input | Acquiring data such as ON/OFF signals | 4 channels |
| SD card | For maintenance | One slot on the front side (maximum 32 GB SD card available) |

1.3 Data Acquisition Function

This section explains about main data which can be acquired through the interface of the data acquisition unit: optical servo communication, analog input, and RIO.

1.3.1 Optical Servo Communication Data Input

Optical servo communication data can be taken into the unit by changing wiring of optical servo communication cable between CNC and drive unit and placing the data acquisition unit between CNC and a drive unit.

Acquirable optical servo communication data through the data acquisition unit

| Data types | Overview of the data | Unit |
|---------------------|---|--|
| Position command | Position command to drive unit from NC | Linear axis: 0.00005 mm Rotary axis: 0.00005° |
| Position FB | Position FB to NC from drive unit | Linear axis: 0.00005 mm Rotary axis: 0.00005° |
| Droop | Difference between position command and position FB | Linear axis: 0.00005 mm Rotary axis: 0.00005° |
| Speed FB | Speed FB to NC from drive unit | 0.01 r/min |
| Electric current FB | Electric current FB in drive unit | % or 0.01 % (Depends on the parameter) |
| Alarm/warning No. | Alarm/warning No. of drive unit | No unit |

1.3.2 Analog Input

Sensor data which can be output as the analog voltage can be taken into the data acquisition unit by analog input function of the unit. In addition, primary conversion (tilt or offset) of acquired data is possible.

The number of channels is four. Refer to "Connection: General Specifications: Connectors" for analog input specifications.

1.3.3 RIO Input/Output

By connecting RIO unit to RIO master of the data acquisition unit, data of RIO unit can be taken into the unit. When thermistor input unit is connected to RIO unit, the data acquisition unit converts voltage data into temperature data. By connecting RIO slave of the data acquisition unit and CNC, data can be transmitted or received between PLC (ladder) within CNC and the unit. As the unit is equipped with two connectors of RIO slave, it can be connected with a daisy chain in the same manner as RIO unit.

1.4 Data Sending Function

From the data acquisition unit to the edge personal computer, data can be sent with MQTT protocol. Data can be narrowed down to prevent users from sending unnecessary data of the edge personal computer.

1.4.1 MQTT

MQ Telemetry Transport (MQTT) is a lightweight broker-based publish/subscribe messaging protocol designed to be open, simple, lightweight and easy to implement. MQTT is designed to be open, simple, lightweight, and easy to implement. (Source: IMQTT version 3.1 protocol specifications of IBM)

The broker and the subscriber need to be prepared by the machine tool builder (MTB). If a commercially available broker or the broker of the open source software (OSS) satisfies the specifications described in the table below, it can be used as it is. The subscriber needs to be designed and created by the MTB so that users can receive and decrypt the data sent from the unit (publisher) and use it in the edge personal computer. We offer sample source code of the subscriber (based on Mosquitto version 1.4.14, the open-source implementation of MQTT), so please make use of it.

Specifications of MQTT in the data acquisition unit

| Items | Specifications |
|--|------------------------------------|
| Protocol version | 3.1.1 compliant |
| TCP/IP port | 1883 |
| The role of the unit | Publisher |
| Maximum message size | Approximately 200 Kbytes |
| QoS (quality of service for sending messages) to be used | 0 (at most once), 2 (exactly once) |
| Retain function | Use |
| Will function | Do not use |

1.5 Date and Time Settings

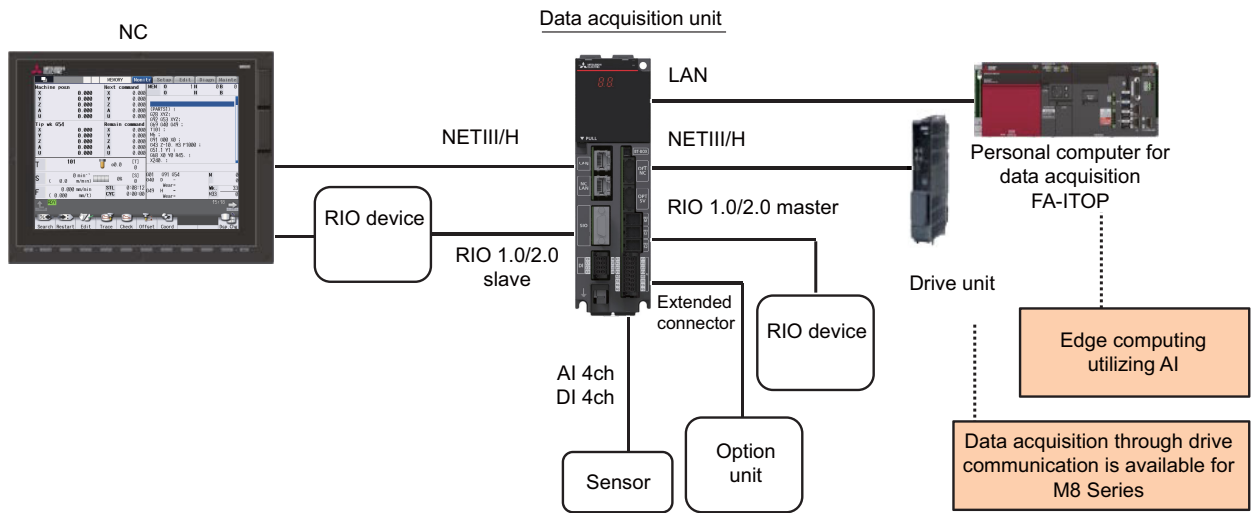
Real time clock is equipped with the data acquisition unit to add date and time information to the data which is sent with MQTT protocol from the unit. Time can be synchronized between the time server and SNTP (Simple Network Time Protocol) so that no time lag occurs in the unit. SNTP carries out time synchronization when the unit is turned ON. Batteries (optional) need not to be connected to the unit to perform the time synchronization.

To make various settings (SNTP, time and use of batteries), connect the personal computer for setting to the data acquisition unit and access to the unit from the PC through a Web browser.

2

Connection

2.1 System Basic Configuration Drawing

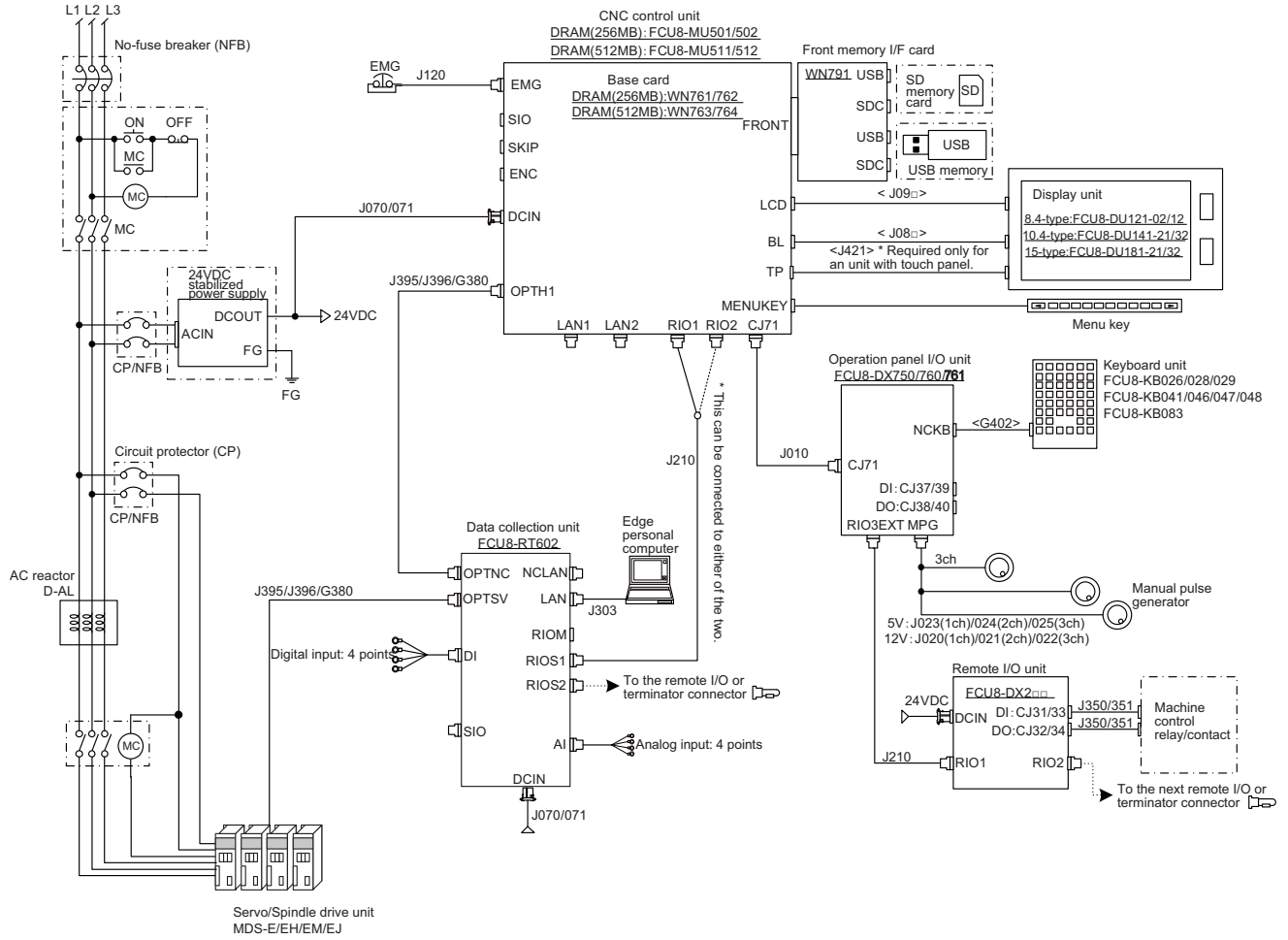


2.2 General Connection Diagram

2.2.1 General Connection Diagram of Data Acquisition Unit (M80 Connection)

 Dotted lines indicate the sections prepared by the machine tool builder.

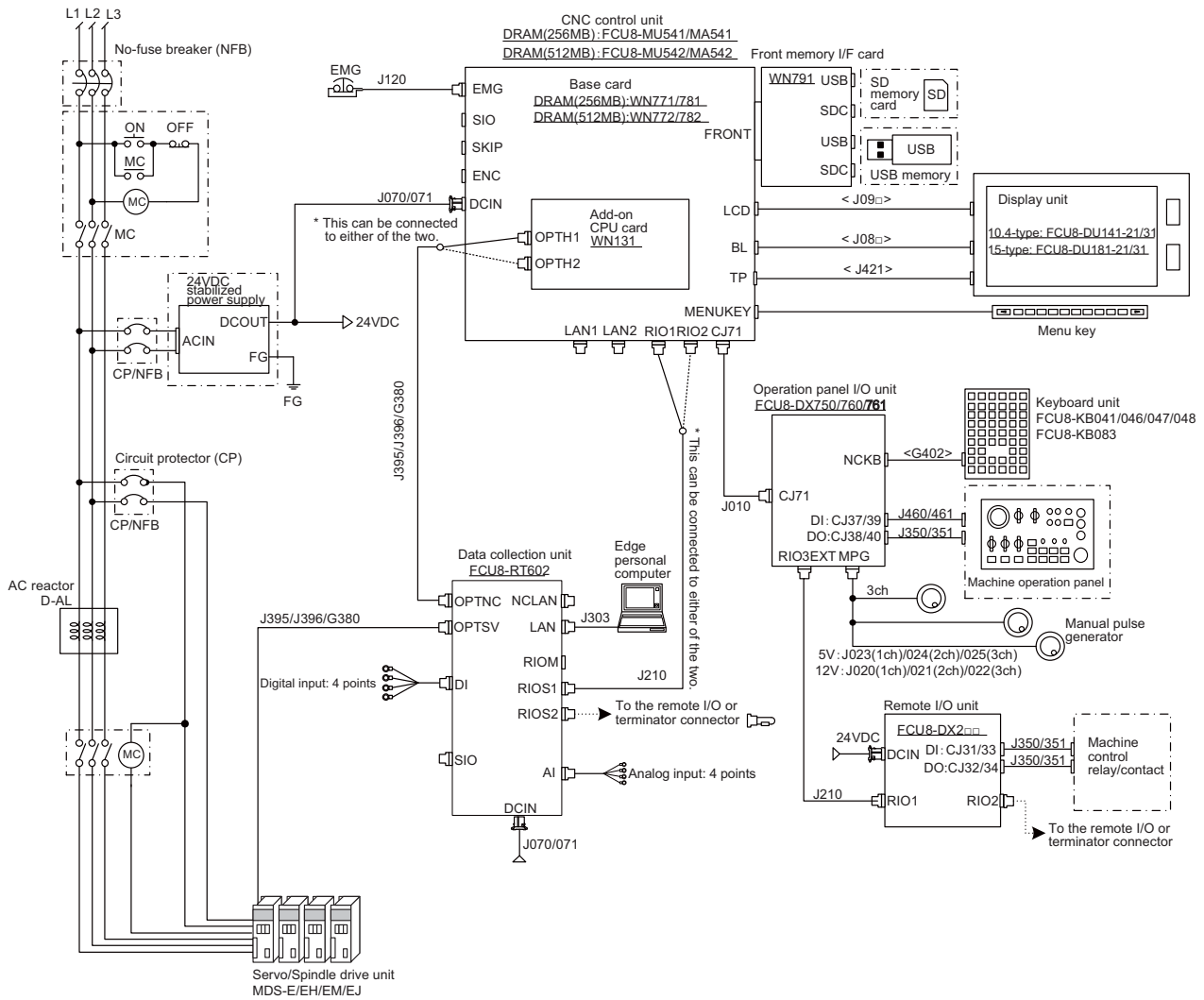
<> Angle brackets indicates attached cable of unit.



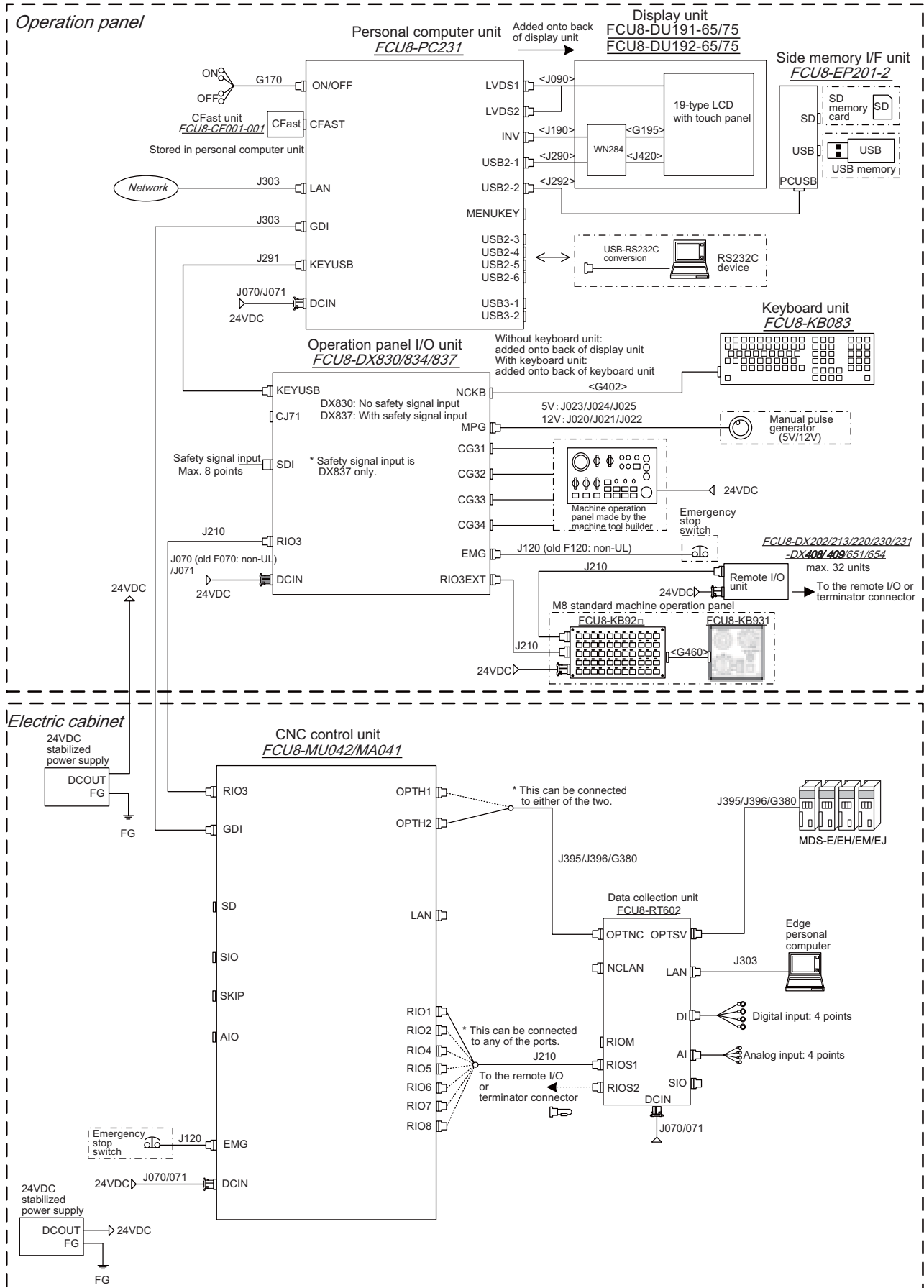
2.2.2 General Connection Diagram of Data Acquisition Unit (M800S Connection)

 Dotted lines indicate the sections prepared by the machine tool builder.

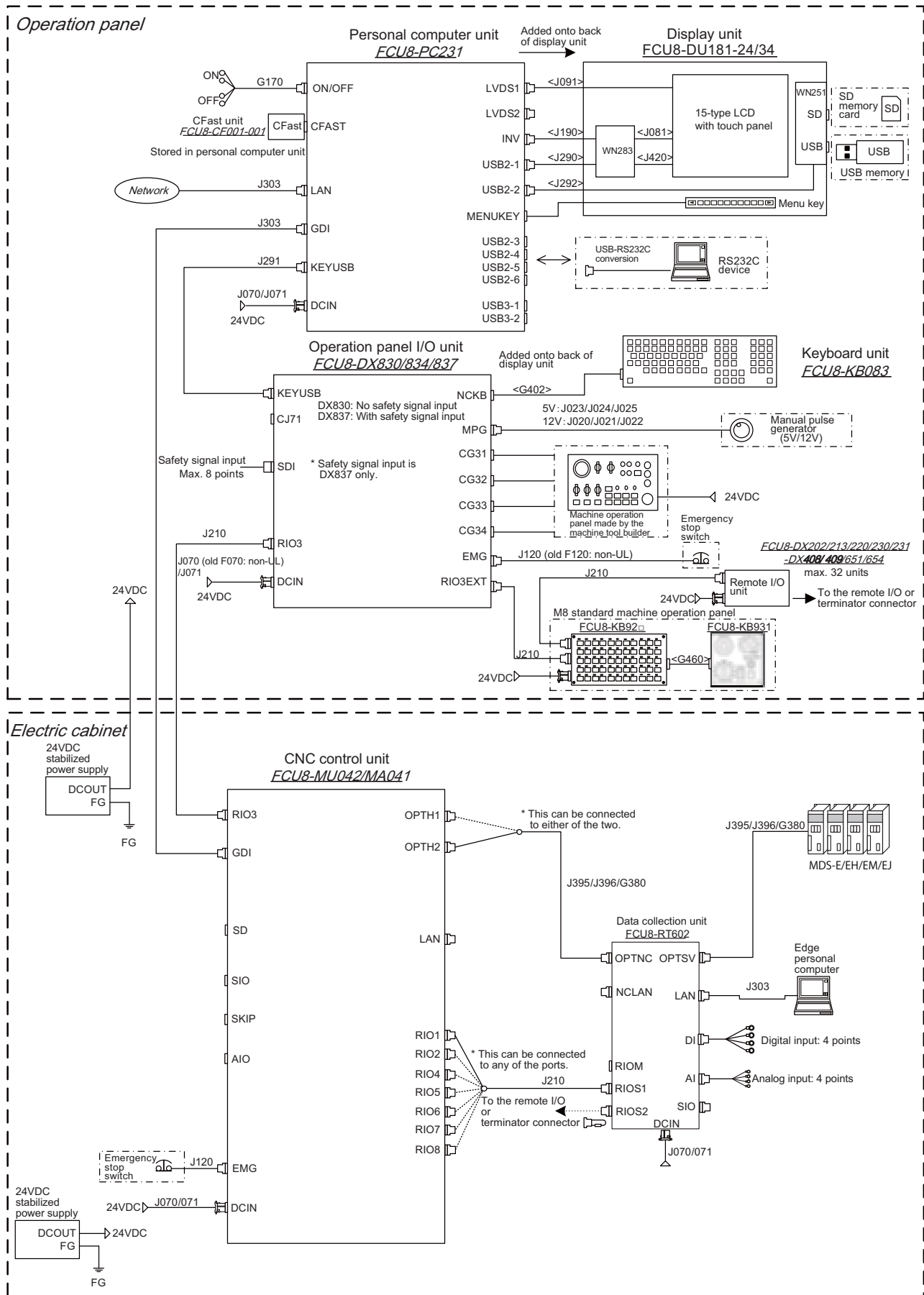
<> Angle brackets indicates attached cable of unit.



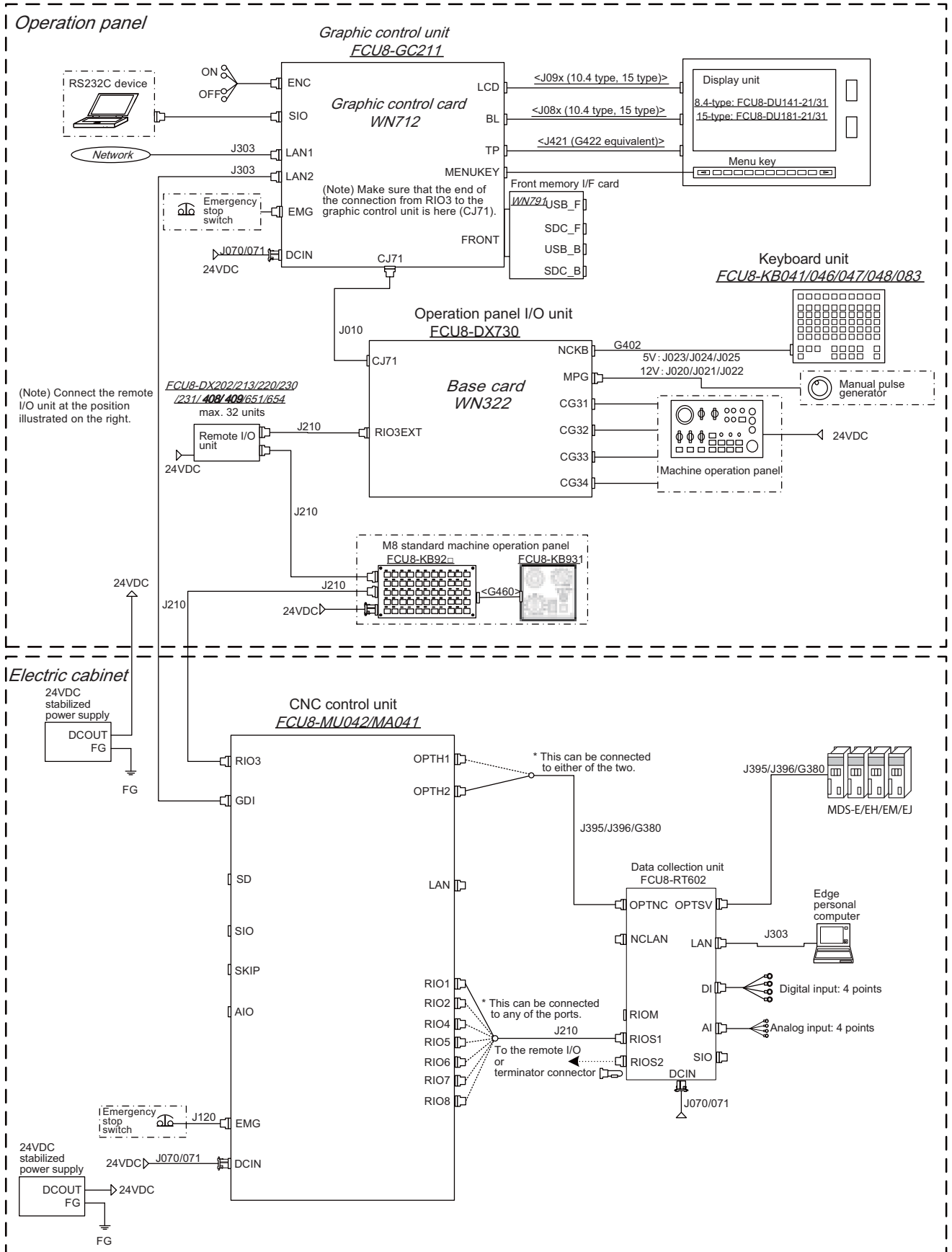
2.2.3 General Connection Diagram of Data Acquisition Unit (M800W Series, Windows-based Display Unit (19-type))



2.2.4 General Connection Diagram of Data Acquisition Unit (M800W Series, Windows-based Display Unit (15-type))



2.2.5 General Connection Diagram of Data Acquisition Unit (M800W Series, Non-Windows-based Display Unit (10.4-type/15-type))



2.3 List of Configuration

2.3.1 Module Configuration List

| Classification | Type | Components | Remarks |
|-----------------------|------------|---|----------------|
| [IoT unit] | | | |
| Data acquisition unit | FCU8-RT602 | Base control card Add-on card Relay card 7SEG card | Not applicable |

2.3.2 Durable Parts

| Durable parts | Part type |
|--|-----------|
| Battery for data acquisition unit (option) | Q6BAT |

2.3.3 Replacements

| Replacements | Part type |
|---|-----------|
| Protection fuse for data acquisition unit | LM40 |

2.3.4 Cable List

| Type | Application | Length of the cable provided by Mitsubishi (m) | Maximum cable length |
|------------|---|--|----------------------|
| G380 L □ M | Optical communication cable (PCF type, with sheath) (for wiring inside panel) | 5, 10, 12, 15, 20, 25, 30 | 30 m |
| J070 | 24VDC power cable | 1, 2, 3, 5, 7, 10, 15 | 15 m |
| J071 | 24VDC power cable (for long distance) | 20 | 20 m |
| J210 | Remote I/O communication cable (RIO2.0) | 0.3, 1, 2, 3, 5, 7, 10, 15, 20, 30, 40, 50 | 50 m |
| J212 | RIO2.0-RIO1.0 communication cable | 1, 2, 3, 5, 7, 10, 15, 20, 30, 40, 50 | 50 m |
| J303 | LAN straight cable | 1, 2, 3, 5, 7, 10, 15, 20, 30, 40, 50 | 50 m |
| J395 | Optical communication cable (POF type, with sheath) (for wiring inside panel) | 1, 2, 3, 5, 7, 10 | 10 m |
| J396 | Optical communication cable (POF type, with sheath) (for wiring outside panel) | 0.2, 0.3, 0.5, 1, 2, 3, 5 | 5 m |

2.4 General Specifications

2.4.1 Environment Conditions (Installation Environment Conditions)

| Unit name | | Data acquisition unit | |
|-----------------------------------|----------------------|-------------------------------------|---|
| Unit type | | FCU8-RT602 | |
| General specifications | Ambient temperature | During operation | 0 to 55 °C (Note 1) |
| | | During storage | -20 to 60 °C |
| | Ambient humidity | Long term | 10 to 75% RH (with no dew condensation) |
| | | Short term (Note 2) | 10 to 95% RH (with no dew condensation) |
| | Vibration resistance | | 4.9 m/s ² or less |
| | Shock resistance | | 29.4 m/s ² or less |
| | Working atmosphere | | No corrosive gases, dust or oil mist |
| | Altitude | | Operation/Storage: 1000 meters or less above sea level Transportation: 13000 meters or less above sea level (Note 3) |
| Power supply voltage | | 24VDC | |
| Current consumption (max) | | 0.5 A | |
| Instantaneous stop tolerance time | | 36 ms or less | |
| Maximum heating value (W) | | 12 W | |
| Mass | | 0.95 kg | |
| Outline dimension | | 60 mm (W) × 151 mm (D) × 205 mm (H) | |

(Note 1) Installable inside the operation panel as it can operate under the environment of 58 °C.

