User's Manual

Hardware Manual

●QR Code

The product has a QR Code pasted for efficient plant maintenance work and asset information management.
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For more details,please refer to the following URL.
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Applicable Product

● **Range-free Controller FA-M3**

The document number for this manual is given below.

Refer to the document number in all communications, including when purchasing additional copies of this manual.

- Document No.: IM 34M06C11-01E

Precautions

■ About This Manual

- This Manual should be passed on to the end user.

- This manual is an essential part of the product; keep it in a safe place for future reference.

- This product is designed to be used by a person with specialized knowledge.

- Before using the product, read this manual thoroughly to have a clear understanding of the product.

- This manual explains the functions of this product, but there is no guarantee that they will suit the particular purpose of the user.

- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.

- The contents of this manual are subject to change without prior notice.

- Every effort has been made to ensure accuracy in the preparation of this manual. However, should any errors or omissions come to the attention of the user, please contact the nearest Yokogawa Electric representative or sales office.

■ Safety Symbols

- **"Handle with care."** This symbol on the product indicates that the operator must follow the instructions laid out in this user's manual to avoid the risk of personnel injuries, fatalities, or damage to the instrument.

- **Protective Conductor Terminal**

  This terminal is to prevent electric shock. Before using the instrument, connect to the Protective earth (Comply with the regulation of each country.), and route the line through the shortest path possible.

- **Functional Earth Terminal**

  This terminal is for stable operation. Before using the instrument, be sure to ground this terminal.

- **Alternating current.** Indicates alternating current.

- **Direct current.** Indicates direct current.

The following symbols are used only in the user's manual.

⚠️ **WARNING**

- Draws attention to information essential to prevent electrical shock or other dangers that may result in injury or the loss of life.

⚠️ **CAUTION**

- Draws attention to information essential to prevent hardware damage, software damage or system failure.

NOTE

- Draws attention to information essential to the understanding of operation and functions.

■ Safety Precautions when Using/Maintaining the Product

- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety stated in this manual whenever handling the product. Take special note that if you handle the product in a manner other than prescribed in these instructions, the protection feature of the product may be damaged or impaired. In such cases, Yokogawa cannot guarantee the quality, performance, function and safety of the product.

- When installing protection and/or safety circuits such as lightning protection devices and equipment for the product and control system as well as designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of processes and lines using the product and the system controlled by it, the user should implement it using devices and equipment, additional to this product.

- If component parts or consumable are to be replaced, be sure to use parts specified by the company.

- This product is not designed or manufactured to be used in critical applications which directly affect or threaten human lives and safety — such as nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, shipboard equipment, aviation facilities or medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.

- Do not attempt to modify the product.

- To avoid electrical shock, turn off the power before wiring.

- This product is classified as Class A for use in industrial environments. If used in a residential environment, it may cause electromagnetic interference (EMI).

  In such situations, it is the user's responsibility to adopt the necessary measures against EMI.

■ Exemption from Responsibility

- Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa Electric) makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.

- Yokogawa Electric assumes no liability to any party for any loss or damage, direct or indirect, caused by the use or any unpredictable defect of the product.

■ Software Supplied by the Company

- Yokogawa Electric makes no other warranties expressed or implied except as provided in its warranty clause for software supplied by the company.

- Use the software with one computer only. You must purchase another copy of the software for use with each additional computer.

- Copying the software for any purposes other than backup is strictly prohibited.

- Store the original media that contain the software in a safe place.

- Reverse engineering, such as decompiling of the software, is strictly prohibited.

- Under absolutely no circumstances may the software supplied by Yokogawa Electric be transferred, exchanged, or sublet or leased, in part or as a whole, for use by any third party without prior permission by Yokogawa Electric.

■ General Requirements for Using the FA-M3 / e-RT3 Controller

● Set the product in a location that fulfills the following requirements:

- INDOOR USE ONLY
- This product is an open equipment. The product must be installed in a metallic panel enclosure with an impact rating IK08 or more.
- Where the product will not be exposed to direct sunlight, and where the operating surrounding air temperature is from 0°C to 55°C (32°F to 131°F).

  There are modules that must be used in an environment where the operating surrounding air temperature is in a range smaller than 0°C to 55°C (32°F to 131°F). Refer to "Hardware Manual" (IM 34M06C11-01E) or the applicable user's manual. In case of attaching such a module, the entire system's operating surrounding air temperature is limited to the module's individual operating surrounding air temperature.
- Where the relative humidity is from 10 to 90%.

  In places where there is a chance of condensation, use a space heater or the like to constantly keep the product warm and prevent condensation.
- For use in Pollution Degree 2 Environment.
- Where there are no corrosive or flammable gases.
- Where the product will not be exposed to mechanical vibration or shock that exceed specifications.
- Where there is no chance the product may be exposed to radioactivity.

● Use the correct types of wire for external wiring:

- USE COPPER CONDUCTORS ONLY.
- Use conductors with temperature rating above 75°C.

● Securely tighten screws:

- Securely tighten module mounting screws and terminal screws to avoid problems such as faulty operation.
- Tighten terminal block screws with the correct tightening torque as given in this manual. Refer to the "Hardware Manual" (IM 34M06C11-01E) or the applicable user's manual for the appropriate tightening torque.

● Securely lock connecting cables:

- Securely lock the connectors of cables, and check them thoroughly before turning on the power.

● Interlock with emergency-stop circuitry using external relays:

- Equipment incorporating the FA-M3 / e-RT3 controller must be furnished with emergency-stop circuitry that uses external relays. This circuitry should be set up to interlock correctly with controller status (stop/run).

● Ground for low impedance:

- For safety reasons, connect the [FG] grounding terminal to a protective earth (Comply with the regulation of each country.). For compliance to CE Marking, use braided or other wires that can ensure low impedance even at high frequencies for grounding.

- **Configure and route cables with noise control considerations:**

  - Perform installation and wiring that segregates system parts that may likely become noise sources and system parts that are susceptible to noise. Segregation can be achieved by measures such as segregating by distance, installing a filter or segregating the grounding system.

- **Configure for CE Marking Conformance:**

  - For compliance to CE Marking, perform installation and cable routing according to the description on compliance to CE Marking in the "Hardware Manual" (IM 34M06C11-01E).

  - The list of CE conforming models is available in Appendix A2. of "Hardware Manual".

- **Keep spare parts on hand:**

  - We recommend that you stock up on maintenance parts, including spare modules, in advance.

  - Preventive maintenance (replacement of the module) is required for using the module beyond 10 years.

- **Discharge static electricity before touching the system:**

  - Because static charge can accumulate in dry conditions, first touch grounded metal to discharge any static electricity before touching the system.

- **Wipe off dirt with a soft cloth:**

  - Gently wipe off dirt on the product's surfaces with a soft cloth.

  - If you soak the cloth in water or a neutral detergent, tightly wring it out before wiping the product. Letting water enter the module interior can cause malfunctions.

  - Do not use volatile solvents such as benzine or paint thinner or chemicals for cleaning, as they may cause deformity, discoloration, or malfunctioning.

- **Avoid storing the FA-M3 /e-RT3 controller in places with high temperature or humidity:**

  - Since the CPU module has a built-in battery, avoid storage in places with high temperature or humidity.

  - Since the service life of the battery is drastically reduced by exposure to high temperatures, take special care (storage surrounding air temperature should be from -20°C to 75°C).

  - There is a built-in lithium battery in a Sequence CPU module which serves as backup power supply for programs, device information and configuration information.

    In the case of F3SP□□, the service life of the battery is over 10 years in a non-energized state at room temperature. For F3RP6 , F3RP7 and F3NP5 , see each the User's Manual for the service life of the battery.

    Take note that the service life of the battery may be shortened when installed or stored at locations of extreme low or high temperatures. Therefore, we recommend that modules with built-in batteries be stored at room temperature.

- **Always turn off the power before installing or removing modules:**

  - Failing to turn off the power supply when installing or removing modules, may result in damage.

● **Do not touch components in the module:**

  - In some modules you can remove the right-side cover and install ROM packs or change switch settings. While doing this, do not touch any components on the printed-circuit board, otherwise components may be damaged and modules may fail to work.

● **Do not use unused terminals:**

  - Do not connect wires to unused terminals on a terminal block or in a connector. Doing so may adversely affect the functions of the module.

● **Use the following power source:**

  - Use only F3PU□□-□□ as the power supply module.
  - If using this product as a UL-approved product, for the external power supply, use a limited voltage / current circuit power source or a Class 2 power source.
  - If using this product as a CE-complied product, for the external power supply, use a SELV and limited-energy circuit separated by reinforced insulation or double insulation from hazardous voltage.

● **Refer to the user's manual before connecting wires:**

  - Refer to the "Hardware Manual" (IM 34M06C11-01E) or the applicable user's manual for the external wiring drawing.
  - Refer to "A3.6.5 Connecting Output Devices" in the "Hardware Manual" before connecting the wiring for the output signal.
  - Refer to "A3.5.4 Grounding Procedure" in the "Hardware Manual" for attaching the grounding wiring.

● **Authorized Representative in the EEA:**

  - The Authorized Representative for this product in the EEA is:

    Yokogawa Europe B. V.

    Euroweg 2, 3825 HD Amersfoort, The Netherlands

● **In relation to UKCA marking, the importer for this product into Great Britain market via the YOKOGAWA sales channel is:**

  - **Yokogawa United Kingdom Limited**, Stuart Road Manor Park Runcorn, WA7 1TR, United Kingdom.

■ General Requirements for Using the FA-M3 Slave Units (TAH Series)

● Connect YHLS cable to SHIELD terminal:

- Connect the DRAIN line of the YHLS cable to the SHIELD terminal of the YHLS master module securely. Failing to do so may affect the performance of the YHLS system.

● Do not touch components in the unit:

- Do not remove the back cover of the unit. Doing so may cause a failure.

■ Waste Electrical and Electronic Equipment (WEEE)

Waste Electrical and Electronic Equipment (WEEE)

(Only valid in the EEA for EU WEEE Directive and in the UK for UK WEEE Regulation)

This product complies with the WEEE marking requirement.

This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

When disposing of products in the EEA and UK, contact your local Yokogawa office in the EEA and/or UK respectively.

■ How to dispose the batteries

(Only valid in the EEA for EU Battery Directive/Regulation and in the UK for UK Battery Regulation)

Batteries are included in some modules of this product.

This marking indicates they shall be sorted out and collected as ordained in the EU battery Directive/Regulation and UK battery Regulation.

The procedure is different when the user can remove or cannot remove.

①Batteries the user can remove

The battery of F3RP6□, F3RP7□ and F3NP5□ can be removed by yourself.
When you remove the battery from F3RP6□, F3RP7□ and F3NP5□ dispose it, discard them in accordance with domestic law concerning disposal. See the User's Manual of F3RP6□, F3RP7□ and F3NP5□ for the removal procedure.

If you don't remove the battery from this product, please see ②.

②Batteries the user cannot remove

Dispose the battery together with this product.
When you dispose this product in the EEA and UK, contact your local Yokogawa office in the EEA and/or UK respectively.
Do not dispose them as domestic household waste.

Battery category: Lithium battery

Introduction

■ Overview of the Manual

This manual explains the configuration, specifications, compatible specification, and installation of the Range-Free Multi-controller FA-M3. It also discusses the individual specifications of power supply modules, base modules, I/O modules, cables and terminal block units.

■ Configuration of the Manual

This manual consists of three parts.

● Part A   Standard Version

The main part of this manual explains all the details of the FA-M3 system except for those of the FA-M3 Value and FA-M3 Value II.

● Part B   FA-M3 Value (F3SC21-1N) Version

The second part of the manual discusses the details specific to the FA-M3 Value (F3SC21-1N).

● Part C   FA-M3 Value II (F3SC22-□□, F3SC23-□□) Version

The third part of the manual discusses the details specific to the FA-M3 Value II (F3SC22-□□, F3SC23-□□).

Chapters A3 (Installation and Wiring), A4 (Test Runs and Troubleshooting) and A5 (Maintenance and Inspection) are common to the standard FA-M3, the FA-M3 Value and the FA-M3 Value II. Be sure to read these chapters before using the FA-M3 Value and the FA-M3 Value II.

■ Other User's Manuals

For products other than the power supply module, base module, I/O module, cable and terminal block unit, refer to their respective manuals.

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Hardware Manual

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Part B FA-M3 Value (F3SC21-1N)

Part C FA-M3 Value II (F3SC22-□□, F3SC23-□□)

Hardware Manual
Part A Standard Version

IM 34M06C11-01E

A1. System Configuration

A1.1 System Configuration

■ Basic Configuration

The basic configuration of FA-M3 is a unit.

A unit is a system with the minimum configuration consisting of the following modules. Install these modules on the base module to compose the unit.

Table A1.1   Modules (Components) of a Unit

Module	Description
Base module	Six types are available, allowing different number of modules to be mounted.
Power supply module	A unit must have at least one power supply module.
CPU module	Different types are available with different functionalities. A unit must have at least one CPU module.
I/O module	Various types are available with different I/O and number of I/O points.
Special module	Various types are available, including analog I/O and communication modules.

■ Main Unit

A unit in which a CPU module is installed is referred to as a main unit. Thus a main unit is comprised of only one unit.

The unit number of a main unit is 0.

■ Subunit

Subunits are used to increase the number of I/O ports. A subunit contains no CPU module. A maximum of seven subunits can be added to the system to handle up to 8192 (depending on the CPU module type) I/O points. The unit number of a subunit is either 1, 2, 3, 4, 5, 6, or 7.
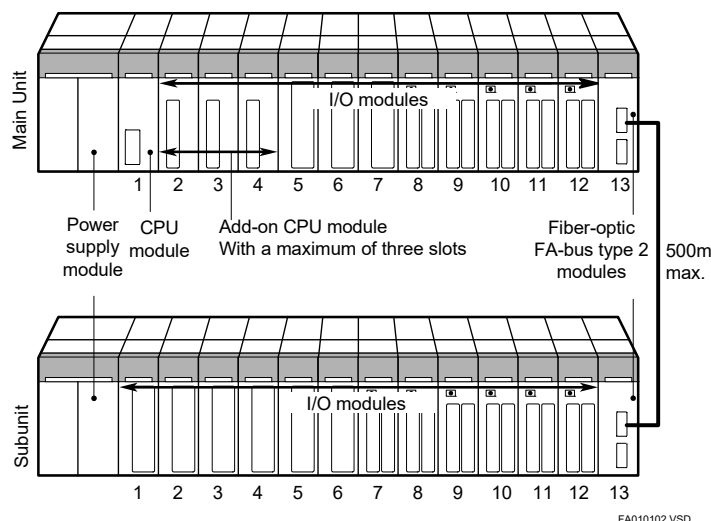
Figure A1.1   Main Unit and Subunit

■ Slot Number

A slot number identifies a slot of a base module in which a CPU module, an I/O module or some other module can be installed. A slot number is a 3-digit integer with the first digit representing a unit number. The unit number of the main unit is 0.
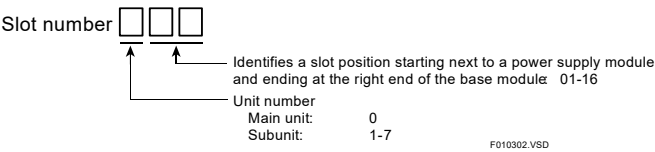
Figure A1.2   Slot Number Definition
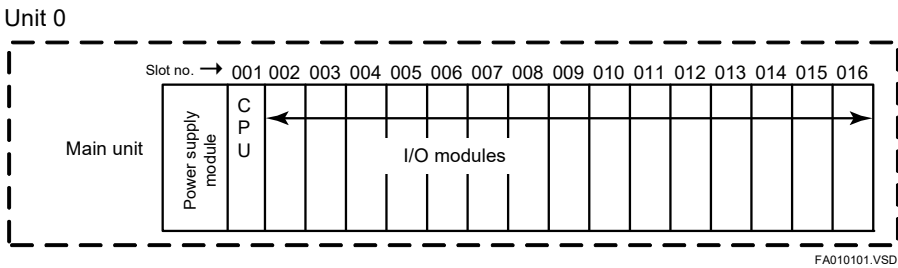
Figure A1.3   Slot Numbers for the Main Unit

■ Example of Increasing the Number of I/O Points Using Fiber-optic FA-bus Type 2 Modules

You can install fiber-optic FA-bus type 2 modules in both main and subunits and connect them with fiber-optic cables. This enables distributed arrangement of remote I/O points, increase in the number of I/O points, and control of I/O modules via high-speed, noise-immune communication.

CPU module

Fiber-optic FA-bus type 2 module

FA-M3 main unit

Power supply module

Example of I/O configuration (32 points)

224 points
(384 points without expansion module)

add-on sequence CPU modules (up to three)

Subunit 1

Power supply module

Subunit 2

Power supply module

Subunit 3

Power supply module

* denotes a fiber-optic FA-bus type 2 module.

Subunit 4

Power supply module

Subunit 5

Power supply module

Subunit 6

Power supply module

Subunit 7

Power supply module

The maximum length of each fiber-optic cable between units is 500m.

FA010103.VSD

Figure A1.4   Increasing the Number of I/O Points Using Fiber-optic FA-bus Type 2 Modules

The maximum number of subunits that can be connected is 7.
Subunit numbers are determined depending on the setting of the rotary switch on the fiber-optic FA-bus type 2 module mounted to a subunit.

Note

■ Example of increasing the number of I/O points using FA-bus type 2 modules

As with fiber-optic FA-bus type 2 modules, the number of I/O points can be increased using FA-bus type 2 modules.

FA-bus type 2 modules use shielded twisted-pair cables for the connection between subunits. (The cable length is restricted compared to fiber-optic FA-bus type 2 modules.)

A1.2   Restrictions on Module Installation

A1.2.1   Restrictions on Module Location

- A Power supply module must be installed in the most left side slot.
- A CPU module installed in slot 1 serves as the main CPU module.
- CPU modules installed in slots 2 to 4 serve as the add-on CPU modules.
- I/O modules may also be installed in slots 2 to 4. No add-on sequence CPU module or add-on BASIC CPU module can be installed in a slot with a slot number greater than those of the I/O modules.
- In an application where two or more CPU modules are installed, no I/O module can be installed between any two CPU modules.
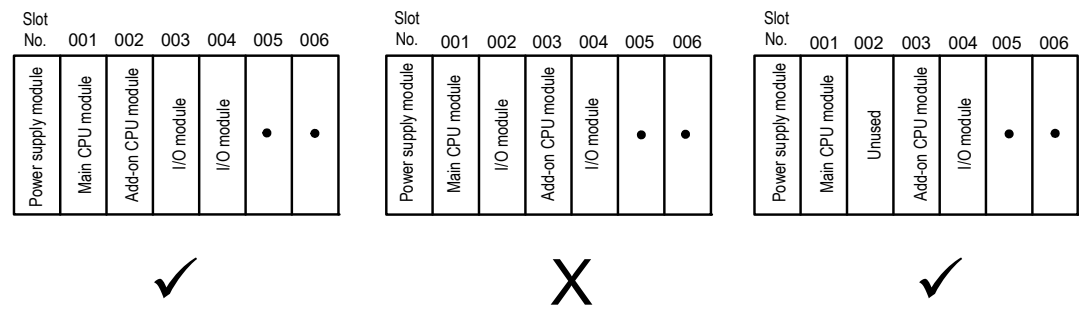
FA010201.VSD

Figure A1.5   Restrictions on Module Location

Note

Don't install Power supply module in slots 1 to 16. This causes malfunction of other modules installed in the same unit.

A1.2.2 Restrictions on CPU Module Installation

A maximum of four CPU modules can be installed in slots 1 to 4.

Table A1.2 Combinations of Main CPU Modules with Add-on CPU Modules

Model	Maximum Qty. [1]	F3SP21-0N	F3SP22-0S	F3SP25-2N	F3SP35-5N	F3SP28-3□	F3SP38-6□	F3SP53-4□	F3SP58-6□	F3SP59-7S	F3SP6□-□S	F3SP7□-□N	F3SP7□-□S	F3BP20-0N	F3BP30-0N	F3FP36-3N	F3RP70-2L	F3NP5□-□□
F3SP21-0N	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ [2]	✓	✓	✓	✓	–	–
F3SP22-0S	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
F3SP25-2N	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ [2]	✓	✓	✓	✓	–	–
F3SP35-5N	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ [2]	✓	✓	✓	✓	–	–
F3SP28-3□	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
F3SP38-6□	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
F3SP53-4□	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
F3SP58-6□	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
F3SP59-7S	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
F3SP6□-□S	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
F3SP7□-□N	4	✓ [2]	✓	✓ [2]	✓ [2]	✓	✓	✓	✓	✓	✓	✓	✓ [3]	✓ [2]	✓ [2]	–	–	–
F3SP7□-□S	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ [3]	✓	✓	✓	–	✓	✓
F3BP20-0N	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ [2]	✓	–	–	✓	–	–
F3BP30-0N	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ [2]	✓	–	–	✓	–	–
F3FP36-3N	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	✓	✓	–	–	–
F3RP70-2L	4	–	✓	–	–	–	–	–	–	–	–	–	✓	–	–	–	✓	✓
F3NP5□-□□	4	–	✓	–	–	–	–	–	–	–	–	–	✓	–	–	–	✓	✓

(Main CPU Module — row label spanning the left side)

*1: Indicates the maximum number of modules that can be used in total including the main CPU module when CPU modules with the same model name as the main CPU module are used as add-on CPU modules.

*2: A maximum of two modules can be installed in this combination.

*3: The combination of F3SP7□-□N + F3SP7□-□N + F3SP21 (25, 35/ F3BP20, 30) is not possible.
The combination of F3SP7□-□N + F3SP7□-□S + F3SP21 (25, 35/ F3BP20, 30) is not possible.
The combination of F3SP7□-□S + F3SP7□-□S + F3SP21 (25, 35/ F3BP20, 30) is possible.
The combination of F3SP7□-□N + F3SP7□-□S is possible.

A1.2.3 Restrictions on I/O Module Installation

Table A1.3 shows the types of modules that each CPU module can access directly, as well as the maximum number of modules of each type that can be installed at the same time. The maximum number referred to here means a limit to the quantity of modules when a multiple of the same I/O module is installed.

- "✓" identifies an I/O module that can be installed without limitation on its quantity.
- "–" identifies an I/O module to which the CPU module in question cannot have direct access.
- Each numeral means the maximum number of I/O modules that can be installed, provided that they are of the same type.

In addition to the restrictions on the quantity of each I/O module, there are system-wide limitations to the quantity of I/O modules that can be installed. For more information, see Appendix A1, "System-wide Restrictions on Module Installation."

In the table below, modules with shaded module names must be installed in the main unit.

Table A1.3 Modules that Each CPU can Access Directly and the Maximum Number that can be Installed (1/4)

Module Name / Model		F3SP21-0N	F3SP22-0S	F3SP25-2N	F3SP35-5N	F3SP28-3□	F3SP38-6□	F3SP53-4□	F3SP58-6□	F3SP59-7S	F3SP66-4S	F3SP67-6S	F3SP71-4N	F3SP76-7N	F3SP71-4S	F3SP76-7S	F3FP36-3N
Memory card module	F3EM01-0N	2[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	–
Digital Input module	F3XA□□-□N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XH04-3N	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	F3XC08-0□	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XD08-6□	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XD08-6N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XD16-□F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XD16-3H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XD32-□F	64	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XD16-□N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XD32-□N	64	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3XD64-□□	32	64	64	✓	64	✓	64	✓	✓	64	✓	64	✓	64	✓	64
Pulse input module	F3XS04-□N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Digital Output module	F3YA08-2N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3YC08-0C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3YC08-0N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3YC16-0N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3YD04-7N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3YD08-□□	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3YD14-5□	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3YD32-1□	64	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F3YD64-1□	32	64	64	✓	64	✓	64	✓	✓	64	✓	64	✓	64	✓	64
I/O module	F3WD64-□□	32	64	64	✓	64	✓	64	✓	✓	64	✓	64	✓	64	✓	64
Analog input module	F3AD04-□□	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	F3AD08-□□	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Analog output module	F3DA02-□□	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	F3DA04-□□	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	F3DA08-□□	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Temperature control and monitoring module	F3CT04-□N	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
	F3CR04-□N	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
PID control module	F3CV04-1N	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Temperature control and PID	F3CU04-□□	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Temperature monitoring module	F3CX04-0□	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
High-speed data acquisition module	F3HA08-0N	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	F3HA06-1R	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	F3HA12-1R	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
ASi Master module	F3LA01-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
PROFIBUS-DP Interface	F3LB01-0N	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

Table A1.3   Modules that Each CPU can Access Directly and the Maximum Number that can be Installed (2/4)

Module Name		Model	Sequence CPU															
			F3SP21-0N	F3SP22-0S	F3SP25-2N	F3SP35-5N	F3SP28-3□	F3SP38-6□	F3SP53-4□	F3SP58-6□	F3SP59-7S	F3SP66-4S	F3SP67-6S	F3SP71-4N	F3SP76-7N	F3SP71-4S	F3SP76-7S	F3FP36-3N
Ethernet interface module		F3LE01-□T	2[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]
		F3LE01-5T	2[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]
		F3LE11-□T	2[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]
		F3LE12-□T	2[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]
NX interface module		F3NX01-□N	2[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]
EhterNet/IP interface module		F3LN01-0N	–	1[*12]	–	–	–	–	–	–	–	–	–	–	–	1[*12]	2[*12]	–
FL-net (OPCN-2) interface module		F3LX02-1N	–	1[*12]	–	–	1[*9] [*12]	2[*9] [*12]	1[*9] [*12]	2[*9] [*12]	2[*9] [*12]	1[*12]	2[*12]	1[*12]	2[*12]	1[*12]	2[*12]	–
		F3LX02-2N	–	1[*12]	–	–	1[*9] [*12]	2[*9] [*12]	1[*9] [*12]	2[*9] [*12]	2[*9] [*12]	1[*12]	2[*12]	1[*12]	2[*12]	1[*12]	2[*12]	–
DeviceNet interface module		F3LD01-0N	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		F3LD02-1N	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
CAN2.0B interface module		F3LD21-0N	8	8	–	–	8	8	8	8	8	8	8	8	8	8	8	–
Modbus interface module		F3LC31-2F	2[*1]	6[*1]	–	–	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	–
GP-IB communication module		F3GB01-0N[*7]	8 / 2[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]	8 / 6[*1]
Personal computer link module		F3LC11-1F	2[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]	6[*1]
		F3LC11-1N																
		F3LC11-2□																
		F3LC12-1F																
Ladder communication module		F3RZ81-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
		F3RZ81-0F	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
		F3RZ82-0F	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
		F3RZ91-0□	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
RS-232-C communication module		F3RS22-0N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
RS-422-A communication module		F3RS41-0N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
UT link module		F3LC51-2N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
FA link H module		F3LP02-0N	2[*3] [*6] [*12]	8[*3] [*8] [*12]	8[*3] [*6] [*12]	8[*3] [*6] [*12]	8[*3] [*8] [*12]	8[*3] [*8] [*12]	8[*3] [*8] [*12]	8[*3] [*8] [*12]	8[*3] [*8] [*12]	8[*3] [*8] [*12]	8[*3] [*8] [*12]	–[*10]	–[*10]	8[*3] [*8] [*12]	8[*3] [*8] [*12]	8[*3] [*4][*6] [*12]
Fiber-optic FA link H module		F3LP12-0N																
FA link H2 module		F3LP32-0N	–	8[*3] [*8] [*12]	–	–	8[*3] [*8][*11] [*12]	8[*3] [*8][*11] [*12]	8[*3] [*8][*11] [*12]	8[*3] [*8][*11] [*12]	8[*3] [*8][*11] [*12]	8[*3] [*8][*11] [*12]	8[*3] [*8][*11] [*12]	–[*10]	–[*10]	8[*3] [*8] [*12]	8[*3] [*8] [*12]	–
YHLS master module		F3LH0□-0N	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
		F3LH01-1N	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
		F3LH02-1N	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Fiber-optic FA-bus module		F3LR01-0N	7[*5] [*6]	7[*5]	7[*5] [*6]	7[*5] [*6]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5] [*6]
Fiber-optic FA-bus type 2 module		F3LR02-0N																
FA-bus type 2 module		F3LR02-1W	7[*5] [*6]	7[*5]	7[*5] [*6]	7[*5] [*6]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5]	7[*5] [*6]
High-speed counter module		F3XP01-0H	32	64	64	✓	64	✓	64	✓	✓	64	✓	64	✓	64	✓	64
		F3XP02-0H	32	64	64	✓	64	✓	64	✓	✓	64	✓	64	✓	64	✓	64
Positioning module	(with multi-channel pulse output)	F3YP04-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
		F3YP08-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
		F3YP14-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
		F3YP18-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
		F3YP22-0P	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		F3YP24-0P	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		F3YP28-0P	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	(advanced model with pulse output)	F3NC11-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
		F3NC12-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	(with pulse output)	F3NC32-0N	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		F3NC34-0N	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	(with analog voltage output)	F3NC51-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
		F3NC52-0N	32	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	(MECHATROLIN K-II)	F3NC96-0N	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	(MECHATROLINK-III)	F3NC97-0N	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Table A1.3   Modules that Each CPU can Access Directly and the Maximum Number that can be Installed (3/4)

Module Name Model		BASIC CPU		OS-free CPU	IEC CPU
		F3BP20-0N	F3BP30-0N	F3RP70-2L	F3NP5□-□
Memory card module	F3EM01-0N	–	–	–	–
Digital Input module	F3XA□□-□N	✓	✓	✓	✓
	F3XH04-3N	16*2	16*2	16*2	16*2
	F3XC08-0□	✓	✓	✓	✓
	F3XD08-6□	✓	✓	✓	✓
	F3XD08-6N	✓	✓	✓	✓
	F3XD16-□F	✓	✓	✓	✓
	F3XD16-3H	✓	✓	✓	✓
	F3XD32-□F	✓	✓	✓	✓
	F3XD16-□N	✓	✓	✓	✓
	F3XD32-□N	✓	✓	✓	✓
	F3XD64-□□	✓	✓	✓	✓
Pulse input module	F3XS04-□N	36	36	36	36
Digital Output module	F3YA08-2N	✓	✓	✓	✓
	F3YC08-0C	✓	✓	✓	✓
	F3YC08-0N	✓	✓	✓	✓
	F3YC16-0N	✓	✓	✓	✓
	F3YD04-7N	✓	✓	✓	✓
	F3YD08-□□	✓	✓	✓	✓
	F3YD14-5□	✓	✓	✓	✓
	F3YD32-1□	✓	✓	✓	✓
	F3YD64-1□	✓	✓	✓	✓*13
I/O module	F3WD64-□□	✓	✓	✓	✓*13
Analog input module	F3AD04-□□	36	36	36	36
	F3AD08-□□	36	36	36	36
Analog output module	F3DA02-□□	36	36	36	36
	F3DA04-□□	36	36	36	36
	F3DA08-□□	36	36	36	36
Temperature control and monitoring module	F3CT04-□N	28	28	28	28
	F3CR04-□N	28	28	28	28
PID control module	F3CV04-1N	28	28	28	28
Temperature control and PID	F3CU04-□□	36	36	36	36
Temperature monitoring module	F3CX04-0□	36	36	36	36
High-speed data acquisition module	F3HA08-0N	8	8	8	8
	F3HA06-1R	8	8	8	8
	F3HA12-1R	8	8	8	8
ASi Master module	F3LA01-0N	36	36	36	36
PROFIBUS-DP Interface	F3LB01-0N	16	16	16	16

Table A1.3   Modules that Each CPU can Access Directly and the Maximum Number that can be Installed (4/4)

Module Name		Model	BASIC CPU		OS-free CPU	IEC CPU
			F3BP20-0N	F3BP30-0N	F3RP70-2L	F3NP5□-□
Ethernet interface module		F3LE01-□T	6[*1]	6[*1]	6[*1*8]	6[*1*8]
		F3LE01-5T	6[*1]	6[*1]	6[*1*8]	6[*1*8]
		F3LE11-□T	6[*1]	6[*1]	6[*1*8]	6[*1*8]
		F3LE12-□T	6[*1]	6[*1]	6[*1*8]	6[*1*8]
NX interface module		F3NX01-□N	–	–	–	–
EhterNet/IP interface module		F3LN01-0N	–	–	–	–
FL-net (OPCN-2) interface module		F3LX02-1N	–	–	–	–
		F3LX02-2N	–	–	2[*12*14]	2[*12*15]
DeviceNet interface module		F3LD01-0N	16	16	16	16
		F3LD02-1N	8	8	8	8
CAN2.0B interface module		F3LD21-0N	8	8	8	8
Modbus interface module		F3LC31-2F	6[*1]	6[*1]	6[*1]	6[*1]
GP-IB communication module		F3GB01-0N[*7]	8 6[*1]	8 6[*1]	8 -[*1]	8 -[*1]
Personal computer link module		F3LC11-1F	6[*1]	6[*1]	6[*1]	6[*1]
		F3LC11-1N				
		F3LC11-2□				
		F3LC12-1F				
Ladder communication module		F3RZ81-0N	–	–	36	36
		F3RZ81-0F	–	–	36	36
		F3RZ82-0F	–	–	36	36
		F3RZ91-0□	–	–	36	36
RS-232-C communication module		F3RS22-0N	36	36	–	–
RS-422-A communication module		F3RS41-0N	36	36	–	–
UT link module		F3LC51-2N	4	4	–	–
FA link H module		F3LP02-0N	–	–	–	–
Fiber-optic FA link H module		F3LP12-0N	–	–	–	–
FA link H2 module		F3LP32-0N	–	–	–	–
YHLS master module		F3LH0□-0N	15	15	15	15
		F3LH01-1N	28	28	28	28
		F3LH02-1N	28	28	28	28
Fiber-optic FA-bus module		F3LR01-0N	7[*5]	7[*5]	7[*5]	7[*5]
Fiber-optic FA-bus type 2 module		F3LR02-0N				
FA-bus type 2 module		F3LR02-1W	7[*5]	7[*5]	7[*5]	7[*5]
High-speed counter module		F3XP01-0H	✓	✓	✓	✓
		F3XP02-0H	✓	✓	✓	✓
Positioning module	(with multi-channel pulse output)	F3YP04-0N	36	36	36	36
		F3YP08-0N	36	36	36	36
		F3YP14-0N	36	36	36	36
		F3YP18-0N	36	36	36	36
		F3YP22-0P	16	16	16	16
		F3YP24-0P	16	16	16	16
		F3YP28-0P	16	16	16	16
	(advanced model with pulse output)	F3NC11-0N	36	36	36	36
		F3NC12-0N	36	36	36	36
	(with pulse output)	F3NC32-0N	16	16	36	36
		F3NC34-0N	16	16	36	36
	(with analog voltage output)	F3NC51-0N	36	36	36	36
		F3NC52-0N	36	36	36	36
	(MECHATROLIN K-II)	F3NC96-0N	8	8	8	8
	(MECHATROLINK-III)	F3NC97-0N	8	8	8	8

*1: Each number denotes the largest combined number of personal computer link modules, Ethernet interface modules, GP-IB communication modules (when in slave mode), FL-net interface modules, EtherNet/IP interface module, Modbus interface module and memory card modules that can be installed. If two or more CPU modules having different maximum limits are installed, the smallest limit applies.

*2: The pulse-capture feature is disabled.

*3: Each number denotes the largest combined number of FA link H modules , FA link H2 modules and fiber-optic FA link H modules that can be installed. If two or more CPU modules having different maximum limits are installed, the smallest limit applies.

*4: Configure the module using WideField, WideField2, WideField3 or Ladder Diagram Support Program M3.

*5: Each number denotes the largest combined number of fiber-optic FA-bus, fiber-optic FA-bus type 2 and FA-bus type 2 modules that can be installed in a main unit. If two or more CPU modules having different maximum limits are installed, the smallest limit applies. If subunits are grouped using fiber-optic FA-bus type 2 modules, the maximum limit may be increased depending on the grouping pattern. For more information, see the Fiber-optic FA-bus Module and Fiber-optic FA-bus Type 2 Module, FA-bus Type 2 Module (IM 34M06H45-01E).

*6: FA link H, fiber-optic FA link H, fiber-optic FA-bus type 2 and FA-bus type 2 modules must be used with sequence CPU modules version 8 or later. For information on the version of a sequence CPU module, refer to the mark on its side. There is no usage limitation, however, for F3SP□□-□S.

*7: The maximum number of each module that can be installed depends on the operating mode. The left number and right number in each cell apply when the module is in master mode and slave mode respectively.

*8: Up to 7 modules can be installed if used with FL-net (OPCN-2) interface module or EtherNet/IP interface module, provided link device capacities are not exceeded.

*9: FL-net (OPCN-2) interface module can be used with sequence CPU modules rev. 5 or higher. There is no restriction when used with F3SP□□-□S modules.

*10: FA link, FA link H ,FA link H2 and fiber-optic FA link H modules cannot coexist with F3SP7□-□N.

*11: Available only for REV: 02:□□ or later of the FA link H2 module. The FA link H2 module can only be used with F3SP□□-□S.

*12: Each number denotes the largest combined number of Ethernet/IP interface modules, FL-net (OPCN-2) interface module, FA link H modules, FA link H2 modules and fiber-optic FA link H modules that can be installed.

*13: F3NP5□-□□ cannot be used with F3YD64-1A, F3YD64-1M, and F3WD64-□N.

*14: FL-net (OPCN-2) interface module can be used with SFRD14-MDW R2.1.1 or later.

*15: F3LX02-2N can be used with F3NP5□-□□ REV: 03:□□ or later, and SFND10-MDW R1.04 or later.

A1.2.4 Restrictions due to Current Consumption

Design your system making sure that the total sum of current consumed by modules in each unit does not exceed the capacity of the power supply module.

For more information, see Section A2.9, "Module Current Consumption Tables"

A1.3 Peripheral Tools Supporting the Program Development of the FA-M3

You can conveniently create and debug your programs on your personal computer.

- FA-M3 Programming Tool WideField3
- FA-M3 ToolBox
- BASIC Programming Tool M3 for Windows

CD-ROM

Personal computer

FA-M3

Ethernet, cable for programming tools (RS-232-C), USB or FL-net

Printer
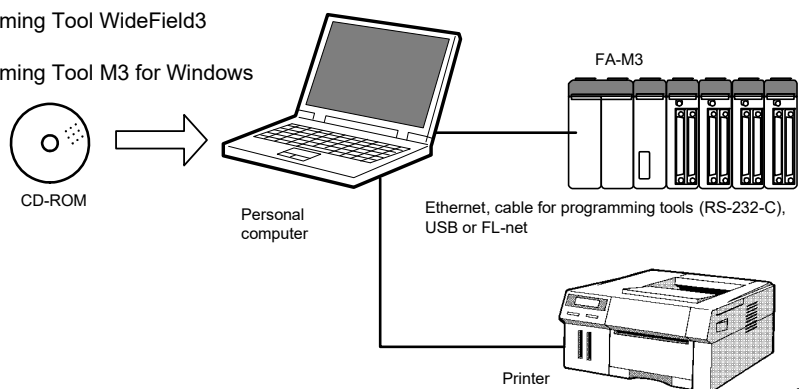
FA010301.VSD

Figure A1.5   Support Tools for the FA-M3

A2. Specifications and Configuration

A2.1 Specifications

■ Common Specifications

Item			Specifications
Environment	Surrounding air temperature range		Operating : 0 to 55°C *1
			Storage : -20°C to 75°C
	Surrounding humidity range		Operating : 10 to 90% RH (non-condensing)
			Storage : 10 to 90% RH (non-condensing)
	Surrounding atmosphere		Must be free of corrosive gases, flammable gases or heavy dust.
	Grounding		AC Power supply module : Protective earth (Comply with the regulation of each country.)
			DC Power supply module : Functional earth
	Noise immunity		Tested using a noise simulator with a noise voltage of 1500 Vp-p, pulse width of 1μs, rise time of 1 ns, and repetition frequency of 25 to 60Hz.
			For CE/UKCA Marking-compliant modules, compliant to EN 61326-1, EN 61326-2-3*4 and EN 61000-6-2
	Vibration resistance		Tested in compliance with JIS C60068-2-6 under the following conditions:
			- Frequency ranges: 10 to 57Hz with an amplitude of 0.075mm
			57 to 150Hz with an acceleration of $9.8m/s^2$ (1G)
			- Direction and sweep cycles: 10 times each in the X, Y, and Z directions
	Shock resistance		Tested in compliance with JIS C60068-2-27 under the following conditions:
			- Direction and sweep cycles: 3 times each in the X, Y, and Z directions with an acceleration of $147m/s^2$ ($98m/s^2$ with DIN-rail mounting)
Structure & Appearance	Structure		Designed for mounting inside a panel enclosure
	Altitude of installation		Max. of 2000m above sea level
	Compliance with safety and EMC standards,etc *2	UL	UL 508 approved (File No.E188707, Overvoltage Category*5 : II, Pollution Degree*6 : 2)
		CE UKCA — EMC Directive /Regulation*3	EN 61326-1 Class A, Table 2 EN 61326-2-3*4, EN 55011 Class A, Group 1 EN 61000-6-2, EN 61000-3-2, EN 61000-3-3 compliance
		CE UKCA — Low Voltage Directive /Regulation	EN 61010-1, EN IEC 61010-2-201 compliance (Overvoltage Category*5 : II, Pollution Degree*6 : 2, Altitude : up to 2,000 m) EN IEC 61010-2-030 compliance (Measurement Category O) *7
		CE UKCA — RoHS Directive /Regulation*8	EN IEC 63000 compliance
		CE — Battery Regulation	REGULATION (EU) 2023/1542 compliance
		RCM	EN 61326-1 Class A, Table 2 EN 55011 Class A, Group 1 compliance
		KC	Korea Electromagnetic Conformity Standard compliance
		EAC	CU TR 004/2011 CU TR 020/2011 compliance
		TSCA	USA: Toxic Substances Control Act (TSCA) compliance
	Cooling method		Natural-air cooled
	Mounting		Direct mounting with M4-size setscrews *9 or DIN-rail mounting (except for F3BU16-0N module)
	Finish color		Light cobalt blue, equivalent to Munsell 6.2PB 4.6/8.8; Lampblack, equivalent to Munsell 0.8Y 2.5/0.4
	External dimensions		See the dimensional figures in Section A2.10, "External Dimensions."

*1: Some FA-M3 modules may have a narrower surrounding temperature range than 0-55°C. A system incorporating such modules must be used within the narrower surrounding temperature range for such modules.

*2: For details on conforming modules, see Appendix A2, "Standard compliant products".

*3: This product is classified as Class A for use in industrial environments.If used in a residential environment, it may cause electromagnetic interference (EMI). In such situations, it is the user's responsibility to adopt the necessary measures against EMI.

*4: EN 61326-2-3 is applicable only to F3CU04-□□.

*5: The term Overvoltage Category involves prescriptions on resistance to surge voltage reduction due to lightning and has four categories. Overvoltage Category II applies to systems with a rated voltage of 220/230/240 V and applies to electrical appliances, portable devices, etc.

*6: The term Pollution Degree represents the degree of pollution with foreign matter, solid, liquid or gaseous, that may produce a reduction of dielectric strength or surface resistivity in the operating environment of the equipment. Pollution degree 2 refers to an environment where normally only non-conductive pollution occurs but occasionally temporary conductivity caused by condensation is to be expected.

*7: EN IEC 61010-2-030 is applicable only to modules with analog input terminal.

Don't use analog input terminals of the FA-M3 for measurement on Mains Circuit, since it has no measurement category.

*8: 10-Substances RoHS. Phthalate ester have high migration (the property of substance transfer from other products upon contact). Therefore, care must be taken to prevent process contamination. After unpacking each package, please control the products to prevent contamination by the customer side.

*9: For details on the number of mounting screws, see subsection A3.2.2.

■ Power Supply Specifications

Item	Specifications					
	F3PU10-0N **F3PU10-0S**	**F3PU20-0N** **F3PU20-0S**	**F3PU30-0N** **F3PU30-0S**	**F3PU16-0N** **F3PU16-0S**	**F3PU26-0N** **F3PU26-0S**	**F3PU36-0N** **F3PU36-0S**
Supply voltage range	100 to 240V AC, single phase 50/60Hz			24V DC		
Range of supply voltage change	85 to 264V AC 50/60Hz±3Hz			15.6 to 31.2V DC		
Power consumption	35VA	85VA	100VA	15.4W	33.1W	46.2W
Insulation resistance	5MΩ min. when tested between a group of external AC terminals and the FG terminal using a 500V DC insulation resistance tester			5MΩ min. when tested across a group of external DC terminals and the FG terminal using a 500V DC insulation resistance tester		
	5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.					
Withstanding voltage	1500V AC for one minute between a group of external AC terminals and the FG terminal			1500V AC for one minute between a group of external DC terminals and the FG terminal		
	1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.					
FAIL-signal contact output	Located on the front terminal block of power supply module; contact ratings: 24V DC, 0.3A (Equipped with both normally-open and normally-closed terminals)					
Leakage current	3.5mA max.			———		
Allowable momentary power failure time	20ms (Standard Mode) 10ms (Immediate Detection Mode)			20ms (Standard Mode) 2ms (Immediate Detection Mode)		

* For detailed power supply module specifications, see A2.3, "Power Supply Modules."

A2.2 FA-M3 Controller Configuration

A2.2.1 Components

■ Module Names

Base module

Power supply module

CPU module

I/O modules and special modules

FA020201.VSD
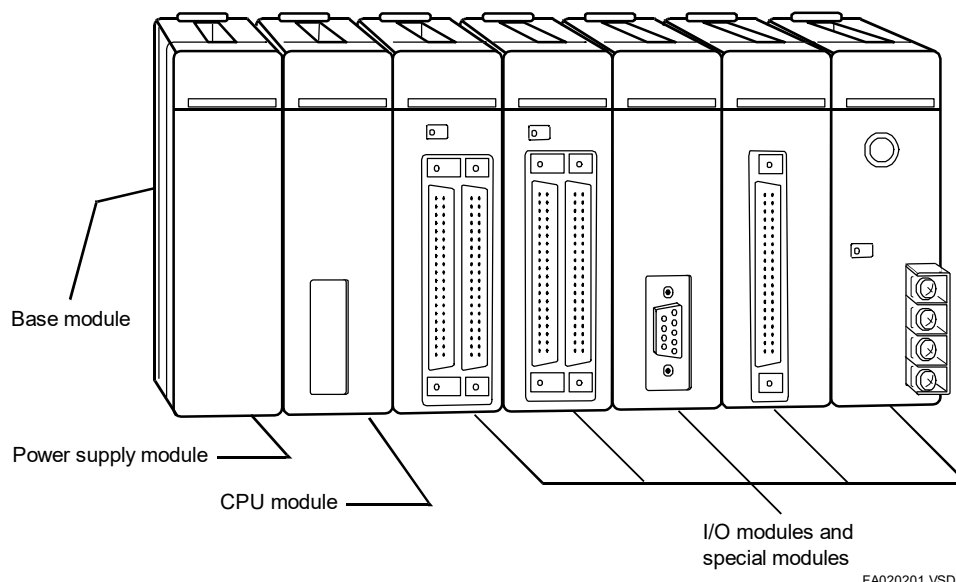
Figure A2.1 FA-M3 Controller

■ FA-M3 Components

Modules indicated by the triangle symbol (▲) in the tables below are no longer available.

● Base Modules

Module Description		Model	Specifications
Base module		F3BU04-0N	Slot for F3PU10/16 power supply module plus 4 slots (for CPU and I/O modules)
		F3BU06-0N	Slot for F3PU10/16 power supply module plus 6 slots (for CPU and I/O modules)
		F3BU05-0D	Slot for F3PU20/26/30/36 power supply module plus 5 slots (for CPU and I/O modules)
		F3BU09-0N	Slot for F3PU20/26/30/36 power supply module plus 9 slots (for CPU and I/O modules)
		F3BU13-0N	Slot for F3PU20/26/30/36 power supply module plus 13 slots (for CPU and I/O modules)
		F3BU16-0N	Slot for F3PU20/26/30/36 power supply module plus 16 slots (for CPU and I/O modules)

*: For detailed base module specifications, see A2.4, "Base Modules."

● Power Supply Modules

Module Description		Model	Specifications
Power supply module	▲	F3PU10-0N	100 to 240V AC, for F3BU04 and F3BU06
		F3PU10-0S	
	▲	F3PU16-0N	24V DC, for F3BU04 and F3BU06
		F3PU16-0S	
	▲	F3PU20-0N	100-240V AC, for F3BU05, F3BU09, F3BU13 and F3BU16
		F3PU20-0S	
	▲	F3PU26-0N	24V DC, for F3BU05, F3BU09, F3BU13 and F3BU16
		F3PU26-0S	
	▲	F3PU30-0N	100-240V AC, for F3BU05, F3BU09, F3BU13 and F3BU16
		F3PU30-0S	
	▲	F3PU36-0N	24V DC, for F3BU05, F3BU09, F3BU13 and F3BU16
		F3PU36-0S	

*: For detailed power supply module specifications, see A2.3, "Power Supply Modules."

● **CPU Modules**

Module Description		Model	Specifications
Sequence CPU module (with memory)	▲	F3SP21-0N	10K ladder steps, 0.18 to 0.36μs execution time for basic instructions
	▲	F3SP25-2N	20K ladder steps, 0.12 to 0.24μs execution time for basic instructions
	▲	F3SP35-5N	100K ladder steps, 0.09 to 0.18μs execution time for basic instructions
	▲	F3SP28-3N	30K ladder steps, 0.045 to 0.18μs execution time for basic instructions
	▲	F3SP38-6N	120K ladder steps, 0.045 to 0.18μs execution time for basic instructions
	▲	F3SP53-4H	56K ladder steps, 0.0175 to 0.07μs execution time for basic instructions
	▲	F3SP58-6H	120K ladder steps, 0.0175 to 0.07μs execution time for basic instructions
		F3SP22-0S	30K ladder steps, 0.045 to 0.18μs execution time for basic instructions
	▲	F3SP28-3S	30K ladder steps, 0.045 to 0.18μs execution time for basic instructions
	▲	F3SP38-6S	120K ladder steps, 0.045 to 0.18μs execution time for basic instructions
	▲	F3SP53-4S	56K ladder steps, 0.0175 to 0.07μs execution time for basic instructions
	▲	F3SP58-6S	120K ladder steps, 0.0175 to 0.07μs execution time for basic instructions
	▲	F3SP59-7S	254K ladder steps, 0.0175 to 0.07μs execution time for basic instructions
Sequence CPU module (with network functions)	▲	F3SP66-4S	56K ladder steps, 0.0175 to 0.07μs execution time for basic instructions
	▲	F3SP67-6S	120K ladder steps, 0.0175 to 0.07μs execution time for basic instructions
	▲	F3SP71-4N	60K ladder steps, 0.00375μs or more execution time for basic instructions
	▲	F3SP76-7N	260K ladder steps, 0.00375μs or more execution time for basic instructions
		F3SP71-4S	60K ladder steps, 0.00375μs or more execution time for basic instructions
		F3SP76-7S	260K ladder steps, 0.00375μs or more execution time for basic instructions
Sequence CPU module (with memory)	▲	F3FP36-3N	For SFC/ladder language; 40K ladder steps Contact coil 0.09μs per instruction
BASIC CPU module	▲	F3BP20-0N	120KB for BASIC
	▲	F3BP30-0N	510KB for BASIC

⚠ **CAUTION**

WideField3 R4.05 or later must be used to use F3SP22-0S in up to 30K steps. When using WideField3 R4.04 or earlier, there is a limit of up to 10K steps.

● **OS-free CPU Module**

*: For detailed OS-free CPU specifications, please refer to " e-RT3 CPU Module (F3RP7)Hardware Manual"

● **IEC61131-3 CPU Modules**

*: For detailed IEC61131-3 CPU Module specifications, please refer to "CPU Module for IEC61131-3 Hardware Manual"

● **ROM Packs**

Module Description		Model	Specifications
ROM pack	▲	RK10-0N	5K ladder steps (F3SP21)
	▲	RK30-0N	20K ladder steps; 120KB for BASIC (F3SP21/25/35, F3BP20)
	▲	RK50-0N	100K ladder steps; 510KB for BASIC (F3SP21/25/35, F3BP30)
		RK33-0N	56K ladder steps (F3SP21/22/25/28/35/38/53/58)
	▲	RK53-0N	100K ladder steps; 510KB for BASIC (F3SP21/25/35, F3BP30)
		RK73-0N	120K ladder steps (F3SP22/28/38/53/58/59)
	▲	RK93-0N	254K ladder steps (F3SP38/58/59)

*: CPU modules F3SP66, 67, 71 and 76 do not support the ROM pack.
*: For detailed ROM pack specifications, see A2.6, "ROM Packs."

● Memory Card Module

Module Description		Model	Specifications
Memory card module	▲	F3EM01-0N	Media : Compact Flash, FAT16 compatible

● I/O Modules

Digital I/O

Module Description		Model	Specifications
High-speed input module		F3XH04-3N	24V DC high-speed input points with pulse-capture feature, 4 points
AC input module		F3XA08-1N	100 to 120V AC, 8 points
		F3XA08-2N	200 to 240V AC, 8 points
		F3XA16-1N	100 to 120V AC, 16 points
DC input module		F3XD08-6F	DC Input sink/source, 12 to 24V DC, 8 points *1
		F3XD16-3F	DC Input sink/source, 24V DC, 16 points *1
		F3XD16-4F	DC Input sink/source, 12V DC, 16 points *1
		F3XD16-3H	DC Input sink (positive common), 24V DC, 16 points (High speed input)
		F3XD32-3F	DC Input sink/source, 24V DC, 32 points *1
		F3XD32-4F	DC Input sink/source, 12V DC, 32 points *1
		F3XD32-5F	DC Input sink/source, 5V DC, 32 points *1
		F3XD64-3F	DC Input sink/source, 24V DC, 64 points *1
		F3XD64-4F	DC Input sink/source, 12V DC, 64 points *1
	▲	F3XD08-6N	DC input sink/ source, 12 to 24V DC, 8 points
	▲	F3XD16-3N	DC Input sink/source, 24V DC, 16 points
	▲	F3XD16-4N	DC Input sink/source, 12V DC, 16 points
	▲	F3XD32-3N	DC Input sink/source, 24V DC, 32 points
	▲	F3XD32-4N	DC Input sink/source, 12V DC, 32 points
	▲	F3XD32-5N	DC Input sink/source, 5V DC, 32 points
	▲	F3XD64-3N	DC Input sink/source, 24V DC, 64 points
	▲	F3XD64-4N	DC Input sink/source, 12V DC, 64 points
		F3XD64-6M	DC Input matrix scan, 12 to 24V DC, 64 points
No-voltage contact input module		F3XC08-0N	No-voltage contact input, 8 points
		F3XC08-0C	No-voltage contact input, 8 points, independent commons
Pulse input module		F3XS04-3N	20kHz, 4 channels, 24V input, 16bits
		F3XS04-4N	20kHz, 4 channels, 12V input, 16bits
Triac output module		F3YA08-2N	Triac output (100 to 240V AC), 1A, 8 points
Relay output module		F3YC08-0C	Relay output (24V DC, 100 to 240V AC), 2A, 8 points, all independent
		F3YC08-0N	Relay output (24V DC, 100 to 240V AC), 2A, 8 points
		F3YC16-0N	Relay output (24V DC, 100 to 240V AC), 2A, 16 points
Transistor output module		F3YD04-7N	TR output, 24V DC, 2A, all independent, 4 points
		F3YD08-6A	TR output sink type, 12 to 24V DC, 1A, 8 points
		F3YD08-6B	TR output source type, 12 to 24V DC, 1A, 8 points
		F3YD08-7A	TR output sink type, 12 to 24V DC, 2A, 8 points
		F3YD14-5A	TR output sink type, 12 to 24V DC, 0.5A, 14 points
		F3YD14-5B	TR output source type, 12 to 24V DC, 0.5A, 14 points
	▲	F3YD32-1A	TR output sink type, 12 to 24V DC, 0.1A, 32 points
	▲	F3YD32-1B	TR output source type, 12 to 24V DC, 0.1A, 32 points
		F3YD32-1H	TR output sink type, 12 to 24V DC, 0.1A, 32 points (High speed output)
		F3YD32-1P	TR output sink type (with short-circuit protector), 12 to 24V DC, 0.1A, 32 points
		F3YD32-1R	TR output source type (with short-circuit protector), 12 to 24V DC, 0.1A, 32 points
		F3YD32-1T	TTL output, 5V DC, 16mA, 32 points
	▲	F3YD64-1A	TR output sink type, 24V DC, 0.1A, 64 points
	▲	F3YD64-1F	TR output sink type, 24V DC, 0.1A, 64 points *2
		F3YD64-1M	TR output matrix scan, 12 to 24V DC, 0.1A, 64 points
		F3YD64-1P	TR output sink type (with short-circuit protector), 12 to 24V DC, 0.1A, 64 points *2
		F3YD64-1R	TR output source type (with short-circuit protector), 12 to 24V DC, 0.1A, 64 points *2

Module Description		Model	Specifications
I/O module	▲	F3WD64-3F	DC input sink/source, 24V DC, 32 points *1 TR output sink type, 24V DC, 0.1A, 32 points *2
	▲	F3WD64-4F	DC input sink/source, 12V DC, 32 points *1 TR output sink type, 12V DC, 0.1A, 32 points *2
	▲	F3WD64-3N	DC input sink/source, 24V DC, 32 points TR output sink type, 24V DC, 0.1A, 32 points
	▲	F3WD64-4N	DC input sink/source, 12V DC, 32 points TR output sink type, 12V DC, 0.1A, 32 points
		F3WD64-3P	DC input sink/source, 24V DC, 32 points TR output sink type (with short-circuit protector), 24V DC, 0.1A, 32 points
		F3WD64-4P	DC input sink/source, 12V DC, 32 points TR output sink type (with short-circuit protector), 12V DC, 0.1A, 32 points

*1: Input sampling time of 62.5μs or more can be configured when using F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76, F3RP70 or F3NP□□ CPU modules.
*2: You can configure the module to either HOLD or RESET external outputs in the event of a major failure when using F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76, F3RP70 or F3NP□□ CPU modules.
*3: For detailed I/O module specifications, see A2.5, "I/O Modules."

Analog I/O

Module Description		Model	Specifications
Analog input module	▲	F3AD04-0N	0 to 5V DC /1 to 5V DC /-10 to 10V DC, 4 points, 12-bit ADC
	▲	F3AD04-0R	0 to 5V DC /1 to 5V DC /-10 to 10V DC, 4 points, 16-bit ADC
		F3AD04-5R	0 to 5V / 1 to 5V / -10 to 10V / 0 to 10V DC 4 differential inputs, 16-bit A/D conversion
	▲	F3AD04-0V	0 to 5V DC /1 to 5V DC /-10 to 10V DC, 4 points, 12-bit ADC
		F3AD04-5V	0 to 5V / 1 to 5V / -10 to 10V / 0 to 10V DC 4 differential inputs, 12-bit A/D conversion
	▲	F3AD08-1N	0 to 5V DC /1 to 5V DC /-10 to 10V DC, 8 points
	▲	F3AD08-1R	0 to 5V DC /1 to 5V DC / - 10 to 10V DC, 8 points (differential inputs), 16-bit ADC
		F3AD08-4R	0 to 20mA DC / 4 to 20mA DC, 8 points (differential inputs), 16-bit ADC
		F3AD08-5R	0 to 5V DC /1 to 5V DC, -10 to 10V DC, 0 to 10V DC 8 points (differential inputs), 16-bit ADC
		F3AD08-6R	0 to 5V DC /1 to 5V DC /-10 to 10V DC /0 to 10V DC /0 to 20mA DC, 4 to 20mA DC, 8 points (differential inputs), 16-bit ADC
	▲	F3AD08-1V	0 to 5V DC /1 to 5V DC /-10 to 10V DC, 8 points (differential inputs), 12-bit ADC
	▲	F3AD08-4V	0 to 20mA DC /4 to 20mA DC, 8 points (differential inputs), 12-bit ADC
		F3AD08-5V	0 to 5V / 1 to 5V / -10 to 10V / 0 to 10V DC 8 differential inputs, 12-bit A/D conversion
		F3AD08-4W	0 to 20mA, 4 to 20mA DC 8 differential inputs, 12-bit A/D conversion
Analog output module	▲	F3DA02-0N	- 10 to 10V DC /4 to 20mA DC, 2 points, 12bit DAC
	▲	F3DA04-1N	- 10 to 10V DC /4 to 20mA DC, 4 points, 12bit DAC
	▲	F3DA08-5N	- 10 to 10V DC output, 8 points, 12bit DAC
		F3DA04-6R	- 10 to 10V DC/0 to 10V DC/0 to 5V DC/1 to 5V DC/ 4 to 20mA DC/0 to 20mA DC/ - 20 to 20mA DC, output 4 points, 16-bit DAC, 2μs/ch
		F3DA08-5R	- 10 to 10V DC /0 to 10V DC /0 to 5V DC /1 to 5V DC / output 8 points, 16-bit DAC, 2μs/ch

Temperature

Module Description		Model	Specifications
Temperature control/monitoring module	▲	F3CT04-0N	Thermocouple or mV input, 0.5 s scan, 4 loops
	▲	F3CT04-1N	Thermocouple or mV input, 0.5 s scan, 4 to 20mA DC output, 4 loops
	▲	F3CR04-0N	RTD input, 0.5 s scan, 4 loops
	▲	F3CR04-1N	RTD input, 0.5 s scan, 4 to 20mA DC output, 4 loops
PID control module	▲	F3CV04-1N	DC-voltage input, 0.5 s scan, 4 loops
Temperature control and PID module	▲	F3CU04-0N	4 loops, universal input, time-proportional PID output (open collector), single-slot size
	▲	F3CU04-0S	4 loops, universal input, time-proportional PID output (open collector), single-slot size
		F3CU04-0H	4 loops, universal input, time-proportional PID output (open collector), single-slot size
	▲	F3CU04-1N	4 loops, universal input, universal output (open collector, 4-20mA continuous output), double-slot size
	▲	F3CU04-1S	4 loops, universal input, universal output (open collector, 4-20mA continuous output), double-slot size
		F3CU04-1H	4 loops, universal input, universal output (open collector, 4-20mA continuous output), single-slot size
Temperature monitoring module	▲	F3CX04-0N	4 channels, universal input, single-slot size
		F3CX04-0H	4 channels, universal input, single-slot size

Data Acquisition

Module Description		Model	Specifications
High-speed data acquisition module	▲	F3HA08-0N	0 to 5V DC / -10 to 10V DC, 8 points (Concurrent sampling for 4 points)
		F3HA06-1R	AI: -10 to 10V / 0 to 10V / 1 to 5V /-5 to 5V / -2.5 to 2.5V 6 input channels, 16-bit ADC, 5µs DI: 5V, 3 input channels
		F3HA12-1R	AI: -10 to 10 / 0 to 10V / 1 to 5 /-5 to 5V / -2.5 to 2.5V 12 input channels, 16-bit ADC, 5µs DI: 5V, 3 input channels

Communicator

Module Description		Model	Specifications
ASi Master module	▲	F3LA01-0N	1 AS-interface V2.1 port
PROFIBUS-DP Interface module	▲	F3LB01-0N	1 PROFIBUS-DP port; 12Mbps max.
Ethernet interface module	▲	F3LE01-0T	10Mbps, 10BASE-T
	▲	F3LE01-5T	10Mbps, 10BASE5/10BASE-T
	▲	F3LE11-0T	10Mbps/100Mbps, 10BASE-T/100BASE-TX
	▲	F3LE12-0T	10Mbps/100Mbps, 10BASE-T/100BASE-TX, message communications
		F3LE01-1T	10Mbps, 10BASE-T, TCP/IP, UDP/IP, ICMP, ARP
		F3LE11-1T	10Mbps/100Mbps, 10BASE-T/100BASE-TX, TCP/IP, UDP/IP, ICMP, ARP, SMTP/POP3, HTTP 1.0
		F3LE12-1T	10Mbps/100Mbps, 10BASE-T/100BASE-TX, TCP/IP, UDP/IP, ICMP, ARP
NX interface module	▲	F3NX01-0N	10Mbps, 10BASE5/10BASE-T, equipped with autonomous decentralized protocol
	▲	F3NX01-1N	10Mbps/100Mbps, 10BASE-T/100BASE-TX, equipped with autonomous decentralized protocol
		F3NX01-2N	10Mbps/100Mbps, 10BASE-T/100BASE-TX, equipped with autonomous decentralized protocol
EtherNet/IP interface module		F3LN01-0N	10Mbps/100Mbps,10BASE-T/100BASE-TX TCP/IP,UDP/IP,ICMP,ARP,CIP
FL-net (OPCN-2) interface module	▲	F3LX02-1N	10Mbps, 10BASE5/10BASE-T, FL-net (OPCN-2) Ver2.00
		F3LX02-2N	10Mbps/100Mbps, 10BASE-T/100BASE-TX, FL-net (OPCN-2) Ver2.00
DeviceNet interface module		F3LD01-0N	1 DeviceNet port of 500kbps max., with master/scanner functions
		F3LD02-1N	1 DeviceNet port of 500kbps max., with slave/adapter functions
CAN2.0B interface module		F3LD21-0N	1 CAN2.0B port of 1Mbps max
Modbus interface module		F3LC31-2F	1 RS-422-A/RS-485 port; 115.2kbps max.
GP-IB communication module		F3GB01-0N	1 GP-IB communication port
Personal computer link module		F3LC11-1F	1 RS-232-C port; 115.2kbps max.
	▲	F3LC11-1N	1 RS-232-C port; 19200bps max.
		F3LC11-2F	1 RS-422-A/RS-485 port; 115.2kbps max.
	▲	F3LC11-2N	1 RS-422-A/RS-485 port; 19200bps max.
		F3LC12-1F	2 RS-232-C ports; 115.2kbps max.
Ladder communication module		F3RZ81-0F	1 RS-232-C port, 115kbps max.
	▲	F3RZ81-0N	1 RS-232-C port; 19200bps max.
		F3RZ82-0F	2 RS-232-C ports, 115kbps max.
		F3RZ91-0F	1 RS-422-A/RS-485 port; 115kbps max.
	▲	F3RZ91-0N	1 RS-422/RS-485 port, 19200bps max.
RS-232-C communication module	▲	F3RS22-0N	2 RS-232-C ports; 19200bps max.
RS-422 communication module	▲	F3RS41-0N	1 RS-422-A/RS-485 port; 19200bps max.
UT link module		F3LC51-2N	1 RS-422-A/RS-485 port of 38400bps max. for easy connection with a temperature controller
FA link H module	▲	F3LP02-0N	32 stations max., total transmission distance 1km, 1.25Mbps max.
Fiber-optic FA link H module	▲	F3LP12-0N	32 stations max., total transmission distance 10km, 1.25Mbps max.
FA link H2 module		F3LP32-0N	32 stations max., total transmission distance 1km, 1.25Mbps max.

Remote I/O

Module Description		Model	Specifications
YHLS master module		F3LH01-1N	12Mbps max., YHLS port x 1
		F3LH02-1N	12Mbps max., YHLS port x 2
	▲	F3LH02-0N	12Mbps max., 126 slaves max., 300m range max., 2 ports
	▲	F3LH04-0N	12Mbps max., 252 slaves max., 300m range max., 4 ports
Fiber-optic FA-bus module		F3LR01-0N	7 stations max., total transmission distance 200m, 10Mbps
Fiber-optic FA-bus Type 2 module		F3LR02-0N	56[1] stations max., total transmission distance 1.4km[2], 10Mbps
FA-bus Type 2 module		F3LR02-1W	7 stations max., total transmission distance 70m, max., distance between stations 10m, using twisted-pair cables

*1: Up to 32 stations per system.
*2: When 3 stations are interconnected.

Positioning

Module Description		Model	Specifications
High-speed counter module		F3XP01-0H	100kpps, 1 channel, 32bits
		F3XP02-0H	100kpps, 2 channels, 32bits
Positioning module (advanced model with pulse output)	▲	F3NC11-0N	1-axis position and speed control with max. speed of 249.75kpps
	▲	F3NC12-0N	2-axis position and speed control with max. speed of 249.75kpps
Positioning module (with pulse output)		F3NC32-0N	2-axis position and speed control with max. speed of 5Mpps when servo motor is used and max. speed of 1Mpps when stepper motor is used. 2 counters for input from encoder (including absolute encoder)
		F3NC34-0N	4-axis position and speed control with max. speed of 5 Mpps when servo motor is used and max. speed of 1 Mpps when stepper motor is used. 4 counters for input from encoder (including absolute encoder)
Positioning module (with analog voltage output)		F3NC51-0N	1-axis position and speed control with max. speed of 2Mpps
		F3NC52-0N	2-axis position and speed control with max. speed of 2Mpps
Positioning module (for torque control)		F3NC61-0N	1-axis position-loop control, -10 to +10V speed reference voltage output, with max. speed of 2Mpps, analog input/output
Positioning module (with MECHATROLINK-II interface)		F3NC96-0N	15-axis control with MECHATROLINK-II interface
Positioning module (with MECHATROLINK-III interface)		F3NC97-0N	15-axis control with MECHATROLINK-III interface
Positioning module (with multi-channel pulse output)	▲	F3YP04-0N	4-axis position control with max. speed of 250kpps
	▲	F3YP08-0N	8-axis position control with max. speed of 250kpps
	▲	F3YP14-0N	4-axis position control with max. speed of 3.998Mpps when servo motor is used and max. speed of 499.750kpps when stepper motor is used.
	▲	F3YP18-0N	8- axis position control with max. speed of 3.998Mpps when servo motor is used and max. speed of 499.750kpps when stepper motor is used.
		F3YP22-0P	2-axis position control with max. speed of 7.996Mpps when servo motor is used and max. speed of 1.999Mpps when stepper motor is used. 1ch pulse counter, max. 8Mpps pulse input
		F3YP24-0P	4-axis position control with max. speed of 7.996Mpps when servo motor is used and max. speed of 1.999Mpps when stepper motor is used. 1ch pulse counter, max. 8Mpps pulse inpu
		F3YP28-0P	8-axis position control with max. speed of 7.996Mpps when servo motor is used and max. speed of 1.999Mpps when stepper motor is used. 1ch pulse counter, max. 8Mpps pulse input

● Cables

For detailed cable specifications, see A2.7, "Cables."

