# MITSUBISHI ELECTRIC

## PROGRAMMABLE CONTROLLERS

**MELSEC iQ-F** series

MELSEC iQ-F
FX5UC User's Manual (Hardware)

# SAFETY PRECAUTIONS

(Read these precautions before use.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety in order to handle the product correctly.

This manual classifies the safety precautions into two categories: [⚠ WARNING] and [⚠ CAUTION].

| ⚠ **WARNING** | Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury. |
|---|---|
| ⚠ **CAUTION** | Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage. |

Depending on the circumstances, procedures indicated by [⚠ CAUTION] may also cause severe injury.

It is important to follow all precautions for personal safety.

Store this manual in a safe place so that it can be read whenever necessary. Always forward it to the end user.

## [DESIGN PRECAUTIONS]

### ⚠ WARNING

● Make sure to set up the following safety circuits outside the PLC to ensure safe system operation even during external power supply problems or PLC failure. Otherwise, malfunctions may cause serious accidents.
  - Most importantly, set up the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as forward vs. reverse rotation), and an interlock circuit to prevent damage to the equipment at the upper and lower positioning limits.
  - Note that when the CPU module detects an error, such as a watchdog timer error, during self-diagnosis, all outputs are turned off. Also, when an error that cannot be detected by the CPU module occurs in an input/output control block, output control may be disabled. External circuits and mechanisms should be designed to ensure safe machine operation in such a case.
  - Note that when an error occurs in a relay, transistor or triac of an output circuit, the output might stay on or off. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machine operation.
● Construct an interlock circuit in the program so that the whole system always operates on the safe side before executing the control (for data change) of the PLC in operation.
  Read the manual thoroughly and ensure complete safety before executing other controls (for program change, parameter change, forced output and operation status change) of the PLC in operation. Otherwise, the machine may be damaged and accidents may occur due to erroneous operations.
● In an output circuit, when a load current exceeding the current rating or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
● For the operating status of each station after a communication failure of the network, refer to relevant manuals for the network. Incorrect output or malfunction may result in an accident.

# [DESIGN PRECAUTIONS]

## ⚠CAUTION

- When an inductive load such as a lamp, heater, or solenoid valve is controlled, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Take proper measures so that the flowing current does not exceed the value corresponding to the maximum load specification of the resistance load.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size.
  Design circuits so that the entire system will always operate safely, regardless of this variation in time.
- Simultaneously turn on and off the power supplies of the CPU module and extension modules.
- If a long-time power failure or an abnormal voltage drop occurs, the PLC stops, and output is turned off. When the power supply is restored, it will automatically restart (when the RUN/STOP/RESET switch is on RUN side).

# [INSTALLATION PRECAUTIONS]

## ⚠WARNING

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.
- Use the product within the generic environment specifications described in ☞ Page 17 Generic Specifications of this manual.
  Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, $Cl_2$, $H_2S$, $SO_2$ or $NO_2$), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind.
  If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.

# [INSTALLATION PRECAUTIONS]

## ⚠ **CAUTION**

- Do not touch the conductive parts of the product directly. Doing so may cause device failures or malfunctions.
- When drilling screw holes or wiring, make sure that cutting and wiring debris do not enter the ventilation slits of the PLC. Failure to do so may cause fire, equipment failures or malfunctions.
- For product supplied together with a dust proof sheet, the sheet should be affixed to the ventilation slits before the installation and wiring work in order to block foreign objects such as cutting and wiring debris.
  However, when the installation work is completed, make sure to remove the sheet to provide adequate ventilation. Failure to do so may cause fire, equipment failures or malfunctions.
- Install the product on a flat surface. If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformities.
- Install the product securely using a DIN rail.
- Connect the expansion adapter securely to their designated connectors. Loose connections may cause malfunctions.
- Work carefully when using a screwdriver during product installation. Failure to do so may cause damage to the product or accidents.
- Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors. Loose connections may cause malfunctions.
- When using an SD memory card, insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause device failures or malfunctions.
  - Peripheral devices and expansion adapter
  - Extension modules, bus conversion module and connector conversion module
  - Battery

# [WIRING PRECAUTIONS]

## ⚠WARNING

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.
- Make sure to attach the terminal cover, provided as an accessory, before turning on the power or initiating operation after installation or wiring work. Failure to do so may cause electric shock.
- The temperature rating of the cable should be 80℃ or more.
- Make sure to wire the screw terminal block in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - Wire terminals should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Tighten the screws using a Phillips-head screwdriver No. 2 (shaft diameter 6 mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
- Make sure to wire the terminal block (European type) in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - Wire terminals should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the ends of stranded wires and make sure that there are no loose wires.
  - Do not solder-plate the electric wire ends.
  - Do not connect more than the specified number of wires or electric wires of unspecified size.
  - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.

# [WIRING PRECAUTIONS]

## ⚠CAUTION

- Perform class D grounding (grounding resistance: 100 Ω or less) of the grounding terminal on the CPU module and extension modules with a wire 2 mm$^2$ or thicker.
  However, do not use common grounding (refer to ☞ Page 56 Grounding) with heavy electrical systems.
- Connect the power supply wiring to the dedicated terminals described in this manual. If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the PLC will burn out.
- Do not wire vacant terminals externally. Doing so may cause damage to the product.
- Install module so that excessive force will not be applied to terminal blocks, power connectors, I/O connectors, communication connectors, or communication cables. Failure to do so may result in wire damage/breakage or PLC failure.

# ⚠ CAUTION

● Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to malfunction of the PLC caused by abnormal data written to the PLC due to the effects of noise.
  - Do not bundle the power line, control line and communication cables together with or lay them close to the main circuit, high-voltage line, load line or power line. As a guideline, lay the power line, control line and connection cables at least 100 mm (3.94") away from the main circuit, high-voltage line, load line or power line.
  - Ground the shield of the shield wire or shielded cable at one point on the PLC. However, do not use common grounding with heavy electrical systems.
  - Ground the shield of the analog input/output cable at one point on the signal receiving side. Do not use common grounding with heavy electrical systems.