(Note 2) Short term means within one month.

(Note 3) For the whole NC system, consider the characteristics of the drive units when the altitude is more than 1000 meters above sea level.

Refer to the manual of drive unit for details.

2.4.2 24VDC Stabilized Power Supply Selecting Conditions

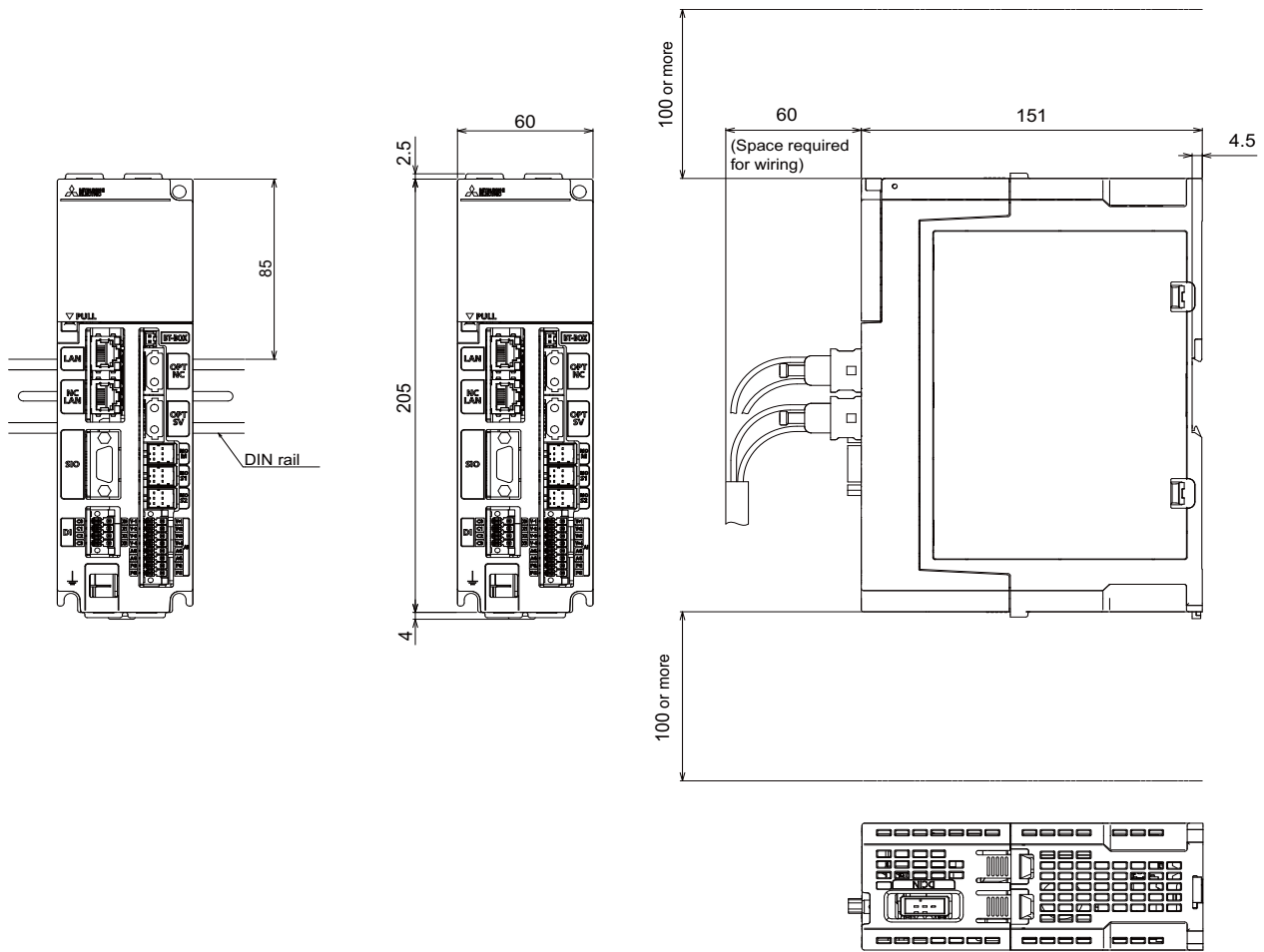
Considering the following characteristics for the stabilized power supply, select a power supply that complies with laws, regulations, and safety standards of the country where the machine will be installed.

| Items | Specifications | Remarks |
|--------|-------------------------------------|---|
| Output | Voltage | 24VDC When the stabilized power supply and 24VDC input unit are distant from each other, select the stabilized power supply which is possible to set output voltage 24VDC or more allowing for the influence of voltage drop by the cable. |
| | Voltage fluctuation | ±5% |
| | Current | - Calculate the current value by referring to maximum current consumption for the unit which uses the power supply. |
| | Ripple noise | 0.2 V (P-P) |
| | Output holding time | min 20 ms Output holding time is decided by loading ratio; however, the stabilized power supply which complies with the specification on the left must be selected during maximum loading. |
| | Overcurrent output shutoff function | - Use a power supply having the overcurrent output shutoff function. |

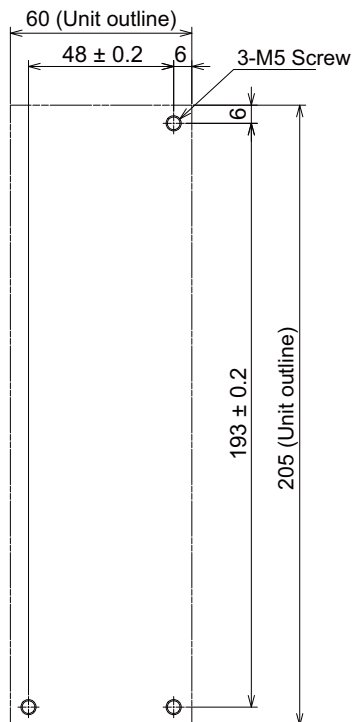
CAUTION

- Using a stabilized power supply without overcurrent protection may cause the unit's failure due to miswiring of 24V.

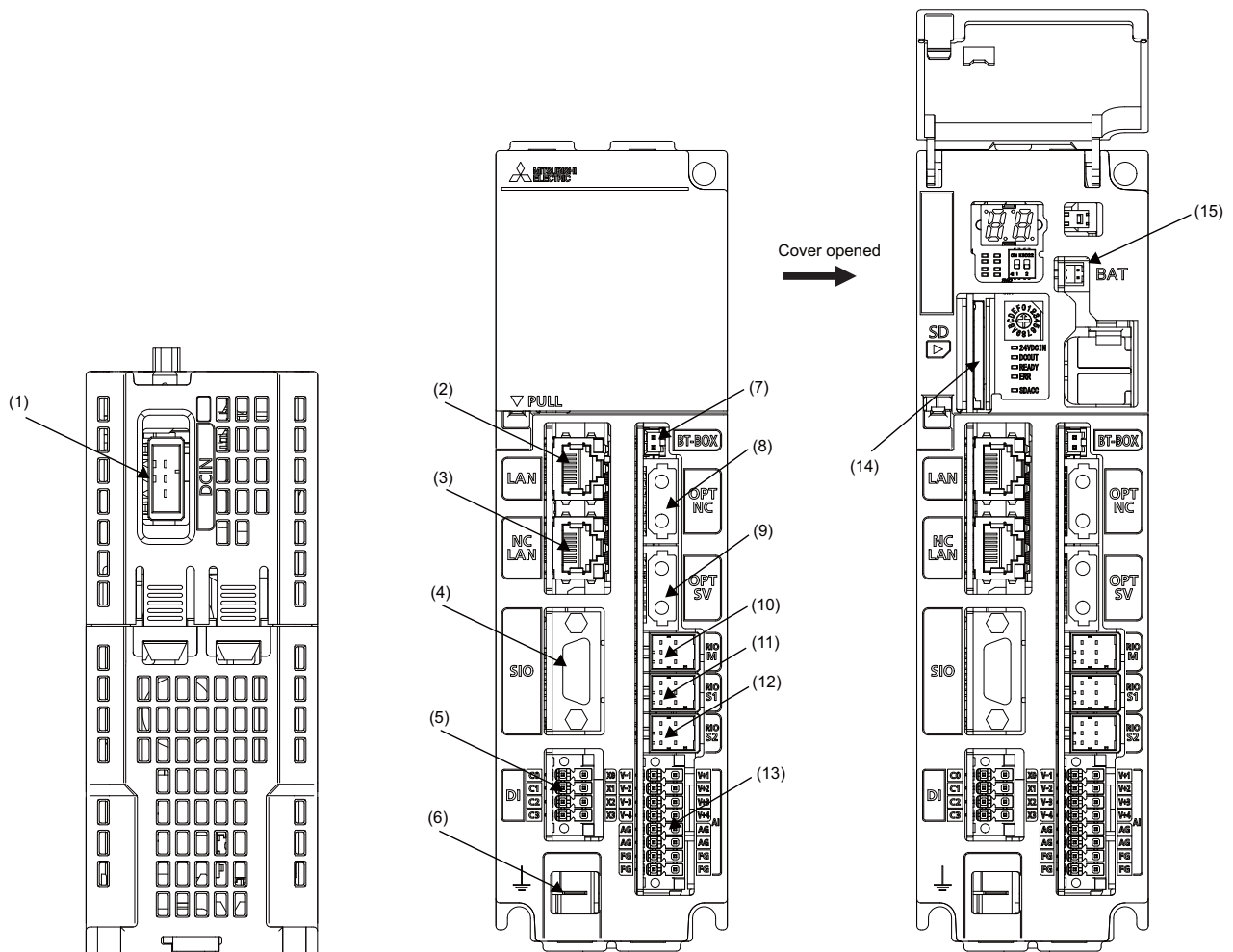
2.4.3 Outline Dimension



2.4.4 Installation Dimension



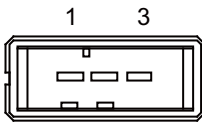
2.4.5 Connectors



| No. | Connector name | Function |
|------|----------------|---|
| (1) | DCIN | 24VDC input |
| (2) | LAN | Ethernet communication |
| (3) | NCLAN | Ethernet communication |
| (4) | SIO | (Not used) |
| (5) | DI | Digital input 4 channels |
| (6) | FG | FG terminal |
| (7) | BT-BOX | For battery box connection |
| (8) | OPTNC | For high-speed optical servo communication for NC control unit connection |
| (9) | OPTSV | For high-speed optical servo communication for drive unit connection |
| (10) | RIOM | Remote I/O communication (master) |
| (11) | RIOS1 | Remote I/O communication (slave) |
| (12) | RIOS2 | Remote I/O communication (slave) |
| (13) | AI | Analog input 4 channels |
| (14) | SD | SD card I/F |
| (15) | BAT | For Q6BAT connection |

(Note) Q6BAT and BT-BOX are used to retain time data when the data acquisition unit is used in a stand-alone configuration. When SNTP server is connected, Q6BAT and BT-BOX are unnecessary as time data can be acquired via Ethernet.

(1) DCIN (24VDC input)



| | | |
|---|---|------|
| 1 | I | +24V |
| 2 | | 0 V |
| 3 | | FG |

<Cable side connector type>

Connector: 2-178288-3

Contact: 1-175218-5

Recommended manufacturer: Tyco Electronics

(a) Specifications of power supply

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

[Stabilized power supply selection items]

| Items | Standard setting |
|-----------------------------------|---|
| Output Voltage fluctuation | ±5% or less of 24VDC |
| Ripple noise | 200 mV (P-P) |
| Power capacity | Calculate the current value as a reference of maximum current consumption for the unit which uses the power supply. |
| Output holding time | 20 ms |
| Overcurrent protection | Required |

[Standards]

Safety Standards: UL1950, CSA C22.2 No. 234 approved, IEC950 compliant

Noise Terminal Voltage: FCC Class A, VCCI-Class A

High Harmonics Current Restrictions: IEC61000-3-2

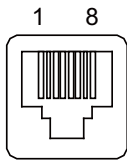
(Note) 24VDC voltage may drop temporarily due to rush current at the beginning of 24V power supply to the control unit.

The level of voltage drop depends on the capacity of the power supply. Do not share the power supply with the devices that generate alarms to warn the voltage drop.


CAUTION

1. Using a stabilized power supply without overcurrent protection may cause the unit's failure due to miswiring of 24V.

(2) LAN (Ethernet communication)



| | | |
|---|-----|---------|
| 1 | I/O | TXRXD0+ |
| 2 | I/O | TXRXD0- |
| 3 | I/O | TXRXD1+ |
| 4 | I/O | TXRXD2+ |
| 5 | I/O | TXRXD2- |
| 6 | I/O | TXRXD1- |
| 7 | I/O | TXRXD3+ |
| 8 | I/O | TXRXD3- |

- Connect connector case with FG pattern.
- Use J303 cable when directly connecting a device such as a personal computer to the unit.

<Cable side connector type>

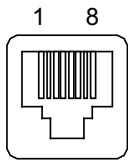
Connector: J00026A0165

Recommended manufacturer: Japan Telegärtner

Lighting specification of LAN LED

| | LED name | Indication | Details | |
|----------|---------------------|----------------------|--------------------------|----------------------|
| | LINK | Communication status | Lit (Yellow green) | LINK is established. |
| Flashing | | | Communicating | |
| Not lit | | | LINK is not established. | |
| SPEED | Communication speed | Lit (Yellow green) | 1000 Base | |
| | | Lit (Yellow) | 100 Base | |
| | | Not lit | 10 Base | |

(3) NCLAN (Ethernet communication)



| | | |
|---|---|------|
| 1 | O | TXD+ |
| 2 | O | TXD- |
| 3 | I | RXD+ |
| 4 | | NC |
| 5 | | NC |
| 6 | I | RXD- |
| 7 | | NC |
| 8 | | NC |

- Connect connector case with FG pattern.

<Cable side connector type>

Connector: J00026A0165

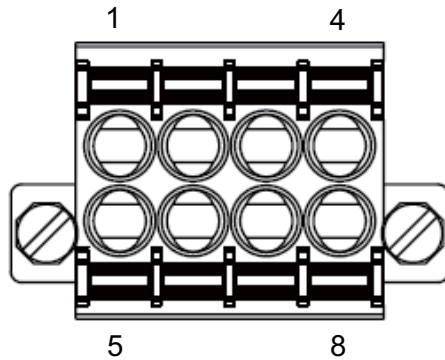
Recommended manufacturer: Japan Telegärtner

Lighting specification of NCLAN LED

| | LED name | Indication | Details | |
|--|----------|----------------------|--------------------|--------------------------|
| | LINK | Communication status | Lit (Yellow green) | LINK is established. |
| | | | Flashing | Communicating |
| | | | Not lit | LINK is not established. |
| | SPEED | Communication speed | Lit (Yellow) | 100 Base |
| | | | Not lit | 10 Base |

(4) SIO
Not used.

(5) DI (Digital input 4 channels)



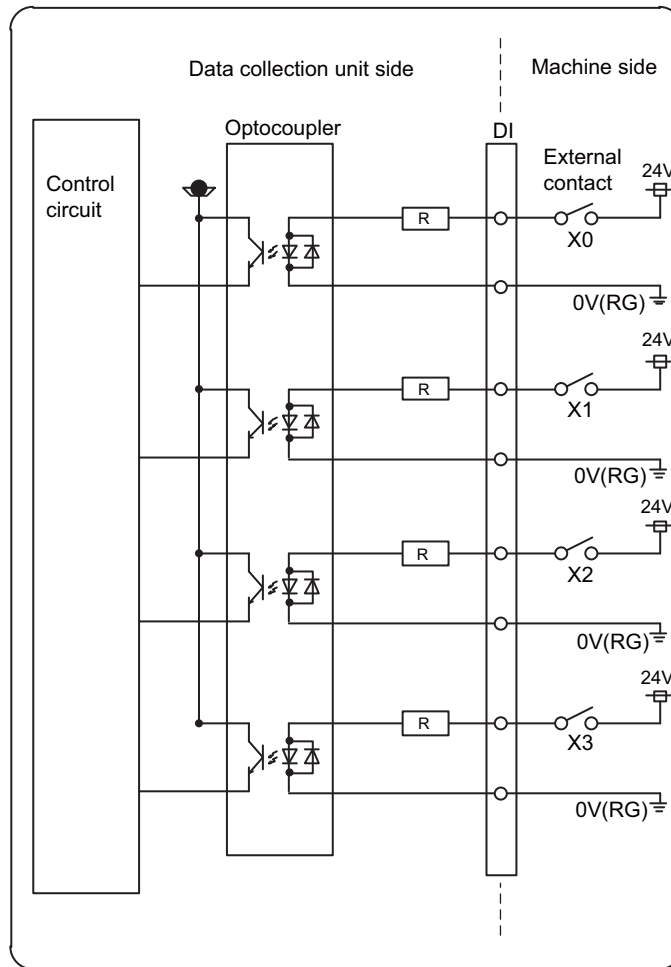
| No. | Signal name | I/O | Supplement | No. | Signal name | I/O | Supplement |
|-----|-------------|-----|------------|-----|-------------|-----|------------|
| 1 | X0 | I | DI (ch0) | 5 | C0 | - | RG (ch0) |
| 2 | X1 | I | DI (ch1) | 6 | C1 | - | RG (ch1) |
| 3 | X2 | I | DI (ch2) | 7 | C2 | - | RG (ch2) |
| 4 | XI3 | I | DI (ch3) | 8 | C3 | - | RG (ch3) |

- COM separate type connector
- The cable side connector is provided as an accessory of the unit.
- Screw-fastening type connector is recommended.
- Easy lock release type connector is distributed; however, using this type connector could result in connection faults due to large vibration.

<Cable side connector type>

Connector: DFMC1.5/4-STF-3.5 (Standard module)
 DFMC1.5/4-STF-3.5 BKO-CB1257H01 (Pin code printed)
 Recommended manufacturer: Phoenix Contact

(a) Overview of digital signal input circuit (COM separate type)

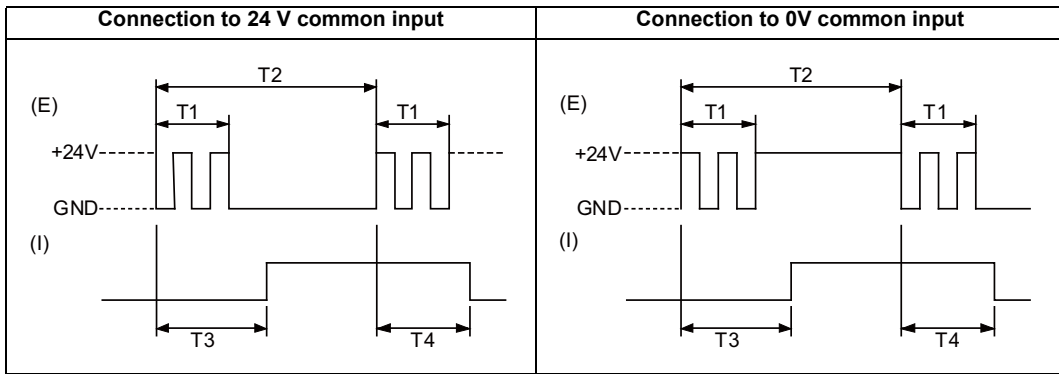


Input conditions

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

| | | Data acquisition unit |
|---|---------------------------------------|-----------------------------------|
| 1 | Input voltage at external contact ON | 18 V or more, 25.2 V or less |
| 2 | Input current at external contact ON | 7.18 mA or more, 11.38 mA or less |
| 3 | Input voltage at external contact OFF | 3.8 V or less |
| 4 | Input current at external contact OFF | 0.7 V or less |
| 5 | Tolerable chattering time | 1 ms or less |
| 6 | Input signal holding time | 1.7 ms or more |
| 7 | Input circuit operation delay time | 1 to 2 ms |
| 8 | Machine side contact capacity | 30 V or more, 16 mA or less |

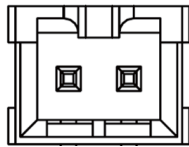
DI Input timing



(E): External signal, (I): Internal signal

(6) FG (FG terminal)

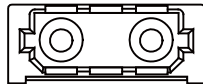
(7) BT-BOX (for battery box connection)



| No. | Signal name | I/O | Supplement |
|-----|-------------|-----|------------|
| 1 | BTBOX | - | +3.6 V |
| 2 | GND | - | GND |

(8) OPTNC (for high-speed optical servo communication for NC control unit connection)

(9) OPTSV (For high-speed optical servo communication for drive unit connection)



<Cable side connector type>

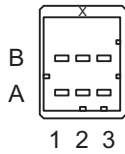
Connector: LGP-Z0007K

Recommended manufacturer: HONDA TSUSHIN KOGYO

(10) RIOM (remote I/O communication (master))

(11) RIOS1 (remote I/O communication (slave))

(12) RIOS2 (remote I/O communication (slave))



| A | | | B | | |
|---|-----|-------|---|-----|--------|
| 1 | I/O | TXRXD | 1 | I/O | TXRXD* |
| 2 | | NC | 2 | | 0 V |
| 3 | | FG | 3 | | NC |

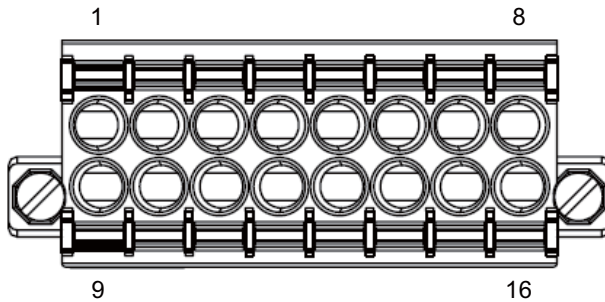
<Cable side connector type>

Connector: 1-1318119-3

Contact: 1318107-1

Recommended manufacturer: Tyco Electronics

(13) AI (analog input 4 channels)



| No. | Signal name | I/O | Supplement | No. | Signal name | I/O | Supplement |
|-----|-------------|-----|-----------------------------|-----|-------------|-----|-----------------------------|
| 1 | AIN1P (V+1) | I | CH1 analog input signal (+) | 9 | AIN1N (V-1) | I | CH1 analog input signal (-) |
| 2 | AIN2P (V+2) | I | CH2 analog input signal (+) | 10 | AIN2N (V-2) | I | CH2 analog input signal (-) |
| 3 | AIN3P (V+3) | I | CH3 analog input signal (+) | 11 | AIN3N (V-3) | I | CH3 analog input signal (-) |
| 4 | AIN4P (V+4) | I | CH4 analog input signal (+) | 12 | AIN4N (V-4) | I | CH4 analog input signal (-) |
| 5 | AG | - | Analog ground | 13 | AG | - | Analog ground |
| 6 | AG | - | Analog ground | 14 | AG | - | Analog ground |
| 7 | FG | - | FG (shield) | 15 | FG | - | FG (shield) |
| 8 | FG | - | FG (shield) | 16 | FG | - | FG (shield) |

- The cable side connector is provided as an accessory of the unit.
- Screw-fastening type connector is recommended.
- Easy lock release type connector is distributed; however, using this type connector could result in connection faults due to large vibration.

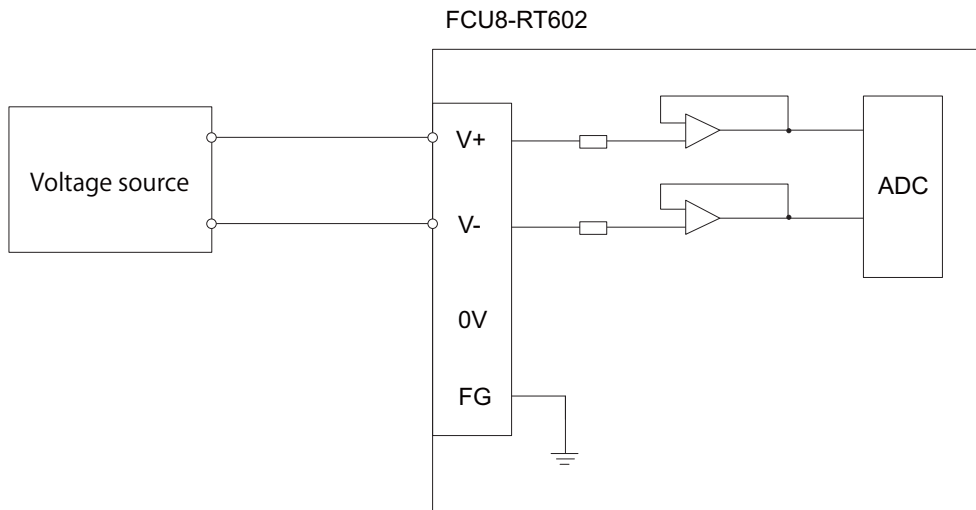
<Cable side connector type>

Connector: DFMC1.5/8-STF-3.5 (Standard module)

DFMC1.5/8-STF-3.5 BKO-CB1257H02 (Pin code printed)

Recommended manufacturer: Phoenix Contact

(a) Summary of analog input circuit



(Note 1) 0 V does not need to be wired.

(Note 2) Connect to 0 V when the voltage source side is used as the reference potential.

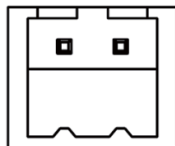
(Note 3) Each pin for 0 V or FG is connected by internal circuit.

Analog input I/F specifications

| Items | Specifications |
|--|---------------------------------|
| Number of input channels | 4 channels (differential input) |
| Sampling rate | 45 kHz |
| Input voltage range | -10 to +10 VDC |
| Input band | 0 to 18 kHz |
| Effective resolution | 12 bits ±10 V range: 4.88 mV |
| Conversion accuracy | ±1%/FS (0 to 58 °C) |
| Insulation/Non-insulation between channels | Non-insulation |
| Disconnection detecting function | None. |

(14) SD (SD card I/F)

(15) BAT (for Q6BAT connection)



| No. | Signal name | I/O | Supplement |
|-----|-------------|-----|------------|
| 1 | BAT (+) | - | 3.0 V |
| 2 | BAT (-) | - | GND |

2.4.6 Exclusive SD Cards for MITSUBISHI CNC

| Items | | FCU8-SD001G | FCU8-SD004G |
|---------------------|------------------|--|-------------|
| Capacity | | 1 GB | 4 GB |
| NAND Flash | | SLC (Note 1) | |
| Ambient temperature | During operation | -25 to +85 °C | |
| | During storage | -40 to +85 °C | |
| Ambient humidity | During operation | 5% to 95%RH (with no dew condensation) | |
| | During storage | 5% to 95%RH (with no dew condensation) | |

(Note 1) SLC stands for Single Level Cell, and it stores one bit data in each memory cell.