Cable Description		Model	Style Code	Specifications
Cable for programming tools		KM11-2N	*A	D-sub, 25-pin, male, 3m long[4]
		KM11-2T	*A	D-sub, 9-pin, female, 3m long[1]
▲		KM11-3T	*A	D-sub, 9-pin, female, 5m long[1]
▲		KM11-4T	*A	D-sub, 9-pin, female, 10m long[1]
		KM13-1S	—	USB 1.1 compliant USB-serial converter, approx. 3m long
Monitor cable (for F3SP08-2□, -3□, and -5□)		KM21-2A	—	D-sub,25-pin, male on device side, 3m long, connected to programming port
		KM21-2B	—	D-sub, 9-pin, female on device side, 3m long, connected to programming port
Monitor cable (for F3SP66 and F3SP67)	▲	KM21-2T	—	D-sub, 9-pin, female on PC side, 3m long
	▲	KM21-2N	—	D-sub, 25-pin, male on PC side, 3m long
SIO port/D-sub 9-pin adapter cable	▲	KM10-0S	—	SIO port/D-sub 9-pin adaptor cable, 0.5m long
CPU port/D-sub 9-pin adapter cable		KM10-0C	—	D-sub, 9-pin, female, approx. 0.5m long
Fiber-optic cord[2][3] for wiring inside panel enclosure (compatible with F3LR01, F3LR02 and F3LP12)		KM60-S06	—	Cord for system expansion inside panel enclosure; 0.6m long
		KM60-001	—	Cord for system expansion inside panel enclosure; 1m long
		KM60-003	—	Cord for system expansion inside panel enclosure; 3m long
Fiber-optic cable[2][3] for indoor wiring, supplied with tension member (compatible with F3LR01, F3LR02 and F3LP12)		KM61-010	—	Cable for indoor system expansion; 10m long
		KM61-100	—	Cable for indoor system expansion; 100m long (with one pulling eye)
	▲	KM61-150	—	Cable for indoor system expansion; 150m long (with one pulling eye)
	▲	KM61-200	—	Cable for indoor system expansion; 200m long (with one pulling eye)
Fiber-optic cable[2][3] for indoor wiring (compatible with F3LR01, F3LR02 and F3LP12)		KM65-001	—	Cable for indoor system expansion; 1m long
	▲	KM65-002	—	Cable for indoor system expansion; 2m long
		KM65-003	—	Cable for indoor system expansion; 3m long
	▲	KM65-004	—	Cable for indoor system expansion; 4m long
		KM65-005	—	Cable for indoor system expansion; 5m long
	▲	KM65-007	—	Cable for indoor system expansion; 7m long
		KM65-010	—	Cable for indoor system expansion; 10m long
	▲	KM65-012	—	Cable for indoor system expansion; 12m long
	▲	KM65-015	—	Cable for indoor system expansion; 15m long
		KM65-020	—	Cable for indoor system expansion; 20m long
	▲	KM65-025	—	Cable for indoor system expansion; 25m long
	▲	KM65-030	—	Cable for indoor system expansion; 30m long
Fiber-optic cable[2][3] for outdoor wiring, supplied with tension member (compatible with F3LR01 [up to 200m], F3LR02 [up to 200m], and F3LP12 [up to 1000m])		KM62-100	—	Cable for outdoor system expansion; 100m long (with one pulling eye)
	▲	KM62-200	—	Cable for outdoor system expansion; 200m long (with one pulling eye)
	▲	KM62-300	—	Cable for outdoor system expansion; 300m long (with one pulling eye)
	▲	KM62-400	—	Cable for outdoor system expansion; 400m long (with one pulling eye)
	▲	KM62-500	—	Cable for outdoor system expansion; 500m long (with one pulling eye)
	▲	KM62-600	—	Cable for outdoor system expansion; 600m long (with one pulling eye)
	▲	KM62-700	—	Cable for outdoor system expansion; 700m long (with one pulling eye)
	▲	KM62-800	—	Cable for outdoor system expansion; 800m long (with one pulling eye)
	▲	KM62-900	—	Cable for outdoor system expansion; 900m long (with one pulling eye)
	▲	KM62-L01	—	Cable for outdoor system expansion; 1000m long (with one pulling eye)

Cable Description		Model	Style Code	Specifications
Fiber-optic cable[2] for outdoor wiring, supplied with tension member (compatible with F3LR02 (200 to 500m))	▲	KM67-300	—	Cable for outdoor system expansion; 300m long (with one pulling eye)
	▲	KM67-400	—	Cable for outdoor system expansion; 400m long (with one pulling eye)
	▲	KM67-500	—	Cable for outdoor system expansion; 500m long (with one pulling eye)
Fiber-optic cable[2] for outdoor wiring, supplied with tension member (compatible with F3LR01,F3LR02)		KM69-010	—	Cable for outdoor system expansion;10m long, flame-retardant cable(equivalent of VW-1)

*1:   Supports DOS/V.
*2:   For details, see "Fiber-optic FA-bus Module and Fiber-optic FA-bus Type 2 Module" (IM 34M06H45-01E).
*3:   For details, see "FA Link H Module, Fiber-optic FA Link H Module" (IM 34M06H43-01E).
*4:   Supports PC-9801 series from NEC.

For detailed cable specifications, see A2.7, "Cables."

Cable Description	Model	Style Code	Specifications
Cable for connector terminal blocks[5]	KM55-005	—	For connection between module and connector terminal block; 0.5m long
	KM55-010	—	For connection between module and connector terminal block; 1m long
	KM55-015	—	For connection between module and connector terminal block; 1.5m long
	KM55-020	—	For connection between module and connector terminal block; 2m long
	KM55-025	—	For connection between module and connector terminal block; 2.5m long
	KM55-030	—	For connection between module and connector terminal block; 3m long

*5:   Cannot be used with F3YP04, F3YP08, F3YP14, F3YP18, F3YP22, F3YP24, F3YP28, F3NC32 and F3NC34 as they use 48-pin connectors.

● YHLS Cables

Name		Model	Specifications
YHLS fixed cables		KM80-010	Fixed cable, 10m long, Flame-retardant cable(VW-1)
		KM80-050	Fixed cable, 50m long, Flame-retardant cable(VW-1)
		KM80-100	Fixed cable, 100m long, Flame-retardant cable(VW-1)
		KM80-200	Fixed cable, 200m long, Flame-retardant cable(VW-1)
		KM80-300	Fixed cable, 300m long, Flame-retardant cable(VW-1)
YHLS flexible cables		KM81-010	Flexible cable, 10m long, Flame-retardant cable(VW-1)
		KM81-050	Flexible cable, 50m long, Flame-retardant cable(VW-1)
		KM81-100	Flexible cable, 100m long, Flame-retardant cable(VW-1)
		KM81-200	Flexible cable, 200m long, Flame-retardant cable(VW-1)
	▲	KM81-300	Flexible cable, 300m long, Flame-retardant cable(VW-1)

● YHLS Slave Units

Name		Model	Specifications
TAH series		TAHWD32-3PAM	16 inputs (with positive common) and 16 outputs (sink type)
		TAHWD32-3NBM	16 inputs (with negative common) and 16 outputs (source type)
		TAHXD16-3PEM	16 inputs (with positive common)
		TAHXD16-3NEM	16 inputs (with negative common)
		TAHYD16-3EAM	16 outputs (sink type)
		TAHYD16-3EBM	16 outputs (source type)
TAC series	▲	TACXD08-3AE	8 DC inputs (sink type), 24V DC, e-CON
	▲	TACXD16-3AM	16 DC inputs (sink type), 24V DC, MIL
	▲	TACYD08-1AE	8 TR outputs (sink type), 24V DC, 0.1mA, e-CON
	▲	TACYD16-1AM	16 TR outputs (sink type), 24V DC, 0.1mA, MIL
	▲	TACYC04-0NB	4 relay outputs, 24V DC/250V AC 1A, European
	▲	TACWD08-3NE	4 inputs and 4 outputs, 24V DC, e-CON
	▲	TACWD16-3NM	8 inputs and 8 outputs, 24V DC, MIL

● Terminal Block

Name		Model	Specifications
Terminal block unit[*1][*2]		TA40-0N	40 points; voltage rating: 5 to 24V DC
Connector terminal block[*1][*2]		TA50-0N	Connector terminal block 40 points (M3.5 screw)
	▲	TA50-1N	Connector terminal block 40 points (M3 screw)
	▲	TA50-2N	Connector terminal block 40 points (M3 screw)
	▲	TA60-0N	Connector terminal block 40 points (Europe terminal type)

*1: Cannot be used with F3YP04, F3YP08, F3YP14, F3YP18, F3YP22, F3YP24, F3YP28, F3NC32 and F3NC34 as they use 48-pin connectors.

*2: For detailed terminal block specifications, see A2.8, "Terminal Block Unit and Connector Terminal Block."

● Spare Parts

Description		Part Number	Compatible Module
Terminal for 10-point terminal block		A2301JT	F3XH04, F3XA08, F3XC08-0N, F3XD08, F3YD04, F3YA08, F3YC08-0N, F3YD08, F3AD04-0N, F3AD04-0R, F3AD04-0V, F3DA02
	▲	A1474JT	
Terminal cover for 10-point terminal block		T9113PF	
Terminal for 18-point terminal block		A2264JT	F3XA16, F3XC08-0C, F3XD16, F3YD14, F3YC08-0C, F3YC16, F3CR04, F3CV04, F3CU04-1N, F3CU04-1S, F3AD04-5R, F3AD04-5V, F3AD08, F3DA04, F3DA08, F3XS04, F3HB08, F3HA08
	▲	A1496JT	
		T9112ZU	F3CU04-0N, F3CU04-1N, F3CU04-0S, F3CU04-1S, F3CX04-0N
Terminal cover for 18-point terminal block		T9113PG	F3XA16, F3XC08-0C, F3XD16, F3YD14, F3YC08-0C, F3YC16, F3CR04, F3CV04, F3CU04-0N, F3CU04-1N, F3CU04-0S, F3CU04-1S, F3CX04-0N, F3AD04-5R, F3AD04-5V, F3AD08, F3DA04, F3DA08, F3XS04, F3HB08, F3HA08
Terminal for 40-pin terminal block		T9113PL	F3CU04-0H, F3CU04-1H, F3CX04-0H
Soldered connector (40-pin plug)		A1451JD[*1]	F3XD32, F3XD64, F3WD64, F3XP01, F3XP02 F3YD32, F3YD64, F3NC11, F3NC12, F3NC51, F3NC52
Cover for connector (40-pin plug)		A1452JD[*1]	
Soldered connector (48-pin plug)		A1612JD[*1]	F3YP04, F3YP08, F3YP14, F3YP18, F3YP22, F3YP24, F3YP28, F3NC32, F3NC34
Cover for connector (48-pin plug)		A1613JD[*1]	
Dustproof connector cover (4pcs/bag)		T9031AS	F3BU04, F3BU06, F3BU05, F3BU09, F3BU13, F3BU16
Rail-mounting kit (includes 3 parts)		T9031AP[*1]	F3BU04, F3BU06, F3BU05
Rail-mounting kit (includes 6 parts)		T9031AQ[*1]	F3BU09, F3BU13
Battery for memory backup		A1126EB	F3RP70

*1: Not supplied with the product.

● Other Components

Description		Model	Specifications
Blank module		F3BL00-0N	For empty I/O slots

A2.3 Power Supply Modules

(1) F3PU10-0N/F3PU10-0S/F3PU20-0N/F3PU20-0S Power Supply Modules

● Specifications

Item	Specifications	
	F3PU10-0N/ F3PU10-0S [*1]	**F3PU20-0N/ F3PU20-0S** [*1]
Supply voltage range	100 to 240V AC, single phase 50/60Hz	
Range of supply voltage change	85 to 264V AC 50/60Hz±3Hz	
Power consumption	35VA	85VA
Inrush current	20A max. (120V AC, Ta=25°C) 45A max. (240V AC, Ta=25°C)	
Fuse	Time-lag fuse (Built into the L and N terminals and cannot be replaced.)	Time-lag fuse (Built into the L and N terminals and cannot be replaced.)
Rated output voltage	5V DC	
Rated output current	2.0A	4.3A
Insulation resistance	5MΩ min. when tested between a group of external AC terminals and the FG terminal using a 500V DC insulation resistance tester	
	5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.	
Withstanding voltage	1500V AC for one minute between a group of external AC terminals and the FG terminal	
	1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.	
Leakage current	3.5mA max	
Allowable momentary power failure time	20ms (Standard Mode) 10ms (Immediate Detection Mode)	
External dimensions	28.9 (W) × 100 (H) × 83.2 (D) mm [*2]	58 (W) × 100 (H) × 83.2 (D) mm [*2]
Weight	190g	320g
Compatible base module	Dedicated to F3BU04 and F3BU06	Dedicated to F3BU05, F3BU09, F3BU13 and F3BU16

*1: F3PU10-0N (respectively F3PU20-0N) and F3PU10-0S (respectively F3PU20-0S) have terminal blocks with different screw sizes but are otherwise exactly the same.

*2: Excluding protrusions (see the dimensional figures for more information)

● Components and Their Functions

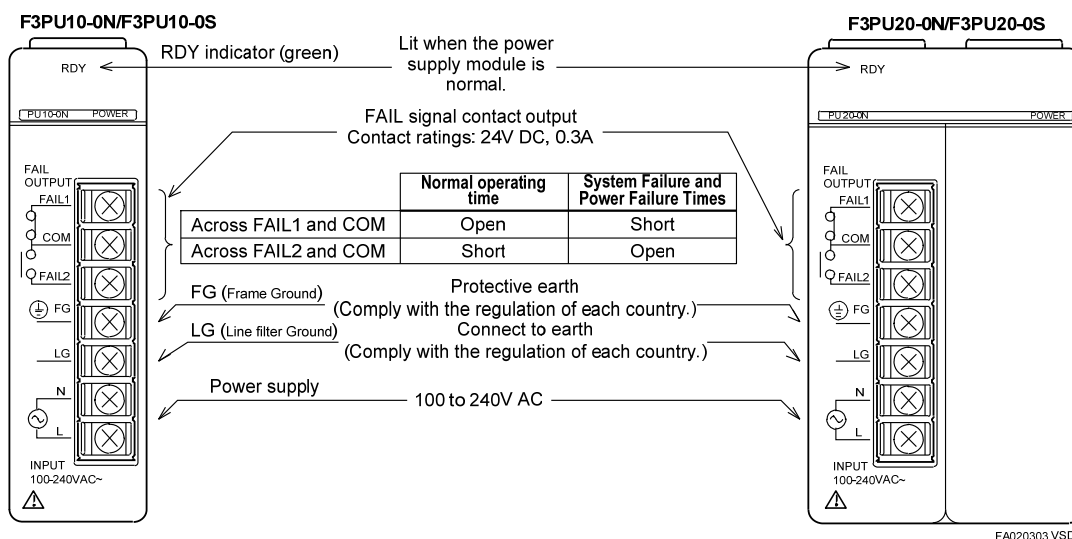The figure below shows the power supply modules with their covers removed.

Figure A2.2 F3PU10-0N/F3PU10-0S and F3PU20-0N/F3PU20-0S Power Supply Modules
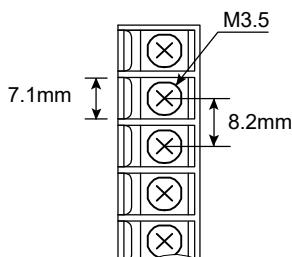
⚠️ **WARNING**

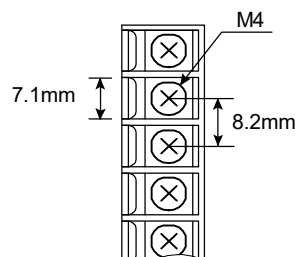To avoid electrical shock, turn off the power before wiring.

Note

LG terminal has a half potential of the input power supply voltage when LG terminal isn't connected to earth appropriately.

● **Terminal dimensions**

F3PU10-0N / F3PU20-0N

F3PU10-0S / F3PU20-0S

FA020304.VSD

● **Adaptable crimp-on terminal**

Vendor	Model	Compatible Conductor	Compatible Modules and Crimping Torque	
			F3PU10-0N F3PU20-0N	F3PU10-0S F3PU20-0S
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M3	AWG22 to 18 (0.33 to 0.82mm²) (Copper wire)	0.8N·m (7.1 lbf·in)	May not be used
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M4			1.2N·m (10.6 lbf·in)
Japan Solderless Terminal Mfg Co., Ltd.	V2-M4	AWG16 to 14 (1.3 to 2.1mm²) (Copper wire)		

Note

When crimping terminals, be sure only to use the tool specified by each terminal manufacturer.

Once the power supply module is installed in the base module, both the FG terminal of the power supply module and the signal ground (GND terminal of the module's 5V output) of the FA-M3 automatically come into contact with the metal chassis of the base module. The FG terminal and the signal ground are isolated from each other inside the power supply module.

For details on the grounding lines of the FA-M3, see subsection A3.3.2, "Grounding Lines."

Note

- F3PU10-0N (respectively F3PU20-0N) and F3PU10-0S (respectively F3PU20-0S) have the same dimensions, internal circuitry and other characteristics, except that F3PU10-0N (respectively F3PU20-0N) uses M3.5-screw terminals while F3PU10-0S (respectively F3PU20-0S) uses M4-screw terminals.

- F3PU10-0N and F3PU20-0N are not CE Marking compliant. F3PU10-0S and F3PU20-0S are CE Marking compliant.

- For compliance to CE Marking of the final product incorporating these modules, F3PU10-0S or F3PU20-0S must be used.

Note

Power supply circuit which is connected to FAIL signal contact output terminal must be SELV and limited-energy circuit separated by reinforced insulation or double insulation from hazardous voltage.
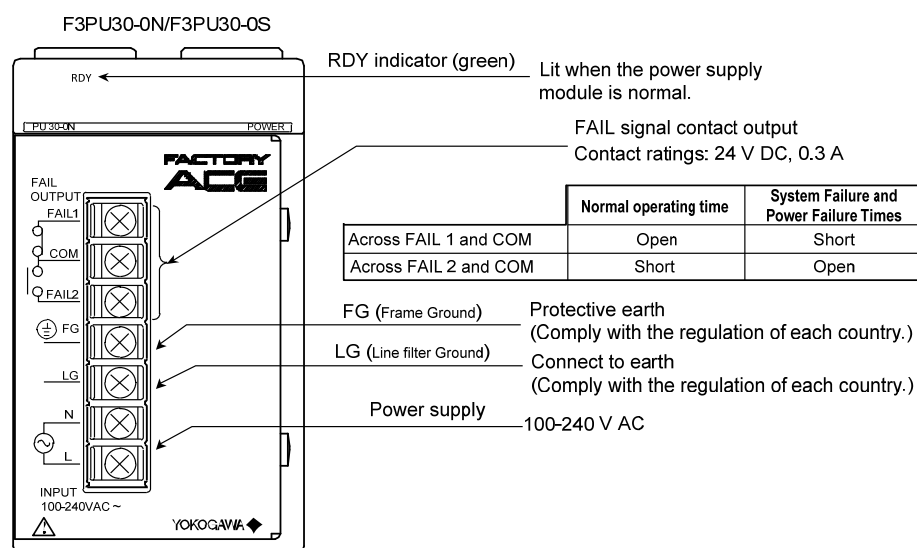
(2)   F3PU30-0N/F3PU30-0S Power Supply Modules

● Specifications

Item	Specifications
	F3PU30-0N/F3PU30-0S[*1]
Supply voltage	100 to 240V AC, single phase, 50/60Hz
Range of supply voltage change	85 to 264V AC, 50/60Hz ±3Hz
Power consumption	100VA
Inrush current	20A max. (120V AC, Ta=25°C), 45A max. (240V AC, Ta=25°C)
Fuse	Time-lag fuse (Built into the L and N terminals and cannot be replaced.)
Rated output voltage	5V DC
Rated output current	6.0A
Insulation resistance	5MΩ min. when tested between a group of external AC terminals and the FG terminal using a 500V DC insulation resistance tester
	5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.
Withstanding voltage	1500V AC for one minute between a group of external AC terminals and the FG terminal
	1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.
Leakage current	3.5mA max.
Allowable momentary power failure time	20ms (Standard Mode) 10ms (Immediate Detection Mode)
External dimensions	58.0 (W) x 100 (H) x 126.1(D)mm [*2]
Weight	380g
Compatible base module	Dedicated to F3BU05, F3BU09, F3BU13 and F3BU16

*1:   The only difference between modules F3PU30-0N and F3PU30-0S lies in the screw diameter of their screw terminal blocks.

*2:   Excluding protrusions (see the dimensional figures for more information)

● Components and Their Functions

Figure A2.3   F3PU30-0N/F3PU30-0S Power Supply Modules

⚠️ **WARNING**

To avoid electrical shock, turn off the power before wiring.

Note

LG terminal has a half potential of the input power supply voltage when LG terminal isn't connected to earth appropriately.

● **Terminal dimensions**

F3PU30-0N

F3PU30-0S

FA020306.VSD

● **Adaptable crimp-on terminals**

Vendor	Model	Compatible Conductor	Crimping Torque	
			F3PU30-0N	F3PU30-0S
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M3	AWG22 to 18 (0.33 to 0.82mm^2) (Copper wire)	0.8N·m (7.1 lbf·in)	May not be used
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M4			1.2N·m (10.6 lbf·in)
Japan Solderless Terminal Mfg Co., Ltd.	V2-M4	AWG16 to 14 (1.3 to 2.1mm^2) (Copper wire)		

Note

When crimping terminals, be sure only to use the tool specified by each terminal manufacturer.

Once the power supply module is installed in the base module, both the FG terminal of the power supply module and the signal ground (GND terminal of the module's 5V output) of the FA-M3 automatically come into contact with the metal chassis of the base module. The FG terminal and the signal ground are isolated from each other inside the power supply module.

For details on the grounding lines of the FA-M3, see subsection A3.3.2, "Grounding Lines."

Note

- F3PU30-0S module is the same as F3PU30-0N module, but it uses M4 terminal screws instead of M3.5 terminal screws. Other than terminal screw diameter, their dimensions and internal circuitries are identical.

- F3PU30-0N is not CE Marking compliant.
  F3PU30-0S is CE Marking compliant.

- For compliance to CE Marking of the final product incorporating these modules, F3PU30-0S must be used.

Note

Power supply circuit which is connected to FAIL signal contact output terminal must be SELV and limited-energy circuit separated by reinforced insulation or double insulation from hazardous voltage.

(3) F3PU16-0N/ F3PU16-0S and F3PU26-0N/ F3PU26-0S Power Supply Modules

● Specifications

Item	Specifications	
	F3PU16-0N/ F3PU16-0S [1]	**F3PU26-0N/ F3PU26-0S** [1]
Supply voltage	24V DC	
Range of supply voltage change	15.6 to 31.2V DC	
Power consumption	15.4W	33.1W
Inrush current	20A max. (31.2V DC, Ta=25°C)	
Fuse	Built-in Time-lag fuse, cannot be replaced.	
Rated output voltage	5V DC	
Rated output current	2.0A	4.3A
Insulation resistance	5MΩ min. when tested between a group of external DC terminals and the FG terminal using a 500V DC insulation resistance tester	
	5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.	
Withstanding voltage	1500V AC for one minute between a group of external DC terminals and the FG terminal	
	1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.	
Allowable momentary power failure time	20ms (Standard Mode) 2ms (Immediate Detection Mode)	
External dimensions	28.9 (W) × 100 (H) × 83.2 (D)mm [2]	58 (W) × 100 (H) × 83.2 (D)mm [2]
Weight	190g	320g
Compatible base module	Dedicated to F3BU04 and F3BU06	Dedicated to F3BU05, F3BU09, F3BU13 and F3BU16

[1]: F3PU16-0N (respectively F3PU26-0N) and F3PU16-0S (respectively F3PU26-0S) have terminal blocks with different screw sizes but are otherwise exactly the same.
[2]: Excluding protrusions (see the dimensional figures for more information)

● Components and Their Functions

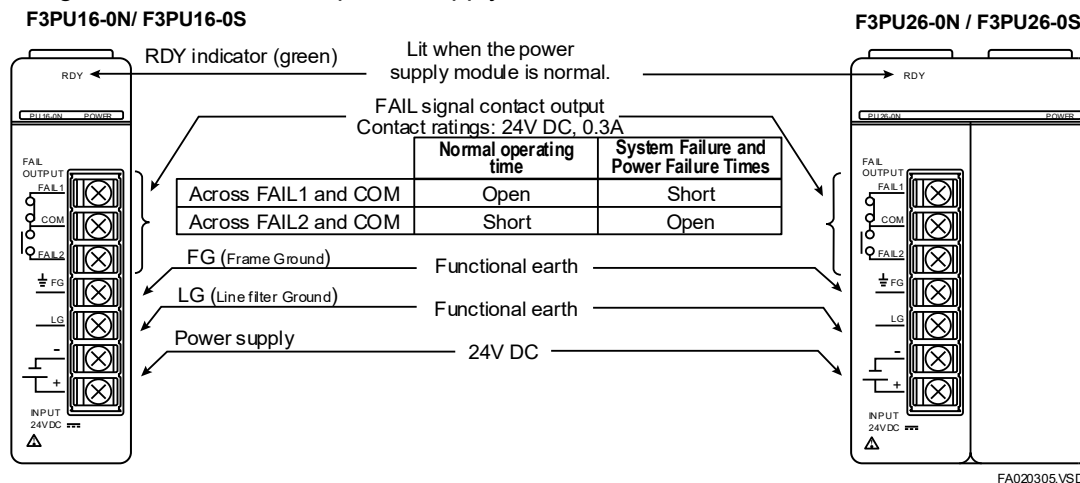The figure below shows the power supply modules with their covers removed.

F3PU16-0N/ F3PU16-0S

RDY indicator (green) — Lit when the power supply module is normal.

FAIL signal contact output
Contact ratings: 24V DC, 0.3A

	Normal operating time	System Failure and Power Failure Times
Across FAIL1 and COM	Open	Short
Across FAIL2 and COM	Short	Open

FG (Frame Ground) — Functional earth
LG (Line filter Ground) — Functional earth
Power supply — 24V DC

F3PU26-0N / F3PU26-0S

FA020305.VSD

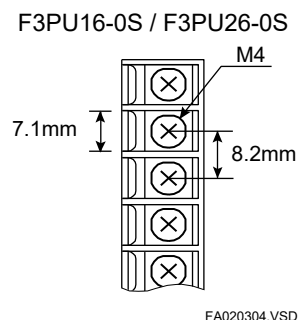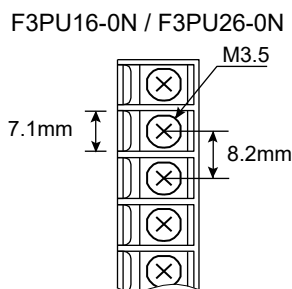**Figure A2.4   F3PU16-0N/ F3PU16-0S and F3PU26-0N/ F3PU26-0S Power Supply Modules**

⚠️ **WARNING**

To avoid electrical shock, turn off the power before wiring.

Note

LG terminal has a half potential of the input power supply voltage when LG terminal isn't connected to earth appropriately.

● **Terminal dimensions**

F3PU16-0N / F3PU26-0N

F3PU16-0S / F3PU26-0S

FA020304.VSD

● **Adaptable crimp-on terminals**

Vendor	Model	Compatible Conductor	Crimping Torque	
			F3PU16-0N F3PU26-0N	F3PU16-0S F3PU26-0S
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M3	AWG22 to 18 (0.33 to 0.82mm^2) (Copper wire)	0.8N·m (7.1 lbf·in)	May not be used
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M4			1.2N·m (10.6 lbf·in)
Japan Solderless Terminal Mfg Co., Ltd.	V2-M4	AWG16 to 14 (1.3 to 2.1mm^2) (Copper wire)		

Note

When crimping terminals, be sure only to use the tool specified by each terminal manufacturer.

Once the power supply module is installed in the base module, both the FG terminal of the power supply module and the signal ground (GND terminal of the module's 5V output) of the FA-M3 automatically come into contact with the metal chassis of the base module. The FG terminal and the signal ground are isolated from each other inside the power supply module.

For details on the grounding lines of the FA-M3, see subsection A3.3.2, "Grounding Lines."

Note

- F3PU16-0N (respectively F3PU26-0N) and F3PU16-0S (respectively F3PU26-0S) have the same dimensions, internal circuitry and other characteristics, except that F3PU16-0N (respectively F3PU26-0N) uses M3.5-screw terminals while F3PU16-0S (respectively F3PU26-0S) uses M4-screw terminals.

- F3PU16-0N and F3PU26-0N are not CE Marking compliant. F3PU16-0S and F3PU26-0S are CE Marking compliant.

- For compliance to CE Marking of the final product incorporating these modules, F3PU16-0S or F3PU26-0S must be used.

Note

Power supply circuit which is connected to 24V DC power supply terminal and FAIL signal contact output terminal must be SELV and limited-energy circuit separated by reinforced insulation or double insulation from hazardous voltage.

(4)   F3PU36-0N/F3PU36-0S Power Supply Module

● Specifications

Item	Specifications
	F3PU36-0N/F3PU36-0S[*1]
Supply voltage	24V DC
Range of supply voltage change	15.6 to 31.2V DC
Power consumption	46.2W
Inrush current	20A max. (31.2V DC, Ta=25°C)
Fuse	Built-in Time-lag fuse, cannot be replaced.
Rated output voltage	5V DC
Rated output current	6.0A
Insulation resistance	5MΩ min. when tested between a group of external DC terminals and the FG terminal using a 500V DC insulation resistance tester
	5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.
Withstanding voltage	1500V AC for one minute between a group of external DC terminals and the FG terminal
	1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.
Allowable momentary power failure time	20ms (Standard Mode) 2ms (Immediate Detection Mode)
External dimensions	58 (W) × 100 (H) × 126.1 (D) mm [*2]
Weight	410g
Compatible base module	Dedicated to F3BU05, F3BU09, F3BU13 and F3BU16

*1:   The only difference between modules F3PU30-0N and F3PU30-0S lies in the screw diameter of their screw terminal blocks.

*2:   Excluding protrusions (see the dimensional figures for more information)

● Components and Their Functions

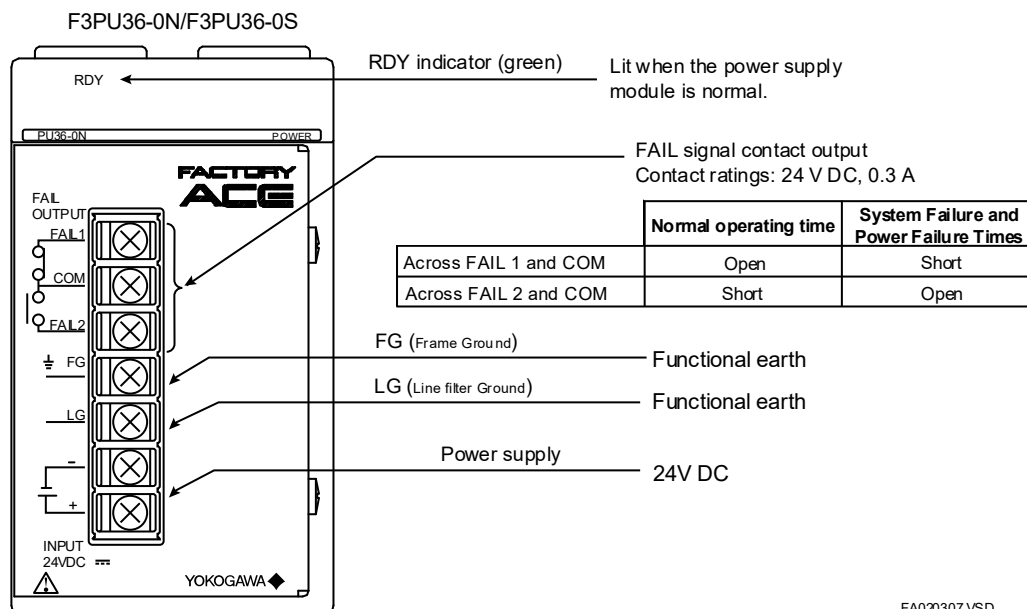The figure below shows the power supply modules with their covers removed.

	Normal operating time	System Failure and Power Failure Times
Across FAIL 1 and COM	Open	Short
Across FAIL 2 and COM	Short	Open

Figure A2.5   F3PU36-0N/F3PU36-0S Power Supply Module

⚠️ **WARNING**

To avoid electrical shock, turn off the power before wiring.

Note

LG terminal has a half potential of the input power supply voltage when LG terminal isn't connected to earth appropriately.

● Terminal dimensions

F3PU36-0N

F3PU36-0S

FA020306.VSD

● Adaptable crimp-on terminals

Vendor	Model	Compatible Conductor	Crimping Torque	
			F3PU36-0N	F3PU36-0S
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M3	AWG22 to 18 (0.33 to 0.82mm^2) (Copper wire)	0.8N·m (7.1 lbf·in)	May not be used
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M4			1.2N·m (10.6 lbf·in)
Japan Solderless Terminal Mfg Co., Ltd.	V2-M4	AWG16 to 14 (1.3 to 2.1mm^2) (Copper wire)		

Note

When crimping terminals, be sure only to use the tool specified by each terminal manufacturer.

Once the power supply module is installed in the base module, both the FG terminal of the power supply module and the signal ground (GND terminal of the module's 5V output) of the FA-M3 automatically come into contact with the metal chassis of the base module. The FG terminal and the signal ground are isolated from each other inside the power supply module.

For details on the grounding lines of the FA-M3, see subsection A3.3.2, "Grounding Lines."

Note

- F3PU36-0S module is the same as F3PU36-0N module, but it uses M4 terminal screws instead of M3.5 terminal screws. Other than terminal screw diameter, their dimensions and internal circuitries are identical.

- F3PU36-0N is not compliant to CE Marking.
  F3PU36-0S is compliant to CE Marking.

- For compliance to CE Marking of the final product incorporating these modules, F3PU36-0S must be used.
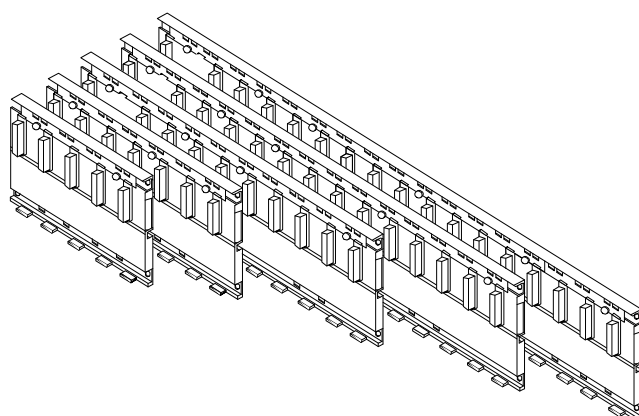
Note

Power supply circuit which is connected to 24V DC power supply terminal and FAIL signal contact output terminal must be SELV and limited-energy circuit separated by reinforced insulation or double insulation from hazardous voltage.

A2.4   Base Modules

There are six types of base modules: 4-, 6-, 5-, 9-, 13-, and 16-slot modules. Select an appropriate type of module according to your application needs.

Model	Number of Slots	Number of I/O Slots	Weight
F3BU04-0N	4	3	150g
F3BU06-0N	6	5	210g
F3BU05-0D	5	4	210g
F3BU09-0N	9	8	340g
F3BU13-0N	13	12	470g
F3BU16-0N	16	15	550g

F0204.EPS

Figure A2.6 Base Modules

Note

Once the power supply module is installed in the base module, both the FG terminal of the power supply module and the signal ground (GND terminal of the module's 5V output) of the FA-M3 automatically come into contact with the metal chassis of the base module.

When any module having a SHIELD terminal is installed in the base module, the SHIELD terminal automatically comes into contact with the metal chassis of the base module.

Likewise, when any module having a D-sub or GP-IB connector is installed in the base module, the connector's metal shell automatically comes into contact with the metal chassis of the base module.
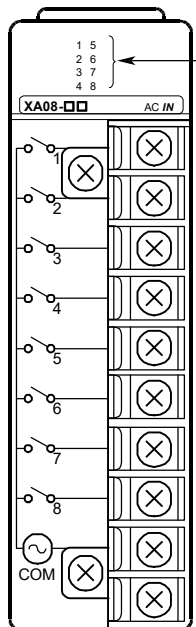
For details on the grounding lines of the FA-M3, see subsection A3.3.2, "Grounding Lines."

A2.5   I/O Modules

■ Components and Their Functions
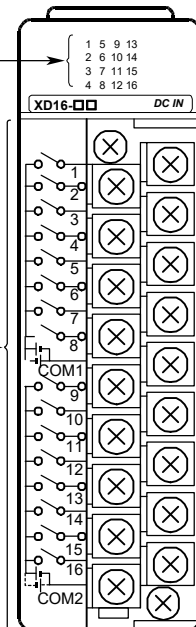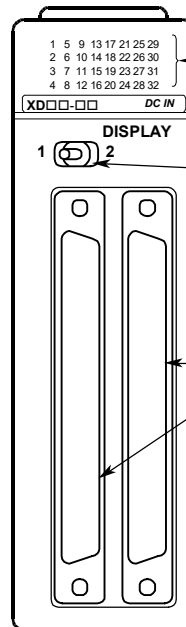
● Terminal Block Type

● Connector Type

Display Selector Switch	Contents of 1 to 32 input LEDs
1	Indicates the on/off state of input terminals 1 to 32.
2	Indicates the on/off state of input terminals 33 to 64.

FA020501.VSD

Figure A2.7   I/O Module Front View

■ External Dimensions

unit: mm
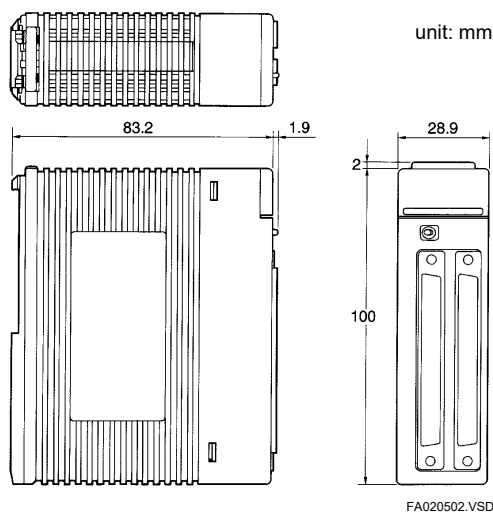
FA020502.VSD

Figure A2.8   I/O Module External Dimensions (F3XD64-3N)

■ Isolation Methods

The internal circuit is isolated from the field using one of the following methods:

Photocoupler isolation : Withstands 1500V AC for 1 minute.

Mechanical isolation : Withstands 1500V AC for 1 minute.

Transformer isolation : Withstands 500V AC for 1 minute.

■ Terminal Arrangement
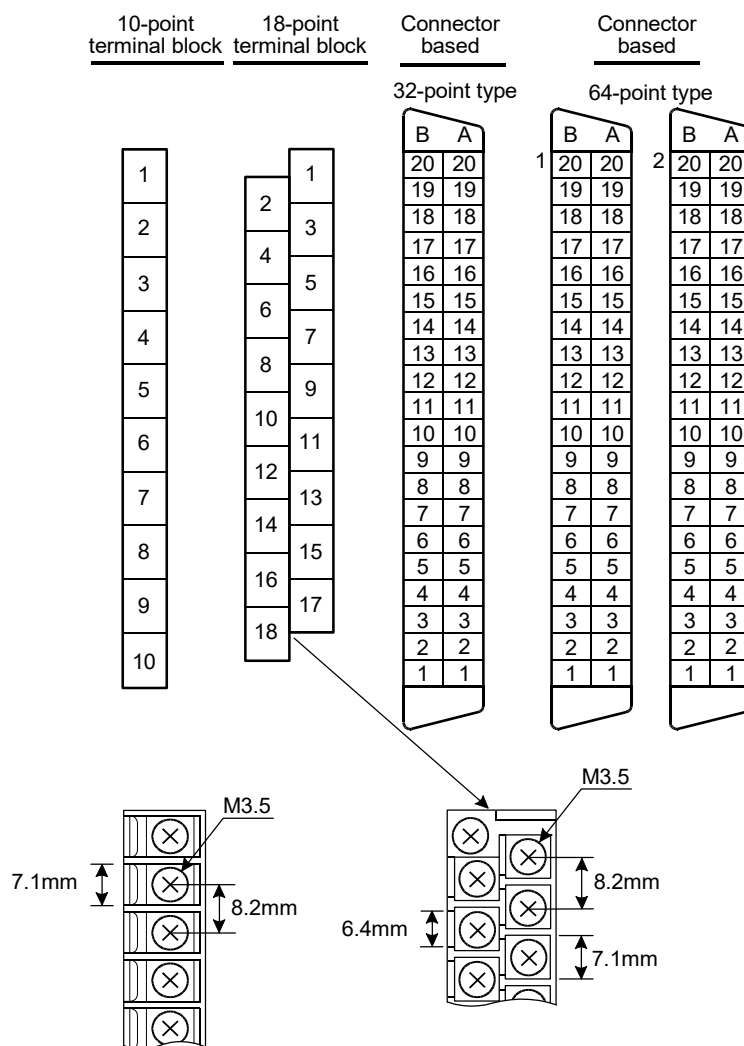
Note: Viewed from the front side of the module.   FA020503.VSD

■ External Connection

There are two ways of connecting an input/output module externally: through a terminal block (10 or 18 points) and through a connector. See Section A3.6, "Wiring I/O Modules," for more details on wiring.

(1)   F3XH04-3N High-speed Input Module

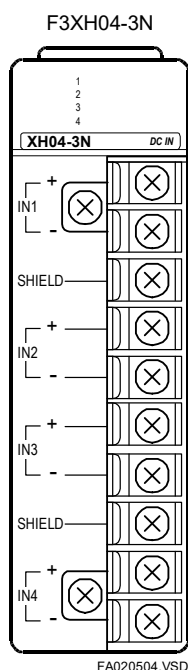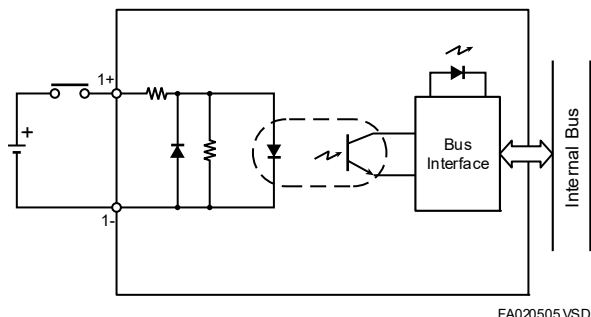| Item		Specifications	Item		Specifications
Input type		DC voltage	Pulse-capture features [*]	Selection	Selected by DIP switches
Number of points		4			
Common line type		4 independent points			
Insulation method		Photo-coupler insulation			
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection (excluding SHIELD) and the internal circuit	Interrupt features [*]	Selection	Selected by DIP switches
Rated input voltage		24V DC		Setting	Set for each point using Ladder Diagram Support Program M3.
Operating voltage range		20.4 to 26.4V DC			
Rated input current		11.2mA/point (24V DC)		Input hold time	The input signal is held for 512µs after detection of an off-to-on transition.
Input impedance		2.1kΩ			
Operating voltage/ Current	ON	16V DC min. 7.2mA min.			
	OFF	6.0V DC max. 2.5mA max.	Dissipating current		30mA (5V DC)
			Input display		LED (Lit when input is on)
Response time	OFF→ON	50µs max.	External connection		10-point terminal block with M3.5 screws
	ON→OFF	50µs max.	Weight		130g
Minimum input pulse width		50µs	Maximum ratio of inputs turned on simultaneously		100%

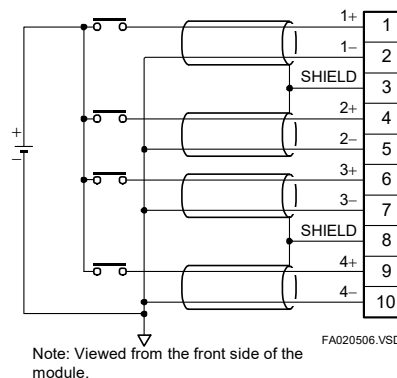*:   The pulse capture feature and the interrupt feature cannot be used together.

● **Front View**

F3XH04-3N

FA020504.VSD

● **Internal Circuit Configuration**

FA020505.VSD

● **External Connection Diagram**

FA020506.VSD

Note: Viewed from the front side of the module.

● **Setting up the Pulse-capture and Interrupt Functions**

The F3XH04-3N allows you to enable the pulse-capture or interrupt function by setting its internal DIP switch (DIP SW).

(1) Hardware Setup

Remove the side cover and select the desired function with internal DIP SW 1.
The pulse-capture function is selected as default at the factory.

Side View of Module

F3XH04-3N Side View With Side Cover Removed

FA020507.VSD
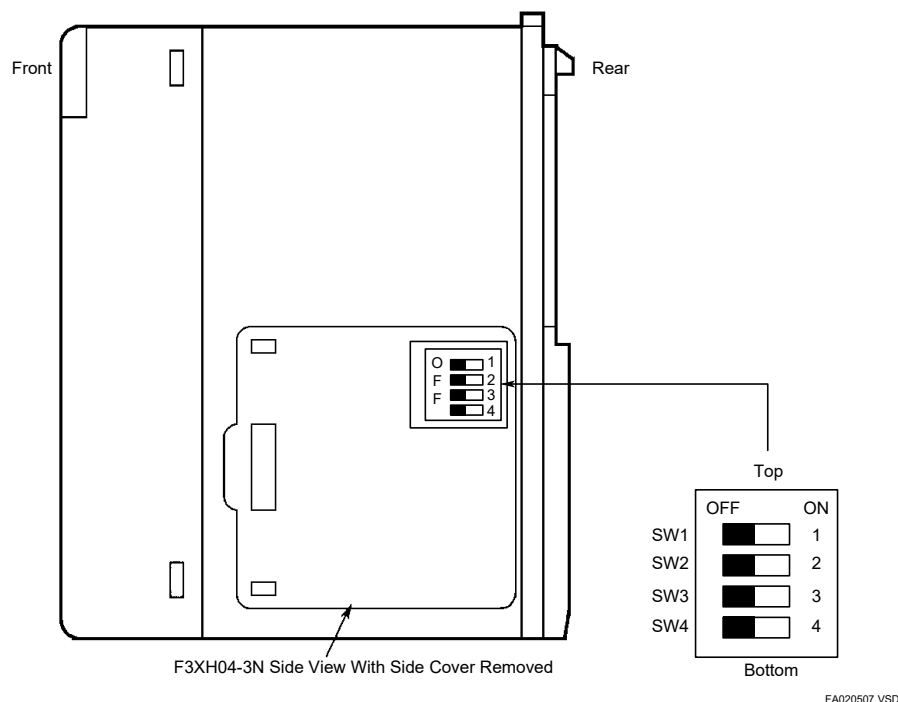
DIP.SW No.	OFF	ON	Default
1	Pulse-capture function	Interrupt function	OFF
2	Not used	Not used	OFF
3	Not used	Not used	OFF
4	Not used	Not used	OFF

Figure A2.9   Setting the Pulse-capture/Interrupt Functions

(2) Software Setting

You can use the pulse-capture function by specifying terminal numbers 17-20 in a ladder program. There is no need to make special settings. Set the interrupt function for each input point. In either case, make sure that the correct function is selected as explained in the paragraph entitled "Hardware Setup."

(3) Accessing a Module

-   **Pulse-capture function**
    This function is available only through a ladder program. Inputs 1-4 correspond to terminal numbers 17-20.

    $X\ell mm17$-$X\ell mm20$

    ℓ : Unit number (0 to 7)

    mm : Slot position

Figure A2.10 Input Relay Number

- **Interrupt function**

The interrupt function may be used from either a ladder or BASIC program.

Inputs 1-4 correspond to terminal numbers 1-4.

(1) Interrupt processing in a ladder program

When using the interrupt function as an interrupt input, make an "I/O interrupt definition" using the INTP instruction.

You can perform I/O interrupt definitions for a maximum of 4 points per single CPU module. When an interrupt input is presented from the F3XH04-3N, an interrupt program that begins with an INTP instruction and ends with an IRET instruction is executed.

The interrupt response time, which is the time required for the CPU module to recognize an interrupt input from the F3XH04-3N and start executing the interrupt program, is dependant on the CPU module model and has the following approximate values.

F3SP21/25/35	: approximately 0.5ms
F3SP22/28/38	: approximately 120µs
F3SP53/58/59/66/67	: approximately 100µs
F3SP71/76	: approximately 100µs

Note

Do not perform "I/O Interrupt Definition" for the same F3XH04-3N input module from multiple CPU modules. The CPU module cannot be correctly notified of an interrupt from the F3XH04-3N input module.

Define the following interrupt period as a standard:

- Interrupt input . . . only one point defined per CPU   1ms and above
  If the interrupt period is 1 to 2ms, ensure that the scan time is 2ms or longer. If the scan time is less than 2ms, use the constant scan time feature.

- Interrupt input . . . 2 to 4 points defined per CPU   10ms and above
  If the interrupt period is short, the interrupt program will be executed frequently, affecting normal program execution. It may also cause delay in responding to commands from programming tool or personal computer links.

(2) Interrupt processing in a BASIC program

Declare the acceptance of interrupts with an ON INT statement after declaring the use of a module with an ASSIGN statement.

For more information, see Section C4.3, "Interrupts" , in the BASIC CPU Modules and YM-BASIC/FA Programming Language (IM 34M06Q22-01E).

(3) Interrupt processing in a OS-free/IEC61131-3 CPU module

For more information, refer to OS-free /IEC61131-3 CPU manual.

(4) Functional Description

- Pulse-capture Function

The pulse-capture function is designed to reliably catch input pulses shorter than the scan time.

As the CPU module usually reads the data of I/O modules during I/O refresh cycle, when a normal input module is used, the CPU may fail to read input pulses shorter than the scan time. The F3XH04-3N module provides a pulse capture function, which can, once it detects pulses longer than 50μs, hold the data until the next timing for data reading so that such pulses can be reliably captured by the the CPU during I/O refreshing. However, the F3XH04-3N module cannot catch input pulses shorter than 50μs.

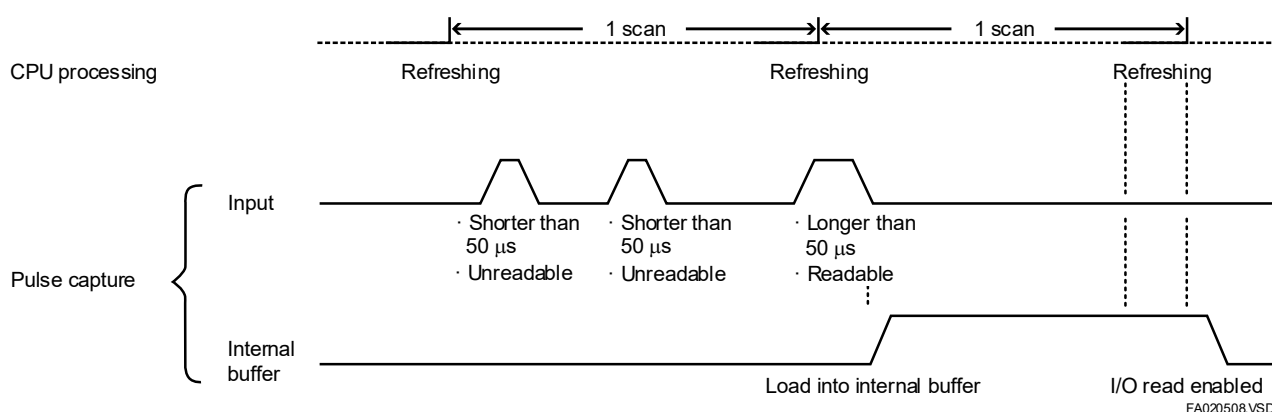The timing diagram of this function is shown below.

Figure A2.11 Behavior when Pulses Shorter than the Scan Time are Inputted

When a pulse longer than the scan time is inputted, the input is regarded as having been on only for the duration of one scan time.
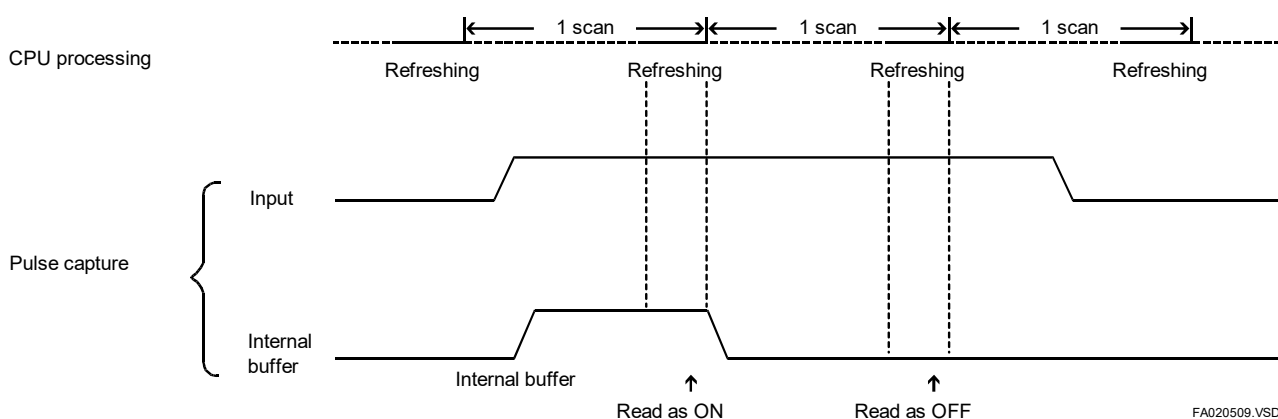

Figure A2.12   Behavior when Pulses Longer than the Scan Time are Inputted

- **Interrupt Function**

If the interrupt function is selected, the F3XH04-3N module continues to hold its input on for the duration of 512µs once it detects an off-to-on transition in the input. The interrupt program therefore may not be executed if an input pulse shorter than 512µs is used as the interrupt signal. If a module that responds very quickly to a change in the input signal, like this F3XH04-3N module, is used as the means for inputting interrupt signals, the CPU module will continue to run the interrupt program for an input of consecutive high-speed pulses and fail to run its regular programs. To avoid this, the F3XH04-3N module is designed to hold the given input signal for a specific length of time once it detects a pulse in order to prohibit itself from detecting any subsequent pulses. This function thus prevents the CPU module from running the interrupt program repeatedly.

The timing diagram of the interrupt function is show below.
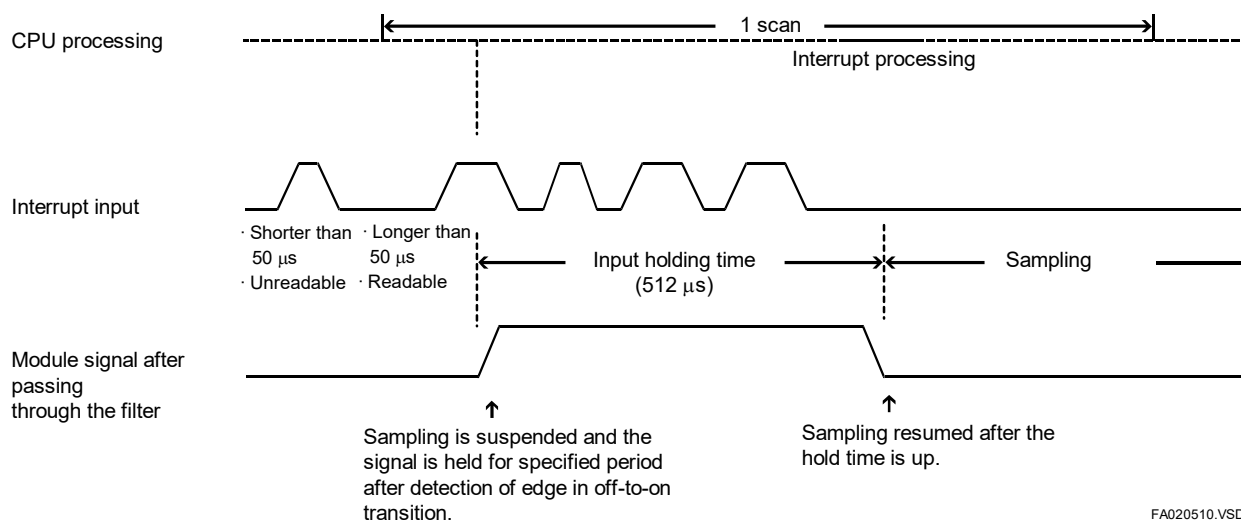
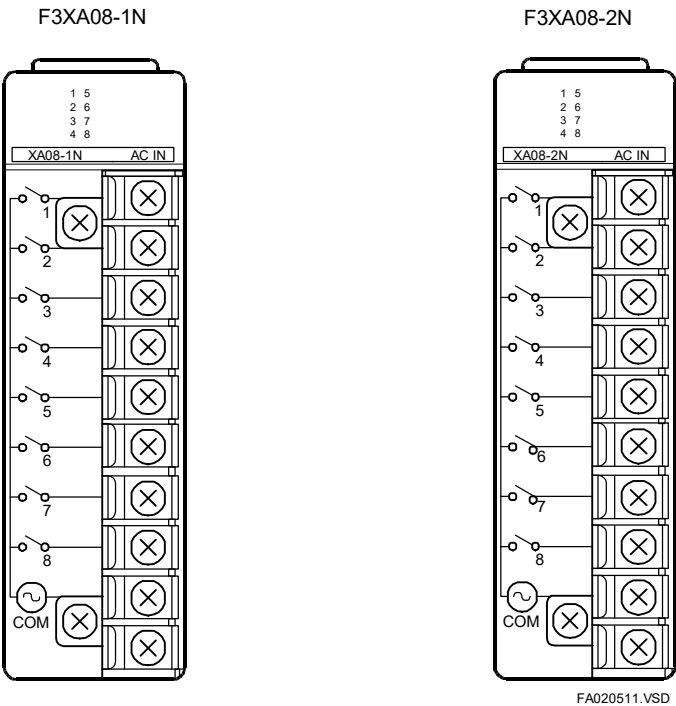**Figure A2.13   Behavior when an Interrupt Occurs**

Note

Do not allow the input relays of any single F3XH04-3N module to be shared by more than one CPU module. Otherwise, the pulse-capture or interrupt function may not work correctly. (This is still applicable even if two or more CPU modules share a relay having a different number.)

(2)   F3XA08-1N/F3XA08-2N AC Input Modules

Item		Specifications	
		F3XA08-1N	**F3XA08-2N**
Input type		AC voltage	
Number of points		8	
Common line type		8 points/common line	
Isolation method		Photocoupler insulation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated input voltage		100 to 120V AC 50/60Hz	200 to 240V AC 50/60Hz
Operating voltage range		85 to 132V AC 50/60Hz	170 to 264V AC 50/60Hz
Rated input current		5.4-6.5mA/point (100-120V AC, 60Hz)	5.1-6.1mA/point (200-240V AC, 60Hz)
Input impedance		21.9kΩ 50Hz 18.5k Ω 60Hz	47.1 kΩ 50Hz 39.4 kΩ 60Hz
Operating voltage/current	ON	80V AC min. 5mA min.	160V AC min. 4mA min.
	OFF	40V AC max. 1mA max.	70V AC max. 1mA max.
Response time	OFF→ON	15ms max. or 30ms, selectable	
	ON→OFF	25ms max. or 40ms, selectable	
Interrupt		Can be specified for each input point	
Current consumption		40mA (5V DC)	
Input display		LED (lit when input is turned on)	
External connection		10-point terminal block with M3.5 screws	
Weight		130g	
Maximum ratio of inputs turned on simultaneously		100%	

● **Front View**

F3XA08-1N   F3XA08-2N

FA020511.VSD

● **Internal Circuit Configuration**   ● **External Connection Diagram**

FA020512.VSD

FA020513.VSD

Note: Viewed from the front side of the module.

(3) F3XA16-1N AC Input Module

Item	Specifications	Item		Specifications
Input type	AC voltage	Operating voltage /current	ON	80V AC min., 5mA min.
Number of points	16		OFF	40V AC max., 1mA min.
Common line type	8 points/common line	Response time	OFF→ON	15ms max. or 30ms, selectable
Isolation method	Transformer insulation		ON→OFF	25ms max. or 40ms, selectable
Withstanding voltage	1500V AC for one minute between the group of terminals for external connection and the internal circuit	Interrupt		Can be specified for each input point
		Dissipating current		65mA (5V DC)
Rated input voltage	100 to 120V AC 50/60Hz	Input display		LED (lit when input is turned on)
Operating voltage range	85 to 132V AC 50/60Hz	External connection		18-point terminal block with M3.5 screws
Rated input current	5.4-6.5mA/point (100-120V AC, 60Hz)	Weight		180g
Input impedance	21.9kΩ 50Hz 18.5kΩ 60Hz	Maximum ratio of inputs turned on simultaneously		100%

● **Front View**

F3XA16-1N

FA020516_1.VSD

● **Internal Circuit Configuration**

FA020512.VSD

● **External Connection Diagram**

Note: Viewed from the front side of the module.

FA020516_2.vsd

(4) F3XC08-0N No-voltage Contact Input Module

Item	Specifications	Item		Specifications
Input type	No-voltage contact[*1]	Response time	OFF→ON	2.0ms max. or 17ms, selectable
Number of points	8			
Common line type	8 points/common line		ON→OFF	2.0ms max. or 17ms, selectable
Isolation method	Transformer insulation			
Withstanding voltage	500V AC for one minute between the group of terminals for external connection and the internal circuit	Interrupt		Can be specified for each input point
Open voltage when contact is OFF	5 to 7V[*2]	Dissipating current		75mA (5V DC)
Current when contact is ON	1 to 3mA[*2]	Input display		LED (lit when input is turned on)
On resistance	200Ω max.	External connection		10-point terminal block with M3.5 screws
Off resistance	100kΩ min.	Weight		140g

*1: Do not apply an external voltage to an input terminal of the F3XC08 or it will cause a failure.
*2: External contacts connecting to input terminals of the F3XC08 must be able to turn on/off under these conditions.

● **Front View**
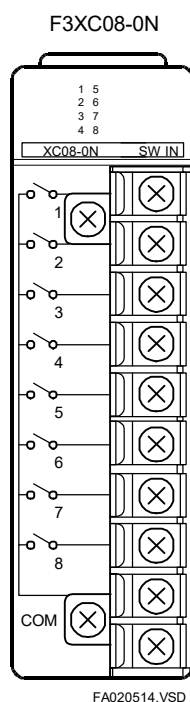
F3XC08-0N

FA020514.VSD

● **Internal Circuit Configuration**

FA020515.VSD

● **External Connection Diagram**

FA020516.VSD

Note: Viewed from the front side of the module

(5) F3XC08-0C No-voltage Contact Input Module (independent commons)

Item	Specifications	Item		Specifications
Input type	No-voltage contact[1]	Response time	OFF→ON	Input sampling time can be specified for 5 steps: Always (0μs), 62.5μs, 250μs, 1ms, and 16ms.[3][4]
Number of points	8			
Common line type	Independent commons		ON→OFF	Input sampling time can be specified for 5 steps: Always (0μs), 62.5μs, 250μs, 1ms, and 16ms.[3][4]
Isolation method	Transformer insulation			
Withstanding voltage	500V AC for one minute between the group of terminals for external connection and the internal circuit	Interrupt		Can be specified for each input point
Open voltage when contact is OFF	5 to 7V[2]	Dissipating current		75mA (5V DC)
Current when contact is ON	1 to 3mA[2]	Input display		LED (lit when input is turned on)
On resistance	200Ω max.	External connection		10-point terminal block with M3.5 screws
Off resistance	100kΩ min.	Weight		170g

[1]: Do not apply an external voltage to an input terminal of the F3XC08 or it will cause a failure.
[2]: External contacts connecting to input terminals of the F3XC08 must be able to turn on/off under these conditions.
[3]: The actual response time is obtained by adding 1 ms max. to the specified value.
[4]: If input interrupt is to be used, set the input sampling time to 62.5μs or more.
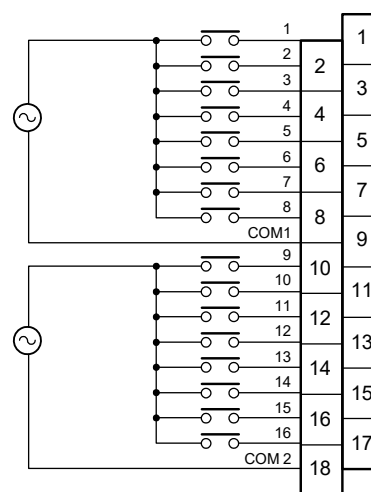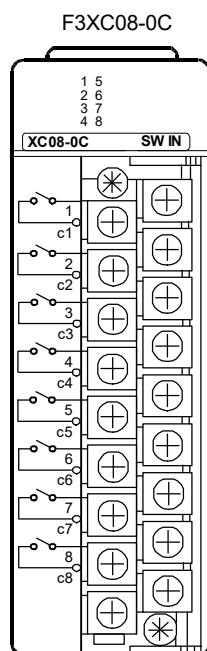
● Front View

F3XC08-0C

● Internal Circuit Configuration
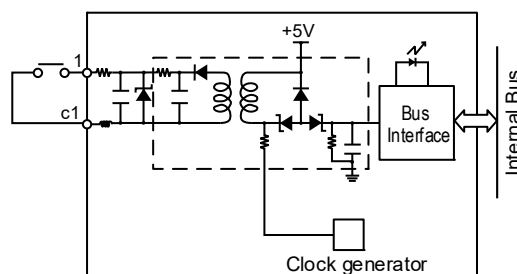
● External Connection Diagram
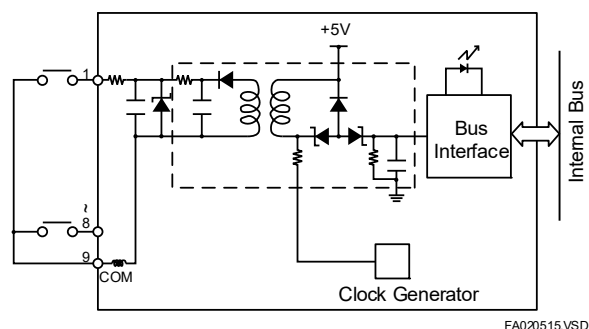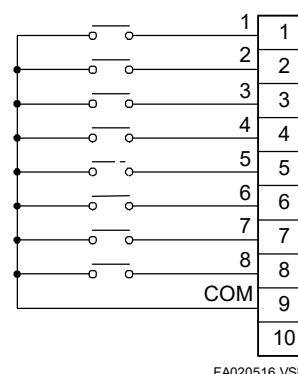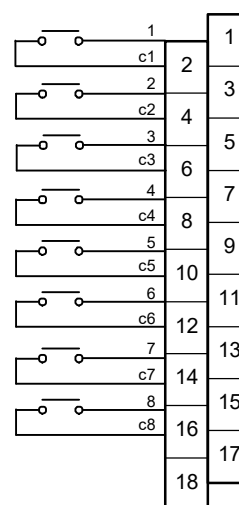

Note: Viewed from the front side of the module.

(6) F3XD08-6F DC Input Module

Item	Specifications	Item		Specifications
Input type	DC voltage	Response time	OFF→ON	Input sampling time can be specified for 5 steps: Always (0μs), 62.5μs, 250μs, 1ms, and 16ms.[*1]
Number of points	8			
Common line type	8 points/common line			
Isolation method	Photocoupler isolation			
Withstanding voltage	1500V AC for one minute between the group of terminals for external connection and the internal circuit		ON→OFF	Input sampling time can be specified for 5 steps: Always (0μs), 62.5μs, 250μs, 1ms, and 16ms.[*1]
Rated input voltage	12-24V DC			
Operating voltage range	10.2 to 26.4V DC			
Rated input current	4.1mA/point（12V DC）8.5mA/point（24V DC）	Interrupt[*2]		Can be specified for each input point
		Dissipating current		40mA（5V DC）
Input impedance	2.9kΩ	Input display		LED (lit when input is turned on)
Operating voltage/current	ON	8.0V DC min. 2.6mA min.	External connection		10-point terminal block with M3.5 screws
	OFF	3.4V DC max. 1.0mA max.	Weight		130g
			Maximum ratio of inputs turned on simultaneously		100%

*1: These values are applicable when using the module with CPU module F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76, F3RP70 or F3NP□□ module. If other CPU modules are used, the values are the same as those for F3XD08-6N modules. The actual response time is obtained by adding about 100μs for OFF→ON and about 300μs for ON→OFF to the specified value.
If the input sampling time is set to a very small value, the modules become susceptible to noise. In such a case, implement countermeasures against noise as described in Section A3.4 "Noise Control Considerations" and Section A3.9 "CE Marking Compliance".
*2: If input interrupt is to be used, set the input sampling time to 62.5μs or more.

● **Front View**

F3XD08-6F

FA020517.VSD

● **Internal Circuit Configuration**

FA020518.VSD

● **External Connection Diagram**

FA020519.VSD
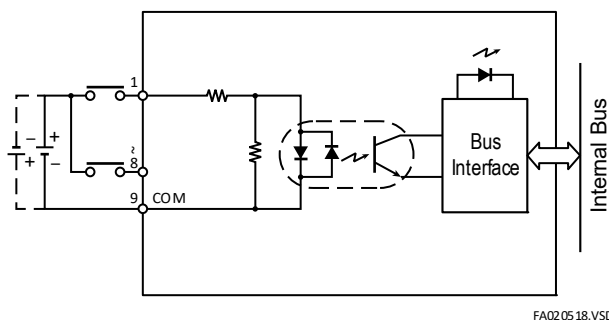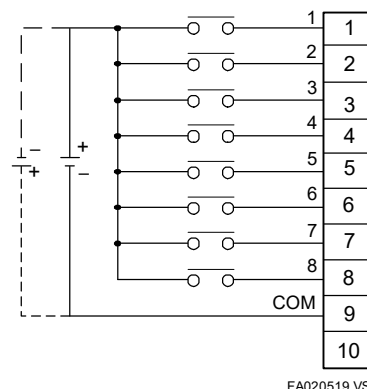
Note: Viewed from the front side of the module.

(7)   F3XD16-3F/F3XD16-4F/F3XD16-3H DC Input Modules

Item		Specifications		
		F3XD16-3F	F3XD16-4F	F3XD16-3H
Input type		DC voltage		DC voltage (positive common)
Number of points		16		
Common line type		8 points/common line		
Isolation method		Photocoupler isolation		
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit		
Rated input voltage		24V DC	12V DC	24V DC
Operating voltage range		20.4 to 26.4V DC	10.2 to 13.2V DC	20.4 to 26.4V DC
Rated input current		4.1mA/point (24V DC)	4.1mA/point (12V DC)	4.7mA/point (24V DC)
Input impedance		5.9kΩ	2.9kΩ	5.1kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.	16.0V DC min. 3.2mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.	5.8V DC max. 0.9mA max.
Response time	OFF→ON	Input sampling time can be specified for 5 steps : Always (0μs), 62.5μs, 250μs, 1ms and 16ms[*1]		
	ON→OFF	Input sampling time can be specified for 5 steps : Always (0μs), 62.5μs, 250μs, 1ms and 16ms[*1]		
Interrupt[*2]		Can be specified for each input point		
Dissipating current		65mA (5V DC)		
Input display		LED (lit when input is turned on)		
External connection		18-point terminal block with M3.5 screws		
Weight		160g		
Maximum ratio of inputs turned on simultaneously		100%		

*1:   These values are applicable when using the module with CPU module F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76,F3RP70 or F3NP□□ module. If other CPU modules are used, the values are the same as those for F3XD16-□F modules. The actual response time is obtained by adding about 100μs for OFF→ON and about 300μs for ON→OFF to the specified value for F3XD16-□F modules and by adding about 10μs to the specified value for F3XD16-3H modules.
If the input sampling time is set to a very small value, the modules become susceptible to noise. In such a case, implement countermeasures against noise as described in Section A3.4 "Noise Control Considerations" and Section A3.9 "CE Marking Compliance".

*2:   For F3XD16-□F modules, set the input sampling time to 62.5μs or more if input interrupt is to be used.