# [STARTUP AND MAINTENANCE PRECAUTIONS]

## ⚠ WARNING

● Do not touch any terminal while the PLC's power is on. Doing so may cause electric shock or malfunctions.
● Before cleaning or retightening terminals, cut off all phases of the power supply externally. Failure to do so may cause electric shock.
● Before modifying the program in mid-operation, forcing output, running or stopping the PLC, read through this manual carefully, and ensure complete safety. An operation error may damage the machinery or cause accidents.
● Do not change the program in the PLC from two or more peripheral equipment devices at the same time. (i.e. from an engineering tool and a GOT) Doing so may cause destruction or malfunction of the PLC program.
● Use the battery for memory backup in conformance to this manual.
  - Use the battery for the specified purpose only.
  - Connect the battery correctly.
  - Do not charge, disassemble, heat, put in fire, short-circuit, connect reversely, weld, swallow or burn the battery, or apply excessive force (vibration, impact, drop, etc.) to the battery.
  - Do not store or use the battery at high temperatures or expose to direct sunlight.
  - Do not expose to water, bring near fire or touch liquid leakage or other contents directly.
Incorrect handling of the battery may cause excessive heat, bursting, ignition, liquid leakage or deformation, and lead to injury, fire or failures and malfunction of facilities and other equipment.

# [STARTUP AND MAINTENANCE PRECAUTIONS]

## ⚠**CAUTION**

- Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions.
  *For repair, contact your local Mitsubishi Electric representative.
- After the first use of the SD memory card, do not insert/remove the memory card more than 500 times. Insertion/removal 500 times or more may cause malfunction.
- Turn off the power to the PLC before connecting or disconnecting any extension cable. Failure to do so may cause device failures or malfunctions.
- Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause device failures or malfunctions.
  - Peripheral devices and expansion adapter
  - Extension modules, bus conversion module and connector conversion module
  - Battery

# [OPERATION PRECAUTIONS]

## ⚠**CAUTION**

- Construct an interlock circuit in the program to ensure safe operation for the whole system when executing control (for data change) of the PLC in operation. Read the manual thoroughly and ensure complete safety before executing other controls (for program change, parameter change, forced output and operation status change) of the PLC in operation. Otherwise, the machine may be damaged and accidents may occur by erroneous operations.

# [DISPOSAL PRECAUTIONS]

## ⚠**CAUTION**

- Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.
- When disposing of batteries, separate them from other waste according to local regulations. For details on the Battery Directive in EU countries, refer to ☞ Page 140 Handling of Batteries and Devices with Built-in Batteries in EU Member States.

# [TRANSPORTATION PRECAUTIONS]

## ⚠ CAUTION

- When transporting the PLC with the optional battery, turn on the PLC before shipment, confirm that the battery mode is set in PLC parameters and the BAT LED is OFF, and check the battery life. If the PLC is transported with the BAT LED on or the battery exhausted, the battery-backed data may be lost during transportation.
- The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in the general specifications (☞ Page 17 Generic Specifications) by using dedicated packaging boxes and shock-absorbing palettes. Failure to do so may cause failures in the PLC. After transportation, verify operation of the PLC and check for damage of the mounting part, etc.
- When transporting lithium batteries, follow required transportation regulations. For details on the regulated products, refer to ☞ Page 140 Handling of Batteries and Devices with Built-in Batteries in EU Member States.
- Fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine used for disinfecting and protecting wooden packaging from insects will cause malfunction in Mitsubishi products. Please take necessary precautions to ensure that residual fumigants do not enter the product, or treat packaging with methods other than fumigation (heat method). Additionally, disinfect and protect wood from insects before packing.

# INTRODUCTION

This manual contains text, diagrams and explanations which will guide the reader in the correct installation, safe use and operation of the FX5UC Programmable Controllers and should be read and understood before attempting to install or use the module.
Always forward it to the end user.

## Regarding use of this product

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult Mitsubishi Electric.
- This product has been manufactured under strict quality control. However when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

## Note

- If in doubt at any stage during the installation of the product, always consult a professional electrical engineer who is qualified and trained in the local and national standards.  If in doubt about the operation or use, please consult the nearest Mitsubishi Electric representative.
- Since the examples indicated by this manual, technical bulletin, catalog, etc. are used as a reference, please use it after confirming the function and safety of the equipment and system. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.
- This manual content, specification etc. may be changed, without a notice, for improvement.
- The information in this manual has been carefully checked and is believed to be accurate; however, if you notice a doubtful point, an error, etc., please contact the nearest Mitsubishi Electric representative. When doing so, please provide the manual number given at the end of this manual.

# CONTENTS

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# RELEVANT MANUALS

## User's manuals for the applicable modules

| Manual name <manual number> | Description |
|---|---|
| MELSEC iQ-F FX5UC CPU Module Hardware Manual <JY997D61001> | Describes the details of input/output specifications, wiring and installation of the FX5UC CPU module from MELSEC iQ-F FX5UC User's Manual (Hardware). |
| MELSEC iQ-F FX5 User's Manual (Startup) <JY997D58201> | Performance specifications, procedures before operation, and troubleshooting of the CPU module. |
| MELSEC iQ-F FX5U User's Manual (Hardware) <JY997D55301> | Describes the details of hardware of the FX5U CPU module, including input/output specifications, wiring, installation, and maintenance. |
| MELSEC iQ-F FX5UC User's Manual (Hardware) <JY997D61401> (This manual) | Describes the details of hardware of the FX5UC CPU module, including input/output specifications, wiring, installation, and maintenance. |
| MELSEC iQ-F FX5 User's Manual (Application) <JY997D55401> | Describes basic knowledge required for program design, functions of the CPU module, devices/labels, and parameters. |
| MELSEC iQ-F FX5 Programming Manual (Program Design) <JY997D55701> | Describes specifications of ladders, ST, FBD/LD, and other programs and labels. |
| MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks) <JY997D55801> | Describes specifications of instructions and functions that can be used in programs. |
| MELSEC iQ-F FX5 User's Manual (Serial Communication) <JY997D55901> | Describes N:N network, MELSEC Communication protocol, inverter communication, non-protocol communication, and predefined protocol support. |
| MELSEC iQ-F FX5 User's Manual (MODBUS Communication) <JY997D56101> | Describes MODBUS serial communication. |
| MELSEC iQ-F FX5 User's Manual (Ethernet Communication) <JY997D56201> | Describes the functions of the built-in Ethernet port communication function. |
| MELSEC iQ-F FX5 User's Manual (SLMP) <JY997D56001> | Explains methods for the device that is communicating with the CPU module by SLMP to read and write the data of the CPU module. |
| MELSEC iQ-F FX5 User's Manual (Positioning Control) <JY997D56301> | Describes the built-in positioning function. |
| MELSEC iQ-F FX5 User's Manual (Analog Control) <JY997D60501> | Describes the analog function. |
| GX Works3 Operating Manual <SH-081215ENG> | System configuration, parameter settings, and online operations of GX Works3. |

# TERMS

Unless otherwise specified, this manual uses the following terms.