This provides longer life span and high product reliability in comparison with such as MLC (Multi Level Cell) and TLC (Triple Level Cell), which are commonly applied to SD cards.

(Note 2) Do not touch the terminal part with fingers, etc. when handling the SD cards.

A stain on the terminal part of SD card causes a poor contact or a failure.

2.4.6.1 SD Interface

| Standards | SD/SDHC (Note 1) |
|----------------------|-----------------------------------|
| Transfer speed | Depends on the connecting SD card |
| Maximum capacity | 32 GB |
| Number of free ports | 1 |

(Note 1) SDXC is not supported.

(1) Precautions for use of commercially available SD card

MITUBISHI will not provide performance guarantee and maintenance for commercially available SD card, mini SD card or micro SD card (converting adapter required). Using any of them requires the machine tool builder a careful performance check.

Commercially available devices may not be compatible with MITSUBISHI units or suitable FA environment for temperature- or noise-wise.

(2) Precautions for insertion/removal of SD card

When inserting/removing an SD card, turn the MITUBISHI device's power OFF. Do not remove the card or turn OFF the power during access to the SD card. Failure to observe this could cause the memory contents to be erased.

As a precaution, always backup important data by duplicating it, for example, as MITUBISHI will not guarantee the broken or lost data.

2.5 Installation

2.5.1 Heat Radiation Countermeasures

Please refer to the following method for heat radiation countermeasures.

The data acquisition unit can be installed inside the operation panel or the electric cabinet.

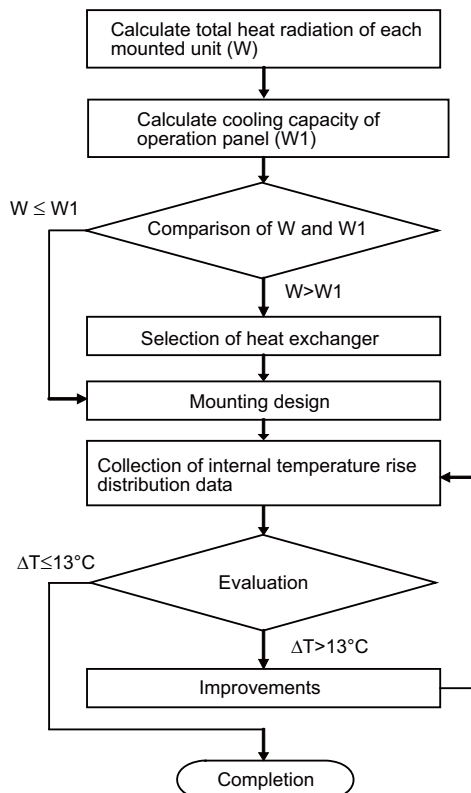
When the unit is to be installed inside the operation panel, follow the procedures of heat radiation countermeasures.

Example of heat radiation countermeasures

<Assumed conditions>

- (1) Average internal temperature of operation panel: $T \leq 58 \text{ }^\circ\text{C}$
- (2) Peripheral temperature of operation panel: $T_a \leq 0 \text{ }^\circ\text{C}$ to $45 \text{ }^\circ\text{C}$
- (3) Internal temperature rise value: $\Delta T = T - T_a$ (max) = $13 \text{ }^\circ\text{C}$

Procedures for heat design and verification



<Supplemental explanation>

- (1) Refer to "General Specifications" for the heat generated by each unit.
- (2) Enclosed cabinet (thin steel plate) cooling capacity calculation equation ($W1$)

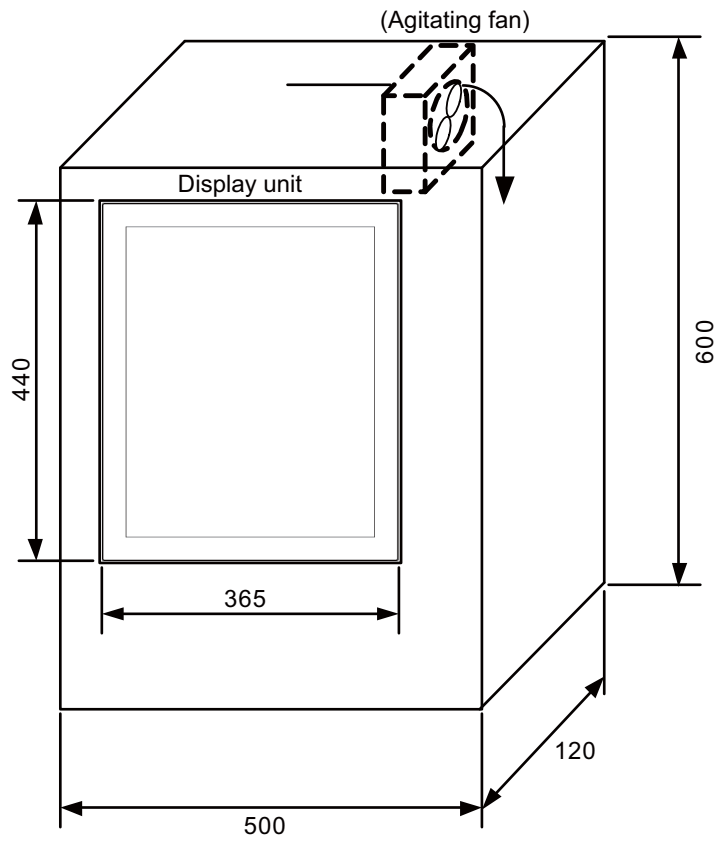
$$W1 = U \times A \times \Delta T$$

$$U: 6 \text{ W/m}^2 \text{ }^\circ\text{C}$$

$$A: \text{Effective heat radiation area (m}^2\text{) (Area where heat can be radiated from operation panel)}$$

$$\Delta T: \text{Internal temperature rise value (13 }^\circ\text{C)}$$
 (Note) $8 \text{ W/m}^2 \text{ }^\circ\text{C}$ can be applied only when the operation panel is small enough that the internal temperature stays uniform.
- (3) Points of caution for heat radiation countermeasures when designing mounting state
 - Consider convection in operation panel (eliminate heat spots).
 - Collect hot air at suction port of heat exchanger in operation panel.
- (4) Criterion for internal temperature rise distribution data
 - ΔT (average value) $\leq 13 \text{ }^\circ\text{C}$
 - ΔT_{max} (maximum value) $\leq 15 \text{ }^\circ\text{C}$
 - R (inconsistency $\Delta T_{\text{max}} - \Delta T_{\text{min}}$) $\leq 6 \text{ }^\circ\text{C}$
 - (Evaluate existence of heat spots)

The following shows an example of calculation applied to heat radiation countermeasures for the operation panel when 19-type display unit is used. Because heat accumulates in the upper portions of the unit, install an agitating fan as required.



Calculation example of panel internal heating value

(1) Calculation of unit heating value (When FCU8-DU191-75 + FCU8-DX837 is assumed to be used)

Heating value (W)

Total heating value of units (W):

26.1 W (= display unit + operation panel I/O unit)

Total heating value (W) by machine input (D1):

9.2 W (= 24V (total heating value when the 80 points are simultaneously turned ON) × 4.8 mA × 80)

... 24 V (current consumption per point of the operation panel I/O unit DI) divided by 5 kΩ ≈ 4.8 mA

Total heating value W = 35.3 W (26.1 + 9.2)

(2) Calculation of operation panel cooling capacity

Tolerance value for temperature rise (Δ t)

- Panel internal temperature (according to each unit's specification) T ≤ 58 °C

- Panel peripheral temperature (according to machine's specification) Ta ≤ 45 °C

Tolerance value for internal temperature rise Δ T = 13 °C (T - Ta)

Heat radiation area (A)

The surface of the molded unit, which has lower radiation capacity than the metal plate surface, should be excluded from the heat radiation area in principle.

The bottom of the operation panel, which has difficulty in radiating due to the temperature distribution, should also be excluded from the heat radiation area in principle.

Heat radiation area A

$$= 0.643 \text{ mm}^2 (\approx 0.5 \times 0.12 \quad + \quad 0.6 \times 0.5 \times 2 \quad + \quad 0.6 \times 0.12 \times 2 \quad - \quad 0.44 \times 0.365)$$

(Top surface) (Front, rear surface) (Both sides surface) (Unit surface)

Operation panel cooling capacity (W1)

Calculate the cooling capacity to keep the temperature rise in the operation panel 13 °C or less.

$$\text{Cooling capacity } W1 = 50.2 \text{ W } (6 \times A \times \Delta T)$$

(3) Comparison of heating value and operation panel cooling capacity

The operation panel cooling capacity is over the heating value, thus installing the heat exchanger is presumed to be unnecessary.

(4) Confirmation with the actual machine

The result of the calculation above is only a rough indication. The actual temperature rise may differ according to the structure of the operation panel.

Be sure to confirm the temperature rise value in the operation panel when the machine is running.

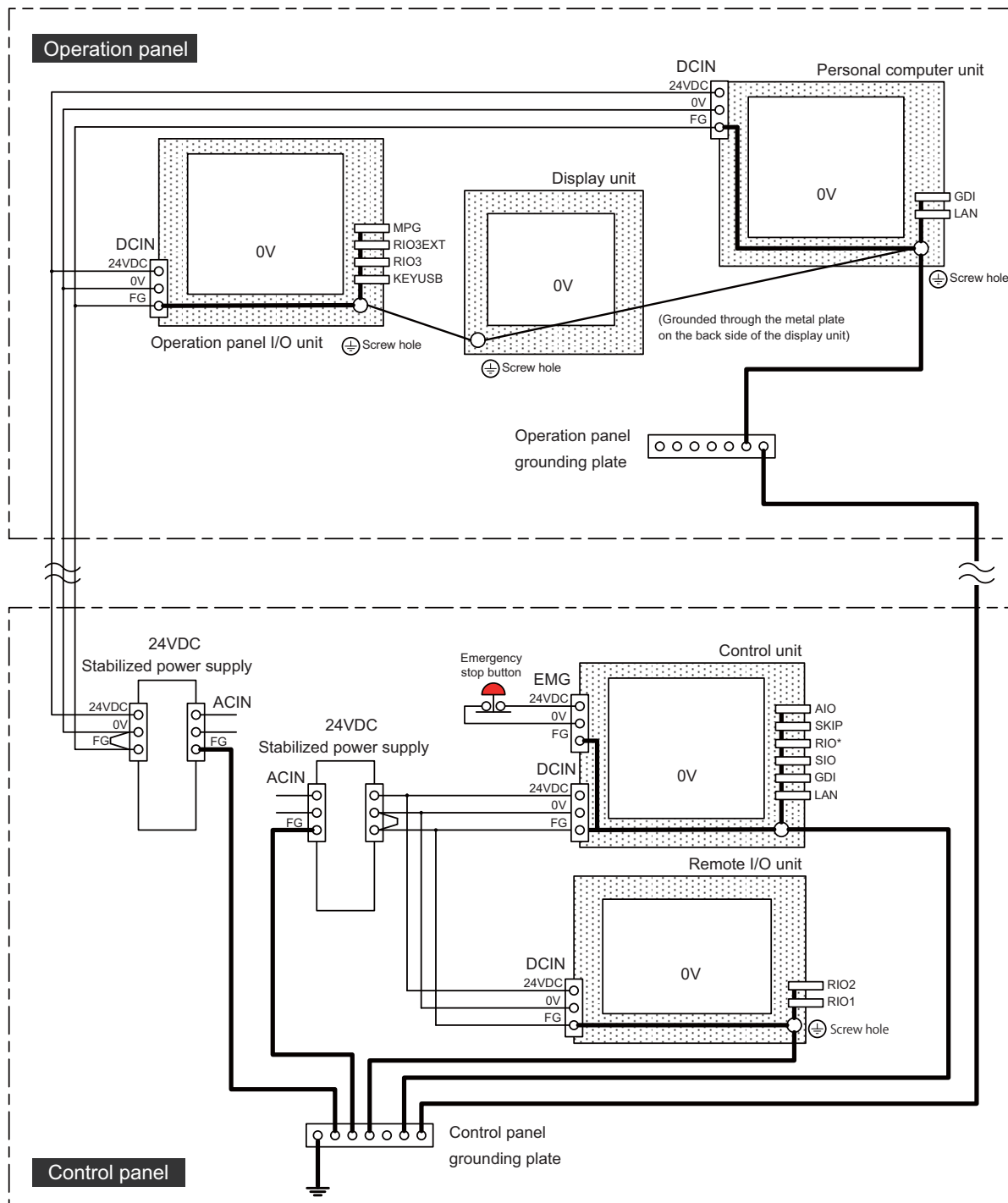
2.5.2 Noise Countermeasures



2.5.2.1 Connection of Frame Ground (FG)

The frame should basically be grounded at one ground point.

Because the personal computer unit and the operation panel I/O unit are located in a place away from the electric cabinet, connect the ground terminal of the personal computer to the grounding plate of the operation section and connect the grounding plate of the operation panel to the grounding plate of the electric cabinet. (Be sure to ground the ground terminal of the personal computer. Otherwise, it affects controllability of the touchscreen.)

Connect 0V (common) and FG on the 24VDC power supply.



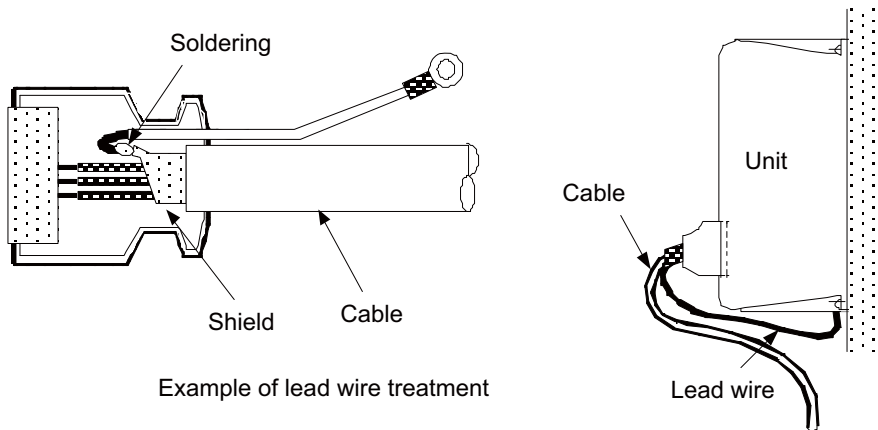
 : Indicates that the metal case of connector is connected to FG  according to the pattern on PCB.

2.5.2.2 Shield Clamping of Cables

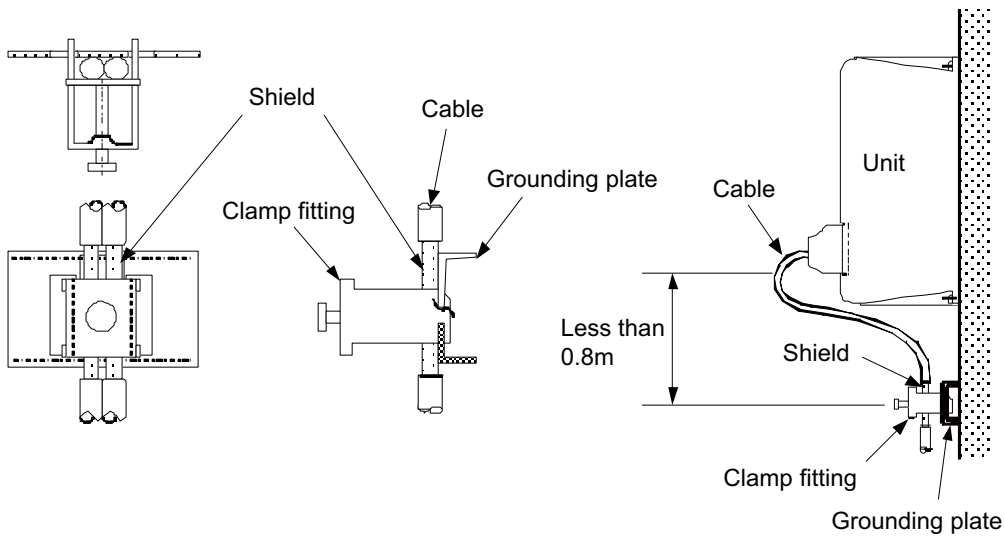
The shield of the shield cable connected to the control unit and drive unit must be connected to the grounding plate to stabilize operation while preventing malfunctioning due to noise.

The shield can be connected to the grounding plate with lead wires or clamp fittings. Refer to the following drawings to fix the shield cable.

[Example of connection with lead wire]



[Example of connection with clamp fitting]



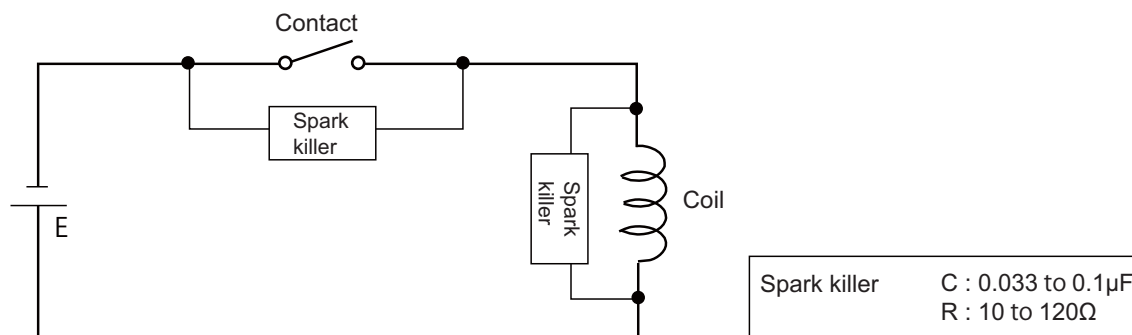
- (1) Peel part of the cable sheath and expose the shield as shown in the drawing. Press the exposed part against the grounding plate with the cable clamp fittings.
- (2) If the cable is thin, clamp several together in a bunch.
- (3) Tighten the cable with appropriate strength not to damage the wire material.
- (4) Connect each grounding plate together and ground them at one point.

2.5.2.3 Connecting Spark Killers

The noise which is generated during the operation of the coil or contact needs to be eliminated.

Connect the spark killers (CR composite element) in parallel with the coil and the contact for the countermeasure.

The spark killer is effective in eliminating the noise generated by electromagnetic induction.

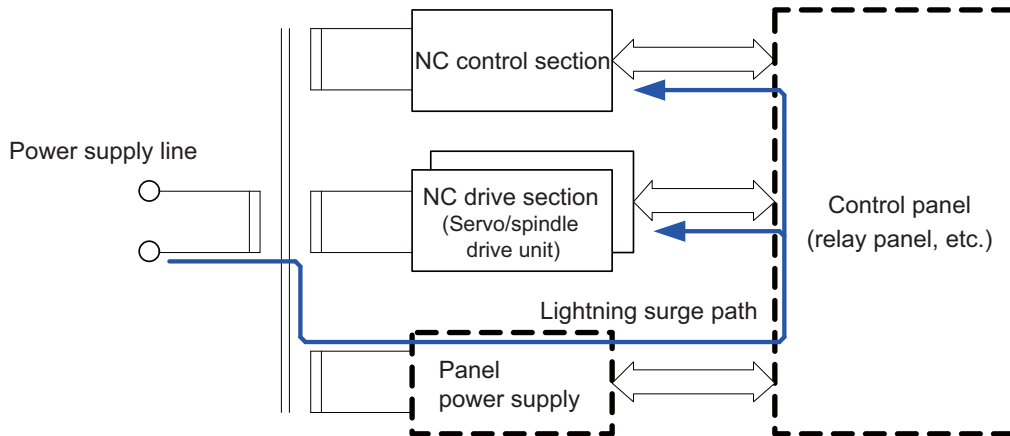


2.5.2.4 Lightning Surge Protection Countermeasure

Generally, the lightning surge intrudes into the control power supply of device from the power supply line, and the surge may damage the control power supply and the internal circuit.

For protection from the lightning surge, MITSUBUSHI NC unit has the surge absorber for the control power supply of the NC control section and the NC drive section.

However, when there is a device which is not applied with the countermeasure as illustrated below, the lightning surge may intrude through the signal line of the device and may damage the NC device.



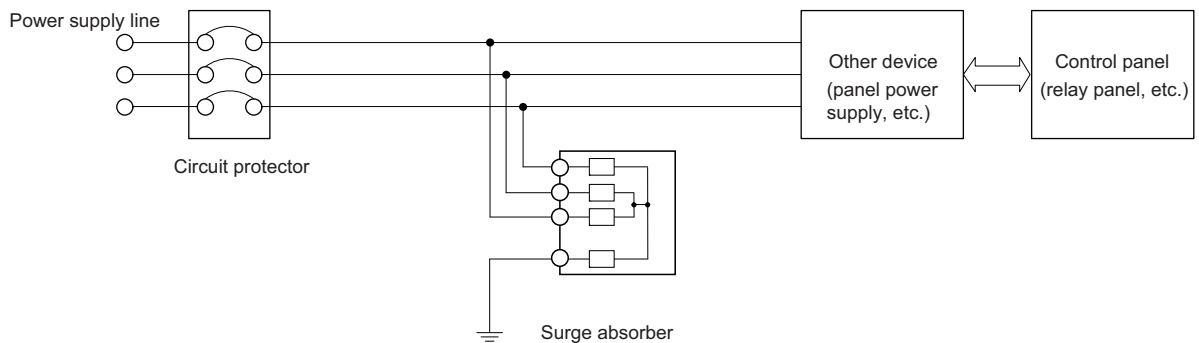
Path of damage caused by lightning surge

(1) Protection countermeasure method

Add the surge absorber to the power supply lines as illustrated below for the power supply device, etc., which are separately prepared.

The following two items are needed to protect the entire system from surge.

- Surge absorber installation
- Circuit protector installation



Lightning surge countermeasure for three-phase power supply line

(2) Product example of surge absorber

Example of using OKAYA ELECTRIC INDUSTRIES surge absorber

| Type | Rated Voltage (50/60 Hz) | DC Breakdown voltage | Voltage protection level | Normal discharge current | Maximum discharge current | Surge current life |
|-------------|--------------------------|----------------------|--------------------------|--------------------------|---------------------------|---|
| RSPD-250-U4 | 250 VAC (Three phases) | 700 V ± 25% | 1.3 kV | 8/20 μs 2.5 kA | 8/20 μs 5 kA | Approximately 300 times 8/20 μs - 1 kA |

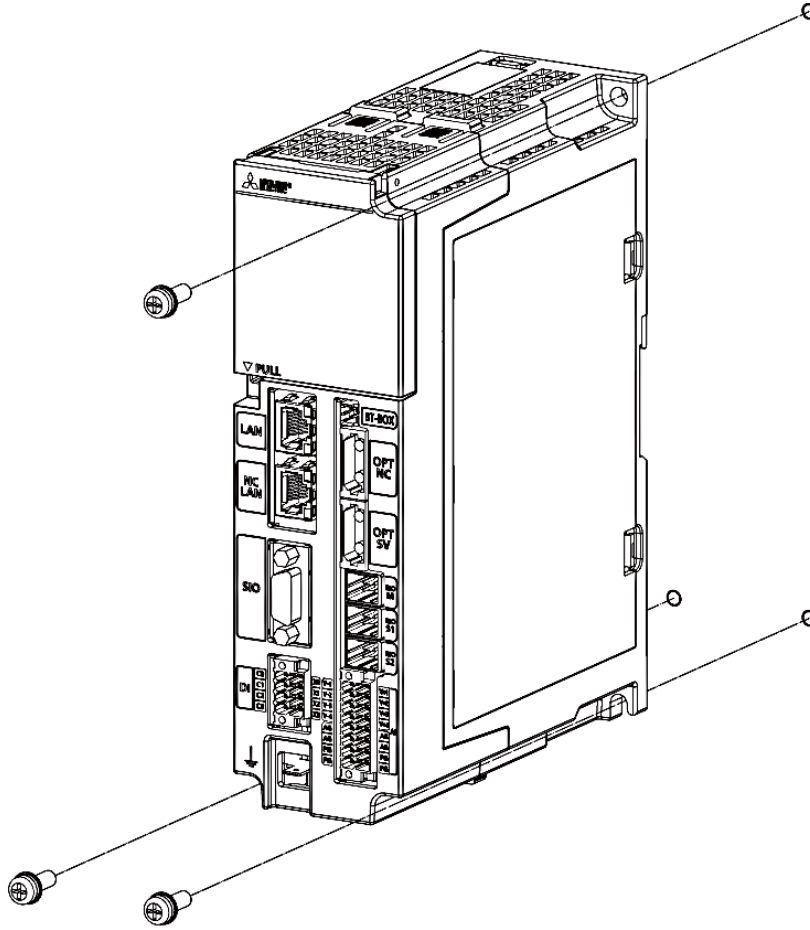
(Note) Refer to "EMC Installation Guidelines: EMC Countermeasure Parts: Surge Absorber" for the outline, etc. Refer to the manufacturer catalog for detailed characteristics, outline and connection methods of the surge absorber.

2.5.3 Unit Installation

Mount the data acquisition unit with the prescribed number of fixing screws.

(Note) Refer to "General Specifications" for the installation dimension and the screw hole position.

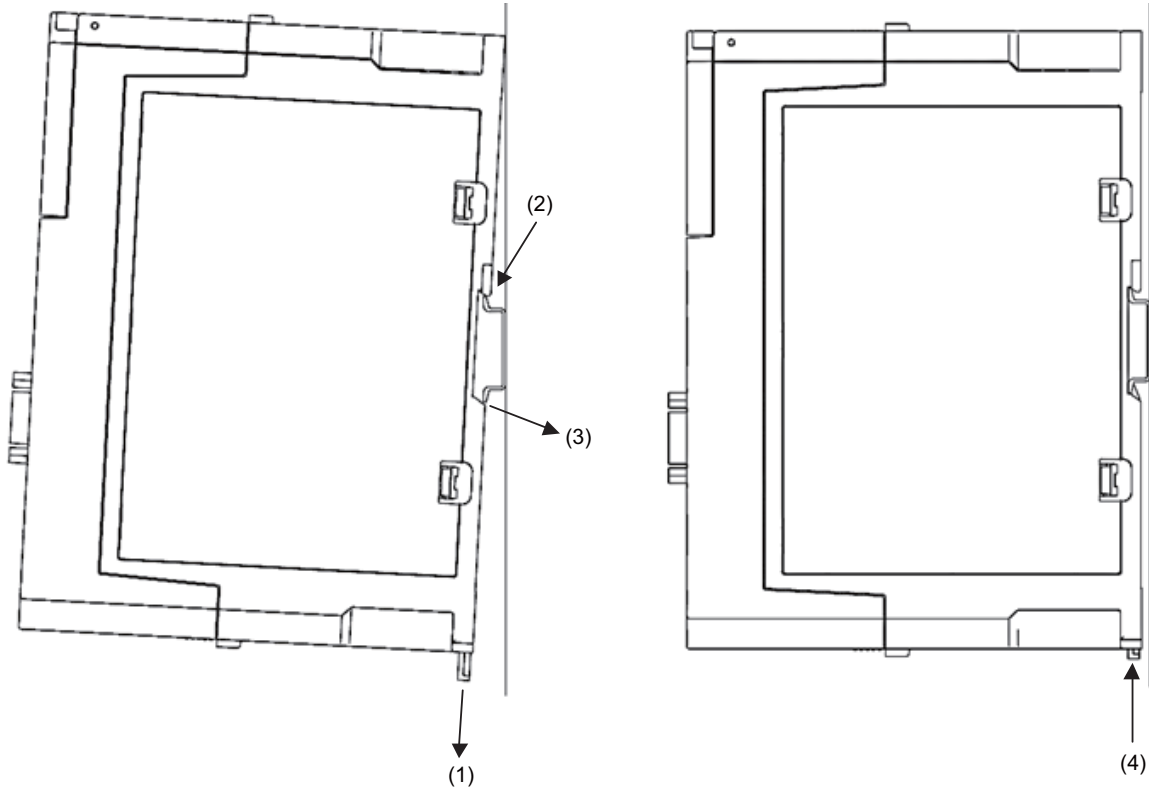
[FCU8-RT602]



Fixing screw : M5 (3 pcs)

[Install to DIN rail]

- (1) Pull down the rail hook.
- (2) Hook the upper latch of the unit on the DIN rail.
- (3) Push the unit into the rail.
- (4) Lock it.