● **Front View**
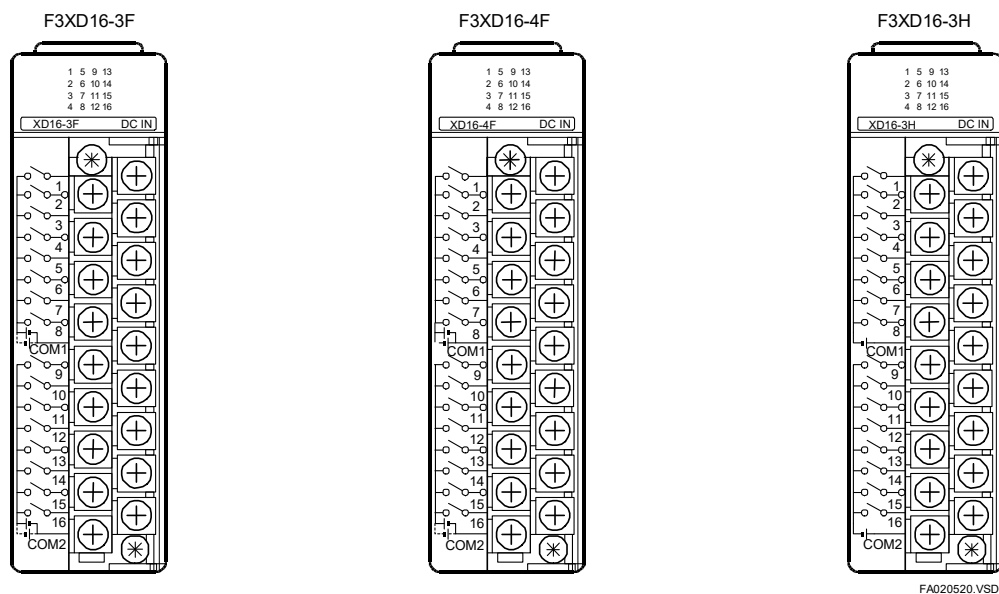
F3XD16-3F

```
      1  5  9 13
      2  6 10 14
      3  7 11 15
      4  8 12 16
XD16-3F      DC IN
```

F3XD16-4F

```
      1  5  9 13
      2  6 10 14
      3  7 11 15
      4  8 12 16
XD16-4F      DC IN
```

F3XD16-3H

```
      1  5  9 13
      2  6 10 14
      3  7 11 15
      4  8 12 16
XD16-3H      DC IN
```

FA020520.VSD

● **Internal Circuit Configuration**

F3XD16-3F, F3XD16-4F

F3XD16-3H

FA020521.VSD

● **External Connection Diagram**

F3XD16-3F,F3XD16-4F

Note: Viewed from the front of the module

F3XD16-3H

FA020522.VSD
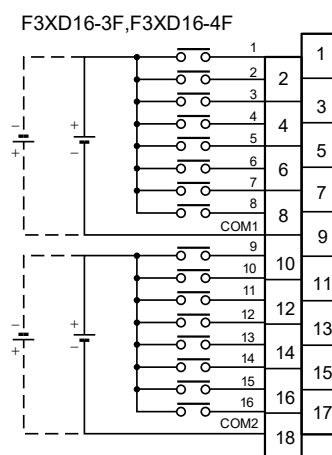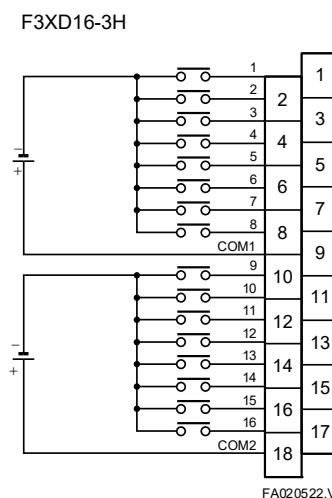
Note: Viewed from the front of the module

(8) F3XD32-3F/F3XD32-4F/F3XD32-5F DC Input Modules

Item		Specifications		
		F3XD32-3F	F3XD32-4F	F3XD32-5F
Input type		DC voltage		
Number of points		32		
Common line type		8 points/common line		
Isolation method		Photocoupler isolation		
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit		
Rated input voltage		24V DC	12V DC	5V DC
Operating voltage range		20.4 to 26.4V DC	10.2 to 13.2V DC	4.5 to 5.5V DC
Rated input current		4.1mA/point (24V DC)	4.1mA/point (12V DC)	4.0mA/point (5V DC)
Input impedance		5.9kΩ	2.9kΩ	1.3kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.	3.5V DC min. 2.0mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.	1.0V DC max. 0.2mA max.
Response time	OFF→ON	Input sampling time can be specified for 5 steps : Always (0μs), 62.5μs, 250μs, 1ms and 16ms[1]		
	ON→OFF	Input sampling time can be specified for 5 steps : Always (0μs), 62.5μs, 250μs, 1ms and 16ms[1]		
Interrupt [2]		Can be specified for each input point		
Dissipating current		75mA (5V DC)		
Input display		LED (lit when input is turned on)		
External connection		One 40-pin connector		
Weight		120g		
Maximum ratio of inputs turned on simultaneously		100%		

[1]: These values are applicable when using the module with CPU module F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76,F3RP70 or F3NP□□ module. If other CPU modules are used, the values are the same as those for F3XD32-□F modules. The actual response time is obtained by adding about 100μs for OFF→ON and about 300μs for ON→OFF to the specified value.
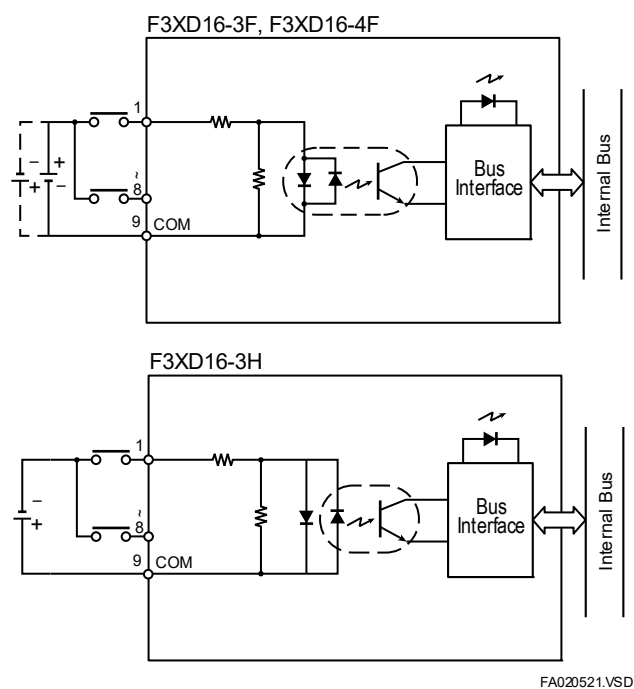 If the input sampling time is set to a very small value, the modules become susceptible to noise. In such a case, implement countermeasures against noise as described in Section A3.4 "Noise Control Considerations" and Section A3.9 "CE Marking Compliance".

[2]: If input interrupt is to be used, set the input sampling time to 62.5μs or more.

● **Front View**

F3XD32-3F   F3XD32-4F   F3XD32-5F

FA020523.VSD

● **Internal Circuit Configuration**

FA020524.VSD

● **External Connection Diagram**

FA020525.VSD
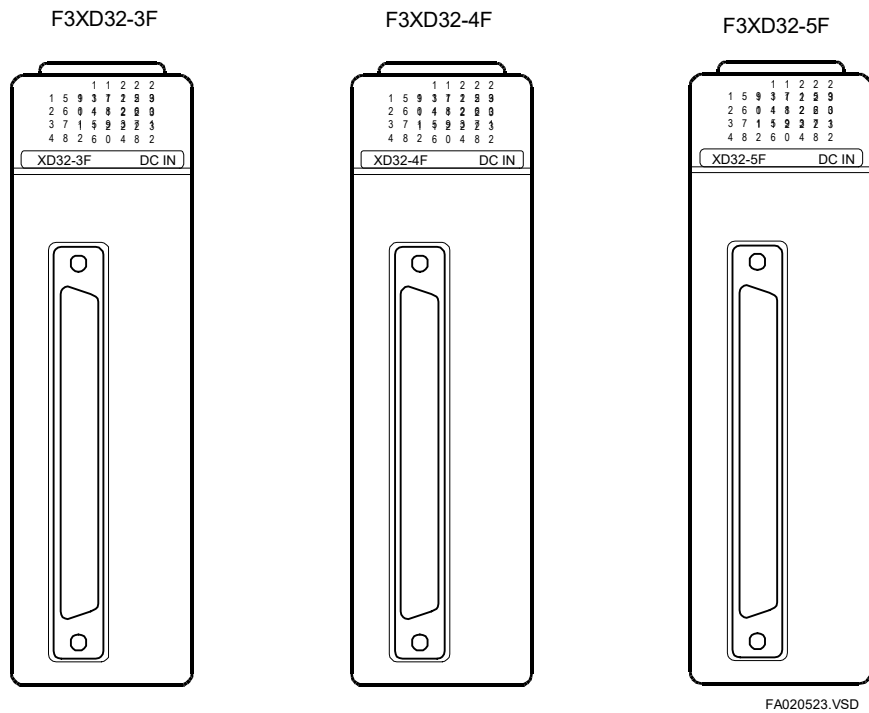
Note :View from the front side of the module.

(9) F3XD64-3F/F3XD64-4F DC Input Modules

Item		Specifications	
		F3XD64-3F	**F3XD64-4F**
Input type		DC voltage	
Number of points		64	
Common line type		8 points/common line	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated input voltage		24V DC	12V DC
Operating voltage range		20.4 to 26.4V DC	10.2 to 13.2V DC
Rated input current		4.1mA/point (24V DC)	4.1mA/point (12V DC)
Input impedance		5.9kΩ	2.9kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.
Response time	OFF→ON	Input sampling time can be specified for 4 steps : Always (0μs), 62.5μs, 250μs and 1ms[1]	
	ON→OFF	Input sampling time can be specified for 4 steps : Always (0μs), 62.5μs, 250μs and 1ms[1]	
Interrupt		None	
Dissipating current		100mA (5V DC)	
Input display		LED (lit when input is turned on) 32 points are displayed at a time as selected by a selector switch.	
External connection		Two 40-pin connectors	
Weight		160g	
Maximum ratio of inputs turned on simultaneously		60%	

*1:　These values are applicable when using the module with CPU module using F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76, F3RP70 or F3NP□□ module. If other CPU modules are used, the values are the same as those for F3XD64-□N modules. The actual response time is obtained by adding about 100μs for OFF→ON and about 300μs for ON→OFF to the specified value.
　　If the input sampling time is set to a very small value, the modules become susceptible to noise. In such a case, implement countermeasures against noise as described in Section A3.4 "Noise Control Considerations" and Section A3.9 "CE Marking Compliance".

*2:　If input interrupt is to be used, set the input sampling time to 62.5μs or more.

● Front View

F3XD64-3F
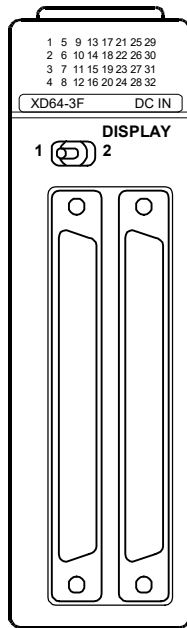
F3XD64-4F
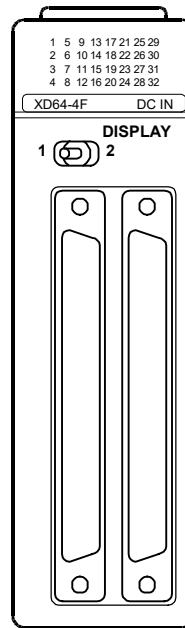
FA020526.VSD

● **Internal Circuit Configuration**
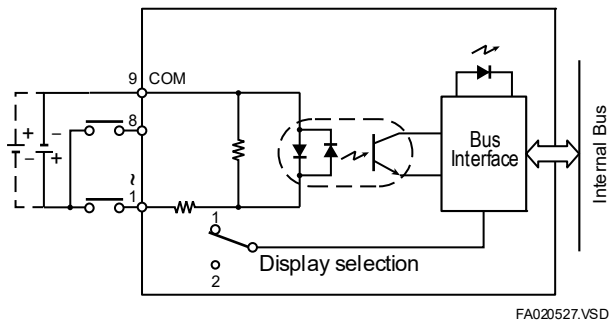
FA020527.VSD

● **External Connection Diagram**
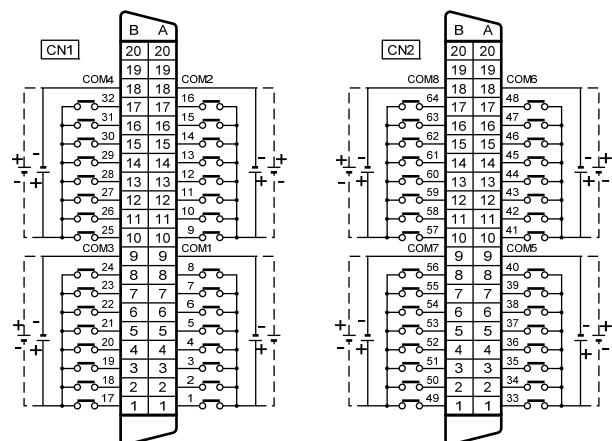
Note: Viewed from the front side of the module.

FA020528.VSD
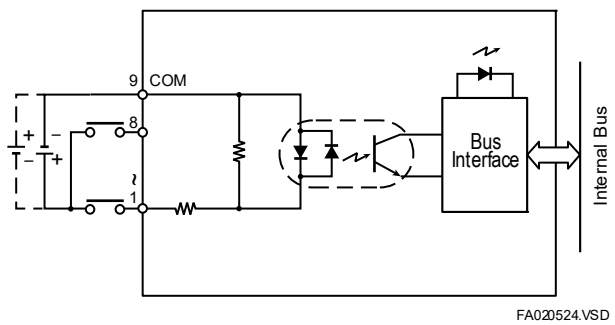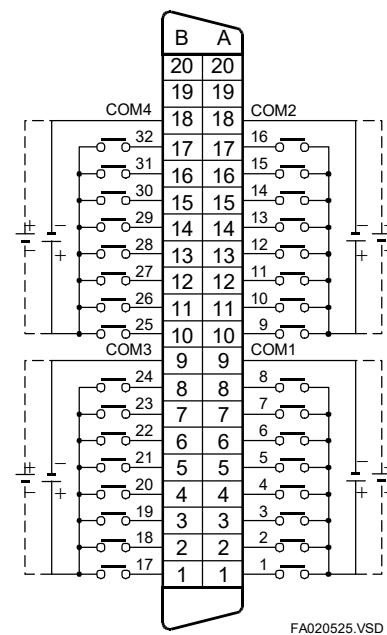
(10) F3XD08-6N DC Input Module

Item	Specifications	Item		Specifications
Input type	DC voltage	Response time	OFF→ON	2.0ms max. or 17ms, selectable
Number of points	8			
Common line type	8 points/common line			
Isolation method	Photocoupler isolation			
Withstanding voltage	1500V AC for one minute between the group of terminals for external connection and the internal circuit		ON→OFF	3.5ms max. or 18.5ms, selectable
Rated input voltage	12-24V DC			
Operating voltage range	10.2 to 26.4V DC			
Rated input current	4.1mA/point （12V DC） 8.5mA/point （24V DC）	Interrupt		Can be specified for each input point
		Dissipating current		40mA (5V DC)
Input impedance	2.9kΩ	Input display		LED (lit when input is turned on)
Operating voltage/current	ON: 8.0V DC min. 2.6mA min.	External connection		10-point terminal block with M3.5 screws
	OFF: 3.4V DC max. 1.0mA max.	Weight		130g
		Maximum ratio of inputs turned on simultaneously		100%

● **Front View**

F3XD08-6N

FA020529.VSD

● **Internal Circuit Configuration**

FA020530.VSD

● **External Connection Diagram**

FA020531.VSD

Note: Viewed from the front side of the module.

(11) F3XD16-3N/F3XD16-4N DC-Input Modules

Item		Specifications	
		F3XD16-3N	**F3XD16-4N**
Input type		DC voltage	
Number of points		16	
Common line type		8 points/common line	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated input voltage		24V DC	12V DC
Operating voltage range		20.4 to 26.4V DC	10.2 to 13.2V DC
Rated input current		4.1mA/point (24V DC)	4.1mA/point (12V DC)
Input impedance		5.9kΩ	2.9kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.
Response time	OFF→ON	2.0ms max. or 17ms, selectable	
	ON→OFF	3.5ms max. or 18.5ms, selectable	
Interrupt		Can be specified for each input point	
Dissipating current		65mA (5V DC)	
Input display		LED (lit when input is turned on)	
External connection		10-point terminal block with M3.5 screws	
Weight		160g	
Maximum ratio of inputs turned on simultaneously		100%	

● **Front View**

F3XD16-3N

F3XD16-4N

FA020532.VSD

● **Internal Circuit Configuration**

FA020533.VSD

● **External Connection Diagram**

FA020534.VSD

Note: Viewed from the front side of the module.

(12) F3XD32-3N/F3XD32-4N/F3XD32-5N DC Input Modules

Item		Specifications		
		F3XD32-3N	**F3XD32-4N**	**F3XD32-5N**
Input type		DC voltage		
Number of points		32		
Common line type		8 points/common line		
Isolation method		Photocoupler isolation		
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit		
Rated input voltage		24V DC	12V DC	5V DC
Operating voltage range		20.4 to 26.4V DC	10.2 to 13.2V DC	4.5 to 5.5V DC
Rated input current		4.1mA/point (24V DC)	4.1mA/point (12V DC)	4.0mA/point (5V DC)
Input impedance		5.9kΩ	2.9kΩ	1.3kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.	3.5V DC min. 2.0mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.	1.0V DC max. 0.2mA max.
Response time	OFF→ON	2.0ms max. or 17ms, selectable		
	ON→OFF	3.5ms max. or 18.5ms, selectable		
Interrupt		Can be specified for each input point		
Dissipating current		75mA (5V DC)		
Input display		LED (lit when input is turned on)		
External connection		One 40-pin connector		
Weight		120g		
Maximum ratio of inputs turned on simultaneously		100%		

● **Front View**

F3XD32-3N

```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```
XD32-3N   DC IN

F3XD32-4N

```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```
XD32-4N   DC IN

F3XD32-5N

```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```
XD32-5N   DC IN

FA020535.VSD

● **Internal Circuit Configuration**

FA020536.VSD

● **External Connection Diagram**

FA020537.VSD

Note: Viewed from the front side of the module.

(13) F3XD64-3N/F3XD64-4N DC Input Modules

Item		Specifications	
		F3XD64-3N	**F3XD64-4N**
Input type		DC voltage	
Number of points		64	
Common line type		8 points/common line	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated input voltage		24V DC	12V DC
Operating voltage range		20.4 to 26.4V DC	10.2 to 13.2V DC
Rated input current		4.1 mA/point (24V DC)	4.1 mA/point (12V DC)
Input impedance		5.9kΩ	2.9kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.
Response time	OFF→ON	1.0ms max.	
	ON→OFF	2.5ms max.	
Interrupt		None	
Dissipating current		100mA (5V DC)	
Input display		LED (lit when input is turned on) 32 points are displayed at a time as selected by a selector switch.	
External connection		Two 40-pin connectors	
Weight		160g	
Maximum ratio of inputs turned on simultaneously		60%	

● **Front View**
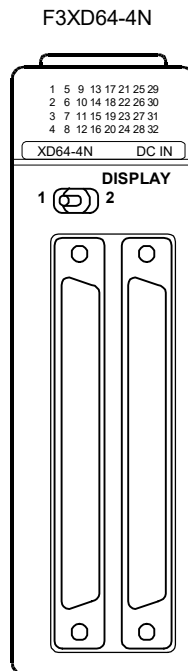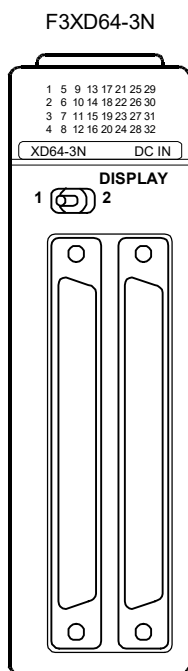
F3XD64-3N

F3XD64-4N

FA020538.VSD

● **Internal Circuit Configuration**

FA020539.VSD

● **External Connection Diagram**

FA020540.VSD
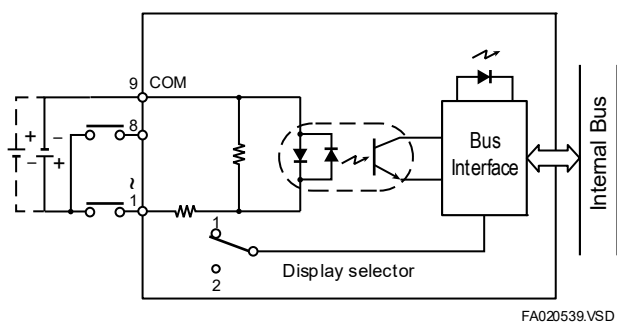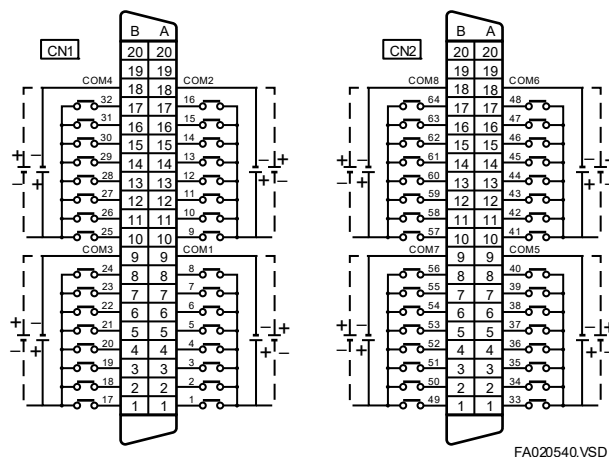
Note: Viewed from the front side of the module.

(14) F3XD64-6M DC Input Module

Item		Specifications	Item		Specifications
Input type		DC voltage	Response time	OFF→ON	16ms max.
Number of points		64			
Common line type		8 × 8 matrix scan			
Isolation method		Photocoupler isolation			
Withstanding voltage		1500V AC for one minute between the group of connectors for external connection and the internal circuit		ON→OFF	16ms max.
Rated input voltage		12-24V DC			
Operating voltage range		10.2 to 26.4V DC			
Rated input current		3.9mA (12V DC) 8.2mA (24V DC)	Interrupt		None
			Dissipating current		110mA (5V DC)
Input impedance		2.9kΩ	Input display		LED (Lit when inputs are turned on) Status is displayed for 32 points selected by a switch.
			External power supply		12-24V DC 70mA
Operating Voltage/ current	ON	8.0V DC min. 2.6mA min.	External connection		One 40-pin connector
	OFF	3.4V DC max. 1.0mA max.	Weight		130g

● **Front View**

F3XD64-6M
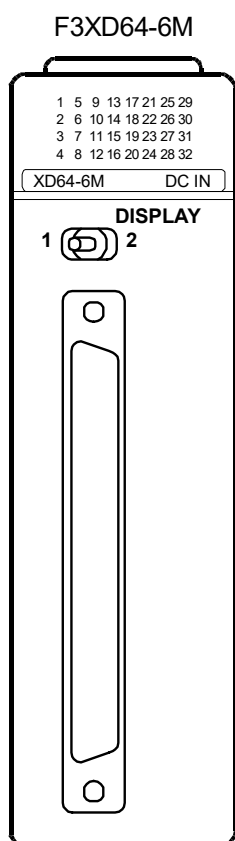
FA020541.VSD

● **Internal Circuit Configuration**
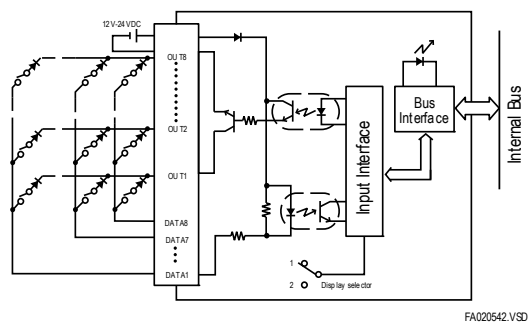
FA020542.VSD

● **External Connection Diagram**

FA020543.VSD

Note: Viewed from the front side of the module.

(15) F3YD04-7N Transistor Output Module

Item		Specifications	Item		Specifications
Output type		Transistor contact	Service life	Mechanical	—
Number of points		4		Electrical	—
Common line type		All points independent	Surge protector[*1]		Zener diode
Isolation method		Photocoupler isolation	Fuse[*2]		3.15A time-lag fuse (Built into each type-N terminal and cannot be replaced.)
Withstanding voltage		1500V AC for one minute between the group of connectors for external connection and the internal circuit	Dissipating current		85mA (5V DC)
			Output display[*3]		LED (Lit when output is on)
Rated load Voltage (Operating load voltage range)	DC	24V DC (20.4 to 26.4V DC)	Output status when the program stops HOLD/RESET[*4]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.
	AC	—			
Maximum load current		2A/point			When a BASIC CPU module is used: No setting function The status is always HOLD
Response time	OFF→ON	5ms max.			When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.
	ON→OFF	3ms max.	External power supply		Not required.
ON voltage		0.5V DC max.	External connection		10-point terminal block with M3.5 screws
Off-time leak current		0.1mA max.	Weight		140g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

*2: Fuses in the output module are for the purpose of preventing abnormal heat generation or burnout of external wiring due to continuous flow of excess short-circuit current resulting from a short-circuited load.
They are not intended for protecting output elements in the module against possible damage.
The fuses may fail to blow in failure modes other than short-circuited loads.

*3: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

*4: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."

● **Front View**

F3YD04-7N

FA020544.VSD

● **Internal Circuit Configuration**

FA020545.VSD

● **External Connection Diagram**

FA020546.VSD

(16) F3YA08-2N Triac Output Module

Item		Specifications	Item		Specifications
Output type		Triac contact	Service life	Mechanical	—
Number of points		8		Electrical	—
Common line type		8 points/common	Surge protector[*1]		CR absorber, varistor
Isolation method		Photocoupler isolation	Fuse[*2]		4A time-lag fuse (Built into the COM terminal and cannot be replaced.)
Withstanding voltage		1500V AC for one minute between the group of connectors for external connection and the internal circuit	Dissipating current		130mA (5V DC)
Rated load voltage range (maximum load voltage)	DC	—	Output display[*3]		LED (Lit when output is on)
	AC	100-240V (264V)			
Maximum load current		1A/point (0 to 40°C) 0.7A/point (40 to 55°C) 3A/common line	Output status when the program stops HOLD/RESET[*4]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.
Minimum load voltage/current		24V AC,10 mA/point			When a BASIC CPU module is used: No setting function The status is always HOLD
Response time	OFF→ON	1ms max.			When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.
	ON→OFF	1/2cycle + 1ms max.	External power supply		Not required
ON voltage		1.5V AC max.	External connection		10-points terminal block with M3.5 screws
Off-time leak current		3mA max.	Weight		150g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

*2: Fuses in the output module are for the purpose of preventing abnormal heat generation or burnout of external wiring due to continuous flow of excess short-circuit current resulting from a short-circuited load.
They are not intended for protecting output elements in the module against possible damage.
The fuses may fail to blow in failure modes other than short-circuited loads.

*3: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

*4: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."

● **Front View**

F3YA08-2N

FA020547.VSD

● **Internal Circuit Configuration**

FA020548.VSD

● **External Connection Diagram**

FA020549.VSD
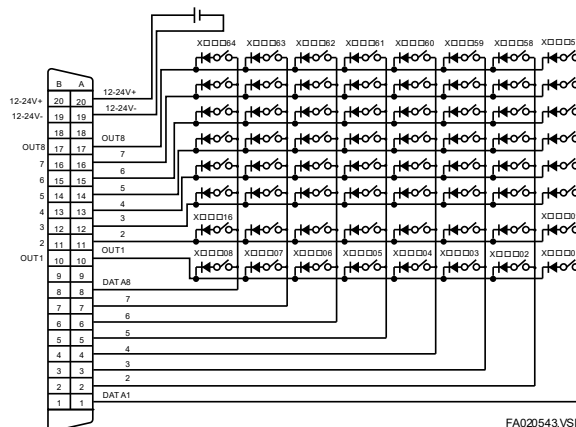
Note: Viewed from the front side of the module

(17) F3YC08-0C/F3YC08-0N Relay Output Module

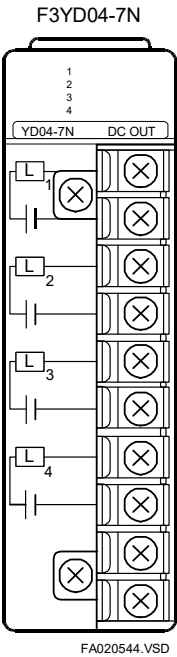| Item		Specifications	
		F3YC08-0C	**F3YC08-0N**
Output type		Relay contact	
Number of points		8	
Common line type		All points independent	8 points/common
Isolation method		Mechanical insulation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated load voltage range （maximum load voltage）	DC	5-24V 　（125V）	
	AC	100-240V 　（264V）	
Maximum load current		2A/point 　（resistive load）	2A/point, 8A/common line （resistive load）
Maximum switching capacity		530VA/point, or 60W/point (for resistive load)	
Minimum load voltage/current		5V DC, 10mA	
Response time	OFF→ON	10ms max.	
	ON→OFF	10ms max.	
ON voltage		———	
Off-time leak current		———	
Service life	Mechanical	20 million operations or more	
	Electrical	100,000 operations or more （rated load）	
Surge protector[1]		None	
Fuse		None	
Dissipating current		205mA 　（5V DC）	
Output display[2]		LED （Lit when output is on）	
Output status when the program stops HOLD/RESET[3]		When a sequence CPU module is used: Default: RESET; can be set globally on a module-by-module basis.	
		When a BASIC CPU module is used: No setting function; the status is always HOLD.	
		When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
External power supply		Not required	
External connection		18-point terminal block with M3.5 screws	10-point terminal block with M3.5 screws
Weight		180g	160g

[1]: If an inductive load, such as a relay, is to be connected, a surge protector is required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."
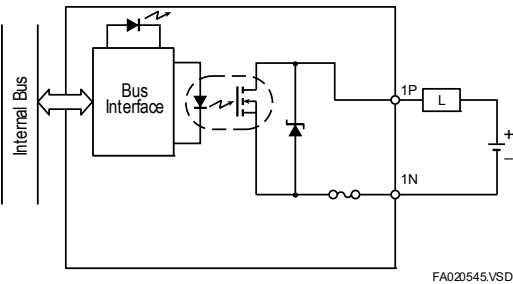
[2]: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

[3]: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
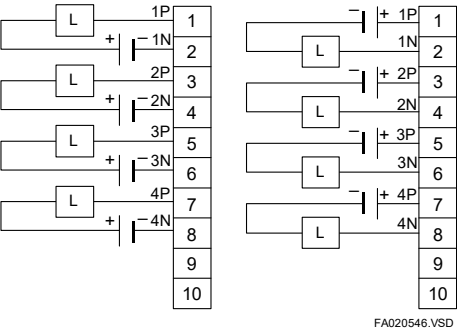
> ⚠️ **WARNING**
>
> Don't connect DC load and AC load to single module together.
>
> Don't connect loads from different AC sources to single module together.
>
> In case of using these loads at once, connect to different relay output modules separately.

Note

The relays in the relay output modules are not of hermetically sealed type.

Dust or corrosive gases in the installation environment adversely affect the service life of the relays.

Relays that are switched on and off in an atmosphere containing silicone gases from silicone-based materials may suffer from poor electrical contact due to SiO_2 (silicon dioxide) formed and deposited on the surfaces of their contacts.

Risks of bad contact due to silicon gases are especially high under load conditions below 24V DC and 500mA. In such environments, we recommend the use of transistor output modules or other modules employing semiconductor elements instead.

● **Front View**

F3YC08-0C

FA020550.VSD

● **Internal Circuit Configuration**

FA020551.VSD

● **External Connection Diagram**

FA020552.VSD

Note: Viewed from the front side of the module.

● **Front View**

F3YC08-0N

FA020553.VSD

● **Internal Circuit Configuration**

FA020554.VSD

● **External Connection Diagram**

FA020555.VSD

Note: Viewed from the front side of the module.

(18) **F3YD08-6A/F3YD08-6B Transistor Output Modules**

Item		Specifications	
		F3YD08-6A	**F3YD08-6B**
Output type		Transistor contact (sink type)	Transistor contact (source type)
Number of points		8	
Common line type		8 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated load voltage (Operating load voltage range)	DC	12-24V DC (10.2 to 26.4V DC)	
	AC	———	
Maximum load current		1A/point, 4A/common line	
Response time	OFF→ON	1ms max.	
	ON→OFF	1ms max.	
ON voltage		0.5V DC max.	
Off-time leak current		0.1mA max.	
Service life	Mechanical	———	
	Electrical	———	
Surge protector[1]		Active clamp circuit	
Fuse[2]		6.3A time-lag fuse (Built into the COM terminal and cannot be replaced.)	
Dissipating current		60mA (5V DC)	
Output display[3]		LED (Lit when output is on)	
Output status when the program stops HOLD/RESET[4]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.	
		When a BASIC CPU module is used: No setting function The status is always HOLD	
		When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
External power supply		12-24V DC, 10mA	
External connection		10-point terminal block with M3.5 screws	
Weight		130g	

*1:   If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

*2:   Fuses in the output module are for the purpose of preventing abnormal heat generation or burnout of external wiring due to continuous flow of excess short-circuit current resulting from a short-circuited load.
      They are not intended for protecting output elements in the module against possible damage.
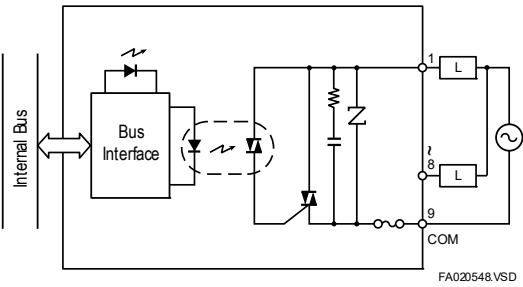   The fuses may fail to blow in failure modes other than short-circuited loads.

*3:   The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

*4:   For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
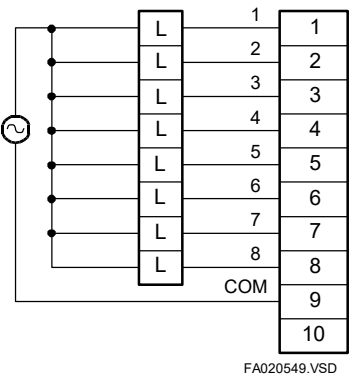
● **Front View**

F3YD08-6A

FA020556.VSD

● **Internal Circuit Configuration**

FA020557.VSD

● **External Connection Diagram**

FA020558.VSD

Note: Viewed from the front side of the module.

● **Front View**

F3YD08-6B

FA020559.VSD

● **Internal Circuit Configuration**

FA020560.VSD

● **External Connection Diagram**

FA020561.VSD

Note: Viewed from the front side of the module.

(19) F3YD08-7A Transistor Output Module

Item		Specifications
		F3YD08-7A
Output type		Transistor contact (sink type)
Number of points		8
Common line type		8 points/common
Isolation method		Photocoupler isolation
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit
Rated load voltage (Operating load voltage range)	DC	12-24V DC (10.2 to 26.4V DC)
	AC	─────
Maximum load current		2A/point, 8A/common line
Response time	OFF→ON	1ms max.
	ON→OFF	1ms max.
ON voltage		0.5V DC max.
Off-time leak current		0.1mA max.
Service life	Mechanical	─────
	Electrical	─────
Surge protector[1]		Active clamp circuit
Fuse[2]		None
Dissipating current		80mA (5V DC)
Output display[3]		LED (Lit when output is on)
Output status when the program stops HOLD/RESET[4]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.
		When a BASIC CPU module is used: No setting function The status is always HOLD
		When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.
External power supply		12-24V DC, 10 mA
External connection		10-point terminal block with M3.5 screws
Weight		130g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

*2 : The module does not contain any fuse but incorporates a short-circuit protector function. Note that the function protects against short-circuit only when the polarity of the external power supply is correct.

*3: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

*4: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."

⚠ **CAUTION**

Make sure that the polarity of the external power supply is correct.
If incorrect polarity and shorted load occur at the same time, the output element will be damaged and smoking or scattering chips may occur.

● **Front View**
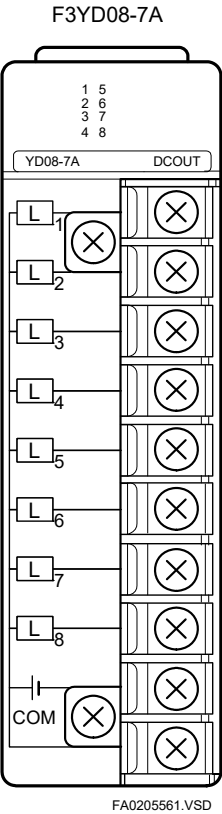
F3YD08-7A

FA0205561.VSD

● **Internal Circuit Configuration**

FA0205571.VSD

● **External Connection Diagram**

FA020558.VSD
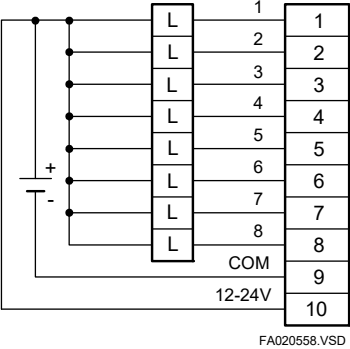
Note: Viewed from the front side of the module.

(20) F3YD14-5A/F3YD14-5B Transistor Output Modules

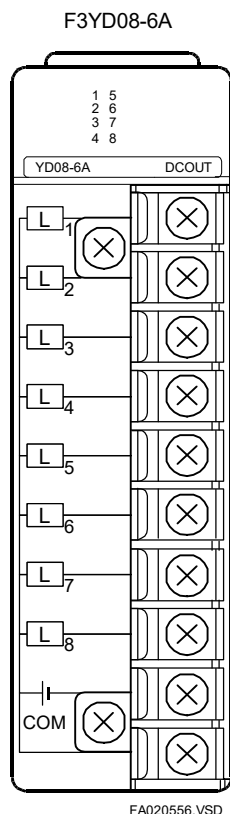| Item		Specifications	
		F3YD14-5A	**F3YD14-5B**
Output type		Transistor contact (sink type)	Transistor contact (source type)
Number of points		14	
Common line type		8 points/common, 6 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated load voltage (Operating load voltage range)	DC	12-24V DC (10.2 to 26.4V DC)	
	AC	———	
Maximum load current		0.5A/point, 2A/common line	
Response time	OFF→ON	1ms max.	
	ON→OFF	1ms max.	
ON voltage		0.5V DC max.	
Off-time leak current		0.1mA max.	
Service life	Mechanical	———	
	Electrical	———	
Surge protector[1]		Active clamp circuit	
Fuse[2]		5A time-lag fuse (Built into the COM terminal and cannot be replaced.)	
Dissipating current		120mA (5V DC)	
Output display[3]		LED (Lit when output is on)	
Output status when the program stops HOLD/RESET [4]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.	
		When a BASIC CPU module is used: No setting function The status is always HOLD	
		When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
External power supply		12-24V DC, 20mA	
External connection		18-point terminal block with M3.5 screws	
Weight		160g	

[1]: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

[2]: Fuses in the output module are for the purpose of preventing abnormal heat generation or burnout of external wiring due to continuous flow of excess short-circuit current resulting from a short-circuited load.
They are not intended for protecting output elements in the module against possible damage.
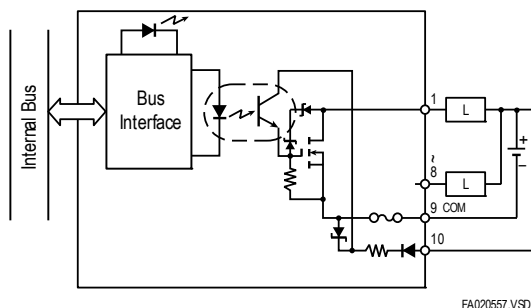The fuses may fail to blow in failure modes other than short-circuited loads.

[3]: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

[4]: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
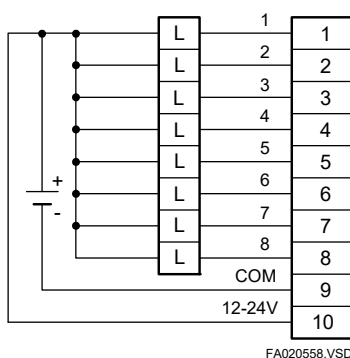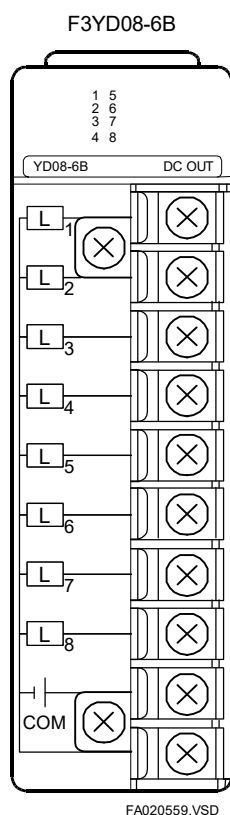
● **Front View**

F3YD14-5A

FA020562.VSD

● **Front View**

F3YD14-5B

FA020565.VSD

● **Internal Circuit Configuration**

FA020563.VSD

● **External Connection Diagram**

FA020564.VSD

Note: Viewed from the front side of the module.

● **Internal Circuit Configuration**

FA020566.VSD

● **External Connection Diagram**

FA020567.VSD

Note: Viewed from the front side of the module.

(21) F3YC16-0N Relay Output Module

Item		Specifications	Item		Specifications
Output type		Relay contact	Service life	Mechanical	20 million operations or more
Number of points		16		Electrical	100,000 operations or more (rated load)
Common line type		8 points/common	Surge protector*1		None
Isolation method		Mechanical insulation	Fuse		None
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	Dissipating current		380mA (5V DC)
Rated load voltage range (maximum load voltage)	DC	5-24V (125V)	Output display*2		LED (Lit when output is on)
	AC	100-240V (264V)	Output status when the program stops HOLD/RESET *3		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.
Maximum load current		2A/point, 8A/common line (resistive load)			
Maximum switching capacity		530VA/point, or 60W/point (for resistive load)			When a BASIC CPU module is used: No setting function The status is always HOLD
Minimum load voltage/current		5V DC, 10mA			
Response time	OFF→ON	10ms max.			When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.
	ON→OFF	10ms max.	External power supply		Not required
ON voltage		—	External connection		18-point terminal block with M3.5 screws
Off-time leak current		—	Weight		220g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
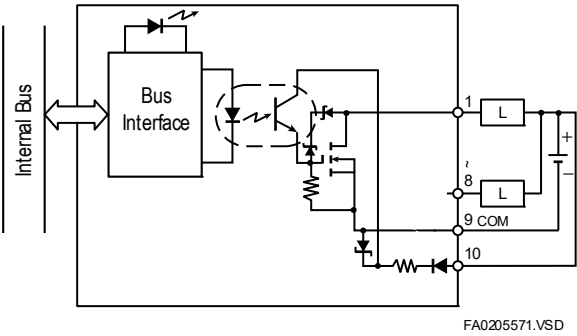
⚠ **WARNING**

Don't connect DC load and AC load to single module together.

Don't connect loads from different AC sources to single module together.

In case of using these loads at once, connect to different relay output modules separately.

Note

The relays in the relay output modules are not of hermetically sealed type.

Dust or corrosive gases in the installation environment adversely affect the service life of the relays.

Relays that are switched on and off in an atmosphere containing silicone gases from silicone-based materials may suffer from poor electrical contact due to SiO_2 (silicon dioxide) formed and deposited on the surfaces of their contacts.

Risks of bad contact due to silicon gases are especially high under load conditions below 24V DC and 500mA. In such environments, we recommend the use of transistor output modules or other modules employing semiconductor elements instead.

● **Front View**

F3YC16-0N

FA020568.VSD

● **Internal Circuit Configuration**

FA020569.VSD

● **External Connection Diagram**

FA020570.VSD

Note: Viewed from the front side of the module.

(22) **F3YD32-1A/F3YD32-1B Transistor Output Modules**

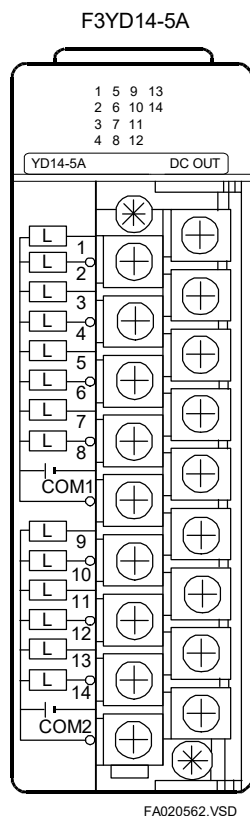| Item		Specifications	
		F3YD32-1A	**F3YD32-1B**
Output type		Transistor contact (sink type)	Transistor contact (source type)
Number of points		32	
Common line type		8 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated load voltage range (Operating load voltage range)	DC	12-24V DC (10.2 to 26.4V DC)	
	AC	————	
Maximum load current		0.1A/point, 0.5A/common line	
Response time	OFF→ON	1ms max.	
	ON→OFF	1ms max.	
ON voltage		0.5V DC max.	
Off-time leak current		0.1mA max.	
Service life	Mechanical	————	
	Electrical	————	
Surge protector[*1]		Zener diode	
Fuse		None	
Dissipating current		210mA (5V DC)	
Output display[*2]		LED (Lit when output is on)	
Output status when the program stops HOLD/RESET [*3]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.[*4]	
		When a BASIC CPU module is used: No setting function The status is always HOLD	
		When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
External power supply		12-24V DC, 115mA	
External connection		One 40-pin connector	
Weight		100g	

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
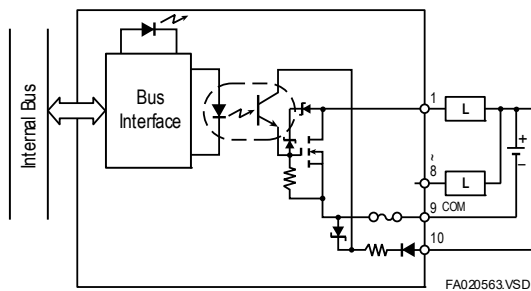
*4: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.

● **Front View**

F3YD32-1A

```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```

YD32-1A   DC OUT

FA020571.VSD

● **Internal Circuit Configuration**

FA020572.VSD

● **External Connection Diagram**

FA020573.VSD

Note: Viewed from the front side of the module.

● **Internal Circuit Configuration**

FA020575.VSD

● **Front View**

F3YD32-1B

```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```

YD32-1B   DC OUT

FA020574.VSD

● **External Connection Diagram**

FA020576.VSD

Note: Viewed from the front side of the module.

(23) F3YD32-1H Transistor Output Module (for high speed output)

Item		Specifications	Item		Specifications
Output type		Transistor contact (sink type)	Service life	Mechanical	—
				Electrical	—
Number of points		32	Protection circuitry	Short-circuit	Controlled short-circuit current
Common line type		8 points/common		Overheat	Output shutdown
Isolation method		Photocoupler isolation	Surge protector*1		Active clamp circuit
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	Fuse		None
			Dissipating current		165mA (5V DC)
			Output display*2		LED (Lit when output is on)
Rated load voltage (operating load voltage range)	DC	12-24V DC (10.2-26.4V DC)	Output status when the program stops HOLD/RESET *3		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis *4
	AC	—			
Maximum load current		0.1A/point, 0.5A/common line			When a BASIC CPU module is used: No setting function The status is always HOLD
Response time	OFF→ON	0.1ms max.			When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.
	ON→OFF	0.1ms max.			
ON voltage		0.5V DC max.	External power supply		12-24V DC, 30mA
			External connection		One 40-pin connector
Off-time leak current		0.1mA max.	Weight		110g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."
*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.
*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
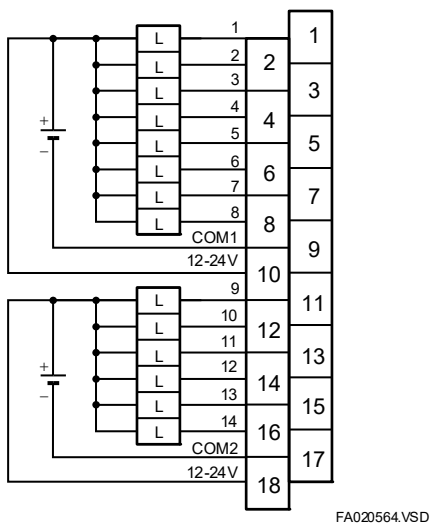*4: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.

⚠️ **CAUTION**

Ensure that the polarity of the external power supply is correct. Otherwise, a short-circuit condition may damage an output element and cause smoldering and scattering of chips. Beware that wrongly connecting a connector wired for F3XD32 or F3XD64 to the module may disable the protectors and damage internal elements.

Note

Operation of the protection circuitry:
-   If short-circuit occurs, the ON voltage increases and the short-circuit current is limited within the range 1-3A.
-   If the short-circuit condition is removed, normal operation resumes.
-   If the short-circuit condition persists, the short-circuit current may cause the temperature of the output element to reach approx. 160°C, triggering the overheat protector to shut down the output.
-   If the temperature of the overheated output element then drops by about 10°C, normal operation resumes.
-   The overheat protector will not be triggered if the module is operated normally within its specifications with no short-circuit condition.
-   Both the short-circuit protector and overheat protector are designed to control outputs individually. Under some short-circuit conditions, however, the overheat protector may shut down not only its associated output but also other outputs.
-   Short-circuit and overheat protectors are designed to protect the output element against short-term short-circuit. Never leave the module in prolonged short-circuit condition. Otherwise, the module enclosure may deteriorate or the PCB may be discolored.

● **Front View**

F3YD32-1H


```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```

YD32-1H   DC OUT

FA020571_3.VSD

● **Internal Circuit Configuration**

FA020571_2.vsd

● **External Connection Diagram**

FA020573.VSD

Note: Viewed from the front side of the module.

(24) F3YD32-1P/F3YD64-1P Transistor Output Modules (with short-circuit protector)

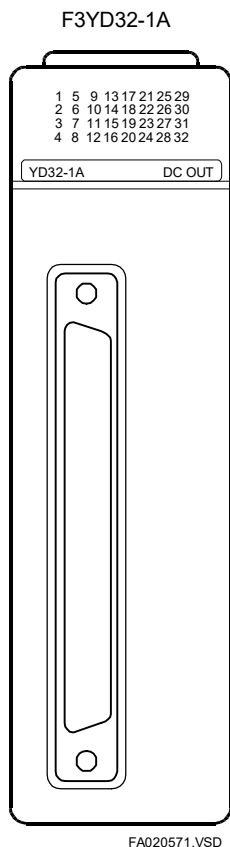| Item		F3YD32-1P	F3YD64-1P	Item		F3YD32-1P	F3YD64-1P
Output type		Transistor contact (sink type)		Protection circuitry	Short-circuit	Limit the output current or output shutdown	
					Overheat	Output shutdown	
Number of points		32	64	Surge protector[1]		Active clamp circuit	
Common line type		8 points/common		Fuse		None	
Isolation method		Photocoupler isolation		Dissipating current		160mA (5V DC)	275mA (5V DC)
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit		Output display[2]		LED (Lit when output is on)	LED (Lit when output is on for 32 outputs selectable by a switch)
Rated load voltage (operating load voltage range)		12-24V DC (10.2-26.4V DC)		Output status when the program stops HOLD/RESET[3]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis [4]	
Maximum load current		0.1A/point, 0.5A/common line	0.1A/point, 0.4A/common line				
Response time	OFF→ON	1ms max.				When a BASIC CPU module is used: No setting function The status is always HOLD	
	ON→OFF	1ms max.				When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
ON voltage		0.5V DC max.		External power supply		12-24V DC, 55mA	12-24V DC, 95mA
Off-time leak current		0.1mA max.		External connection		One 40-pin connector	Two 40-pin connectors
Service life	Mechanical	—		Weight		110g	130g
	Electrical	—					

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."
*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.
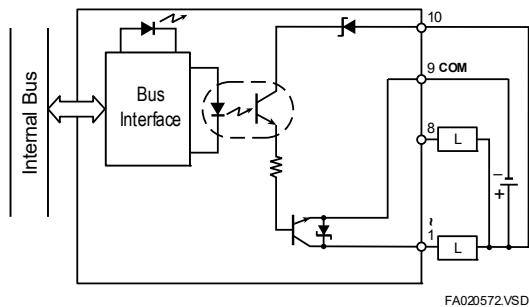*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
*4: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.
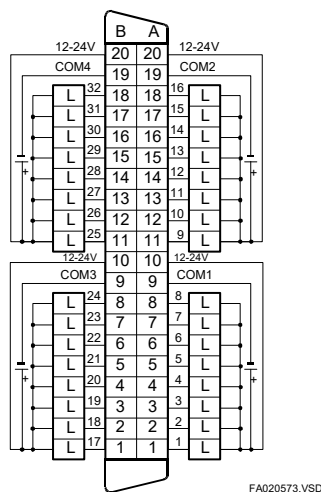
⚠ **CAUTION**

Ensure that the polarity of the external power supply is correct. Otherwise, a short-circuit condition may damage an output element and cause smoldering and scattering of chips. Beware that wrongly connecting a connector wired for F3XD32 or F3XD64 to the module may disable the protectors and damage internal elements.

Note

Operation of the protection circuitry:
- If short-circuit occurs, the output current is limited or the output is turned off for a certain period of time.
- If the short-circuit condition is removed, normal operation resumes.
- If the short-circuit condition persists, the temperature of the output element will rise. When the internal temperature of the output element exceeds a certain temperature, overheat protection is activated and the output is turned off.
- If the temperature of the overheated output element, then drops, normal operation resumes.
- The overheat protector will not be triggered if the module is operated normally within its specifications with no short-circuit condition.
- Both the short-circuit protector and overheat protector are designed to control outputs individually. Under some short-circuit conditions, however, the overheat protector may shut down not only its associated output but also other outputs.
- Short-circuit and overheat protectors are designed to protect the output element against short-term short-circuit. Never leave the module in prolonged short-circuit condition. Otherwise, the module enclosure may deteriorate or the PCB may be discolored.

● **Front View**

F3YD32-1P


```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```
YD32-1P   DC OUT

FA020571_1.VSD

F3YD64-1P


```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```
YD64-1P   DC OUT

DISPLAY
1   2

FA020580_1.VSD

● **Internal Circuit Configuration**

FA020571_2.vsd

● **External Connection Diagram**

F3YD32-1P

FA020573.VSD

Note: Viewed from the front side of the module.

F3YD64-1P

FA020582.VSD
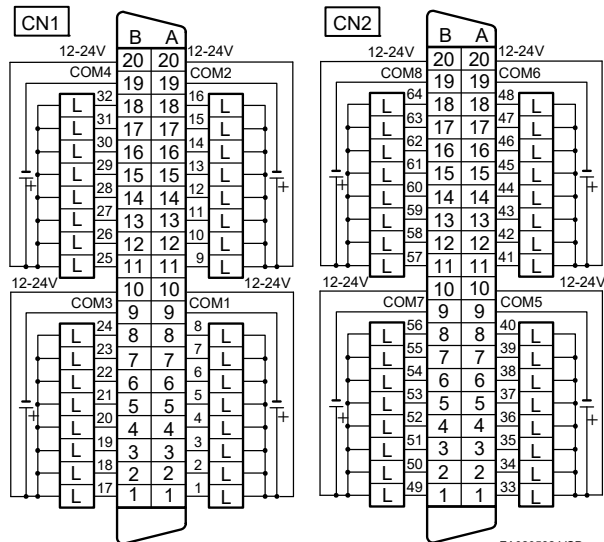
Note: Viewed from the front side of the module.

(25) F3YD32-1R/F3YD64-1R Transistor Output Modules (with short-circuit protector)

Item		F3YD32-1R	F3YD64-1R
Output type		Transistor contact (source type)	
Number of points		32	64
Common line type		8 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated load voltage (operating load voltage range)		12-24V DC (10.2-26.4V DC)	
Maximum load current		0.1A/point, 0.5A/common line	0.1A/point, 0.4A/common line
Response time	OFF→ON	1ms max.	
	ON→OFF	1ms max.	
ON voltage		0.5V DC max.	
Off-time leak current		0.1mA max.	
Service life	Mechanical	—	
	Electrical	—	
Protection circuitry	Short-circuit	Controlled short-circuit current	
	Overheat	Output shutdown	
Surge protector[1]		None	
Fuse		None	
Dissipating current		170mA (5V DC)	275mA (5V DC)
Output display[2]		LED (Lit when output is on)	LED (Lit when output is on for 32 outputs selectable by a switch)
Output status when the program stops HOLD/RESET [3]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis [4]	
		When a BASIC CPU module is used: No setting function The status is always HOLD	
		When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
External power supply		12-24V DC, 60mA	12-24V DC, 110mA
External connection		One 40-pin connector	
Weight		110g	130g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."
*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.
*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
*4: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.
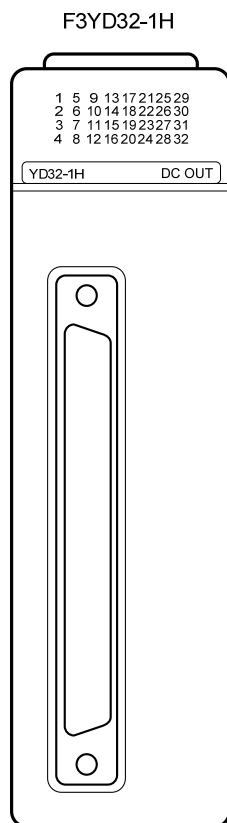
⚠ **CAUTION**

Ensure that the polarity of the external power supply is correct. Otherwise, a short-circuit condition may damage an output element and cause smoldering and scattering of chips. Beware that wrongly connecting a connector wired for F3XD32 or F3XD64 to the module may disable the protectors and damage internal elements.

Note
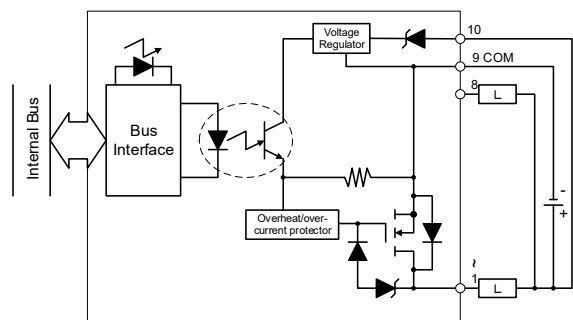
Operation of the protection circuitry:

- If short-circuit occurs, the ON voltage increases and the short-circuit current is limited within the range 1-3A.

- If the short-circuit condition is removed, normal operation resumes.

- If the short-circuit condition persists, the short-circuit current may cause the temperature of the output element to reach approx. 160°C, triggering the overheat protector to shut down the output.

- If the temperature of the overheated output element then drops by about 10°C, normal operation resumes.

- The overheat protector will not be triggered if the module is operated normally within its specifications with no short-circuit condition.

- Short-circuit protectors are designed to control outputs individually. On the other hand, the overheat protectors control outputs in pairs: OUT1 and OUT2, OUT3 and OUT4, …, OUT63 and OUT64..Under some short-circuit conditions, however, the overheat protector may shut down not only its associated outputs but also other outputs.

- Short-circuit and overheat protectors are designed to protect the output elements of the module against short-term short-circuit conditions. Never leave the module in prolonged short-circuit condition. Otherwise, the module enclosure may deteriorate or the PCB may be discolored.
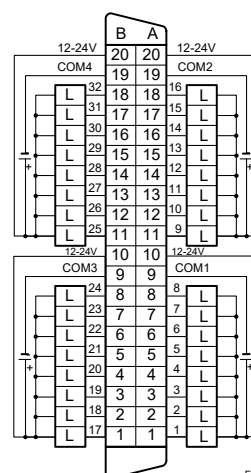
- Output loads must be driven by the external power supply only. Never try to use a power supply other than the external power supply to drive the output loads even if its output voltage is the same as that of the external power supply. Otherwise, the output elements may be damaged.

● **Front View**

F3YD32-1R


```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```

YD32-1R   DC OUT

FA020571_3.VSD

● **Internal Circuit Configuration**

Voltage Regulator

Bus Interface

Overheat/over-current protector

9 COM
8 L
1 L
10

FA020571_4.vsd

● **External Connection Diagram**

F3YD32-1R

	B	A	
0V	20	20	0V
COM4	19	19	COM2
L 32	18	18	16 L
L 31	17	17	15 L
L 30	16	16	14 L
L 29	15	15	13 L
L 28	14	14	12 L
L 27	13	13	11 L
L 26	12	12	10 L
L 25	11	11	9 L
0V	10	10	0V
COM3	9	9	COM1
L 24	8	8	8 L
L 23	7	7	7 L
L 22	6	6	6 L
L 21	5	5	5 L
L 20	4	4	4 L
L 19	3	3	3 L
L 18	2	2	2 L
L 17	1	1	1 L

FA020576.VSD

Note: Viewed from the front side of the module.

● Front View

F3YD64-1R


```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```

YD64-1R   DC OUT

DISPLAY

1 2

FA020580_3.VSD

● Internal Circuit Configuration
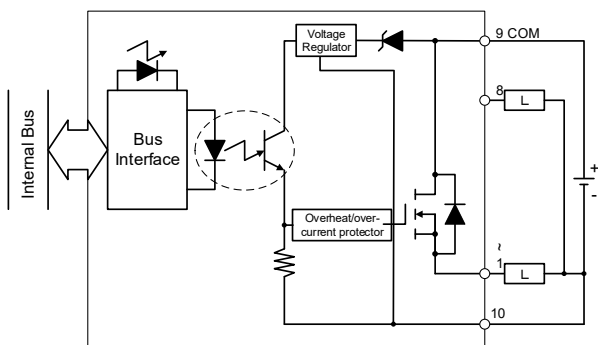
FA020571_4.vsd

● External Connection Diagram

F3YD64-1R
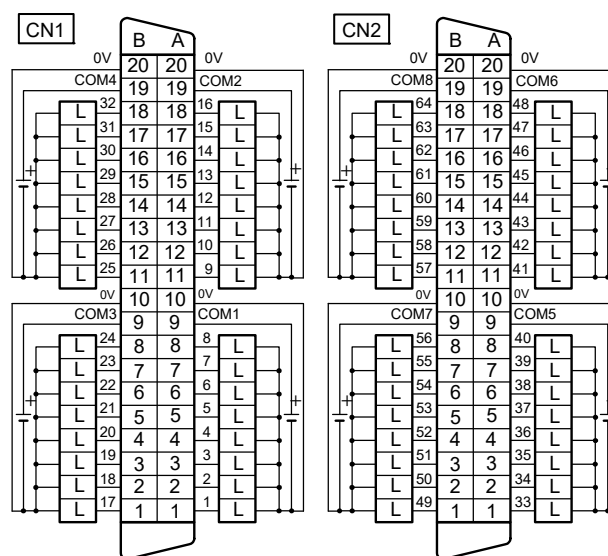
Note: Viewed from the front side of the module.

FA020582_2.VSD

(26) F3YD32-1T TTL Output Module

Item		Specifications	Item		Specifications
Output type		Transistor contact (TTL output)	Fuse		None
Number of points		32	Output voltage	Off time	4.9V min. (no load) 3.0V min. (with 0.4mA load)
Common line type		8 points/common		On time	0.4V max. (over entire load range)
Isolation method		Photocoupler isolation	Response time	OFF→ON	1ms max.
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit		ON→OFF	1ms max.
Rated load voltage	DC	5V DC			
	AC	—	Dissipating current		210mA (5V DC)
Operating load voltage range		4.5 to 5.5V DC	Output display[2]		LED (Lit when output is on)
Output current	Off time	0.4mA/point (source)	Output status when the program stops HOLD/RESET [3]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis [4]
					When a BASIC CPU module is used: No setting function The status is always HOLD
	On time	16mA/point (sink)			When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.
Maximum load current		16mA/point 128mA/common line	External power supply		5V DC, 60mA
			External connection		One 40-pin connector
Surge protector[1]		Zener diode	Weight		110g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."
*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.
*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
*4: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.

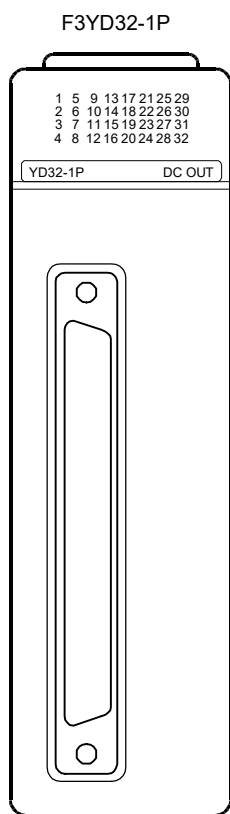## ● Front View

F3YD32-1T


```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```

YD32-1T   DC OUT

FA020577.VSD

● Internal Circuit Configuration

FA020578.VSD

● External Connection Diagram

FA020579.VSD

Note: Viewed from the front side of the module.

(27) F3YD64-1A Transistor Output Module

Item		Specifications	Item		Specifications
Output type		Transistor contact (sink type)	Service life	Mechanical	—
				Electrical	—
Number of points		64	Surge protector[*1]		Zener diode
Common line type		8 points/common	Fuse		None
Isolation method		Photocoupler isolation	Dissipating current		275mA (5V DC)
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	Output display[*2]		LED (Lit when output is on) Status displayed for 32 points selected by a switch
Rated load voltage (Operating load voltage range)	DC	24V DC (20.4 to 26.4V DC)	Output status when the program stops HOLD/RESET [*3]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.[*4]
	AC	—			When a BASIC CPU module is used: No setting function The status is always HOLD
Maximum load current		0.1A/point 0.4A/common line			When an OS-free CPU module is used: Default: HOLD Can be specified for each set of 8 points.
Response time	OFF→ON	1ms max.			
	ON→OFF	1ms max.	External power supply		24V DC, 150mA
ON voltage		0.5V DC max.	External connection		Two 40-pin connectors
Off-time leak current		0.1mA max.	Weight		160g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."
*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.
*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
*4: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.
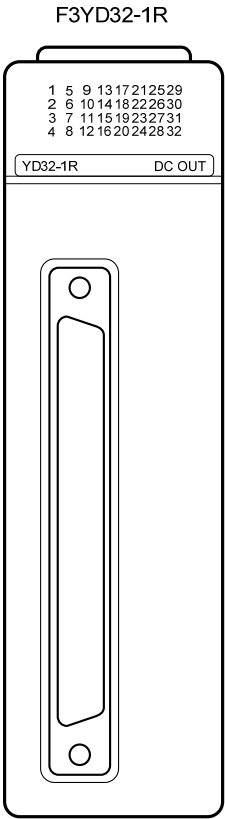
Note

Differences between F3YD64-1F and F3YD64-1A

- For F3YD64-1F, the output status can be configured to HOLD or RESET in the event of a major sequence CPU module failure when the F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76 or F3NP□□ CPU module is used.   For other CPU modules, the output is always HOLD in the event of a major sequence CPU module failure.

- For F3YD64-1A, the output status is always HOLD in the event of a major sequence CPU module failure regardless of the CPU module used.

For more information, see Section A4.3.3 "Indicating Problem Severity and Status of Output Module."

● **Front View**

F3YD64-1A

```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```

YD64-1A   DC OUT

DISPLAY
1 ⬚ 2

FA020583.VSD

● **Internal Circuit Configuration**

Internal Bus

Bus Interface

Select Display

10
9 COM
8 L
1 L

FA020584.VSD

● **External Connection Diagram**

CN1

	B	A	
+24V	20	20	+24V
COM4	19	19	COM2
L 32	18	18	16 L
L 31	17	17	15 L
L 30	16	16	14 L
L 29	15	15	13 L
L 28	14	14	12 L
L 27	13	13	11 L
L 26	12	12	10 L
L 25	11	11	9 L
+24V	10	10	+24V
COM3	9	9	COM1
L 24	8	8	8 L
L 23	7	7	7 L
L 22	6	6	6 L
L 21	5	5	5 L
L 20	4	4	4 L
L 19	3	3	3 L
L 18	2	2	2 L
L 17	1	1	1 L

CN2

	B	A	
+24V	20	20	+24V
COM8	19	19	COM6
L 64	18	18	48 L
L 63	17	17	47 L
L 62	16	16	46 L
L 61	15	15	45 L
L 60	14	14	44 L
L 59	13	13	43 L
L 58	12	12	42 L
L 57	11	11	41 L
+24V	10	10	+24V
COM7	9	9	COM5
L 56	8	8	40 L
L 55	7	7	39 L
L 54	6	6	38 L
L 53	5	5	37 L
L 52	4	4	36 L
L 51	3	3	35 L
L 50	2	2	34 L
L 49	1	1	33 L

FA020585.VSD

Note: Viewed from the front side of the module.

(28) F3YD64-1F Transistor Output Module

Item	Specifications	Item		Specifications
Output type	Transistor contact (sink type)	Service life	Mechanical	—
			Electrical	—
Number of points	64	Surge protector[1]		Zener diode
Common line type	8 points/common	Fuse		None
Isolation method	Photocoupler isolation	Dissipating current		275mA (5V DC)
Withstanding voltage	1500V AC for one minute between the group of terminals for external connection and the internal circuit	Output display[2]		LED (Lit when output is on) Status displayed for 32 points selected by a switch
Rated load voltage (Operating load voltage range)	DC	24V DC (20.4 to 26.4V DC)	Output status when the program stops HOLD/RESET[3]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.[4]
	AC	—			When a BASIC CPU module is used: No setting function The status is always HOLD
					When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.
Maximum load current		0.1A/point, 0.4A/common line			
Response time	OFF→ON	1ms max.			
	ON→OFF	1ms max.	External power supply		24V DC, 150mA
ON voltage		0.5V DC max.	External connection		Two 40-pin connectors
Off-time leak current		0.1mA max.	Weight		160g

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."
*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.
*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
*4: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.

Note

Differences between F3YD64-1F and F3YD64-1A

- For F3YD64-1F, the output status can be configured to HOLD or RESET in the event of a major sequence CPU module failure when the F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76 or F3NP□□ CPU module is used. For other CPU modules, the output is always HOLD in the event of a major sequence CPU module failure.

- For F3YD64-1A, the output status is always HOLD in the event of a major sequence CPU module failure regardless of the CPU module used.

For more information, see Section A4.3.3 "Indicating Problem Severity and Status of Output Module."

● **Front View**

F3YD64-1F

FA020580.VSD

● **Internal Circuit Configuration**

FA020581.VSD

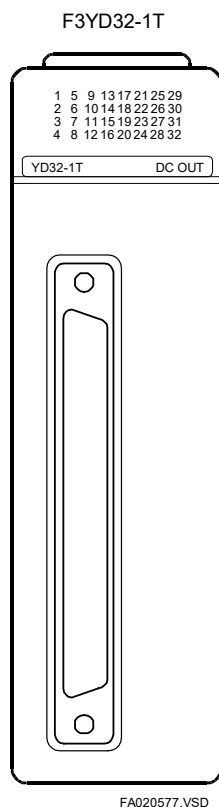● **External Connection Diagram**

Note: Viewed from the front side of the module.

FA020582.VSD

(29) F3YD64-1M Transistor Output Module

Item		Specifications	Item		Specifications
Output type		Transistor contact (matrix scan)	Service life	Mechanical	—
				Electrical	—
Number of points		64	Surge protector		Zener diode
Common line type		8 × 8 matrix	Fuse		None
Isolation method		Photocoupler isolation	Dissipating current		125mA (5V DC)
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	Output display[*1]		LED (Lit when output is on) Status displayed for 32 points selected by a switch
Rated load voltage (Operating load voltage range)	DC	12-24V DC (10.2 to 26.4V DC)	Output status when the program stops HOLD/RESET [*2]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.[*3]
	AC	—			When a BASIC CPU module is used: No setting function The status is always HOLD
Maximum load current		0.1A			
Response time	OFF→ON	16ms max.			When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.
	ON→OFF	16ms max.	External power supply		12-24V DC, 40mA
ON voltage		1.5V DC max.	External connection		One 40-pin connector
Off-time leak current		0.1mA max.	Weight		110g

*: The F3YD64-1M module is designed to drive an 8 × 8 matrix of LEDs and cannot be used for loads other than LEDs.

*: No resistor for limiting load current is included in the module. Add current-limiting resistors to the DATA1 to DATA8 lines before connecting the load to the module. Any LED display whose LED components are equipped with a current-limiting resistor cannot be used as the load.

*: Use the output terminals in units of 8-terminal groups classified as Y0001-Y0008, Y0009-Y0016, Y0017-Y0024, Y0025-Y0032, Y0033-Y0040, Y0041-Y0048, Y0049-Y0056 and Y0057-Y0064. If there are any output terminals in the same group to which no load is connected, connect a diode to that terminal. For the diode, select one that has the reverse voltage rating (VR) of at least 30V and an average rectified current rating (IO) of at least 0.3A. There is no need to connect diodes to a group where no load is connected at all.

*1: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

*2: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."