• □ indicates a variable part to collectively call multiple models or versions.

(Example) FX5-C32EX/D, FX5-C32ET/D, FX5-C32EYT/D ⇨ FX5-C32E□/D

• For details on the FX3 devices that can be connected with the FX5UC CPU module, refer to

| Terms | Description |
|---|---|
| ■Devices | |
| FX5 | Generic term for FX5U and FX5UC PLCs |
| FX3 | Generic term for FX3S, FX3G, FX3GC, FX3U, and FX3UC PLCs |
| FX5 CPU module | Generic term for FX5U CPU module and FX5UC CPU module |
| FX5U CPU module | Generic term for FX5U-32MR/ES, FX5U-32MT/ES, FX5U-32MT/ESS, FX5U-64MR/ES, FX5U-64MT/ES, FX5U-64MT/ESS, FX5U-80MR/ES, FX5U-80MT/ES, and FX5U-80MT/ESS |
| FX5UC CPU module | Generic term for FX5UC-32MT/D and FX5UC-32MT/DSS |
| Extension module | Generic term for FX5 extension modules and FX3 extension modules |
| • FX5 extension module | Generic term for I/O modules, and FX5 intelligent function modules |
| • FX3 extension module | Generic term for FX3 intelligent function module |
| Extension module (extension cable type) | Input modules (extension cable type), Output modules (extension cable type), Bus conversion module (extension cable type), and Intelligent function modules |
| Extension module (extension connector type) | Input modules (extension connector type), Output modules (extension connector type), Input/output modules, Bus conversion module (extension connector type), and Connector conversion module (extension connector type) |
| I/O module | Generic term for input modules, output modules, and Input/output modules |

| Terms | Description |
|---|---|
| Input module | Generic term for Input modules (extension cable type) and Input modules (extension connector type) |
| • Input module (extension cable type) | Generic term for FX5-8EX/ES and FX5-16EX/ES |
| • Input module (extension connector type) | Generic term for FX5-C32EX/D and FX5-C32EX/DS |
| Output module | Generic term for output modules (extension cable type) and output modules (extension connector type) |
| • Output module (extension cable type) | Generic term for FX5-8EYR/ES, FX5-8EYT/ES, FX5-8EYT/ESS, FX5-16EYR/ES, FX5-16EYT/ES, and FX5-16EYT/ESS |
| • Output module (extension connector type) | Generic term for FX5-C32EYT/D and FX5-C32EYT/DSS |
| Input/output modules | Generic term for FX5-C32ET/D and FX5-C32ET/DSS |
| Intelligent module | The abbreviation for intelligent function modules |
| Intelligent function module | Generic term for FX5 intelligent function modules and FX3 intelligent function modules |
| • FX5 intelligent function module | Generic term for FX5 intelligent function modules |
| • FX3 intelligent function module | Different name for FX3 special function blocks |
| Simple motion module | Different name for FX5-40SSC-S |
| Expansion adapter | Generic term for adapter for FX5 CPU module |
| • Communication adapter | Generic term for FX5-232ADP and FX5-485ADP |
| • Analog adapter | Generic term for FX5-4AD-ADP and FX5-4DA-ADP |
| Bus conversion module | Generic term for Bus conversion module (extension cable type) and Bus conversion module (extension connector type) |
| • Bus conversion module (extension cable type) | Different name for FX5-CNV-BUS |
| • Bus conversion module (extension connector type) | Different name for FX5-CNV-BUSC |
| Battery | Different name for FX3U-32BL |
| SD memory card | Generic term for NZ1MEM-2GBSD, NZ1MEM-4GBSD, L1MEM-2GBSD and L1MEM-4GBSD SD memory cards<br>Abbreviation of Secure Digital Memory Card. Device that stores data using flash memory. |
| Peripheral device | Generic term for engineering tools and GOTs |
| GOT | Generic term for Mitsubishi Graphic Operation Terminal GOT1000 and GOT2000 series |
| ■Software packages | |
| Engineering tool | The product name of the software package for the MELSEC programmable controllers |
| GX Works3 | The product name of the software package, SWnDND-GXW3, for the MELSEC programmable controllers (The 'n' represents a version.) |
| ■Manuals | |
| Hardware manual | Generic term for manuals enclosed with the product |
| • FX5UC Hardware manual | Abbreviation of MELSEC iQ-F FX5UC CPU Module Hardware Manual |
| User's manual | Generic term for separate manuals |
| • User's manual (Startup) | Abbreviation of MELSEC iQ-F FX5 User's Manual (Startup) |
| • User's manual (Hardware) | Abbreviation of MELSEC iQ-F FX5UC User's Manual (Hardware) |
| • User's manual (Application) | Abbreviation of MELSEC iQ-F FX5 User's Manual (Application) |
| Programming manual (Program Design) | Abbreviation of MELSEC iQ-F FX5 Programming Manual (Program Design) |
| Programming manual (Instructions, Standard Functions/Function Blocks) | Abbreviation of MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks) |
| Communication manual | Generic term for MELSEC iQ-F FX5 User's Manual (Serial Communication), MELSEC iQ-F FX5 User's Manual (MODBUS Communication), MELSEC iQ-F FX5 User's Manual (Ethernet Communication), and MELSEC iQ-F FX5 User's Manual (SLMP) |
| • Serial communication manual | Abbreviation of MELSEC iQ-F FX5 User's Manual (Serial Communication) |
| • MODBUS communication manual | Abbreviation of MELSEC iQ-F FX5 User's Manual (MODBUS Communication) |
| • Ethernet communication manual | Abbreviation of MELSEC iQ-F FX5 User's Manual (Ethernet Communication) |
| • SLMP manual | Abbreviation of MELSEC iQ-F FX5 User's Manual (SLMP) |
| Positioning manual | Abbreviation of MELSEC iQ-F FX5 User's Manual (Positioning Control) |
| Analog manual | Abbreviation of MELSEC iQ-F FX5 User's Manual (Analog Control) |