Designate one of the types listed below as DIN rail standard.

- TH35-7.5Fe: 7.5
- TH35-7.5AL: 7.5
- TH35-15Fe: 15

2.6 Precautions for Connecting

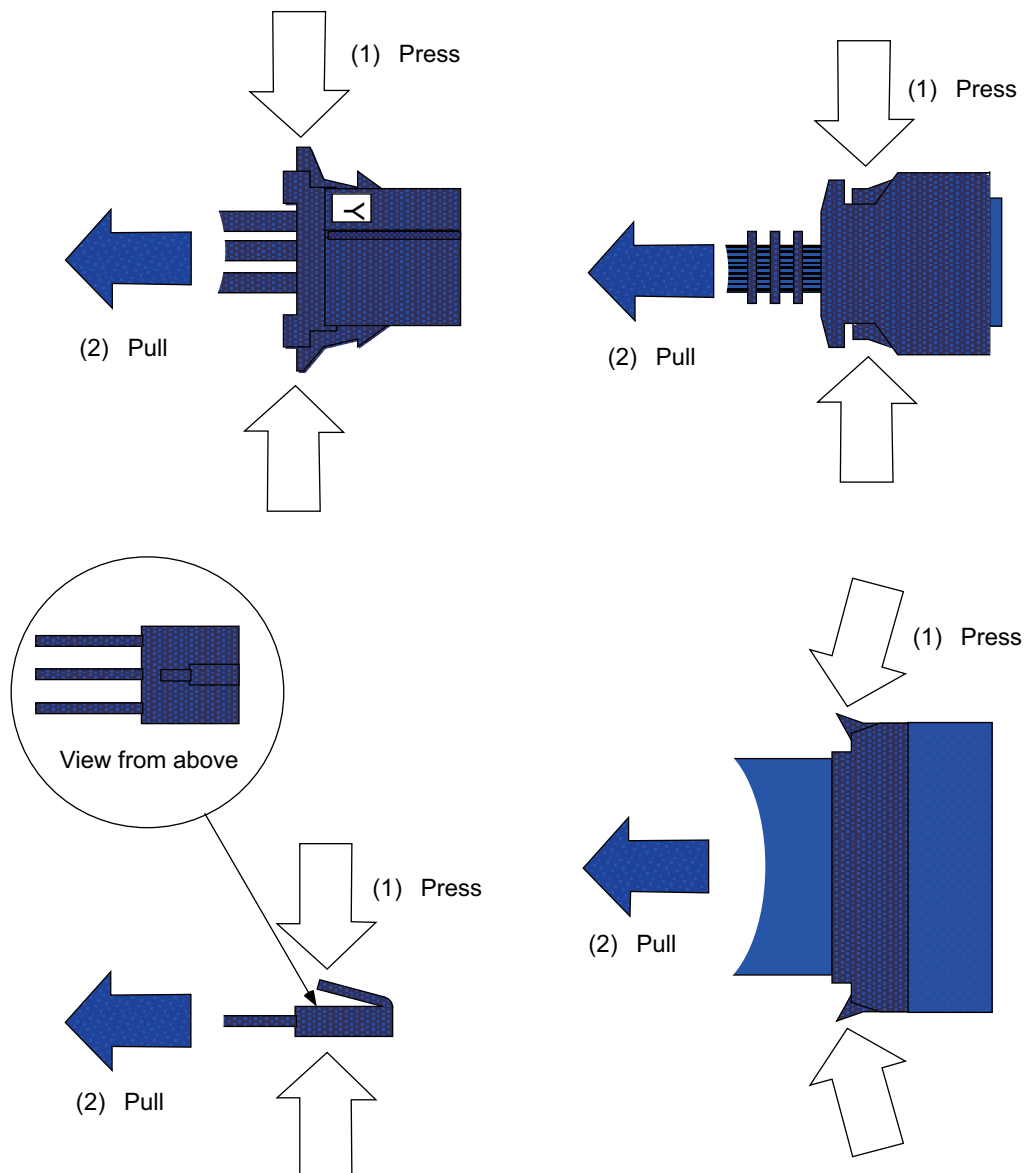
2.6.1 Precautions for Wiring

2.6.1.1 Precautions for Connecting/Disconnecting Cables

If the cable is connected/disconnected without turning the power OFF, the normal unit or peripheral devices could be damaged, and risks could be imposed.

Disconnect each cable with the following procedures.

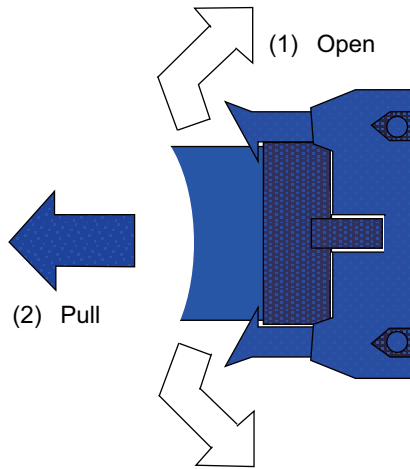
- (a) For the following type of connector, press the tabs with a thumb and a forefinger in the direction of the arrow, and pull the connector off.



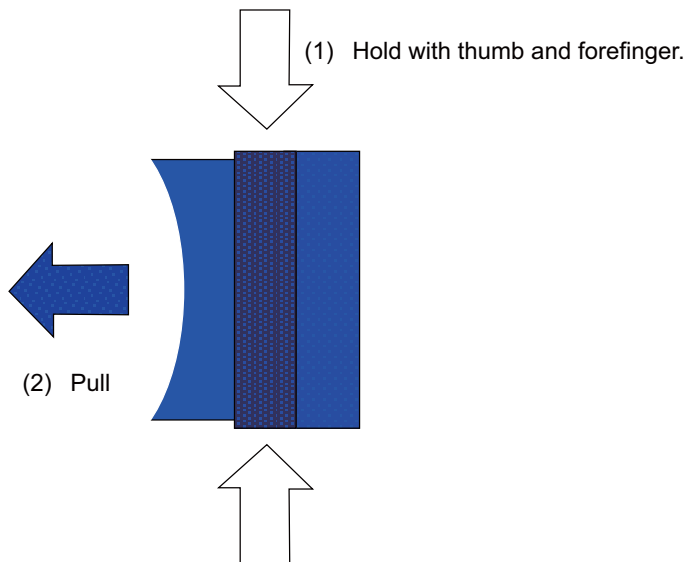
CAUTION

1. Do not connect or disconnect the cables between units while the power is ON.
2. Do not pull the cables when connecting/disconnecting it.

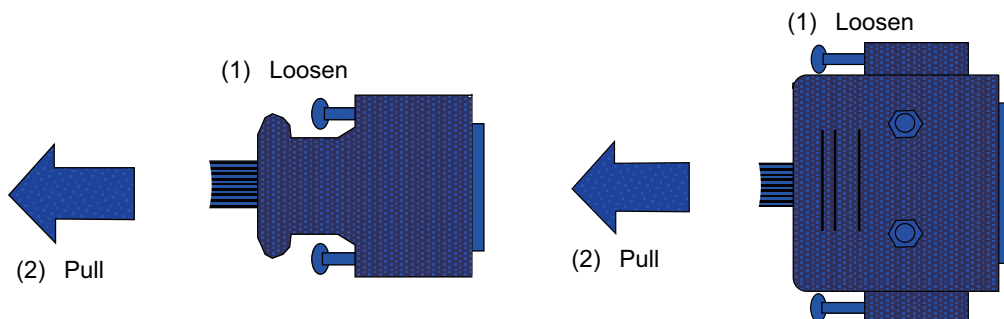
(b) For a flat cable type connector with latches, open the latches in the directions of the arrows, and pull the connector off.



(c) For a flat cable type connector without latches, hold the connector with a thumb and a forefinger, and pull the connector off.



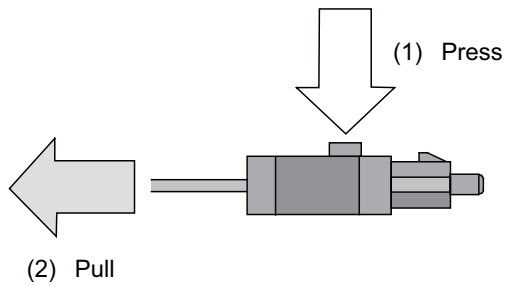
(d) For the screw fixed type connector, loosen the two fixing screws, and pull the connector off.



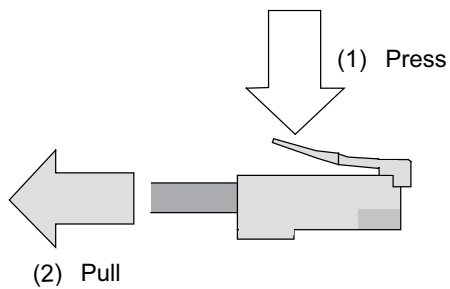
CAUTION

1. Do not connect or disconnect the cables between units while the power is ON.
2. Do not pull the cables when connecting/disconnecting it.

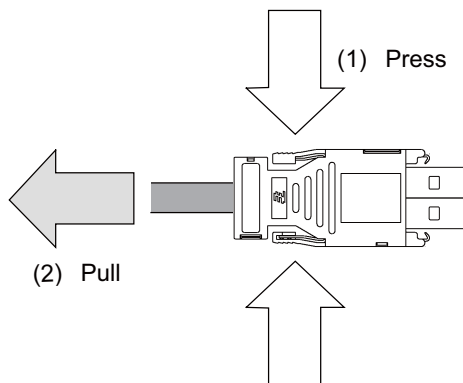
(e) For the optical cable connector, pull it off while holding down the lock button.



(f) For the Ethernet connector, pull it off while holding down the locked latch.



(g) For the USB connector, pull it off while holding down the locked latch.



⚠ CAUTION

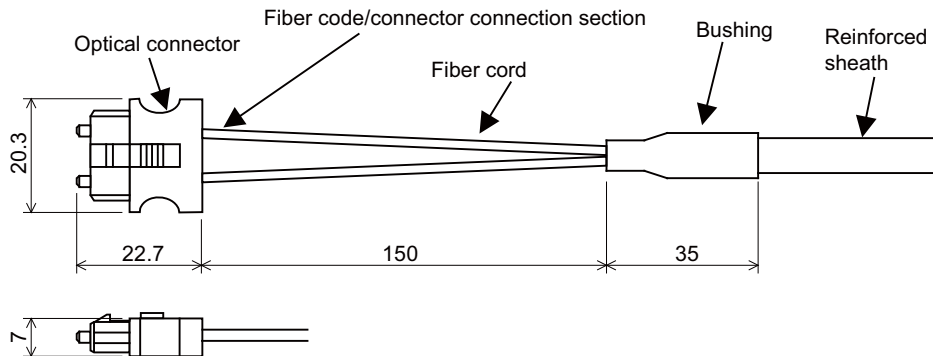
1. Do not connect or disconnect the cables between units while the power is ON.
2. Do not pull the cables when connecting/disconnecting it.

2.6.1.2 Precautions for Using Optical Communication Cable

An optical communication cable is used for communication between the control unit and the drive unit. Special precautions, differing from the conventional cable, are required when laying and handling the optical communication cable.

(Note) If the cable you use is not Mitsubishi's, malfunctions resulted from connection problems or aged deterioration are not covered under the warranty.

Optical communication cable outline and parts



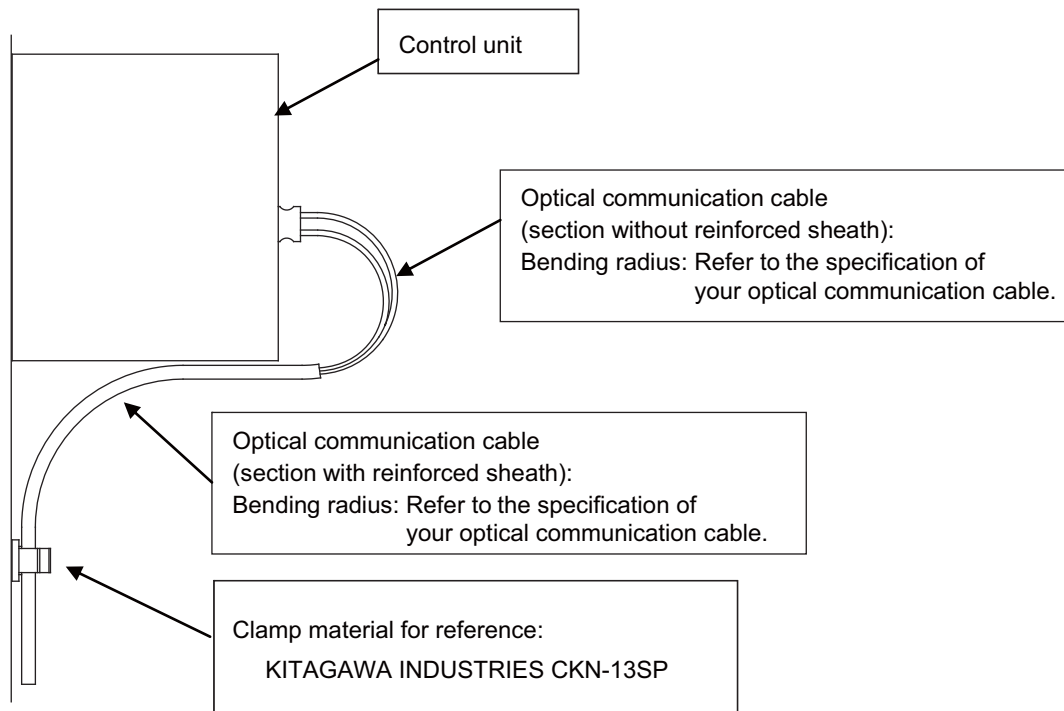
To ensure the system performance and reliability, purchase the optical communication cable from Mitsubishi. A machining drawing is given in "Cable" as reference, but the purchased optical communication cable cannot be cut or connected by the machine tool builder.

Precautions for handling optical communication cable

- (1) A protective cap is attached to the optical module and optical communication cable mounted on the PCB when the system is delivered. Leaving this protective cap unattached could result in connection faults from the adherence of dirt and dust. Do not remove the protective cap when not connecting the cable. If dirty, wipe off lightly with a piece of dry gauze, etc. (Do not use solvents such as alcohol as the optical fiber material could melt.)
- (2) Hold the connector section when connecting or disconnecting the optical connector. Holding the fiber cord will result in force exceeding the tolerable tension on the fiber cord and connector connection section, and could cause the fiber cord to dislocate from the optical connector thereby inhibiting use.
- (3) The optical connector cannot be connected in reversed. Check the connector orientation when connecting the optical communication cable to the optical module. Align the connector lock lever with the lock holes on the PCB's optical module, and press the connector straight in. Confirm that the lock lever connects with the optical module and that a "click" is heard.
- (4) When disconnecting the optical communication cable from the PCB, press the lock release buttons on the lock lever, and pull out the cable while holding the connector section. The connector could be damaged if the cable is pulled without pressing down on the lock release buttons.
- (5) Do not apply excessive force onto the optical communication cable by stepping on it or dropping tools, etc., on it.

Precautions for laying optical communication cable

- (1) Do not apply a force exceeding the cable's tolerable tension. Binding the cables too tight with tie-wraps could result in an increased loss or a disconnection. Use a cushioning material such as a sponge or rubber when bundling the cables and fix so that the cables do not move.
- (2) Do not connect the cables with a radius less than the tolerable bending radius. Excessive stress could be applied near the connector connection section and cause the optical characteristics to drop. The cable bending radius should be 10 times or more than the outer diameter at the reinforced sheath, and 20 times or more than the outer diameter at the fiber cord section.
- (3) Do not apply torsion to the optical communication cable. Laying a twisted cable could cause the optical characteristics to drop.
- (4) When laying the cables in a conduit, avoid applying stress on the fiber cord and connector connection section. Use the tensile end such as a pulling eye or cable grip, etc.
- (5) Fix the reinforced sheath with a cable clamp so that the mass of the optical communication cable is not directly applied on the fiber cord and connector connection section.
- (6) Never bundle the cables with vinyl tape. The plasticizing material in the vinyl tape could cause the POF cable to break.
- (7) Loop the excessive cable with twice or more than the minimum bending radius.

**2.6.1.3 Precautions for Connecting 24V Power Supply**

- (1) Note that when 24V power is supplied to the unit, welding may occur on the contacts due to rush current when both of the following conditions are met.
 - When 24 VDC's ON/OFF are directly controlled by a magnetic switch such as relay
 - When heat capacity of the contacts for relay, etc. used to control 24 VDC's ON/OFF is small

2.6.2 Turning the Power ON/OFF

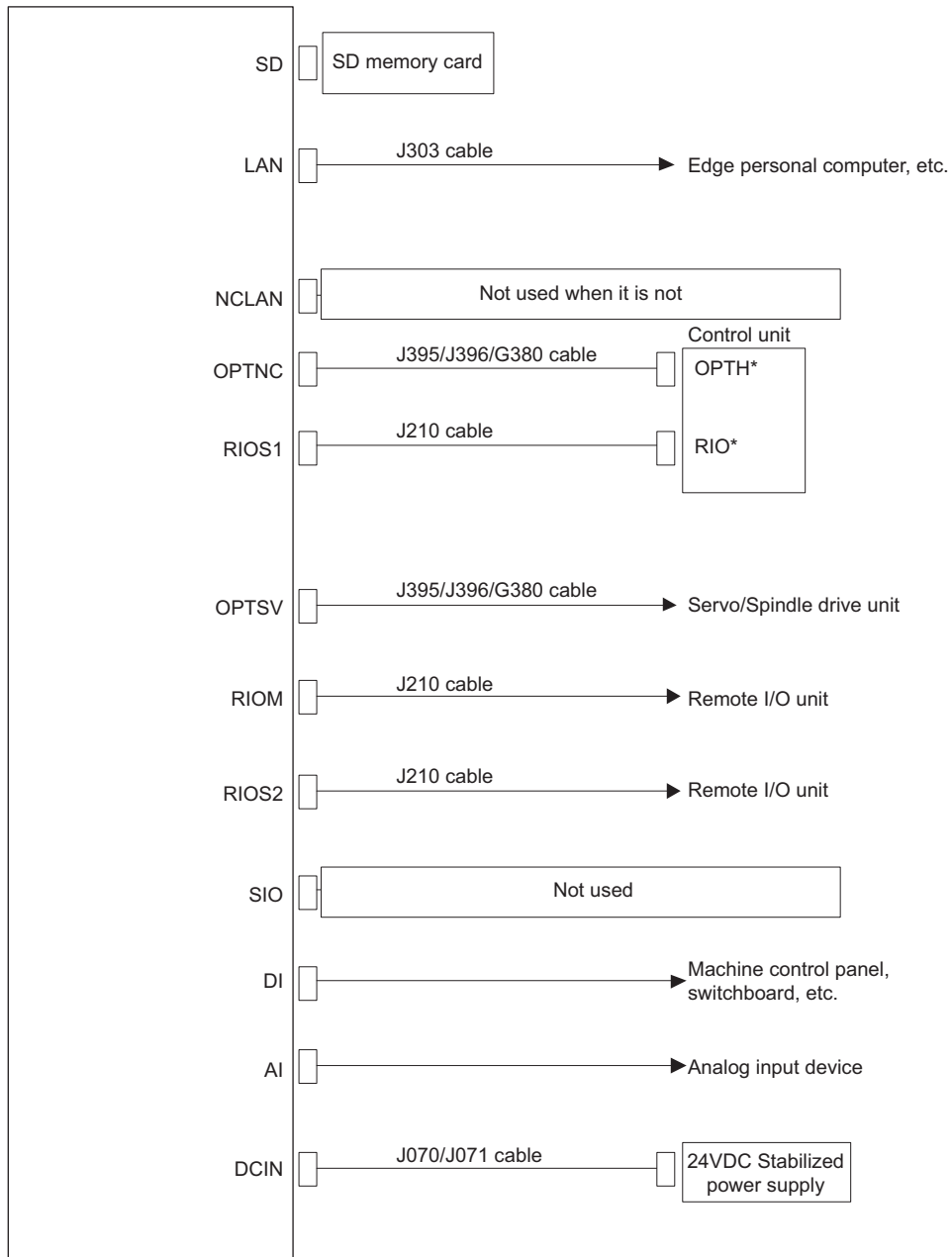
For details on the process of turning the power ON/OFF, refer to "Connection and Setup Manual" of the NC you are using.

2.6.3 Timing of Turning the Power ON

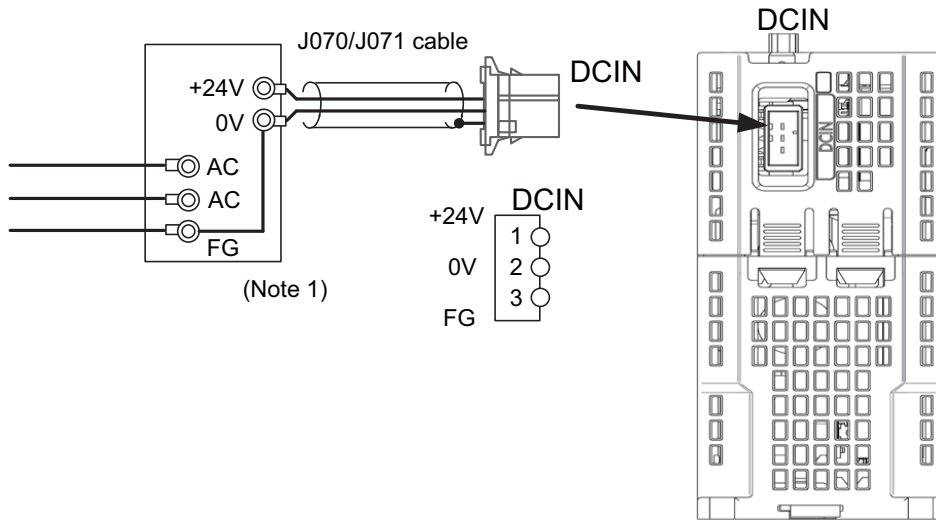
Turn ON the power of the data acquisition unit at the same time or earlier when the NC control unit is turned ON.

2.7 Connecting Data Acquisition Unit

2.7.1 General Connection System Drawing



2.7.2 Connecting with Power Supply



(Note 1) For noise countermeasure, short between 0 V and FG using connectors.

(Note 2) Rush current may cause welding on the contacts, when a magnetic switch such as relay directly controls 24VDC's ON/OFF during 24 V power supply to the control unit.

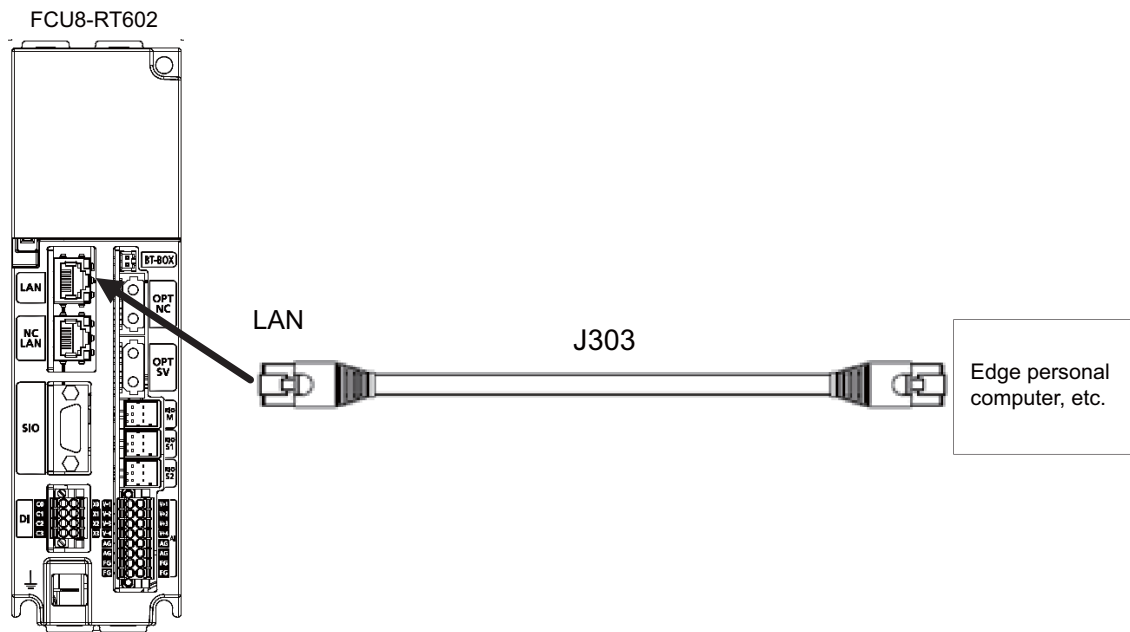
Use relay with large heat capacity of contacts to control 24VDC's ON/OFF.

<Related Items>

Cable drawing: "Cable: J070/J071 Cable"

Connector pin assignment: "General Specifications: Connectors" (DCIN connector)

2.7.3 Connecting with Host Device (Edge Computer)



<Related Items>

Cable drawing: "Cable: J303 Cable"

Connector pin assignment: "General Specifications: Connectors" (LAN connector)

2.7.4 Connecting with Digital Input (DI)

<Applicable wire>

- Single wire: 0.2-1.5 mm²
- Twisted wire: 0.2-1.5 mm²
- Bar terminal with insulation collar: 0.25-0.75 mm²
- Bar terminal without insulation collar: 0.25-1.5 mm²
- Stripping line length: 10 mm

<Wire mounting tool (driver) type>

- Type: SZS 0,4X2,5 VDE
- Recommended manufacturer: Phoenix Contact

<Bar terminal type>

- Type: AI series
- Recommended manufacturer: Phoenix Contact

<Crimp tool type>

- Type: CRIMPFOX 6
- Recommended manufacturer: Phoenix Contact

<Recommended cable with shield material>

- Type: HK-SB/20276XL LF
- Recommended manufacturer: Taiyo Cabletec

(Select the wire diameter from DI connector specification.)

Maximum cable length is 50 m.

<Related Items>

Connector pin assignment: "General Specifications: Connectors" (DI connector)

(Note 1) The connector is provided as an accessory of the unit.

(Note 2) When the connector is damaged, purchase either of the following types from the connector manufacturer.