*3: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.
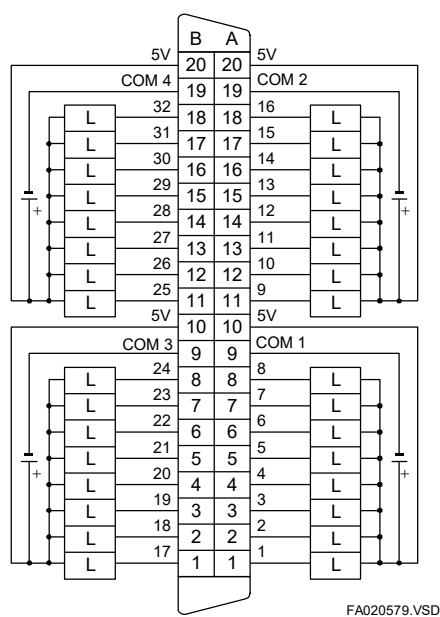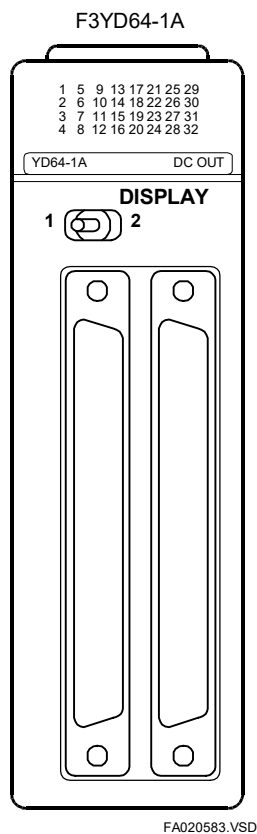
● Front View

F3YD64-1M

```
    1  5  9 13 17 21 25 29
    2  6 10 14 18 22 26 30
    3  7 11 15 19 23 27 31
    4  8 12 16 20 24 28 32
```
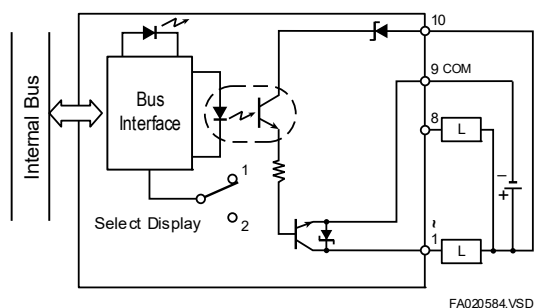
YD64-1M   DC OUT

DISPLAY

1 2

FA020586.VSD

● Internal Circuit Configuration

FA020587.VSD
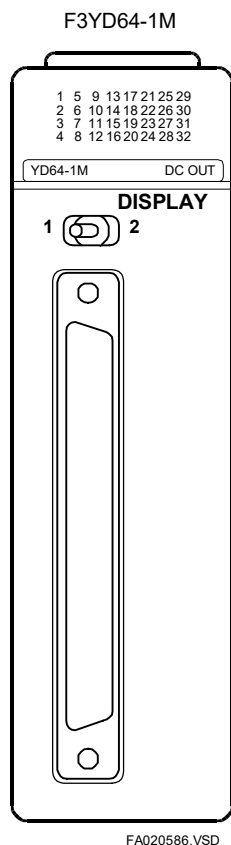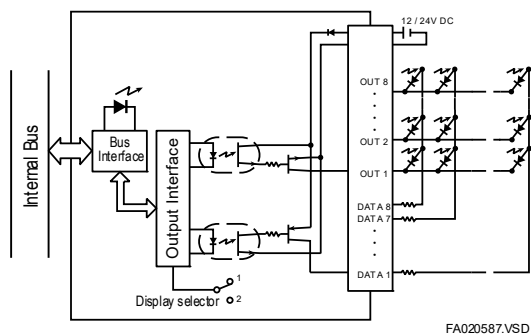
● External Connection Diagram
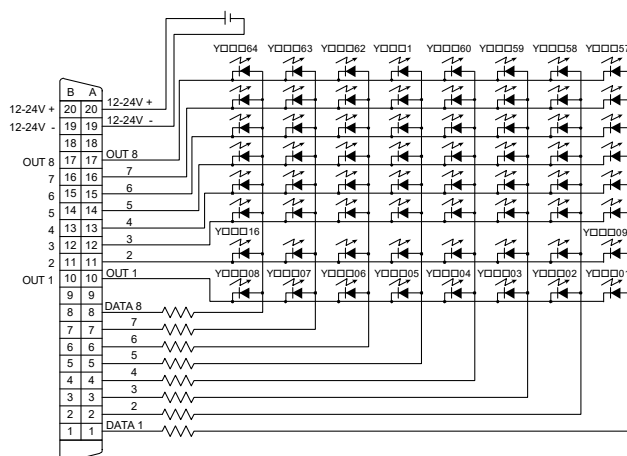
Note: Viewed from the front side of the module.

FA020588.VSD

(30) F3WD64-3P/F3WD64-4P Input/Output Modules (with short-circuit protector)

● Input Block

Item		F3WD64-3P	F3WD64-4P
Input type		DC voltage	
Number of points		32 (terminal Nos. 01 - 32)	
Common line type		8 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated input voltage (operating voltage range)		24V DC (20.4 to 26.4V DC)	12V DC (10.2 to 13.2V DC)
Rated input current		4.1mA/point (24V DC)	4.1mA/point (12V DC)
Input impedance		5.9kΩ	2.9kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.
Response time	OFF→ON	Input sampling time can be specified for 4 steps: Always (0μs), 62.5μs, 250μs, and 1ms.[1]	
	ON→OFF	Input sampling time can be specified for 4 steps: Always (0μs), 62.5μs, 250μs, and 1ms.[1]	
Interrupt		None	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Input display [2]		Lit when input is on (Input or output status indication can be selected using a switch.)	
Dissipating current		170mA (5V DC) (for input and output)	
External connection		One 40-pin connector	
Weight		120g (for input and output)	
Maximum ratio of inputs turned on simultaneously		60%	100%

[1]: These values are applicable when using the module with CPU module using F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76 or F3NP□□ module. If other CPU modules are used, the values for OFF→ON and for ON→OFF are 1.0 ms and 2.5 ms max. respectively. The actual response time is obtained by adding about 100μs for OFF→ON and about 300μs for ON→OFF to the specified value.
If input interrupt is to be used, set the input sampling time to 62.5μs or more.

[2]: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

● **Output Block**

Item		F3WD64-3P	F3WD64-4P
Output type		Transistor contact (sink type)	
Number of points		32 (terminal Nos. 33 - 64)	
Common line type		8 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated load voltage (Operating load voltage range)		24V DC (20.4 to 26.4V DC)	12V DC (10.2 to 13.2V DC)
Maximum load current		0.1A/point, 0.4A/common line	
Response time	OFF→ON	1ms max.	
	ON→OFF	1ms max.	
ON voltage		0.5V DC max.	
Off-time leak current		0.1mA max.	
Protection circuitry	Short-circuit	Controlled short-circuit current	
	Overheat	Output shutdown	
Surge protector [3]		Active clamp	
Fuse		None	
Output status when the program stops HOLD/RESET [4]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis [5]	
		When a BASIC CPU module is used: No setting function The status is always HOLD	
		When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
External power supply		24V DC, 55mA	12V DC, 55mA
Output status display [6]		Lit when output is on (Input or output status indication can be selected using a switch.)	
Dissipating current		170mA (5V DC) (for input and output)	
External connection		One 40-pin connector	
Weight		120g (for input and output)	

[3]: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

[4]: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."

[5]: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.
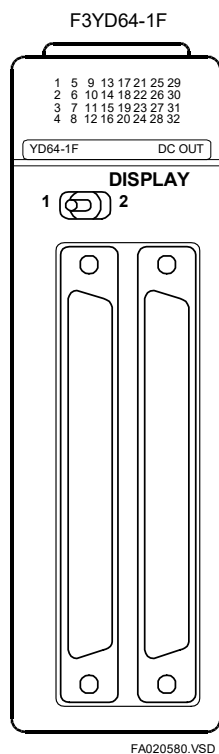
[6]: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

⚠ **CAUTION**

Make sure that the polarity of the external power supply is correct. If incorrect polarity and shorted load occur at the same time, the output element will be damaged and smoking or scattering chips may occur.
Never connect to these modules a connector wired for F3XD32 or F3XD64. Otherwise, the protector function would not work and the internal elements may be damaged.

Note

Operation of the protection circuitry:

- If short-circuit occurs, the ON voltage increases and the short-circuit current is limited within the range 1-3A.
- Once the short-circuit condition disappears, output behavior is restored to normal.
- If the short-circuit condition continues, the temperature of the output element increases due to the short-circuit current. If the temperature reaches approx. 160°C, the overheat protector will be activated and will shut down the output.
- If the temperature drops by approx. 10°C after the overheat protector had been activated, the output is restored.
- The overheat protector is not activated as long as there is no short-circuit condition and the module is operated normally within its specifications.
- Both the short-circuit protector and overheat protector are designed to control outputs individually. Under some short-circuit conditions, however, the overheat protector may shut down not only its associated output but also other outputs.
- Both the short-circuit protector and overheat protector are designed to protect the output elements of the module against short-term short-circuit conditions. Never leave the module in prolonged short-circuit condition. Otherwise, the module enclosure may deteriorate or the PCB may be discolored.

● **Front View**

F3WD64-3P

F3WD64-4P

```
1  5  9  13 17 21 25 29
2  6  10 14 18 22 26 30
3  7  11 15 19 23 27 31
4  8  12 16 20 24 28 32
```

WD64-3P   DC I/O

DISPLAY
IN (◐) OUT

```
1  5  9  13 17 21 25 29
2  6  10 14 18 22 26 30
3  7  11 15 19 23 27 31
4  8  12 16 20 24 28 32
```

WD64-4P   DC I/O

DISPLAY
IN (◐) OUT

FA020589_2.VSD

● **Internal Circuit Configuration**

FA020590_2.VSD
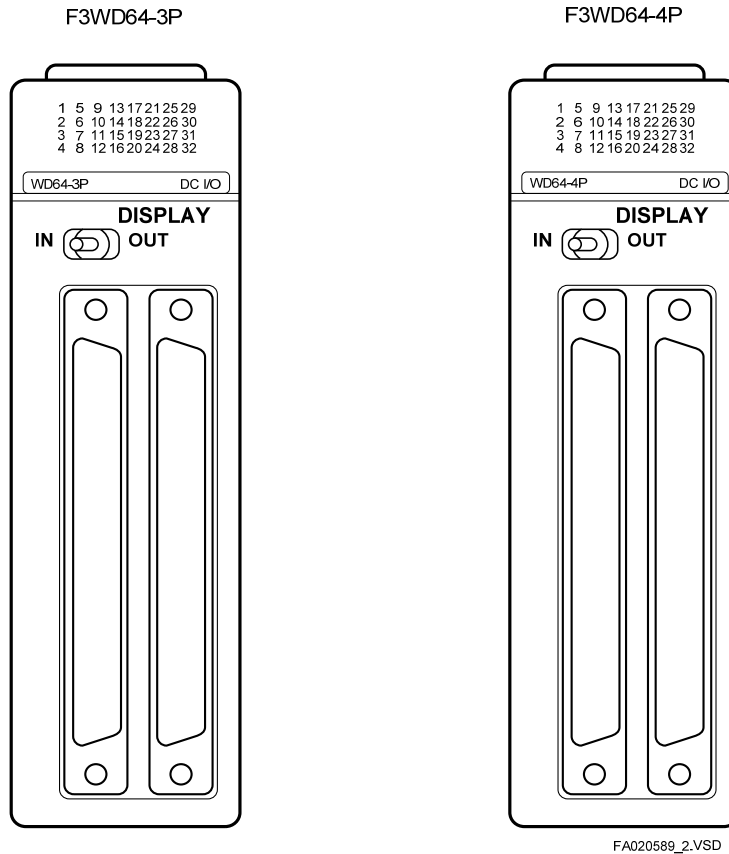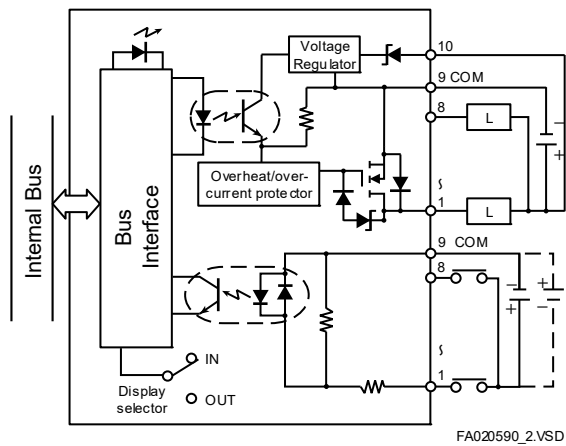
● **External Connection Diagram**
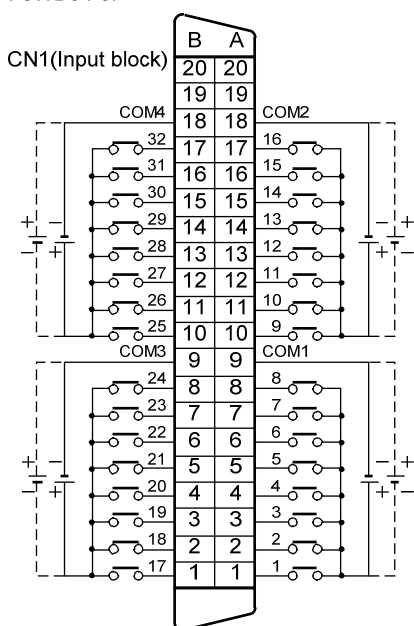
F3WD64-3P

Note: Viewed from the front side of the module.
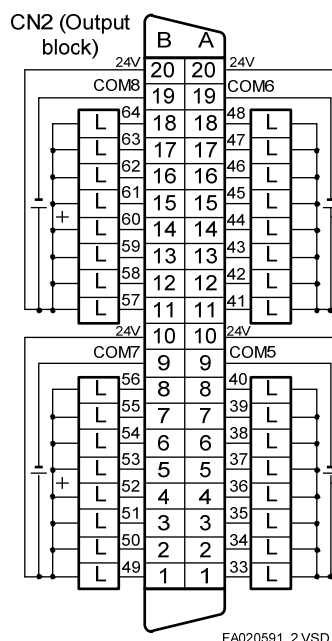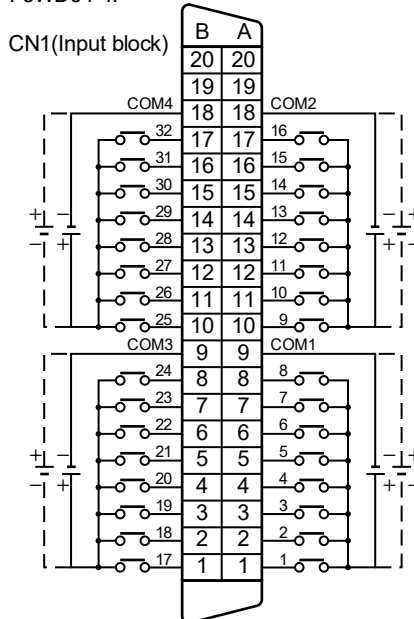
F3WD64-4P

Note: Viewed from the front side of the module.
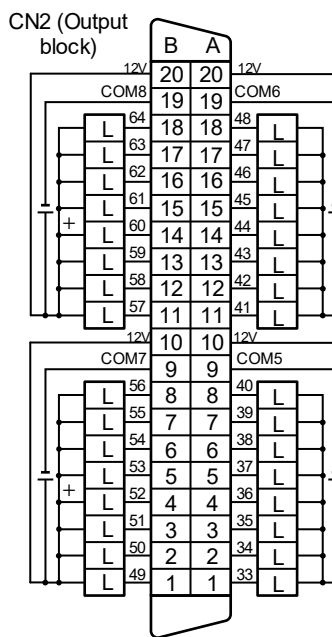
(31) F3WD64-3F/F3WD64-4F Input/Output Modules

● Input Block

Item		Specifications	
		F3WD64-3F	**F3WD64-4F**
Input type		DC voltage	
Number of points		32 (terminal Nos. 01 - 32)	
Common line type		8 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated input voltage		24V DC	12V DC
Operating voltage range		20.4 to 26.4V DC	10.2 to 13.2V DC
Rated input current		4.1mA/point (24V DC)	4.1mA/point (12V DC)
Input impedance		5.9kΩ	2.9kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.
Response time	OFF→ON	Input sampling time can be specified for 4 steps: Always (0μs), 62.5μs, 250μs, and 1ms.[1]	
	ON→OFF	Input sampling time can be specified for 4 steps: Always (0μs), 62.5μs, 250μs, and 1ms.[1]	
Interrupt		None	
Dissipating current		200mA (5V DC) (for input and output)	
Input display		LED (Lit when inputs are turned on) If the selector switch is set to IN, the input state is displayed.	
External connection		One 40-pin connector	
Weight		160g (for input and output)	
Maximum ratio of inputs turned on simultaneously		60%	100%

[1]: These values are applicable when using the module with CPU module using F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71, F3SP76 or F3NP□□ module. If other CPU modules are used, the values are the same as those for F3WD64-□N modules. The actual response time is obtained by adding about 100μs for OFF→ON and about 300μs for ON→OFF to the specified value.
If the input sampling time is set to a very small value, the modules become susceptible to noise. In such a case, implement countermeasures against noise as described in Section A3.4 "Noise Control Considerations" and Section A3.9 "CE Marking Compliance".
If input interrupt is to be used, set the input sampling time to 62.5μs or more.

● **Output Block**

Item	Specifications	
	F3WD64-3F	**F3WD64-4F**
Output type	Transistor contact (sink type)	
Number of points	32 (terminal Nos. 33 - 64)	
Common line type	8 points/common	
Isolation method	Photocoupler isolation	
Withstanding voltage	1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated load voltage (Operating load voltage range)	24V DC (20.4 to 26.4V DC)	12V DC (10.2 to 13.2V DC)
Maximum load current	0.1A/point, 0.4A/common line	
Response time — OFF→ON	1ms max.	
Response time — ON→OFF	1ms max.	
ON voltage	0.5V DC max.	
Off-time leak current	0.1mA max.	
Service life — Mechanical	———	
Service life — Electrical	———	
Surge protector[1]	Zener diode	
Fuse	None	
Dissipating current	200mA (5V DC) (for input and output)	
Output display[2]	LED (Lit when output is on) If the selector switch is set to OUT, the output state is displayed.	
Output status when the program stops HOLD/RESET [3]	When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.[4]	
	When a BASIC CPU module is used: No setting function The status is always HOLD	
	When an OS-free/IEC61131-3 CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
External power supply	24V DC, 60mA	12V DC, 60mA
External connection	Two 40-pin connectors	
Weight	160g (for input and output)	

[1]: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."

[2]: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.

[3]: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."

[4]: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, all points can be specified in 16-point units.

● **Front View**

F3WD64-3F

F3WD64-4F

FA020589.VSD

● **Internal Circuit Configuration**

FA020590.VSD
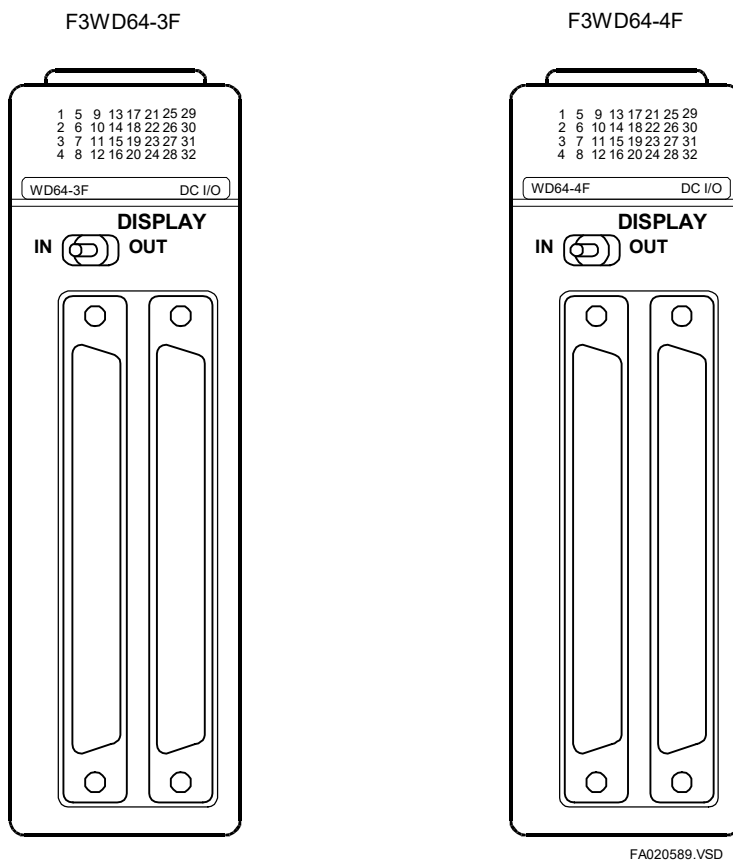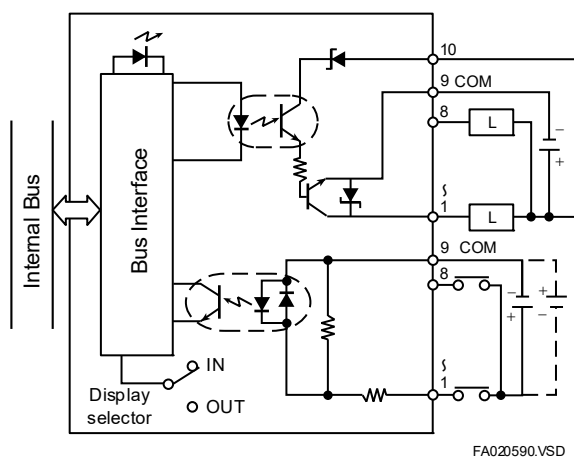
● **External Connection Diagram**

F3WD64-3F

CN1 (input block)

CN2 (output block)

Note: Viewed from the front side of the module.
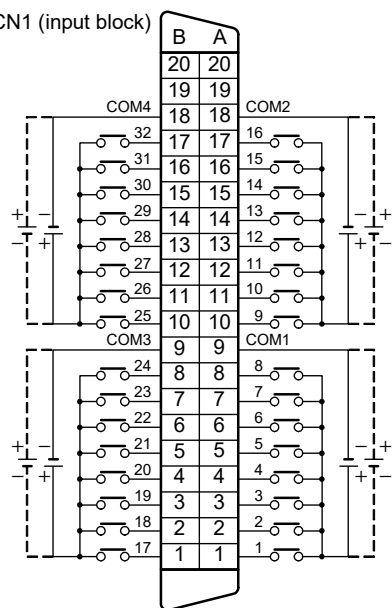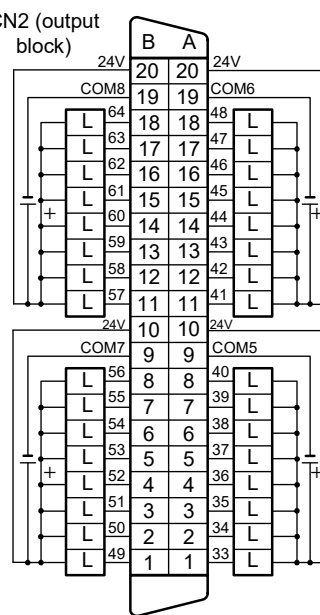
F3WD64-4F

CN1 (Input block)
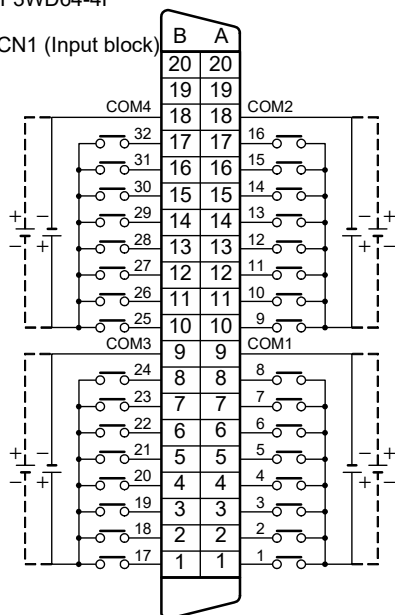
CN2 (Output block)

FA020591.VSD

Note: Viewed from the front side of the module.
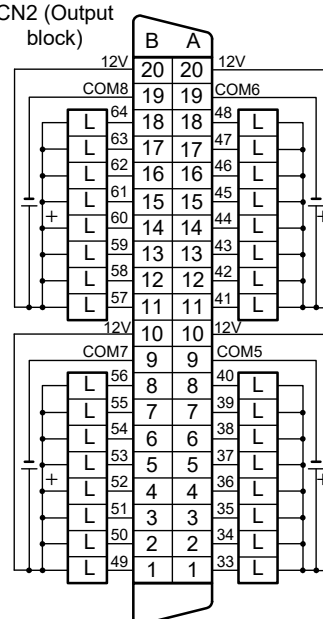
FA020592.VSD

(32) F3WD64-3N/F3WD64-4N Input/Output Modules

● Input Block

Item		Specifications	
		F3WD64-3N	**F3WD64-4N**
Input type		DC voltage	
Number of points		32 (terminal Nos. 01 - 32)	
Common line type		8 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated input voltage		24V DC	12V DC
Operating voltage range		20.4 to 26.4V DC	10.2 to 13.2V DC
Rated input current		4.1mA/point (24V DC)	4.1mA/point (12V DC)
Input impedance		5.9kΩ	2.9kΩ
Operating voltage/current	ON	16.0V DC min. 3.2mA min.	8.0V DC min. 2.6mA min.
	OFF	5.8V DC max. 0.9mA max.	3.4V DC max. 1.0mA max.
Response time	OFF→ON	1.0ms max.	
	ON→OFF	2.5ms max.	
Interrupt		None	
Dissipating current		200mA (5V DC) (for input and output)	
Input display		LED (Lit when inputs are turned on) Input state is displayed when the display selector is set to "IN"	
External connection		One 40-pin connector	
Weight		160g (for input and output)	
Maximum ratio of inputs turned on simultaneously		60%	100%

● Output Block

Item		Specifications	
		F3WD64-3N	**F3WD64-4N**
Output type		Transistor contact (sink type)	
Number of points		32 (terminal Nos. 33 - 64)	
Common line type		8 points/common	
Isolation method		Photocoupler isolation	
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit	
Rated load voltage (Operating load voltage range)		24V DC (20.4 to 26.4V DC)	12V DC (10.2 to 13.2V DC)
Maximum load current		0.1A/point, 0.4A/common line	
Response time	OFF→ON	1ms max.	
	ON→OFF	1ms max.	
ON voltage		0.5V DC max.	
Off-time leak current		0.1mA max.	
Service life	Mechanical	——	
	Electrical	——	
Surge protector[*1]		Zener diode	
Fuse		None	
Dissipating current		200mA (5V DC) (for input and output)	
Output display[*2]		LED (Lit when output is on) Output state is displayed when the display selector is set to "OUT"	
Output status when the program stops HOLD/RESET [*3]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.[*4]	
		When a BASIC CPU module is used: No setting function The status is always HOLD	
		When an OS-free CPU module is used: Default: HOLD Can be specified for each set of 8 points.	
External power supply		24V DC, 60mA	12V DC, 60mA
External connection		One 40-pin connector	
Weight		160g (for input and output)	

*1: If an inductive load, such as a relay, is to be connected, a surge protector is also required on the load side. Connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range. For details, see Subsection A3.6.5, "Connecting Output Devices."
*2: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.
*3: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."
*4: When F3SP22, F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66, F3SP67, F3SP71 or F3SP76 module is used, this setting can be specified in 16-point units.

● **Front View**

F3WD64-3N

```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```
WD64-3N   DC I/O

DISPLAY
IN ⊙ OUT

F3WD64-4N

```
1  5  9 13 17 21 25 29
2  6 10 14 18 22 26 30
3  7 11 15 19 23 27 31
4  8 12 16 20 24 28 32
```
WD64-4N   DC I/O

DISPLAY
IN ⊙ OUT

FA020593.VSD

● **Internal Circuit Configuration**

FA020594.VSD

● **External Connection Diagram**

F3WD64-3N

FA020595.VSD

Note: Viewed from the front side of the module.

F3WD64-4N

FA020596.VSD

Note: Viewed from the front side of the module.

A2.6 ROM Packs

ROM packs can be installed in sequence CPU modules and BASIC CPU modules and used to store programs or data.

You can write to a ROM pack from the programming tool. At CPU startup, programs and data are read from the ROM pack into the memory for execution.

Data written to a ROM pack includes program control information, programs, configuration data, various control tables, preset value tables for timers and counters, and comment management data.

When used with sequence CPU modules, a ROM pack can store 1024 words of data.

When used with sequence CPU modules F3SP22/28/38/53/58/59, a ROM pack can store circuit comments, subcomments and tag name definition (includes I/O comments.)

You may not use ROM packs with F3SP66/67/71/76 sequence CPU modules (with network functions). You can use SD memory cards instead.

● Specifications

Item	Specifications						
	RK10-0N	RK30-0N	RK50-0N	RK33-0N	RK53-0N	RK73-0N	RK93-0N
When using F3SP05-0P	5K steps[*1]	5K steps	5K steps	5K steps	5K steps	Not available	Not available
When using F3SP08-0P	5K steps[*1]	10K steps	10K steps	10K steps	10K steps	Not available	Not available
When using F3SP22-0S	Not available	Not available	Not available	30K steps	Not available	30K steps[*6]	Not available
When using F3SP21-0N	5K steps[*1]	10K steps	10K steps	10K steps	10K steps	Not available	Not available
When using F3SP25-2N	Not available	20K steps	20K steps	20K steps	20K steps	Not available	Not available
When using F3SP35-5N	Not available	20K steps[*2]	100K steps[*3]	20K steps[*2]	100K steps[*3]	Not available	Not available
When using F3SP28-3N	Not available	Not available	Not available	30K steps	Not available	30K steps	Not available
When using F3SP38-6N	Not available	Not available	Not available	56K steps	Not available	120K steps	Not available
When using F3SP53-4H	Not available	Not available	Not available	56K steps	Not available	56K steps	Not available
When using F3SP58-6H	Not available	Not available	Not available	56K steps	Not available	120K steps	Not available
When using F3SP28-3S	Not available	Not available	Not available	30K steps	Not available	30K steps[*6]	Not available
When using F3SP38-6S	Not available	Not available	Not available	56K steps	Not available	120K steps	120K steps[*7]
When using F3SP53-4S	Not available	Not available	Not available	56K steps	Not available	56K steps[*6]	Not available
When using F3SP58-6S	Not available	Not available	Not available	56K steps	Not available	120K steps	120K steps[*7]
When using F3SP59-7S	Not available	Not available	Not available	56K steps	Not available	120K steps	254K steps[*7]
When using F3SP71-4N	Not available	Not available	Not available	Not available	Not available	Not available	Not available
When using F3SP76-7N	Not available	Not available	Not available	Not available	Not available	Not available	Not available
When using F3SP71-4S	Not available	Not available	Not available	Not available	Not available	Not available	Not available
When using F3SP76-7S	Not available	Not available	Not available	Not available	Not available	Not available	Not available
When using F3BP20-0N	Not available	120K bytes[*4]	Not available	Not available	Not available	Not available	Not available
When using F3BP30-0N	Not available	Not available	510K bytes[*5]	Not available	510K bytes[*5]	Not available	Not available

(Row label spanning left: Program that can be stored)

*1: Up to 400 lines of circuit comments and subcomments in total (not applicable to F3SP66 and F3SP67).
*2: Can store up to 2048 points of timers and counters in total.
   Can store up to 128 program blocks.
*3: Can store programs of up to 80K steps if the number of program blocks is 33 or more.
*4: Can store up to 120K bytes of user programs and common area data in total.
*5: Can store up to 510K bytes of user programs and common area data in total.
*6: Can store up to 120K steps of programs and tag name definition data in total.
*7: Can store up to 360K steps of programs and tag name definition data in total.

⚠ **CAUTION**

WideField3 R4.05 or later must be used to use F3SP22-0S in up to 30K steps. When using WideField3 R4.04 or earlier, there is a limit of up to 10K steps.

● **Maximum Writing Operations and Weight**

	RK10	RK30	RK50	RK33	RK53	RK73	RK93
Max. writing operations	10,000 times			100,000 times			
Weight	7g						

● **Installing a ROM Pack**

Remove the side cover of the CPU module and attach the ROM pack to the internal connector.

FA020601.VSD
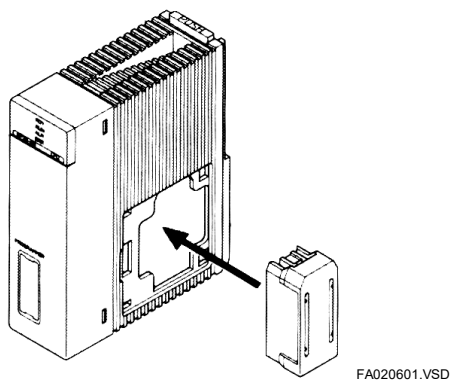
● **External Dimensions**

(1) RK10, RK30, RK50

Unit : mm

19   17.5   43
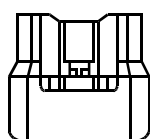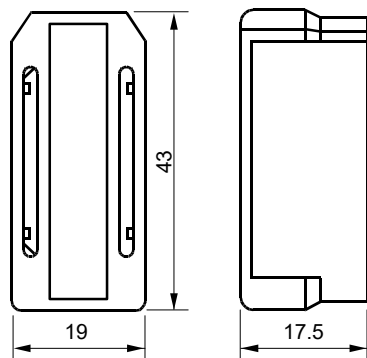
FA020602.VSD

(2) RK33, RK53, RK73, RK93

Unit : mm

19   17.5   43
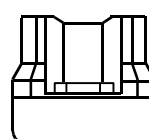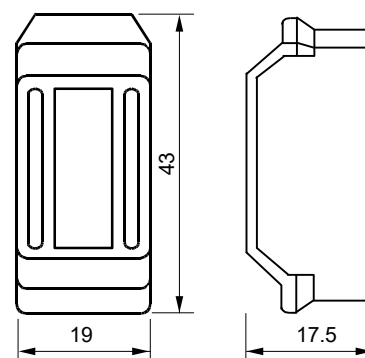
FA020603.VSD

A2.7 Cables

⚠️ **CAUTION**

Be sure to hold the cable's connector when connecting or disconnecting the cable. The cable may break if you pull it forcibly while holding any part other than the connector or if you apply stress to the cable joint when the cable is bent at an angle of almost 90° from the connector.

FA020705.VSD
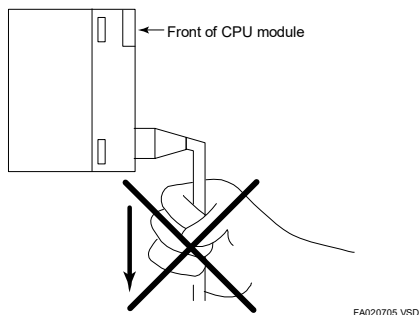
(1) Cables for Programming Tool

The programming tool cable is used to connect CPU modules, such as sequence CPU modules, to external equipment such as a personal computer or a display unit.

Connect the cable to the connector labeled PROGRAMMER on the CPU module's front.

Note

This cable cannot be used with the F3SP66-4S, F3SP67-6S, F3SP71 or F3SP76 sequence CPU module.

● KM11-2N (for PC9801 (NEC))
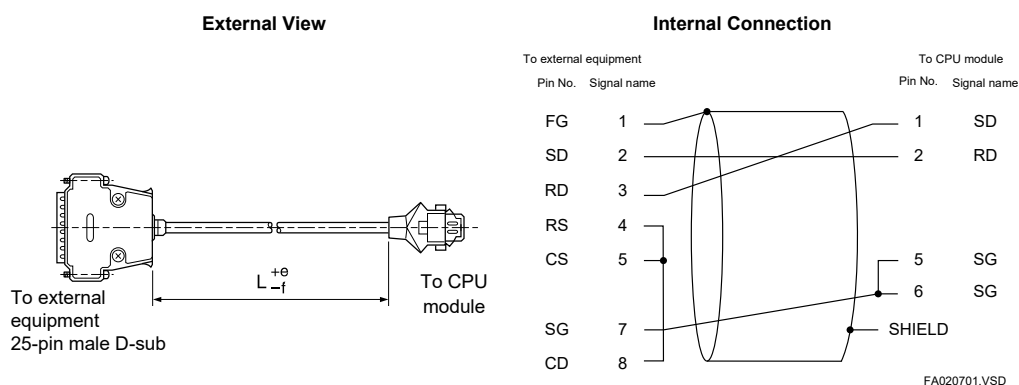
External View

Internal Connection

FA020701.VSD

Model	Length L (m)	Tolerance +e (cm)	Tolerance –f (cm)	Maximum number of insertions	
				Equipment end	CPU module end
KM11-2N	3	20	0	500 times	1000 times

● KM11-2T/KM11-3T/KM11-4T (for DOS/V (IBM PC/AT Compatibles))
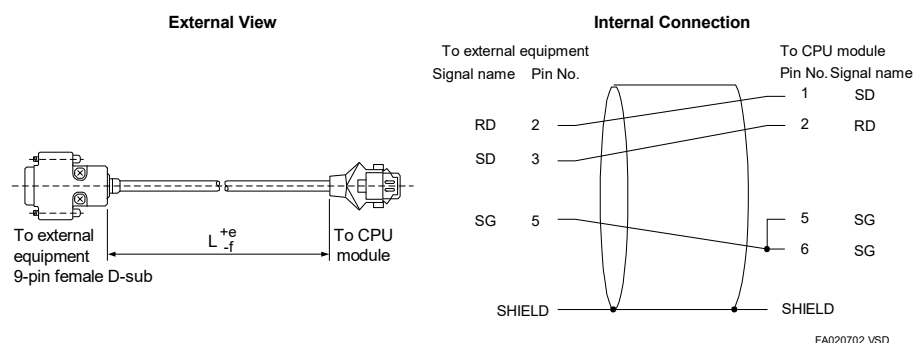
External View

Internal Connection

To external equipment

Signal name   Pin No.

RD   2

SD   3

SG   5

To CPU module

Pin No. Signal name

1   SD

2   RD

5   SG

6   SG

To external equipment
9-pin female D-sub

L^{+e}_{-f}

To CPU module

SHIELD   SHIELD

FA020702.VSD

Model	Length L (m)	Tolerance +e (cm)	Tolerance –f (cm)	Maximum number of insertions	
				Equipment end	CPU module end
KM11-2T	3	20	0	500 times	1000 times
KM11-3T	5	20	0		
KM11-4T	10	30	30		

● KM13-1S (USB-serial Converter)

Ferrite core

To external equipment

350±10 mm   107 mm   2280±50 mm

To CPU module
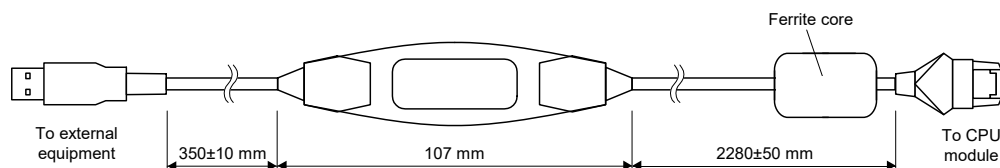
Item	Description
Input/output signal level	RS232C compliant
Connection interface	USB (Universal Serial Bus) 1.1 compliant
Number of I/O ports	1port
Size	85mm (L) x 28mm (W) x 11mm (H). For cable length, see the figure above.
Weight	128g
Communications protocol	Asynchronous communication
Transmission speed	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bps[1]
Transmission distance	15m max.
Power supply voltage	+5V DC (supplied by USB bus)
Current consumption	Average 30mA at 5V (50mA max. at 5V)
Communications parameters	7 or 8 bits; 1 start bit; 1, 1.5 or 2 stop bits; Odd, even, or no parity
LED display	PWR: Power LED (lit when 5V is available from USB bus) TXD: LED for data transmission (from PC to device) RXD: LED for data receiving (from device to PC)
Operating temperature/ humidity ranges	0 to 50°C/10 to 90% (non-condensing)
Storage temperature/ humidity ranges	-20 to 65°C/10 to 90% (non-condensing)
Maximum number of insertions	1000 insertions for USB side, 1000 insertions for CPU side

*1   The actual maximum achievable transmission speed depends on the specifications of the PC.

(2) CPU Port/D-sub 9-pin Adapter Cable

The CPU Port/D-sub 9-pin adapter cable is used to adapt the programming tool connector to a standard D-sub 9–pin female connector. An additional cable is required, however, for connecting a display unit.

● KM10-0C

External View

To external
equipment
9-pin female D-sub

To CPU
module

Approx. 0.5 m

Maximum no. of insertions/removals:
    External equipment side: 500 times
    CPU module side: 1000 times

Internal Connection

To external equipment

Signal name Pin No.

To CPU module

Pin No. Signal name

Signal name	Pin No.	Pin No.	Signal name
		1	SD
RD	2	2	RD
SD	3	3	
		4	
SG	5	5	SG
		6	SG
SHIELD			SHIELD

FA020704.VSD
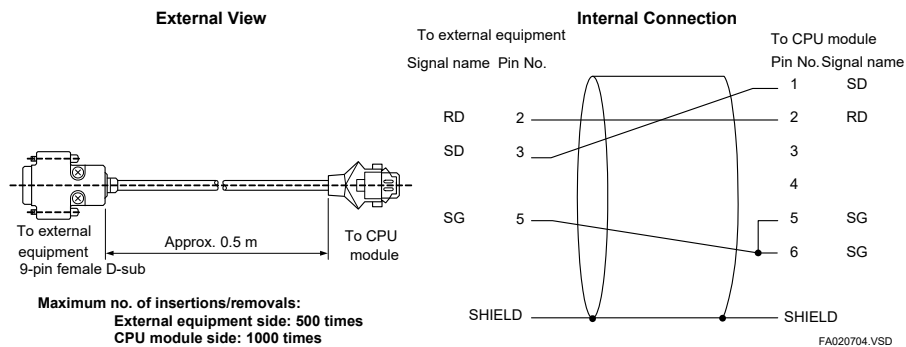
(3) Cables for Connector Terminal Blocks

Connector terminal block cables connects connector terminal block TA50-□N, TA60-0N to I/O modules of connector specifications.

● KM55-005, KM55-010, KM55-015, KM55-020, KM55-025, KM55-030
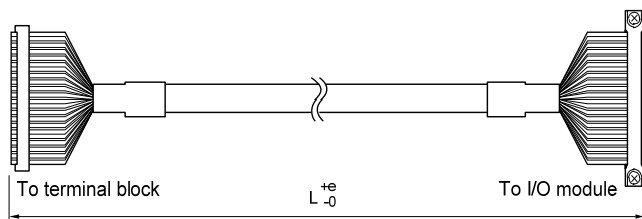
Model	Length L (m)	Tolerance +e (cm)
KM55-005	0.5	5
KM55-010	1	
KM55-015	1.5	10
KM55-020	2	
KM55-025	2.5	
KM55-030	3	

To terminal block $L\,^{+e}_{-0}$ To I/O module

FA20706.VSD

Connection Diagram

I/O module side

| B1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| A1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

Terminal block side
(TA50-□N, TA60-0N side)

| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 |
| 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 |
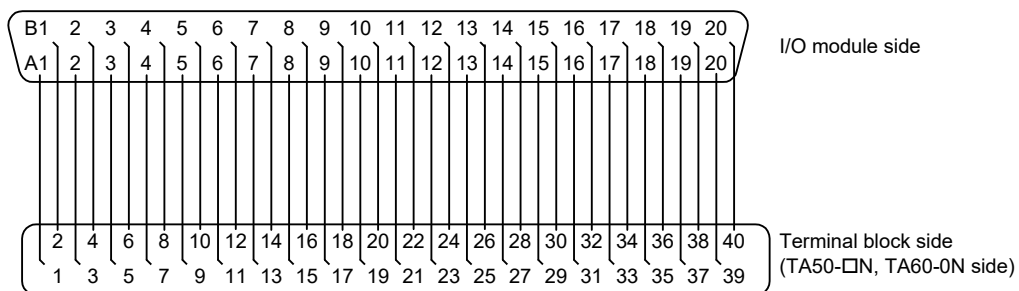
FA020707.VSD

Note: The terminal arrangement of the terminal block is the same as that of the connector on a module.

(4) Fiber-Optic Cord

KM60 fiber-optic cord is used for wiring inside the panel enclosure on Fiber-optic FA link H modules, Fiber-optic FA-bus modules and Fiber-optic FA-bus type 2 modules.

● **KM60**

Optical connector · Serial No. · Fiber-optic cord · L + tolerance $^{+e}_{-0}$

Optical connector · Identification marking · Fiber-optic cord · L + tolerance $^{+e}_{-0}$

Length L (m)	Tolerance + e (m)
L ≤ 3	0.20

F01.VSD
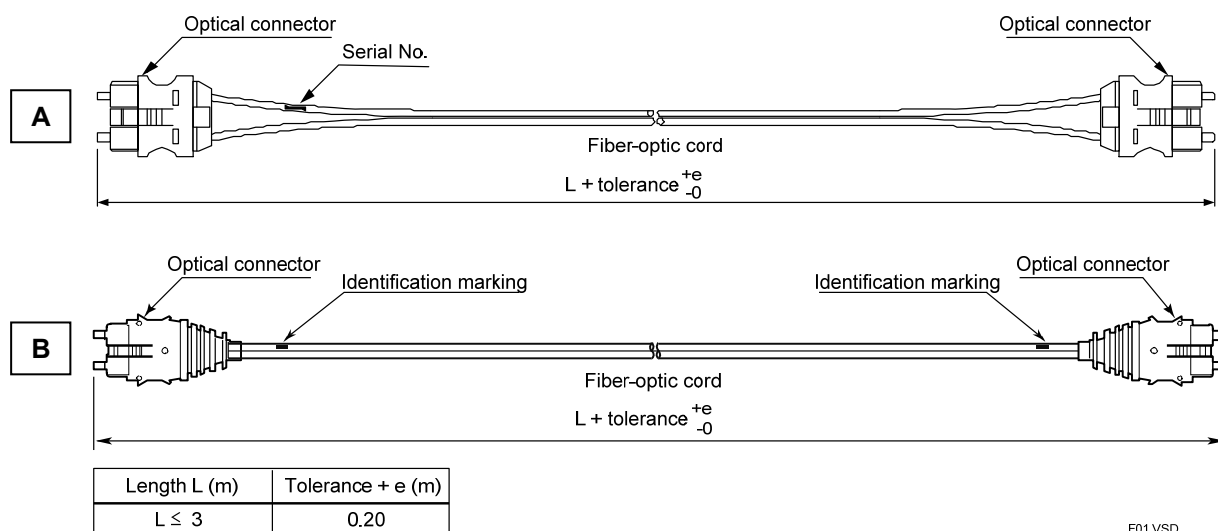
Note: There are two types of Fiber-optic Cord (KM60) with different optical connector. Type A is manufactured by SWCC Showa Cable Systems, and type B is manufactured by Sumitomo Electric Industries.

The Fiber-optic Cord (KM60) manufactured by SWCC Showa Cable Systems was discontinued since February 2020.

Fiber-optic Cable for Connections inside Panel
(with bonding and polishing treatment on optical connector)

Model	Suffix Code	Style Code	Option Code	Description	Max. Transmission Loss (dB)	Compatible Modules
KM60	-S06	—	—	Cable length 0.6m	2.60	F3LR01, F3LR02, F3LP12
	-001	—	—	Cable length 1m	2.60	
	-003	—	—	Cable length 3m	2.60	

● **Operating Environment Specifications**

Item	Specifications
Surrounding air temperature range	Operating : 0 to 55°C
	Storage : -20°C to 70°C
Surrounding humidity range	Operating : 10 to 90% RH (non-condensing)
	Storage : 10 to 90% RH (non-condensing)
Surrounding atmosphere	Must be free of corrosive gases, flammable gases or heavy dust.

Note

Handle the fiber-optic cord very carefully since it may break readily if bent or tied like regular electrical cables. The cable is more likely to break at a point near the optical connector. For details on its installation, see the relevant instruction manual.

(5) Fiber-optic Cables

KM61, KM62, KM65, KM67 and KM69 fiber-optic cables are designed for use on Fiber-optic FA link H modules, Fiber-optic FA-bus modules and Fiber-optic FA-bus type 2 modules. KM61 and KM65 are used for indoor wiring whilst KM62 and KM67 are used for outdoor wiring. KM69 is used for wiring which is required flame-retardant characteristic.

● KM61, KM62, KM67, KM69
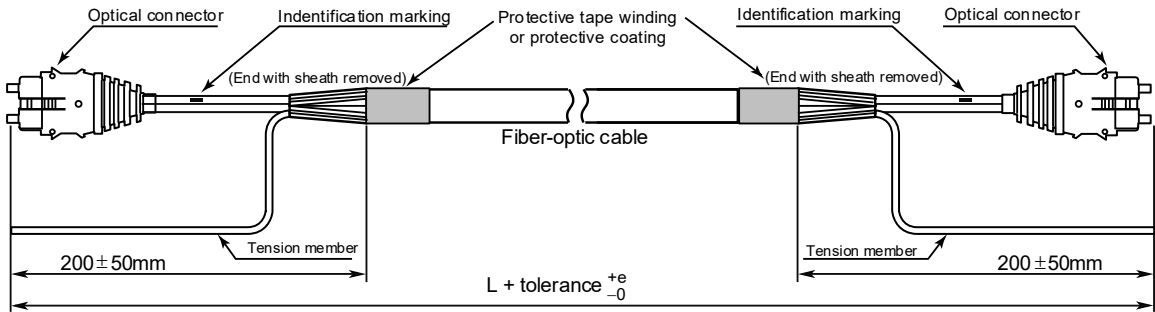
F02.VSD

Cable Length L (m)	Tolerance +e (m)
$10 < L \leq 30$	0.50
$30 < L$	L x 0.03 (3%)

● KM65
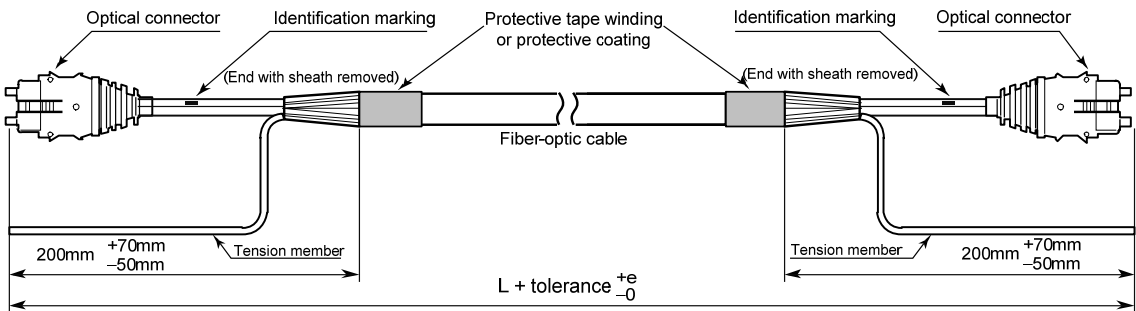
F03.VSD

Cable Length L (m)	Tolerance +e (m)
$L \leq 5$	0.20
$5 < L \leq 15$	0.30
$15 < L \leq 30$	0.50

● Operating Environment Specifications

Item	Specifications
Surrounding air temperature range	Operating : 0 to 55°C
	Storage : -20°C to 70°C
Surrounding humidity range	Operating : 10 to 90% RH (non-condensing)
	Storage : 10 to 90% RH (non-condensing)
Surrounding atmosphere	Must be free of corrosive gases, flammable gases or heavy dust.

Fiber-optic Cable for Indoor Use with Tension Members
(with bonding and polishing treatment on optical connector)

Model	Suffix Code	Style Code	Option Code	Description	Max. Transmission Loss (dB)	Compatible Module
KM61	-010	—	—	Cable length: 10m	1.10	F3LR01, F3LR02, and F3LP12
	-100	—	—	Cable length: 100m, a pulling eye on one end	1.10	
	-150	—	—	Cable length: 150m, a pulling eye on one end	1.54	
	-200	—	—	Cable length: 200m, a pulling eye on one end	1.95	

Note: For information on pulling eyes, see the fiber-optic lead-in cable laying pulling-eye assembly diagram in this manual.
Note: Use the KM62 cable in wet environments (but not submerged environments).

Fiber-optic Cable for Indoor Use with Tension Members
(with crimping and cutting treatment on optical connector)

Model	Suffix Code	Style Code	Option Code	Description	Max. Transmission Loss (dB)	Compatible Module
KM65	-001	—	—	Cable length: 1m	2.00	F3LR01 (Max. 200m) F3LR02 (Max. 200m) F3LP12 (Max. 1000m)
	-002	—	—	Cable length: 2m	2.00	
	-003	—	—	Cable length: 3m	2.00	
	-004	—	—	Cable length: 4m	2.00	
	-005	—	—	Cable length: 5m	2.00	
	-007	—	—	Cable length: 7m	2.00	
	-010	—	—	Cable length: 10m	2.00	
	-012	—	—	Cable length: 12m	2.00	
	-015	—	—	Cable length: 15m	2.00	
	-020	—	—	Cable length: 20m	2.00	
	-025	—	—	Cable length: 25m	2.00	
	-030	—	—	Cable length: 30m	2.00	

Note: Use the KM62 cable in wet environments (but not submerged environments).
Note: KM65 cables are not supplied with pulling eyes. If pulling eye is required, use the KM61 or KM62 cables.

Fiber-optic Cable for Outdoor Use with Tension Members
(with bonding and polishing treatment on optical connector)

Model	Suffix Code	Style Code	Option Code	Description	Max. Transmission Loss (dB)	Compatible Module
KM62	-100	—	—	Cable length: 100m, a pulling eye on one end	1.10	F3LR01 (Max. 200m) F3LR02 (Max. 200m) F3LP12 (Max. 1000m)
	-200	—	—	Cable length: 200m, a pulling eye on one end	1.95	
	-300	—	—	Cable length: 300m, a pulling eye on one end	2.72	
	-400	—	—	Cable length: 400m, a pulling eye on one end	3.43	
	-500	—	—	Cable length: 500m, a pulling eye on one end	4.10	
	-600	—	—	Cable length: 600m, a pulling eye on one end	4.73	
	-700	—	—	Cable length: 700m, a pulling eye on one end	5.33	
	-800	—	—	Cable length: 800m, a pulling eye on one end	5.91	
	-900	—	—	Cable length: 900m, a pulling eye on one end	6.46	
	-L01	—	—	Cable length: 1000m, a pulling eye on one end	7.00	
KM67	-300	—	—	Cable length: 300m, a pulling eye on one end	3.34	F3LR02 (200 to 500m)
	-400	—	—	Cable length: 400m, a pulling eye on one end	4.15	
	-500	—	—	Cable length: 500m, a pulling eye on one end	4.90	
KM69	-010	—	—	Cable length: 10m, flame-retardant cable (equivalent of VW-1)	1.10	F3LR01 F3LR02

When leading the cable in, connect the pulling eye to a pull rope through an anti-twist fitting, such as one shown below attached to the head of the pulling eye.

Pull rope   Pulling eye

Anti-twist fitting (swivel)   Fiber-optic cable

FA020710.VSD
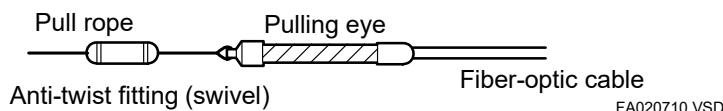
Note

- Use the specified fiber-optic cables to avoid problems, malfunctions or under-performance.

- KM6☐ cables cannot be used in submerged environments. Contact Yokogawa sales office for assistance.

Note

Handle the fiber-optic cable very carefully since it may break readily if bent or tied like regular electrical cables. The cable is more likely to break at a point near the optical connector. For details on its installation, see the relevant instruction manual.

Note

- Before laying cables, customers should check the cables (immediately after delivery) for any defect. In principle, the provided warranty does not cover functional defects (e.g., cable discontinuity) discovered after installation.
- Fiber-optic cables KM61, KM62, KM65, KM67, and KM69 are made-to-order products. Hence, replacement of a defective cable may require a week for KM65 cables, a month for KM61, KM62, and KM67 cables, and two months for KM69 cables.

(6) Monitor Cables (for F3SP08, F3SP2☐, F3SP3☐ and F3SP5☐)

These cables are used to connect to the sequence CPU modules F3SP08, F3SP2☐, F3SP3☐ and F3SP5☐ only. They are connected to the programming port labeled PROGRAMMER of the CPU module to provide for higher-level link (personal computer link) service.

They cannot be used to provide connection for the FA-M3 programming tool WideField3.

● **KM21-2A (D-sub 25-pin)**

External View

To external equipment
D-sub 25-pin male

L^{+e}_{-f}

To CPU module

Maximum number of insertions/removals:
External equipment end: 500 times
CPU module end: 1000 times

Internal Connection

To external equipment			To CPU module	
Signal name	Pin No.		Pin No.	Signal name
FG	1		1	SD
SD	2		2	RD
RD	3			
RS	4			
CS	5		5	SG
			6	SG
SG	7			
CD	8			
SHIELD			SHIELD	

● **KM21-2B (D-sub 9-pin)**

External View

To external equipment
D-sub 9-pin female

L^{+e}_{-f}

To CPU module

Maximum number of insertions/removals:
External equipment end: 500 times
CPU module end: 1000 times

Internal Connection

To external equipment			To CPU module	
Signal name	Pin No.		Pin No.	Signal name
CD	1		1	SD
RD	2		2	RD
SD	3			
SG	5		5	SG
RS	7		6	SG
CS	8			
SHIELD			SHIELD	

Model	Length L1 (m)	Tolerance +L2 (cm)	Tolerance –L3 (cm)	Maximum number of insertions/removals	
				External equipment	CPU module
KM21-2A	3	15	0	500 times	1000 times
KM21-2B	3	15	0		

(7) Monitor Cables (for F3SP66-4S and F3SP67-6S)

These cables are used to connect sequence CPU modules (F3SP66-4S and F3SP67-6S) to a personal computer or a display unit for higher-level link (personal computer link) service.

Connect the cable to the connector labeled SIO on the front of the F3SP66-4S or F3SP67-6S sequence CPU module.

● KM21-2T (D-sub 9-pin)
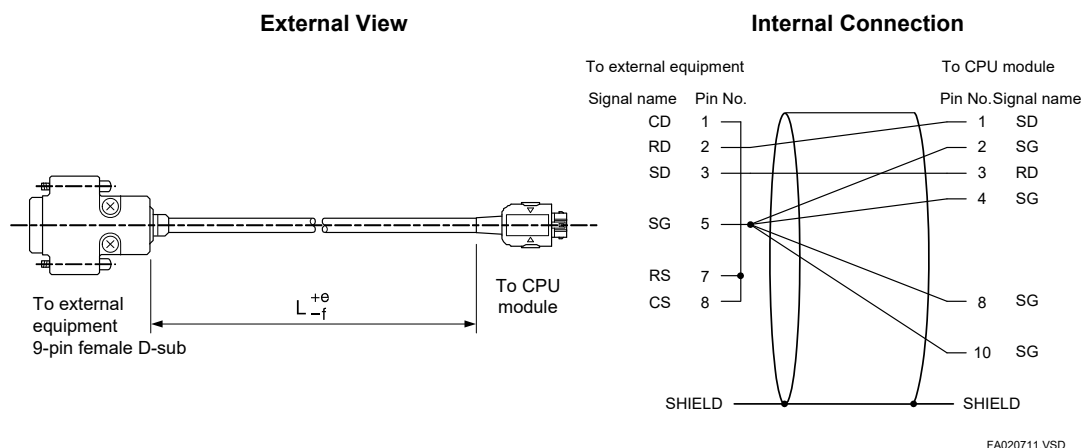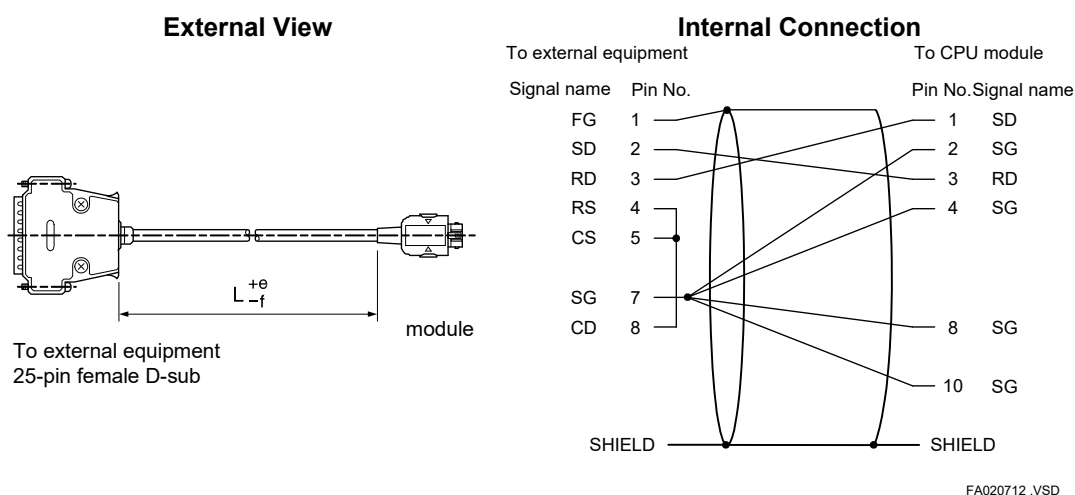
External View   **Internal Connection**

FA020711.VSD

● KM21-2N (D-sub 25-pin)

External View   **Internal Connection**

FA020712 .VSD

Model	Length L (m)	Tolerance +e (cm)	Tolerance –f (cm)	Maximum number of insertions/removals	
				External equipment	CPU module
KM21-2T	3	20	0	500 times	1000 times
KM21-2N	3	20	0		

Note

The KM21-2N and KM21-2T monitor cables are dedicated for higher-level link service (personal computer link functions) only, and cannot be used for connection to the FA-M3 programming tool WideField3.

(8) SIO port/D-sub 9-pin Adaptor Cable (for F3SP66-4S and F3SP67-6S)

● **KM10-0S**

The SIO port/D-sub 9-pin adapter cable adapts the SIO connector to the standard D-sub 9-pin female connector. An additional cable is necessary however to connect such equipment as a display unit.
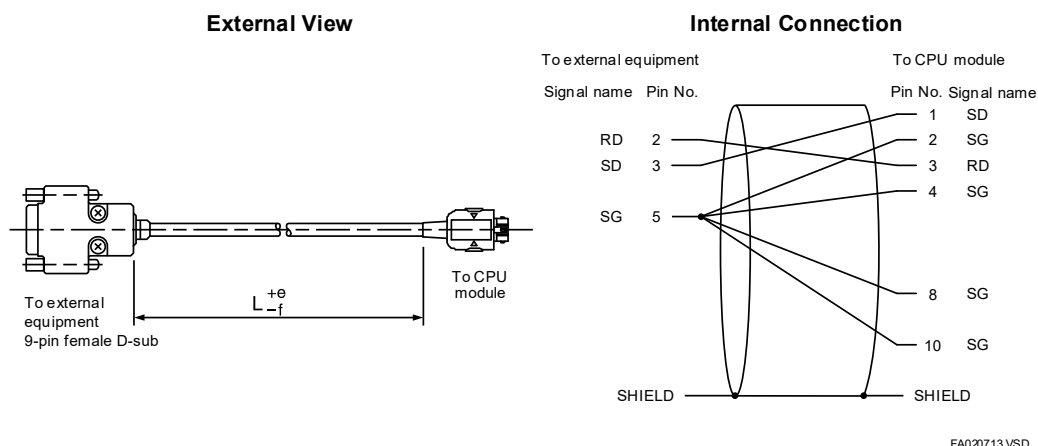
External View   **Internal Connection**

FA020713.VSD

Model	Length L (m)	Tolerance +e (cm)	Tolerance –f (cm)	Maximum number of insertions/removals	
				External equipment	CPU module
KM10-0S	0.5	5	0	500 times	1000 times

Note

The monitor cables and the SIO port of the F3SP66-4S and F3SP67-6S sequence CPU modules are dedicated for higher-level link service (personal computer link function) only, and cannot be used for connection to the FA-M3 programming tool WideField3.

A2.8 Terminal Block Unit and Connector Terminal Block

(1) TA40-0N

The TA40-0N terminal block unit is installed and used on I/O modules of connector specifications.

● Features

- Allows 1:1 conversion of the connector of the I/O module to European type screw terminal.
- Using the European type terminal block eliminates the need for soldering, using crimp-on terminals or terminating I/O cables.
- Does not require a cable for connecting the terminal block unit to the I/O module since it is directly installed to the I/O module.
- Can be secured to the I/O module using screws.
- With a slim connector size, it can be installed even adjacent to 64-point I/O modules.
- Suitable for applications requiring permanent mounting, as well as applications where the system is temporarily wired for testing and debugging.

Cable ties, such as Tiewrap, may be used to provide neat cable routing.
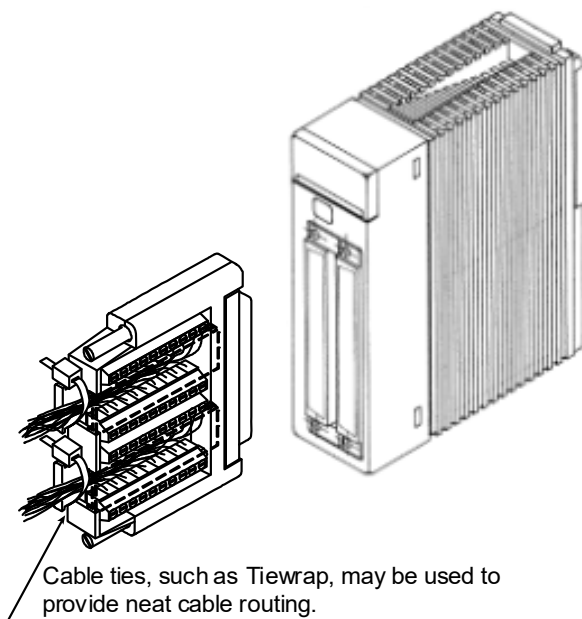
FA020801.VSD

● **Specifications**

Item	Specifications
Number of I/O points	40
Rated voltage	5 to 24V DC
Operating voltage range	4.5 to 26.4V DC
Maximum current	0.5A DC/point
Compatible cable	AWG28 to 23 (0.08 to 0.26mm^2)
Terminal block screw	Slotted M2-size screw
Mounting screw	Slotted M2.6-size screw
Color	Black
Weight	50g

Note: The TA40-0N terminal block unit cannot be used with F3YP04,F3YP08,F3YP14,F3YP18,F3YP22, F3YP24,F3YP28,F3NC32 and F3NC34 modules.

● **Terminal Arrangement**

FA020802.VSD

● **Operating Environment Specifications**

Item	Specifications	
Surrounding air temperature range	Operating : 0 to 55°C	
	Storage : -20°C to 75°C	
Surrounding humidity range	Operating : 10 to 90% RH (non-condensing)	
	Storage : 10 to 90% RH (non-condensing)	
Surrounding atmosphere	Must be free of corrosive gases, flammable gases or heavy dust.	

● **Internal Connection**

FA020803.VSD

- The terminal arrangement of the screw terminal is the same as that of the connector on a module.

● **External Dimensions**

Unit: mm

11.8   4   61.4   75.4

FA020804.VSD
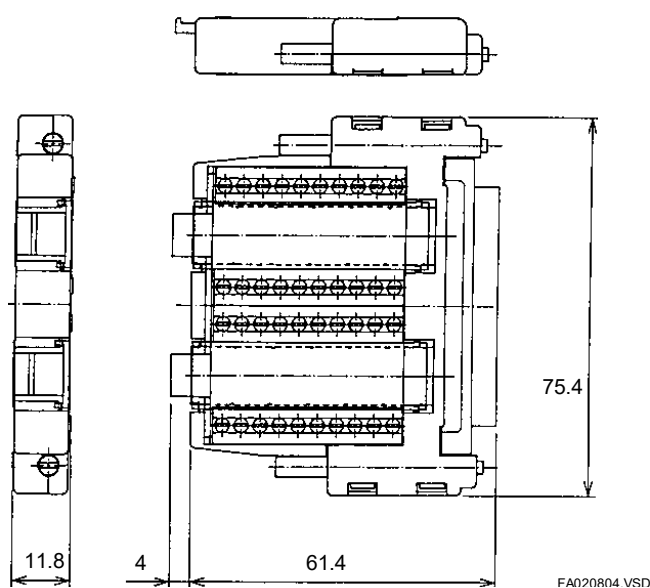
⚠ **CAUTION**

The correct tightening torque of the terminal block screws is 0.22 N·m (1.9 lbf·in). Use a screwdriver of the correct size; otherwise the screw head may be damaged.

(2)　TA50-0N/TA50-1N/TA50-2N

TA50-0N, TA50-1N and TA50-2N connector terminal blocks are designed for use with I/O modules of connector specifications.

● Features

- Allows 1:1 expansion of the connector of the I/O module to screw terminal.
- Connects to an I/O module using a dedicated connector terminal block KM55-0□□ cable, thus saving wiring.
- Can be mounted using either a DIN rail or screws.
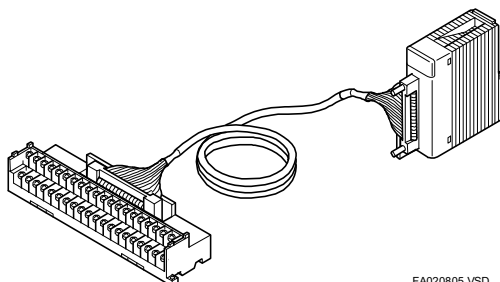
FA020805.VSD

● Specifications

Item	Specifications		
	TA50-0N	TA50-1N	TA50-2N
Number of I/O points	40		
Rated voltage	5 to 24V DC		
Operating voltage range	4.5 to 26.4V DC		
Maximum current	0.5A DC/point		
Compatible cable	2mm^2 maximum	1.25mm^2 maximum	
Terminal block screw	M3.5	M3	
Compatible terminal	Crimp-on terminal with a diameter of up 8mm	Crimp-on terminal with a diameter of up 5.8mm	
Connector	HIF3BA-40PA-2.54DSA（71）(compliant to MIL standard)		
Mounting	35mm wide DIN rail or screws		
Mounting screw (When screw-mounted)	M4-size screws (2 places)		
Color	Black	Gray	
Weight	300g	175g	162g

This connector terminal block cannot be used on F3YP04, F3YP08, F3YP14, F3YP18, F3NC32 and F3NC34. You need to separately procure the KM55-0□□ cable for connecting the module and the connector terminal block as it is not supplied with the connector terminal block.

● Terminal Arrangement (TA50-0N)
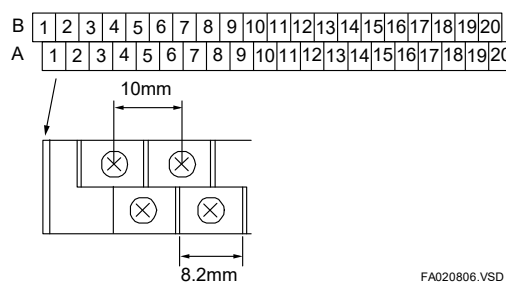
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● Terminal Arrangement (TA50-1N/TA50-2N)
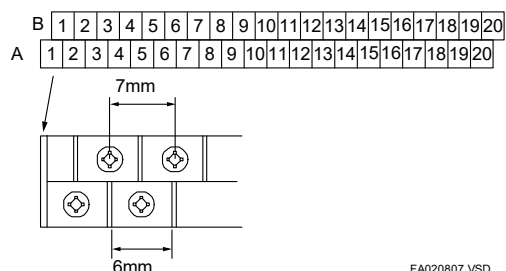
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● Internal Connection
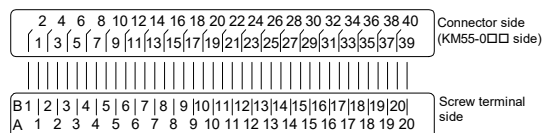
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Note: The terminal arrangement of the terminal block is the same as that of the connector on a module.

●Operating Environment Specifications

Item	Specifications
Surrounding air temperature range	Operating : 0 to 55°C
	Storage : -20°C to 75°C
Surrounding humidity range	Operating : 10 to 90% RH (non-condensing)
	Storage : 10 to 90% RH (non-condensing)
Surrounding atmosphere	Must be free of corrosive gases, flammable gases or heavy dust.

● External Dimensions

TA50-0N

Mounting Dimension

FA020809.VSD

TA50-1N

Unit: mm
2-Ø4.5 × 5.6
oval holes

Unit: mm

141.6

150

16.5

45

4

14

45

Note: With a terminal cover

Mounting dimension

M4

141.6±1

FA020810.VSD

TA50-2N

Unit:mm

142

150

9.8

4.4

40

2

14.5

42.3

Mounting Dimension

M 4

$142^{+0.2}_{0}$
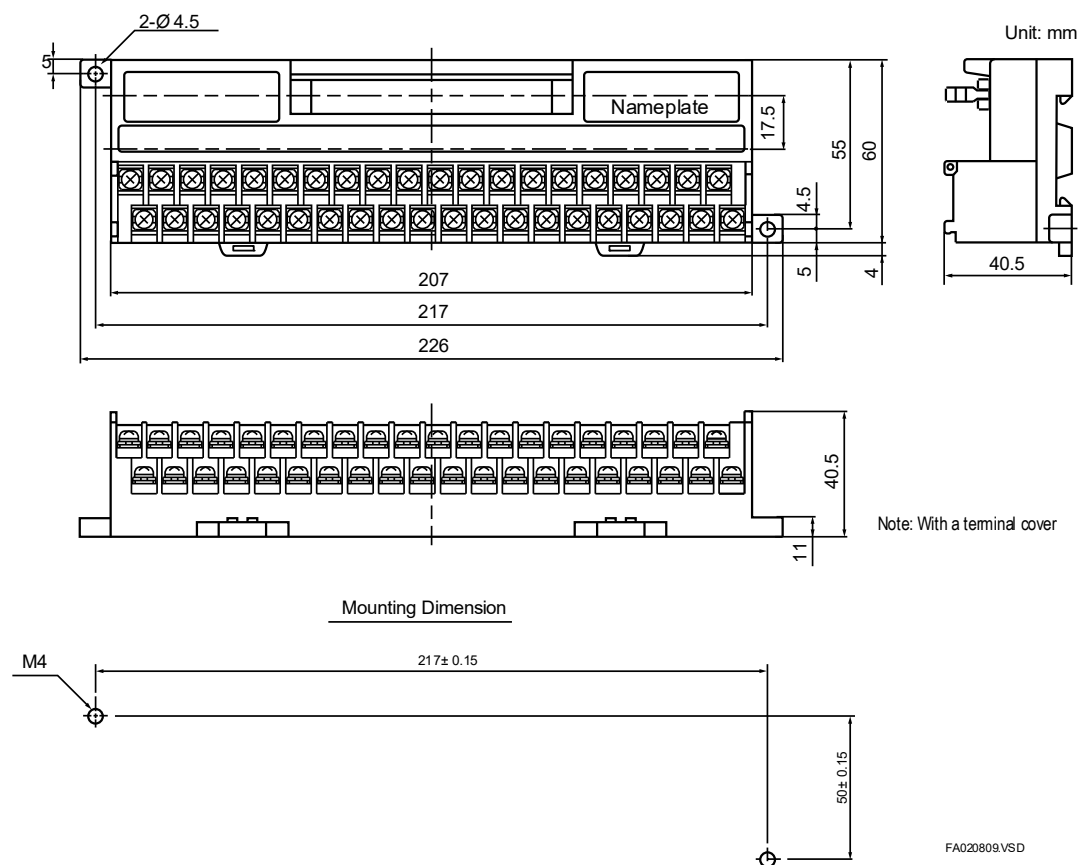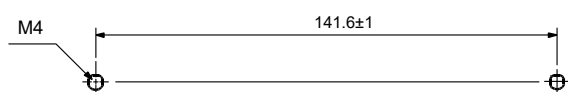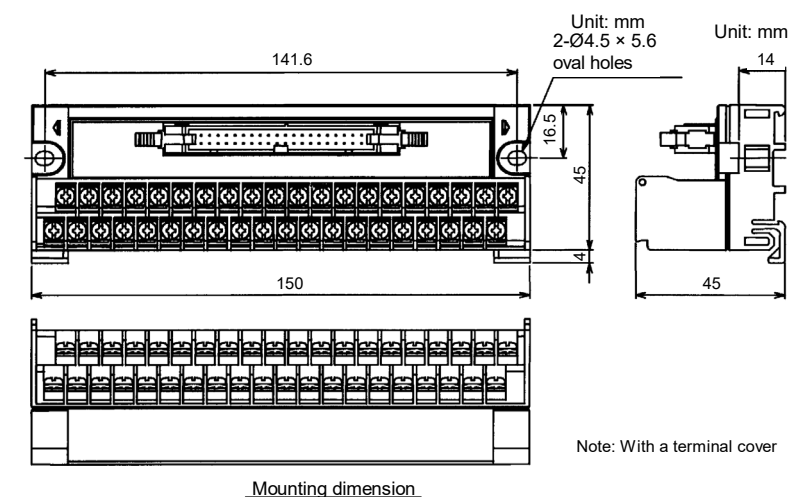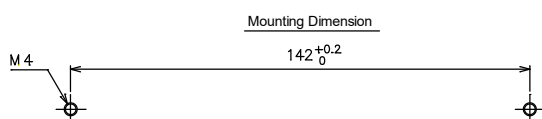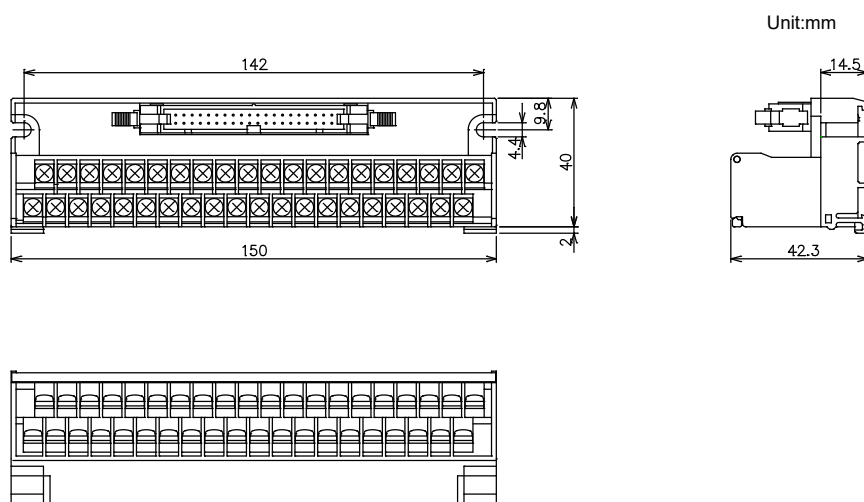
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⚠ **CAUTION**

The correct tightening torque of the terminal block screws is 0.8 N·m (7.1 lbf·in). Use a screwdriver of the correct size; otherwise the screw head may be damaged.

(3)   TA60-0N

The TA60-0N connector terminal block is designed for use with I/O modules of connector specifications.

● **Features**

- Allows 1:1 expansion of the connector of the I/O module to European type screw terminal.
- Using the European type terminal block eliminates the need for installing soldered and crimp-on terminals and end processing of I/O cables.
- Compact design saves space.
- Connects to an I/O module using a dedicated connector terminal block KM55-0□□ cable, thus saving wire.
- Can be mounted using either a DIN rail or screws.
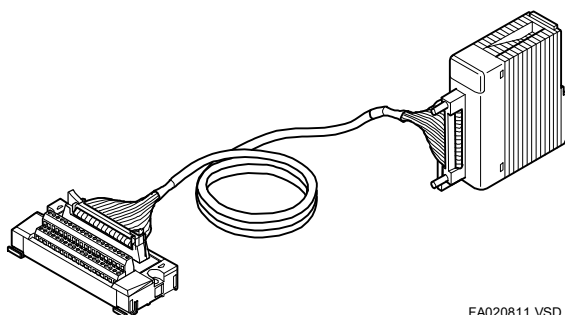
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● **Specifications**

Item	Specifications
Number of I/O points	40
Rated voltage	5 to 24V DC
Operating voltage range	4.5 to 26.4V DC
Maximum current	0.5A DC/point
Compatible cable	AWG28 to 23 (0.08 to 0.26mm^2)
Connector	M2 (European Terminal type)
Connector	HIF3BA-40PA- 2.54DSA (Conforming to MIL standard)
Mounting	35m wide DIN rail or screws
Mounting screw (When screw-mounted)	M4 screws (2 places)
Color	Gray
Weight	80g

- This connector terminal block cannot be used on F3YP04,F3YP08,F3YP14,F3YP18,F3YP22,F3YP24,F3YP28, F3NC32 and F3NC34.
- You need to separately procure the KM55-0□□ cable for connecting the module and the connector terminal block as it is not supplied with the connector terminal block.

● **Operating Environment Specifications**

Item	Specifications
Surrounding air temperature range	Operating : 0 to 55°C
	Storage : -20°C to 75°C
Surrounding humidity range	Operating : 10 to 90% RH (non-condensing)
	Storage : 10 to 90% RH (non-condensing)
Surrounding atmosphere	Must be free of corrosive gases, flammable gases or heavy dust.

●Internal Connection