# 1 OUTLINE

## 1.1 Part Names

### Front panel



When the front covers are open
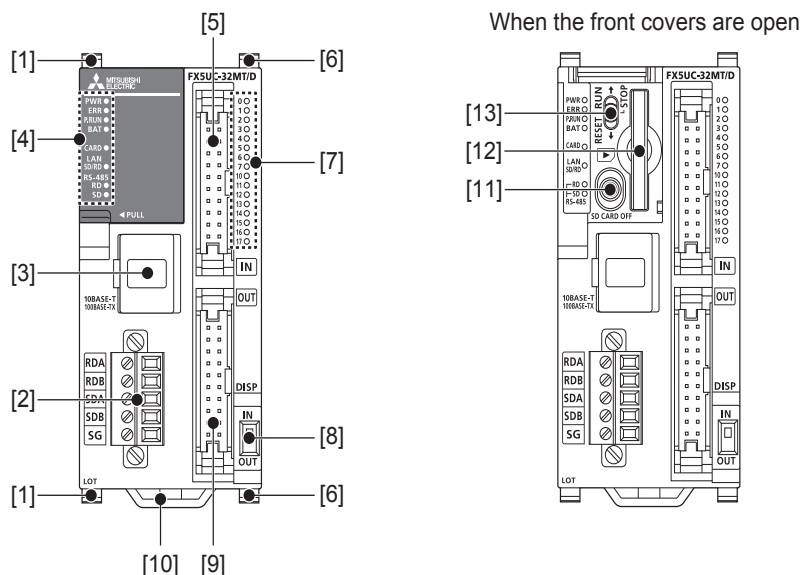
| No. | Name | Description |
|---|---|---|
| [1] | Expansion adapter connecting hooks | When connecting an expansion adapter, secure it with these hooks. |
| [2] | Built-in RS-485 communication terminal block | Terminal block for connection with RS-485-compatible devices |
| [3] | Built-in Ethernet communication connector | Connector for connection with Ethernet-compatible devices (with cap)<br>For details, refer to ⊞MELSEC iQ-F FX5 User's Manual (Ethernet Communication). |
| [4] | Operation status display LED | |
| | PWR LED | Indicates whether the CPU module is powered or not.<br>Lit: Powered<br>Off: Not powered or hardware error (☞ Page 101 Checking with LEDs) |
| | ERR LED | Indicates the error status of the CPU module. (☞ Page 101 Checking with LEDs)<br>Lit: Error or hardware error<br>Flashing: Factory default setting, error, hardware error, or resetting<br>Off: Operating normally |
| | P.RUN LED | Indicates the program running status.<br>Lit: Operating normally<br>Flashing: Paused<br>Off: Stopped or stop error |
| | BAT LED | Indicates the battery status.<br>Flashing: Battery error<br>Off: Operating normally (☞ Page 101 Checking with LEDs) |
| | CARD LED | Indicates whether an SD memory card can be used or not.<br>Lit: Can be used or cannot be removed.<br>Flashing: In preparation<br>Off: Not inserted or can be removed. |
| | SD/RD LED | Lit when the CPU module is sending or receiving data through built-in Ethernet communication. |
| | RD LED | Lit when the CPU module is receiving data through built-in RS-485 communication. |
| | SD LED | Lit when the CPU module is sending data through built-in RS-485 communication. |
| [5] | Input connector | Connector for connecting input signal cables. |
| [6] | Extension module connecting hook | When connecting an expansion module, secure it with these hooks. |
| [7] | I/O display LED | Lit when the input or output is on. |
| [8] | DISP switch | Switches input/output of the I/O display LED. |

| No. | Name | Description |
|---|---|---|
| [9] | Output connector | Connector for connecting output signal cables. |
| [10] | DIN rail mounting hook | Hook for mounting a CPU module on a DIN rail of DIN46277 (35 mm (1.38") wide). |
| [11] | SD memory card disable switch | Switch for disabling access to the SD memory card when the card is to be removed. |
| [12] | SD memory card slot | Slot for inserting an SD memory card. |
| [13] | RUN/STOP/RESET switch | Switch for operating the CPU module. (☞ Page 95 Methods of running, stopping, and resetting)<br>RUN: Runs the program<br>STOP: Stops the program<br>RESET: Resets the CPU module (hold the switch on the RESET side for approximately 1 second.) |

# Side

## Left side/right side
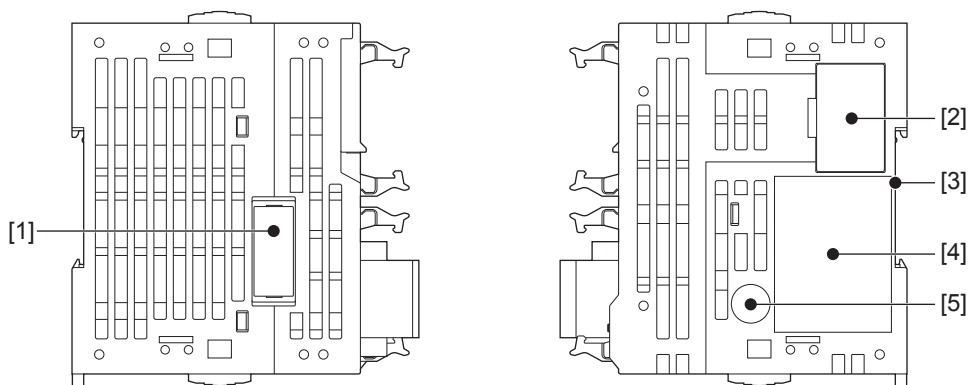


| No. | Name | Description |
|---|---|---|
| [1] | Expansion adapter connector cover | Cover for protecting the expansion adapter connector. |
| [2] | Subsequent extension connector cover | Cover for protecting the subsequent extension connector. |
| [3] | DIN rail mounting groove | The module can be installed on a DIN46277 rail (35 mm (1.38") wide). |
| [4] | Nameplate | The product model name, manufacturer's serial number, power supply specifications, and MAC address are shown. |
| [5] | Genuine product certification label | Genuine product certification label to prevent counterfeiting |

*Point*

Products that do not have the genuine product certification label or nameplate are not covered by the warranty.