<Cable side connector type>

- Connector: DFMC1.5/4-STF-3.5 (Standard module)
- DFMC1.5/4-STF-3.5 BKO-CB1257H01 (Pin code printed)

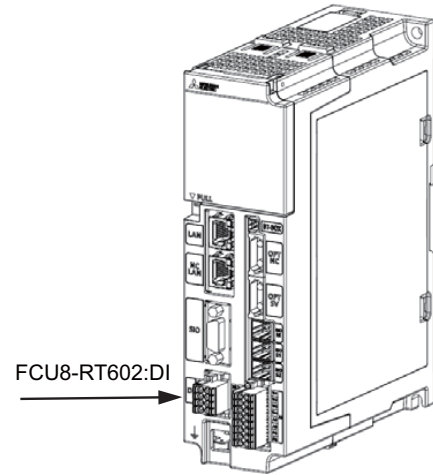
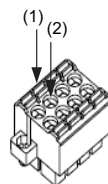
Recommended manufacturer: Phoenix Contact

(Note 3) Use a screw tightening type connector.

(Note 4) Easy lock type connectors can also be used, but note that signal communication may be interrupted by machine vibration.

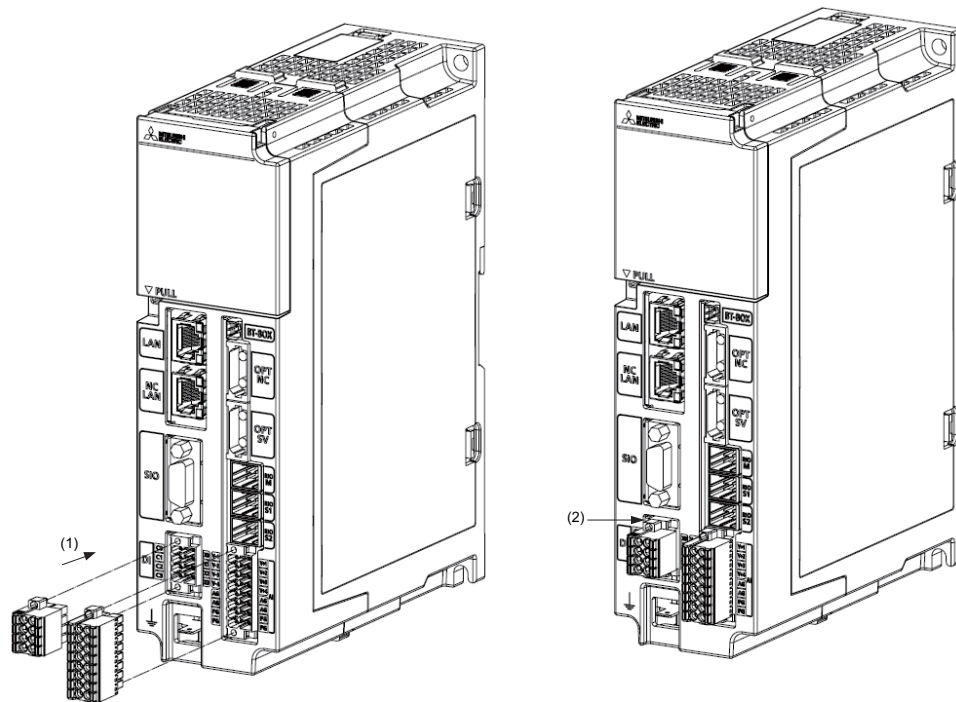
[Mounting the wire]

- (1) Push in the wire opening lever (orange) using a slotted screwdriver (blade width: 2.5 mm).
- (2) Insert the wire and then pull the screwdriver out of the wire opening lever.



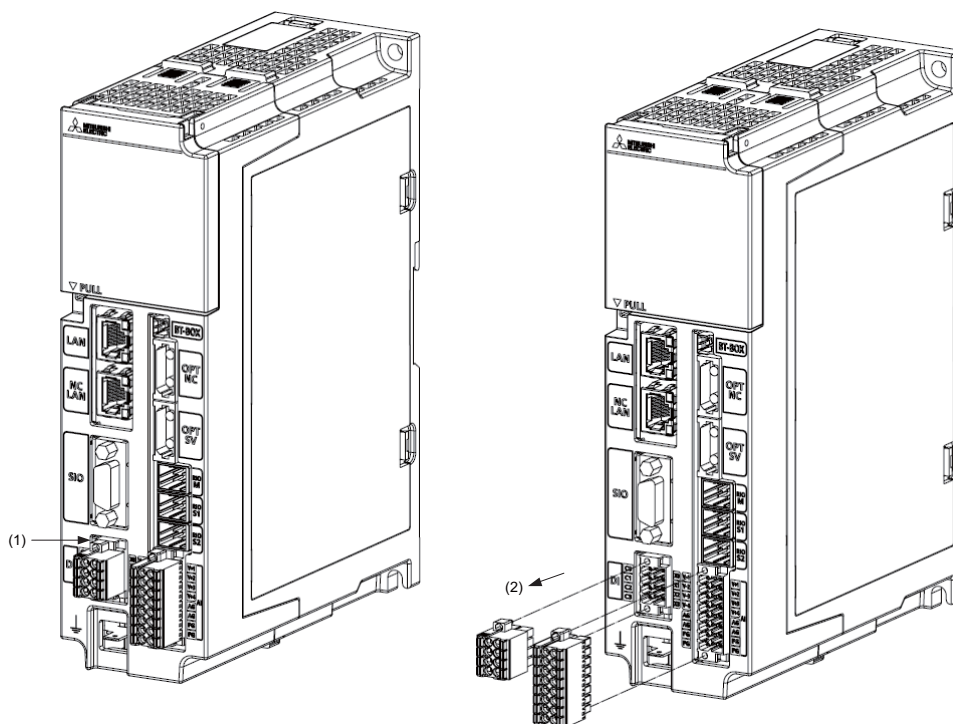
[Mounting the connector]

- (1) Connect the connector to the DI of the unit.
- (2) Tighten the screws on both ends of the connector with a slotted screwdriver. (Tightening torque: 0.1 to 0.2 N·m)

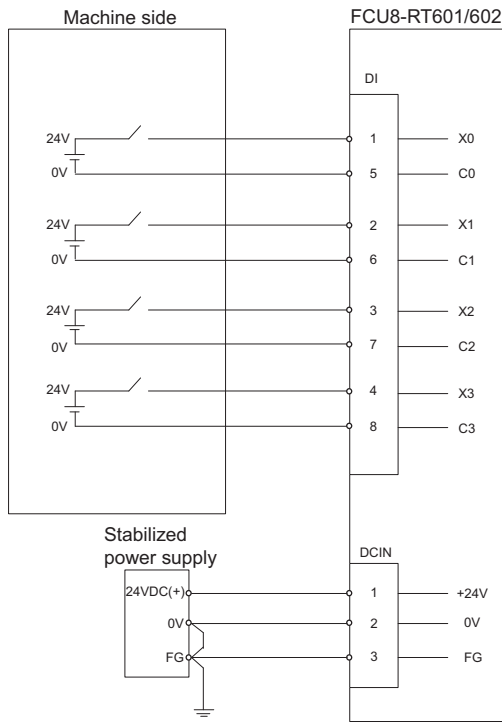


[Removing the connector]

- (1) Loosen the screws on both ends of the connector with a slotted screwdriver.
- (2) Remove the connector from the DI of the unit.

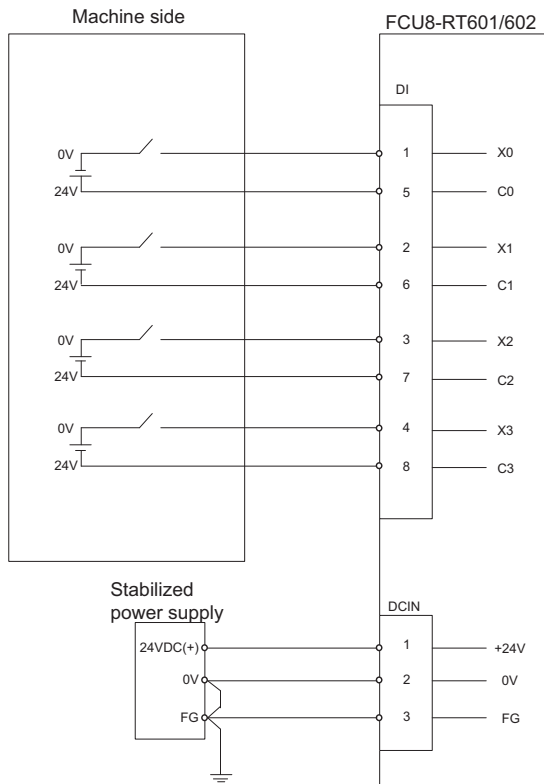


[Machine input (wiring example 1)]



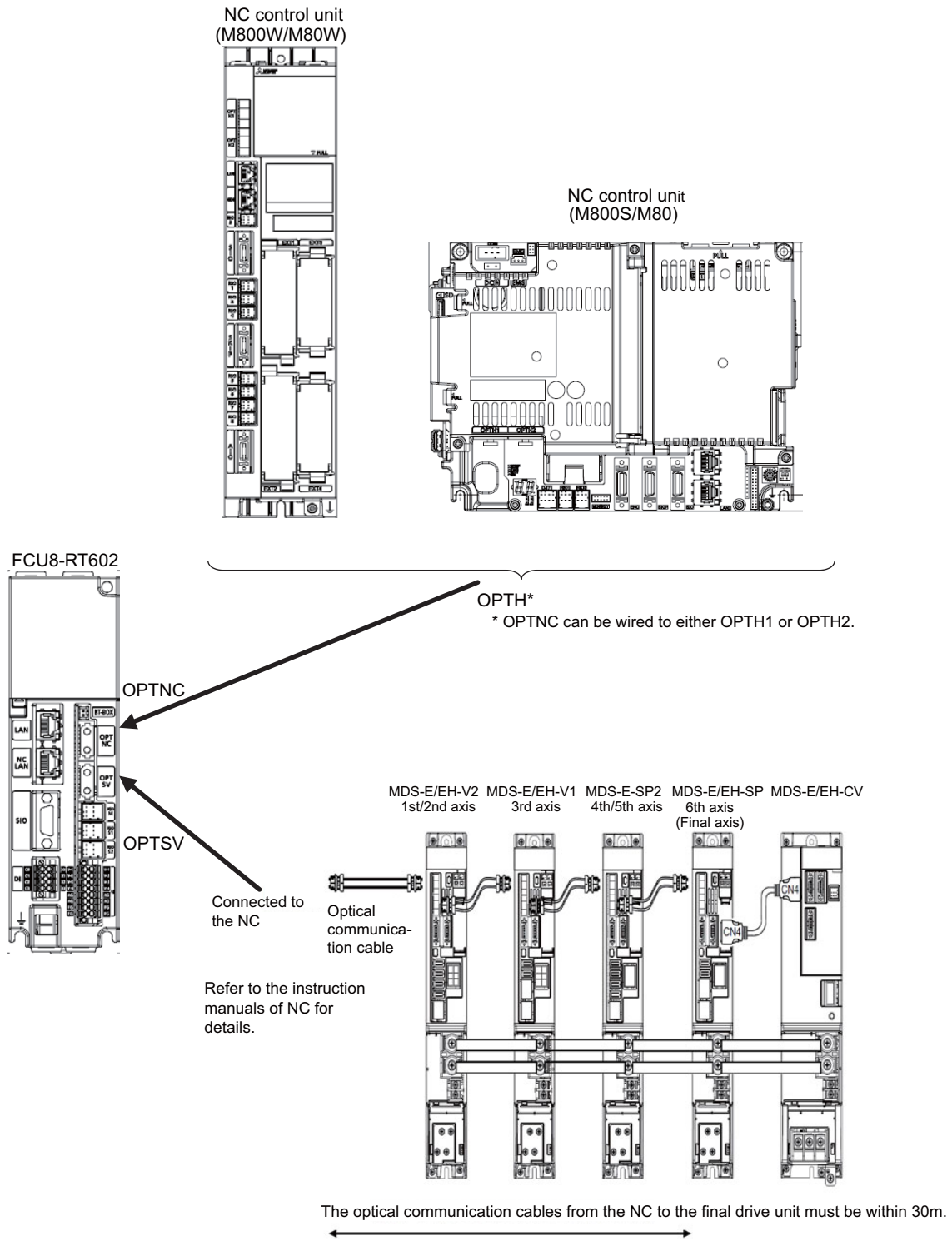
Channels (C0, C1, C2, C3) are insulated.

[Machine input (wiring example 2)]



Channels (C0, C1, C2, C3) are insulated.

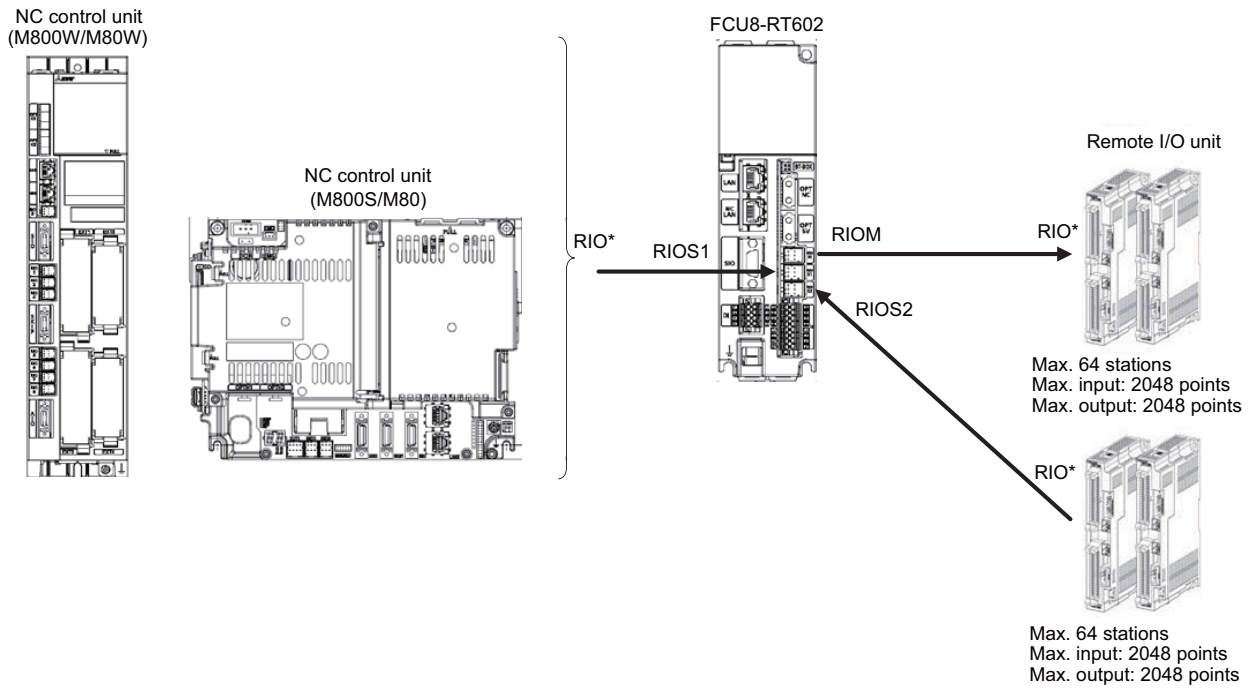
2.7.5 Connecting with Drive Unit



(Note 1) Wire the information collection unit so that it connect the NC control unit and drive unit.

(Note 2) The optical communication cables from the NC to the final drive unit must be within 30m.

2.7.6 Connecting with Remote I/O unit



(Note 1) RIOM is master of remote I/O.
 RIOS1 and RIOS2 are slave of remote I/O.

(Note 2) Connect data collection unit and NC control unit with RIOS1.

<Related Items>

Cable drawing: "Cable: J210 Cable"

Connector pin assignment: "General Specifications: Connectors" (RION connector, RIOS connector)

2.7.7 Connecting with Analog Input

<Applicable wire>

Single wire: 0.2-1.5 mm²

Twisted wire: 0.2-1.5 mm²

Bar terminal with insulation collar: 0.25-0.75 mm²

Bar terminal without insulation collar: 0.25-1.5 mm²

Stripping line length: 10 mm

<Wire mounting tool (driver) type>

Type: SZS 0,4X2,5 VDE

Recommended manufacturer: Phoenix Contact

<Bar terminal type>

Type: AI series

Recommended manufacturer: Phoenix Contact

<Crimp tool type>

Type: CRIMPFOX 6

Recommended manufacturer: Phoenix Contact

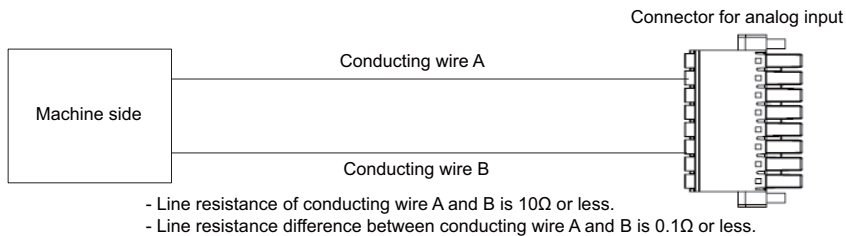
<Recommended cable with shield material>

Type: HK-SB/20276XL LF

Recommended manufacturer: Taiyo Cabletec

(Select the wire diameter from AI connector specification.)

Maximum cable length is 30m. Line resistance is 10 Ω or less, and line resistance difference is 0.1 Ω or less (see below).



<Related Items>

Connector pin assignment: "General Specifications: Connectors" (AI connector)

(Note 1) The connector is provided as an accessory of the unit.

(Note 2) When the connector is damaged, purchase the following one from the connector manufacturer.

<Cable side connector type>

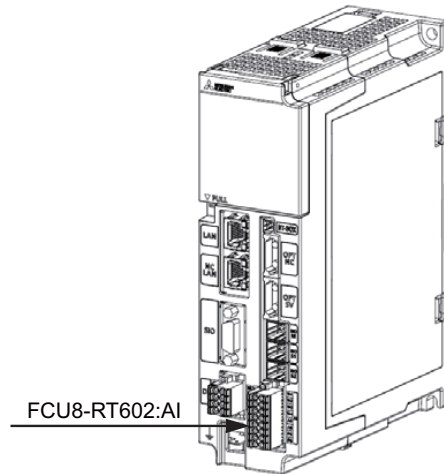
Connector: DFMC1.5/8-STF-3.5 (Standard module)

DFMC1.5/8-STF-3.5 BKO-CB1257H02 (Pin code printed)

Recommended manufacturer: Phoenix Contact

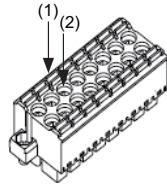
(Note 3) Use a screw tightening type connector.

(Note 4) Easy lock type connectors can also be used, but note that signal communication may be interrupted by machine vibration.



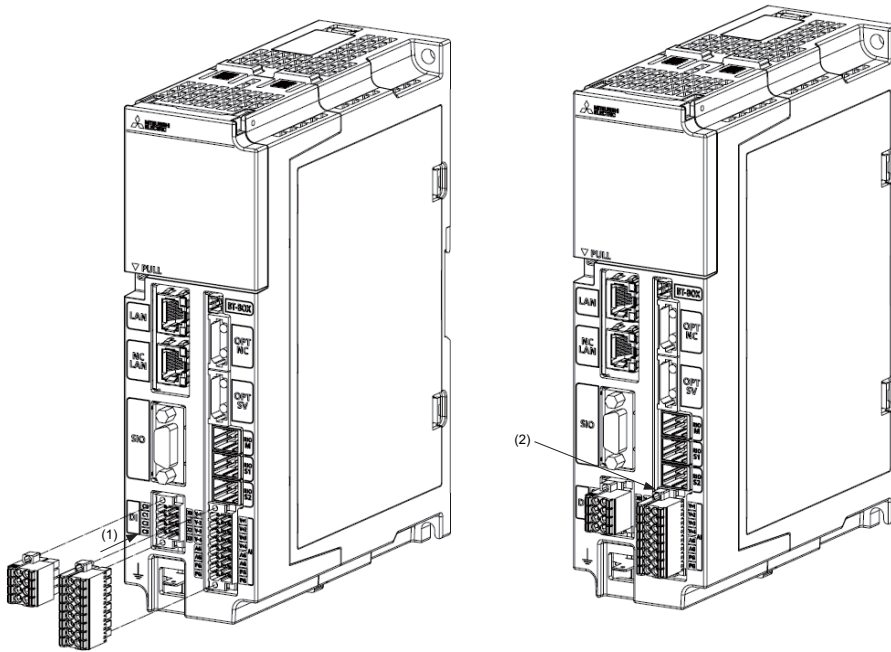
[Mounting the wire]

- (1) Push in the wire opening lever (orange) using a slotted screwdriver (blade width: 2.5 mm).
- (2) Insert the wire and then pull the screwdriver out of the wire opening lever.



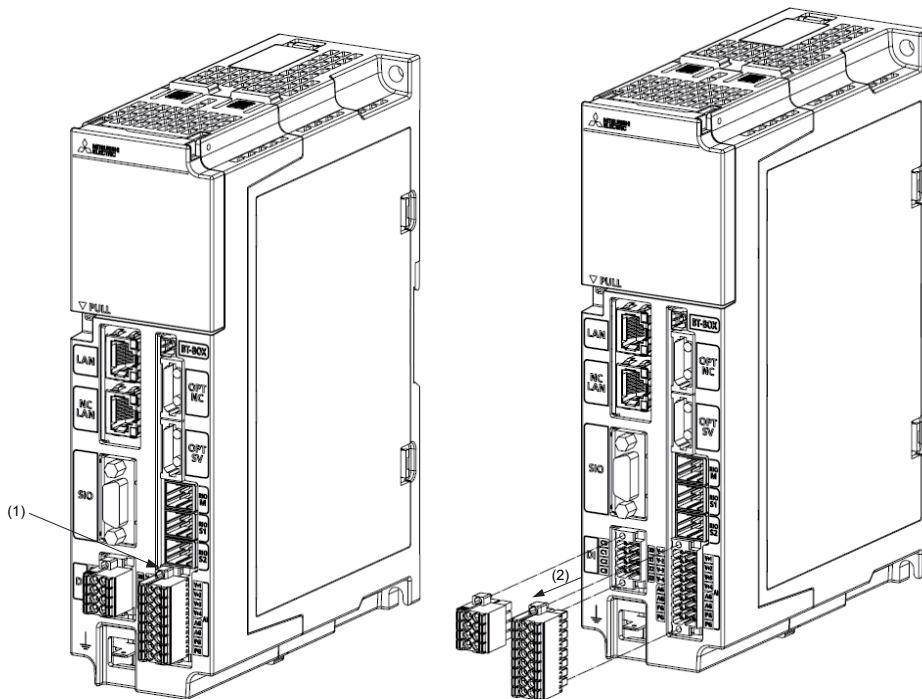
[Mounting the connector]

- (1) Connect the connector to the DI of the unit.
- (2) Tighten the screws on both ends of the connector with a slotted screwdriver. (Tightening torque: 0.1 to 0.2 N·m)

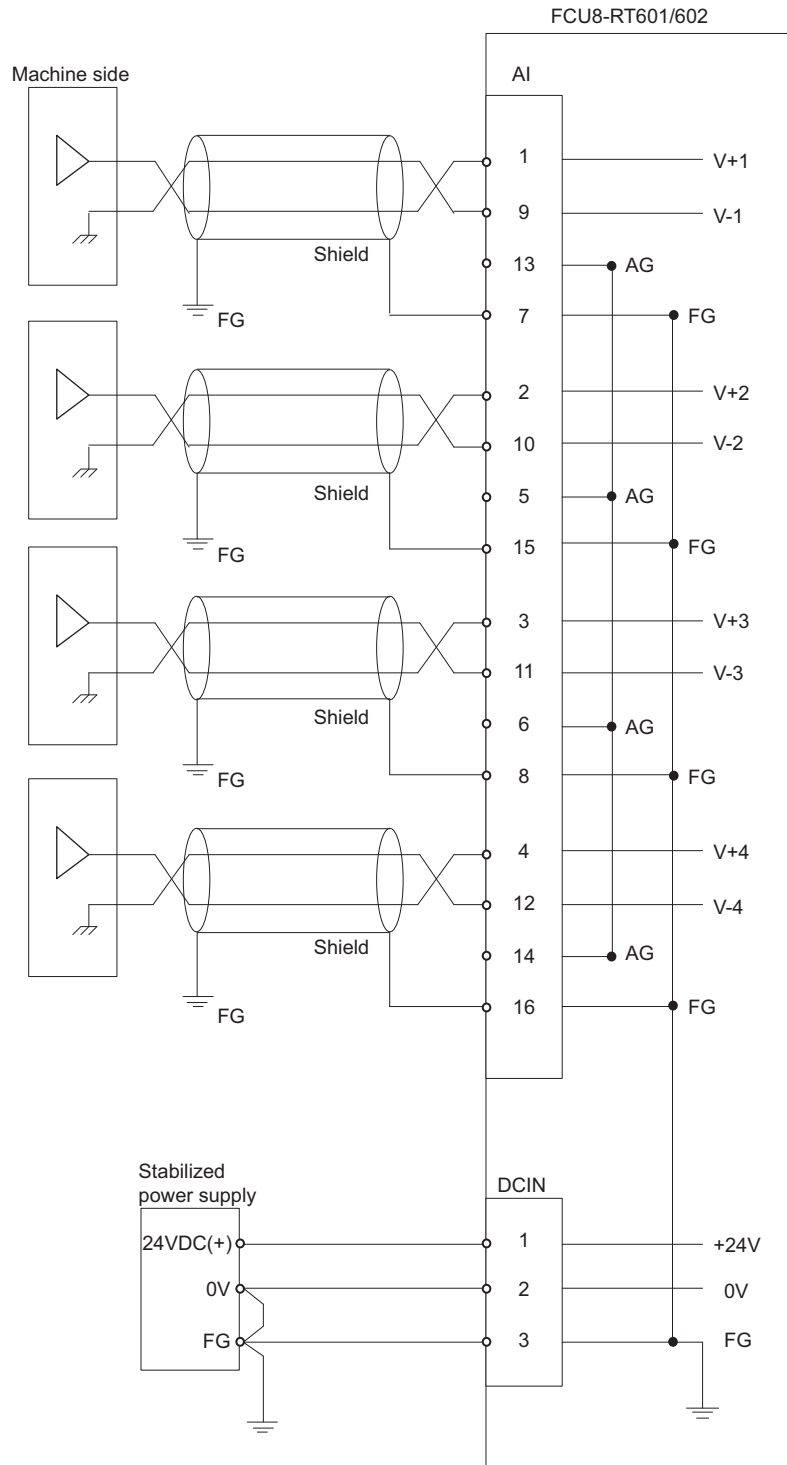


[Removing the connector]

- (1) Loosen the screws on both ends of the connector with a slotted screwdriver.
- (2) Remove the connector from the unit DI.



[Connecting with voltage input signal]



- (Note 1) Use a shielded twisted cable to reduce the influence of noise.
- (Note 2) Connect the shield to the FG pin of the AI connector. Ground the machine side as well.
- (Note 3) The FG pin is connected inside the unit.
- (Note 4) Use the AG pin to take GND for the differential input signal.
- (Note 5) The AG pin is connected inside the unit.
- (Note 6) Do not connect or disconnect connection cables between units while power is being supplied.