```
  2  4  6  8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40      Connector side
┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐ ┌┐      (KM55-0□□ side)
  1  3  5  7  9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39

 │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │

B 1│2│3│4│5│6│7│8│9│10│11│12│13│14│15│16│17│18│19│20│
A 1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20      Screw terminal side
```

FA020812.VSD

Note: The terminal arrangement of the screw terminal is the same as that of the connector on a module.

●External Dimensions

Unit: mm

Mounting dimension
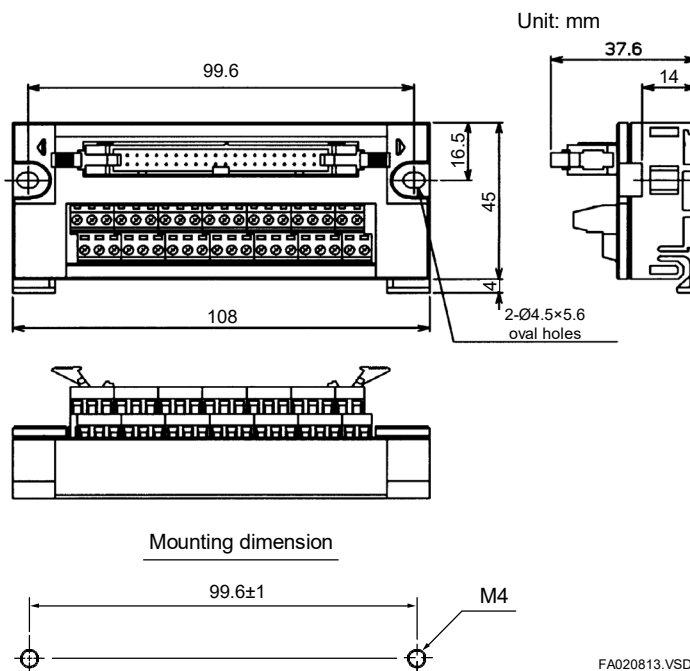
FA020813.VSD

⚠ **CAUTION**

The correct tightening torque of the terminal block screws is 0.22 N·m (1.9 lbf·in). Use a screwdriver of the correct size; otherwise the screw head may be damaged.

A2.9 Module Current Consumption Tables

Design your system making sure that the total sum of current consumed by modules with a 5V supply does not exceed the capacity of the internal 5V source of the power supply module. If necessary, separately procure an external power supply, which meets the specifications.

■ Base Modules

| Module Description	Model	Max. Current at 5V Supply (mA)	Power Supply from External Sources	
			Voltage (VDC)	Current (mA)
Base module	F3BU04-0N	50	—	—
	F3BU06-0N	50	—	—
	F3BU05-0D	50	—	—
	F3BU09-0N	50	—	—
	F3BU13-0N	50	—	—
	F3BU16-0N	50	—	—

■ Power Supply Modules

Module Description	Model	Capacity of Internal 5V Source (mA)	Supply Current to External Devices (mA)
Power supply module	F3PU10-0N F3PU10-0S	2000	None
	F3PU16-0N F3PU16-0S	2000	None
	F3PU20-0N F3PU20-0S	4300	None
	F3PU26-0N F3PU26-0S	4300	None
	F3PU30-0N F3PU30-0S	6000	None
	F3PU36-0N F3PU36-0S	6000	None

■ CPU Modules

Module Description	Model	Max. Current at 5V Supply (mA)	Power Supply from External Sources	
			Voltage (VDC)	Current (mA)
Sequence CPU module	F3SP21-0N	350	—	—
	F3SP22-0S	450	—	—
	F3SP25-2N	420	—	—
	F3SP35-5N	560	—	—
	F3SP28-3N	450	—	—
	F3SP38-6N	450	—	—
	F3SP53-4H	890	—	—
	F3SP58-6H	890	—	—
	F3SP28-3S	450	—	—
	F3SP38-6S	450	—	—
	F3SP53-4S	890	—	—
	F3SP58-6S	890	—	—
	F3SP59-7S	890	—	—
	F3SP66-4S	850	—	—
	F3SP67-6S	850	—	—
	F3SP71-4N	460	—	—
	F3SP76-7N	460	—	—
	F3SP71-4S	460	—	—

Module Description	Model	Max. Current at 5V Supply (mA)	Power Supply from External Sources	
			Voltage (VDC)	Current (mA)
Sequence CPU module	F3SP76-7S	460	—	—
	F3FP36-3N	560	—	—
BASIC CPU module	F3BP20-0N	200	—	—
	F3BP30-0N	200	—	—
OS-free CPU module	F3RP70-2L	1200	—	—
IEC61131-3 CPU module	F3NP55-5N	1200	—	—

■ I/O Modules

Module Description	Model	Max. Current at 5V Supply (mA)	Power Supply from External Sources	
			Voltage (VDC)	Current (mA)
High-speed input module	F3XH04-3N	30	—	—
AC input module	F3XA08-1N	40	—	—
	F3XA08-2N	40	—	—
	F3XA16-1N	65	—	—
DC input module	F3XD08-6F	40	—	—
	F3XD16-3F	65	—	—
	F3XD16-4F	65	—	—
	F3XD16-3H	65	—	—
	F3XD32-3F	75	—	—
	F3XD32-4F	75	—	—
	F3XD32-5F	75	—	—
	F3XD64-3F	100	—	—
	F3XD64-4F	100	—	—
	F3XD08-6N	40	—	—
	F3XD16-3N	65	—	—
	F3XD16-4N	65	—	—
	F3XD32-3N	75	—	—
	F3XD32-4N	75	—	—
	F3XD32-5N	75	—	—
	F3XD64-3N	100	—	—
	F3XD64-4N	100	—	—
	F3XD64-6M	110	12 to 24	70
Pulse input module	F3XS04-3N	230	—	—
	F3XS04-4N	230	—	—
No-voltage contact input module	F3XC08-0N	75	—	—
	F3XC08-0C	75	—	—
Triac output module	F3YA08-2N	130	—	—
Relay output module	F3YC08-0C	205	—	—
	F3YC08-0N	205	—	—
	F3YC16-0N	380	—	—
Transistor output module	F3YD04-7N	85	—	—
	F3YD08-6A	60	12 to 24	10
	F3YD08-6B	60	12 to 24	10
	F3YD08-7A	80	12 to 24	10
	F3YD14-5A	120	12 to 24	20
	F3YD14-5B	120	12 to 24	20
	F3YD32-1A	210	12 to 24	115
	F3YD32-1B	210	12 to 24	115
	F3YD32-1H	165	12 to 24	30
	F3YD32-1P	160	12 to 24	55
	F3YD32-1R	170	12 to 24	60
	F3YD32-1T	210	5	60
	F3YD64-1F	275	24	150
	F3YD64-1A	275	24	150
	F3YD64-1M	125	12 to 24	40
	F3YD64-1P	275	12 to 24	95
	F3YD64-1R	275	12 to 24	110
	F3WD64-4P	170	12	55

Module Description	Model	Max. Current at 5V Supply (mA)	Power Supply from External Sources	
			Voltage (VDC)	Current (mA)
I/O module	F3WD64-3F	200	24	60
	F3WD64-4F	200	12	60
	F3WD64-3N	200	24	60
	F3WD64-4N	200	12	60
	F3WD64-3P	170	24	55
	F3WD64-4P	170	12	55
I/O module (for e-RT3)	F3WD64-3E	170	24	55
Analog input module	F3AD04-0N	210	—	—
	F3AD04-0R	210	—	—
	F3AD04-5R	210	—	—
	F3AD04-0V	210	—	—
	F3AD04-5V	210	—	—
	F3AD08-1N	210	—	—
	F3AD08-1R	210	—	—
	F3AD08-4R	210	—	—
	F3AD08-5R	210	—	—
	F3AD08-6R	210	—	—
	F3AD08-1V	210	—	—
	F3AD08-4V	210	—	—
	F3AD08-4W	210	—	—
	F3AD08-5V	210	—	—
Analog output module	F3DA02-0N	100	24	150
	F3DA04-1N	100	24	180
	F3DA08-5N	100	24	100
	F3DA04-6R	60	24	200
	F3DA08-5R	60	24	200
Temperature control/monitoring module	F3CT04-0N	250	24	200
	F3CT04-1N	250	24	200
	F3CR04-0N	250	24	200
	F3CR04-1N	250	24	200
PID control module	F3CV04-1N	250	24	200
Temperature control and PID module	F3CU04-0N	460	24	10
	F3CU04-0S	460	24	10
	F3CU04-0H	200	24	20
	F3CU04-1N	470	24	250
	F3CU04-1S	470	24	250
	F3CU04-1H	200	24	250
Temperature monitoring module	F3CX04-0N	440	—	—
	F3CX04-0H	200	—	—
High-speed data acquisition module	F3HA08-0N	450	—	—
	F3HA06-1R	420	—	—
	F3HA12-1R	570	—	—
ASi Master module	F3LA01-0N	330	30	2,000 / 200*
PROFIBUS-DP Interface module	F3LB01-0N	610	—	—
Ethernet interface module	F3LE01-0T	500	—	—
	F3LE01-5T	330	12	500
	F3LE11-0T	500	—	—
	F3LE12-0T	500	—	—
	F3LE01-1T	330	—	—
	F3LE11-1T	330	—	—
	F3LE12-1T	330	—	—
NX interface module	F3NX01-0N	330	12	500
	F3NX01-1N	500	—	—
	F3NX01-2N	330	—	—
EtherNet/IP interface module	F3LN01-0N	330	—	—
FL-net (OPCN-2) interface module	F3LX02-1N	460	12	500
	F3LX02-2N	330	—	—
DeviceNet interface module	F3LD01-0N	200	11 to 25	40
	F3LD02-1N	200	11 to 25	40
CAN2.0B interface module	F3LD21-0N	200	11 to 25	40
Modbus interface module	F3LC31-2F	290	—	—
GP-IB communication module	F3GB01-0N	250	—	—

*: The maximum current which can be supplied to communication line through F3LA01-0N is 2000mA. (Include current consumption of F3LA01-0N, 200mA.)

Module Description	Model	Max. Current at 5V Supply (mA)	Power Supply from External Sources	
			Voltage (VDC)	Current (mA)
Personal computer link module	F3LC11-1F	320	—	—
	F3LC11-1N	100	—	—
	F3LC11-2F	350	—	—
	F3LC11-2N	170	—	—
	F3LC12-1F	350	—	—
Ladder communication module	F3RZ81-0F	320	—	—
	F3RZ81-0N	100	—	—
	F3RZ82-0F	350	—	—
	F3RZ91-0F	350	—	—
	F3RZ91-0N	210	—	—
RS-232-C communication module	F3RS22-0N	350	—	—
RS-422-A communication module	F3RS41-0N	350	—	—
UT link module	F3LC51-2N	290	—	—
Fiber-optic FA link H module	F3LP12-0N	495	—	—
FA link H2 module	F3LP32-0N	220	—	—
YHLS master module	F3LH02-0N	440	—	—
	F3LH01-1N	360	—	—
	F3LH02-1N	480	—	—
Fiber-optic FA-bus module	F3LR01-0N	220	—	—
Fiber-optic FA-bus type 2 module	F3LR02-0N	460	—	—
FA-bus type 2 module	F3LR02-1W	320	—	—
High-speed counter module	F3XP01-0H	100	—	—
	F3XP02-0H	150	—	—
Positioning module (advanced model with pulse output)	F3NC11-0N	180	5	200
	F3NC12-0N	180	5	200
Positioning module (with pulse output)	F3NC32-0N	450	24	80
	F3NC34-0N	540	24	120
Positioning module (with analog voltage output)	F3NC51-0N	390	24	10
	F3NC52-0N	400	24	10
Positioning module (for torque control)	F3NC61-0N	580	24	10
Positioning module (with MECHATROLINK-II Interface)	F3NC96-0N	570	—	—
Positioning module (with MECHATROLINK-III Interface)	F3NC97-0N	530	—	—
Positioning module (with multi-channel pulse output)	F3YP04-0N	300	5	350
	F3YP08-0N	350	5	700
	F3YP14-0N	320	5	350
	F3YP18-0N	380	5	700
	F3YP22-0P	210	24	70*
	F3YP24-0P	240	24	110*
	F3YP28-0P	280	24	200*

*: Sum of current for the pulse output and the counter contact output.

■ Memory Card Module

Module Description	Model	Max. Current at 5V Supply (mA)	Power Supply from External Sources	
			Voltage (VDC)	Current (mA)
Memory card module	F3EM01-0N	300	—	—

A2.10 External Power Supply

Use an external power supply that meets the following requirements.

Item	Specifications	
Output Voltage	24V DC 12V DC	5V DC
Ripple	240mV p-p max.	100mV p-p max.
Noise	360mV p-p max.	150mV p-p max.
Overcurrent protection	Should be included	
Insulation	Separated by reinforced insulation or double insulation from hazardous voltage.	

If the product is used as a UL-approved product, the external power supply must be provided from a limited voltage/current circuit[1] or class 2 power supply[2].

If the product is used as a CE-complied product, the external power supply must be provided from a SELV and limited-energy circuit*3 separated by reinforced insulation or double insulation from hazardous voltage.

*1   A limited voltage/current circuit is a UL 508-approved isolated power supply which is limited to 30V AC or 42.4V peak in output voltage and to 8A in output current.
*2   A class 2 power supply is a UL 1310-approved power supply which is tested and proved by UL that its output voltage is 30V DC max. and its output current is 8A max.
*3   A SELV and limited-energy circuit is defined in the EN IEC 61010-2-201. It is limited to 30V ACr.m.s., 42.4V peak, or 60V DC in output voltage and limited to 6.25A (24V DC), 8.3A (12V DC), 20A (5V DC) in output current, in normal and single-fault condition.

A2.11 External Dimensions

● **External View of the FA-M3 Controller** (when F3BU06-0N Base Module is used)

Unit : mm

88.8*

* : To obtain the depth including the base module, add 5.6 mm to the depth of the installed module. When mounting on the DIN rail, add another 6.5 mm.

102
100
205

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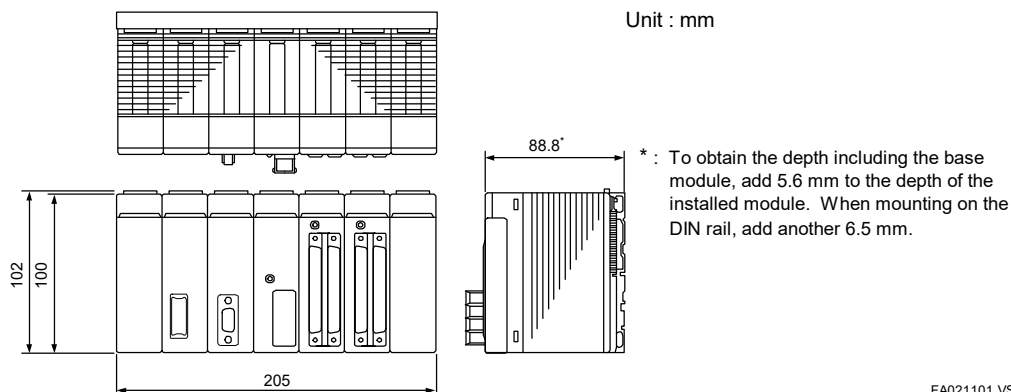
● **Base Modules**

The external dimensions of a base module vary depending on the number of slots the module provides, as shown below.

Unit: mm

Model	Number of Slots	Number of I/0 Slots	Full Width (W1)	Mounting Width (W2)	Mounting Width (W3)	Mounting Width (W4)
F3BU04-0N	4	3	147	138	—	—
F3BU06-0N	6	5	205	196	—	—
F3BU05-0D	5	4	205	196	—	—
F3BU09-0N	9	8	322	313	138	—
F3BU13-0N	13	12	439	430	196	—
F3BU16-0N	16	15	527	517	138	313

F3BU16-0N
F3BU13-0N
F3BU09-0N
F3BU06-0N, F3BU05-0D
F3BU04-0N

Ø5 mounting hole
(for M4-size mounting screws)

9.6

85 | 100

10.5

4.5
Mounting width W3

7.5

Mounting width W4

(when modules are installed)

Mounting width W2

Full width W1

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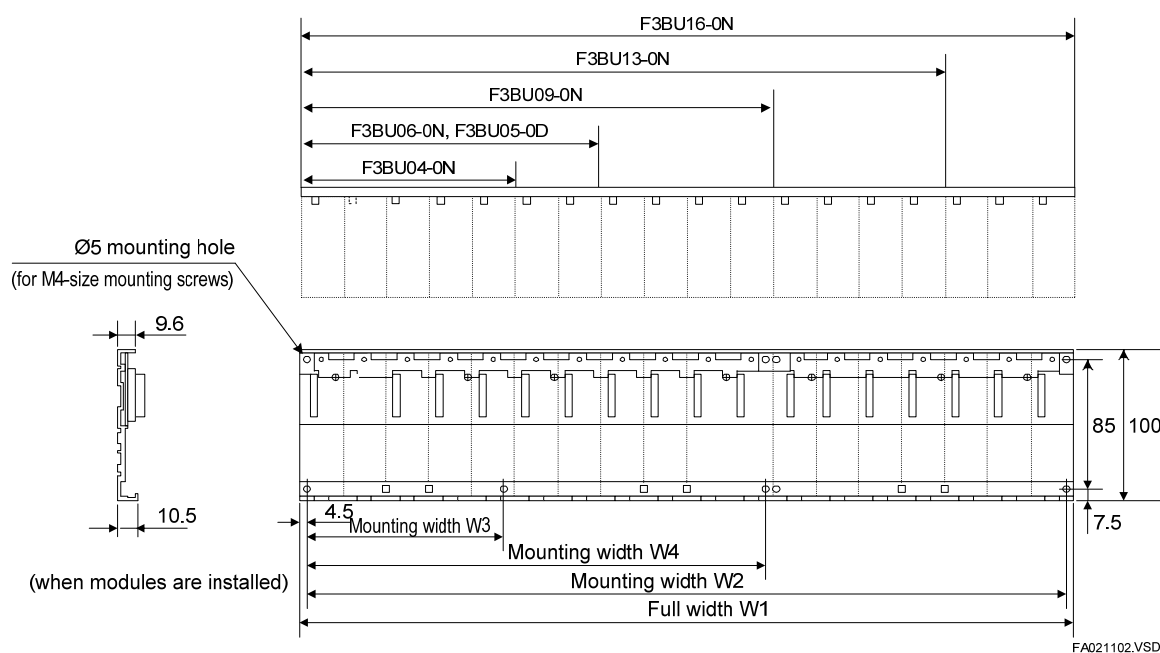
● **Power Supply Modules**

Unit: mm

F3PU01, F3PU10, F3PU16

F3PU20, F3PU26

83.2   28.9   2   100

83.2   58   2   100
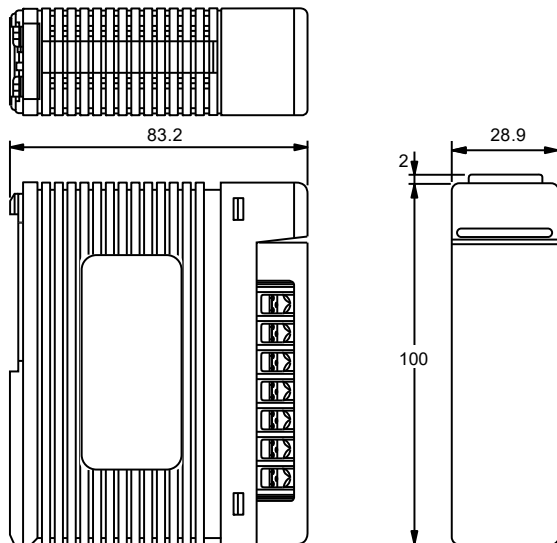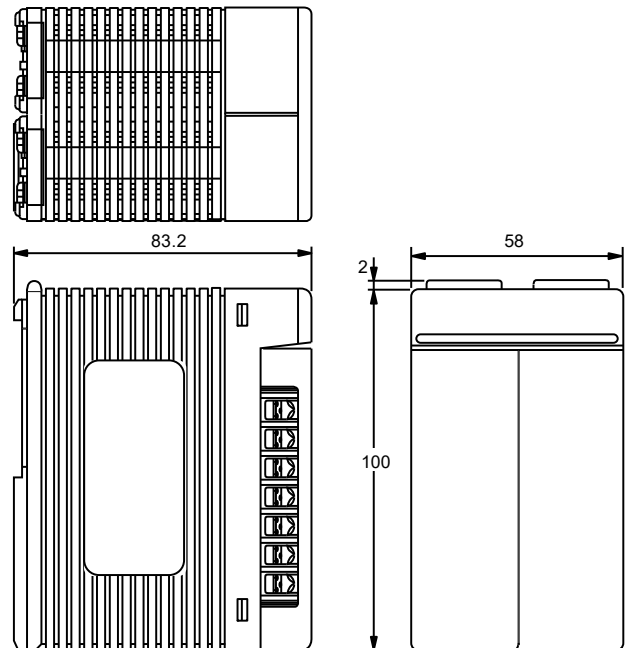
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F3PU30, F3PU36

83.2   30   (12.9)   2   58   100
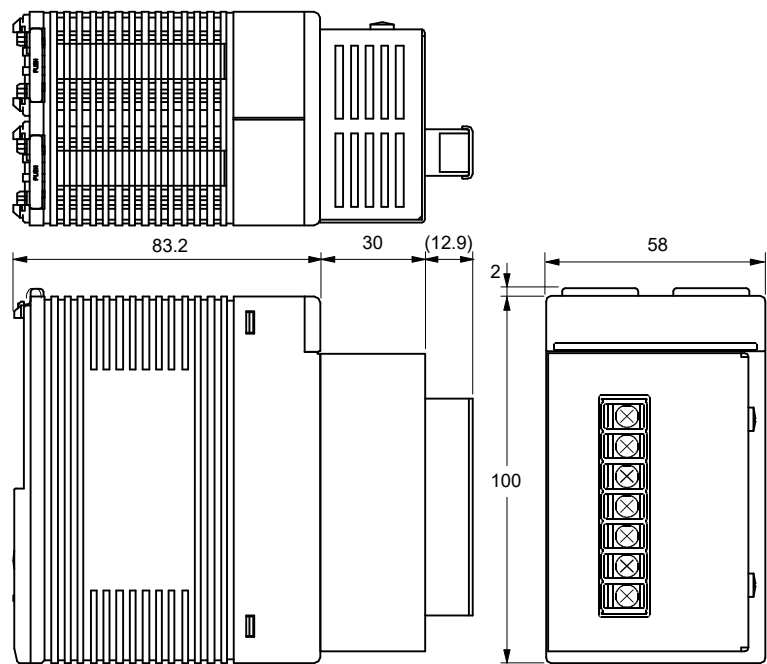
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● I/O Modules

Unit: mm

F3XH04, F3XA08, F3XC08-0N, F3XD08

F3XD08-0C, F3XD16

83.2

28.9

2

100

83.2　　9

28.9

2

100

F3XA16

83.2　　22.9

28.9

2

100
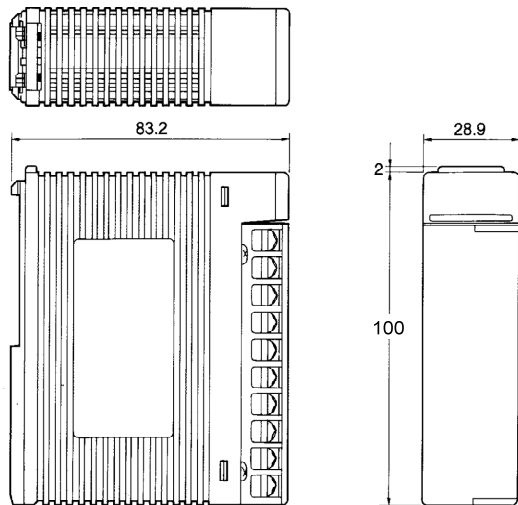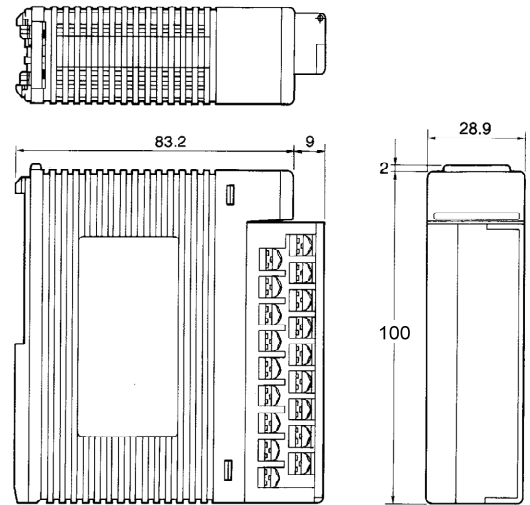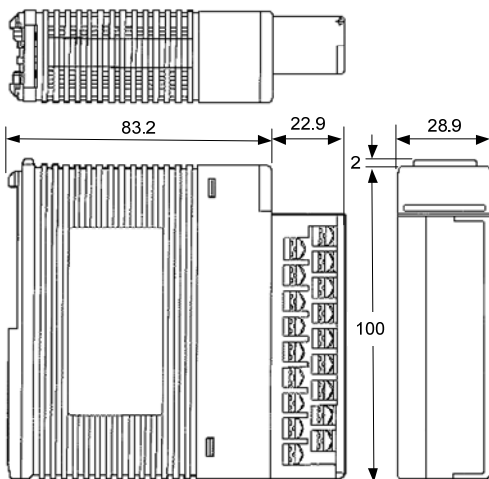
FA021104.VSD

Unit: mm

F3XD32
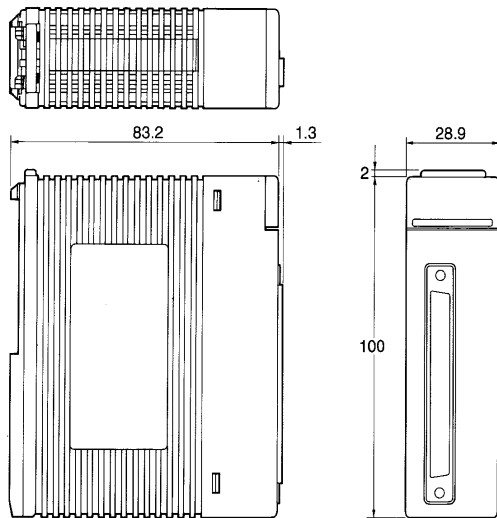
F3XD64-3N, F3XD64-4N, F3XD64-3F, F3XD64-4F

83.2   1.3   28.9   2   100

83.2   1.9   28.9   2   100

F3XD64-6M

83.2   1.9   28.9   2   100
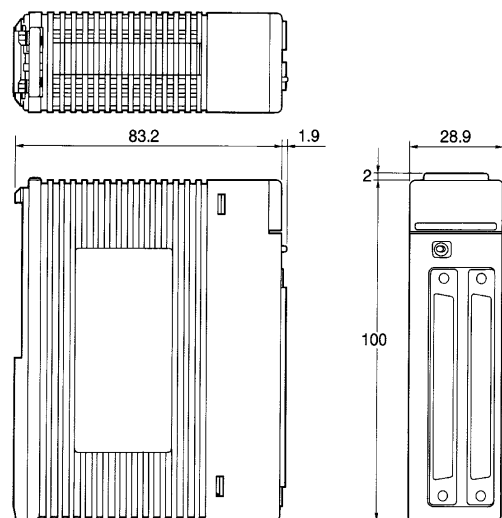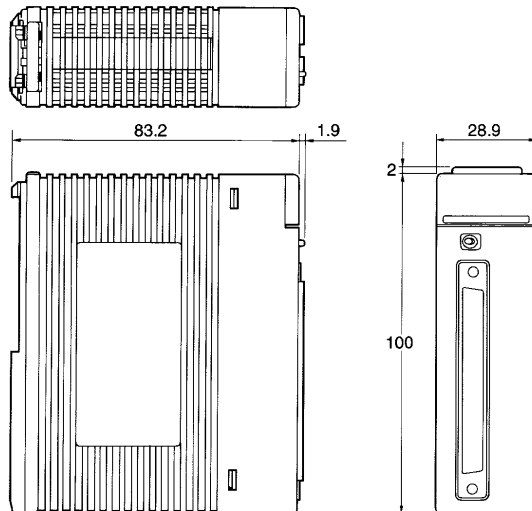
F3YA08, F3YD04
F3YC08-0N, F3YD08

83.2   28.9   2   100

F3YD14, F3YC08-0C, F3YC16

83.2   9   28.9   2   100
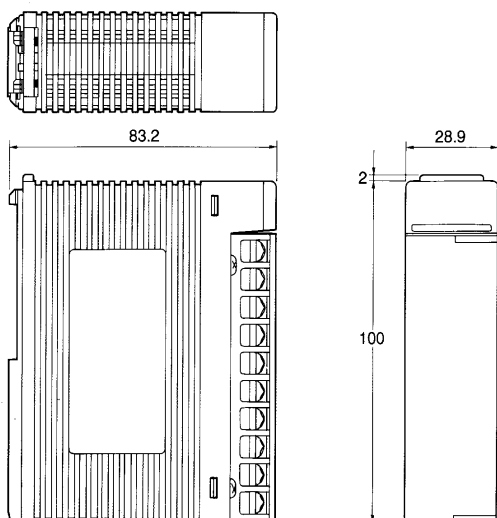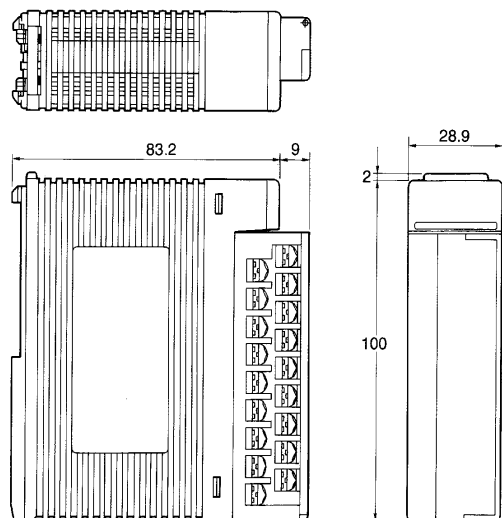
FA021105.VSD

Unit: mm

F3YD32
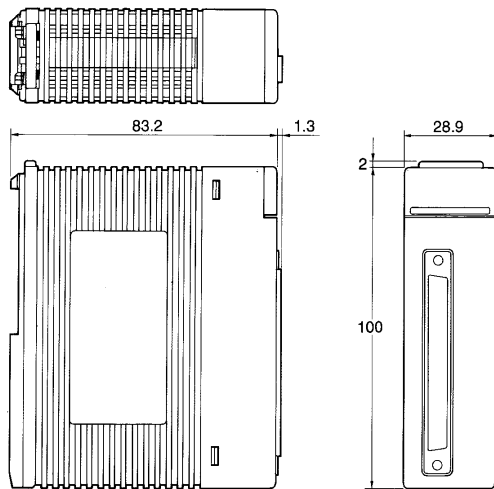
F3YD64-1A, F3YD64-1F, F3YD64-1P, F3YD64−1R, F3WD64

83.2 1.3   28.9   2   100

83.2 1.9   28.9   2   100

F3YD64-1M

83.2 1.9   28.9   2   100
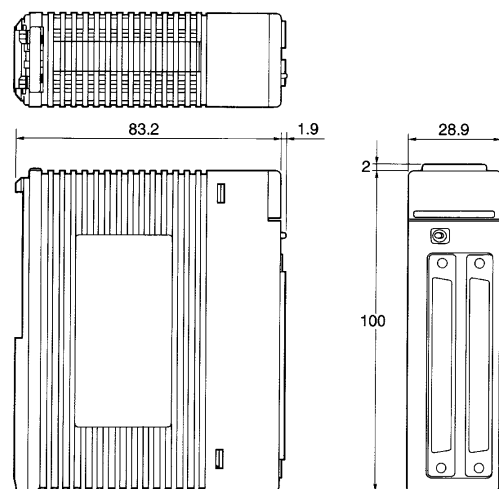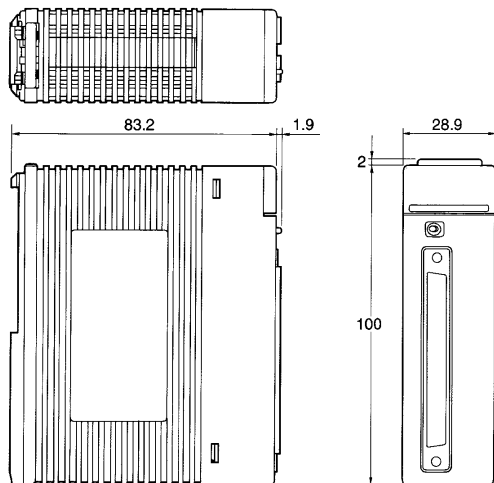
FA021106.VSD

A3.   Installation and Wiring

A3.1   Environmental Conditions for Installation within a Panel Enclosure

Refer to the following considerations when designing the interior of the panel enclosure to ensure operability, maintainability, and environmental durability.

Figure A3.1 shows a typical example of a layout within a panel enclosure.

■ Temperature Considerations

- Provide good ventilation to prevent heat from being trapped inside the panel enclosure. If two or more FA-M3 controller units are installed vertically within the same panel enclosure, provide a clearance of at least 8cm between them.

- Ensure that the upper and lower vents near the FA-M3 controller are not blocked either by wiring or otherwise.

- Avoid mounting the controller directly above any equipment that generate large amounts of heat.

- If there will be times where the temperature inside the panel enclosure reaches 55°C (131°F) or higher, use a fan or an air conditioner for cooling. Consider providing a safety mechanism such as a temperature sensor inside the panel enclosure to raise an alarm upon failure of the fan or air conditioner as such failures may adversely affect the system. Conversely, if temperature is likely to fall below 0°C (32°F) during morning startup, include a small heater, lamp, or other heat source to preheat the panel enclosure.
Figure A3.2 shows examples of cooling systems.

■ Humidity Considerations

Condensation may occur due to sudden temperature changes resulting from the turning on and off of an air conditioner. If condensation occurs on any of the circuit boards, the instrument may malfunction due to shorted internal circuitry. If there is a risk of condensation, either keep the power turned on at all times, or use a space heater or other alternative means to keep the controller constantly preheated.

■ Vibration and Shock Considerations

- As a countermeasure to keep shock or vibration below the specified limit, place the panel enclosure as far away as possible from any source of vibration or shock, or place the panel enclosure on vibration-proof rubber.

- As a countermeasure to keep mechanical shock from electromagnetic switches mounted inside the panel enclosure below the specified limits, install such devices on vibration-proof rubber.

Note

Be wary of any vibration and shock to the hard disk module.

Any mechanical vibration or shock occurring during transportation of equipment or facilities into which the FA-M3 has been assembled must also be within the specifications limits. The specification range for vibration and shock is especially stringent for the hard disk module, as compared to other modules. When transporting, use the same packaging in which the product was originally shipped.

■ Atmospheric Considerations

In a dusty location, either hermetically seal the panel enclosure, or purge the panel enclosure with clean air ensuring the interior of the panel enclosure is pressurized slightly higher than its surroundings to prevent the intrusion of outside dust.
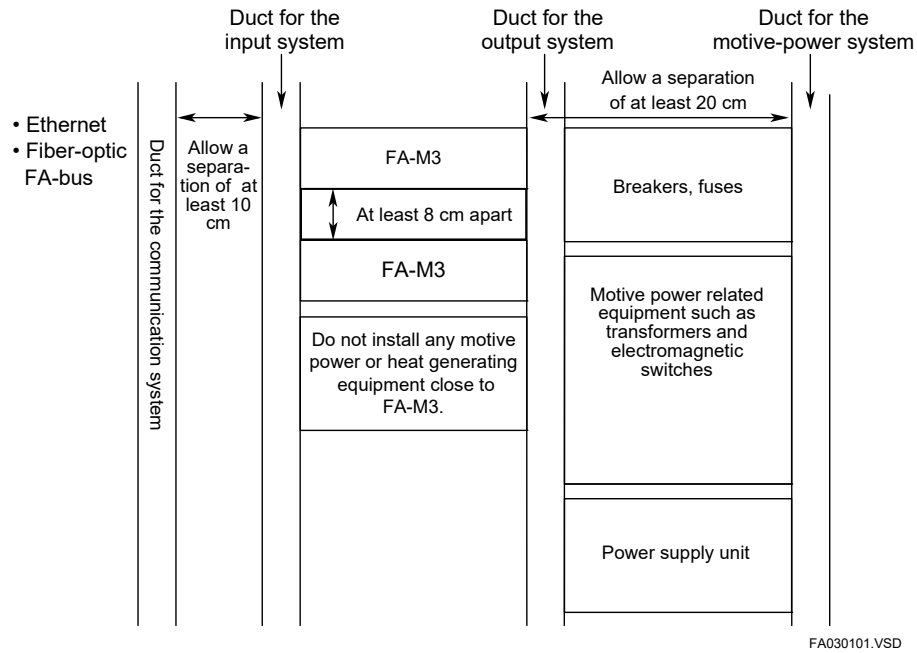
Figure A3.1   Example of a Panel Enclosure Layout

(1) Natural air cooling   (2) Forced ventilation   (3) Forced circulation

(4) Air-cooling the entire room
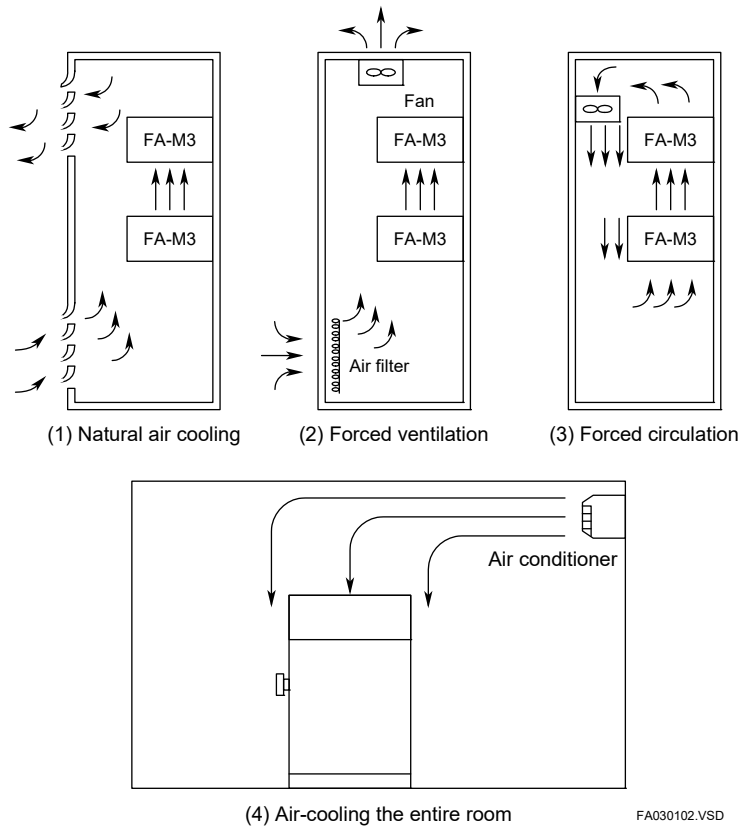
Figure A3.2   Methods for Cooling the Panel Enclosure

A3.2 Methods for Mounting the FA-M3 within a Panel Enclosure

A3.2.1 Mounting Positions

The FA-M3 module is designed with natural air cooling heat design considerations. Install the FA-M3, orientated so that the LED display is at the top and the air outlets are at the top and bottom.

FA030201.VSD

30mm min.[*1]

30mm min.[*2]

FA030201-2.VSD
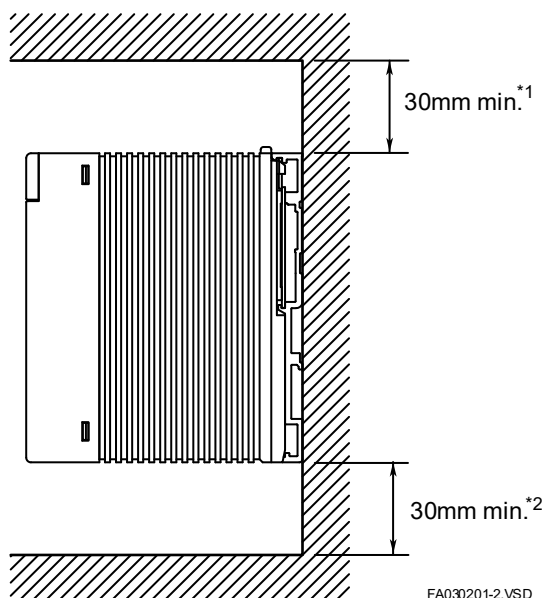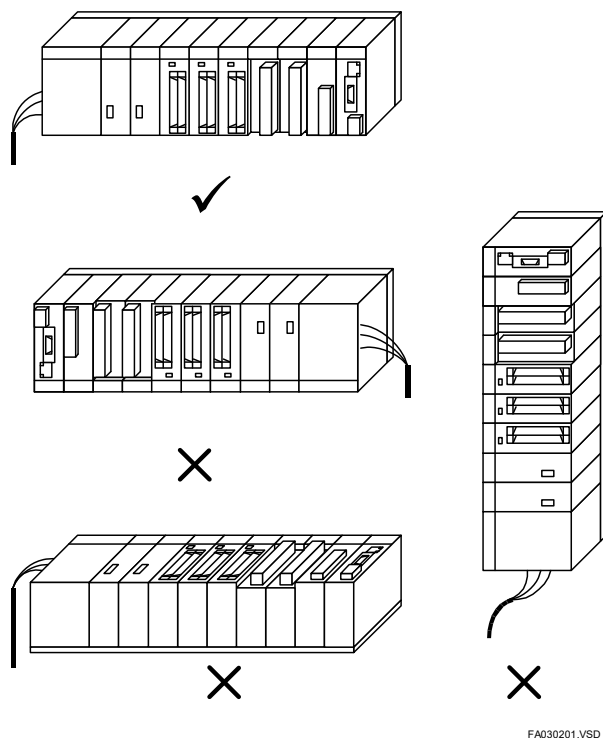
*1: Leave a space in order to attaching/detaching the modules.
*2: When there is the connector wiring from the bottom of the module, see subsection A3.2.5, "Mounting Depth and Space".

Figure A3.3   Mounting posture and position

A3.2.2 Mounting Dimensions

■ Screw Mounting

Unit: mm

FA030202.VSD
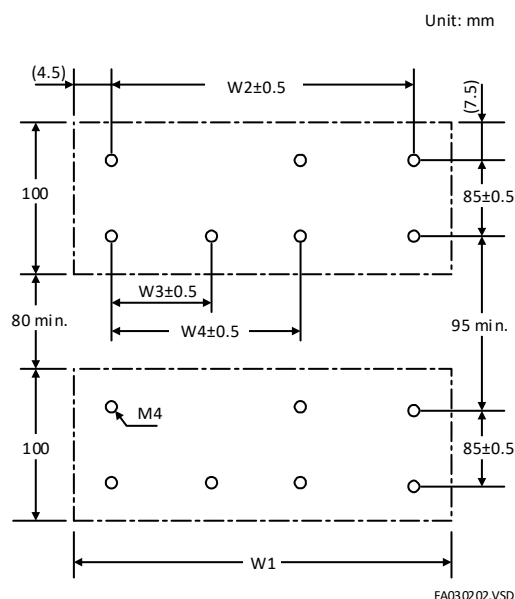
Base Module Model	Full Width W1	Mounting Width		
		W2	W3	W4
F3BU04-0N	147	138	—	—
F3BU06-0N	205	196	—	—
F3BU05-0D	205	196	—	—
F3BU09-0N	322	313	138	—
F3BU13-0N	439	430	196	—
F3BU16-0N	527	517.3	138	313

Note: The FA-M3 does not come with the screws for mounting base modules.
Each base module requires the following number of mounting screws.
F3BU04, F3BU06, F3BU05, F3BU09 and F3BU13: Four
F3BU16: Six
The specifications of the mounting screws are as follows:
M4-size binding-head screw, 12 to 15mm long (or 14 to 15mm long, if fitted with a washer)

■ DIN Rail Mounting

FA030203.VSD

A3.2.3 Mounting on and Removing from a DIN Rail

When mounting the FA-M3 on a DIN rail, attach a rail mount kit to the back of the controller. For the rail mount kit, purchase either Model T9031AP (for F3BU04, F3BU06 and F3BU05 base modules) or Model T9031AQ (for F3BU09 and F3BU13 base modules) separately. Note that F3BU16-0N, F3BU09-2N and F3BU13-2N are not designed for mounting on a DIN rail.

■ Installing a Rail Mount Kit

A rail mount kit comprises two component parts that are used in combination.

(A)   (B)

FA030204.VSD
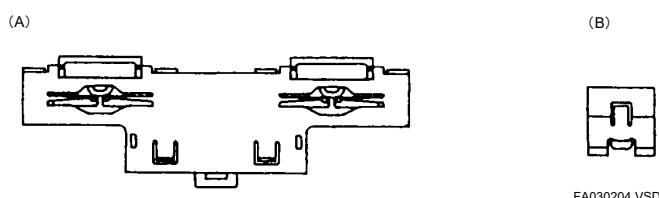
The number of components needed is shown below.

(A) X 1 and (B) × 2 (for F3BU04, F3BU06 and F3BU05 base modules)

(A) X 2 and (B) × 4 (for F3BU09 and F3BU13 base modules)

● Mounting location (Rear of the controller)

FA030205.VSD

● Mounting procedure

For both components (A) and (B), insert one of their hooks into the opening in the DIN rail. Then push in the other hook (use a flat-blade screwdriver as necessary).

(1) Insert one of the hooks.

(2) Push in the other hook.

(1) Insert one of the hooks.

(2) Push in the other hook.

FA030206.VSD
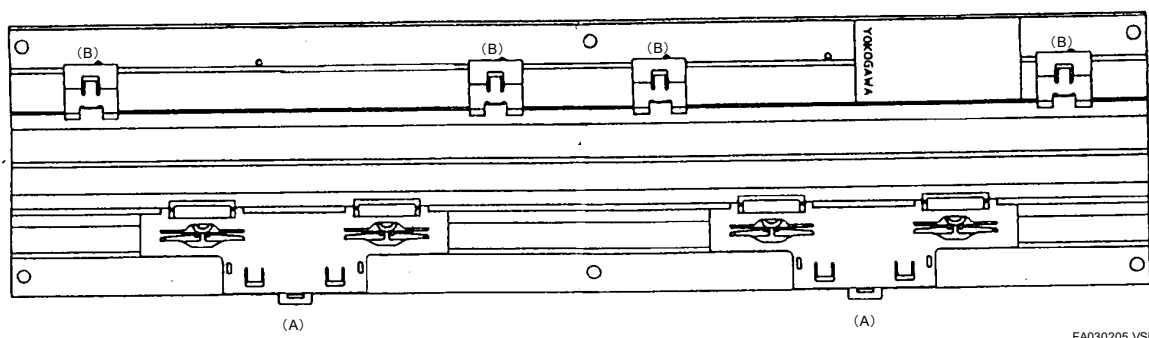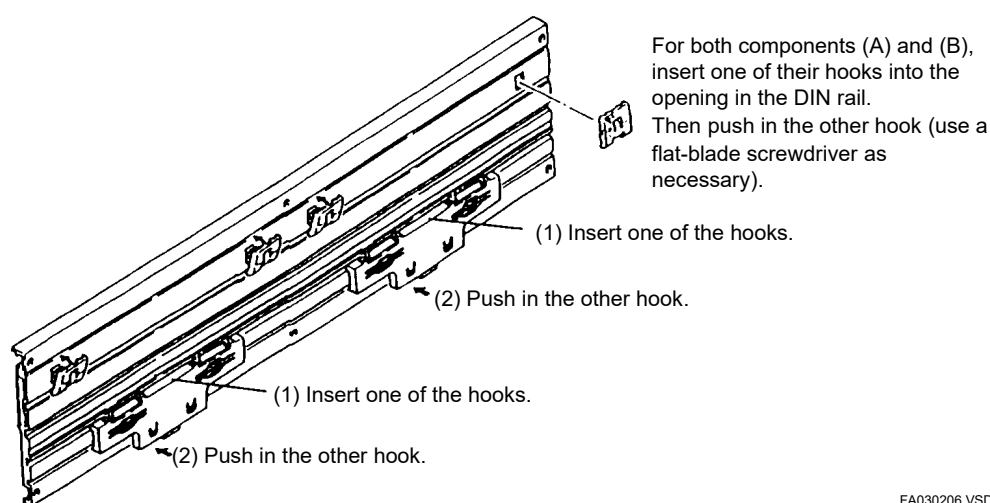
■ Mounting on the DIN Rail

Mount a base module on the DIN rail as follows.

Note

- Ensure that the base module is securely attached to the DIN rail.

- Do not use the DIN rail to install the FA-M3 system in an environment where it would be subjected to excessive vibration, impact or mechanical load as it may fall off the DIN rail.

- Secure both ends of the base module so that it would not slide along the base module.

(B)

(1) Hook this side.

DIN rail

(2) Push in the other side.

(A)

Viewed from the side of the FA-M3

(1) Hook this side.

(1) Hook this side.

(2) Push in the other side.
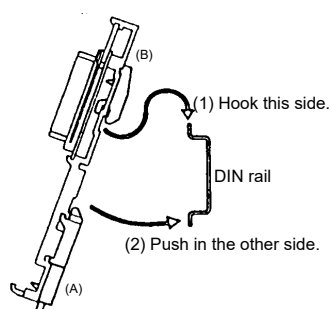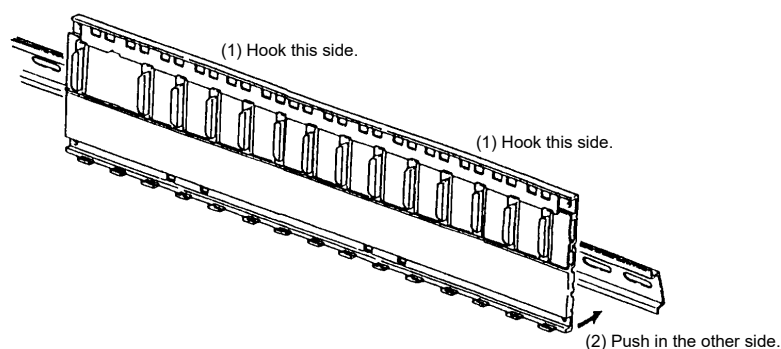
FA030207.VSD

■ Removing from the DIN Rail

(1) Pull downward

(2) Pull toward you.

(1) Pull downward
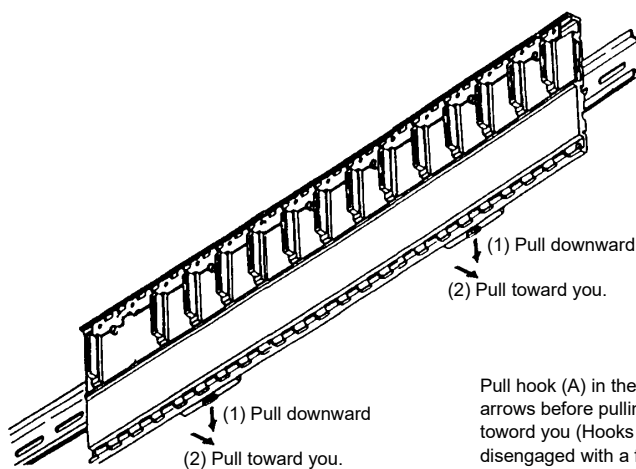
(2) Pull toward you.

Pull hook (A) in the direction of the arrows before pulling the module toword you (Hooks can be easily disengaged with a flat-blade screwdriver).

FA030208.VSD

■ Removing the Rail Mount Kit

⊖ Flat-blade screwdriver

(B)

Release the latch

(A)

Viewed from the side
of the FA-M3

Removing latch (A)
Release the latch on the front
of the base module by hand
and remove it.
Removing latch (B)
Insert a flat-blade screwdriver
between the base module and
the latch and turn it slightly to
remove the latch
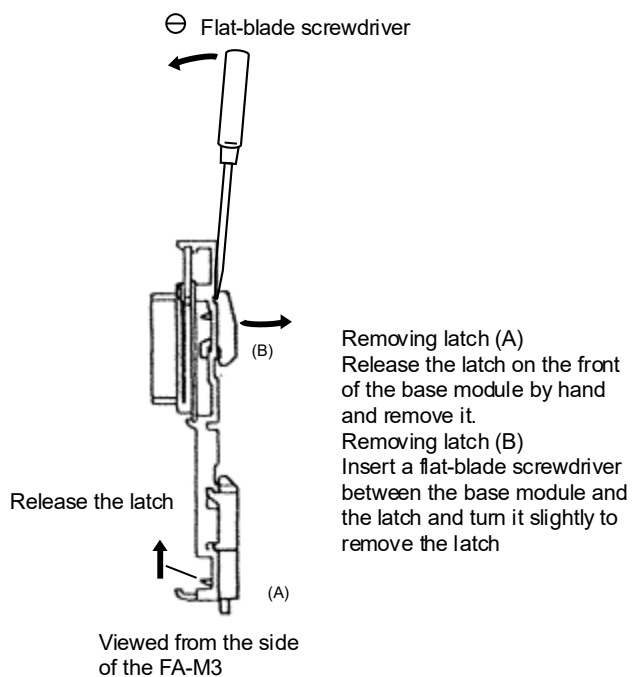
FA030209.VSD
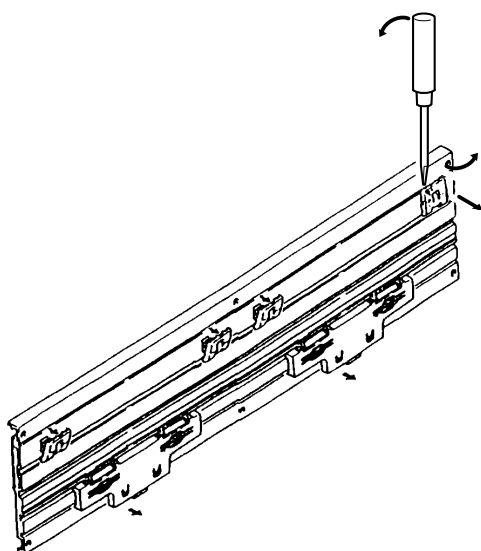
FA030210.VSD

A3.2.4   Attaching/Detaching the Module

■ Attaching the Module

Figure A3.4 shows how to attach the module to the base module. First hook the anchor slot at the bottom of the module to be attached onto the anchor pin on the bottom of the base module. Push the top of the module toward the base module until the anchor/release button (yellow button) clicks into place.

> ⚠ **CAUTION**
>
> Always switch off the power before attaching or detaching the module.
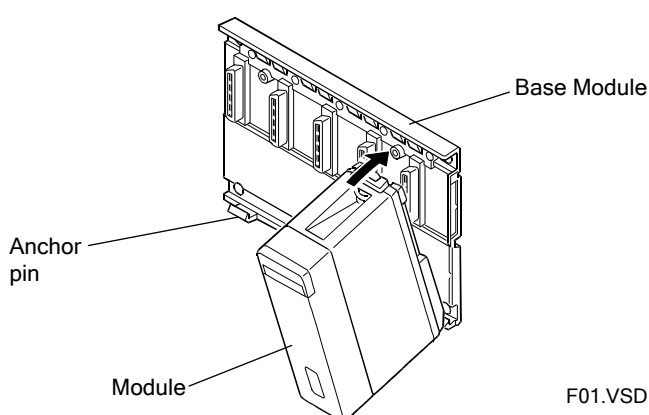
Figure A3.4   Attaching/Detaching the Module

> ⚠ **CAUTION**
>
> Do not bend the connector on the rear of the module by force during the above operation. If the module is pushed with improper force, the connector may bend causing an error.

■ Detaching the Module

To remove the module from the base module, reverse the above operation.

Press the anchor/release button (yellow button) on the top of this module to unlock it and tilt the module away from the base module.

■ Attaching the Module in Intense Vibration Environments

If the module is used in intense vibration environments, fasten the module with a screw.

Use screws of type listed in the table below.

Insert these screws into the screw holes on top of the module and tighten them with a Phillips screwdriver.

Required Screw
Binding head machine screw M4 of 12 to 15 mm long (washer screw of 14-15 mm long)

F02R1.VSD
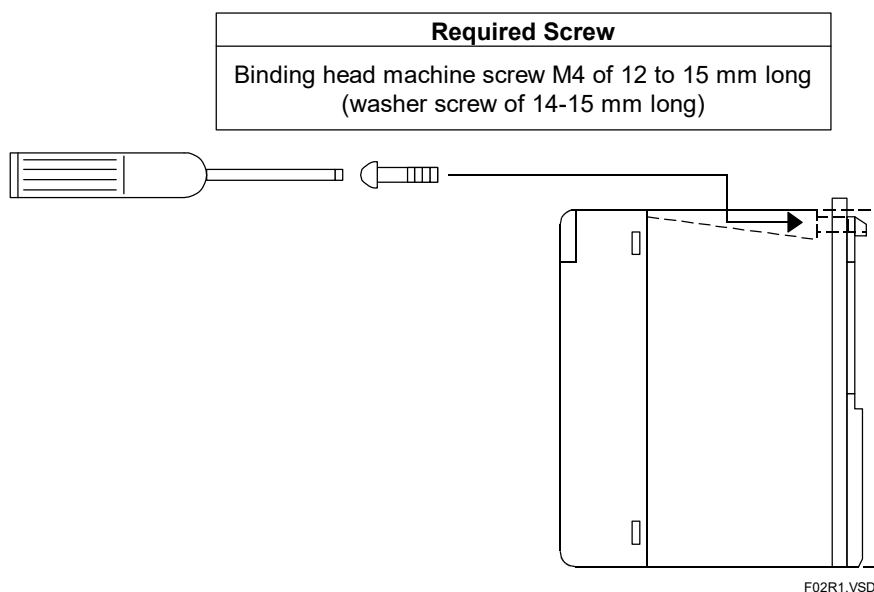
Figure A3.5   Securing Module Using Screws

⚠ **CAUTION**

Do not apply excessive load on the module.
Be particularly aware that a downward load of 5kg or more applied on the connector head (at a position 55mm from the front side of the module) may cause the module to fall off from the base module.

55mm

FA030212_1.VSD
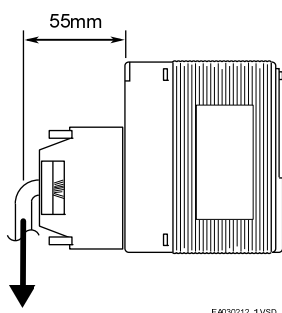
A3.2.5 Mounting Depth and Space

- The depth of the installed module and the base module together is approximately 90mm. An additional length should be allowed for cable bending however, if any cable with connectors is attached to the controller.
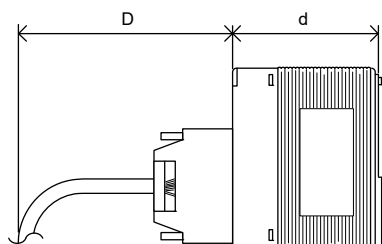
Module	D (mm)	d (mm)
Terminal block type	80 min.	—
Connector type		83.2

FA030212.VSD

Figure A3.6 Mounting Depth

- In the case of fiber-optic FA-bus, fiber-optic FA-bus type 2 and fiber-optic FA link H modules, the mounting depth should allow for the bending radius of their fiber-optic cords or cables.
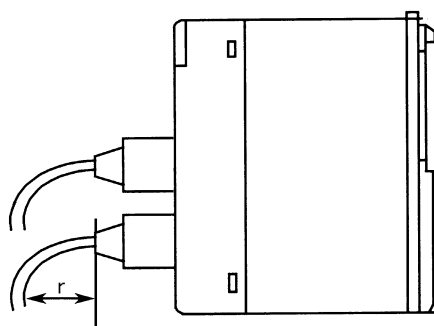
	Bending Radius r (mm)	
	During cable laying (Temporary)	When secured
Fiber-optic cord	15 min.	50 min.
Fiber-optic cable	50 min.	100 min.

FA030213.VSD

Figure A3.7   Mounting Depth for Modules with Fiber-optic Cords or Cables

When you lay the fiber-optic cord or cable yourself, follow the instructions given below.

1. The product comes with an instruction manual. The person in charge of wiring should first read the manual thoroughly, and then lay the cord or cable as instructed.

2. Upon delivery, be sure to test the performance of the product by sending light beams through it. The performance of optical fiber can be easily tested by sending sunlight or flashlight beams from one end of the cord or cable and confirming their arrival at the other end.

   Test the performance of the product before installation.

Note

- Before laying cables, customers should check the cables (immediately after delivery) for any defect. In principle, the provided warranty does not cover functional defects (e.g., cable discontinuity) discovered after installation.

- Fiber-optic cables KM61, KM62, KM65, KM67, and KM69 are made-to-order products. Hence, replacement of a defective cable may require a week for KM65 cables, a month for KM61, KM62, and KM67 cables, and two months for KM69 cables.

- In the case of Positioning module(with multi-channel pulse output) F3YP22-0P, F3YP24-0P, F3YP28-0P, this module requires space for the wiring of the connector for counters.

	D(mm)
Min. space	100 min.

FA030214.VSD
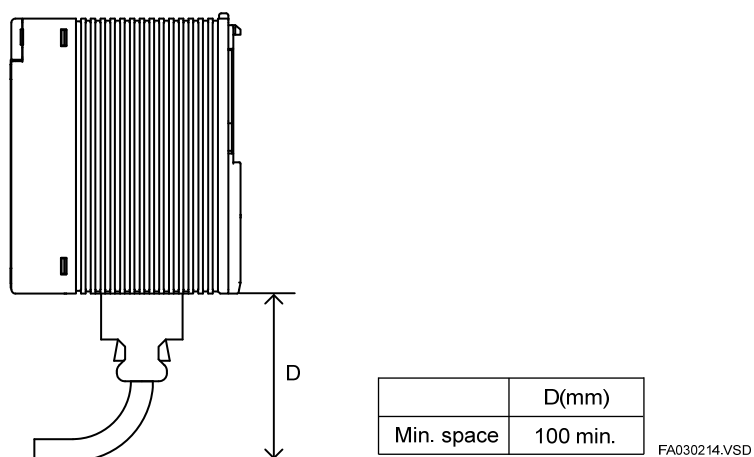
Figuer A3.8 Mounting Space for Positioning module(with multi-channel pulse output)

A3.3 System Design Considerations

This section contains the considerations you should take into account when designing a system that incorporates the FA-M3.

A3.3.1 Power Line Wiring and Emergency-stop Circuit

The power lines can roughly be divided into three groups: one for motive-power equipment, one for control equipment except for the FA-M3 and one for the FA-M3 itself. The power line for the FA-M3 is further divided into one for the power supply module and one for I/O units. All these power lines must be equipped with separate circuit breakers or switches and wired separately.

Use the FAIL OUTPUT terminal on the power supply module of the FA-M3 in combination with your external relay circuit to configure an emergency-stop circuit. The adoption of this strategy is essential to prevent erroneous operation of the entire system or any possible failure or malfunction in the FA-M3.
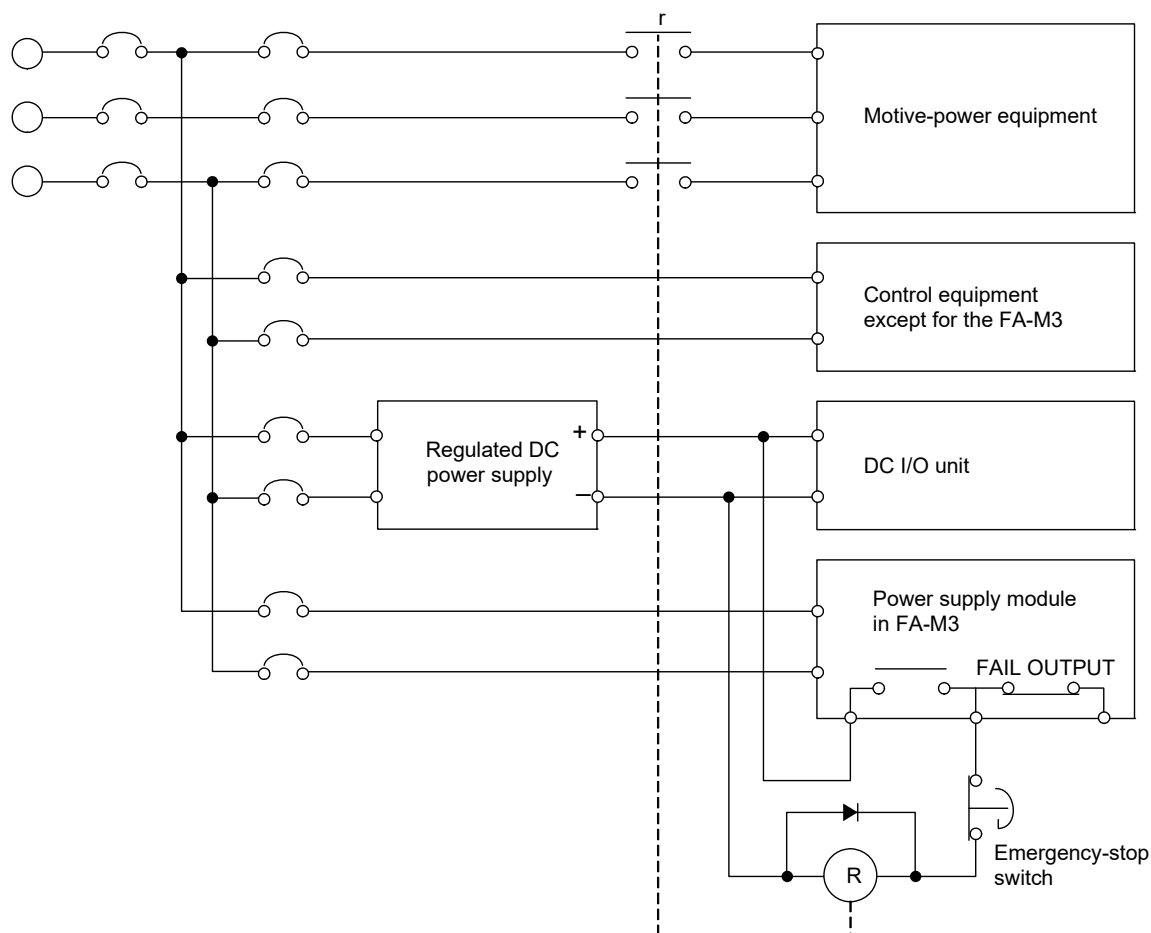
The FAIL OUTPUT terminal comes in two types: one that turns on if the FA-M3 fails and one that turns off if the FA-M3 fails. Normally, a system should be designed so that the terminal turns off if the FA-M3 fails.

FA030301.VSD

Figure A3.9 Circuit Diagram of Power Lines and Example of Emergency-stop Circuit

⚠ **CAUTION**

If there is a risk that the system could cause injury or death of personnel, be sure to take appropriate security measures, such as power shutdown to the motive-power circuit in the case of an emergency, as shown in Figure A3.9.

A3.3.2 Grounding Lines

When considering the grounding system in your panel enclosure, take into account the following:

- To increase noise immunity, connect the signal ground (the GND terminal for the 5V output of the power supply module) to the metal chassis of the base module. This defines the signal ground as the point of reference potential. To stabilize the reference potential, directly fix the base module onto a grounded metal plate installed inside the panel enclosure. It is advisable that you use a plated metal material with excellent conductivity as the metal plate.

- For grounding lines connecting to the FG terminal and LG terminal of the power supply module, use thick wiring of at least 2mm². Connect to the Protective earth (Comply with the regulation of each country.) , and route the line through the shortest path possible.

   For compliance to CE Marking, use braided wires for the system configured with this module for low impedance even at high frequency.

- It is anticipated that a system failure due to stray current or for other reasons may occur, though this is very rare, if both the base module and other equipment are directly fixed onto the metal plate inside the panel enclosure. In such situations, electrically isolate the base module or the other equipment from the metal plate. When isolating the base module or other equipment from the plate, connect the grounding lines of the base module and the other equipment separately to their respective grounding points. Depending on the cause of system failure, such measures as disconnecting the SHIELD terminal of each I/O module may be required.
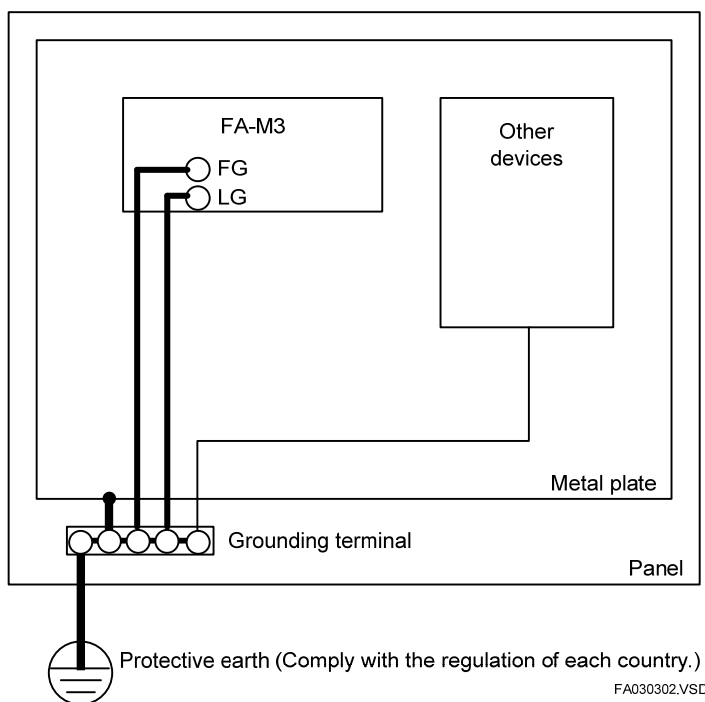
Figure A3.10 Grounding System Diagram

A3.3.3 Relay Circuits

The input/output points of the FA-M3 are normally connected directly to external devices. Relays, however, should be placed between the input/output points of the controller and the external devices in the following cases:

- The controller is far away from the external devices and is susceptible to noise interferences in the field.

- The controller is to be connected to devices that will generate high-voltage noise.

- There is a need to clarify the relationship between other control lines with regards to the responsibility of handling respective signals.

- A manually operated circuit needs to be included as a backup against failure of the I/O equipment.
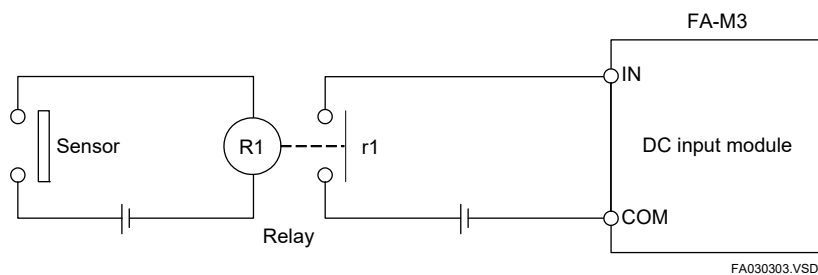
Figure A3.11   Example of Use of Relay

A3.3.4 Protection against Output Short-circuit

If any of the loads connected to the output terminals of the FA-M3 are short-circuited, an excess short-circuit current flows and there is the possibility that the external wiring will burn or there will be a generation of abnormal heat. It is therefore common practice to install fuses in the output circuits to ensure safety in the case of short-circuited loads and minimize damage to the FA-M3. Use of external fuses is recommended, especially for output modules that do not have built-in fuses or short-circuit protectors.

Figure A3.12 is an example of an FA-M3 that is equipped with output short-circuit protection fuses. Note that these fuses are not intended to protect internal output elements against possible damage. In addition, these fuses may fail to blow in failure modes other than short-circuited loads.
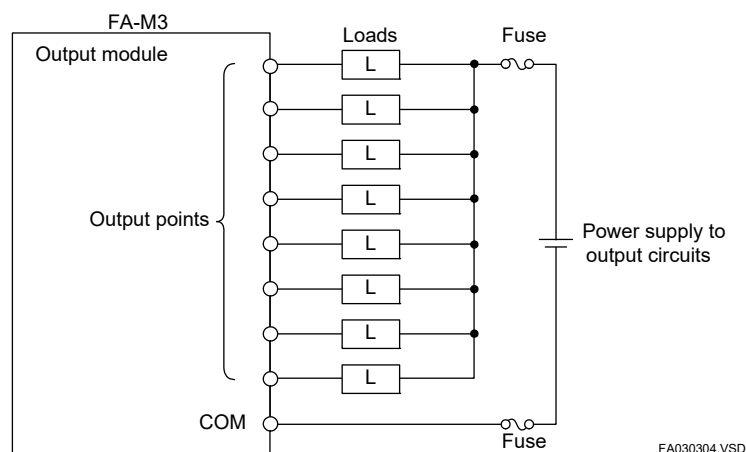
Figure A3.12   Example of Use of Output Short-circuit Protection Fuses

A3.3.5   Interlocking

An interlock circuit is required when you handle particular outputs, such as those for the forward and reverse rotation of a motor that must not turn on at the same time. In such a case, installing an external interlock circuit allows one of the "b" contacts of the two relay coils to cut off the other when energized. Figure A3.13 shows an example of an interlock circuit.
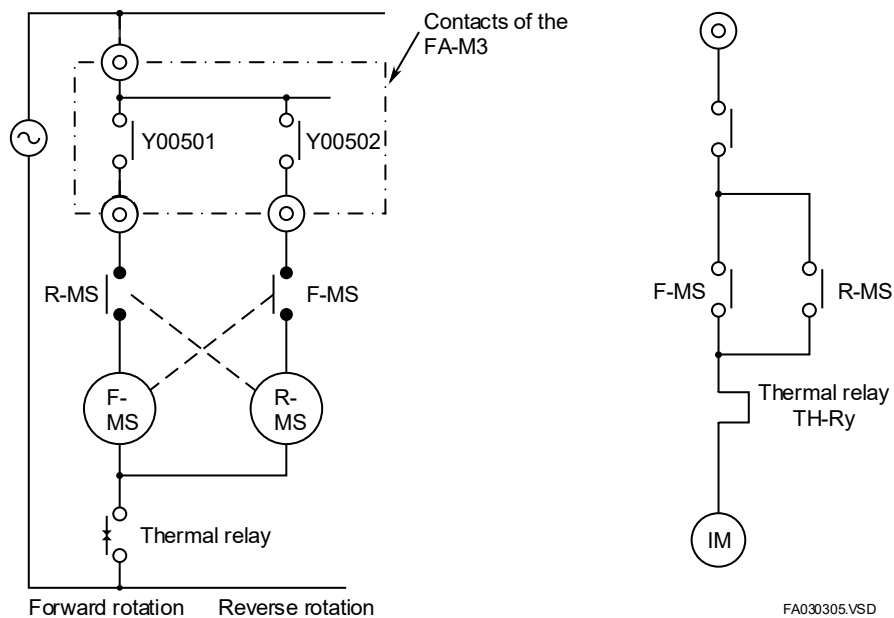
Figure A3.13   Example of an Interlock Circuit

A3.3.6 Measures against Power Failure

The power supply block of the FA-M3 incorporates a built-in power sequence circuit which prevents the system from malfunctioning when a momentary power failure or voltage reduction occurs. This system has two modes of detecting power failures; one is the standard mode and the other is the immediate detection mode. There are restrictions on the use of the immediate detection mode, as summarized in the table given below, according to the type of power supply module or CPU module used. The default (factory setting) mode is the standard mode.

Mode	Available Power Supply Module	Available CPU Module
Standard	All types	All types
Immediate detection*	F3PU10-0N F3PU10-0S F3PU16-0N F3PU16-0S F3PU20-0N F3PU20-0S F3PU26-0N F3PU26-0S F3PU30-0N F3PU30-0S F3PU36-0N F3PU36-0S	F3SP2□-□□ F3SP3□-□□ F3SP5□-□□ F3SP6□-□□ F3SP7□-□□ F3FP36-3N F3BP20-0N F3BP30-0N F3RP70-2L F3NP5□-□□

*: Select the immediate detection mode from the "CPU Configuration" menu. For more details, refer to "FA-M3 Programming Tool WideField" (IM 34M06Q14-01E), "FA-M3 Programming Tool WideField2" (IM 34M06Q15-01E) or "FA-M3 Programming Tool WideField3" (IM 34M06Q16-□□E). For details on the modes of detecting power failures supported by the F3BP20, F3BP30 BASIC CPU module, refer to the BASIC CPU Modules and YM-BASIC/FA Programming Language (IM 34M06Q22-01E).

For details on the modes of detecting power failures supported by the F3RP70 OS-free module, refer to the OS-free manual

For details on the modes of detecting power failures supported by the F3NP5□-□□ module, refer to the "CPU Module for IEC61131-3 Function Manual" (IM 34M06M52-62EN).

■ Standard Mode (common to all power supply modules)

● Momentary Power Failure Detection

- System operation continues without interruption even if the power fails momentarily for no longer than 20ms (undetected momentary power failure).

- If a power failure longer than 20ms occurs, the controller may or may not recognize a momentary power failure condition because an uncertainty is involved. When the controller detects a momentary power failure, it suspends program execution while retaining the current state of its outputs. It also records the date and time at which the momentary power failure occurred into the error log file in the CPU. When power is restored, the controller resumes the execution of the program.

● Power Failure Detection

When the CPU operating voltage (+5V) falls below 95% of the rated voltage, the controller stops operation, turns off its outputs, and then turn on the FAIL contact. (Refer to Section A2.3 for details on how the FAIL contact works).

● Automatic Recovery

The controller resumes normal operation automatically when the power recovers from a momentary power failure condition and the CPU operating voltage (+5V) rises above 95% of the rated voltage. The controller restarts in the reset restart mode after a power failure is detected.

● Power on/off Sequences
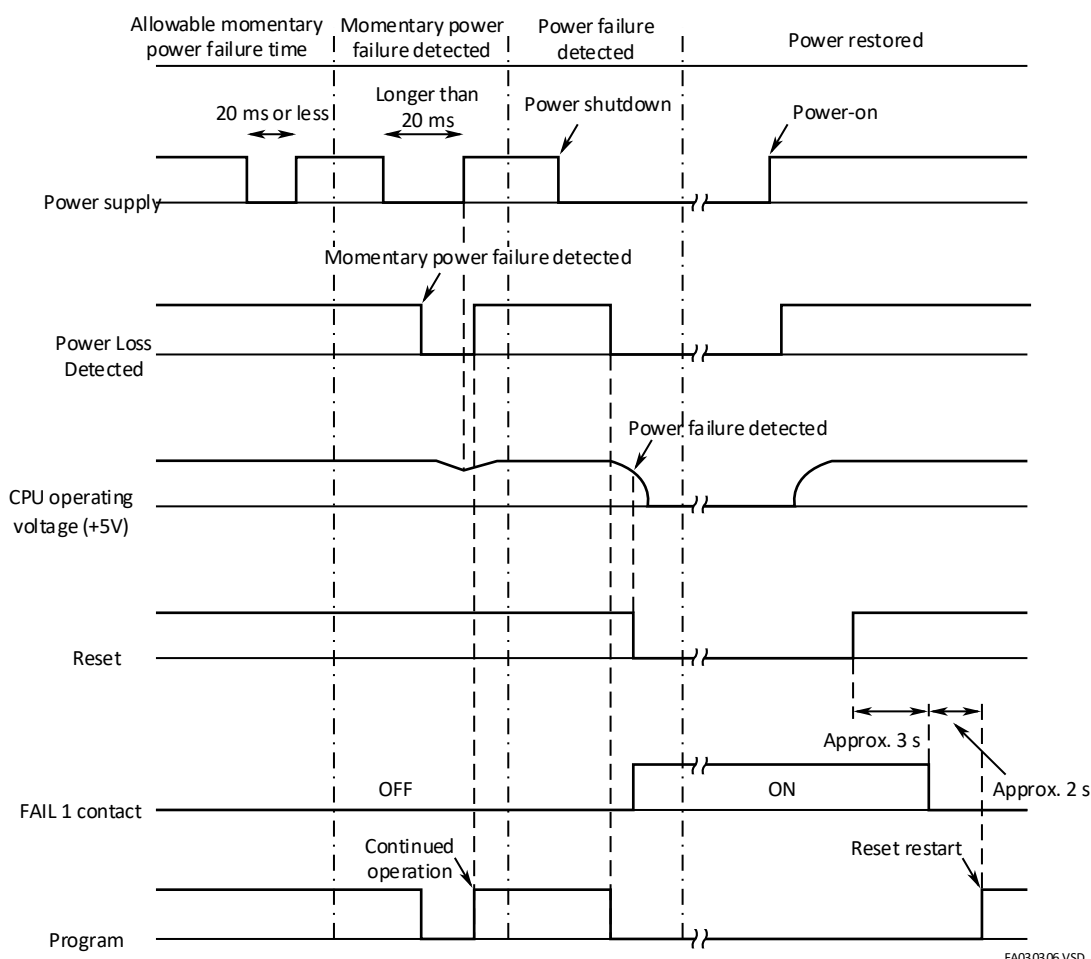
Figure A3.14 Detection of Abnormal Supply Voltage Levels in Standard Mode

■ Immediate Detection Mode
(when F3PU10-0N, F3PU10-0S, F3PU20-0N, F3PU20-0S, F3PU30-0N or F3PU30-0S is used)

● Momentary Power Failure Detection
- System operation continues without interruption even if the power fails momentarily for no longer than 10ms (undetected momentary power failure).
- If a power failure longer than 10ms and less than 25ms occurs, the controller may or may not recognize a momentary power failure condition because an uncertainty is involved. When the controller detects a momentary power failure, it holds or resets its outputs (in accordance with the output set at stop) , it suspends program execution, and then it turns on the FAIL contact. (Refer to Section A2.3 of this manual for details on how the FAIL contact works). It also records the date and time at which the momentary power failure occurred into the error log file in the CPU. The controller restarts in the reset restart mode after a momentary power failure is detected.
- The controller always detects any momentary power loss conditions that are longer than 25ms.

● Power Failure Detection
The entire functionality of the controller is disabled when the CPU operating voltage (+5V) falls below 95% of the rated voltage.

● Automatic Recovery
The controller resumes normal operation automatically when the power recovers from a momentary power failure condition and the CPU operating voltage (+5V) rises above 95% of the rated voltage. The controller restarts in the reset restart mode following the detection of a power failure condition.

● Power on/off sequences
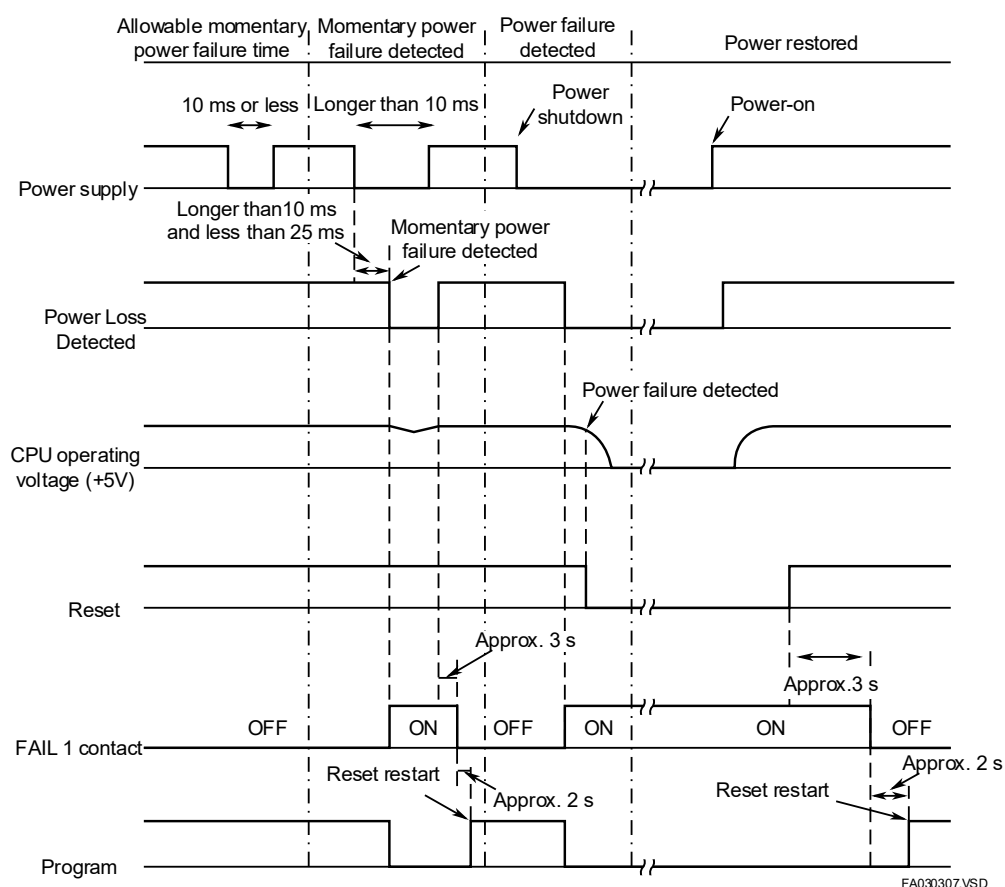
Figure A3.15   Detection of Abnormal Supply Voltage Levels in Immediate Detection Mode (for F3PU10, F3PU20 and F3PU30)