## Bottom side
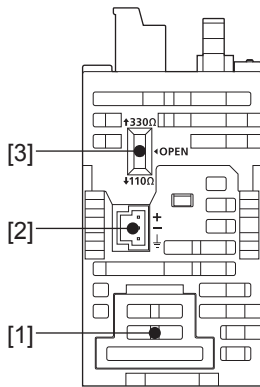


| No. | Name | Description |
|---|---|---|
| [1] | Battery cover | Cover for protecting the battery connecting connector. |
| [2] | Power connector for CPU module | Connector for connecting power cables. |
| [3] | RS-485 terminal resistor selector switch | Switch for switching terminal resistance for built-in RS-485 communication. |

**Point**

Use a tool such as a screwdriver to operate the RS-485 terminal resistance selector switch. Make sure that the tip of a tool does not damage the switch or case.

# 2 SPECIFICATIONS

The CPU module specifications are explained below.

## 2.1 Generic Specifications

| Item | Specifications | | | | |
|------|------|------|------|------|------|
| Operating ambient temperature[1] | 0 to 55℃ (32 to 131 ℉)[2] | | | | |
| Storage ambient temperature | -25 to 75℃ (-13 to 167 ℉) | | | | |
| Operating ambient humidity | 5 to 95%RH, non-condensation | | | | |
| Storage ambient humidity | 5 to 95%RH, non-condensation | | | | |
| Vibration resistance[3][4] | — | Frequency | Acceleration | Half amplitude | Sweep count |
| | Installed on DIN rail | 5 to 8.4 Hz | — | 1.75 mm | 10 times each in X, Y, Z directions (80 min in each direction) |
| | | 8.4 to 150 Hz | 4.9 m/s² | — | |
| Shock resistance[3] | 147 m/s², Action time: 11 ms, 3 times by half-sine pulse in each direction X, Y, and Z | | | | |
| Noise durability | By noise simulator at noise voltage of 1000 Vp-p, noise width of 1 μs and period of 30 to 100 Hz | | | | |
| Grounding | Class D grounding (grounding resistance: 100 Ω or less) <Common grounding with a heavy electrical system is not allowed.>[5] | | | | |
| Working atmosphere | Free from corrosive or flammable gas and excessive conductive dust | | | | |
| Operating altitude[6] | 0 to 2000 m | | | | |
| Installation location | Inside a control panel | | | | |
| Overvoltage category[7] | Ⅱ or less | | | | |
| Pollution degree[8] | 2 or less | | | | |
| Equipment class | Class 2 | | | | |

*1 The simultaneous ON ratio of available PLC inputs or outputs changes with respect to the ambient temperature, refer to ☞ Page 20 Input/Output Derating Curve.
*2 For details on Intelligent function modules, refer to manuals of each product.
*3 The criterion is shown in IEC61131-2.
*4 When the system has equipment which specification values are lower than above mentioned vibration resistance specification values, the vibration resistance specification of the whole system is corresponding to the lower specification.
*5 For grounding, refer to ☞ Page 56 Grounding.
*6 The PLC cannot be used at a pressure higher than the atmospheric pressure to avoid damage.
*7 This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises. Category Ⅱ applies to equipment for which electrical power is supplied from fixed facilities. The withstand surge voltage for the equipment with the rated voltage up to 300 V is 2500 V.
*8 This index indicates the degree to which conductive material is generated in the environment in which the equipment is used. Pollution level 2 is when only non-conductive pollution occurs. Temporary conductivity caused by condensation must be expected occasionally.

## Dielectric withstand voltage test and insulation resistance test

Perform dielectric withstand voltage test and insulation resistance test at the following voltages between each terminal and the CPU module ground terminal.

### ■ CPU module, I/O module

| Between terminals | Dielectric withstand voltage | Insulation resistance | Remarks |
|------|------|------|------|
| Between power supply terminal (24 V DC) and ground terminal | 500 V AC for one minute | 10 MΩ or higher by 500 V DC insulation resistance tester | — |
| Between input terminal (24 V DC) and ground terminal | | | — |
| Between output terminal (transistor) and ground terminal | | | — |
| Between output terminal (relay) and ground terminal | 1.5 kV AC for one minute | | I/O module only |

### ■Expansion adapter

For information concerning the dielectric withstand voltage and insulation resistance of each expansion adapter, refer to manuals of each expansion adapter.

### ■Intelligent function module

For information concerning dielectric withstand voltage and insulation resistance of each intelligent function module, refer to manuals of each intelligent function module.

# 2.2 Power Supply Specifications

The CPU module power supply specifications are explained below.

For the consumption current of each extension module, refer to ☞ Page 26 PRODUCT LIST or manuals of each extension module.

## DC power supply

| Item | Specifications |
|---|---|
| Power supply voltage | 24 V DC |
| Allowable voltage range | 20.4 to 28.8 V DC |
| Allowable instantaneous power failure time | Operation can be continued upon occurrence of instantaneous power failure for 5 ms or less. |
| Power fuse | 125 V, 3.15 A Time-lag fuse |
| Rush current | 30 A max. 0.5 ms or less/24 V DC |
| Power consumption[*1] | 8 W [30 W] |
| 5 V DC power supply capacity | 720 mA |
| 24 V DC power supply capacity | 500 mA |