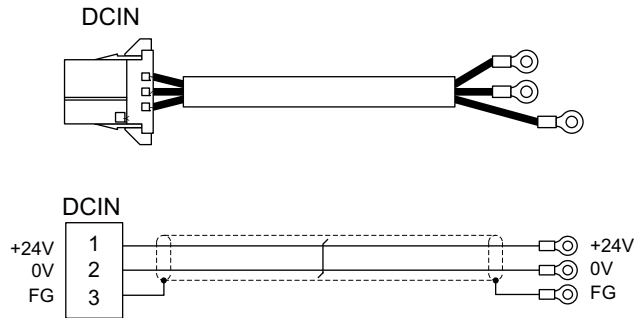
2.8 Cables

Cable list

| No. | Cable type | Maximum cable length | Supplement | Connectors |
|-----|------------|----------------------|--|------------------|
| 1 | J070 | 15 m | 24VDC power cable | DCIN |
| 2 | J071 | 20 m | 24VDC power cable (for long distance) | |
| 3 | J210 | 50 m | RIO2.0 communication cable | RIOS1/RIOS2/RIOM |
| 4 | J212 | 50 m | RIO2.0-RIO1.0 communication cable | |
| 5 | J303 | 50 m | Ethernet communication cable | NCLAN/LAN |
| 6 | J395 | 10 m | Optical servo communication cable (for wiring outside panel) | OPTNC/OPTSV |
| 7 | J396 | 5 m | Optical servo communication cable (for wiring inside panel) | |

<J070/J071 cable outline drawing>

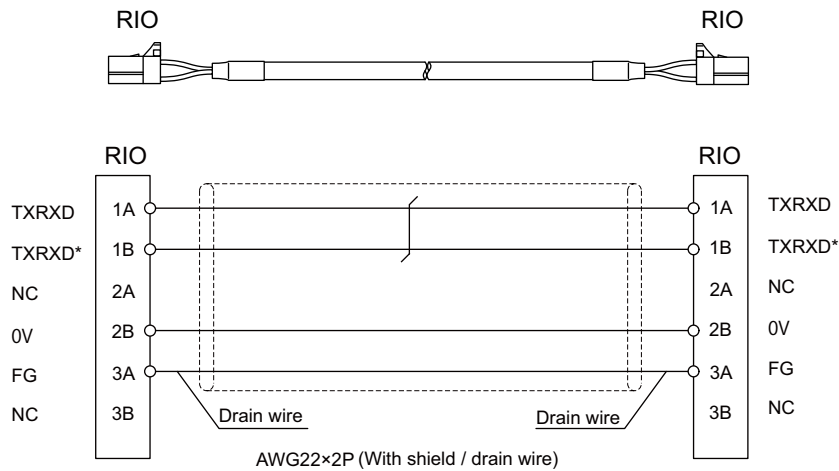
Maximum cable length: 15 m (J070)/20 m (J071)
 Application: 24VDC power cable



| | | |
|--|---|-------------------------------|
| [DCIN] | [J070 cable] | |
| Connector: 2-178288-3 | Wire material: 2464C BIOS-CL3-16 02C × 16AWG (26/0.26) | |
| Contact: 1-175218-5 | Recommended manufacturer: BANDO DENSEN | Crimp terminal: R1.25-4 × 3 |
| Recommended manufacturer: Tyco Electronics | [J071 cable] | Recommended manufacturer: JST |
| | Wire material: UL2464-SB TEW 2×14AWG(41/0.26)LF Black × White | |
| | Recommended manufacturer: Hitachi Metals | |

<J210 cable outline drawing>

Maximum cable length: 50 m
 Application: Remote I/O 2.0 communication cable



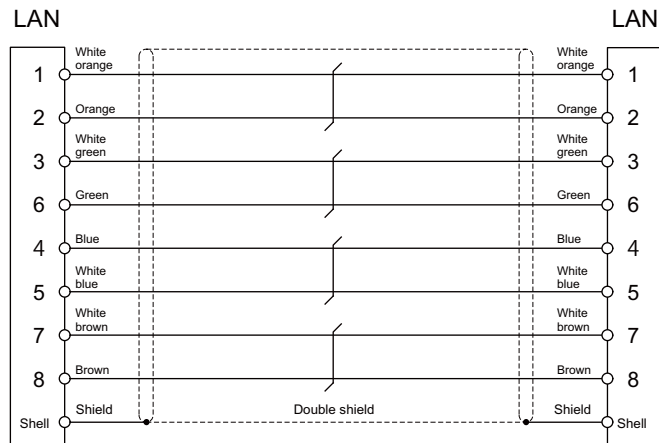
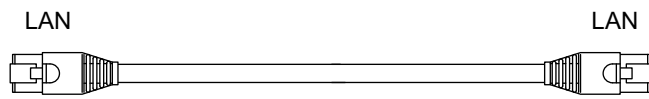
| | |
|--|--|
| [RIO] | Wire material: HK-SB/20276XL Black LF 2P × 22AWG |
| Connector: 1-1318119-3 | Recommended manufacturer: Taiyo Cabletec |
| Contact: 1318107-1 | |
| Recommended manufacturer: Tyco Electronics | |

(Note 1) Use the wire material of which impedance characteristics is 110 Ω.

<J303 cable outline drawing>

Maximum cable length: 50 m

Application: LAN straight cable



[LAN]

Connector: J00026A0165

Boot: B00080F0090

Recommended manufacturer: Japan Telegärtner

Wire material: FANC-IEF-SB 24AWG × 4P

Recommended manufacturer: Kuramo Electric

2.9 Initial Setup

2.9.1 Connecting Data Acquisition Unit with a Battery

The battery is not connected when the machine is delivered as it is an option.

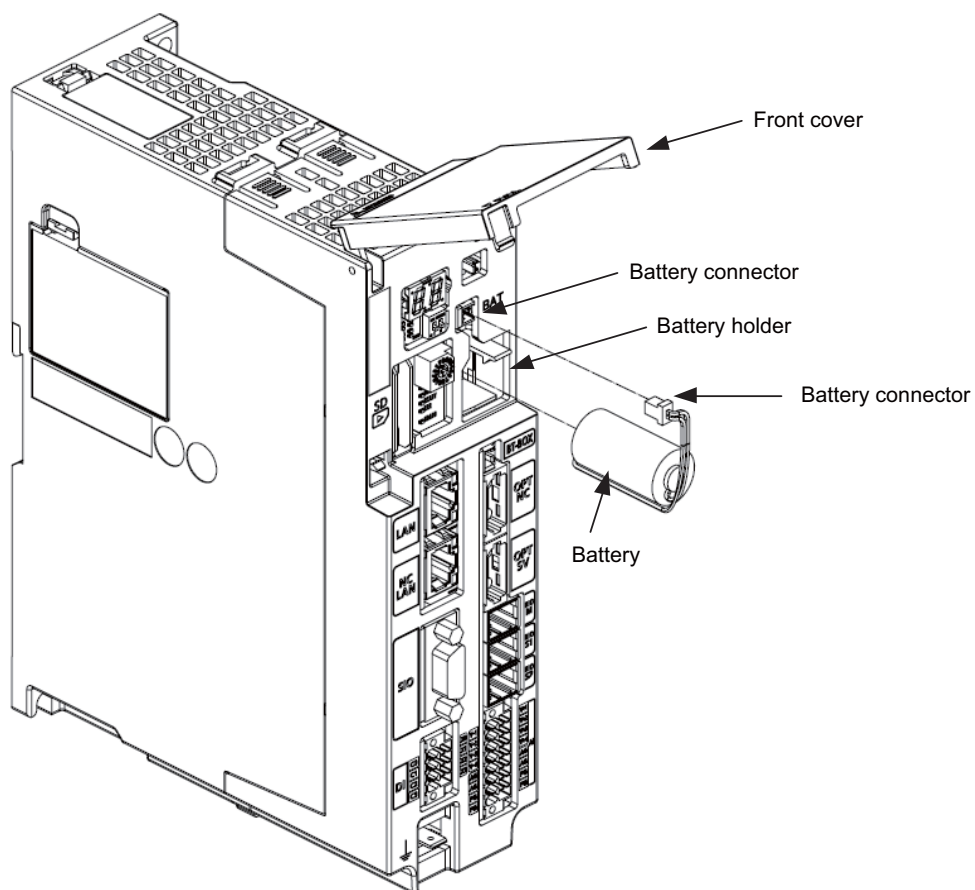
The battery is used to retain time data when the data acquisition unit is used on a stand-alone basis.

Q6BAT or BTBOX is available as a battery.

| | |
|---|--|
| Battery | Q6BAT |
| Battery cumulative data holding time | 45,000 hours (At 0 to 45 °C. The life will be shorter if the temperature is high.) |
| Battery life | Approximately 5 years (from date of battery manufacture) |

[Installation procedure]

- (1) Check that the machine power is turned OFF. (If the power is not OFF, turn it OFF.)
- (2) Confirm that the control unit LED, 7-segment display, etc., are all OFF.
- (3) Open the front cover of the data acquisition unit.
- (4) Insert the connector connected to the new battery into the BAT connector. Pay attention to the connector orientation: do not insert backwards.
- (5) Fit the new battery into the battery holder.
- (6) Close the front cover of the data acquisition unit. At this time, confirm that the cover is closed by listening for the "click" sound when the latch catches.



[Precautions for handling battery]

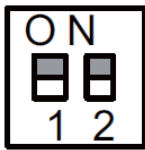
- (1) Do not disassemble the battery.
- (2) Do not place the battery in flames or water.
- (3) Do not pressurize and deform the battery.
- (4) This is a primary battery so do not charge it.



CAUTION

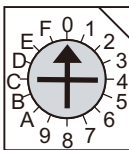
Do not short-circuit, charge, overheat, incinerate or disassemble the battery.

2.9.2 DIP Switch



As a standard setting, turn the all DIP switches OFF.

2.9.3 Rotary Switch



As a standard setting, set the rotary switch to "0" position.

Parameters

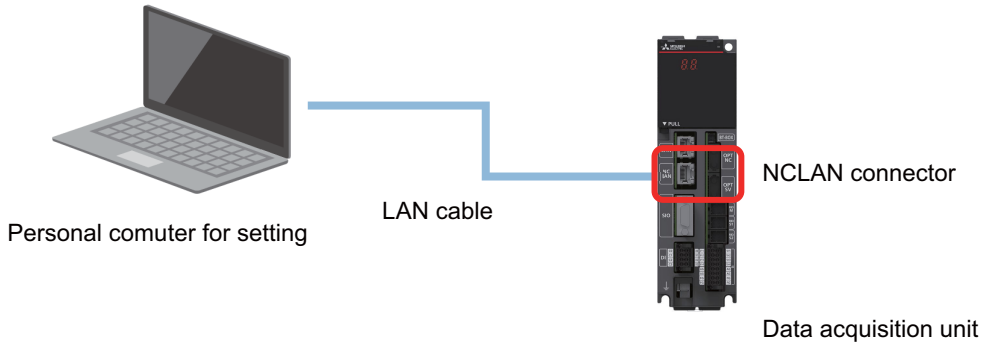
3.1 Setting Parameters

To set parameters of the unit, connect "NCLAN" of the unit and a personal computer for setting with an Ethernet cable, then access to the unit with a Web browser of the personal computer.

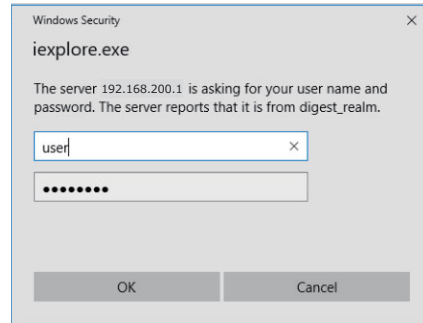
3.1.1 Displaying the Setting Screen

(1) Preparation

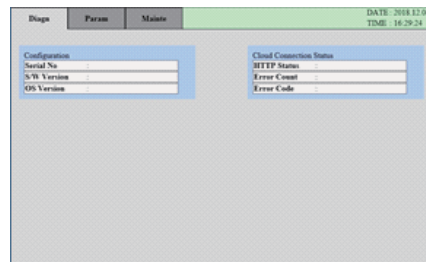
Connect to the network of the personal computer for setting and data acquisition unit as shown in the figure below.



(2) After starting the data acquisition unit, start the browser on the personal computer for setting, input "http://" followed by IP address of the data acquisition unit in the address bar. → The authentication dialog appears.



(3) Input "user" in the "User name" and "password" in the "Password", then press [OK] button. → The setting screen appears.



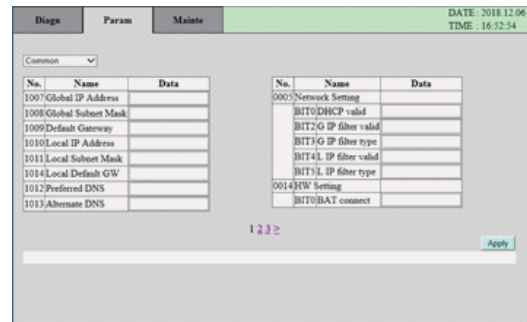
- (Note 1) When the data acquisition unit is in initial state, NCLAN IP address is set to "192.168.200.2". Input the IP address as that for the data acquisition unit in the address bar of the browser.
- (Note 2) When the information input in the "User name" or the "Password" in the authentication dialog is incorrect, after you press the "OK" button, the dialog appears again.
- (Note 3) When the "Cancel" button is pressed in the authentication dialog, a page with the message "401 Unauthorized" appears. When you access to the page by an operation such as pressing the refresh button on a browser, the authentication dialog appears again.

3.1.2 Switching the Diagnosis Screen and the Parameter Screen

(1) Click the [Param] tab on the setting screen.



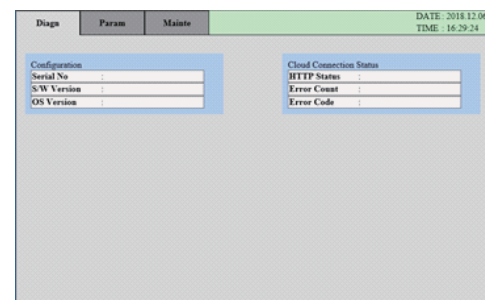
The parameter screen appears.



(2) Click the [Diagn] tab on the setting screen.



The diagnosis screen appears.



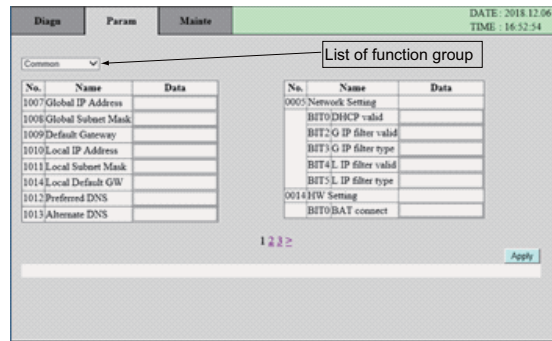
3.1.3 Switching the Parameter Display

(Example) Display the second page of the common parameter

(1) Select "Common" from the function group list.



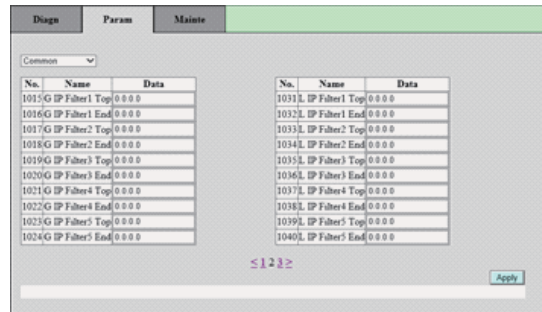
Common parameters appear.



(2) Click the page number "2" or ">".



The second page appears.



3.1.4 Setting Parameters

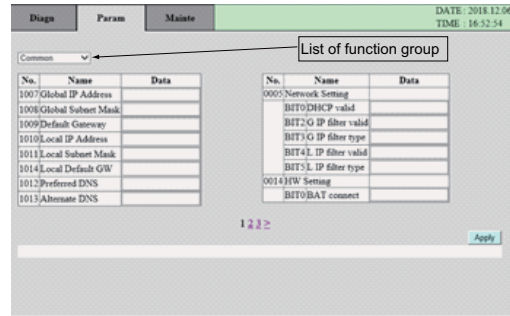
This section describes method for setting parameters. For the setting range for each parameter, refer to "Alarm/Parameter Manual".

(Example 1) Setting "192.168.100.2" to "1007 Global IP Address"

(1) Select "Common" from the function group list.



Common parameters appear.



(2) Move the cursor to the "Data" field of "1007 Global IP Address" and input "192.168.100.2".



"192.168.100.2" appears in the "Data" field.

| No. | Name | Data |
|------|-------------------|---------------|
| 1007 | Global IP Address | 192.168.100.2 |

(3) Press the [Apply] button.



"Setting completed" appears as a setting result under the [Apply] button.

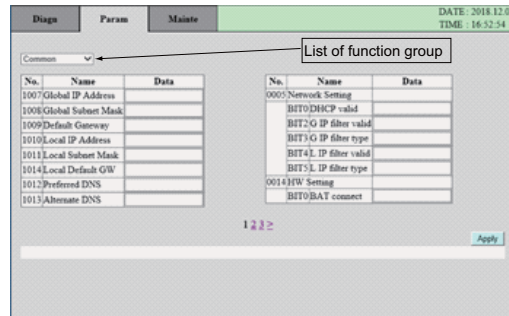
Setting completed

3 Parameters

(Example 2) Setting "1" to "BIT0 DHCP valid" of "0005 Network Setting"

(1) Select "Common" from the function group list.

➔ Common parameters appear.



(2) Input "1" in the "Data" field of "BIT0 DHCP valid".

➔ "1" appears in the "Data" field of "BIT0 DHCP valid".

| No. | Name | Data |
|------|-----------------|------|
| 0005 | Network Setting | |
| | BIT0 DHCP valid | 1 |

(3) Press the [Apply] button.

➔ "Setting completed" appears as a setting result under the [Apply] button.

Setting completed

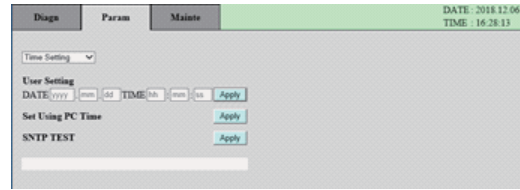
- (Note 1) For some parameters, changes take effect after the unit is turned ON again, and some other parameters requires you to turn ON the NC unit again to make them enable. When these parameters are changed, "UR" (restart the unit) and "PR" (restart the NC) appears on the right side of the tab.
- (Note 2) When parameter setting is failed, "No. XXXX Setting error" ("XXXX" indicates parameter No.) appears as a setting result. Correct the displayed input contents of the parameter value. When there are setting errors in multiple parameters, the number of the first parameter with an error appears.
- (Note 3) Parameters must be set for each page by pressing the [Apply] button.
- (Note 4) The message which appears after pressing the [Apply] button is cleared by switching the function group or switching the displayed page.

3.1.5 Setting the Time of the Data Acquisition Unit

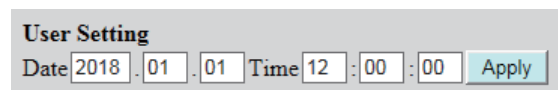
This section describes method for setting the time of the data acquisition unit.

(Example 1) Setting the time of the data acquisition unit to 12:00:00 on January 01, 2018

(1) Select "Time Setting" from the function group list. → Unit time setting screen appears.



(2) Input data for the following items of "User Setting": "2018", "01", "01" for "Date" and "12", "00", "00" for "Time". → The data appears for the following items of "User Setting": "2018", "01", "01" for "Date" and "12", "00", "00" for "Time".

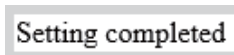


(3) Press the [Apply] button on the right of the "Date" and the "Time" of "User Setting". → "Setting completed" appears as a setting result under the "SNTP TEST".



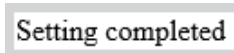
(Example 2) Setting the time of personal computer as the time of the data acquisition unit

(1) Press the [Apply] button on the right of "Set Using PC Time". → "Setting completed" appears as a setting result under the "SNTP TEST".



(Example 3) Setting the current time considering time difference from UTC as the time of the data acquisition unit

(1) Press the [Apply] button on the right of the "SNTP TEST". → "Setting completed" appears as a setting result under the "SNTP TEST".



(Note 1) When the time setting is failed, "Setting error" appears as a setting result. Correct the setting value.

(Note 2) The message which appears after pressing the [Apply] button is cleared by switching the function group.

3.1.6 Initializing the IP Address Setting of the Unit

If you cannot recall a setting value after changing "#1010 Local network IP address" from the initial state, the setting screen cannot be opened. In this case, initialize the IP address with the following method, and open the setting screen with the initial IP address and set a correct IP address.

(1) Temporarily disabling the IP address setting

When the rotary switch on the front of the unit is changed to "B" and the power is turned ON, the unit starts with the initial IP address. Input the initial IP address on a browser to open the setting screen, then input a correct IP address. When the rotary switch is changed from "B" to "0" and the unit is started without setting any IP address, the IP address returns to the original state with the setting value unknown.

(2) Clearing all the parameters

Change the rotary switch on the front side of the unit to "7" and turn ON the power. When "-" is displayed in the 7-segment LED, turn OFF the power. Next, change the rotary switch to "C" and turn ON the power. When "0" and "y" are displayed in the 7-segment LED, it means that parameters are all cleared. Turn OFF the power, and turn ON the power again after the rotary switch is set to "0". Input the initial IP address on a browser to open the setting screen, then input a correct IP address.

3.2 Parameter List

The list of parameters is as follows.

*1 Type for clearing error

PR: Restart the NC

UR: Restart the data acquisition unit

| No. | BIT | Function group | Type for clearing error *1 | | Name | Details | Setting range |
|-------|------|----------------------|----------------------------|----|--|--|--------------------------------------|
| | | | PR | UR | | | |
| #0001 | | NC-DRV communication | ○ | ○ | Basic Setting 1 | | |
| | BIT0 | | | | NC-DRV communication acquisition invalid | Select optical communication sampling between NC-DRVs valid/invalid. If no optical communication cable is connected to a unit, set this bit to "1". | 0: valid 1: invalid |
| #0002 | | DI/AI | — | ○ | Analog Input Set | | |
| | BIT0 | | | | AnalogIn1 Invalid | Select analog input channel 1 valid/invalid. | 0: valid 1: invalid |
| | BIT1 | | | | AnalogIn2 Invalid | Select analog input channel 2 valid/invalid. | 0: valid 1: invalid |
| | BIT2 | | | | AnalogIn3 Invalid | Select analog input channel 3 valid/invalid. | 0: valid 1: invalid |
| | BIT3 | | | | AnalogIn4 Invalid | Select analog input channel 4 valid/invalid. | 0: valid 1: invalid |
| #0003 | | DI/AI | — | ○ | Digital Input Set | | |
| | BIT0 | | | | DI1 Pol. Inversion | Invert the polarity of the digital input channel 1. | 0: no inversion 1: with inversion |
| | BIT1 | | | | DI2 Pol. Inversion | Invert the polarity of the digital input channel 2. | 0: no inversion 1: with inversion |
| | BIT2 | | | | DI3 Pol. Inversion | Invert the polarity of the digital input channel 3. | 0: no inversion 1: with inversion |
| | BIT3 | | | | DI4 Pol. Inversion | Invert the polarity of the digital input channel 4. | 0: no inversion 1: with inversion |
| | BIT4 | | | | DigitalIn1 Invalid | Select digital input channel 1 valid/invalid. | 0: valid 1: invalid |
| | BIT5 | | | | DigitalIn2 Invalid | Select digital input channel 2 valid/invalid. | 0: valid 1: invalid |
| | BIT6 | | | | DigitalIn3 Invalid | Select digital input channel 3 valid/invalid. | 0: valid 1: invalid |
| | BIT7 | | | | DigitalIn4 Invalid | Select digital input channel 4 valid/invalid. | 0: valid 1: invalid |
| #0005 | | General | — | ○ | Network Setting | | |
| | BIT0 | | | | DHCP valid | Enable DHCP function. | 0: invalid 1: valid |
| | BIT2 | | | | G IP filter valid | Enable IP address filter for global network. | 0: invalid 1: valid |
| | BIT3 | | | | G IP filter type | Select IP address filter type for global network. 0: Transmission - Permit access from the specified address. 1: Block - Deny access from the specified address. | 0: transmission 1: block |
| | BIT4 | | | | L IP filter valid | Enable IP address filter for local network. | 0: invalid 1: valid |
| | BIT5 | | | | L IP filter type | Select IP address filter type for local network. 0: Transmission - Permit access from the specified address. 1: Block - Deny access from the specified address. | 0: transmission 1: block |
| #0006 | | DI/AI | — | ○ | AI Scaling Set | | |
| | BIT0 | | | | Scaling 1 Set | Enable analog input (CH1) scaling for analog input function. | 0: invalid 1: valid |

3 Parameters

| No. | BIT | Function group | Type for clearing error *1 | | Name | Details | Setting range |
|-------|------|--------------------|----------------------------|----|--------------------|--|--|
| | | | PR | UR | | | |
| | BIT1 | | | | Scaling 2 Set | Enable analog input (CH2) scaling for analog input function. | 0: invalid 1: valid |
| | BIT2 | | | | Scaling 3 Set | Enable analog input (CH3) scaling for analog input function. | 0: invalid 1: valid |
| | BIT3 | | | | Scaling 4 Set | Enable analog input (CH4) scaling for analog input function. | 0: invalid 1: valid |
| #0007 | | RIO | — | ○ | RIO Com. Set | | |
| | BIT0 | | | | RioMCom. valid | Enable RIO master communication. | 0: invalid 1: valid |
| | BIT1 | | | | RioSCom. valid | Enable RIO slave communication. | 0: invalid 1: valid |
| | BIT2 | | | | RioTCom. valid | Enable RIO transfer function. | 0: invalid 1: valid |
| | BIT3 | | | | RioCard ID | Select RIO card ID. | 0: Set card ID to WN301 (for RIO2.0) or RX311 (for RIO1.0). 1: Set card ID to WN602 (for RIO2.0) or RX311 (for RIO1.0). |
| #0008 | | MQTT communication | — | — | MQTT SendAxisSet1 | | |
| | BIT0 | | | | MQTTch1 ax1 valid | Enable transmission of DRV data CH1 1st axis in MQTT communication. | 0: invalid 1: valid |
| | BIT1 | | | | MQTTch1 ax2 valid | Enable transmission of DRV data CH1 2nd axis in MQTT communication. | 0: invalid 1: valid |
| | BIT2 | | | | MQTTch1 ax3 valid | Enable transmission of DRV data CH1 3rd axis in MQTT communication. | 0: invalid 1: valid |
| | BIT3 | | | | MQTTch1 ax4 valid | Enable transmission of DRV data CH1 4th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT4 | | | | MQTTch1 ax5 valid | Enable transmission of DRV data CH1 5th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT5 | | | | MQTTch1 ax6 valid | Enable transmission of DRV data CH1 6th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT6 | | | | MQTTch1 ax7 valid | Enable transmission of DRV data CH1 7th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT7 | | | | MQTTch1 ax8 valid | Enable transmission of DRV data CH1 8th axis in MQTT communication. | 0: invalid 1: valid |
| #0009 | | MQTT communication | — | — | MQTT SendAxisSet2 | | |
| | BIT0 | | | | MQTTch1 ax9 valid | Enable transmission of DRV data CH1 9th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT1 | | | | MQTTch1 ax10 valid | Enable transmission of DRV data CH1 10th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT2 | | | | MQTTch1 ax11 valid | Enable transmission of DRV data CH1 11th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT3 | | | | MQTTch1 ax12 valid | Enable transmission of DRV data CH1 12th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT4 | | | | MQTTch1 ax13 valid | Enable transmission of DRV data CH1 13th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT5 | | | | MQTTch1 ax14 valid | Enable transmission of DRV data CH1 14th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT6 | | | | MQTTch1 ax15 valid | Enable transmission of DRV data CH1 15th axis in MQTT communication. | 0: invalid 1: valid |
| | BIT7 | | | | MQTTch1 ax16 valid | Enable transmission of DRV data CH1 16th axis in MQTT communication. | 0: invalid 1: valid |