■ Immediate Detection Mode
(when F3PU16-0N, F3PU16-0S, F3PU26-0N, F3PU26-0S, F3PU36-0N or F3PU36-0S is used)

● Momentary Power Failure Detection

- System operation continues without interruption even if the power fails momentarily for no longer than 2ms (undetected momentary power failure).

- If a power failure longer than 2ms and less than 10ms occurs, the controller may or may not recognize a momentary power failure condition because an uncertainty is involved. When the controller detects a momentary power failure, it holds or resets its outputs (in accordance with the output set at stop), it suspends program execution, and then it turns on the FAIL contact. (Refer to Section A2.3 of this manual for details on how the FAIL contact works). It also records the date and time at which the momentary power failure occurred into the error log file in the CPU. The controller restarts in the reset restart mode after a momentary power failure is detected.

- The controller always detects any momentary power loss conditions that are longer than 10ms.

● Power Failure Detection

The entire functionality of the controller is disabled when the CPU operating voltage (+5V) falls below 95% of the rated voltage.

● Automatic Recovery

The controller resumes normal operation automatically when the power recovers from a momentary power failure condition and the CPU operating voltage (+5V) rises above 95% of the rated voltage. The controller restarts in the reset restart mode following the detection of a power failure condition.

● Power on/off sequences
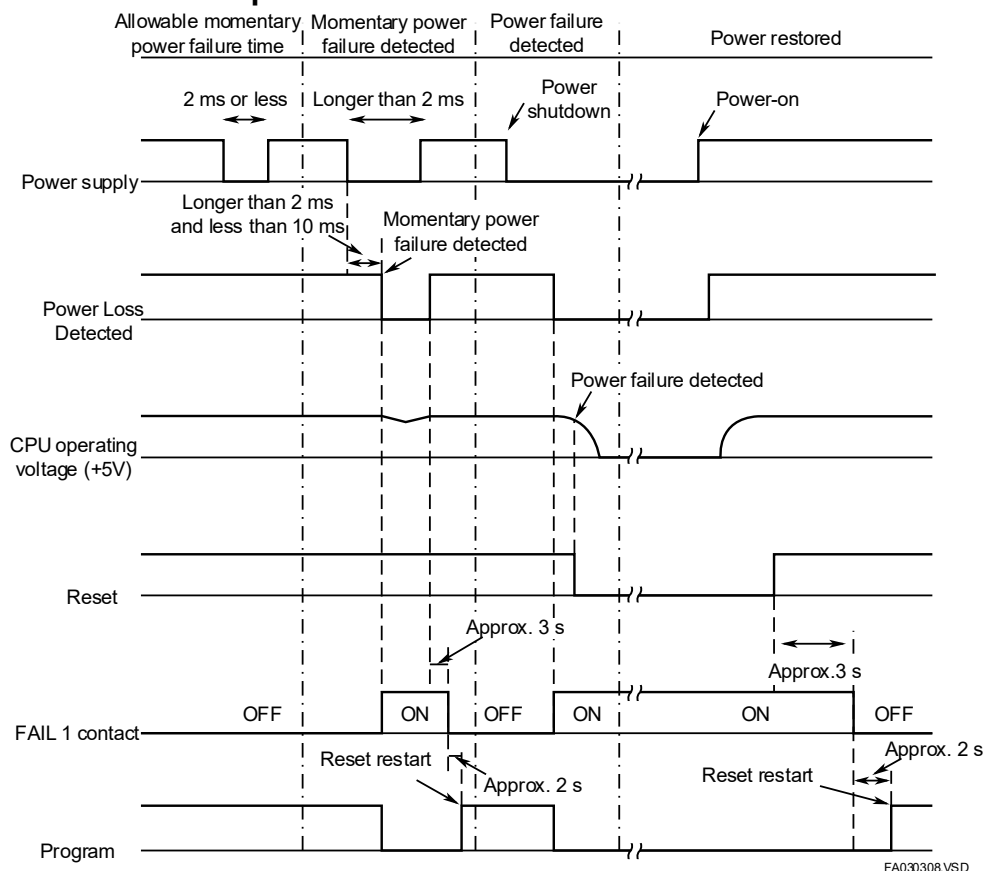
Figure A3.16 Detection of Abnormal Supply Voltage Levels in Immediate Detection Mode (for F3PU16, F3PU26 and F3PU36)

A3.4   Noise Control Considerations

■ Separating Cables from Motive-power Lines

Route motive-power lines so that they are no closer than 20cm to the FA-M3 and all signal lines connected to the FA-M3. If this is not feasible, route the motive-power lines through a grounded metal conduit.

Motive-power lines

20 cm or farther

FA-M3

20 cm or farther

Metal conduit

FA-M3   GND

FA030401.VSD
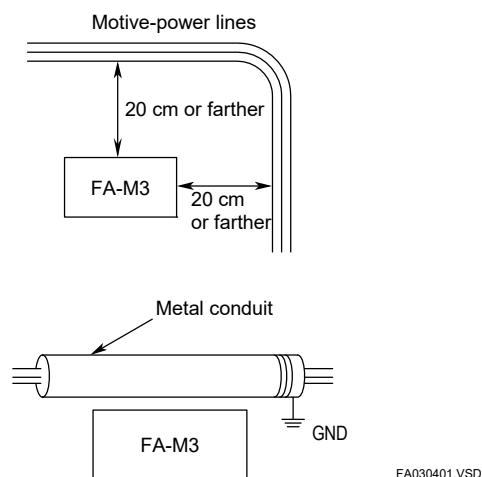
Figure A3.17 Example of Separating Cables from Motive-power Lines

■ Protecting Power Supply Module against Noise

- Form the power line into a twisted pair and route it through the shortest distance possible.

- The power supply module of the FA-M3 contains a noise filter and therefore has a noise immunity level sufficient for noise levels anticipated in general applications. If the module is to be used in an exceptionally noisy environment however, an additional ferrite core , noise filter or a noise cutoff transformer should be located between the power source and the module.

Power inlet terminals

Noise filter

Noise cut-off transformer

Ferrite core

FA-M3

Use a twisted-pair cable.

Use a twisted-pair cable.

Use a twisted-pair cable.

Keep the cable inside the panel enclosure as short as possible.

FA030403.VSD
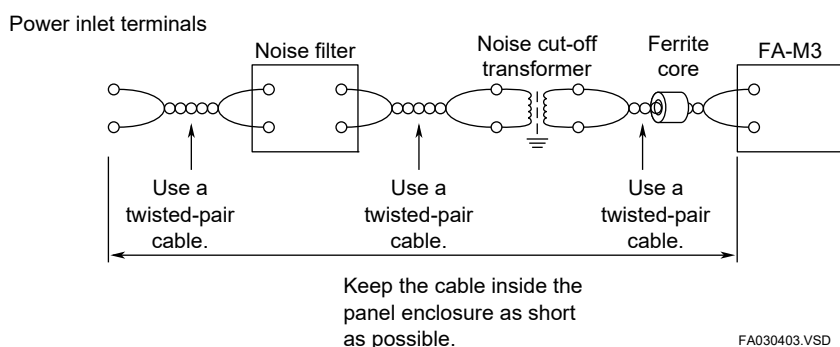
Figure A3.18   Example of Power Supply Circuit Noise Control

■ Protecting Special Modules against Noise

- Analog and communication modules are designed to handle low-level or high-speed signals. Place the lines of these signals at a distance of more than 10cm away from other I/O signal lines and route them through separate cable ducts.

- It is especially difficult to distinguish analog signals and noise and this will cause errors when an analog signal overlapped by noise is converted into a digital signal. As a precaution, lay the analog signal cables away from noise sources such that noise overlapping will not happen and insert a filter (such as a filter circuit, a filter or software calculation filter) to attenuate noise.

- Always use specified cables only and be especially careful about the way they are routed for grounding and interconnection. For further details, see the instruction manual of each module.

■ Protecting I/O Signals against Noise

- Segregate the AC I/O signal lines from DC I/O signal lines when routing them. If this is not feasible, use collectively shielded lines for each group of these signal lines.

- Segregate signal lines carrying larger current from other signal lines when routing them. If this is not feasible, use shielded lines for signal lines carrying large current.

- If any inductive load is to be connected to an input or output terminal of the FA-M3, install a surge protector or a diode near the load. For further details, see "Inductive Load Countermeasures," in subsection A3.6.4, "Connecting Input Devices" or "Inductive Load Countermeasures," in subsection A3.6.5, "Connecting Output Devices."

Note

Install a protective device, such as a surge arrester, when the FA-M3 is to be used in a district with a high frequency of thunder.

A3.5 Wiring the Power Supply Module

A3.5.1 Re-checking Specifications

⚠️ **CAUTION**

- Re-check the I/O specifications for the power supply module. Specifically, note that connecting an AC power supply to a power supply module requiring DC input and connecting a 200-240V AC power supply to a power supply module requiring 100-120V AC input will lead to machine failure.

- To avoid electrical shock, turn off the power before wiring.

- Make sure that the '+' , '–' and FG terminals of a DC input power supply module and the L, N and FG terminals of an AC input power supply module are connected correctly.

A3.5.2 Wiring Materials

(1) Wire

Method of External Connection	Compatible Conductor Size	Temperature Rating	Material
Terminal block	AWG22 to 14 (0.33 to 2.1mm^2)	75°C min	Copper

Use AWG14 (2.1mm^2) for ground cabling.

(2) Terminal Screws and Crimp-on Terminals
The F3PU□□-0S power supply modules use M4-screw terminal blocks, unlike F3PU□□-0N power supply modules, which use M3.5-screw terminal blocks. The following crimp-on terminals are recommended for connecting to the power supply modules:

FA030601.VSD
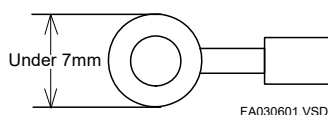
Figure A3.19   Crimp-on Terminals

Vendor	Model	Compatible Conductor	Compatible Modules and Crimping Torque	
			F3PU□□-0N	F3PU□□-0S
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M3	AWG22 to 18 (0.33 to 0.82mm^2) (Copper wire)	0.8N·m (7.1 lbf·in)	Cannot be used
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M4			1.2N·m (10.6 lbf·in)
Japan Solderless Terminal Mfg Co., Ltd.	V2-M4	AWG16 to 14 (1.3 to 2.1mm^2) (Copper wire)		

Note

When crimping terminals, be sure only to use the tool specified by each terminal manufacturer.

A3.5.3   Power Supply Wiring

■ AC Power Supply Module

Model	Supply Voltage	Allowable Range of Supply Voltage Change
F3PU10-0N F3PU10-0S		
F3PU20-0N F3PU20-0S	100-240V AC	85 to 264V AC
F3PU30-0N F3PU30-0S		

When an abnormal condition occurs in the power supply module, the circuit across the FAIL 1 and COM terminals is shorted and the circuit across the FAIL 2 and COM terminals is opened. The maximum switching capacity of the module is 0.3 A at 24 VDC.

Wire other AC power supply modules in a similar manner.
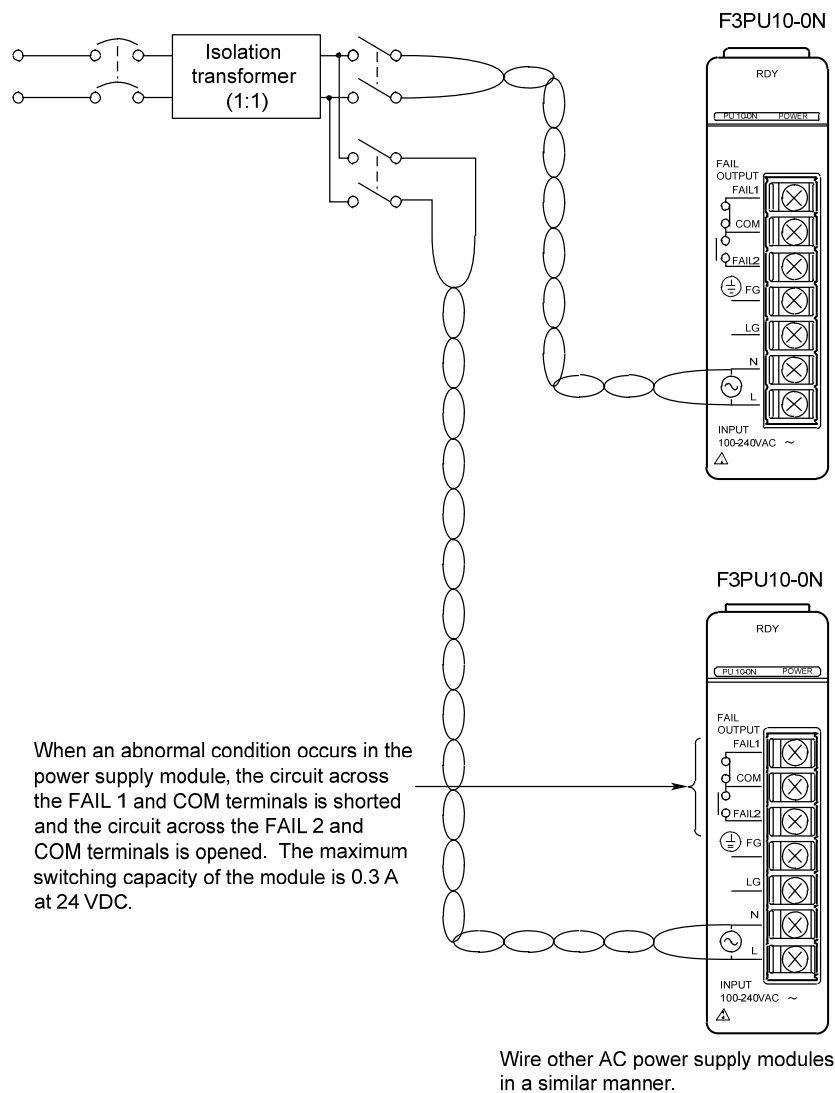
FA030501.VSD

Figure A3.20 Wiring the AC Power Supply Module

⚠ **WARNING**

To avoid electrical shock, turn off the power before wiring.

■ DC Power Supply Module

Model	Supply Voltage	Allowable Range of Supply Voltage Change
F3PU16-0N F3PU16-0S		
F3PU26-0N F3PU26-0S	24V DC	15.6 to 31.2V DC
F3PU36-0N F3PU36-0S		

When an abnormal condition occurs in the power supply module, the circuit across the FAIL 1 and COM terminals is shorted and the circuit across the FAIL 2 and COM terminals is opened. The maximum switching capacity of the module is 24 VDC, 0.3 A.

Wire other DC power supply modules in a similar manner.

FA030502.VSD
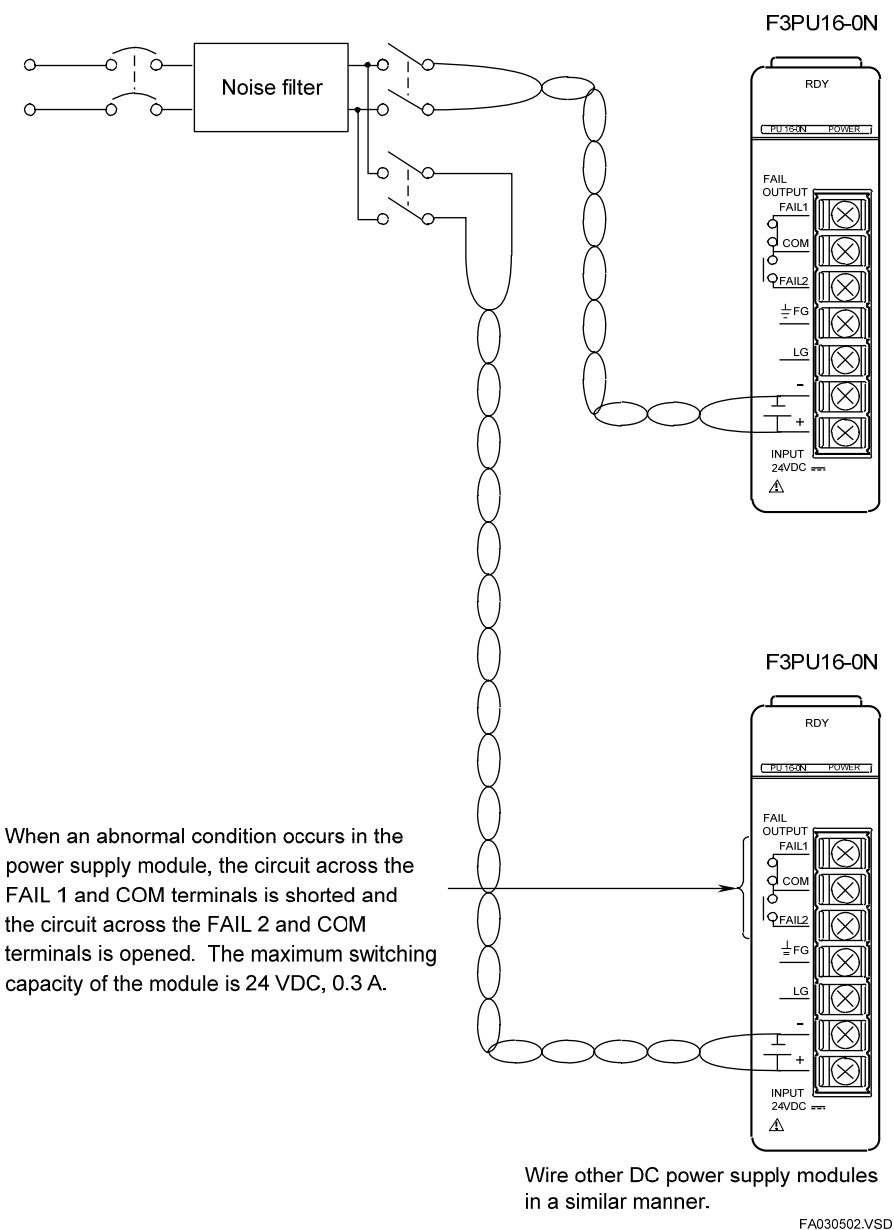
Figure A3.21   Wiring the DC Power Supply Module

⚠ **WARNING**

To avoid electrical shock, turn off the power before wiring.

A3.5.4 Grounding Procedure

FG
It is automatically brought into contact with the metal chassis of the base module when the FA-M3 is mounted onto the base module so it shares the same electric potential with the controller's signal potential with the controller's signal ground. Using a wire with a cross-section area of more than $2mm^2$, connect to the Protective earth (Comply with the regulation of each country.) by taking the shortest route possible. For details on the grounding lines of the FA-M3, see subsection A3.3.2,

LG
Is connected with the neutral terminal of the noise filter within the power supply module.
Grounding the LG terminal properly attenuates the comon mode noise from the power supply. If the LG terminal is opened, the effect of the noise filter will be reduced.

FA030503.VSD

Figure A3.22   Ground Wiring

AC power supply module is required protective earth. DC power supply module is required protective earth or functional earth.

When building a system compliance to CE Marking, connect LG terminal and FG terminal to the ground with the braided or the other wires that ensure low impedance even at high frequencies.

Note

LG terminal has a half potential of the input power supply voltage when LG terminal isn't connected to earth appropriately.

A3.6   Wiring I/O Modules

A3.6.1   Re-checking Specifications

⚠️ **CAUTION**

- Re-check the I/O specifications for the input/output modules. Note that applying a voltage or current that exceeds the maximum permissible input voltage or current of an input module or a voltage or current that exceeds the maximum switching capacity of an output module will lead to machine failure, physical damage or fire hazard.
- To avoid electrical shock, turn off the power before wiring.
- Make sure that the polarity of power terminals is correct.

A3.6.2   Wiring Materials

(1)   Wire

Method of External Connection		Compatible Conductor Size	Temperature Rating	Material
Terminal block		AWG22 to 14 (0.33 to 2.1mm^2)	75°C min	Copper
Connector	Soldered	AWG23 or less (0.26mm^2 or less)		
	Crimp-on	AWG28 to 24 (0.08 to 0.20mm^2)		
	Pressure-welded	AWG28 (0.08mm^2); 1.27mm pitch flat cable		

To ensure that a system incorporating this module conforms to the CE Marking, use shielded cables. By properly grounding the shield, noise emission and receipt will be reduced. For more information on shielded cables, see Section A3.9.1 "Cable Routing Considerations".

(2)   Terminal Screws and Crimp-on Terminals
The I/O modules have an M3.5-screw terminal block each. Use UL recognized crimp-on terminals. The following crimp-on terminals are recommended for connecting to I/O modules:

Under 7mm

FA030601.VSD
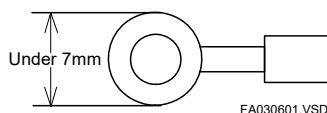
Figure A3.23   Crimp-on Terminals

Vendor	Model	Compatible Conductor	Crimping Torque
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M3	AWG22 to 18 (0.33 to 0.82mm^2) (Copper wire)	0.8N·m (7.1 lbf·in)
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M4		
Japan Solderless Terminal Mfg Co., Ltd.	V2-M4	AWG16 to 14 (1.3 to 2.1mm^2) (Copper wire)	

Note

When crimping terminals, be sure only to use the tool specified by each terminal manufacturer.

A3.6.3 Terminal Blocks and Connectors

(1) Terminal Block

The input/output modules for the FA-M3 use detachable terminal blocks. When removing the terminal block, loosen the mounting screws located on the top and bottom of the terminal block with a screwdriver as shown in the following figure.
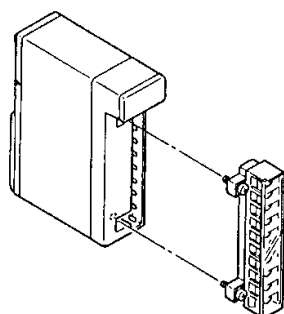
FA030602.VSD

Figure A3.24   Installing and Removing a Terminal Block

⚠ **CAUTION**

The correct tightening torque of the terminal block screws is 0.6 N·m (5.3 lbf·in). Use a screwdriver of the correct size; otherwise the screw head may be damaged.

(2) Connectors

Connectors are used to wire I/O modules to multiple I/O points. Compatible connector types include soldered, crimp-on and pressure-welded connectors. Separately procure connectors that suit your application purpose.

■ Compatible Connectors

Connection method		Compatible connector	
		OTAX Corporation	FUJITSU COMPONENT LIMITED[1]
Soldered type	Connector	N361J040AU	FCN-361J040-AU
	Connector cover	N360C040B	FCN-360C040-B
Crimp-on type	Housing	N363J040	FCN-363J040
	Contact	N363JAU	FCN-363J-AU
	Connector cover	N360C040B	FCN-360C040-B
Pressure-welded type		N367J040AUFW	FCN-367J040-AU/FW

*1: The Connector manufactured by FUJITSU COMPONENT LIMITED was discontinued.

Note

When using crimp-on or pressure-welded connectors, be sure only to use the tool specified by each connector manufacturer.

■ Precautions when Wiring 40-Pin Soldered-type Connectors

When wiring signal lines to an A1451JD 40-pin soldered-type connector, be careful about the orientation of the connector and its pin numbering. The wiring of the input connector (for the input block of F3XD□□-□□ and F3WD□□-□□ modules) differs from the wiring of the output connector (for the output block of F3YD□□-□□ and F3WD□□-□□ modules).

● **Input Connector**

Front view with soldered contacts   FA030603.VSD
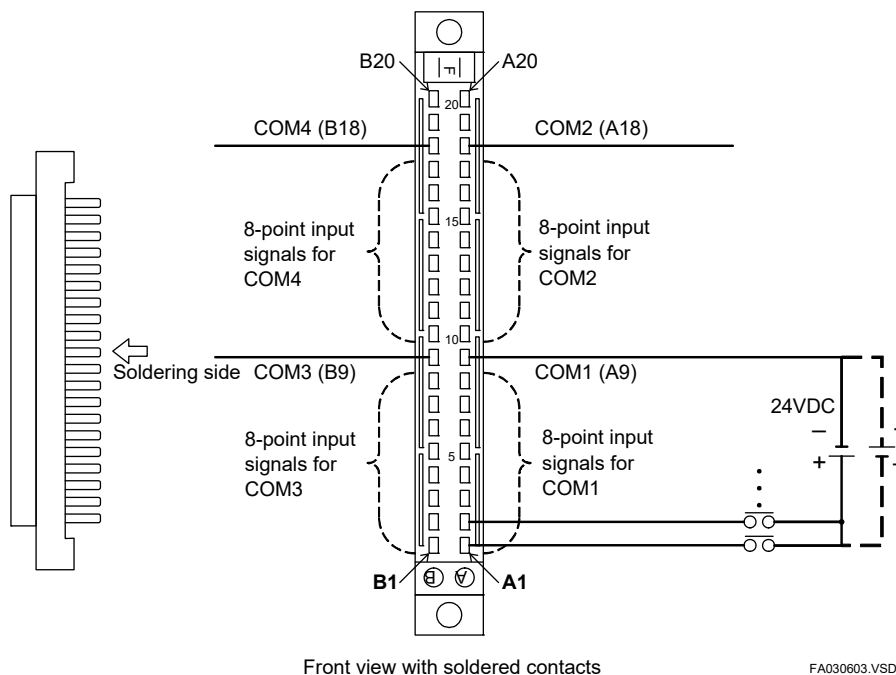
*:   The pin layout is the same for the connectors on the F3XD32-□□, F3XD64-□□, and F3WD64□□.

Figure A3.25   40-pole Plug with Soldered Type for Input

● **Output Connector**

Front view with soldered type   FA030604.VSD
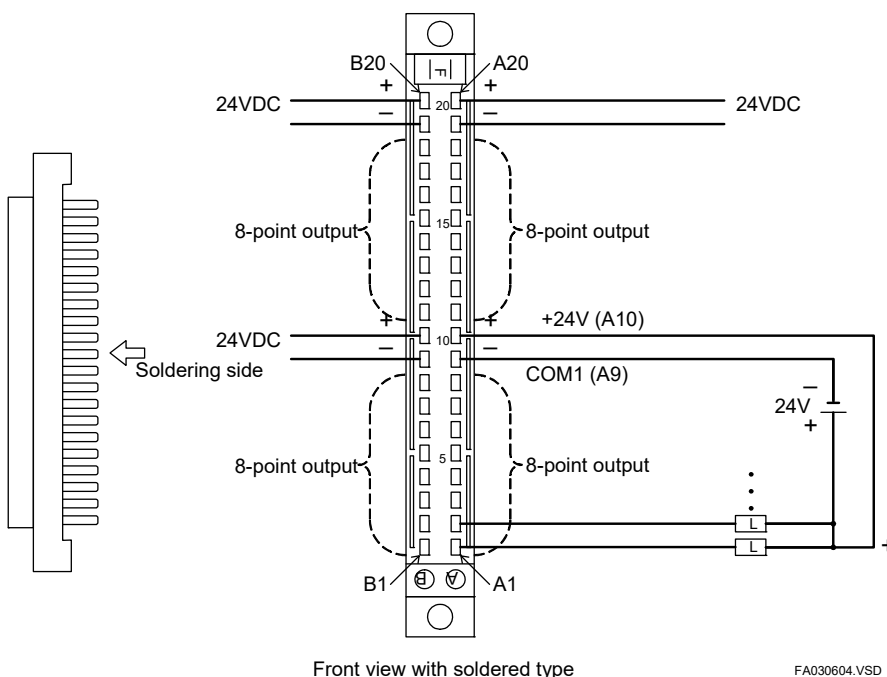
*:   The pin layout is the same for the connectors on the F3YD32-□□, F3YD64-□□, and F3WD64-□□.

Figure A3.26   40-pole Plug with Soldered Type for Output

(3)   Wiring
Wire I/O modules so that they can be replaced if necessary. Route the cables so that they do not get in the way when viewing the I/O status on the display of an I/O module.

A3.6.4 Connecting Input Devices

Refer to this subsection when selecting or connecting the FA-M3 to input devices.

(1) Examples of Connection to DC Input Devices

FA030605.VSD
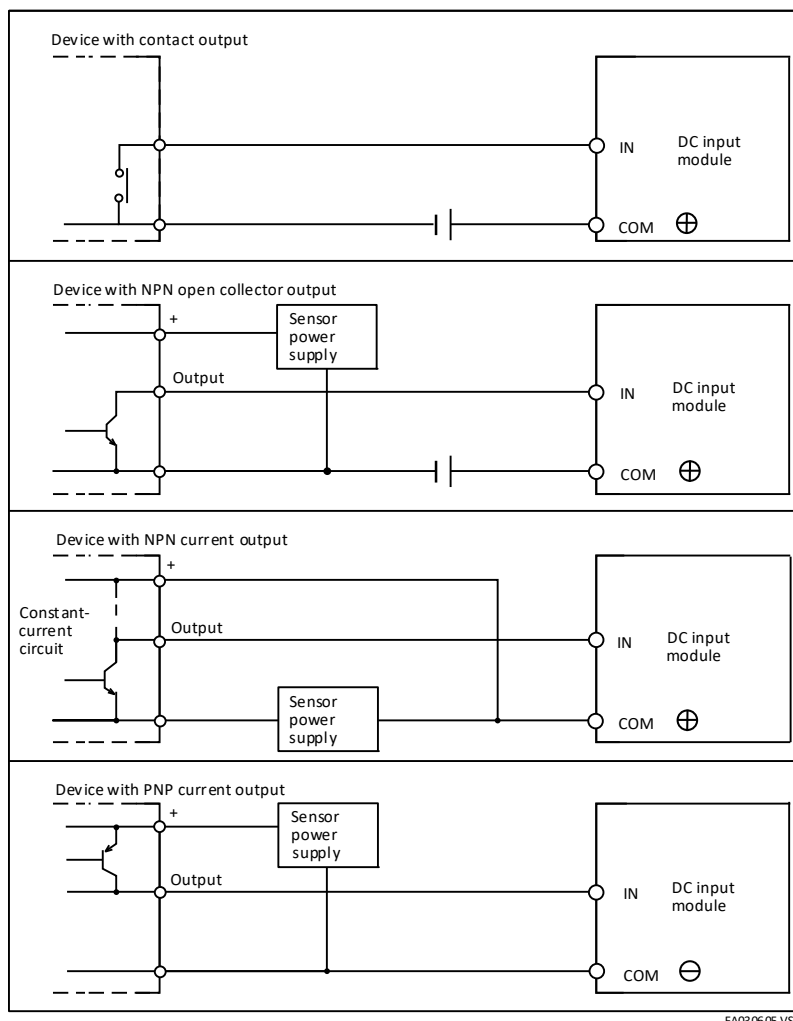
Figure A3.27   Examples of Connection to DC Input Devices

(2) Examples of Connection to AC Input Devices

FA030606.VSD
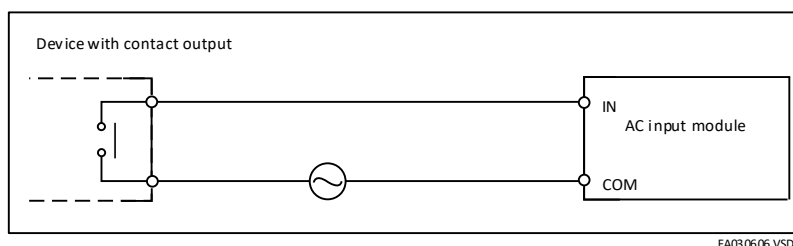
Figure A3.28   Example of Connection to AC Input Devices

(3) Inductive Load Countermeasures

If an inductive load is to be connected to the input block, connect a surge protector or a diode across the load nearby so that the module input voltage will not exceed the specified operating voltage range.
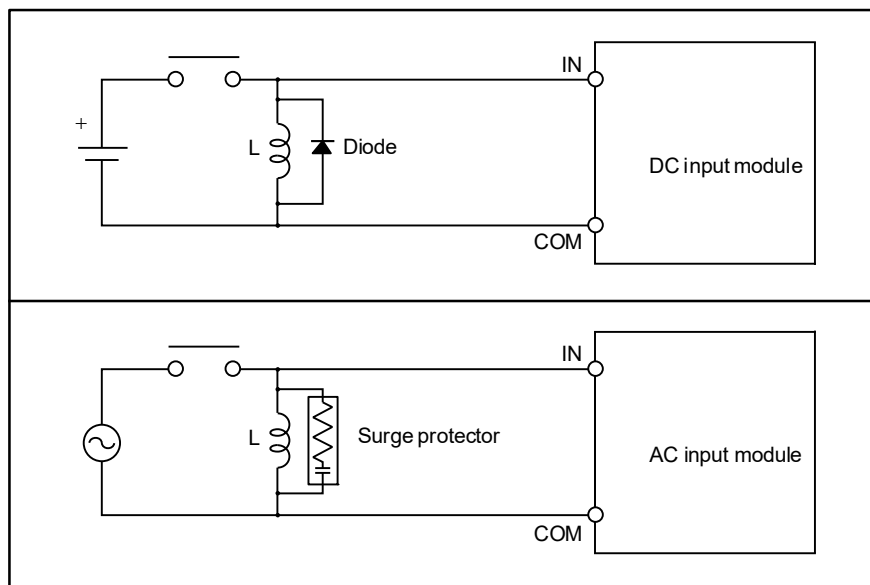
FA030607.VSD

● **Surge protector**

0.5 to 1 Ω with respect to 1V contact voltage
1 to 0.5 µF, rated voltage or higher, with respect to 1 A contact current

FA030608.VSD

● **Diode**

The reverse voltage must be at least three times the size of the circuit voltage and the forward current at least twice the size of the current flowing through the inductive load.
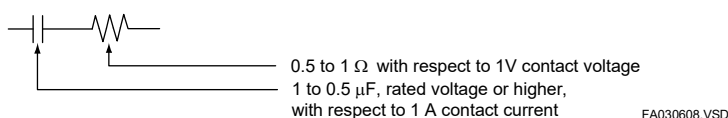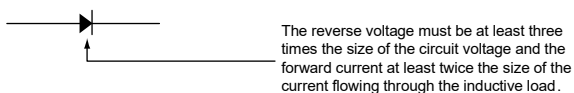
FA030609.VSD

Figure A3.29   Inductive Load Countermeasures for Input Modules

(4) Leakage Current Considerations
There are cases in which a 2-wire sensor (proximity switch, photoelectric switch, etc.) or a limit switch with an LED indicator may cause faulty input signal generation or illumination due to leakage current. There is no problem if the leakage current is smaller than the "off current" that is specified for the module. In situations in which it is likely that the leakage current exceeds the off current, however, add a bleeder resistance as shown in the figure below to lower the input impedance.

$$R \leq \frac{Rin \times VOFF}{Rin \times I - VOFF}$$

where
$$Rin = \frac{Ein}{Iin}$$

$$W \leq \frac{Ein2}{R} \times K \quad [mW]$$

R : bleeder resistor (kO)
Rin : input impedance of the DC input module (kO)
Ein : rated input voltage of the DC input module (V)
Iin : rated input current of the DC input module (mA)
Voff : OFF voltage of the DC input module (V)
I : leakage current of the device (mA)
W : wattage of the bleeder resistor (mW)
K : power margin of the bleeder resistor

Note: Ensure that $K \geq [2$.

FA030610.VSD

A3.6.5   Connecting Output Devices

Observe the following precautions when connecting the FA-M3 to output devices.

If an inductive load is to be connected to the output block, connect a surge protector or a diode across the load nearby so that the module output terminal voltage will not exceed the specified operating load voltage range.
When connecting a diode, connect its cathode to the positive terminal of the power supply.

FA030611.VSD

● **Surge protector**

0.5 to 1Ω for 1 V contact voltage
0.5 to 1μF, rated voltage or higher, for 1 A contact current

FA030612.VSD

● **Diode**

The reverse voltage must be at least three times the size of the circuit voltage and the forward current at least twice the size of the current flowing through the inductive load.

FA030613.VSD
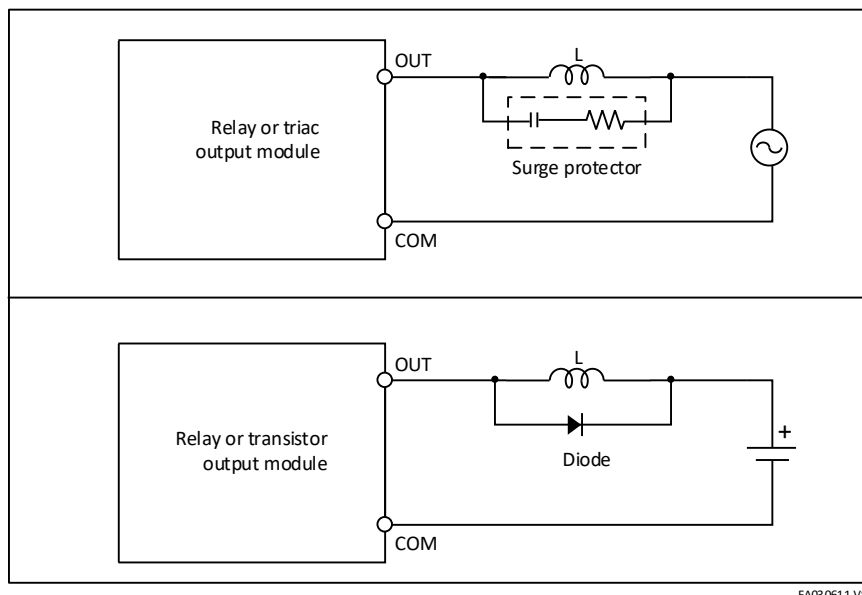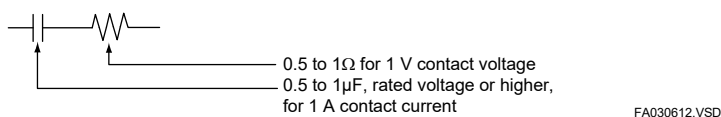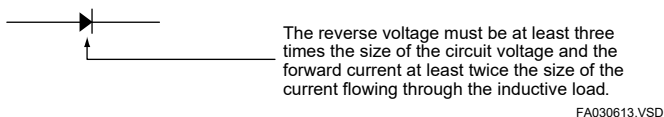
Figure A3.30   Inductive Load Countermeasures for Output Modules

■ Connection of external power supply

In the module with the output signal, connect the external power supply and the load power supply with the same switch; turn on-off the power supply at the same time.

When the external power supply and the load power supply are turned on or off separately, non-intended output may occur.

■ Inrush Current Countermeasures

When connecting an incandescent lamp or other load that generates large inrush current, it is necessary to take special caution to prevent fatal damage to the output elements. Examples of ways to suppress inrush currents are illustrated below.

Examples

● Flowing dark current at one-third the rated value into the incandescent lamp
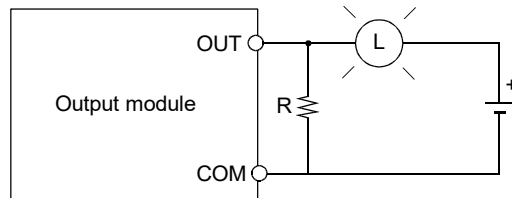
● Inserting a current-limiting resistor
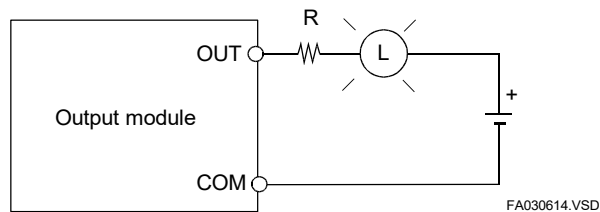
FA030614.VSD

Figure A3.31   Examples of Inrush Current Countermeasures

A3.7   External Cable Routing Requirements

It is especially desirable that the requirements given in this section be satisfied in the routing of the controller's signal cables, power supply cables and power-motive cables of the devices.

● Isolating Cables

When routing cables, segregate by at least 20cm cables that may become noise sources such as power-motive cables and power supply cables from signal cables that are susceptible to noise, as shown in figures A3.32 and A3.33.

If that is not possible, separate the cables by putting a separator between them as shown in figure A3.34.
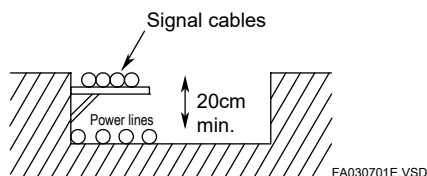
Figure A3.32 Segregation Using Cable Rack
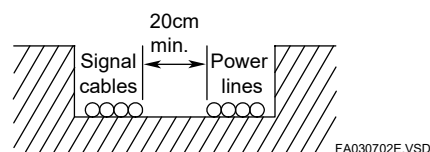
Figure A3.33 Segregation in Parallel Routing
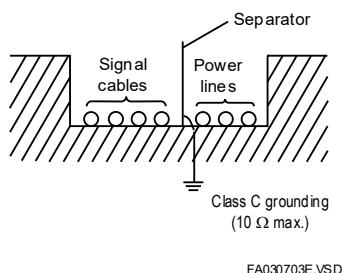
Figure A3.34   Segregation Using Separator

● Perpendicular Crossing of Cables

If the signal cables cross power-motive cables or power supply cables, lay them perpendicular to each other. If no shielded cable is used, it is recommended that a steel plate of at least 1.6mm thick be placed between the two sets of cables at their intersection as shown by the dotted lines in Figure A3.35.
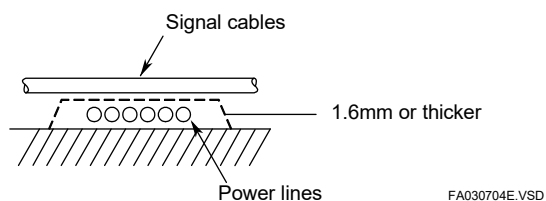
Figure A3.35   Perpendicular Crossing of Cable

A3.8   Calculating Power Consumption

Although the maximum power consumption is shown in item (1) "Common Specifications" in Section A2.1, "Specifications," it actually differs depending on the number and types of modules installed. Calculate the power consumption according to the formulae shown below after reading Section A2.9, "Module Current Consumption Tables."

● When using an F3PU10, F3PU20 or F3PU30 power supply module

$$\text{Power Consumption (W)} = \frac{5 \ [V] \times \Sigma \ (\text{dissipating currents of individual modules}) \ [A]}{\eta} \ [W]$$

$$\text{Power Consumption (VA)} = \frac{5 \ [V] \times \Sigma \ (\text{dissipating currents of individual modules}) \ [A]}{\eta \times COS\varphi} \ [VA]$$

η : Efficiency (approx. 0.65)
$COS\varphi$: Power factor (approx.0.4 to 0.5)

● When using an F3PU16, F3PU26 or F3PU36 power supply module

$$\text{Power Consumption (W)} = \frac{5 \ [V] \times \Sigma \ (\text{dissipating currents of individual modules}) \ [A]}{\eta} \ [W]$$

η : Efficiency (approx. 0.65)

FA030705.VSD

To estimate the temperature increase within the panel enclosure, you need to calculate the total power consumed within the panel enclosure. To do so, you need to add to the power consumption of the power supply module described above, the external power supplied to I/O modules of the FA-M3, as well as the power consumption of peripheral equipment installed within the panel enclosure.

Some examples for calculation of external power supplied to I/O modules of the FA-M3 are given below.

Example 1: Assume that all points of the F3XD32-3F are ON. Rated current input per point is 4.1mA, so power consumption at the module is:

4.1 [mA] x 24 [V] x 32 [points] = 3148.8 [mW] = 3.15 [W]

Example 2: Assume that 30 points of the F3YD64-1F are ON with a load current of 0.1A. For this module, power loss at the output transistors must be considered. The ON voltage is 0.5V max. and the load current per transistor is 0.1A, so power loss at transistors is:
0.5 [V] x 0.1 [A] x 30 [points] = 1.50 [W]
The external power supply is 24V/150mA, so power consumption at external loads is:
24 [V] x 150 [mA] = 3600 [mW] = 3.60 [W]

Example 3: Assume that the F3DA04-1N is used. The external power supply is 24V/180mA, so power consumption at external loads is:

24 [V] x 180 [mA] = 4320 [mW] = 4.32 [W]

For power consumption of peripheral equipment installed within the panel enclosure, calculate and total the power consumptions of all pieces of the equipment.

A3.9   CE Marking Conformance

■ About CE Marking

CE Marking aims to integrate the safety regulations existing in countries within the EC community and ensure free circulation (movement) of products guaranteed to be safe. A manufacturer or importing agent is legally obligated to display a CE mark on a product circulated or marketed within the EC community showing conformity to the requirements of EU directives that are applicable to the product. [*1]

Each EU directive covers a certain range of equipment; the FA-M3 is required to conform to the EMC directive (2014/30/EU), the Low Voltage directive (2014/35/EU) and the RoHS directive (2011/65/EU).

Each directive describes only the essential requirements; an equipment manufacturer is required to test the conformance of equipment to directives applicable to the equipment before displaying the CE Mark on the equipment.

*1 : The CE Mark of the FA-M3 is shown on the system name plate on the base module.
For details on modules conforming to the CE Marking, see Appendix A2, "Approved/Compliant modules."

■ Standards Structure

Figure A3.36 shows a conceptual diagram of the CE Marking standards structure.
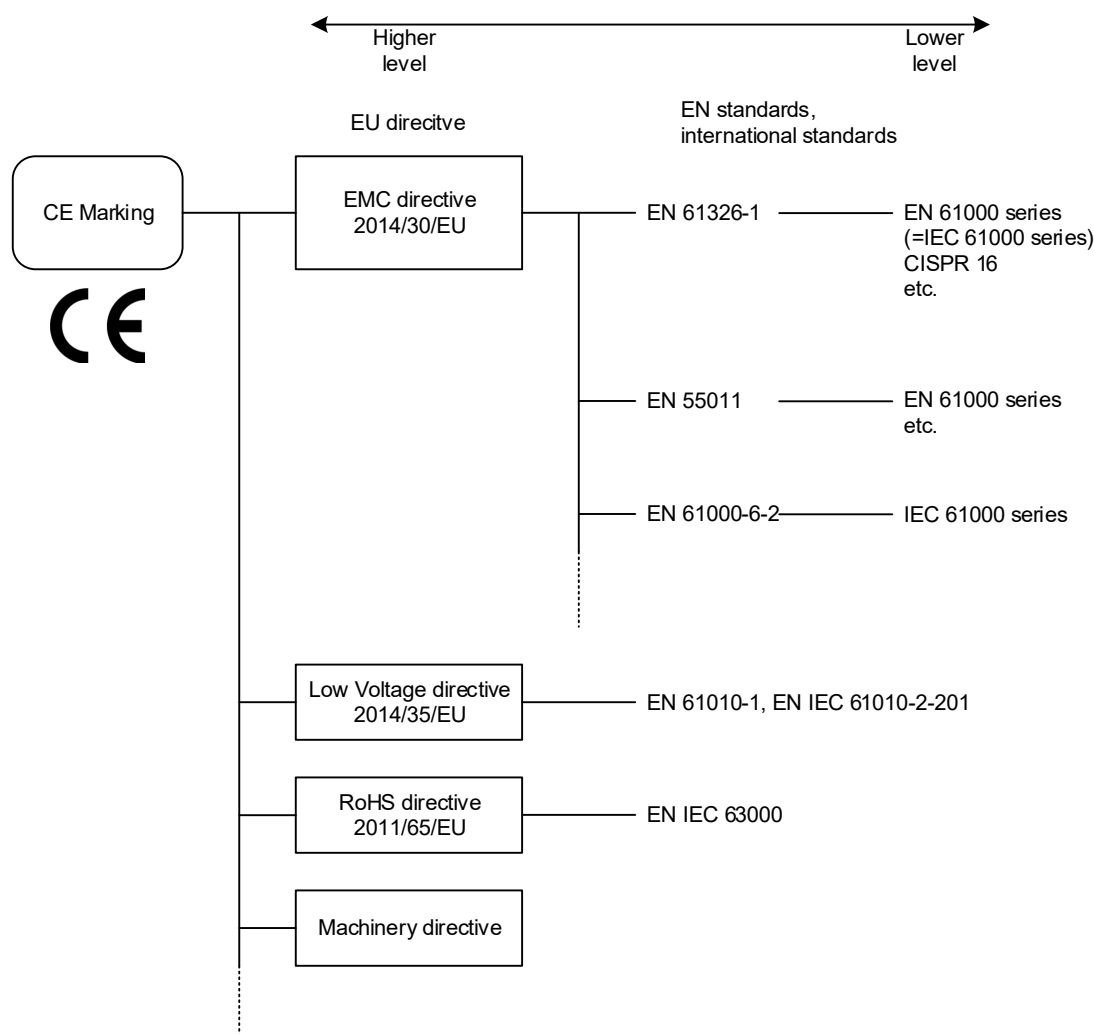
Figure A3.36   Conceptual Diagram of Standards Structure

A3.9.1   EMC Directive

(1) Requirements of EMC Directive

The EMC directive applies to equipment that may emit electromagnetic disturbances or equipment that may be damaged by electromagnetic disturbances.

The EMC directive requires that the electromagnetic disturbances emitted by equipment to not exceed a tolerable level, and that equipment maintains a minimum level of immunity to electromagnetic disturbances. This section summarizes the considerations to ensure that the FA-M3 conforms to the EMC directive. However, the installation manufacturer needs to test and confirm the conformity to the EMC directive of the finished product incorporating the FA-M3.

(2) Applicable Standards of the EMC Directive

The standards applicable to the FA-M3 are given in tables A3.1 and A3.2

Modules declaring conformity to the CE Mark satisfy the specified values and performance criteria displayed in the tables. For details on modules conforming to the CE Marking, see Appendix A2, "Approved/Compliant modules."

From the safety viewpoint of the Low Voltage directive, it is necessary to install and use the equipment within a panel enclosure. The EMC directive conformance test is conducted with the equipment installed in a general panel enclosure. The panel enclosure used during the test has an emissive noise attenuation characteristic of 15dB average and 25dB maximum (from 30 to 1000MHz).

Table A3.1   Applicable Standards of EMC Directive (Emission)

	Applicable Standard	Test Name/ Reference Standards	Test Description[3]	Specified Value
Emission	EN 61326-1 EN 61326-2-3[1] EN 55011 Class A Group1	Emissive electromagnetic noise CISPR 16-1 CISPR 16-2 CISPR 11	Measures the electric wave disturbance which the equipment emits to the external space	30 to 230MHz: 40dBμV/m (QP[2],10m method) 230 to 1000MHz: 47dBμV/m (QP,10m method)
		Power supply terminal Noise CISPR 16-1 CISPR 16-2 CISPR 11	Measures the noise level which the equipment emits to a power supply line.	0.15 to 0.5MHz: 79dBμV (QP),66dBμV (AV[2]) 0.5 to 30MHz: 73dBμV (QP),60dBμV (AV)
	EN 61000-3-2	Power supply harmonic EN 61000-3-2	Measures the size of the harmonic current generated by the power supply of the equipment.	Class A Equipment: Even 2nd harmonic current: 1.08A or less 4th harmonic current: 0.43A or less 6th harmonic current: 0.30A or less : Odd 3rd harmonic current: 2.30A or less 5th harmonic current: 1.14A or less 7th harmonic current: 0.77A or less : Values specified for up to the 40th harmonic current (description omitted here) The FA-M3 belongs to category A but its input is below 75W and hence it lies outside the applicable scope of the standard.
	EN 61000-3-3	Flicker EN 61000-3-3	Measures the voltage fluctuation in the power supply system due to fluctuations in the current consumed by the equipment.	Short flicker index: Pst < 1 Long flicker index: Plt < 0.65 Relative steady voltage fluctuation: dc < 3.3% Maximum relative voltage fluctuation: dmax < 4% Voltage fluctuation time: time where voltage fluctuations exceeds 3.3% should be less than 500ms

*1:   EN 61326-2-3 is applicable only to F3CU04-□□.
*2:   QP : Quasi-Peak   AV: Average value
*3:   USB port on the CPU module is excluded from the EMC test since it is intended for maintenance purposes and not used in actual operation.

Table A3.2   EMC Directive Applicable Standards (Immunity)

	Applicable Standard	Test Name/ Reference Standards	Test Description[4]	Test Value <Performance Criterion[2]>
Immunity	EN 61326-1 EN 61326-2-3[1] EN 61000-6-2	Static electricity discharge immunity EN 61000-4-2 IEC 61000-4-2	Measures the immunity to static electricity discharge	Contact discharge ±4kV (static electricity discharge to the panel enclosure where the FA-M3 system is installed) <Performance criterion B>
		Emissive electric field Immunity EN 61000-4-3 /A1 IEC 61000-4-3 /A1	Measures the immunity when electric field noise is radiated	10V/m: 80 to 1000MHz 3V/m: 1.4 to 4GHz (80% AM modulated, 1kHz) <Performance criterion A>
		High speed transient burst immunity EN 61000-4-4 IEC 61000-4-4	Measures the immunity when burst noise overlaps the power supply line and signal lines	±2kV: power supply line ±1kV: signal line (Tr/Th=5ns/50ns, repeat frequency of 5kHz, pulse width of 15ms and burst cycle of 300ms) <Performance criterion B>
		Surge immunity EN 61000-4-5 IEC 61000-4-5	Measures the immunity when surge voltages induced by transient phenomena (switching or lightning) overlaps the power supply line or signal lines.	Between the lines ±1kV: power supply line To the ground ±2kV: power supply line, ±1kV: signal line [3, *5] (Tr/Th=1.2μs/50μs (8μs/20μs)) <Performance criterion B>
		Conductivity immunity EN 61000-4-6 IEC 61000-4-6	Measures the immunity when external electric field noise overlaps a power supply line or signal line.	10V: 0.15 to 80MHz (80% AM modulated, 1kHz) <Performance criterion A>
		Main power supply frequency magnetic immunity EN 61000-4-8 IEC 61000-4-8	Measures the immunity when magnetic field caused by power supply frequency is applied	30A/m : except CRT 1A/m : CRT (50/60Hz) <Performance criterion A> This does not apply since currently, no element (component) which is sensitive to magnetic field is used in modules which carry a CE Marking conformance declaration.
		Power supply dip /momentary failure EN 61000-4-11 IEC 61000-4-11	Tests the operation when the voltage of a power supply dips or when a momentary power supply occurs	30% dip, 25 cycle <Performance criterion C> 60% dip, 10 cycles <Performance criterion C> 100% dip, 1 cycle <Performance criterion B> 100% dip, 250 cycles <Performance criterion C>

*1:   EN 61326-2-3 is applicable only to F3CU04-□□

*2:   The following criteria are used to determine conformity to a standard:
Performance criterion A: The equipment continues to operate according to specification.
Performance criterion B: There is a temporary drop in performance but the equipment continues to operate according to specification after the noise disappears.
Performance criterion C: There is a temporary failure which can be recovered by the self-recovery function or by operator intervention.
Performance criterion D: Non-recoverable failure due to equipment damage.

The conformance criteria of EN 61326-2-3 are, however, applied to F3CU04-□□.

*3:   Conforming to the standard, the 24V DC line of YHLS Slave Units (TAH Series) is treated as a signal line.

*4:   USB port on the CPU module is excluded from the EMC test since it is intended for maintenance purposes and not used in actual operation.

*5:   RS-232-C communications on F3SP□□, F3RP□□, F3UM13, F3LC□□, F3RZ8□ are excluded from surge test since they are indoor use only.

> ⚠️ **CAUTION**
>
> This product is classified as Class A for use in industrial environments. If used in a residential environment, it may cause electromagnetic interference (EMI). In such situations, it is the user's responsibility to adopt the necessary measures against EMI.

(3) Installation Considerations

From the safety viewpoint of the Low Voltage directive, this equipment should be installed within a panel enclosure. Using a metallic panel enclosure achieves the shield effect from the EMC viewpoint. The EMC directive conformance test is conducted with the equipment installed within a general panel enclosure.

The panel enclosure used during the test has an emissive noise attenuation characteristic of 15dB average and 25dB maximum (from 30 to 1000MHz).

The considerations that should be observed when installing the FA-M3 are summarized below. Figure A3.37 illustrates this graphically.

- Use a metallic panel enclosure and metal plate to install the equipment.
- Ground the panel enclosure and metal plate using braided or other wires to ensure low impedance even at high frequencies.
- Use shielded cables for signal cables leading out of the panel enclosure and ground the shield at both ends of the cable.
- Secure the base module of this equipment directly onto the metal plate using screws.
- Connect the both FG terminal and LG terminal of the power supply module of this equipment to the grounding terminal or metal plate with the shortest wiring possible.
- When coating the metal plate of the panel enclosure, mask the following parts and expose the metallic surface to ensure electrical conductance.
    - the bolts that mounts the FA-M3 to the panel enclosure
    - The contact surface to the aluminum chassis of the base module
    - The connection to the wiring to the FG and LG terminals of the power supply module.
    - The location of the FG clamp for the shielded cable.
- Design the system so that the opening of the panel enclosure is as small as possible to minimize possible leakage of noise generated within the panel enclosure. It is recommended that the diameter of the opening for the cable should be less than 100mm and that of the opening for ventilation should be less than 125mm.

Note

Take the following corrective actions for problems encountered during the installation.

- In case of noise leakage from the opening for the cable, wrap the cables using shield covers, shield tubes, conduit pipes, etc. to prevent noise leakage.

Item	Manufacturer	Product
Shield cover	Nitto Industries, Inc.	SDF-03-04-35ES
Shield tube	Nippon Zipper Tubing, Inc.	OTFX series MTFX series SHX series SHNX series
Conduit pipe	Nitto Industries, Inc.	EMP series

- In case of noise leakage from the ventilation hole, install an electromagnetic shield filter.

Item	Manufacturer	Product
Electromagnetic shield for the ventilation hole	Nitto Industries, Inc.	RSLP series

- In the case of noise leakage from the gap between the panel enclosure and the door, use electromagnetic shield gasket to fill the gap.

Item	Manufacturer	Product
Electromagnetic shield gasket	Kitagawa Industries, Inc.	UC series
	Nippon Zipper Tubing, Inc.	65TS series

- Using a grounding strap to connect the metal plate and the door to the panel enclosure itself may achieve better grounding.

Item	Manufacturer	Product
Grounding strap	Kitagawa Industries, Inc.	FGM series
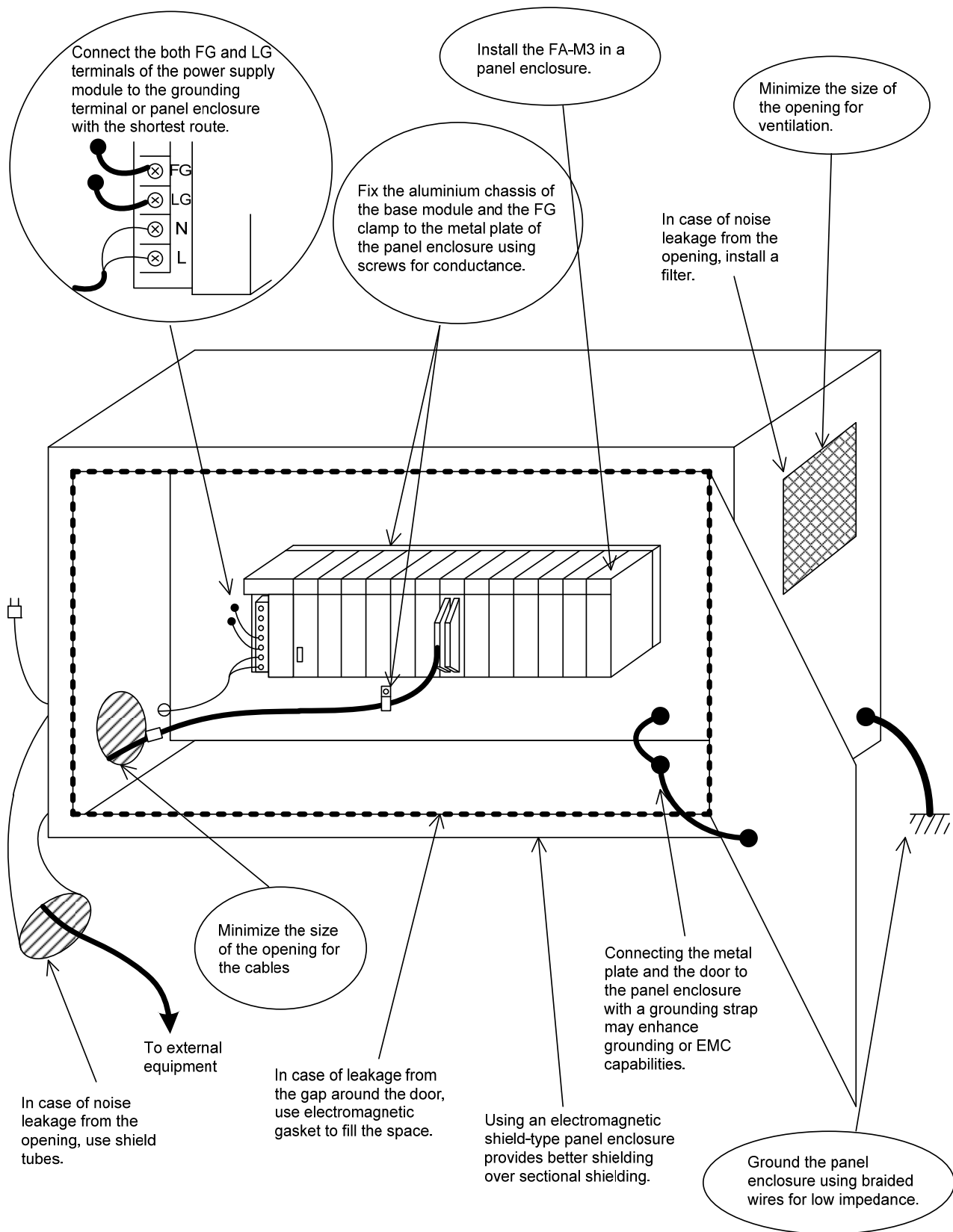
Figure A3.37 Example of Installation Measures

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(4) Considerations on Cable Routing

Signal cables that are connected to the FA-M3 carry harmonic components. The signal cable acts like an antenna and emits these harmonic components as noise to the external space and at the same time receives the noise from the external space.