*1 This item shows value when only the CPU module is used.
The value in [] is the value in the maximum configuration connectable to the CPU module. (The value does not include the external 24 V DC power supply of extension devices)
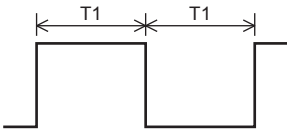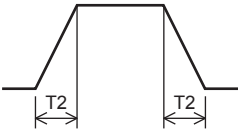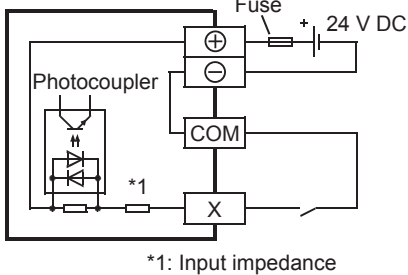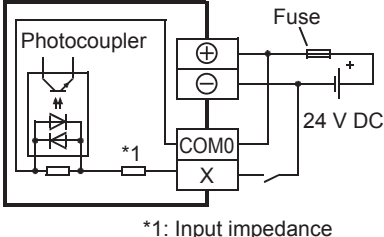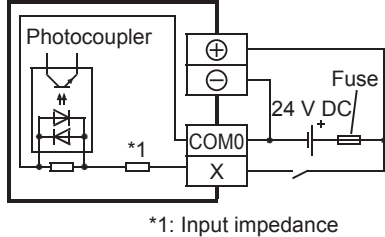
# 2.3 Input Specifications

The CPU module input specifications are explained below.

## 24 V DC input (sink/source)

Input numbers in the table indicate the CPU module umbers.
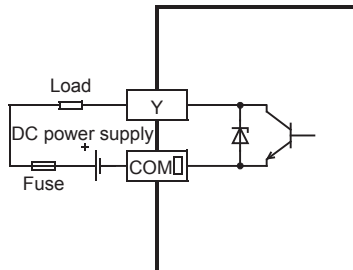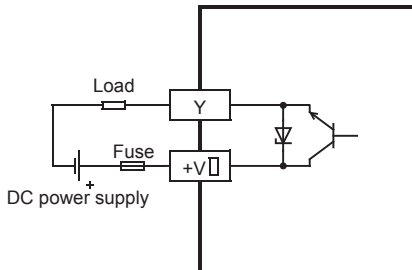
| Item | | Specifications |
|---|---|---|
| No. of input points | | 16 points |
| Connection type | | Connector |
| Input type | FX5UC-32MT/D | Sink |
| | FX5UC-32MT/DSS | Sink/source |
| Input signal voltage | | 24 V DC +20%, -15% |
| Input signal current | | 5.3 mA/24 V DC |
| Input impedance | | 4.3 kΩ |
| ON input sensitivity current | | 3.5 mA or more |
| OFF input sensitivity current | | 1.5 mA or less |
| Input response frequency | X000 to X005 | 200 kHz<br>When capturing pulses of a response frequency of 50 to 200 kHz, refer to ☞ Page 62 When a high-speed pulse is captured. |
| | X006 to X017 | 10 kHz |
| Pulse waveform | Waveform | <br>T1 (pulse width)          T2 (rise/fall time) |
| | X000 to X005 | 2.5 μs or more          1.25 μs or less |
| | X006 to X017 | 50 μs or more          25 μs or less |
| Input response time (H/W filter delay) | X000 to X005 | ON: 2.5 μs or less<br>OFF: 2.5 μs or less |
| | X006 to X017 | ON: 30 μs or less<br>OFF: 50 μs or less |
| Input response time (Digital filter setting value) | | None, 10 μs, 50 μs, 0.1 ms, 0.2 ms, 0.4 ms, 0.6 ms, 1 ms, 5 ms, 10 ms (initial value), 20 ms, 70 ms<br>When using this product in an environment with much noise, set the digital filter. |

| Item | | Specifications |
|---|---|---|
| Input signal format | FX5UC-32MT/D | No-voltage contact input<br>NPN open collector transistor |
| | FX5UC-32MT/DSS | No-voltage contact input<br>Sink: NPN open collector transistor<br>Source: PNP open collector transistor |
| Input circuit insulation | | Photo-coupler insulation |
| Indication of input operation | | LED is lit when input is on (DISP switch: IN) |
| Input signal format | FX5UC-32MT/D | 
*1: Input impedance |
| | FX5UC-32MT/DSS | • Sink input wiring<br>
*1: Input impedance     • Source input wiring<br>
*1: Input impedance |

# 2.4 Output Specifications

The CPU module output specifications are explained below.

## Transistor output

| Item | | Output specifications | |
|---|---|---|---|
| No. of output points | | 16 points | |
| Connection type | | Connector | |
| Output type | FX5UC-32MT/D | Transistor/sink output | |
| | FX5UC-32MT/DSS | Transistor/source output | |
| External power supply | | 5 to 30 V DC | |
| Max. load | Y000 to Y003 | 0.3 A/point | The total load current per common terminal should be the following value. |
| | Y004 and subsequent | 0.1 A/point | • 8 output points/common terminal: 0.8 A or less[1] <br> For details of the common, refer to ☞ Page 25 Terminal Layout. |
| Open circuit leakage current | | 0.1 mA or less/30 V DC | |
| Voltage drop when ON | Y000 to Y003 | 1.0 V or less | |
| | Y004 and subsequent | 1.5 V or less | |
| Response time | Y000 to Y003 | 2.5 μs or less/10 mA or more (5 to 24 V DC) | |
| | Y004 and subsequent | 0.2 ms or less/100 mA (24 V DC) | |
| Insulation of circuit | | Photo-coupler insulation | |
| Indication of output operation | | LED is lit when output is on (DISP switch: OUT) | |
| Output circuit configuration | | Sink output wiring <br><br> Load <br> DC power supply <br> Fuse <br><br> A common number is input in the [] of [COM[]]. | Source output wiring <br><br> Load <br> Fuse <br> DC power supply <br><br> A common number is input in the [] of [+V[]]. |

*1 When two common terminals are connected outside the CPU module, resistance load is 1.6A or less.

# 2.5 Input/Output Derating Curve

The derating curve below shows the simultaneous ON ratio of available PLC inputs or outputs with respect to the ambient temperature. Use the PLC within the simultaneous input or output ON ratio range shown in the figure.