3 Parameters

| No. | BIT | Function group | Type for clearing error *1 | | Name | Details | Setting range |
|-------|------|----------------------|----------------------------|----|--|--|---|
| | | | PR | UR | | | |
| #0012 | | MQTT communication | — | — | MQTT SendValidSet1 | | |
| | BIT0 | | | | MQTT DI valid | Enable transmission of DI data in MQTT communication. | 0: invalid 1: valid |
| | BIT1 | | | | MQTT RIO(M) valid | Enable transmission of RIO Master data in MQTT communication. | 0: invalid 1: valid |
| | BIT2 | | | | MQTT RIO(S) valid | Enable transmission of RIO Slave data in MQTT communication. | 0: invalid 1: valid |
| | BIT3 | | | | MQTT AI valid | Enable transmission of analog input data in MQTT communication. | 0: invalid 1: valid |
| #0014 | | General | — | ○ | HW Setting | | |
| | BIT0 | | | | BAT connect | Set the connection of the battery (Q6BAT, BT-BOX). | 0: not connected 1: connected |
| #0209 | | MQTT communication | — | — | DRV narrowing down | Select how to narrow down DRV data in MQTT communication. 0: Command position, Feedback position, Position droop, Grid amount, Speed feedback, Current feedback, and Display status 1: Data for the set value 0 and control status 1 to 6 2: Data for the set value 1 and current of the first and second layers in three-phase alternating current | 0: Command position, Feedback position, Position droop, Grid amount, Speed feedback, Current feedback, and Display status 1: Data for the set value 1 and control status 1 to 6 2: Data for the set value 1 and current of the first and second layers in three-phase alternating current |
| #0401 | | NC-DRV communication | ○ | ○ | Opt. Timeout | Set the timeout period to wait for runtime state transition between NC-DRV optical communication. | 0 to 10 (sec) |
| #0402 | | General | ○ | ○ | SNTP time lag (h) | Time difference from UTC to current location (hour) | -23 to 23 |
| #0403 | | General | ○ | ○ | SNTP time lag (m) | Time difference from UTC to current location (minute) | 0 to 59 |
| #0404 | | Remote service | — | ○ | Proxy port | Set the proxy server port number. | 0 to 65535 |
| #0407 | | General | ○ | ○ | SNTP Timeout | Set the timeout period for acquiring the time information from the SNTP server. | 0 to 30 (sec) 0: 5 (sec) (Default value) |
| #1007 | | General | — | ○ | Global network IP address | Set the IP address for global network. | 0.0.0.0 to 255.255.255.255 |
| #1008 | | General | — | ○ | Global network sub-net mask | Set the sub-net mask for global network. | 0.0.0.0 to 255.255.255.255 |
| #1009 | | General | — | ○ | Default gateway | Set the default gateway. | 0.0.0.0 to 255.255.255.255 |
| #1010 | | General | — | ○ | Local network IP address | Set the IP address for local network. | 0.0.0.0 to 255.255.255.255 |
| #1011 | | General | — | ○ | Local network sub-net mask | Set the sub-net mask for local network. | 0.0.0.0 to 255.255.255.255 |
| #1012 | | General | — | — | Preferred DNS server | Set the IP address of preferred DNS server. | 0.0.0.0 to 255.255.255.255 |
| #1013 | | General | — | — | Alternate DNS server | Set the IP address of alternate DNS server. | 0.0.0.0 to 255.255.255.255 |
| #1014 | | General | — | ○ | Local default GW | Set the default gateway for local network. | 0.0.0.0 to 255.255.255.255 |
| #1015 | | General | — | ○ | IP address filter 1 range top (global) | Set the top IP address of IP address filter range 1 for global network. | 0.0.0.0 to 255.255.255.255 |
| #1016 | | General | — | ○ | IP address filter 1 range end (global) | Set the end IP address of IP address filter range 1 for global network. | 0.0.0.0 to 255.255.255.255 |
| #1017 | | General | — | ○ | IP address filter 2 range top (global) | Set the top IP address of IP address filter range 2 for global network. | 0.0.0.0 to 255.255.255.255 |

3 Parameters

| No. | BIT | Function group | Type for clearing error *1 | | Name | Details | Setting range |
|-------|-----|--------------------|----------------------------|----|---------------------|--|----------------------------|
| | | | PR | UR | | | |
| #1051 | | MQTT communication | — | — | Broker's IP address | Set the IP address of the MQTT broker to be connected. | 0.0.0.0 to 255.255.255.255 |
| #1607 | | General | — | ○ | SNTP Server | Set the name of SNTP (Time synchronization) server. | String |
| #1608 | | MQTT communication | — | — | MQTT Unit Name | Set up the necessary unit name when broker is connected. | String |
| #1609 | | MQTT communication | — | — | MQTT User Name | When authenticating users, set the user name required when broker is connected. | String |
| #1610 | | MQTT communication | — | — | MQTT Password | When password authentication is performed, set the password required when broker is connected. | String |
| #1801 | | RIO | ○ | ○ | RIO-S Vrtl St. No. | Set the virtual rotary switch number as RIO slave station to connect NC. Set it from 0 to 63. It is invalid if -1 is set. | -1 to 63 |
| #1802 | | RIO | ○ | ○ | RIO-M Trsf St. No. | Set the rotary switch number of the slave station connected to this unit, if transfer is valid between the the slave station connected to this unit and the slave station inside this unit. With this setting, information can be exchanged between NC and the slave station connected to this unit. Set it from 0 to 63. It is invalid if -1 is set. | -1 to 63 |
| #1803 | | DI/AI | — | — | AI Input Data Rng | Set the input voltage range (upper limit) to be used for scale conversion with the analog input CH1 to CH4. | 0 to 10 |
| #1804 | | DI/AI | — | — | AI Scaling Max | Set the scaling range (upper limit) for scale conversion with analog input CH1 to CH4. | -32768 to 32767 |
| #1805 | | DI/AI | — | — | AI Scaling Min | Set the scaling range (lower limit) for scale conversion with analog input CH1 to CH4. | -32768 to 32767 |
| #1806 | | DI/AI | — | — | AI Offset Value | Set the scaling offset value for scale conversion with analog input CH1 to CH4. | -32768 to 32767 |

4

LED Display

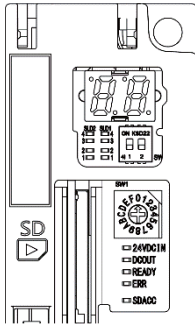
4 LED Display

LED has the following three types.

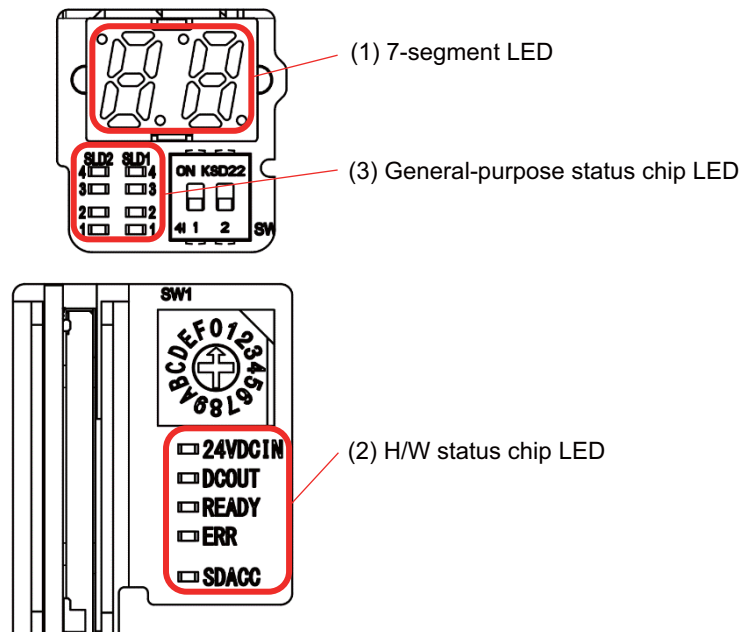
- (1) 7-segment LED
- (2) H/W status chip LED
- (3) General-purpose status chip LED (unused)

Display contents and meanings of LED from (1) to (3) are described in the following sections.

Upper part of the front of the data acquisition unit

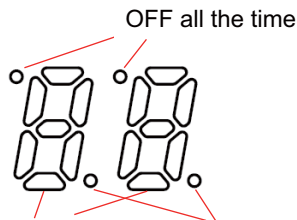


Expanded image of LED



4.1 Segment LED

7-segment LED display area indicates the state of the unit with 2-digit alphabets, numbers, symbols and dots in the lower right.



Character display (alphabets, numbers, symbols) dot

The correspondence between characters displayed on 7-segment LED display and characters to be displayed (alphabets, numbers, and symbols) is as follows.

| | | | | | | | | | | | | | | | |
|------|---|---|---|----|---|---|---|---|---|---|---|---|---|---|-------|
| (SP) | ! | “ | # | \$ | % | & | ‘ | (|) | * | + | , | - | . | / |
| | | | | | | | | | | | | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| | | | | | | | | | | | | | | | |
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| | | | | | | | | | | | | | | | |
| P | Q | R | S | T | U | V | W | X | Y | Z | [| ¥ |] | ^ | _ |
| | | | | | | | | | | | | | | | |
| ~ | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| | | | | | | | | | | | | | | | |
| p | q | r | s | t | u | v | w | x | y | z | { | | } | ~ | (DEL) |
| | | | | | | | | | | | | | | | |

The contents to be displayed on 7-segment LED can be classified into the following two:

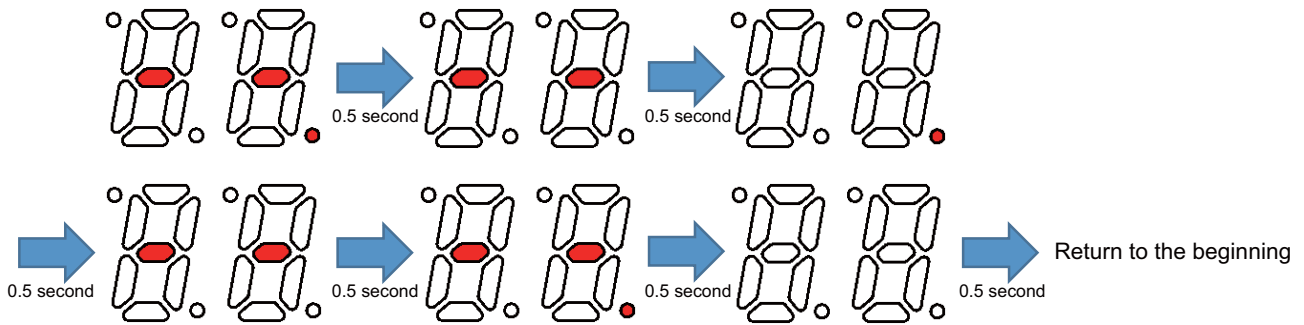
- Contents displayed on H/W, boot, and OS when the unit is turned ON
- Contents displayed on system S/W after the unit is turned ON (refer to "7-segment LED Display After Turning ON the Unit")

4.1.1 7-segment LED Display After Turning ON the Unit

After the data acquisition unit is turned ON, 7-segment LED displays an error occurs in the unit. In normal operation (when no error has occurred), hyphen "-" is displayed with blinking. The dot in the lower right of the second digit blinks every 0.5 second to indicate that the system has not turned down. The dot in the lower right of the first digit is off.

4.1.1.1 7-segment LED Display in Normal Operation

In normal operation (when no error has occurred), hyphen "-" is displayed with blinking. The hyphen "-" is turned on for 1 second and turned off for 0.5 second repeatedly. The dot turns on and off repeatedly every 0.5 second.



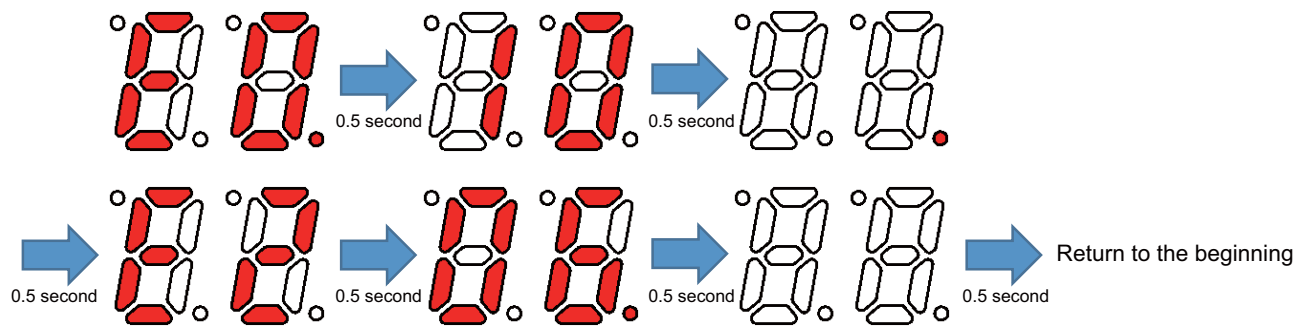
4.1.1.2 7-segment LED Display When an Error Occurred

When an error has occurred, error group code and error code of the error is repeatedly displayed on 7-segment LED. Error group code is displayed for 0.5 second, then error code for 0.5 second, and lastly the light turns off for 0.5 second. This operation is repeated.

When multiple errors have occurred, the error group codes and error codes are displayed in ascending order. This operation is repeated. When there is 21 or more errors have occurred simultaneously, the error group codes and error codes are displayed in ascending order. However, 21st and later errors are not displayed, and "Num of simul errors 20 over" (E0-01) appears for the 21st error.

When the factor of the error is removed and the machine status changes to normal (no error), 7-segment LED also returns to normal. The dot turns on and off repeatedly every 0.5 second.

7-segment LED display when an error has occurred (Example of E0-10 and E2-06 occurred simultaneously)



Refer to "Error List" for the error occurred in the unit.

4.2 H/W status chip LED

Display contents of H/W status chip LED are as follows.

| Name | Lamp state | Details |
|---------|--------------------|---|
| 24VDCIN | Lit (Yellow green) | 24V power is being supplied from the external power source. |
| | Not lit | The following factor may have caused an error: - No power is supplied from the external power source - Disconnection of fuse near DCIN connector - Failure of LED |
| DCOUT | Lit (Yellow green) | Each internal power supply generated from 24V is normally being output. |
| | Not lit | The following factor may have caused an error: - 24V power is not supplied from the external power source - Failure in any of the power output circuits - Failure of LED or IC which helps turn the LED on |
| READY | Lit (Yellow green) | Unit has been turned ON and the system started its periodic processing. |
| | Not lit | Periodic processing has not been started yet. |
| ERR | Lit (Red) | H/W is not operating properly. The following factor may have caused an error: - Occurrence of watchdog error - Failure of main CPU card |
| | Not lit | H/W is operating properly. |
| SDACC | Lit (Green) | Accessing to front side SD card |
| | Not lit | Not accessing to front side SD card |

4.3 General-purpose Status Chip

In display area of general-purpose status chip LED, the status of the unit is indicated with eight chip LEDs.



4.3.1 General-purpose Status Chip LED Display After Turning ON the Unit

LED display is as follows after the data acquisition unit is turned ON normally.



4.4 Error list

An error code consists of "E" and 3-digit code. The first digit next to "E" is called "Error group code". Errors are classified into groups. An error is figured out by a combination of the "Error group code" and "Detailed error code" which is represented by the second digit and the third digit.

[Error example]

E0 - 01

Error group code

Detailed error code

The classification of error groups and the list of errors are as follows.

The classification of error groups

| Error group No. | Classification |
|-----------------|---|
| E0 | Error related system, HW, SD or optical communication |
| E1 | Error related RIO, AI, DI, SIO |
| E2 | Network error |
| E3 | Analyzing process error |

Error list

*1 Type for clearing error

PR: Restart the NC

UR: Restart the data acquisition unit

| Error code | | Type for clearing error *1 | | Name | Details | Remedy |
|------------|---------------|----------------------------|----|-----------------------------|---|---|
| Group code | Detailed code | PR | UR | | | |
| E0 | 01 | — | — | Num of simul errors 20 over | The number of simultaneous errors exceeded 20. The 21st error and subsequent errors are not displayed. However, errors of 21st and subsequent errors are recorded in the error history. This error is not recorded in the error history. | Cancel the displayed 20 errors. |
| E0 | 02 | — | ○ | S/W error | An error occurred in the S/W process inside the unit. | Contact our service center. |
| E0 | 03 | — | ○ | System SD error | An error occurred in the system SD. | Contact our service center. |
| E0 | 04 | — | ○ | SD error | An error occurred in the SD. | Replace the SD card inserted in the unit. |
| E0 | 06 | — | — | Battery low | Battery voltage is low. | Replace the battery. |
| E0 | 07 | — | ○ | Battery exchange required | Battery replacement is required. | Replace the battery. |
| E0 | 08 | — | ○ | Overvoltage | Power supply voltage is abnormal. (Overvoltage) | Correct the power supply environment. |
| E0 | 09 | — | ○ | Undervoltage | Power supply voltage is abnormal. (Undervoltage) | Correct the power supply environment. |
| E0 | 10 | — | — | Overheat | The unit temperature has risen above the designated value. | Cooling measures are required. Turn OFF the unit power, or lower the temperature with a cooler, etc. |
| E0 | 11 | — | — | Heat notice | The unit temperature has risen above the designated value. | Cooling measures are required. Turn OFF the unit power, or lower the temperature with a cooler, etc. |

| Error code | | Type for clearing error *1 | | Name | Details | Remedy |
|------------|---------------|----------------------------|----|--------------------------------|---|---|
| Group code | Detailed code | PR | UR | | | |
| E0 | 12 | ○ | — | SV/SP information error | Parameter for the servo axis or the spindle could not be acquired. | Turn ON the NC power again. |
| E0 | 13 | ○ | — | Runtime state timeout | Unable to detect the transition to runtime state. Connection timed out. NC-DRV communication sampling is invalid. | Turn ON the NC power again. |
| E0 | 14 | — | ○ | Internal voltage fault 1 | Internal voltage fault 1 | Contact our service center. |
| E0 | 15 | — | ○ | Internal voltage fault 2 | Internal voltage fault 2 | Contact our service center. |
| E0 | 16 | — | ○ | Internal voltage fault 3 | Internal voltage fault 3 | Contact our service center. |
| E0 | 17 | — | ○ | Internal voltage fault 4 | Internal voltage fault 4 | Contact our service center. |
| E0 | 18 | — | ○ | Internal voltage fault 5 | Internal voltage fault 5 | Contact our service center. |
| E0 | 19 | — | ○ | Internal voltage fault 6 | Internal voltage fault 6 | Contact our service center. |
| E0 | 20 | — | ○ | Internal voltage fault 7 | Internal voltage fault 7 | Contact our service center. |
| E0 | 21 | — | ○ | Internal voltage fault 8 | Internal voltage fault 8 | Contact our service center. |
| E0 | 22 | — | ○ | Internal voltage fault 9 | Internal voltage fault 9 | Contact our service center. |
| E0 | 23 | — | ○ | Internal voltage fault 10 | Internal voltage fault 10 | Contact our service center. |
| E0 | 24 | — | ○ | Internal voltage fault 11 | Internal voltage fault 11 | Contact our service center. |
| E0 | 25 | — | ○ | Internal voltage fault 12 | Internal voltage fault 12 | Contact our service center. |
| E0 | 26 | — | ○ | Internal voltage fault 13 | Internal voltage fault 13 | Contact our service center. |
| E0 | 27 | — | ○ | Internal voltage fault 14 | Internal voltage fault 14 | Contact our service center. |
| E0 | 28 | — | ○ | Internal voltage fault 15 | Internal voltage fault 15 | Contact our service center. |
| E0 | 29 | — | ○ | Internal voltage fault 16 | Internal voltage fault 16 | Contact our service center. |
| E0 | 30 | — | ○ | H/W error 1 | H/W error 1 | Contact our service center. |
| E0 | 31 | — | ○ | Initialization waiting timeout | Initialization did not complete. Connection timed out. | Contact our service center. |
| E1 | 01 | — | ○ | RIO parameter error | RIO communication function parameter are not set correctly. | Set the RIO parameter of the DAU/RTU correctly. |
| E1 | 02 | — | ○ | Remote I/O error | Communication error occurred in RIO1.0 master communication. | Check the connection of the RIO unit or replace the RIO unit and turn ON the power again. |
| E1 | 03 | — | ○ | Remote I/O 2.0 error | Communication error occurred in RIO2.0 master communication. | Check the connection of the RIO unit or replace the RIO unit and turn ON the power again. |
| E1 | 04 | — | ○ | RIO initialize error | Error occurred in RIO initial communication. | Contact our service center. Set the station number of the RIO unit to a value from 1 to 8. Turn ON the DAU/RTU power again. |
| E2 | 01 | — | ○ | IP address acquisition failure | Failed to acquire IP address from DHCP. | Check communication to the DHCP server. Restart the unit. |
| E2 | 02 | — | ○ | Time synchronization failure | Time synchronization with the SNTP server failed. | Check communication to the SNTP server. Correct "#1607 SNTP server address". Correct "#0407 SNTP server timeout period". Restart the unit. |
| E2 | 03 | — | ○ | IP addr. filter disabled | The IP address filter is disabled, the IP address filter range setting is all 0. | Set "#1015-#1046 IP address filter range". |
| E2 | 04 | — | — | IP addr. filter range abnormal | The IP address filter range setting is all 0. | Set "#1015-#1046 IP address filter range". |
| E2 | 05 | — | — | Illegal unit name setting | The unit name is not set or characters that can not be used are set. | Correct "#1608 unit name". For "#1608 unit name", specify characters from "0 to 9", "a to z", and "A to Z". |
| E2 | 06 | — | — | Illegal broker's IP addr | The broker's IP address has not been set or an incorrect IP address is set. | Correct "#1051 MQTT broker IP Address". |

| Error code | | Type for clearing error *1 | | Name | Details | Remedy |
|------------|---------------|----------------------------|----|-------------------------------|--|--|
| Group code | Detailed code | PR | UR | | | |
| E2 | 07 | — | — | Transmission data size over | The total size of the selected transmission data exceeds the size that can be transmitted. | Correct the setting of the following parameters. "#0008-#0011 MQTT SendAxisSet1 to 4" "#0012/BIT0 MQTT DI valid" "#0012/BIT1 MQTT RIO(M) valid" "#0012/BIT2 MQTT RIO(S) valid" "#0012/BIT3 MQTT AI valid" "#0209 MQTT communication. Select DRV data narrowing down" |
| E2 | 08 | — | — | Transmission time over | Transmission processing could not be completed within 1.8 seconds due to insufficient network communication speed. | Check the communication speed of the network. Reduce the sampling data to be transmitted. |
| E2 | 09 | — | — | Protocol ver not acceptable | Connection return code 1 was received with the CONNACK message. | Prepare the broker corresponding to protocol version 3.1.1. |
| E2 | 10 | — | — | Client identifier rejection | Connection return code 2 was received with the CONNACK message. | Correct "#1608 unit name". Allow "#1608 unit name" as a client identifier in the broker. |
| E2 | 11 | — | — | Server unavailable | Connection return code 3 was received with the CONNACK message. | Make sure that the server is available. |
| E2 | 12 | — | — | Invalid user name or password | Connection return code 4 was received with the CONNACK message. | Correct "#1609 user name for broker connection" and "#1610 password for broker connection". Allow username/password at broker. |
| E2 | 13 | — | — | No authority | Connection return code 5 was received with the CONNACK message. | Check whether the client is allowed to connect. |

Appendix 1: EMC Installation Guidelines

For details of the drive section (servo/spindle drive unit), refer to "EMC Installation Guidelines" of instruction manuals for each drive unit.

5.1 Introduction

EMC Directives became mandatory as of January 1, 1996. The subject products must have a CE mark attached indicating that the product complies with the Directives.

As the NC unit is a component designed to control machine tools, we believe that it is not a direct EMC Directives subject. However, we would like to introduce the following measure plans to back up EMC Directives compliance of the machine tool as the NC unit is a major component of the machine tools.

- (1) **Methods of installation in control/operation panel**
- (2) **Methods of wiring cables to outside of panel**
- (3) **Introduction of members for measures**

Mitsubishi is carrying out tests to confirm the compliance to the EMC Directives under the environment described in this manual. However, the level of the noise varies depending on the equipment type and layout, control panel structure and wiring lead-in, etc.

Thus, we ask that the machine tool builder for confirming the final noise level.

5.2 EMC Directives

The items that the EMC Directives regulate can be roughly divided into the following two types.

- Emission: Capacity to prevent output of obstructive noise that adversely affects external devices
- Immunity: Capacity to not malfunction due to obstructive noise from external source

Contents of the regulation are summarized in the table below.

We assume that the standards and test contents required for a machine tool are almost the same as the following.

| Class | Name | Details | EN Standards | |
|----------|---|--|--|--------------------|
| Emission | | | | |
| | Radiated noise | Restriction of electromagnetic noise radiated through the air | EN61000-6-4 (General industrial machine) | EN55011 (CLASS: A) |
| | Conductive noise | Restriction of electromagnetic noise discharged from power supply line | EN61800-3 (Motor control unit) | |
| Immunity | | | | |
| | Static electricity electrical discharge | (Example) Regulation of withstand level of static electricity electrical discharge accumulated in human body | EN61000-6-2 (General industrial machine) EN61800-3 (Motor control unit) | EN61000-4-2 |
| | Radiation immunity | (Example) Simulation of immunity from digital wireless telephones | | EN61000-4-3 |
| | Burst immunity | (Example) Regulation of withstand level of noise from relay or plug and play | | EN61000-4-4 |
| | Conductive immunity | (Example) Regulation of withstand level of noise flowed from power supply wires, etc. | | EN61000-4-6 |
| | Power supply frequency magnetic field | (Example) Regulation of electromagnetic noise of 50/60Hz power supply frequency | | EN61000-4-8 |
| | Power supply dip (fluctuation) | (Example) Regulation of power voltage drop withstand level | | EN61000-4-11 |
| | Surge | (Example) Regulation of withstand level of noise caused by lightning | | EN61000-4-5 |

5.3 EMC Measures

The following items mainly need to be taken into account as a countermeasure for EMC.

- (1) Store the device in a sealed metal panel.
- (2) Ground all conductors that are floating electrically. Decrease the impedance.
- (3) Increase the distance between the drive line and signal wire.
- (4) Shield the cables wired outside of the panel.
- (5) Install a noise filter.

Pay attention to the following items to suppress the noise radiated outside of the panel.