Therefore, it is necessary to use shielded signal cables.

The EMC conformance test of the FA-M3 is conducted using shielded cables and FG clamps.

The considerations that should be observed during cable routing are summarized below. Figure A3.38 illustrates this graphically.

- Of the signal cables connected to this equipment, those that lead out of the panel enclosure should be shielded and the shield at both ends of the cable should be grounded. 10BASE-T and 100BASE-TX cable sections that lead out of the panel enclosure (say, to connect to a HUB) should be shielded.

Item	Manufacturer	Product
Shielded twisted cable	Fuji Cable Industries, Inc.	FKEV series
Shielded flat cable	Oki Cable, Inc.	SFX-S (**)-7/0.127 3030-SV series
	Daichi Electrical Materials, Inc.	FDS series
Shielded 10BASE-T cable Shielded 100BASE-TX cable	Allied Telsis, Inc.	Category V shielded cable
	Sanwa Supply, Inc.	STP cable
	Hitachi Cable, Inc.	HSTP5 4P (without connector)

- Remove part of the covering on a shielded cable to expose the shield and ground it to the metal plate of the panel enclosure by an FG clamp. When connected to the metal plate in a pig-tail way using a drain wire, it cannot ensure low impedance against harmonic noise and cannot provide sufficient grounding effect (noise shield effect).

Item	Manufacturer	Product
FG clamp	Kitagawa Industries, Inc.	FGC series

- Power supply cables of power supply modules (F3PU30-0S and F3PU36-0S) and YHLS Slave Units (TAH Series) should be fitted with ferrite cores to prevent interference emission.

Item	Manufacturer	Product
Ferrite core	Kitagawa Industries, Inc.	RFC series
	TDK, Inc.	ZCAT series
	NEC Tokin, Inc.	ESD-SR series

Note

Adopt the following corrective actions if necessary when routing the cables.

- Make the wiring cable as short as possible. This minimizes noise emission from the cable and noise receipt on the cable.

- Fit a ferrite core around signal cables susceptible to noise to reduce the effect of the noise. Ferrite core should be fitted near the cable outlet of the panel enclosure.

- When routing cables that are susceptible to noise, isolate them from cables that are noise sources.

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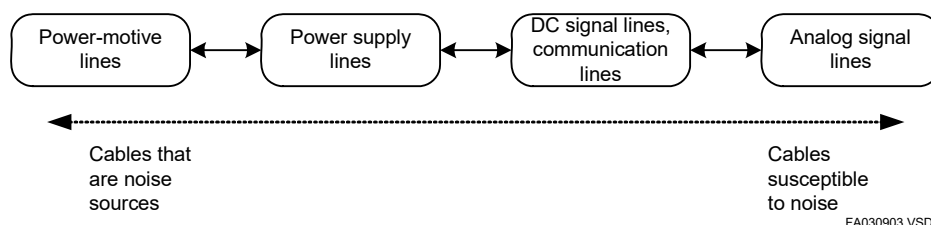
There are several ways to achieve isolation when routing the cables.

- Isolation by distance (Route cables at least 20cm away from power-motive cables and at least 10cm away from other cable groups).

- Place a grounded metal plate between the cables.

- Route each cable group through a grounded metal conduit or a shielded tube.

- When inserting a filter on a cable, make sure that wiring before and after the filter is sufficiently far apart. Otherwise, noise may transfer to other cable sections and reduce the effectiveness of the filter.
  Pay special attention to the following areas:

  - Noise filter inserted in the power supply cable

  - Ferrite core fitted around signal cables

  - Noise reduction circuits (surge protector circuit, arrestor circuit, etc.) inserted into signal cables

(5) Considerations for 24V DC Power Supply to YHLS Slave Units (TAH Series)
- Use a dedicated 24V DC power supply for the TAH series. Avoid sharing power with other equipment.

- The power supply should incorporate an internal noise filter.

- A ferrite core should be fitted on the power cable.

Route wires before and after the filter apart.

Noise filter

Fitting ferrite cores on I/O cables is expected to improve EMC performance. Ferrite core, if fitted, should be near the opening of the panel enclosure.

Fit ferrite cores on power cables of YHLS slave units (TAH series), F3PU30-0S and F3PU36-0S.

HUB

To networks

Minimize cable wiring.

To external equipment

Power-motive cable of motors, etc.

Route cables away from noise sources.

Shielded cable

FG clamp

Remove part of the insulation of a shielded cable and ground the exposed shield to the metal plate of the panel enclosure using an FG clamp.

Ensure that Ethernet, DeviceNet, GP-IB and other cables leading out of the panel enclosure for connection to external equipment are shielded cables and their shield is grounded using FG clamps.

Pig-tail grounding does not provide sufficient grounding.

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Figure A3.38   Example of Routing Measures

A3.9.2   Low Voltage Directive

(1) Requirements of Low Voltage Directive

The Low Voltage directive is applicable to equipment that operates with a rated voltage between 50 to 1000V AC or between 75 to 1500V DC. It requires equipment to be manufactured according to safety considerations and not pose risks of injury or death to personnel, livestock, or damage to property when used in applications for which they are designed.

This section summarizes the considerations to ensure that the FA-M3 conforms to the Low Voltage directive. The installation manufacturer needs to test and confirm the conformity to the Low Voltage directive of the finished product incorporating the FA-M3.

(2) Applicable Standards of the Low Voltage Directive

EN 61010-1

Safety requirements for electrical equipment for measurement, control and laboratory use

Part 1: General Requirements

EN IEC 61010-2-201

Safety requirements for electrical equipment for measurement, control and laboratory use

Part 2-201: Particular requirements for control equipment

EN IEC 61010-2-030

Safety requirements for electrical equipment for measurement, control and laboratory use

Part 2-030: Particular requirements for testing and measuring circuits

The Low Voltage directive is not applicable to modules that operate with a rated voltage of less than 50V AC or less than 75V DC. Modules that bear the CE declaration of conformity and fall within the scope of the Low Voltage directive satisfy the requirements of the above standards.

EN IEC 61010-2-030 should be applicable to measuring circuits of measurement equipment, and is applied only to analog input circuits of FA-M3 series.

The analog input terminals of the FA-M3 have no measurement categories. Therefore it can't use for measurement on Mains Circuit.

For details on modules conforming to the CE Marking, see Appendix A2, "Approved/Compliant modules."

(3) Installation Considerations

- Use the FA-M3 in an Overvoltage Category II environment.
  Overvoltage categories are divided into 4 categories depending on the rate of attenuation of surge voltages induced by lightning.
  Figure A3.39 shows a conceptual diagram for the overvoltage categories.

Overvoltage category I : Applies to signal systems with rated voltage 60V or less.
Special equipment or components of equipment, remote communication, etc.
Overvoltage category II : Applies to station systems with rated voltage 220/230/240V.
Electrical appliances, portable equipment, etc.
Overvoltage category III: Applies to distribution systems with rated voltage 220/230/240V or 380/400/415V.
Fixed installation equipment.
Overvoltage category IV: Single-supply systems with rated voltage 380/400/415 V or more.
Lines and cable systems, etc.

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Figure A3.39   Concept of Overvoltage Categories

- Use the FA-M3 in an environment of pollution degree 2 or lower with no condensation.

  The term pollution degree represents the degree of pollution with foreign matter, solid, liquid or gaseous, that may produce a reduction of dielectric strength or surface resistivity in the operating environment of the equipment.

  The EN 61010-1 and EN IEC 61010-2-201 applies to equipment that is used in environment of pollution degree 1 or pollution degree 2; the FA-M3 is designed for use in an environment of pollution degree 2 with no condensation.

  The definitions for the pollution degree levels are given below.

  Pollution degree 1:

  No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

  Pollution degree 2:

  Normally only non-conductive pollution occurs. Occasionally, temporary conductivity caused by condensation is to be expected.

  Pollution degree 3:

  Conductive pollution occurs, or dry, nonconductive pollution occurs that becomes conductive due to condensation that is to be expected.

Pollution degree 4:

The pollution generates persistent conductivity.

- Install the FA-M3 in a metallic panel enclosure.
  - INDOOR USE ONLY
  - The FA-M3 must be installed in a metallic panel enclosure, because the FA-M3 is a open equipment.
  - Use a metallic panel enclosure which complies with the requirement of EN 61010-1 and EN IEC 61010-2-201.(IK08 or more.)
  - Ground the panel enclosure and the metal plate.
  - Connect the both FG and LG terminals of the power supply module to the grounding terminal or the metal plate with the shortest route possible.
  - As a measure to protect against electric shock, design the door of the panel enclosure such that it can only be opened using a key or special tool, and thus only accessible to authorized personnel with adequate electrical knowledge such as system designers or maintenance personnel.
  - When the cable is drawn out of metallic panel enclosure, use a flame-retardant cable of VW-1 class or more.

- Install an external switch or circuit breaker.

  As the power supply module of the FA-M3 does not have a built-in power supply switch, design the system with an external switch or circuit breaker which:
  - Is compliant with EN 60947,
  - Can disconnect all current-carrying conductors.
  - Is labeled as the power supply switch for the FA-M3 with its ON and OFF positions clearly marked.
  - Is installed near the FA-M3, within reach of an operator,
  - Is not obstructed by nearby objects such that its operation is hindered, and
  - does not disconnect the grounding wire from the FA-M3.

- Use the following external power supply unit to DC power supply modules and I/O modules.
  - Output circuit is insulated by double or reinforced insulation from hazardous voltage.
  - Overcurrent protection device is installed. If not, attach a fuse or a circuit breaker outside.

(4) Precautions in the withstand voltage test

⚠️ **CAUTION**

Figure A3.40 shows the insulation block diagram of FA-M3.

- FA-M3 provides protection against electric shock from each hazardous voltage by both basic insulation and protective earth.

- Apply the appropriate test voltage to the equipment incorporating the FA-M3 by referring to Fig.A3.40. Don't apply the excessive test voltage. It causes the trouble.

- In the FA-M3 module which doesn't handle hazardous voltage, the insulations between input-output terminals and internal circuits are functional insulations or non-insulations. In terms of safety standards, all of these insulations are treated as non-insulation. Therefore, in the withstand voltage test, don't apply the test voltage between these blocks.
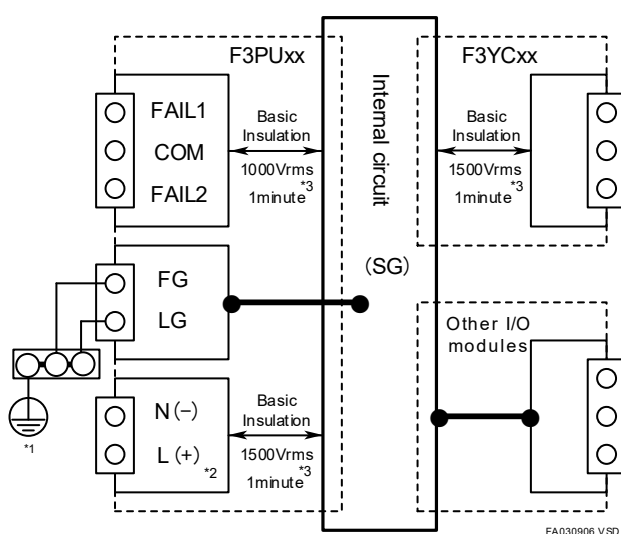
*1: Protective earth for the AC power supply.
    Functional earth for the DC power supply.
*2: L/N is for the AC power supply.
    (+)/(-) is for the DC power supply.
*3: The numerical values show the withstanding voltages.

Figure A3.40   Insulation block diagram of FA-M3

(5) Precautions about analog input terminal

⚠️ **WARNING**

Don't use analog input terminals of the FA-M3 for measurement on Mains Circuit, since it has no measurement category.

Maximum transient overvoltage that can be applied to the analog input terminal is 1,000V.

A4. Test Runs and Troubleshooting

A4.1 Test Run Procedure

Figure A4.1 shows the test run flowchart.

Step	Description
Preliminary check	
Installation check	Check the construction of the control panel and the FA-M3 installation. Check the installation of the individual modules.
Wiring check before power-on	Check cables to ensure that all cables are properly routed and connected to meet the wiring specifications.
Insulation and withstanding voltage test	The FA-M3 is a delicate electronic device. Special care must be taken to avoid damage to the device when checking the insulation of the machine or facility that uses this device.
Test run	
Supply voltage measurement	Before turning on the power, measure the supply voltage to ensure that it conforms to the given specifications.
Power-on test	Before turning on the power, take all possible measures to minimize any damage that might result from faulty wiring. Then, turn the power on and check for problems.
External wiring check	There are two ways to check the external wiring: by using a multimeter to examine the cables one at a time, or by actually turning the power on and looking for problems. The latter method may be hazardous for safety reasons and, therefore, require adequate care.
Safety circuit check	Start the test by checking the operation of safety circuits such as emergency-stop circuits and protective circuits which are actuated when the device gets into trouble.
Individual-mode operation	Test each operating mode by stepping through the machine or facility with push buttons.
Automatic operation	Run each of specific blocks of the machine or facility in the automatic mode or run a standalone test on the machine or facility in the automatic mode. Then, proceed to full automatic operation of the entire system.
Fault-simulating operation	Test to make sure that safety circuits actuates and reset normally when anomalies occur in the machine or facility.

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Figure A4.1 Test Run Flowchart

A4.2   Test Run Precautions

■ Attaching and Detaching Connectors and Modules

Be sure to turn off the power before connecting or disconnecting connectors or modules. Removing or replacing connectors or modules with the power on may result in permanent damage to the device.

■ Precautions in Modifying Programs

Make a backup copy of programs after modifying them as they may be altered during a test run.

A4.3 Self-diagnostic Functions

A4.3.1 CPU Module Operation at Power-on

Figure A4.2 shows the flowchart of CPU module operation at power-on time.
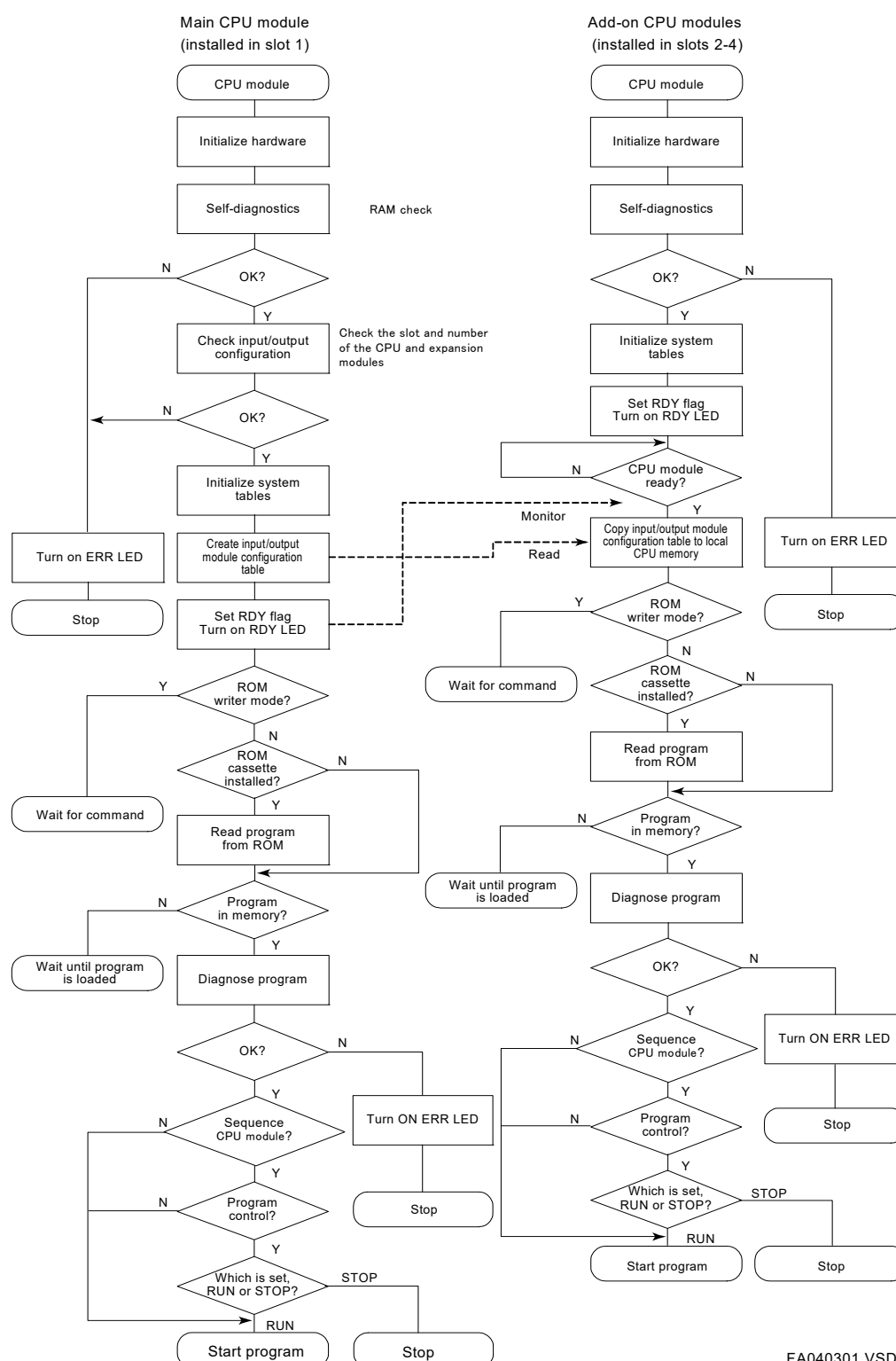
Figure A4.2 CPU Module Operation Flowchart (for CPU modules other than F3SP66-4S, F3SP67-6S, F3SP71-4N/4S and F3SP76-7N/7S)

Main CPU module (installed in slot 1)

Add-on CPU modules (installed in slots 2-4)
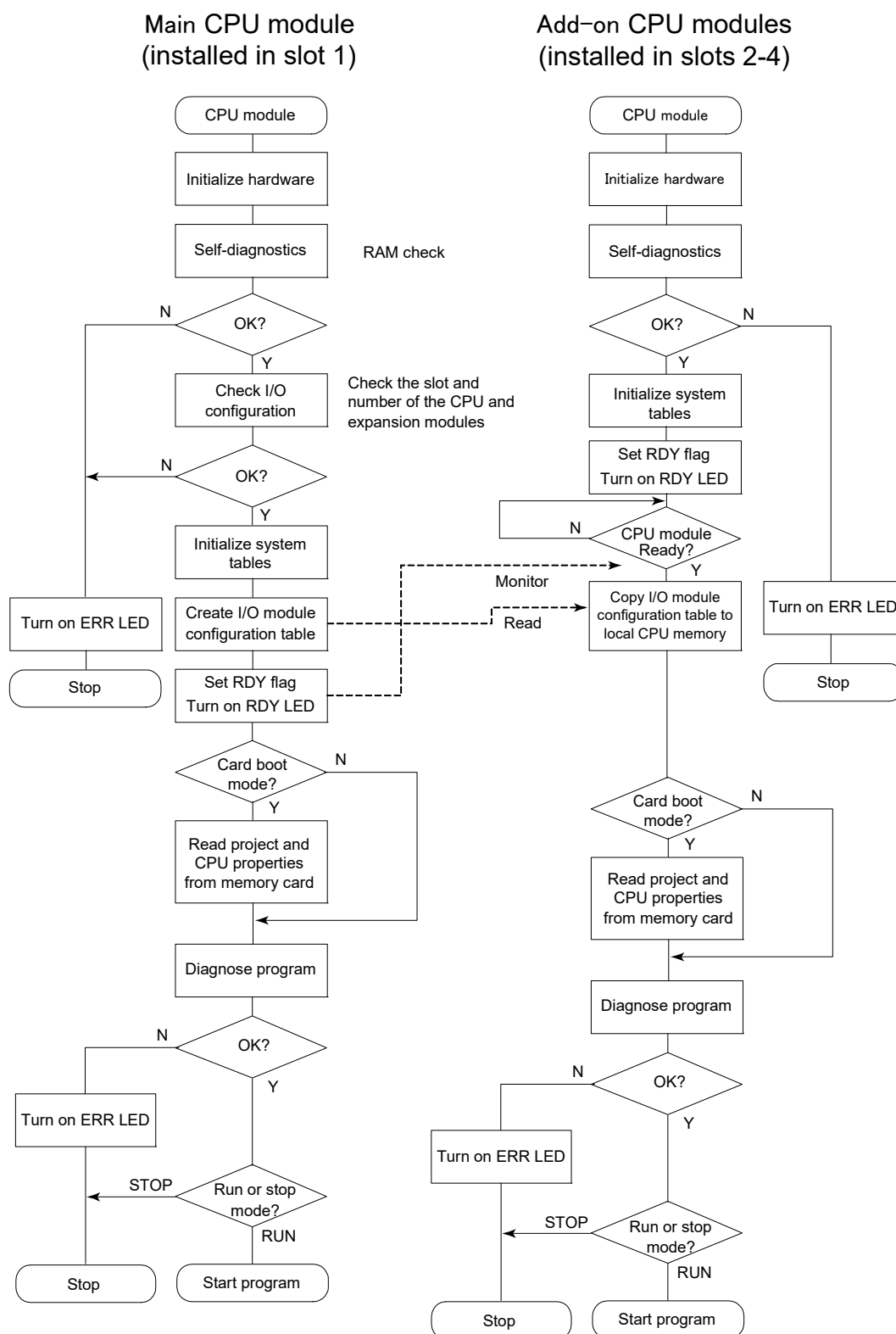
Figure A4.3   CPU Module Operation Flowchart (for F3SP66-4S, F3SP67-6S, F3SP71-4N/4S and F3SP76-7N/7S)

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A4.3.2   Fault Identification

The FA-M3 provides means to quickly identify system faults as illustrated in the following figure. This fault identification system is easy to understand because it is hierarchically structured to facilitate fault analysis by checking for faults at each level.
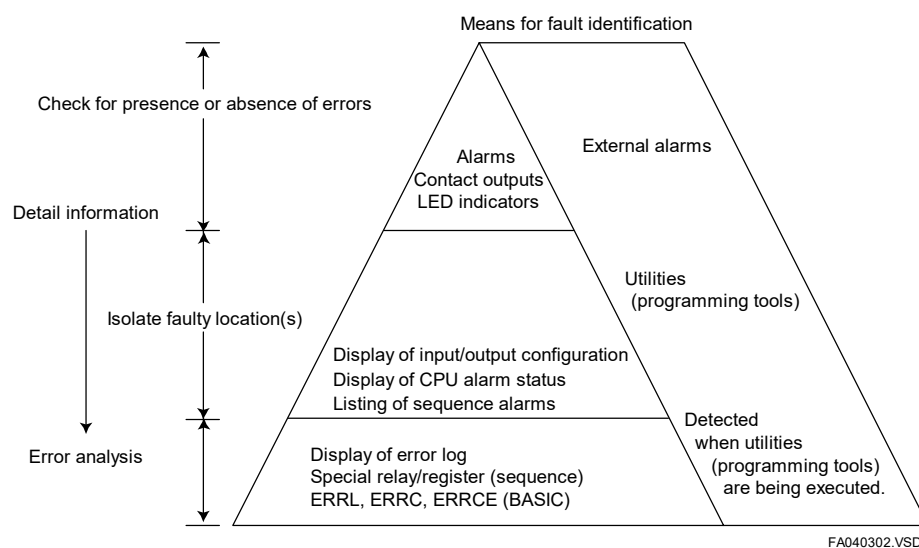
Figure A4.4   Means of Fault Identification

A4.3.3 Indicating Problem Severity and Status of Output Module

The FA-M3 indicates the presence or absence of failures by the LEDs in the upper section of the CPU module, classifying them into major, moderate and minor failures. Tables A4.1 to A4.3 summarize the failure severity levels and the status of the output module in each case.

See the Fiber-optic FA-bus Module and Fiber-optic FA-bus Type 2 Module, FA-bus Type 2 Module (IM 34M06H45-01E) for details on how the FAIL-signal contact output and output module work if a failure arises in a transmission line, such as a fiber-optic cable, in an application where a fiber-optic FA-bus type 2 module is in use.

Table A4.1 Failure Severity Levels and Status of Output Module
(when the CPU module is F3SP21/25/35 or F3FP36)

Severity Level	LED Indication	Effect	Probable Cause	Status of FAIL-signal Contact Output		Status of Output Module	
				Between FAIL1 and COM	Between FAIL2 and COM	Output modules other than F3YD64-1A, F3YD64-1M, F3WD64-□N	F3YD64-1A, F3YD64-1M, F3WD64-□N, Y□□□□□ [4]
Major	Green RDY lamp is off.	The core hardware is disabled.	· CPU error · Memory crash	Shorted	Open	Default: RESET Can be set globally on a module basis.	Setting ignored. The status is always HOLD.
Moderate	Red ERR lamp is lit.	The user program cannot be started or run any further.	· Program error[1] · I/O comparison error[1] · I/O module error [1] · Memory error · SPU error · Instruction error[1] · Scan timeout[1] · Startup error · Invalid instruction found · Number of I/O points exceeded · ROM pack error · Subroutine error[1] · Interrupt error · Subunit communication error[2]	Shorted	Open	Default: RESET Can be set globally on a module basis.	Default: RESET Can be set globally on a module basis.
Minor	Yellow ALM lamp is lit.	The program can still run In spite of a failure.	· Momentary power failure[5] · Inter-CPU communication error · Subunit transmitter switching has occurred[3] · FA link error	Open	Shorted	Operation continues	Operation continues

*1: The severity level of this error item can be set using the Error-time Action field under Operation Control of the Configuration. Setting the field to "Stop" indicates a moderate failure whilst setting it to "Run" indicates a minor failure. The default value is "Stop" (moderate failure).
*2: The severity level of this error item can be set using the Error-time Action field under Operation Control of the Configuration. Setting the field to "Stop" indicates a moderate failure whilst setting it to "Run" indicates a minor failure. The default value is "Run" (minor failure).
*3: When using F3SP21, F3SP25 or F3SP35 CPU modules Rev. 8 or later or F3FP36.
*4: Output relays (Y□□□□□) of the advanced modules.
*5: When supply voltage abnormality is detected, output modules behave differently depending on whether the standard mode or immediate detection mode is selected. Behaviors during momentary power failure in each mode are as follows:

Supply Voltage Abnormality Detection mode	Status of FAIL-signal Contact Output		Status of Output Module	
	Between FAIL1 and COM	Between FAIL2 and COM	Output modules other than F3YD64-1A, F3YD64-1M, F3WD64-□N	F3YD64-1A, F3YD64-1M, F3WD64-□N, Y□□□□□ [4]
Standard mode	Open	Shorted	Hold	Hold
Immediate detection mode	Shorted	Open	Reset	Hold

**Table A4.2   Failure Severity Levels and Status of Output Module
(when the CPU module is F3SP22/28/38/53/58/59/66/67/71/76)**

Severity Level	LED Indication	Effect	Probable Cause[5]	Status of FAIL-signal Contact Output		Status of Output Module	
				Between FAIL1 and COM	Between FAIL2 and COM	Output modules other than F3YD64-1A, F3YD64-1M, F3WD64-□N	F3YD64-1A, F3YD64-1M, F3WD64-□N, Y□□□□□ [3]
Major	Green RDY lamp is off.	Core hardware is disabled.	• Hardware failure • SPU error[6] • Memory error[6]	Shorted	Open	Default: RESET Can be set on a 16-point basis.	Setting ignored The status is always HOLD
Moderate	Red ERR lamp is lit.	The user program cannot be started or run any further.	• Startup error • Boot mode error • SPU error[6] • Memory error[6] • Invalid instruction found • Program error • Power Failure While Writing to a Flash ROM /Flash memory error • ROM pack error • Battery error/Memory check error • Subroutine error[1] • Interrupt error[1] • Instruction error[1],Macro instruction error[1] • I/O comparison error[1] • I/O module error[1] • Scan timeout[1] • Sensor CB scan timeout[1] • Subunit communication error[2]	Shorted	Open	Default: RESET Can be set on a 16-point basis.	Default: RESET Can be set on a 16-point basis.
Minor	Yellow ALM lamp is lit.	The program can still run In spite of a minor failure detected.	• Momentary power failure[4] • Inter-CPU communication error • Subunit transmitter switching has occurred • FA link error	Open	Shorted	Operation continues.	Operation continues.

*1:   The severity level of this error item can be set using the Error-time Action field under Operation Control of the Configuration.   Setting the field to "Stop" indicates a moderate failure whilst setting it to "Run" indicates a minor failure.   The default value is "Stop" (moderate failure).

*2:   The severity level of this error item can be set using the Error-time Action field under Operation Control of the Configuration.   Setting the field to "Stop" indicates a moderate failure whilst setting it to "Run" indicates a minor failure.   The default value is "Run" (minor failure).

*3:   Output relays (Y□□□□□) of the advanced modules.

*4:   When supply voltage abnormality is detected, output modules behave differently depending on whether the standard mode or immediate detection mode is selected. Behaviors during momentary power failure in each mode are as follows:

Supply Voltage Abnormality Detection mode	Status of FAIL-signal Contact Output		Status of Output Module	
	Between FAIL1 and COM	Between FAIL2 and COM	Output modules other than F3YD64-1A, F3YD64-1M, F3WD64-□N	F3YD64-1A, F3YD64-1M, F3WD64-□N, Y□□□□□ [3]
Standard mode	Open	Shorted	Hold	Hold
Immediate detection mode	Shorted	Open	Reset	Hold

*5:   It depends on model. Please refer to the user's manual of each model.

*6:   Depending on the content, it may cause major failure and moderate failure.

Note

- If you want to reset the contacts of an output module in the event of a major or moderate sequence CPU module failure, do the following: Use an output module with 32 or less points and set the Output When Stopped field under "Input/Output Setup" of the Configuration to "RESET". (For F3SP22/28/38/53/58/59/66/67/71/76 modules, F3YD64-1F, F3YD64-1P, F3YD64-1R, F3WD64-□F and F3WD64-□P modules can also be used.)
- If you want to hold the contacts of an output module in the case of a major or moderate sequence CPU module failure, set the Output When Stopped field under "Input/Output Setup" of the Configuration to "HOLD". The behavior is independent of the type of CPU module or output module.

**Table A4.3 Failure Severity Levels and LED Indications
(when the CPU module is F3BP20 or F3BP30)**

Severity Level	LED Indication	Effect	Probable Cause	Status of FAIL-signal Contact Output		Status of Output Module	
				Between FAIL1 and COM	Between FAIL2 and COM	Output modules other than F3YD64-1A, F3YD64-1M, F3WD64-□N	F3YD64-1A, F3YD64-1M, F3WD64-□N, Y□□□□□ [2]
Major	Green RDY lamp if off.	Key hardware is disabled.	• CPU error • Memory crash	Shorted	Open	Default: HOLD Can be set on a 8-point basis. (in a CONTROL statement)	Cannot be set The status is always HOLD
Moderate	Red ERR lamp is lit.	The user program cannot be started or run any further.	• Program error • I/O module error[1] • BASIC error stop (no ON ERROR) • Startup error • Invalid instruction found • Number of I/O points exceeded • ROM pack error • Subroutine error[1] • Interrupt error[1] • Subunit communication error	Open	Shorted	Cannot be set The status is always HOLD	Cannot be set The status is always HOLD
Minor	Yellow ALM[1] lamp is lit.	The program can still run In spite of a minor failure detected.	• Momentary power failure[3] • I/O module error (during interrupt processing)	Open	Shorted	Operation continues	Operation continues

[1]: The yellow ALM LED is also lit when the FA-M3 is in Debug mode.
[2]: Output relays (Y□□□□□) of the advanced modules.
[3]: When supply voltage abnormality is detected, output modules behave differently depending on whether the standard mode or immediate detection mode is selected. Behaviors during momentary power failure in each mode are as follows:

Supply Voltage Abnormality Detection mode	Status of FAIL-signal Contact Output		Status of Output Module	
	Between FAIL1 and COM	Between FAIL2 and COM	Output modules other than F3YD64-1A, F3YD64-1M, F3WD64-□N	F3YD64-1A, F3YD64-1M, F3WD64-□N, Y□□□□□ [2]
Standard mode	Open	Shorted	Hold	Hold
Immediate detection mode	Shorted	Open	Reset	Hold

Table A4.4 OS-free CPU module status and output module status

Status of CPU Module	Status of Output Module	FAIL-signal Contact Output	
		Between FAIL 1 and COM	Between FAIL 2 and COM
Power OFF	—	shorted	open
Operating	—	open	shorted
Operating and Watchdog time out[1]	Configurable ("HOLD" or "RESET") with setting of MODE registers[2]	shorted	open
Operating and executing failure output using RAS API	Configurable ("HOLD" or "RESET") with setting of MODE registers[2]	shorted	open

[1] : These features are included in RAS libraries, and can be called from user application optionally.
[2] : Mode register setting can be set by 8 points through MODE register access. Default is "HOLD".

Table A4.5 IEC61131-3 CPU module status and output module status

Status of CPU Module	Status of Output Module	FAIL-signal Contact Output	
		Between FAIL 1 and COM	Between FAIL 2 and COM
Power OFF	—	shorted	open
Operating	—	open	shorted
When ERR stops and When fail output POU is executed during operation	Configurable ("HOLD" or "RESET") with setting of I/O module stop mode [2]	shorted	open
When RDY LED is off	Configurable ("HOLD" or "RESET") with setting of I/O module stop mode [2]	shorted	open

[1] : These features are included in System management library, and can be called from user application optionally.
[2] : The I/O module stop mode setting can be specified in units of 8 points. Default is "HOLD".
The output relays (Y□□□□) of the advanced modules is always HOLD.

A4.4 Troubleshooting Procedure

If an error condition occurs, take note of the current situation and symptom, then troubleshoot the problem according to the flowchart shown in Figure A4.5 considering the relationship with the other devices and the reproducibility of the error condition.
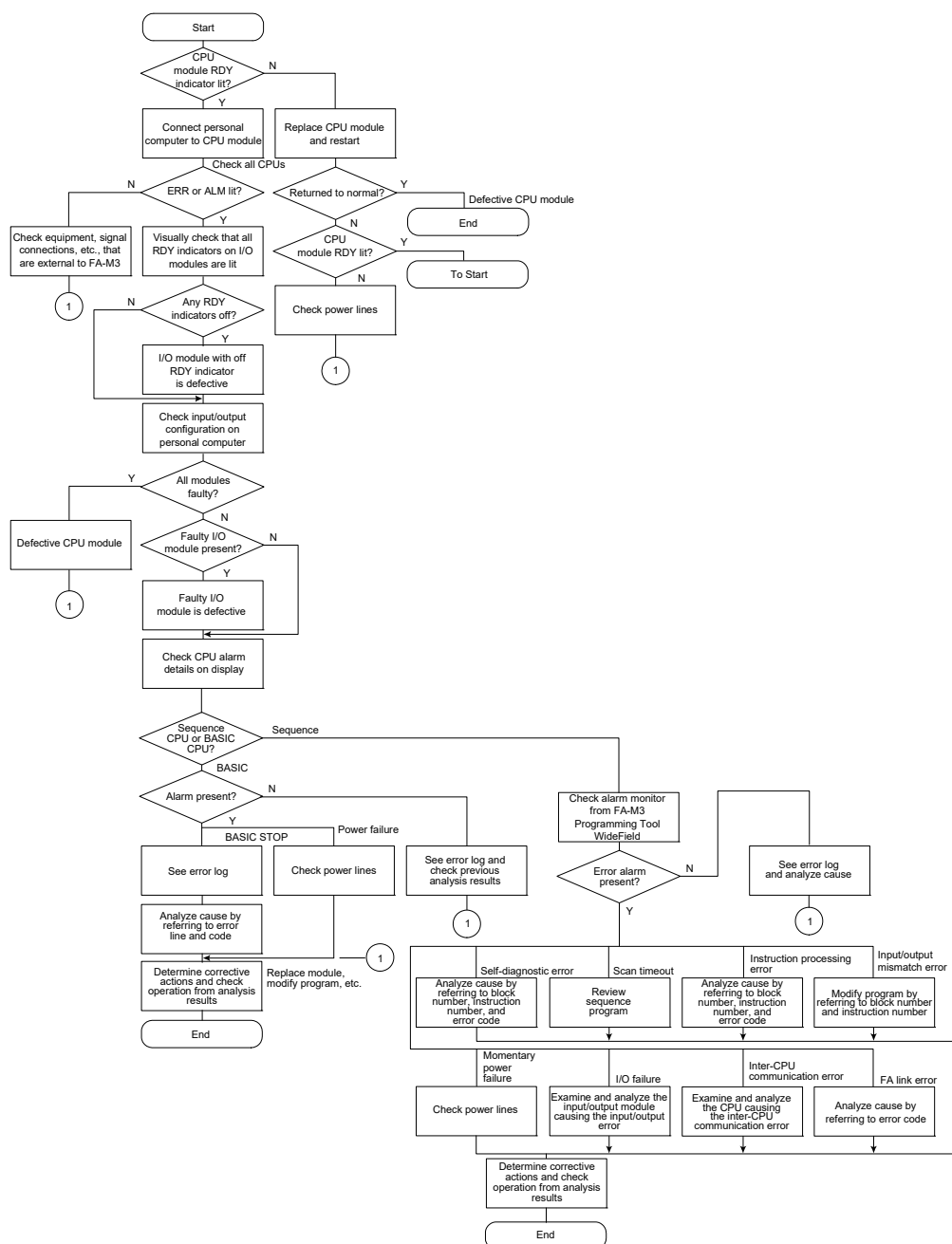
Figure A4.5 Troubleshooting Flowchart

A4.5 CPU Module Reset and Memory Clearance

(1) For the F3SP66, F3SP67, F3SP71 and F3SP76

● Reset

- Using the FA-M3 Programming Tool WideField3:
  Select [Online]–[Extended Functions]–[Reset Start] from the menu bar.
  For details, refer to the FA-M3 Programming Tool WideField3 (IM 34M06Q16-□□E).
  The operations can also be carried out using the FA-M3 Programming Tool WideField2 for F3SP66-4S and F3SP67-6S.

- Using the smart access function:
  Execute the Press & Hold operation (with MODE switch value = 0, 1, 2 or 3) of the rotary switch function, or execute a Reset CPU command of the card batch file function.
  For details, refer to the Sequence CPU – Functions (for F3SP66-4S, F3SP67-6S) (IM 34M06P14-01E) or the Sequence CPU Instruction Manual – Functions (for F3SP71-4N/4S, F3SP76-7N/7S) (IM 34M06P15-01E).

- Using the FTP function (for F3SP66/F3SP67, F3SP71-4S and F3SP76-7S only):
  Execute the Reset CPU command of the virtual directory function.
  For details, refer to the Sequence CPU – Network Functions (for F3SP66-4S, F3SP67-6S) (IM 34M06P14-02E) or the Sequence CPU Instruction Manual – Functions (for F3SP71-4N/4S, F3SP76-7N/7S) (IM 34M06P15-01E). F3SP71-4N and F3SP76-7N do not support the virtual directory function.

● Memory clearance

Select [Online]–[Extended Functions]–[Clear Devices] from the menu bar of the FA-M3 Programming Tool WideField3.
For details, refer to the FA-M3 Programming Tool WideField3 (IM 34M06Q16-□□E).
The operations can also be carried out using the FA-M3 Programming Tool WideField2 for F3SP66-4S and F3SP67-6S.

● Restoring factory settings

Execute the Press & Hold operation (with MODE switch value = C) of the rotary switch function.
For details, refer to the Sequence CPU – Functions (for F3SP66-4S, F3SP67-6S) (IM 34M06P14-01E) or the Sequence CPU Instruction Manual – Functions (for F3SP71-4N/4S, F3SP76-7N/7S) (IM 34M06P15-01E).

Note

- Restoring the factory settings when the rotary switch function is disabled by using function removal (for F3SP66/67/71/76)

The Press & Hold operation cannot be used to restore the factory settings when the rotary switch function is disabled by using function removal.

TIf this situation happens, follow the instructions given below.

Set the rotary switch (MODE switch) to C, install a sequence CPU module in the 5th or higher slot, and turn on the power. After making sure the RDY lamp comes on, turn off the power. This restores the factory settings.

Executing the above-mentioned procedure without setting the rotary switch (MODE switch) to C clears information other than the project and CPU properties information stored in the internal ROM.

(2) For the F3SP22, F3SP28, F3SP38, F3SP53, F3SP58 and F3SP59

Select [Online]–[Extended Functions] from the menu bar of the FA-M3 Programming Tool WideField, WideField2 or WideField3.

For details, refer to the FA-M3 Programming Tool WideField (IM 34M06Q14-01E), the FA-M3 Programming Tool WideField2 (IM 34M06Q15-01E) or the FA-M3 Programming Tool WideField3 (IM 34M06Q16-□□E). F3SP22-0S supports only the FA-M3 Programming Tool WideField3.

(3) For the F3SP21, F3SP25 and F3SP35

Use the Operation Setup menu of the Ladder Diagram Support Program M3.

For details, refer to the Ladder Diagram Support Program M3 (IM 34M06Q13-01E).

The operations can also be carried out using the FA-M3 Programming Tool WideField, WideField2 or WideField3 for F3SP21-0N, F3SP25-2N, and F3SP35-5N modules.

(4) For the F3BP20-0N and F3BP30-0N BASIC CPU

- User area : Initialization using the NEW command.
- Common area   : Initialization using the INIT COM statement.
- Own CPU shared register area   : Initialization using the INICOMM3 library.

    For details on the above-mentioned command, statement and library, refer to the BASIC CPU Modules and YM-BASIC/FA Programming Language (IM 34M06Q22-01E).

Note

Methods of memory clearance when the FA-M3 Programming Tool WideField3 is not available (for F3SP21/22/25/28/35/38/53/58/59 only)

If you mistakenly configure the baud rate of the CPU port to 19200 bps when running the Ladder Diagram Support Program M3 on an earlier version of the PC98 series of personal computers that does not support that baud rate, the communication link is disabled and the program becomes no longer usable.

If this situation happens, follow the instructions given below.

Install a sequence CPU module in the 5th or higher slot and turn on the power. After making sure the RDY lamp has gone out momentarily and then comes on again, turn off the power. This clears the CPU memory completely, and restores the module to its factory setting.

A5. Maintenance and Inspection

A5.1 Replacing Modules

■ Spare Modules

Always have spare modules on hand for immediate countermeasures against failures in the FA-M3.

■ Procedure for Replacing a Module

Be sure to turn off the power before replacing any module. When replacing a module, do not change the type and location of the module.

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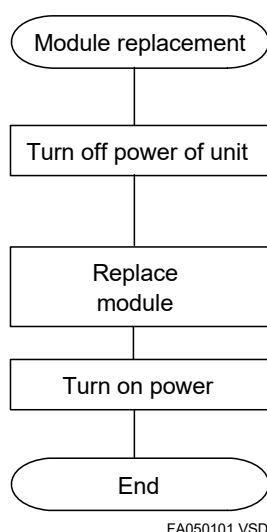
Figure A5.1 Module Replacement Procedure

■ Note the module replacement

Perform the following checks before replacing a module when there is an error:
- Check whether the load conforms to the specifications.
- Check whether the surge protector, if any, is functioning normally.
- Check for cabling errors such as wrong polarity orientation of a diode.

Note

The FA-M3 will fail again after replacing any module when there is a problem with the external wiring, no surge protector is installed or a diode is connected in the reverse polarity. Be sure to solve problems with the external equipment before replacing the module.

A5.2 Routine Inspection

Routine inspection comprises the minimum level of checks used to determine whether any fault might occur in the day's operation. Observing these procedures properly will enable you to maintain stable FA-M3 operation.

Category	Check item	Criterion		
Power supply	Are the voltage fluctuations within the specified limits when measured at the power supply terminals?	Limits	F3PU10-0N F3PU10-0S F3PU20-0N F3PU20-0S F3PU30-0N F3PU30-0S	85 to 264V AC
			F3PU16-0N F3PU16-0S F3PU26-0N F3PU26-0S F3PU36-0N F3PU36-0S	15.6 to 31.2V DC
Input/output power supply	Are the voltage fluctuations within the specified limits when measured at the I/O terminal block.	As per the specifications for the individual input/output module.		
Environment	Is the ambient temperature (inside the panel enclosure) normal?	0 to 55°C		
	Is the ambient humidity (inside the panel enclosure) normal?	10 to 90% RH (non-condensing)		
	Is there any accumulation of dust?	Must be free of dust.		
Mounting state	Is each module secured?	Must be secured firmly.		
	Are all cable connectors fully fitted and secured in place?	Must be secured firmly.		
	Are there any loose external cable screws?	Must be secured firmly.		
	Are there any cuts or nicks in the external cables?	Must be free of visible flaws.		

■ Tools Required for Inspection

- Philips and flat-blade screwdrivers
- Multi-meter or digital voltmeter
- Thermometer
- Humidity gauge

Appendix A1   System-wide Restrictions on Module Installation

Restrictions on module installation include a limitation on the number of modules that can be installed in the system as a whole, in addition to a limitation on the number of respective CPU and I/O modules that can be installed. This appendix explains how to check whether or not your system complies with system-wide restrictions on module installation.

Appendix A1.1   Checking Compliance with Restrictions on Module Installation

List the CPU and I/O modules you will use and follow the procedure shown in Appendix Figure A1.1 to check whether or not your system complies with each restriction. System operation is not guaranteed unless your system satisfies all of these restrictions.