Derating curve

Simultaneous ON ratio

Power supply voltage: 24 V DC
When only the CPU module is used
When extension module are connected

100%
80%
70%
50%

Applicable

25°C   40°C   55°C   Ambient temperature
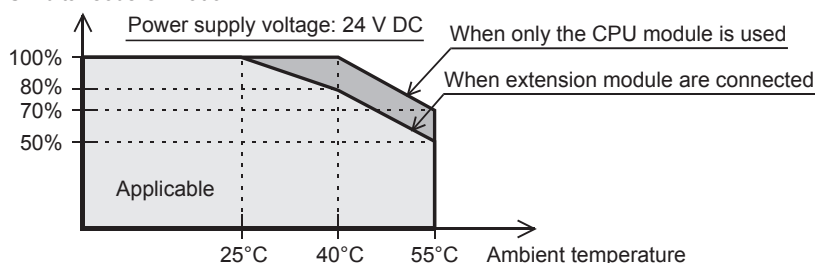
# 2.6 Performance Specifications

| Item | | Specifications |
|---|---|---|
| Control system | | Stored-program repetitive operation |
| Input/output control system | | Refresh system<br>(Direct access input/output allowed by specification of direct access input/output [DX, DY]) |
| Programming specifications | Programming language | Ladder diagram (LD), structured text (ST), function block diagram/ladder diagram (FBD/LD) |
| | Programming extension function | Function block (FB), structured ladder, label programming (local/global) |
| | Constant scan | 0.2 to 2000 ms (can be set in 0.1 ms increments) |
| | Fixed cycle interrupt | 1 to 60000 ms (can be set in 1 ms increments) |
| | Timer performance specifications | 100 ms, 10 ms, 1 ms |
| | No. of program executions | 32 |
| | No. of FB files | 16 (Up to 15 for user) |
| Operation specifications | Execution type | Standby type, initial execution type, scan execution type, fixed-cycle execution type, event execution type |
| | Interrupt type | Internal timer interrupt, input interrupt, high-speed comparison match interrupt |
| Command processing time | LD X0 | 34 ns |
| | MOV D0 D1 | 34 ns |
| Memory capacity | Program capacity | 64 k steps<br>(128 kbytes, flash memory) |
| | SD memory card | Memory card capacity (SD/SDHC memory card: Max. 4 Gbytes) |
| | Device/label memory | 120 kbytes |
| | Data memory/standard ROM | 5 Mbytes |
| Flash memory (Flash ROM) write count | | Maximum 20000 times |
| File storage capacity | Device/label memory | 1 |
| | Data memory<br>P: No. of program files<br>FB: No. of FB files | P: 32, FB: 16 |
| | SD Memory Card | 2 Gbytes: 511[*1] |
| | | 4 Gbytes: 65534[*1] |
| Clock function | Display data | Year, month, day, hour, minute, second, day of week (leap year automatic detection) |
| | Precision | -2.96 to +3.74 (TYP.+1.42) s/d (Ambient temperature: 0℃ (32℉))<br>-3.18 to +3.74 (TYP.+1.50) s/d (Ambient temperature: 25℃ (77℉))<br>-13.20 to +2.12 (TYP.-3.54) s/d (Ambient temperature: 55℃ (131℉)) |
| No. of input/output points | (1) No. of input/output points | 256 points or less |
| | (2) No. of remote I/O points | 384 points or less |
| | Total No. of points of (1) and (2) | 512 points or less |
| Power failure retention[*2] | Retention method | Large-capacity capacitor |
| | Retention time | 10 days (Ambient temperature: 25℃ (77℉)) |
| | Data retained | Clock data |

*1 The value listed above indicates the number of files stored in the root folder.
*2 Clock data is retained using the power accumulated in a large-capacity capacitor incorporated into the PLC. When voltage of the large-capacity capacitor drops, clock data is no longer accurately retained. The retention period of a fully charged capacitor (electricity is conducted across the PLC for at least 30 minutes) is 10 days (ambient temperature: 25℃ (77℉)). How long the capacitor can hold the data depends on the operating ambient temperature. When the operating ambient temperature is high, the holding period is short.

# Number of device points

| Item | | | Base | Max. number of points | |
|---|---|---|---|---|---|
| No. of user device points | Input relay (X) | | 8 | 1024 points | The total number of X and Y assigned to input/output points is up to 256 points. |
| | Output relay (Y) | | 8 | 1024 points | |
| | Internal relay (M) | | 10 | 32768 points (can be changed with parameter)[*1] | |
| | Latch relay (L) | | 10 | 32768 points (can be changed with parameter)[*1] | |
| | Link relay (B) | | 16 | 32768 points (can be changed with parameter)[*1] | |
| | Annunciator (F) | | 10 | 32768 points (can be changed with parameter)[*1] | |
| | Link special relay (SB) | | 16 | 32768 points (can be changed with parameter)[*1] | |
| | Step relay (S) | | 10 | 4096 points (fixed) | |
| | Timer system | Timer (T) | 10 | 1024 points (can be changed with parameter)[*1] | |
| | Accumulation timer system | Accumulation timer (ST) | 10 | 1024 points (can be changed with parameter)[*1] | |
| | Counter system | Counter (C) | 10 | 1024 points (can be changed with parameter)[*1] | |
| | | Long counter (LC) | 10 | 1024 points (can be changed with parameter)[*1] | |
| | Data register (D) | | 10 | 8000 points (can be changed with parameter)[*1] | |
| | Link register (W) | | 16 | 32768 points (can be changed with parameter)[*1] | |
| | Link special register (SW) | | 16 | 32768 points (can be changed with parameter)[*1] | |
| No. of system device points | Special relay (SM) | | 10 | 10000 points (fixed) | |
| | Special register (SD) | | 10 | 12000 points (fixed) | |
| Module access device | Intelligent function module device | | 10 | 65536 points (designated by U□\G□) | |
| No. of index register points | Index register (Z)[*2] | | 10 | 24 points | |
| | Long index register (LZ)[*2] | | 10 | 12 points | |
| No. of file register points | File register (R) | | 10 | 32768 points (can be changed with parameter)[*1] | |
| No. of nesting points | Nesting (N) | | 10 | 15 points (fixed) | |
| No. of pointer points | Pointer (P) | | 10 | 4096 points | |
| | Interrupt pointer (I) | | 10 | 178 points (fixed) | |
| Others | Decimal constant (K) | Signed | — | 16 bits: -32768 to +32767, 32 bits: -2147483648 to +2147483647 | |
| | | Unsigned | — | 16 bits: 0 to 65535, 32 bits: 0 to 4294967295 | |
| | Hexadecimal constant (H) | | — | 16 bits: 0 to FFFF, 32 bits: 0 to FFFFFFFF | |
| | Real constant (E) | Single precision | — | E-3.40282347+38 to E-1.17549435-38, 0, E1.17549435-38 to E3.40282347+38 | |
| | Character string | | — | Shift-JIS code: Max. 255 single-byte characters (256 including NULL) | |

*1 Can be changed with parameters within the capacity range of the CPU built-in memory.
*2 Total of the index register (Z) and long index register (LZ) is maximum 24 words.