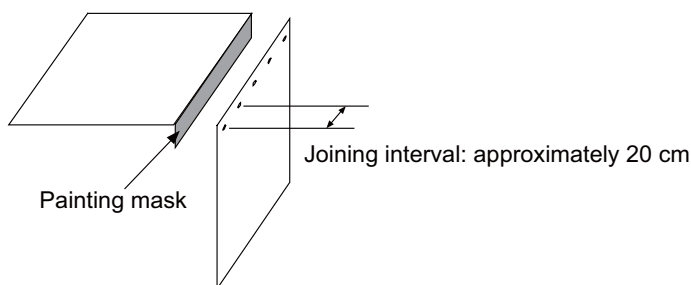
- (1) Accurately ground the devices.
- (2) Use shielded cables.
- (3) Increase the electrical seal of the panel. Reduce the gaps and holes.

5.4 Panel Structure

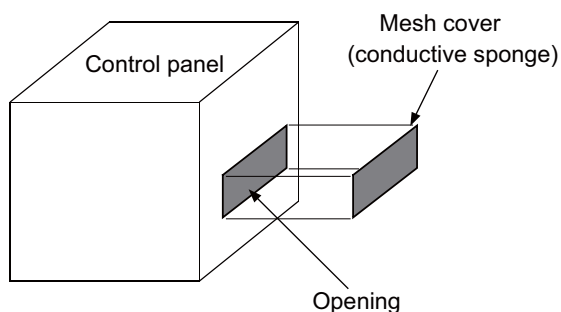
The design of the panel is a very important factor for the EMC measures. Take the following measures sufficiently into consideration when creating a panel.

5.4.1 Measures for Control Panel Body

- (1) Use metal for all members configuring the panel.
- (2) When joining the metal plate, treat the welded or contacting sections so that the impedance is reduced, and then fix with screws.



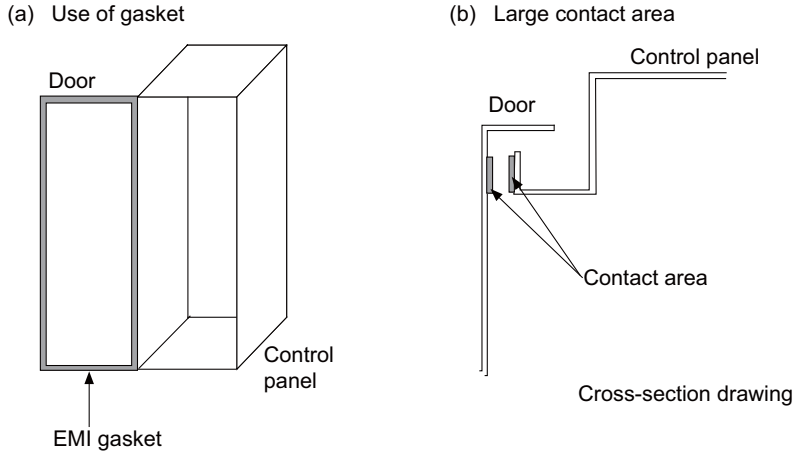
- (3) Be careful not to bend the plate by such as screwing work. If there is a gap, noise leaks out from that part.
- (4) Plate (nickel tin) the metal plate surface at the grounding plate, and connect the connection parts with the low impedance.
- (5) If there is a large opening, such as ventilation holes, make sure to close the hole.



- (Note 1) Using screws to fix the plates that have been painted is the same as an insulated state. Remove the paint and fix the screws.

5.4.2 Measures for Door

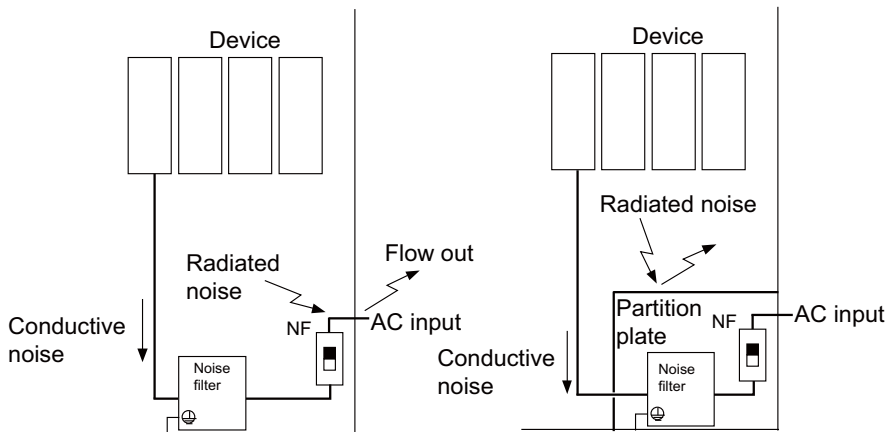
- (1) Use metal for all members configuring the panel.
- (2) When joining the door, use a gasket to lower the impedance of the contacting sections, or use a structure with a large contact area as shown below.
- (3) The EMI gasket or conductive packing must contact the metal surface uniformly and at the correct position.



- (Note 1) When not using a gasket, ground the control panel grounding with a grounding wire to lower the door's impedance.
- (Note 2) Using screws to fix the plates that have been painted (attachment of packing) is the same as an insulated state. Remove the paint and fix the screws.

5.4.3 Measures for Power Supply

- (1) Shield the power supply section and insert a filter to prevent the noise from flowing in or out. Selection of the noise filter capacity varies depending on the drive unit and devices to be used.



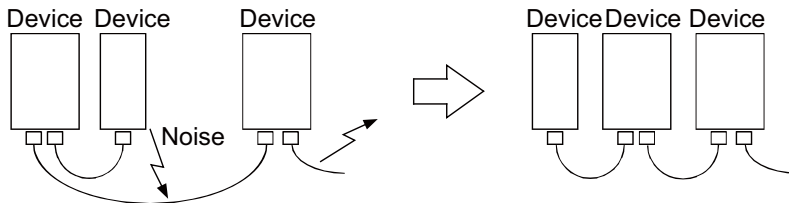
- (Note 1) The conductive noise can be suppressed by inserting a noise filter, but the radiated noise will flow out.
- (Note 2) The conductive and radiated noise can both be suppressed by adding a partition plate to the noise filter.

5.5 Measures for Wiring in Panel

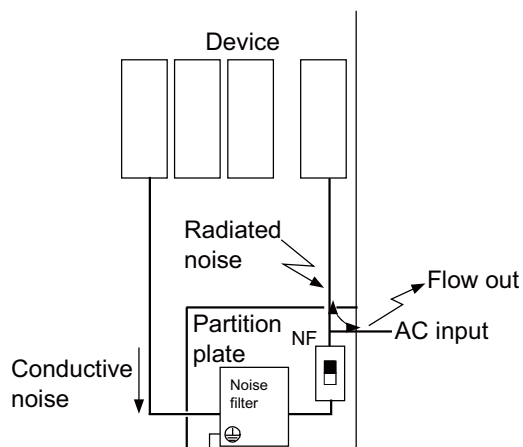
Cables act as antennas to propagate unnecessary noise, and thus must be appropriately shielded and treated. The following measures must be sufficiently taken into consideration to install cables that carry out high-speed communication (J210/J303).

5.5.1 Precautions for Wiring in Panel

- (1) If the cables are led unnecessarily in the panel, they easily pick up noise. Pay attention to the device layout and wire length so that the wiring length is as short as possible.



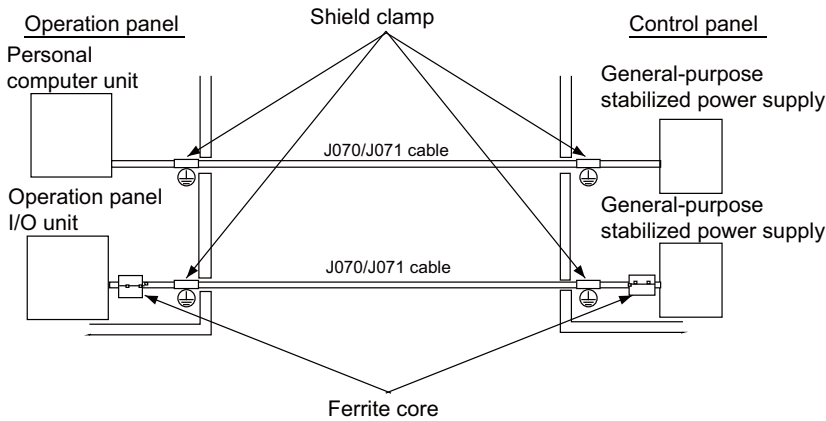
- (2) Always connect the grounding wire to the FG terminal indicated on the device.
- (3) Keep the distance between the drive line and encoder cable to the drive section motor as much as possible when wiring.
- (4) Do not lead the power supply wire around the panel without using a filter.



5.5.2 Shield Treatment of Cables

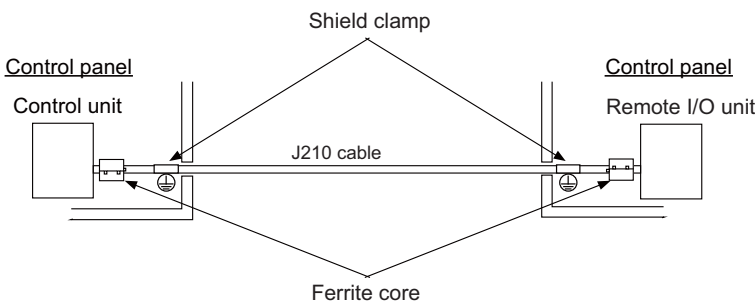
Use shielded cables for the cables wired outside the panel.
 Use a shield clamp within 10 cm of the lead-out port from the panel. (Refer to "EMC Countermeasure Parts: Shield Clamp Fitting".)

(1) DC power supply cable [J070/J071 cable]



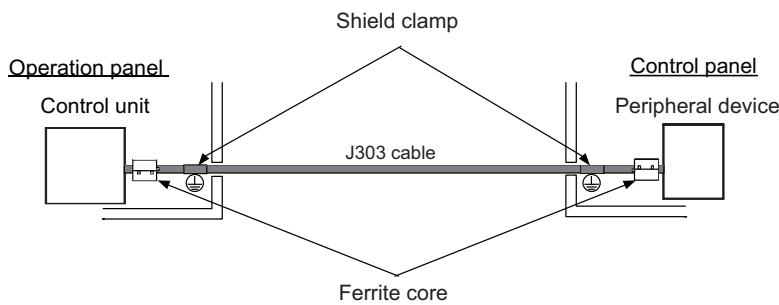
- Use a shield clamp within 10 cm from the panel's inlet/outlet.
- When using a ferrite core, install it on both ends of the connected units.
- Always install a ferrite core (refer to "EMC Countermeasure Parts: Ferrite Core") on the general-purpose stabilized power supply. The ferrite core may not be required depending on the selected power supply.

(2) Remote I/O cable [J210 cable]



- Use a shield clamp within 10 cm from the panel's inlet/outlet.
- When using a ferrite core, install it on both ends of the connected units.

(3) LAN cable [J303 cable]



- Use a shielded cable. Use a shield clamp within 10 cm from the panel's inlet/outlet.
- When using a ferrite core, install it on both ends of the connected units.

5.6 EMC Countermeasure Parts

5.6.1 Shield Clamp Fitting

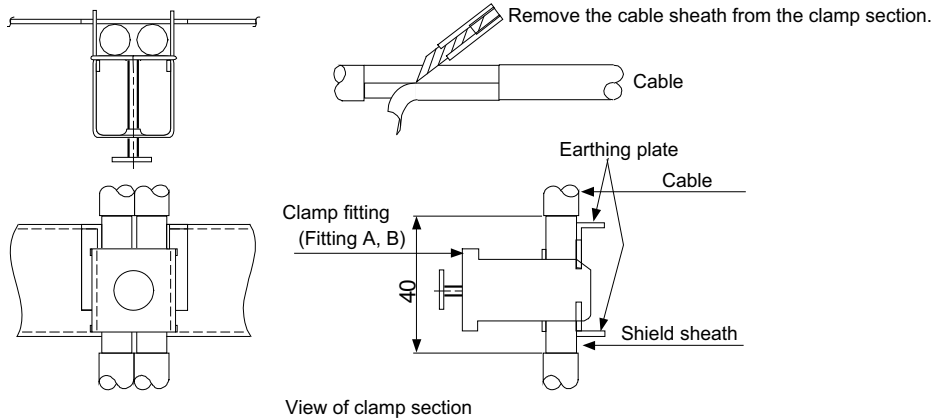
The effect can be improved by directly connecting the cable's shield sheath to the grounding plate as shown below. Install the grounding plate near the outlet (within 10 cm) of each panel, and press against the grounding plate with the clamp fitting.

If the cables are thin, several can be bundled and clamped together.

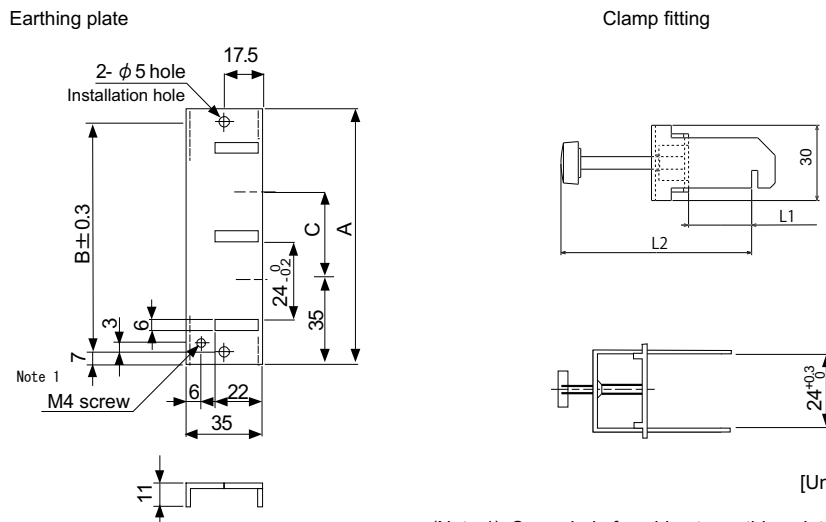
To provide sufficient frame ground, install the grounding plate directly on the cabinet or connect with a grounding wire.

| | A | B | C | Enclosed fittings |
|-----------------|-----|----|----|-------------------|
| Ground Plate #D | 100 | 86 | 30 | Clamp fitting A×2 |
| Ground Plate #E | 70 | 56 | - | Clamp fitting B×1 |

| | L1 (maximum dimension when it is open) | L2 (reference dimension) |
|-----------------|--|--------------------------|
| Clamp fitting A | 25 | (77) |
| Clamp fitting B | 12 | (54) |



• Outline drawing



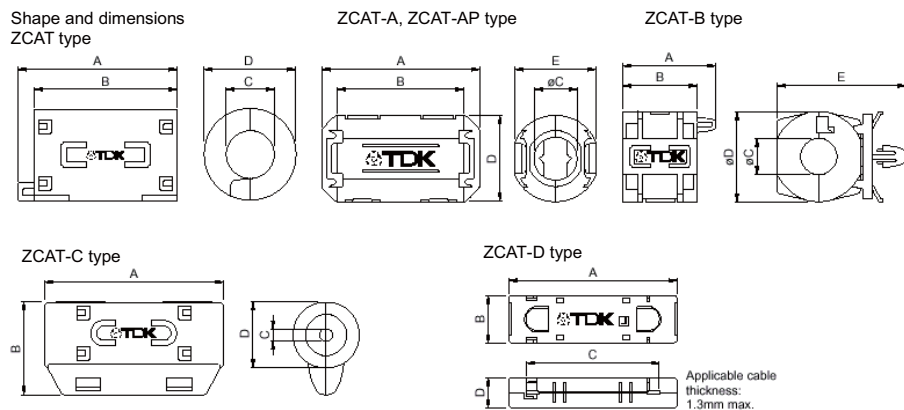
(Note 1) Screw hole for wiring to earthing plate in cabinet.
 (Note 2) The earthing plate thickness is 1.6mm.

5.6.2 Ferrite Core

The ferrite core is mounted integrally with the plastic case.

This can be installed with one touch without cutting the interface cable or power supply cable.

This ferrite core is effective for common mode noise, and countermeasures for noise can be taken without affecting the quality of the signal.



Recommended ferrite core: TDK ZCAT Series

| | | | | | | | Unit: mm |
|-------------------------|--------|--------|-------|--------|--------|---------------------------------|----------|
| Part Name | A | B | φC | φD | E | Applicable cable outer diameter | Mass (g) |
| ZCAT1518-0730-M(-BK)*1 | 22±1 | 18±1 | 7±1 | 15±1 | - | 7 maximum | 6 |
| ZCAT1518-0730(BK)*2 | 22±1 | 18±1 | 7±1 | 15±1 | - | 7 maximum | 6 |
| ZCAT2017-0930-M(-BK) | 21±1 | 17±1 | 9±1 | 20±1 | - | 9 maximum | 11 |
| ZCAT2032-0930-M(-BK)*1 | 36±1 | 32±1 | 9±1 | 19.5±1 | - | 9 maximum | 22 |
| ZCAT2032-0930(-BK)*2 | 36±1 | 32±1 | 9±1 | 19.5±1 | - | 9 maximum | 22 |
| ZCAT2132-1130-M(-BK)*1 | 36±1 | 32±1 | 11±1 | 20.5±1 | - | 11 maximum | 22 |
| ZCAT2132-1130(-BK)*2 | 36±1 | 32±1 | 11±1 | 20.5±1 | - | 11 maximum | 22 |
| ZCAT3035-1330-M(-BK)*1 | 39±1 | 34±1 | 13±1 | 30±1 | - | 13 maximum | 63 |
| ZCAT3035-1330(-BK)*2 | 39±1 | 34±1 | 13±1 | 30±1 | - | 13 maximum | 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) | 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 | 9 maximum | 12 |
| ZCAT2749-0430C-M(-BK) | 49±1 | 27±1 | 4.5±1 | 19.5±1 | - | 4.5 maximum | 26 |
| ZCAT4625-3430D(-BK) | 45.5±1 | 24.5±1 | 34±1 | 12±1 | - | 26 For core flat cable | 32 |
| ZCAT4625-3430DT(-BK)*3 | 45.5±1 | 24.5±1 | 34±1 | 13±1 | - | 26 For core flat cable | 32 |
| ZCAT6819-5230D(-BK) | 67.5±1 | 18.5±1 | 52±1 | 16±1 | - | 40 For core flat cable | 58 |
| ZCAT6819-5230DT(-BK)*3 | 67.5±1 | 18.5±1 | 52±1 | 17±1 | - | 40 For core flat cable | 58 |

*1 The M stamp is attached.

*2 A fixing band is attached at shipment.

*3 The core is fixed with double-sided tape. (The tape is enclosed with the part.)

● ZCAT-B type: Cabinet fixing type installation hole φ 4.8 to 4.9 mm, plate thickness 0.5 to 2 mm

● ZCAT-AP, ZCAT-C type: Structure that prevents easy opening after case is closed.

5.6.3 Surge Absorber

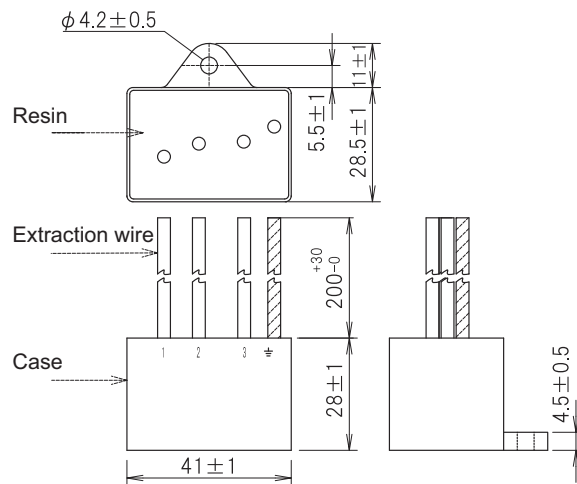
Make sure that the surge does not directly enter the AC line of the general-purpose stabilized power supply (user-prepared) supplying power to the control unit and DIO. Select a product equivalent to or higher than the following products for the surge absorber. Refer to the manufacturer catalog for detailed characteristics, outline and connection methods of the surge absorber.

(1) **Part name: RSPD-250-U4**

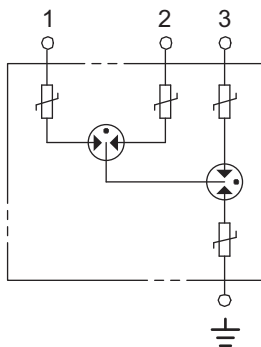
Manufacturer: OKAYA ELECTRIC INDUSTRIES

| Rated Voltage (50/60Hz) | DC Breakdown voltage | Voltage protection level | Normal discharge current | Maximum discharge current | Surge current life |
|-------------------------|----------------------|--------------------------|--------------------------|---------------------------|---------------------------------------|
| 250VAC (Three phase) | 700V±25% | 1.3kV | 8/20µs 2.5kA | 8/20µs 5kA | Approximately 300 times 8/20µs-1kA |

Outline drawing



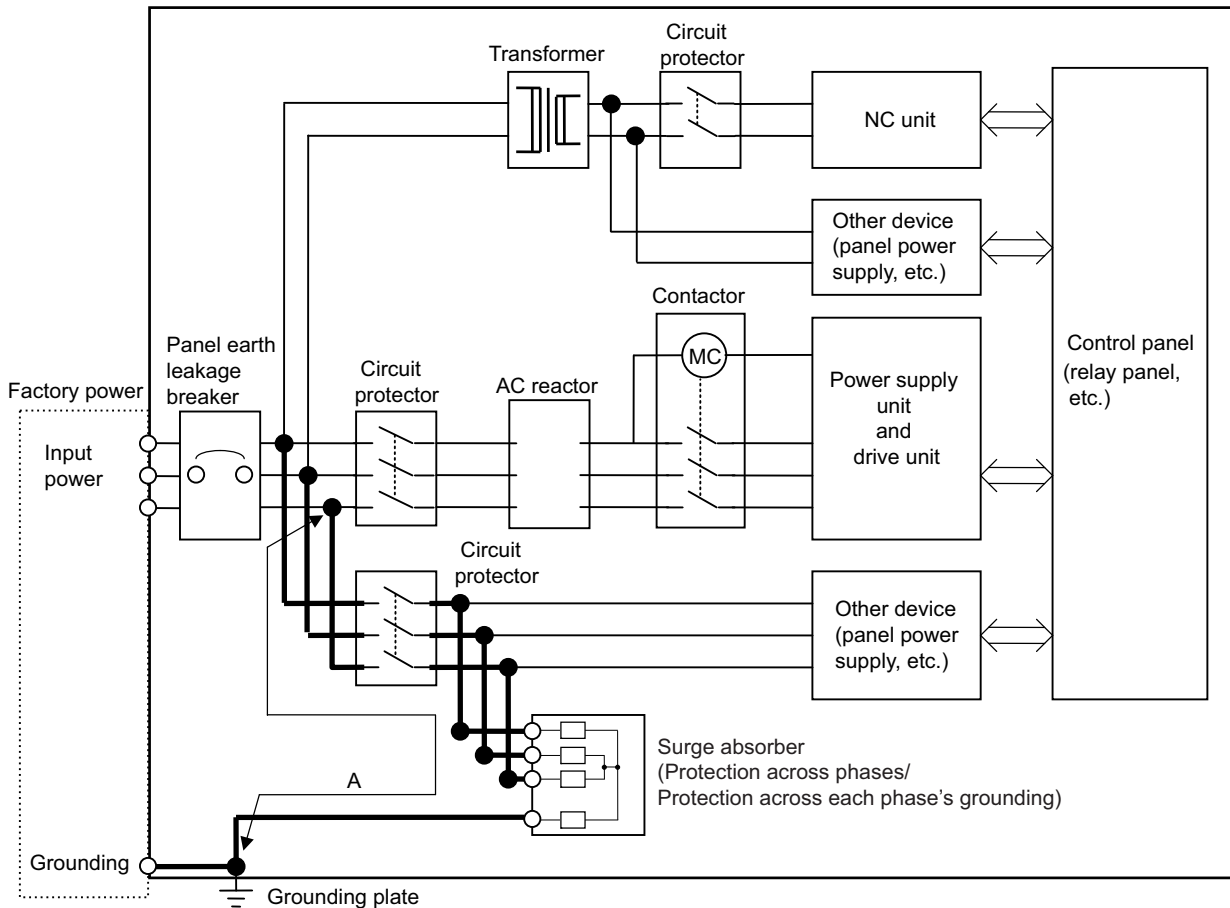
Circuit drawing



(2) Example of surge absorber installation

An example of installing the surge absorber in the machine control panel is shown below.

A short-circuit fault will occur in the surge absorber if a surge exceeding the tolerance is applied. Thus, install a circuit protection breaker in the stage before the surge absorber. Note that almost no current flows to the surge absorber during normal use. Therefore, a breaker installed as the circuit protection for another device can be used with the surge absorber.



Surge absorber installation

⚠ CAUTION

1. The wires from the surge absorber should be connected without extensions.
2. If the surge absorber cannot be installed just with the enclosed wires, keep the wiring length of A to 2m or less. If the wires are long, the surge absorber's performance may drop and inhibit protection of the devices in the panel.
3. Surge absorber to be selected varies depending on input power voltage.
4. Do not insert the surge absorber in the place with a lot of harmonic components.

5.6.4 Selection of Stabilized Power Supply

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

Stabilized power supply selection items

| Item | | Standard setting | Remarks |
|---------------------|---------------------|---------------------|--|
| Output | Voltage fluctuation | ±5% | ±5% or less of 24VDC output |
| | Ripple noise | 120 mV (maximum) | |
| | Spike noise | 500 mV (maximum) | |
| Output current | | --- | Refer to the maximum current consumption of the unit in use and calculate. |
| Output holding time | | 20 ms (min) | Instantaneous power failure time (AC side) |

Standards

Safety Standards: UL1950, CSA C22.2 No. 234 approved, IEC950 compliant

Noise Terminal Voltage: FCC Class A, VCCI-Class A

High Harmonics Current Restrictions: IEC61000-3-2

Appendix 2: Precautions for Compliance to UL/c-UL Standards

- (1) Selection of external 24VDC power supply unit (The unit shall be prepared by the machine tool builder.)

This NC system complies with the UL Standards on the condition that the stabilized power supply unit supplying 24VDC to each unit is a UL-approved part of SELV/limited power LPS or Class 2.

Use a UL-approved part for the stabilized power supply unit supplying 24VDC to each unit.

- (2) Unit ambient temperature

This NC system complies with the UL Standards on the condition that the unit is used at a temperature less than the maximum ambient temperature given in "Environment Conditions" section. Make sure that the maximum ambient temperature of each unit does not exceed the temperature given in "Environment Conditions" section.

Revision History

| Date of revision | Manual No. | Revision details |
|------------------|-----------------|--|
| Nov. 2019 | IB(NA)1501548-A | First edition created. |
| Oct. 2020 | IB(NA)1501548-B | The following chapters were revised. - Introduction - Precautions for Safety |
| | | |

Global Service Network

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Baltimore, MD Service Satellite
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Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible. Please contact your Mitsubishi Electric dealer with any questions or comments regarding the use of this product.

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|------------|-----------------------|
| MODEL | Data Acquisition Unit |
| MODEL CODE | 100-681 |
| Manual No. | IB-1501548 |