```
        ┌─────────────────────┐
        │    Start checking   │
        └─────────────────────┘
                   │
        ┌─────────────────────┐
        │ Restrictions due to │   Refer to Section A1.2, "Restrictions on Module Installation."
        │ installation        │
        │ location, number of │
        │ modules and         │
        │ combination         │
        └─────────────────────┘
                   │
        ┌─────────────────────┐
        │ Restrictions due to │   Refer to Appendix A1.2, "Restrictions due to the Number of Slots."
        │ the number of slots │
        │ into which modules   │
        │ are installed       │
        └─────────────────────┘
                   │
        ┌─────────────────────┐
        │ Restrictions due to │   Refer to Appendix A1.3, "Restrictions due to the Size of Data Area."
        │ the data area within │
        │ the CPU module      │
        └─────────────────────┘
                   │
          Which type of CPU module is it?
           │                        │
   Sequence CPU module      BASIC CPU module
           │                        │
  ┌──────────────────┐    ┌──────────────────┐   Refer to Appendix A1.4, "Restrictions due to the Type of CPU Module."
  │ Restrictions due │    │ Restrictions due │
  │ to the number of │    │ to the work area │
  │ I/O points the   │    │ within the BASIC │
  │ sequence CPU     │    │ CPU module       │
  │ module has       │    └──────────────────┘
  └──────────────────┘
           │
        ┌─────────────────────┐
        │ Restrictions due to │   Refer to Section A2.9, "Module Current Consumption Tables."
        │ the current         │
        │ consumption of a    │
        │ module              │
        └─────────────────────┘
                   │
        ┌─────────────────────┐
        │    End checking     │
        └─────────────────────┘
```

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Appendix Figure A1.1   Flow of Procedure for Checking Restrictions on Module Installation

Refer to Appendix Tables A1.1 and A1.2 when checking each of the restrictions.

Appendix Table A1.1   Number of Slots Occupied and Number of I/O Points Supported by Each CPU Module

Module Description	Model	Number of Slots Occupied	Number of I/O Points Supported
Sequence CPU module	F3SP21-0N	1	2048
	F3SP22-0S	1	4096
	F3SP25-2N	1	4096
	F3SP35-5N	1	8192
	F3SP28-3N	1	4096
	F3SP38-6N	1	8192
	F3SP53-4H	1	4096
	F3SP58-6H	1	8192
	F3SP28-3S	1	4096
	F3SP38-6S	1	8192
	F3SP53-4S	1	4096
	F3SP58-6S	1	8192
	F3SP59-7S	1	8192
	F3SP66-4S	1	4096
	F3SP67-6S	1	8192
	F3SP71-4N	1	4096
	F3SP76-7N	1	8192
	F3SP71-4S	1	4096
	F3SP76-7S	1	8192
	F3FP36-3N	1	4096
BASIC CPU module	F3BP20-0N	1	—
	F3BP30-0N	1	—
OS-free CPU module	F3RP70-2L	1	—
IEC61131-3 CPU module	F3NP55-5N	1	—

Appendix Table A1.2   Number of Slots Occupied and Number of I/O Points Supported by Each I/O Module and its Function Specifications (1/2)

Module Description	Model	Number of Slots ccupied	Number of I/O Points Supported[1]	Size of Data Area	Size of Basic CPU's Work Area
Memory card module	F3EM01-0N	1	64	0	$110
Input module	F3XA08-□N	1	16	0	$50
	F3XA16-1N	1	16	0	$50
	F3XH04-3N	1	16	0	$50
	F3XC08-0□	1	16	0	$50
	F3XD08-6□	1	16	0	$50
	F3XD16-□□	1	16	0	$50
	F3XD32-□□	1	32	0	$50
	F3XD64-□□	1	64	0	$50
Pulse input module	F3XS04-□N	1	64	2	$110
Output module	F3YA08-2N	1	16	0	$50
	F3YC08-0N	1	16	0	$50
	F3YC16-0N	1	16	0	$50
	F3YD04-7N	1	16	0	$50
	F3YD08-□□	1	16	0	$50
	F3YD14-5□	1	16	0	$50
	F3YD32-1□	1	32	0	$50
	F3YD64-1□	1	64	0	$50
I/O module	F3WD64-□□	1	64	0	$50
Analog input module	F3AD04-□□	1	0	2	$110
	F3AD08-□□	1	0	2	$110
Analog output module	F3DA02-□□	1	0	2	$110
	F3DA04-□□	1	0	2	$110
	F3DA08-□□	1	0	2	$110
Temperature control/monitoring module	F3CT04-0N	2	64	4	$110
	F3CR04-1N	2	64	4	$110
PID control module	F3CV04-1N	2	64	4	$110
Temperature control and PID module	F3CU04-0□	1	64	2	$110
	F3CU04-1N	2	64	2	$110
	F3CU04-1S	2	64	2	$110
	F3CU04-1H	1	64	2	$110
Temperature monitoring module	F3CX04-0□	1	64	2	$110
High-speed data acquisition module	F3HA08-0N	1	64	8	$110
	F3HA06-1R	1	64	8	$110
	F3HA12-1R	1	64	8	$110
ASi Master module	F3LA01-0N	1	64	2	$110
PROFIBUS-DP Interface module	F3LB01-0N	1	64	4	$110
Ethernet interface module	F3LE01-0T	1	64	16	$110
	F3LE01-5T	1	64	16	$110
	F3LE11-0T	1	64	16	$110
	F3LE12-0T	1	64	16	$110
	F3LE01-1T	1	64	16	$110
	F3LE11-1T	1	64	16	$110
	F3LE12-1T	1	64	16	$110
NX interface module	F3NX01-□N	1	64	16	$110
EtherNet/IP interface module	F3LN01-0N	1	64	16	0
FL-net (OPCN-2) interface module	F3LX02-1N	1	64	16	$110
	F3LX02-2N	1	64	16	$110
DeviceNet interface module	F3LD01-0N	1	64	4	$110
	F3LD02-1N	1	64	8	$110
CAN2.0B interface module	F3LD21-0N	1	64	8	$110
Modbus Interface Module	F3LC31-2F	1	64	8	$110
GP-IB communication module	F3GB01-0N	1	64	8	$110
Personal computer link module	F3LC11-1F	1	64	2	$110
	F3LC11-1N	1	64	2	$110
	F3LC11-2□	1	64	2	$110
	F3LC12-1F	1	64	4	$110
Ladder communication module	F3RZ81-0N	1	64	2	0
	F3RZ81-0F	1	64	4	0
	F3RZ82-0F	1	64	4	0
	F3RZ91-0□	1	64	2	0
RS-232-C communication module	F3RS22-0N	1	0	2	$110
RS-422-A communication module	F3RS41-0N	1	0	2	$110
UT link module	F3LC51-2N	1	64	8	$110

**Appendix Table A1.2   Number of Slots Occupied and Number of I/O Points Supported by Each
I/O Module and its Function Specifications (2/2)**

Module Description	Model	Number of Slots Occupied	Number of I/O Points Supported[1]	Size of Data Area	Size of Basic CPU's Work Area
FA link H module	F3LP02-0N	1	0	8	0
Fiber-optic FA link H module	F3LP12-0N	1	0	8	0
FA link H2 module	F3LP32-0N	1	0	8	0
YHLS master module	F3LH02-0N	1	64	4	$110
	F3LH01-1N	1	64	4	$110
	F3LH02-1N	1	64	4	$110
Fiber-optic FA-bus module	F3LR01-0N	1	0	0	0
Fiber-optic FA-bus type 2 module	F3LR02-0N	1	0	0	0
FA-bus type 2 module	F3LR02-1W	1	0	0	0
High-speed counter module	F3XP01-0H	1	64	0	$50
	F3XP02-0H	1	64	0	$50
Positioning module (with multi-channel pulse output)	F3YP04-0N	1	64	2	$110
	F3YP08-0N	1	64	2	$110
	F3YP14-0N	1	64	2	$110
	F3YP18-0N	1	64	2	$110
	F3YP22-0P	1	64	4	$110
	F3YP24-0P	1	64	4	$110
	F3YP28-0P	1	64	4	$110
Positioning module (advanced model with pulse output)	F3NC11-0N	1	64	2	$110
	F3NC12-0N	1	64	2	$110
Positioning module (with pulse output)	F3NC32-0N	1	64	4	$110
	F3NC34-0N	1	64	4	$110
Positioning module (with analog voltage output)	F3NC51-0N	1	64	2	$110
	F3NC52-0N	1	64	2	$110
Positioning module (with MECHATROLINK-II interface)	F3NC96-0N	1	64	8	$110
Positioning module (with MECHATROLINK-III interface)	F3NC97-0N	1	64	8	$110

*1:   Input and output modules with 4, 8 and 14 points are all regarded as having 16 points.

Appendix A1.2 Restrictions due to the Number of Slots

Determine the total sum W of slots occupied by all modules excluding the power supply, fiber-optic FA-bus, fiber-optic FA-bus type 2, and FA-bus type 2 modules. Then check that the value of W complies with restrictions placed by the maximum number of slots.

The maximum number of slots varies depending on the types of CPU modules used and their combinations.

If F3SP21/22/25/28/35/38/53/58/59/66/67/71/76, F3FP36, F3BP20, F3BP30,F3RP70 and F3NP5□ modules are used in combination, a maximum of 7 subunits can be added to the system.

- When F3SP21/22/25/28/35/38/53/58/59/66/67/71/76, F3FP36, F3BP20, and F3BP30, modules are used in combination, the maximum number of slots amounts to 120. This number is only effective however, when 16-slot base modules are used with both the main unit and each subunit, and the seven subunits are connected in a daisy-chain or loop topology through fiber-optic FA-bus type 2 and FA-bus type 2 modules.

Note

If subunits are divided into groups using fiber-optic FA-bus type 2 modules, the total number of slots may become smaller than the value noted above depending on the mode of such division. For more information on the calculation of the total sum, see the Fiber-optic FA-bus Module and Fiber-optic FA-bus Type 2 Module, FA-bus Type 2 Module (IM 34M06H45-01E).

Appendix A1.3 Restrictions due to the Size of Data Area

Determine the total size M of the data area provided by all I/O modules (i.e., modules excluding the power supply and CPU modules). Then check that the value of M complies with restrictions placed by the maximum size of data area. The total size of data area M varies depending on the order in which I/O modules are installed. Consider system configuration in advance, including the number of subunits, unit number and I/O modules' installation locations, according to your application needs.

● Restrictions due to the size of data area are defined as

$M \le 112 + 32 \times (4 - n)$, where n = the number of CPU modules.

The values 112 and 32 here are the limits due to the function specifications of the CPU modules.

● Calculation Procedure

Sum up the sizes of data areas in sequence for all I/O modules, starting from slot 1 of the main unit up to slot 16 of the 7th subunit to determine the total size M. If there is any I/O module with a data-area size of 4, 8 or 16, then round up the running total for the data area sizes to the nearest multiple of 4, 8 or 16 before you add the size of that I/O module.

Example:

If the system is configured with the following modules, the total data area M is 56.

	F3PU20	F3SP25	F3BP20	F3XD64	F3YD64	F3AD04	F3DA02	F3NC12	F3CT04	F3LE01	F3RS22	F3LC51	F3LP02
Data-area size:		0	0	0	0	2	2	2	4	16	2	8	8
Cumulative size of data area:		0	0	0	0	2	4	6	12	32	34	48	56
									↑ (1)	↑ (2)		↑ (3)	

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(1) Calculation for an I/O Module with Data-area Size of 4
Round up the running total for the data-area sizes to the nearest multiple of 4, and then add 4.
In this example, round up 6 to 8, and then add 4 to obtain 12.

(2) Calculation for an I/O Module with Data-area Size of 16
Round up the running total for the data-area sizes to the nearest multiple of 16, and then add 16.
In this example, round up 12 to 16, and then add 16 to obtain 32.

(3) Calculation for an I/O Module with Data-area Size of 8
Round up the running total for the data-area sizes to the nearest multiple of 8, and then add 8.
In this example, round up 34 to 40, and then add 8 to obtain 48.

Note

The total size of data area M varies depending on the order in which modules are installed. If the initial system configuration fails to comply with any given restriction, try changing the order in which modules are installed by serially installing I/O modules of the same data-area size, for example. This strategy may achieve compliance with the restriction.

Example:

If the system is configured with the following modules, the total size of data area M is 56.
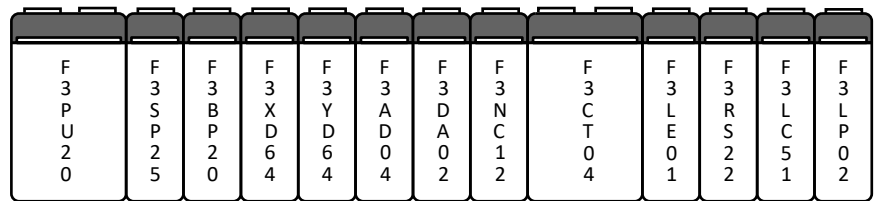
	F3PU20	F3SP25	F3BP20	F3XD64	F3YD64	F3AD04	F3DA02	F3NC12	F3CT04	F3LE01	F3RS22	F3LC51	F3LP02
Data-area size:		0	0	0	0	2	2	2	4	16	2	8	8
Cumulative size of data area:		0	0	0	0	2	4	6	12	32	34	48	56

FAAP0103.VSD

The total size of data area reduces to 44 if you rearrange the I/O modules as shown below.
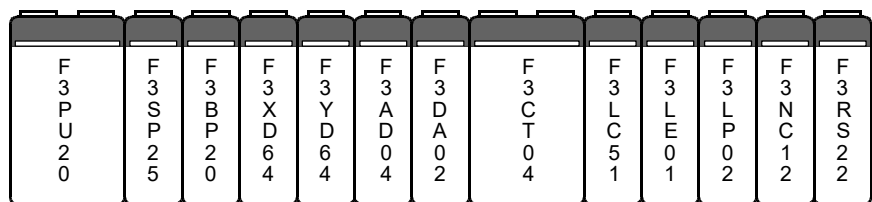
	F3PU20	F3SP25	F3BP20	F3XD64	F3YD64	F3AD04	F3DA02	F3CT04	F3LC51	F3LE01	F3LP02	F3NC12	F3RS22
Data-area size:		0	0	0	0	2	2	4	8	16	8	2	2
Cumulative size of data area		0	0	0	0	2	4	8	16	32	40	42	44

FAAP0104.VSD

Appendix A1.4   Restrictions due to Type of CPU Module

Appendix A1.4.1   For Sequence CPU Module Type

Determine the total sum R of I/O points provided by I/O modules allocated to the sequence CPU module. Then check that the value of R complies with restrictions placed by the maximum number of I/O points. The I/O modules allocated to the CPU module refer to those that are actually installed and set to the Use option of the Configuration menu. If two or more CPU modules are installed, check each of them for compliance.

- **When the CPU module is F3SP21**

    $R \leq 2048$

- **When the CPU module is F3SP22/25/28/53/66/71 or F3FP36**

    $R \leq 4096$

- **When the CPU module is F3SP35/38/58/59/67/76**

    $R \leq 8192$

Note

For details on the allocation of I/O modules, see FA-M3 Programming Tool WideField3 (IM 34M06Q16-□□E), FA-M3 Programming Tool WideField2 (IM 34M06Q15-01E), FA-M3 Programming Tool WideField (IM 34M06Q14-01E) or Section 6.6, "Entering Configuration Items," in the Ladder Diagram Support Program M3 (IM 34M06Q13-01E).

Appendix A1.4.2　For BASIC CPU Module Type

Determine the total sum D of work areas provided by I/O modules for the BASIC CPU module to which the I/O modules are allocated. Then check that the value of D complies with restrictions due to the size of the BASIC CPU's work area. The I/O modules allocated to the CPU module refer to those whose use is declared by the ASSIGN statement in the BASIC program. Be careful when determining the total sum D of the BASIC CPU's work area since the work areas are in hexadecimal.

● **When the CPU module is F3BP20 or F3BP30**

$D \leq \$2900$

The value $2900 is limited by the function specifications of the CPU module.

Note

For details on the allocation of I/O modules, see Section B7.3, "Declaration of Use of I/O Modules" in the "BASIC CPU Modules and YM-BASIC/FA Programming Language" (IM 34M06Q22-01E).

Appendix A2 Standard compliant products

■ General

This table lists that the FA-M3 range-free controller is approved for the UL standard and comply with the CE/UKCA marking, RCM mark, KC mark standard and TSCA.

		Certification or Compliance standard No.
UL		UL 508 approved (File No.E188707, Overvoltage Category[*2] : II, Pollution Degree[*3] : 2)
CE UKCA	EMC Directive/Regulation[*1]	EN 61326-1 Class A, Table2 EN 61326-2-3 [*4] EN 55011 Class A, Group 1 EN 61000-6-2 EN 61000-3-2 EN 61000-3-3 Compliance
	Low Voltage Directive/Regulation	EN 61010-1, EN IEC 61010-2-201 compliance (Overvoltage Category[*2] : II, Pollution Degree[*3] : 2, Altitude : up to 2,000 m) EN IEC 61010-2-030 compliance (Measurement Category :O) [*5]
	RoHS Directive/Regulation[*6]	EN IEC 63000 Compliance
CE	Battery Regulation	REGULATION (EU) 2023/1542 compliance
RCM		EN 61326-1 Class A, Table2 EN 55011 Class A, Group1 Compliance
KC		Korea Electromagnetic Conformity Standard compliance
EAC		CU TR 004/2011 CU TR 020/2011 compliance
TSCA		USA: Toxic Substances Control Act (TSCA) compliance

*1: This product is classified as Class A for use in industrial environments. If used in a residential environment, it may cause electromagnetic interference (EMI). In such situations, it is the user's responsibility to adopt the necessary measures against EMI.

*2: The term Overvoltage Category involves prescriptions on resistance to surge voltage reduction due to lightning and has four categories. Overvoltage Category II applies to systems with a rated voltage of 220/230/240 V and applies to electrical appliances, portable devices, etc.

*3: The term Pollution Degree represents the degree of pollution with foreign matter, solid, liquid or gaseous, that may produce a reduction of dielectric strength or surface resistivity in the operating environment of the equipment. Pollution degree 2 refers to an environment where normally only non-conductive pollution occurs but occasionally temporary conductivity caused by condensation is to be expected.

*4: EN 61326-2-3 is applicable only to F3CU04-□□.

*5: EN IEC 61010-2-030 is applicable only to modules with analog input terminal.
Don't use the analog input terminals of FA-M3 for measurement on Main Circuit, since those terminals have no measurement category.

*6: 10-Substances RoHS. Phthalate ester have high migration (the property of substance transfer from other products upon contact). Therefore, care must be taken to prevent process contamination. After unpacking each package, please control the products to prevent contamination by the customer side.

■ User's Manuals and Approved / Compliant modules
The latest manuals are available to download from the Yokogawa Membership Site "Customer Portal".
URL : https://www.yokogawa.com/member-site-info/

■ General matters related to safety and installation
Refer to the following manual.
IM 34M06C11-01E   Hardware Manual
IM 34M06C12-81   BEFORE USE

■ Standard compliant products
Symbol "✓" in the tables below means "approval" or "compliance".
Symbol "NA" in the tables below means "not applicable".
The blank in the tables below means "non-approval" or "non-compliance".
About a module that isn't shown in the tables below or that has option code /C□□, /S□□ or /Z□□, contact your local Yokogawa sales personnel.
The latest information is available on the Yokogawa Membership Site "Customer Portal" described in "■User's Manuals and Approved / Compliant modules".

● Base

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Base	F3BU04-0N	IM 34M06C11-01E	✓	✓	✓	✓	✓	✓	✓
	F3BU05-0D		✓	✓	✓	✓	✓	✓	✓
	F3BU06-0N		✓	✓	✓	✓	✓	✓	✓
	F3BU09-0N		✓	✓	✓	✓	✓	✓	✓
	F3BU13-0N		✓	✓	✓	✓	✓	✓	✓
	F3BU16-0N		✓	✓	✓	✓	✓	✓	✓

● Power supply

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Power supply	F3PU10-0S	IM 34M06C11-01E	✓	✓	✓	✓	✓	✓	✓
	F3PU16-0S		✓	✓	✓	✓	✓	✓	✓
	F3PU20-0S		✓	✓	✓	✓	✓	✓	✓
	F3PU26-0S		✓	✓	✓	✓	✓	✓	✓
	F3PU30-0S		✓	✓	✓	✓	✓	✓	✓
	F3PU36-0S		✓	✓	✓	✓	✓	✓	✓
	F3PU38-0N	Contact us							

● CPU

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Sequence CPU	F3SP22-0S	IM 34M06P12-03E IM 34M06P13-01E	✓	✓	✓	✓	✓	✓	✓
	F3SP71-4S	IM 34M06P12-03E IM 34M06P15-01E	✓	✓	✓	✓	✓	✓	✓
	F3SP76-7S	IM 34M06P15-02E IM 34M06P15-03E	✓	✓	✓	✓	✓	✓	✓
RTOS-CPU	F3RP61-2L	Contact us	✓	✓	✓	✓	✓		✓
	F3RP61-2R		✓	✓	✓	✓	✓		✓
	F3RP62-2L		✓	✓	✓	✓	✓		✓
	F3RP62-2R		✓	✓	✓	✓	✓		✓
	F3RP62-6L		✓	✓	✓	✓	✓		✓
	F3RP70-2L	IM 34M06M52-01E	✓	✓	✓	✓	✓		✓
	F3RP71-1R		✓	✓	✓	✓	✓		✓
	F3RP71-2L		✓	✓	✓	✓	✓		✓
	F3RP72-1M	Contact us	✓	✓	✓	✓	✓		✓
	F3RP72-2L		✓	✓	✓	✓	✓		✓
	F3RP73-2L		✓	✓	✓	✓	✓		✓
	F3RP74-1R		✓	✓	✓	✓	✓		✓
IEC61131-3 CPU	F3NP55-5N	Contact us	✓	✓	✓	✓	✓		✓

● Memory

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
ROM pack	RK33-0N	IM 34M06C11-01E		✓	✓	✓	✓		✓
	RK73-0N						✓		✓

● Utility

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
CAN Interface	F3UM11-0N	Contact us	✓	✓	✓	✓	✓		✓
	F3UM12-0N		✓	✓	✓	✓	✓		✓
	F3UM11-1N		✓	✓	✓	✓	✓		✓
	F3UM12-1N		✓	✓	✓	✓	✓		✓
Multi-channel RS communication	F3UM13-2N		✓	✓	✓	✓	✓		✓

- Digital I/O

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Input	F3XA08-1N	IM 34M06C11-01E	✓				✓		✓
	F3XA08-2N		✓				✓		✓
	F3XA16-1N						✓		✓
	F3XC08-0C		✓	✓	✓	✓	✓	✓	✓
	F3XC08-0N		✓	✓	✓	✓	✓	✓	✓
	F3XD08-6F		✓	✓	✓	✓	✓	✓	✓
	F3XD16-3F		✓	✓	✓	✓	✓	✓	✓
	F3XD16-3H		✓	✓	✓	✓	✓	✓	✓
	F3XD16-4F		✓	✓	✓	✓	✓	✓	✓
	F3XD16-9N	Contact us							
	F3XD32-3F	IM 34M06C11-01E	✓	✓	✓	✓	✓	✓	✓
	F3XD32-4F		✓	✓	✓	✓	✓	✓	✓
	F3XD32-5F		✓	✓	✓	✓	✓	✓	✓
	F3XD64-3F		✓	✓	✓	✓	✓	✓	✓
	F3XD64-4F		✓	✓	✓	✓	✓	✓	✓
	F3XD64-6M		✓	✓	✓	✓	✓	✓	✓
	F3XH04-3N		✓	✓	✓	✓	✓	✓	✓
Pulse Input	F3XS04-3N	IM 34M06H54-01E	✓	✓	✓	✓	✓	✓	✓
	F3XS04-4N		✓	✓	✓	✓	✓	✓	✓
Output	F3YA08-2N	IM 34M06C11-01E					✓		✓
	F3YC08-0C		✓	✓	✓	✓	✓	✓	✓
	F3YC08-0N		✓	✓	✓	✓	✓	✓	✓
	F3YC16-0N		✓	✓	✓	✓	✓	✓	✓
	F3YD04-7N		✓	✓	✓	✓	✓	✓	✓
	F3YD08-6A		✓	✓	✓	✓	✓	✓	✓
	F3YD08-6B		✓	✓	✓	✓	✓	✓	✓
	F3YD08-7A		✓	✓	✓	✓	✓	✓	✓
	F3YD14-5A		✓	✓	✓	✓	✓	✓	✓
	F3YD14-5B		✓	✓	✓	✓	✓	✓	✓
	F3YD16-1N	Contact us							
	F3YD32-1H	IM 34M06C11-01E	✓	✓	✓	✓	✓	✓	✓
	F3YD32-1P		✓	✓	✓	✓	✓	✓	✓
	F3YD32-1R		✓	✓	✓	✓	✓	✓	✓
	F3YD32-1T		✓	✓	✓	✓	✓	✓	✓
	F3YD64-1M		✓	✓	✓	✓	✓	✓	✓
	F3YD64-1P		✓	✓	✓	✓	✓	✓	✓
	F3YD64-1R		✓	✓	✓	✓	✓	✓	✓
Input/Output	F3WD32-3F	IM 34M06C11-01E	✓	✓	✓	✓	✓	✓	✓
	F3WD64-3E	Contact us		✓	✓	✓	✓		✓
	F3WD64-3P	IM 34M06C11-01E	✓	✓	✓	✓	✓	✓	✓
	F3WD64-3R	Contact us	✓	✓	✓	✓	✓		
	F3WD64-4P	IM 34M06C11-01E	✓	✓	✓	✓	✓	✓	✓

● Analog I/O

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Analog Input	F3AD04-5R	IM 34M06H11-02E	✓	✓	✓	✓	✓	✓	✓
	F3AD04-5V		✓	✓	✓	✓	✓	✓	✓
	F3AD08-4R		✓	✓	✓	✓	✓	✓	✓
	F3AD08-4W		✓	✓	✓	✓	✓	✓	✓
	F3AD08-5R		✓	✓	✓	✓	✓	✓	✓
	F3AD08-5V		✓	✓	✓	✓	✓	✓	✓
	F3AD08-6R		✓	✓	✓	✓	✓	✓	✓
Analog Output	F3DA04-6R	IM 34M06H11-03E	✓	✓	✓	✓	✓	✓	✓
	F3DA08-5R		✓	✓	✓	✓	✓	✓	✓
	F3DA08-5X	Contact us							

● Temperature

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Temperature control and PID	F3CU04-0G	Contact us						✓	
	F3CU04-0R		✓	✓	✓	✓	✓		
	F3CU04-0S	IM 34M06H62-02E	✓	✓	✓	✓	✓		✓
	F3CU04-0H	IM 34M06H62-04E	✓	✓	✓	✓	✓		✓
	F3CU04-1G	Contact us						✓	
	F3CU04-1S	IM 34M06H62-02E	✓	✓	✓	✓	✓		✓
	F3CU04-1H	IM 34M06H62-04E	✓	✓	✓	✓	✓		✓
Temperature monitoring	F3CX04-0G	Contact us						✓	
	F3CX04-0N	IM 34M06H63-01E	✓	✓	✓	✓	✓		✓
	F3CX04-0H	IM 34M06H63-02E	✓	✓	✓	✓	✓		✓
Heater Break Detect	F3HB08-0N	Contact us							

● Data acquisition

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
High-speed data acquisition	F3HA06-1R	IM 34M06G02-02E	✓	✓	✓	✓	✓	✓	✓
	F3HA12-1R		✓	✓	✓	✓	✓	✓	✓

● Communicators

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Ethernet	F3LE01-1T	IM 34M06H24-06E	✓	✓	✓	✓	✓	✓	✓
	F3LE11-1T	IM 34M06H24-07E	✓	✓	✓	✓	✓	✓	✓
	F3LE12-1T	IM 34M06H24-08E	✓	✓	✓	✓	✓	✓	✓
NX interface	F3NX01-2N	IM 34M06H29-02E	✓	✓	✓	✓	✓	✓	✓
EtherNet/IP	F3LN01-0N	IM 34M06H36-01E	✓	✓	✓	✓	✓	✓	✓
FL-net(OPCN-2)	F3LX02-2N	IM 34M06H32-03E	✓	✓	✓	✓	✓		✓
DeviceNet	F3LD01-0N	IM 34M06H28-01E	✓	✓	✓	✓	✓	✓	✓
	F3LD02-1N	IM 34M06H28-05E	✓	✓	✓	✓	✓		✓
CAN2.0B	F3LD21-0N	IM 34M06H37-01E	✓	✓	✓	✓	✓	✓	✓
Modbus	F3LC31-2F	IM 34M06H42-01E	✓	✓	✓	✓	✓	✓	✓
EtherCAT Master	F3EP01-1R	Contact us							
EtherCAT Slave	F3LT02-0N	Contact us	✓	✓	✓	✓	✓		✓
GP-IB communications	F3GB01-0N	IM 34M06H27-01E	✓	✓	✓	✓	✓		✓
	F3GB01-1N	Contact us	✓	✓	✓	✓	✓		✓

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Personal computer link	F3LC11-1F		✓	✓	✓	✓	✓	✓	✓
	F3LC11-2F	IM 34M06H41-02E	✓	✓	✓	✓	✓	✓	✓
	F3LC12-1F		✓	✓	✓	✓	✓	✓	✓
Ladder communication	F3RZ81-0F		✓	✓	✓	✓	✓	✓	✓
	F3RZ82-0F	IM 34M06H22-02E	✓	✓	✓	✓	✓	✓	✓
	F3RZ91-0F		✓	✓	✓	✓	✓	✓	✓
UT link	F3LC51-2N	IM 34M06H25-01E	✓	✓	✓	✓	✓	✓	✓
FA link H2	F3LP32-0N	IM 34M06H43-02E	✓	✓	✓	✓	✓		✓

● Remote I/O

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
YHLS Master	F3LH01-1N	IM 34M06H46-04E	✓	✓	✓	✓	✓	✓	✓
	F3LH02-1N		✓	✓	✓	✓	✓	✓	✓
Fiber-optic FA-bus	F3LR01-0N		✓	✓	✓	✓	✓	✓	✓
Fiber-optic FA-bus Type2	F3LR02-0N	IM 34M06H45-01E	✓	✓	✓	✓	✓	✓	✓
FA-bus Type2	F3LR02-1W		✓	✓	✓	✓	✓	✓	✓

● Counter/ positioning

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
High-speed Counter	F3XP01-0H	IM 34M06H53-01E	✓	✓	✓	✓	✓	✓	✓
	F3XP02-0H		✓	✓	✓	✓	✓	✓	✓
Frequency Counter	F3XF02-0N	Contact us							
Field Programable High-speed IO	F3DF01-0N	Contact us	✓	✓	✓	✓	✓		✓
Positioning (with multi-channel pulse)	F3YP22-0P	IM 34M06H55-04E	✓	✓	✓	✓	✓	✓	✓
	F3YP22-1P	Contact us	✓	✓	✓	✓	✓		✓
	F3YP24-0P	IM 34M06H55-04E	✓	✓	✓	✓	✓	✓	✓
	F3YP24-1P	Contact us	✓	✓	✓	✓	✓		✓
	F3YP28-0P	IM 34M06H55-04E	✓	✓	✓	✓	✓	✓	✓
	F3YP28-1P	Contact us	✓	✓	✓	✓	✓		✓
Positioning (with pulse output)	F3NC32-0N	IM 34M06H56-02E	✓	✓	✓	✓	✓	✓	✓
	F3NC34-0N		✓	✓	✓	✓	✓	✓	✓
Positioning (with analog voltage output)	F3NC51-0N	IM 34M06H58-01E	✓	✓	✓	✓	✓	✓	✓
	F3NC52-0N		✓	✓	✓	✓	✓	✓	✓
Positioning (for Torque Control)	F3NC61-0N	IM 34M06H59-01E	✓	✓	✓	✓	✓		✓
Positioning (MECHATROLINK-Ⅱ)	F3NC96-0F	Contact us							✓
	F3NC96-0N	IM 34M06H60-02E	✓	✓	✓	✓	✓	✓	✓
	F3NC96-1N	Contact us	✓	✓	✓	✓	✓		✓
Positioning (MECHATROLINK-Ⅲ)	F3NC97-0F	Contact us							✓
	F3NC97-0N	IM 34M06H60-03E	✓	✓	✓	✓	✓	✓	✓
	F3NC97-1N	Contact us							✓
	F3NC98-2N		✓	✓	✓	✓	✓		✓

● Other module

Name	Model	Related Manuals	Conformity Standard						
			UL	**CE**	**UKCA**	**RCM**	**KC**	**EAC**	**TSCA**
Other	F3BR01-0N	Contact us							✓
	F3BU09-9N								✓
	F3BU09-9S								✓
	F3LR02-9N								✓
	F3PB01-0N								✓
	F3PU30-9S								✓
	F3PU38-9N								
	F3SP69-9S								

● Peripheral Devices

Name	Model	Related Manuals	Conformity Standard						
			UL	**CE**	**UKCA**	**RCM**	**KC**	**EAC**	**TSCA**
YHLS Slave Unit	TAHWD32-3NBM	IM 34M06H46-03E	✓	✓	✓	✓	✓	✓	✓
	TAHWD32-3PAM		✓	✓	✓	✓	✓	✓	✓
	TAHXD16-3NEM		✓	✓	✓	✓	✓	✓	✓
	TAHXD16-3PEM		✓	✓	✓	✓	✓	✓	✓
	TAHYD16-3EAM		✓	✓	✓	✓	✓	✓	✓
	TAHYD16-3EBM		✓	✓	✓	✓	✓	✓	✓
Cables	KM10-0C	IM 34M06C11-01E	NA	✓	✓	NA	NA		✓
	KM11-2N		NA	✓	✓	NA	NA		✓
	KM11-2T		NA	✓	✓	NA	NA		✓
	KM13-1S		NA	✓	✓	NA	NA		✓
	KM21-2A		NA	✓	✓	NA	NA		✓
	KM21-2B		NA	✓	✓	NA	NA		✓
	KM55-005		NA	✓	✓	NA	NA		✓
	KM55-010		NA	✓	✓	NA	NA		✓
	KM55-015		NA	✓	✓	NA	NA		✓
	KM55-020		NA	✓	✓	NA	NA		✓
	KM55-025		NA	✓	✓	NA	NA		✓
	KM55-030		NA	✓	✓	NA	NA		✓
	KM55-035		NA	✓	✓	NA	NA		✓
	KM55-040		NA	✓	✓	NA	NA		✓
	KM55-045		NA	✓	✓	NA	NA		✓
	KM55-050		NA	✓	✓	NA	NA		✓
	KM55-060		NA	✓	✓	NA	NA		✓
	KM55-070		NA	✓	✓	NA	NA		✓
	KM55-100		NA	✓	✓	NA	NA		✓
	KM60-001		NA	✓	✓	NA	NA		✓
	KM60-003		NA	✓	✓	NA	NA		✓
	KM60-S06		NA	✓	✓	NA	NA		✓
	KM61-003		NA	✓[7]	✓[7]	NA	NA		✓
	KM61-005		NA	✓[7]	✓[7]	NA	NA		✓
	KM61-010		NA	✓[7]	✓[7]	NA	NA		✓
	KM61-015		NA	✓[7]	✓[7]	NA	NA		✓
	KM61-020		NA	✓[7]	✓[7]	NA	NA		✓
	KM61-025		NA	✓[7]	✓[7]	NA	NA		✓
	KM61-030		NA	✓[7]	✓[7]	NA	NA		✓
	KM61-040		NA	✓[7]	✓[7]	NA	NA		✓
	KM61-050		NA	✓[7]	✓[7]	NA	NA		✓

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Cables	KM61-060	IM 34M06C11-01E	NA	✓*7	✓*7	NA	NA		✓
	KM61-070		NA	✓*7	✓*7	NA	NA		✓
	KM61-080		NA	✓*7	✓*7	NA	NA		✓
	KM61-090		NA	✓*7	✓*7	NA	NA		✓
	KM61-100		NA	✓*7	✓*7	NA	NA		✓
	KM62-010		NA	✓*7	✓*7	NA	NA		✓
	KM62-015		NA	✓*7	✓*7	NA	NA		✓
	KM62-020		NA	✓*7	✓*7	NA	NA		✓
	KM62-025		NA	✓*7	✓*7	NA	NA		✓
	KM62-030		NA	✓*7	✓*7	NA	NA		✓
	KM62-040		NA	✓*7	✓*7	NA	NA		✓
	KM62-050		NA	✓*7	✓*7	NA	NA		✓
	KM62-060		NA	✓*7	✓*7	NA	NA		✓
	KM62-070		NA	✓*7	✓*7	NA	NA		✓
	KM62-080		NA	✓*7	✓*7	NA	NA		✓
	KM62-090		NA	✓*7	✓*7	NA	NA		✓
	KM62-100		NA	✓*7	✓*7	NA	NA		✓
	KM65-001		NA	✓*7	✓*7	NA	NA		✓
	KM65-003		NA	✓*7	✓*7	NA	NA		✓
	KM65-005		NA	✓*7	✓*7	NA	NA		✓
	KM65-007		NA	✓*7	✓*7	NA	NA		✓
	KM65-010		NA	✓*7	✓*7	NA	NA		✓
	KM65-015		NA	✓*7	✓*7	NA	NA		✓
	KM65-020		NA	✓*7	✓*7	NA	NA		✓
	KM65-025		NA	✓*7	✓*7	NA	NA		✓
	KM65-030		NA	✓*7	✓*7	NA	NA		✓
	KM69-010		NA	✓	✓	NA	NA		✓
	KM72-2N	Contact us	NA	✓	✓	NA	NA		✓
	KM73-1N		NA	✓	✓	NA	NA		✓
	KM80-010	IM 34M06H46-03E	NA	✓	✓	NA	NA		✓
	KM80-050		NA	✓	✓	NA	NA		✓
	KM80-100		NA	✓	✓	NA	NA		✓
	KM80-200		NA	✓	✓	NA	NA		✓
	KM80-300		NA	✓	✓	NA	NA		✓
	KM81-010		NA	✓	✓	NA	NA		✓
	KM81-050		NA	✓	✓	NA	NA		✓
	KM81-100		NA	✓	✓	NA	NA		✓
	KM81-200		NA	✓	✓	NA	NA		✓
	KM89-002	Contact us							
Terminal Block	TA40-0N	IM 34M06C11-01E	NA	✓	✓	NA	NA		✓
	TA50-0N		NA	✓	✓	NA	NA		✓
Blank	F3BL00-0N	IM 34M06C11-01E	NA	✓	✓	NA	NA	NA	✓

*7: When using to connect between modules in the metallic panel enclosure. Use a flame-retardant cable KM69 (equivalent of VW-1), when the cable is drawn out of the enclosure.

● Software

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Software	SF630-MCW	IM 34M06Q16-11E	NA	NA	NA	NA	NA	NA	✓
	SF631-MCW	IM 34M06Q16-11E IM 34M06Q50-51E	NA	NA	NA	NA	NA	NA	✓
	SF661-MCW	IM 34M06Q30-01E	NA	NA	NA	NA	NA	NA	✓
	SF662-MCW		NA	NA	NA	NA	NA	NA	✓
	SF663-MCW		NA	NA	NA	NA	NA	NA	✓
	SF681-MDW	IM 34M06Q50-51E	NA	NA	NA	NA	NA	NA	✓
	SF691-ECW	Contact us	NA	NA	NA	NA	NA	NA	
	SFND10-MDW		NA	NA	NA	NA	NA	NA	✓
	SFRD11-JCW		NA	NA	NA	NA	NA	NA	✓
	SFRD11-JDW		NA	NA	NA	NA	NA	NA	✓
	SFRD12-JDW	IM 34M06M52-02E	NA	NA	NA	NA	NA	NA	✓
	SFRD13-JDW	Contact us	NA	NA	NA	NA	NA	NA	✓
	SFRD21-JCW		NA	NA	NA	NA	NA	NA	✓
	SFRD21-JDW		NA	NA	NA	NA	NA	NA	✓
	SFRD22-JDW		NA	NA	NA	NA	NA	NA	✓
	SFRD23-JDW		NA	NA	NA	NA	NA	NA	✓
	SFRD24-JDW		NA	NA	NA	NA	NA	NA	✓
	SFRL12-JPW		NA	NA	NA	NA	NA	NA	✓
	SFRL16-JPW		NA	NA	NA	NA	NA	NA	✓
	SFRL18-MPC	IM 34M06M52-16EN IM 34M06M52-15EN	NA	NA	NA	NA	NA	NA	✓
	SFRL22-JPW	Contact us	NA	NA	NA	NA	NA	NA	✓
	SFRM12-JDW		NA	NA	NA	NA	NA	NA	✓
	SFRM13-JDW		NA	NA	NA	NA	NA	NA	✓
	SFRM16-JCW		NA	NA	NA	NA	NA	NA	✓
	SFRM23-JDW		NA	NA	NA	NA	NA	NA	✓
	SFRM24-JDW		NA	NA	NA	NA	NA	NA	✓

● Spare Parts

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
Spare Parts	T9031AP	IM 34M06C11-01E	NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	T9031AQ		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	T9031AS		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	T9113PL		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	T9112ZU		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	T9113PF		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	T9113PG		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	A2301JT		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	A2264JT		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	A1451JD		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	A1452JD		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	A1612JD		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	A1613JD		NA	✓[*8]	✓[*8]	NA	NA	NA	✓
	A1126EB	IM 34M06M52-01E	NA	✓[*10]	✓[*8]	NA	NA	NA	✓
	T9112ZS	Contact us	NA	✓[*8]	✓[*8]	NA	NA	NA	✓

● IO-Open

Name	Model	Related Manuals	Conformity Standard						
			UL	CE	UKCA	RCM	KC	EAC	TSCA
IO-open	YZ15-□□	Contact us	NA	✓ *8	✓ *8	NA	NA	NA	✓
	YZ19-□□		NA	✓ *8	✓ *8	NA	NA	NA	✓
	YZ17-□□		NA	✓ *8,*9	✓ *8,*9	NA	NA	NA	✓ *9

*8:   RoHS Compliance only

*9:   There are some suffix codes that are not compatible. Please contact us.

*10:   Battery Regulation Compliance.

■ Option Code

Some special modules have Option code shown below in SUFFIX on its module name plate.

The model that has option code /NR is non-RoHS, non-CE, non-UKCA, non-TSCA compliant module.

The model that has option code /NS does not comply with UL/CE/UKCA/RCM/KC/EAC/TSCA, but this is RoHS compliance.

The model that has option code /NU does not comply with UL/TSCA, but this is RoHS compliance.

About the model that has option code /C□□, /S□□ or /Z□□, contact your local Yokogawa sales personnel.

Other option codes does not affect the status of conformity.

Option Code	Meaning
/L□, /L□□	With Runtime License
/2N	With Modified Connector
/DCR	With Modified Default-Value
/DF	With unit change function
/CT	With Coating
/L□□□, /S□□□	Cable length
/NR	No RoHS Compliance, No CE Compliance, No UKCA, No TSCA Compliance
/NS	No UL/CE/UKCA/RCM/KC/EAC/TSCA Compliance. RoHS Compliance
/NU	No UL/TSCA Compliance. RoHS Compliance
/C□□	For Limited Customer
/S□□	For Limited Customer
/Z□□	For Limited Customer

**Hardware Manual
Part B FA-M3 Value (F3SC21-1N)**

IM 34M06C11-01E

B1. System Configuration

B1.1 System Configuration

■ Basic Configuration

The FA-M3 Value version (F3SC21-1N) consists of the following components.
- F3BU04-0N base module
- F3SP05-0P sequence CPU module with a power supply and memory
- F3WD64-3N I/O module

Should the FA-M3 Value version fail, it can be fixed by replacing the failed module only.

Install the F3SP05-0P sequence CPU module in the leftmost slot of the F3BU04-0N base module and the F3WD64-3N I/O module in slot 2. The remaining slots 3 and 4 are reserved for a variety of I/O modules available for use with the FA-M3 series.

A slot number consists of three digits of which the third digit is the unit number. The unit number 0 is allocated to the main unit.
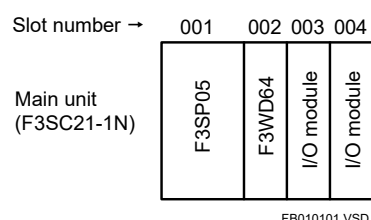
Figure B1.1 Slot Numbering

■ Concept of Unit

● Main Unit

A unit in which the F3SP05-0P sequence CPU module is installed is referred to as a main unit. Consequently, the F3SC21-1N itself serves as the main unit.

● Subunit

Subunits are used to increase the number of I/O ports. A maximum of seven subunits can be added to the Value version of the FA-M3 system to deal with up to 2048 I/O points.

■ Increasing the Number of I/O Points Using Fiber-optic FA-bus Modules

You can install fiber-optic FA-bus or FA-bus type 2 modules in both main and subunits and connect them with fiber-optic cables. This enables the distributed arrangement of remote I/O points, increase in the number of I/O points, and control of I/O modules via high-speed, noise-immune communication. The fiber-optic FA-bus or FA-bus type 2 module may be installed in either slot 3 or slot 4.

Note

■ Example of increasing the number of I/O points using FA-bus type 2 modules

As with fiber-optic FA-bus type 2 modules, the number of I/O points can be increased using FA-bus type 2 modules.

FA-bus type 2 modules use shielded twisted-pair cables for the connection between subunits.

B1.2 Restrictions on Module Installation

B1.2.1 Restrictions on Module Location

In the case of the F3SC21-1N, install the F3SP05-0P in slot 1 and the F3WD64-3N in slot 2. The remaining slots 3 and 4 are reserved for a variety of I/O modules available for use with the FA-M3 series. No CPU module can be installed in slots 3 and 4. For restrictions on the installation of I/O modules, including subunits, refer to Section A1.2, "Restrictions on Module Installation," as they are equivalent to the restrictions specified for the F3SP21-0N module discussed in that section.

B1.2.2 Restrictions due to Current Consumption

Make sure when designing your system that the total sum of current consumed by modules installed in slots 3 and 4 does not exceed the following calculated value. See section A2.9, "Module Current Consumption Tables".

Current-supply capacity of the F3SP05-0P module = 2000mA

Current consumption by the CPU of the F3SP05-0P module = 350mA

Current consumption of the F3BU04-0N module = 50mA

Current consumption of the F3WD64-3N module = 200mA

Consequently, the total amount of current available from slots 3 and 4 is

2000 – 350 – 50 – 200 = 1400mA

B1.3 Peripheral Tools Supporting the Program Development of FA-M3

You can conveniently create and debug your programs on your personal computer.

- FA-M3 Programming Tool WideField3 or WideField2
- FA-M3 ToolBox
- BASIC Programming Tool M3 for Windows

FA-M3

CD-ROM

Personal computer

Ethernet, cable for programming tools (RS-232-C), USB cable or FL-net.

Printer

FB010301.VSD
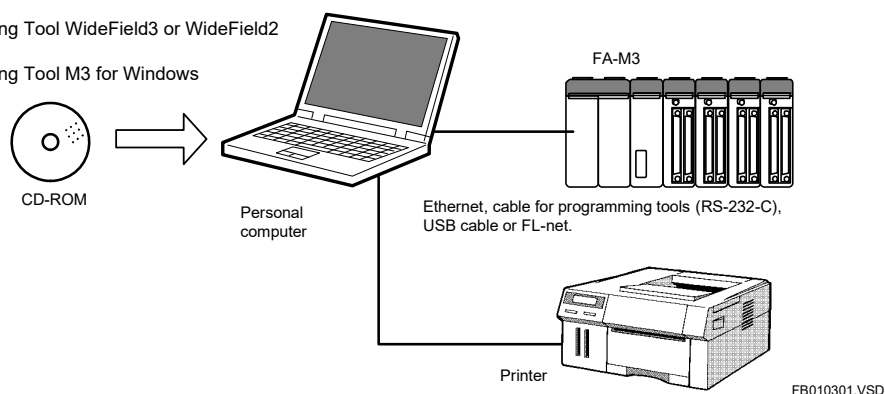
Figure B1.2   Support Tools

B2. Specifications and Configuration

B2.1 Specifications

■ Common Specifications

Item		Specifications
Supply voltage range		100 to 240V AC, single phase 50/60Hz
Range of supply voltage change		85 to 264V AC, 50/60Hz ± 3Hz
Power consumption		35VA
Insulation resistance		5MΩ min. when tested between a group of external AC terminals and the FG terminal using a 500V DC insulation resistance tester
		5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.
Withstanding voltage		1500V AC for one minute between a group of external AC terminals and the FG terminal
		1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.
FAIL-signal contact output		Located on the front terminal block of power supply module; contact ratings: 24V DC, 0.3A (Equipped with both normally-open and normally-closed terminals)
Leakage current		3.5mA max.
Allowable momentary power failure time		20ms (Standard Mode) ／ 10ms (Immediate Detection Mode)
Noise immunity		Tested using a noise simulator with a noise voltage of 1500Vp-p, pulse width of 1μs, rise time of 1 ns, and repetition frequency of 25 to 60Hz.
Vibration resistance		Tested in compliance with JIS C60068-2-6 under the following conditions: - Frequency ranges: 10 to 57Hz with an amplitude of 0.075mm / 57 to 150Hz with an acceleration of 9.8m/s^2 (1G) - Direction and sweep cycles: 10 times each in the X, Y, and Z directions
Shock resistance		Tested in compliance with JIS C60068-2-27 under the following conditions: - Direction and sweep cycles: 3 times each in the X, Y, and Z directions with an acceleration of 147m/s^2 (98m/s^2 with DIN-rail mounting)
Surrounding air temperature range		Operating : 0 to 55°C
		Storage : -20°C to 75°C
Surrounding humidity range		Operating : 10 to 90% RH (non-condensing)
		Storage : 10 to 90% RH (non-condensing)
Surrounding atmosphere		Must be free of corrosive gases, flammable gases or heavy dust.
Grounding		Protective earth (Comply with the regulation of each country.)
Cooling method		Natural-air cooled
Mounting		Direct mounting with 4 M4-size set screws[1] or 35-mm wide DIN-rail mounting
Structure		Designed for mounting inside a panel enclosure
Altitude of installation		Max. of 2000m above sea level
Compliance with safety standards [2]	UL	UL 508 approved, File No.E188707 (Overvoltage Category[3] : II, Pollution Degree[4] : 2)
Finish color		Light cobalt blue, equivalent to Munsell 6.2PB 4.6/8.8; lampblack, equivalent to Munsell 0.8Y 2.5/0.4
External dimensions		147 (W)× 100 (H)× 88.5 (D)(mm) For more information, see the dimensional figures in Section A2.11, "External Dimensions," for the case where an F3BU04-0N module is used

*1: For details on the number of mounting screws, see subsection A3.2.2, "Mounting Dimensions".
*2: For details on conforming modules, see Appendix A2, "Standard compliant products".
*3: The term Overvoltage Category involves prescriptions on resistance to surge voltage reduction due to lightning and has four categories. Overvoltage Category II applies to systems with a rated voltage of 220/230/240V and applies to electrical appliances, portable devices, etc.
*4: The term Pollution Degree represents the degree of pollution with foreign matter, solid, liquid or gaseous, that may produce a reduction of dielectric strength or surface resistivity in the operating environment of the equipment. Pollution degree 2 refers to an environment where normally only non-conductive pollution occurs but occasionally temporary conductivity caused by condensation is to be expected.

■ Model and Specification Code

Model	Basic Specification Code	Style Code	Specification Code Suffix	Remarks
F3SC21	-1N	……	……	FA-M3 Value (with base, power supply, sequence CPU, DI/O (F3WD64-3N) modules installed)

Note: F3SC21-1N is no longer available.

B2.2   System Configuration

B2.2.1   Components

The FA-M3 Value version (F3SC21-1N) consists of the following components.

- F3BU04-0N base module
- F3SP05-0P sequence CPU module with a power supply and memory
- F3WD64-3N I/O module

For details on the specifications of the F3BU04-0N and F3WD64-3N modules and other components, see their respective relevant sections.

B2.3 Sequence CPU Module

B2.3.1 Overview

The F3SP05-0P sequence CPU module with a power supply and memory contains a power supply equivalent to the F3PU10-0N power supply module. This section explains the specifications of this built-in power supply block. Details on the sequence CPU block are explained in the "Sequence CPU – Functions (for F3SP21, F3SP25, F3SP35)" (IM 34M06P12-02E).

B2.3.2 Power Supply Block of F3SP05-0P Module

■ Specifications

Item	Specifications
Supply voltage range	100 to 240V AC, single phase 50/60Hz
Supply voltage fluctuation range	85 to 264V AC, 50/60 Hz±3 Hz
Current consumption	35VA
Inrush current	20A max. (120V AC, Ta=25°C) 45A max. (240V AC, Ta=25°C)
Fuse	Time-lag fuse (Built into the L and N terminals and cannot be replaced.)
Rated output voltage	5V DC
Rated output current	2.0A
Insulation resistance	5MΩ min. when tested between a group of external AC terminals and the FG terminal using a 500V DC insulation resistance tester
	5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.
Withstanding voltage	1500V AC for one minute between a group of external AC terminals and the FG terminal
	1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.
Leakage current	3.5mA max.
Allowable momentary power failure time	20ms (Standard Mode) 10ms (Immediate Detection Mode)
External dimensions	58（W）× 100（H）× 83.2（D）(mm)[*]
Weight	320g (including the sequence CPU block)

[*]: Including the sequence CPU block but excluding protrusions (see the dimensional figures for more information)

■ Model and Specification Code

Model	Basic Specification Code	Style Code	Specification Code Suffix	Remarks
F3SP05	-0P	......	......	Sequence CPU Module (with power supply and memory modules installed) Memory 5K step

Note: F3SP05-0P is no longer available.

■ Components and Their Functions

Figure B2.1 shows the power supply block of the F3SP05-0P with its cover removed.

	Normal operating time	System Failure and Power Failure Times
Across FAIL1 and COM	Open	Short
Across FAIL2 and COM	Short	Open
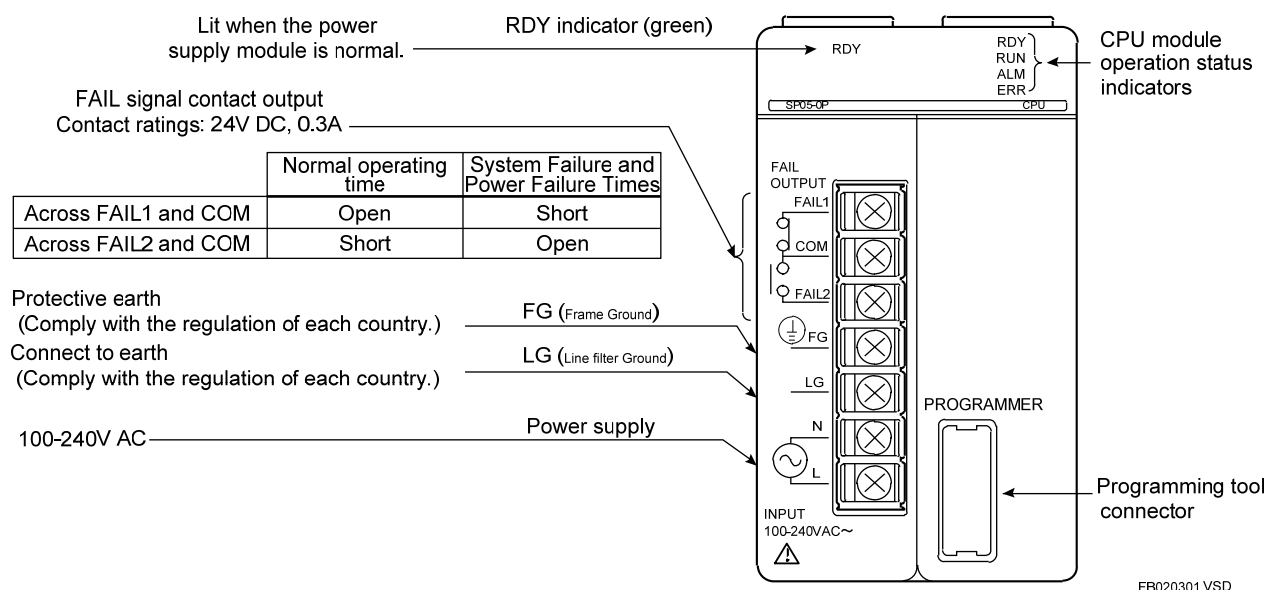
Figure B2.1   F3SP05-0P Sequence CPU Module

● Terminal dimensions (all values in mm)

● Adaptable crimp-on terminal

Vendor	Model	Compatible Conductor	Crimping Torque
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M3	AWG22 to 18 (0.33 to 0.82mm^2) (Copper wire)	0.8N·m (7.1 lbf·in)
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M4		
Japan Solderless Terminal Mfg Co., Ltd.	V2-M4	AWG16 to 14 (1.3 to 2.1mm^2) (Copper wire)	

Note

When crimping terminals, be sure only to use the tool specified by each terminal manufacturer.

⚠ **WARNING**

To avoid electrical shock, turn off the power before wiring.

Note

LG terminal has a half potential of the input power supply voltage when LG terminal isn't connected to earth appropriately.

B2.3.3   External Dimensions

Unit:mm

F3SP05-0P

83.2

58

2

100

FB020303.VSD
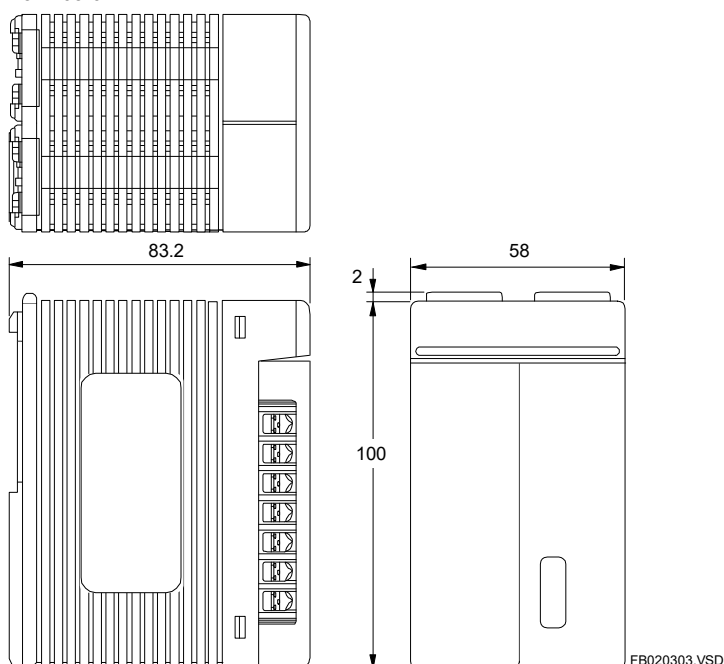
Hardware Manual
Part C FA-M3 Value II (F3SC22-□□, F3SC23-□□)

IM 34M06C11-01E

C1. System Configuration

C1.1 System Configuration

■ Basic Configuration

The FA-M3 Value II (F3SC22-□□, F3SC23-□□) consists of the following components. See Figure C1.1 for the available models with their respective module configurations.

- F3BU04-0N base module
- F3SP08-0P sequence CPU module with power supply (with M3.5 screws) and memory
- F3SP08-SP sequence CPU module with power supply (with M4 screws) and memory
- F3WD32-3F I/O module
- F3WD64-3F I/O module
- F3WD64-3P I/O module
- F3WD64-4P I/O module
- F3XD16-3F input module
- F3YD14-5A output module

Should the FA-M3 Value II fail, it can be fixed by replacing the failed module only.

Install the F3SP08-□P sequence CPU module in the leftmost slot of the F3BU04-0N base module and the other I/O modules in slot 2 (or slots 2 and 3). The remaining slots 3 and 4 (or only slot 4) are reserved for a variety of I/O modules available for use with the FA-M3 series.

A slot number consists of three digits of which the third digit is the unit number. The unit number 0 is allocated to the main unit.
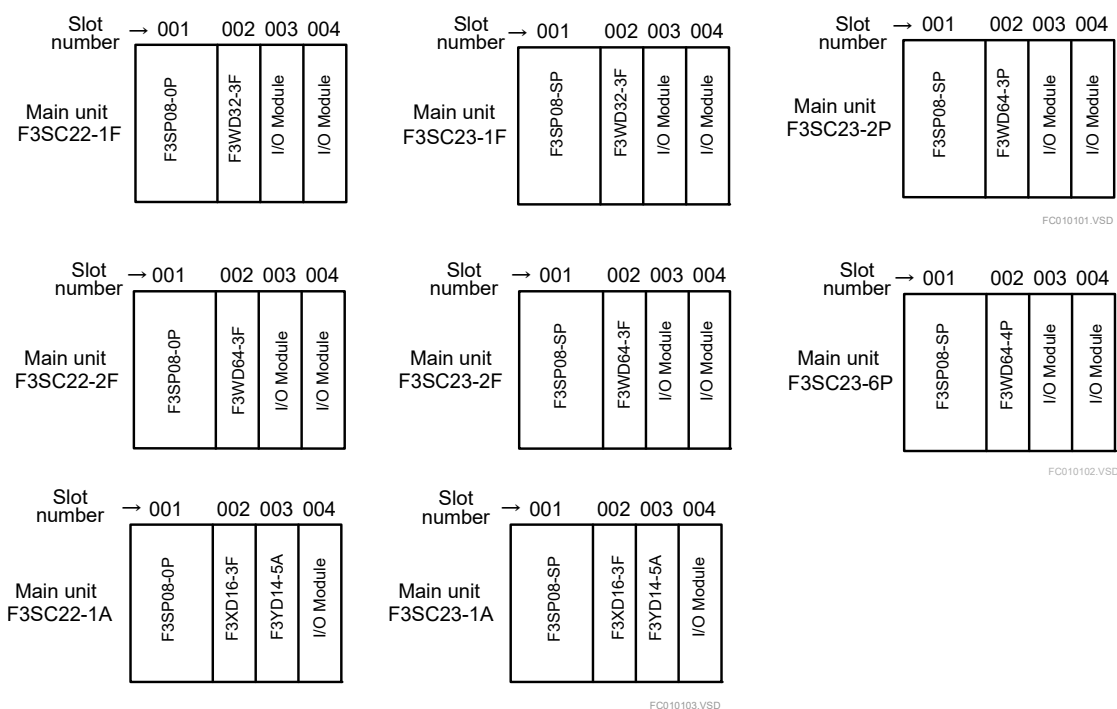
Figure C1.1 Module Configuration and Slot Numbering

■ Concept of Unit

● Main Unit

A unit in which the F3SP08-0P or F3SP08-SP sequence CPU module is installed is referred to as a main unit. Consequently, the F3SC22-□□ or F3SC23- □□ itself serves as the main unit.

● Subunit

Subunits are used to increase the number of I/O ports. A maximum of seven subunits can be added to the Value II of the FA-M3 system to deal with up to 2048 I/O points.

■ Increasing the Number of I/O Points Using Fiber-optic FA-bus Modules

You can install fiber-optic FA-bus or FA-bus type 2 modules in both main and subunits and connect them with fiber-optic cables. This enables the distributed arrangement of remote I/O points, increase in the number of I/O points, and control of I/O modules via high-speed, noise-immune communication. The fiber-optic FA-bus or FA-bus type 2 module may be installed in either slot 3 or slot 4.

Note

■ Example of increasing the number of I/O points using FA-bus type 2 modules

As with fiber-optic FA-bus type 2 modules, the number of I/O points can be increased using FA-bus type 2 modules.

FA-bus type 2 modules use shielded twisted-pair cables for the connection between subunits.

C1.2 Restrictions on Module Installation

C1.2.1 Restrictions on Module Location

Install the F3SP08-0P sequence CPU in slot 1 for the F3SC22-□□, and install the F3SP08-SP sequence CPU module in slot 1 for the F3SC23-□□. Install the other specified component modules in slot 2 (or slots 2 and 3). You may install FA-M3 I/O modules in the remaining slots. You may not install a CPU module in the remaining slots.

For restrictions on the installation of I/O modules, including subunits, refer to Section A1.2, "Restrictions on Module Installation," as they are equivalent to the restrictions specified for the F3SP21-0N module discussed in that section.

C1.2.2 Restrictions due to Current Consumption

Make sure when designing your system that the total sum of current consumed by any modules installed in the remaining slots does not exceed the following calculated value. See section A2.9, "Module Current Consumption Tables".

● **Total Amount of Current Available from the Remaining Slots**

F3SC22-1F/F3SC23-1F	1500mA
F3SC22-2F/F3SC23-2F/F3SC23-2P/F3SC23-6P	1400mA
F3SC22-1A/F3SC23-1A	1415mA

● **Current-supply Capacity, Current Consumption of each Module**

F3SP08-0P/F3SP08-SP	Current-supply Capacity of Power Supply Unit	2000mA
F3SP08-0P/F3SP08-SP	Current Consumption of CPU Unit	350mA
F3BU04-0N	Current Consumption	50mA
F3WD32-3F	Current Consumption	100mA
F3WD64-3F	Current Consumption	200mA
F3WD64-3P	Current Consumption	170mA
F3WD64-4P	Current Consumption	170mA
F3XD16-3F	Current Consumption	65mA
F3YD14-5A	Current Consumption	120mA

Therefore, the total amount of current available from the remaining slots is the current-supply capacity of the power supply unit (2000mA) less the current consumption of all pre-installed modules.

C1.3 Peripheral Tools Supporting the Program Development of FA-M3

You can conveniently create and debug your programs on your personal computer.

- FA-M3 Programming Tool WideField3 or WideField2
- FA-M3 ToolBox
- BASIC Programming Tool M3 for Windows

CD-ROM

Personal computer

FA-M3

Ethernet, cable for programming tools (RS-232-C), USB cable or FL-net.

Printer
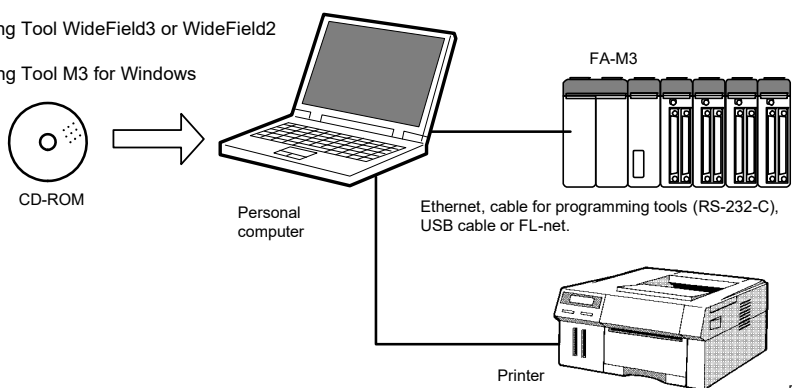
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Figure C1.2   Support Tools

Note

Before using F3SP08-SP, you should set the CPU type to F3SP08-0P on the Change CPU Type/Properties screen of the WideField3, WideField2 or ToolBox software.

C2. Specifications and Configuration

C2.1 Specifications

■ Common Specifications

Item			Specifications
Supply voltage range			100 to 240V AC, single phase 50/60Hz
Range of supply voltage change			85 to 264V AC, 50/60Hz ± 3Hz
Power consumption			35VA
Insulation resistance			5MΩ min. when tested between a group of external AC terminals and the FG terminal using a 500V DC insulation resistance tester
			5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.
Withstanding voltage			1500V AC for one minute between a group of external AC terminals and the FG terminal
			1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.
FAIL-signal contact output			Located on the front terminal block of power supply module; contact ratings: 24V DC, 0.3A (Equipped with both normally-open and normally-closed terminals)
Leakage current			3.5mA max.
Allowable momentary power failure time			20ms (Standard Mode) ／ 10ms (Immediate Detection Mode)
Noise immunity			Tested using a noise simulator with a noise voltage of 1500Vp-p, pulse width of 1 µs, rise time of 1 ns, and repetition frequency of 25 to 60Hz. For CE/UKCA Marking-compliant modules, compliant to EN 61326-1, EN 61326-2-3[5] and EN 61000-6-2
Vibration resistance			Tested in compliance with JIS C60068-2-6 under the following conditions: - Frequency ranges: 10 to 57Hz with an amplitude of 0.075mm 57 to 150Hz with an acceleration of 9.8m/s^2 (1G) - Direction and sweep cycles: 10 times each in the X, Y, and Z directions
Shock resistance			Tested in compliance with JIS C60068-2-27 under the following conditions: - Direction and sweep cycles: 3 times each in the X, Y, and Z directions with an acceleration of 147m/s^2 (98m/s^2 with DIN-rail mounting)
Surrounding air temperature range			Operating : 0 to 55°C
			Storage : -20°C to 75°C
Surrounding humidity range			Operating : 10 to 90% RH (non-condensing)
			Storage : 10 to 90% RH (non-condensing)
Surrounding atmosphere			Must be free of corrosive gases, flammable gases or heavy dust.
Grounding			Protective earth (Comply with the regulation of each country.)
Cooling method			Natural-air cooled
Mounting			Direct mounting with 4 M4-size set screws[1] or 35-mm wide DIN-rail mounting
Structure			Designed for mounting inside a panel enclosure
Altitude of installation			Max. of 2000m above sea level
Compliance with safety and EMC standards, etc [2]	UL		UL 508 approved File No.E188707 (Overvoltage Category[3] : II, Pollution Degree[4] : 2)
	CE UKCA	EMC Directive /Regulation	EN 61326-1 Class A, Table 2 EN 61326-2-3[5] EN 55011 Class A, Group 1 EN 61000-6-2, EN 61000-3-2, EN 61000-3-3 compliance
		Low Voltage Directive /Regulation	EN 61010-1, EN IEC 61010-2-201compliance (only for F3SC23-□□) (Overvoltage Category[3] II, Pollution Degree[4] 2)
		RoHS Directive /Regulation[6][7]	EN IEC 63000 compliance
	CE	Battery Regulation	REGULATION (EU) 2023/1542 compliance
	RCM		EN 55011 Class A, Group 1 compliance EN 61326-1 Class A, Table 2 compliance
	KC		Korea Electromagnetic Conformity Standard compliance
	EAC		CU TR 004/2011 CU TR 020/2011 compliance
	TSCA		USA: Toxic Substances Control Act (TSCA) compliance
Finish color			Light cobalt blue, equivalent to Munsell 6.2PB 4.6/8.8; lampblack, equivalent to Munsell 0.8Y 2.5/0.4
External dimensions			147 (W)× 100 (H)× 88.5 (D)(mm) For more information, see the dimensional figures in Section A2.11, "External Dimensions," for the case where an F3BU04-0N module is used

*1: For details on the number of mounting screws, see subsection A3.2.2, "Mounting Dimensions."
*2: For details on conforming modules, see Appendix A2, "Standard compliant products".

*3:   The term Overvoltage Category involves prescriptions on resistance to surge voltage reduction due to lightning and has four categories. Overvoltage Category II applies to systems with a rated voltage of 220/230/240V and applies to electrical appliances, portable devices, etc.

*4:   The term Pollution Degree represents the degree of pollution with foreign matter, solid, liquid or gaseous, that may produce a reduction of dielectric strength or surface resistivity in the operating environment of the equipment. Pollution degree 2 refers to an environment where normally only non-conductive pollution occurs but occasionally temporary conductivity caused by condensation is to be expected.

*5:   EN 61326-2-3 is applicable only to F3CU04-□□.

*6:   10-Substances RoHS. Phthalate ester have high migration (the property of substance transfer from other products upon contact). Therefore, care must be taken to prevent process contamination. After unpacking each package, please control the products to prevent contamination by the customer side.

*7:   Exclude F3SP8-0P, F3SP08-SP and F3WD64-3F.

■ Model and Specification Code

Model	Basic Specification Code	Style Code	Specification Code Suffix	Remarks
F3SC22	-1A	......	......	FA-M3 Value II (with base, power supply (with M3.5 screws), sequence CPU, DI/O (F3XD16-3F, F3YD14-5A modules installed)
	-1F	......	......	FA-M3 Value II (with base, power supply (with M3.5 screws), sequence CPU, DI/O (F3WD32-3F) modules installed)
	-2F	......	......	FA-M3 Value II (with base, power supply (with M3.5 screws), sequence CPU, DI/O (F3WD64-3F) modules installed)

Note: F3SC22-□□ is no longer available.

Model	Basic Specification Code	Style Code	Specification Code Suffix	Remarks
F3SC23	-1A	......	......	FA-M3 Value II (with base, power supply (with M4 screws), sequence CPU, DI/O (F3XD16-3F and F3YD14-5A) modules installed)
	-1F	......	......	FA-M3 Value II (with base, power supply (with M4 screws), sequence CPU, DI/O (F3WD32-3F) modules installed)
	-2F	......	......	FA-M3 Value II (with base, power supply (with M4 screws), sequence CPU, DI/O (F3WD64-3F) modules installed)
	-2P	......	......	FA-M3 Value II (with base, power supply (with M4 screws), sequence CPU, DI/O (F3WD64-3P) modules installed)
	-6P	......	......	FA-M3 Value II (with base, power supply (with M4 screws), sequence CPU, DI/O (F3WD64-4P) modules installed)

Note: F3SC23-2F is no longer available.

C2.2 System Configuration

C2.2.1 Components

The FA-M3 Value II (F3SC22-□□, F3SC23-□□) consists of the following components. See Figure C1.1 for the available models with their respective module configurations.

- F3BU04-0N base module
- F3SP08-0P sequence CPU module with power supply (with M3.5 screws) and memory
- F3SP08-SP sequence CPU module with power supply (with M4 screws) and memory
- F3WD32-3F I/O module
- F3WD64-3F I/O module
- F3WD64-3P I/O module
- F3WD64-4P I/O module
- F3XD16-3F input module
- F3YD14-5A output module

For details on the specifications of the F3BU04-0N, F3WD64-□□, F3XD16-3F, F3YD14-5A modules and other components, see their respective relevant sections.

We describe here the F3SP08-0P, F3SP08-SP and F3WD32-3F modules, which are specific to the FA-M3 Value II (F3SC22-□□, F3SC23-□□).

Note

Before using F3SP08-SP, you should set the CPU type to F3SP08-0P on the Change CPU Type/Properties screen of the FA-M3 WideField3, WideField2 or ToolBox software.

C2.3 Sequence CPU Module

C2.3.1 Overview

The F3SP08-0P (or F3SP08-SP) sequence CPU module with a power supply and memory contains a power supply equivalent to the F3PU10-0N (or F3PU10-0S) power supply module. This section explains the specifications of this built-in power supply block. Details on the sequence CPU block are explained in the instruction manual "Sequence CPU - Functions (for F3SP21, F3SP25 and F3SP35)" (IM 34M06P12-02E).

C2.3.2 Power Supply Block of F3SP08-0P and F3SP08-SP Module

■ Specifications

Item	Specifications
Supply voltage range	100 to 240V AC, single phase 50/60Hz
Supply voltage fluctuation range	85 to 264V AC, 50/60 Hz±3Hz
Current consumption	35VA
Inrush current	20A max. (120V AC, Ta=25°C) 45A max. (240V AC, Ta=25°C)
Fuse	Time-lag fuse (Built into the L and N terminals and cannot be replaced.)
Rated output voltage	5V DC
Rated output current	2.0A
Insulation resistance	5MΩ min. when tested between a group of external AC terminals and the FG terminal using a 500V DC insulation resistance tester 5MΩ min. when tested between a group of FAIL-signal contact output and internal circuit using a 500V DC insulation resistance tester.
Withstanding voltage	1500V AC for one minute between a group of external AC terminals and the FG terminal 1000V AC for one minute between a group of FAIL-signal contact output and internal circuit.
Leakage current	3.5mA max.
Allowable momentary power failure time	20ms (Standard Mode) 10ms (Immediate Detection Mode)
External dimensions	58（W）× 100（H）× 83.2（D）(mm)[*]
Weight	320g (including the sequence CPU block)

[*]: Including the sequence CPU block but excluding protrusions (see the dimensional figures for more information)

■ Model and Specification Code

Model	Basic Specification Code	Style Code	Specification Code Suffix	Remarks
F3SP08	-0P	……	……	Sequence CPU Module (with power supply and memory modules installed) Memory: 10K step Power supply terminal screw: M3.5
	-SP	……	……	Sequence CPU Module (with power supply and memory modules installed) Memory: 10K step Power supply terminal screw: M4

Note: F3SP08-0P is no longer available.

■ Components and Their Functions

Figure C2.1 shows the power supply block of the F3SP08-0P with its cover removed.

Figure C2.1   F3SP08-0P and F3SP08-SP Sequence CPU Module

	Normal operating time	System Failure and Power Failure Times
Across FAIL1 and COM	Open	Short
Across FAIL2 and COM	Short	Open

● Terminal dimensions (all values in mm)

F3SP08-0P

F3SP08-SP

● Adaptable crimp-on terminal

Vendor	Model	Compatible Conductor	Compatible Modules and Crimping Torque	
			F3SP08-0P	F3SP08-SP
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M3	AWG22 to 18 (0.33 to 0.82mm^2) (Copper wire)	0.8N·m (7.1 lbf·in)	May not be used
Japan Solderless Terminal Mfg Co., Ltd.	V1.25-M4			1.2N·m (10.6 lbf·in)
Japan Solderless Terminal Mfg Co., Ltd.	V2-M4	AWG16 to 14 (1.3 to 2.1mm^2) (Copper wire)		

Note

When crimping terminals, be sure only to use the tool specified by each terminal manufacturer.

⚠ WARNING

To avoid electrical shock, turn off the power before wiring.

Note

LG terminal has a half potential of the input power supply voltage when LG terminal isn't connected to earth appropriately.

C2.3.3   External Dimensions

Unit: mm

F3SP08-0P/ F3SP08-SP

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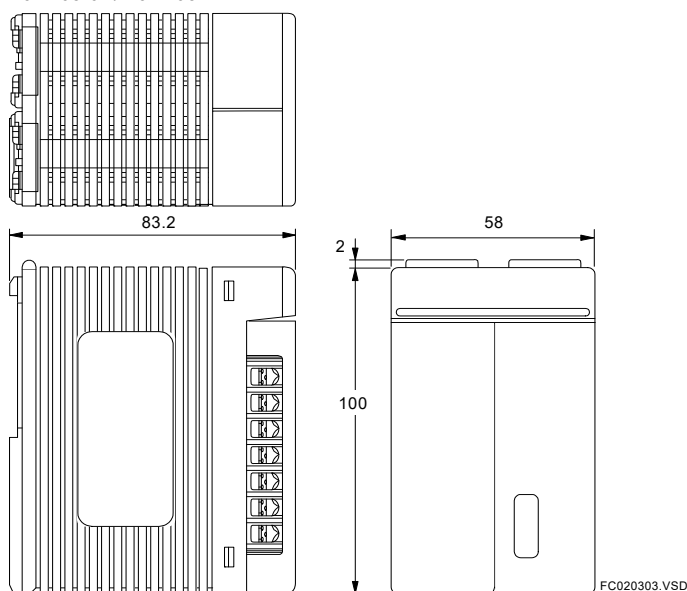
Note

- F3SP08-0P and F3SP08-SP have exactly the same dimensions, internal circuitry and other characteristics, except that F3SP08-0P uses M3.5-screw terminals while F3SP08-SP uses M4-screw terminals.

C2.4 F3WD32-3F Input/Output Module

● Input Block

Item		Specifications
		F3WD32-3F
Input type		DC voltage
Number of points		16
Common line type		8 points/common
Isolation method		Photocoupler isolation
Withstanding voltage		1500V AC for one minute between the group of terminals for external connection and the internal circuit
Rated input voltage		24V DC
Operating voltage range		20.4 to 26.4V DC
Rated input current		4.1mA/point (24V DC)
Input impedance		5.9kΩ
Operating voltage/current	ON	16.0V DC min 3.2mA min
	OFF	5.8V DC max 0.9mA max
Response time	OFF→ON	can be specified as 2ms max. or 17ms
	ON→OFF	can be specified as 3.5ms max. or 18.5ms
Interrupt		None
Dissipating current		100mA (5V DC) (including the output block)
Input display		LED (Lit when inputs are turned on)
External connection		One 40-pin connector (shared with the output block)
Weight		100g (including the output block)
Maximum ratio of inputs turned on simultaneously		100%

● **Output Block**

Item		Specifications
		F3WD32-3F
Output type		Transistor contact (sink type)
Number of points		16
Common line type		8 points/common
Isolation method		Photocoupler isolation
Rated load voltage (Operating load voltage range)	DC	24V DC (20.4 to 26.4V DC)
	AC	——
Maximum load current		0.1A/point, 0.4A/common line
Response time	OFF→ON	1ms max.
	ON→OFF	1ms max.
ON voltage		0.5V DC max.
Off-time lead current		0.1mA max.
Service life	Mechanical	——
	Electrical	——
Surge protector[1]		Zener diode
Fuse		None
Dissipating current		100mA (5V DC) (including the input block)
Output display[2]		LED (Lit when inputs are turned on) If the selector switch is set to OUT, the output state is displayed.
Output status when the program stops HOLD/RESET [3]		When a sequence CPU module is used: Default: RESET Can be set globally on a module-by-module basis.
		When a BASIC CPU module is used: No setting function The status is always HOLD
External power supply		24V DC, 30mA
External connection		One 40-pin connector (shared with the input block)
Weight		100g (including the input block)

[1]: A surge protector is also required on the load side if an inductive load such as a relay is to be connected. See subsection A3.6.5, "Connecting to Output Devices."
[2]: The contact operation of the output block of the circuit and the LED display operate independently and thus may be inconsistent in the event of an error.
[3]: For information on the module's behavior during a CPU failure, see subsection A4.3.3, "Indicating Problem Severity and Status of Output Module."

● **Front View**

F3WD32-3F
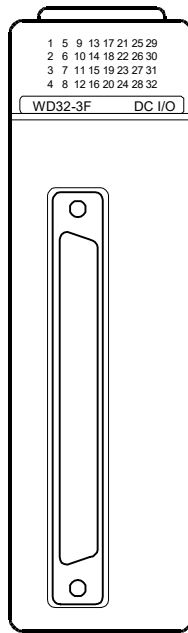
FC020304.VSD

■ Input/Output Module

● Internal Circuit Configuration
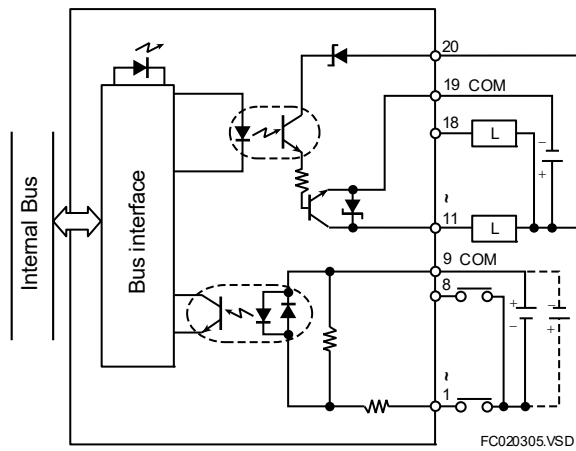
FC020305.VSD

● External Connection Diagram
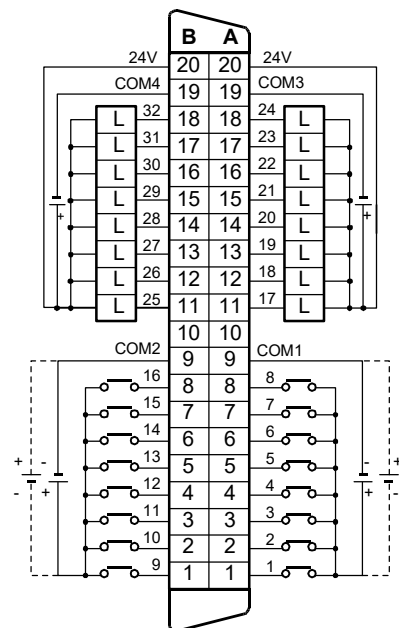
Note: Viewed from the front side of the module.
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● Operating Environment

This module can be used with the following CPU modules.

- F3SP08-0P
- F3SP08-SP

● Model and Specification Code

Model	Basic Specification Code	Style Code	Specification Code Suffix	Remarks
F3WD32	-3F	......	......	24V DC Input/Output

● External Dimensions

Unit:mm

83.2   1.3   28.9   2   100

FC020307.VSD

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Revision Information

Title   :   Hardware Manual

Document No.   :   IM 34M06C11-01E

Oct. 2024 / 52nd Edition
   CE Battery Regulation compliance. Appx.A2 Update.

July. 2024 / 51st Edition
   USA: Toxic Substances Control Act (TSCA) compliance. Appx.A2 Update.
   Additional of F3NP5□-□□ support for F3LX02-2N module.

Mar. 2024 / 50th Edition
   Additional of F3RP70-2L support for F3LX02-2N module.

Apr. 2023 / 49th Edition
   Additional of modules and operating environment specifications.

Sep. 2022 / 48th Edition
   Correction of errors.

Sep. 2022 / 47th Edition
   Appx.A2 Update.

Apr. 2022 / 46th Edition
   Addition of modules, UKCA compliance. Appx.A2 Update.

Dec. 2021 / 45th Edition
   Addition of modules. Appx.A2 Update. Correction of errors.

Sep. 2021 / 44th Edition
   Change of module information.

Jun. 2021 / 43rd Edition
   Addition of modules. Appx.A2 Update.

Dec. 2020 / 42nd Edition
   Addition of modules. Appx.A2 Update.

Apr. 2020 / 41st Edition
   Addition of F3RP70-2L.

Mar. 2020 / 40th Edition
   Addition of modules. Appx.A2 Update. Correction of errors.

Nov. 2019 / 39th Edition
   Addition of modules. Appx.A2 Update.

Aug. 2019 / 38th Edition
   Addition of modules. Appx.A2 Update.

Mar. 2019 / 37th Edition
   Addition of modules. Appx.A2 Update. Correction of errors.

Feb. 2019 / 36th Edition
   Correction of errors.

Jan. 2019 / 35th Edition
   Appx.A2 Update.

July. 2018 / 34th Edition
> Addition of modules. Appx.A2 Update.

May. 2018 / 33rd Edition
> Addition of modules. Appx.A2 Update.

Dec. 2017 / 32nd Edition
> Correction of errors. Appx.A2 Update.

May. 2017 / 31th Edition
> Addition of F3LX02-2N. Correction of errors. Appx.A2 Update.

Mar. 2017 / 30th Edition
> Addition of F3LX02-2N. Correction of errors.

Dec. 2016 / 29th Edition
> Addition of recommended equipment for protecting Power Supply Module against Noise.
> Correction of errors.

Mar. 2016 / 28th Edition
> Change of Terminal (T9113PF, T9113PG). Addition of KM11-2N. Correction of errors.

Dec. 2015 / 27th Edition
> Addition of modules. Correction of errors. Addition of explanation on compliance with
> EN 61010-2-201.

Sep. 2015 / 26th Edition
> Appx.A2 Update. Correction of errors.

Mar. 2015 / 25th Edition
> Addition of modules. Incorporation of addendum contents. Addition of explanation
> on compliant with CE25. Correction of errors.

May. 2014 / 24th Edition
> Addition of modules. Incorporation of addendum contents. Correction of errors.

Oct. 2013 / 23rd Edition
> Ed.3, Addition of modules.

Jan. 2012 / 22nd Edition
> Addition of modules. Correction of errors.

Oct. 2010 / 21st Edition
> UL compliance. Terminology change. Incorporation of addendum contents.

Oct. 2009 / 20th Edition
> CE compliance. Incorporation of addendum contents.

Apr. 2009 / 19th Edition
> Additional information according to WEEE Directive (2002/96/EC). Addition of modules.
> Incorporation of addendum contents.

Jan. 2008 / 18th Edition
> Addition of modules.

Jun. 2007 / 17th Edition
> Addition of modules.

May 2006 / 16th Edition
> Addition of modules.

Nov. 2005 /15th Edition
Addition of modules.

Apr. 2005 / 14th Edition
Addition of modules

Dec. 2004 / 13th Edition
Addition of modules. Addition of corresponding descriptions to specifications.

Apr. 2004 / 12th Edition
Addition of modules. Correction of errors. Addition of explanation on compliance with.
EN 61010-1:2001.

July 2003 / 11th Edition
Addition of modules. Correction of errors.

Apr. 2003 / 10th Edition
Addition of KM65 fiber-optic cable. Correction of errors.

Oct. 2002 / 9th Edition
Addition of modules. Correction of errors.

Apr. 2002 / 8th Edition
Addition of modules.

Oct. 2001 / 7th Edition
Addition of Part C FA-M3 Value II (F3CS22-□□).
Change in grounding standard to support revision of clause 10 of the Electrical
Equipment Technical Standard.
Partial amendment of EMC compliance specifications.
Change the vibration resistance and shock resistance standard specification to support
new specifications since JIS C0911 and C0912 has been abolished.
Correction of errors.

May 2001 / 6th Edition
Additional information and errata on additional modules and CE marking.

July 2000 / 5th Edition
Support of F3SP28, 38,53 and CPUs.

Sep.1999 / 4th Edition
Addition of explanations on support of CE Mark; correction of typographical errors.

Nov. 1994 / 3rd Edition
Addition of modules.

Oct. 1992 / 2nd Edition
Addition of modules.

Dec. 1992 / 1st Edition
New publication