# 2.7　Communication Specifications

The built-in Ethernet and built-in RS-485 communication specifications are as explained below.

## Built-in Ethernet communication

📖MELSEC iQ-F FX5 User's Manual (Ethernet Communication)
📖MELSEC iQ-F FX5 User's Manual (SLMP)

| Item | | Specifications |
|---|---|---|
| Data transmission speed | | 100/10 Mbps |
| Communication mode | | Full-duplex (FDX)/ Half-duplex (HDX) |
| Interface | | RJ45 connector |
| Transmission method | | Base band |
| Maximum segment length (The distance between hub and node) | | 100 m (328'1") |
| Cascade connection | 100BASE-TX | Cascade connection max. 2 stages[1] |
| | 10BASE-T | Cascade connection max. 4 stages[1] |
| Protocol type | | MELSOFT connection |
| | | SLMP (3E frame) |
| | | Socket communication |
| | | Predefined protocol support |
| Number of simultaneously open connections allowed | | Total of 8 for MELSOFT connection, SLMP, socket communication, and predefined protocol support (Up to 8 external devices can access one CPU module at the same time.) |
| Insulation method | | Pulse transformer insulation |
| Cable used[2] | For 100BASE-TX connection | Ethernet standard-compatible cable, category 5 or higher (STP cable) |
| | For 10BASE-T connection | Ethernet standard-compatible cable, category 3 or higher (STP cable) |

[1]　Number of stages that can be connected when a repeater hub is used. When a switching hub is used, check the specifications of the switching hub used.

[2]　A straight cable can be used. If a personal computer or GOT and CPU module are directly connected a cross cable can be used.

## Built-in RS-485 communication

📖MELSEC iQ-F FX5 User's Manual (Serial Communication)
📖MELSEC iQ-F FX5 User's Manual (MODBUS Communication)

| Item | Specifications |
|---|---|
| Transmission standards | Conforms to RS-485/RS-422 specifications |
| Data transmission speed | Max. 115.2 kbps |
| Communication method | Full-duplex (FDX) / Half-duplex (HDX) |
| Maximum total extension distance | 50 m (164'0") |
| Protocol type | MELSOFT connection |
| | Non-protocol communication |
| | MELSEC Communication protocol (3C/4C frame) |
| | MODBUS RTU communication |
| | Predefined protocol support |
| | Inverter communication |
| | N:N Network |
| Insulation method | Not insulated |
| Terminal resistors | Built-in (OPEN/110 Ω/330 Ω) |
| Terminal block used | European-type terminal block |

# 2.8 External Dimensions

## FX5UC-32MT/D, FX5UC-32MT/DSS

Unit: mm (inches)

90 (3.55")

W

74 (2.92")

89.1 (3.51")
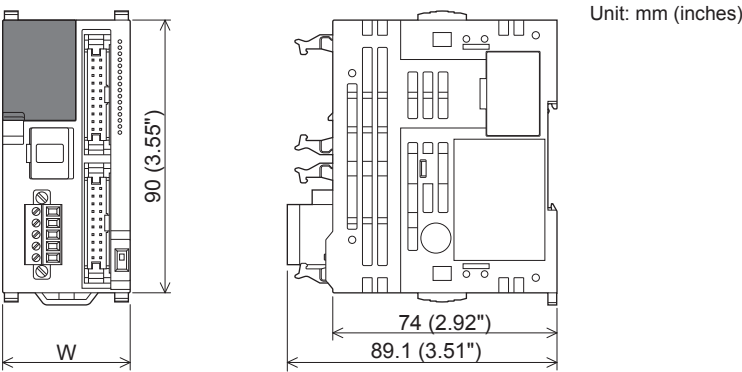
| Model | W | Mass (weight) |
|---|---|---|
| FX5UC-32MT/D, FX5UC-32MT/DSS | 42.1 mm (1.66") | Approx. 0.2 kg (0.44lbs) |

• Exterior color

Main body: Munsell 0.6B7.6/0.2

• Accessories

Manual supplied with product

FX2NC-100MPCB power cable: 1 m (3'3")

FX2NC-100BPCB power cable: 1 m (3'3") (FX5UC-32MT/D only)

# 2.9 Terminal Layout

## Built-in RS-485 terminal

European-type terminal block

RDA (RXD+)
RDB (RXD-)
SDA (TXD+)
SDB (TXD-)
SG (GND)

5 poles
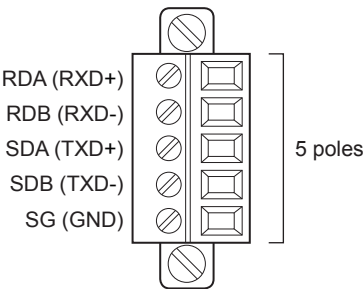
## Built-in Ethernet connector
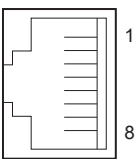
| Pin | Signal name |
|-----|-------------|
| 1 | TD+ |
| 2 | TD- |
| 3 | RD+ |
| 4 | Not used |
| 5 | Not used |
| 6 | RD- |
| 7 | Not used |
| 8 | Not used |

## Input/output connectors

FX5UC-32MT/D

| Input | |
|-----|-----|
| X0 | X10 |
| X1 | X11 |
| X2 | X12 |
| X3 | X13 |
| X4 | X14 |
| X5 | X15 |
| X6 | X16 |
| X7 | X17 |
| COM | COM |
| • | • |

Notch

| Output | |
|-----|-----|
| Y0 | Y10 |
| Y1 | Y11 |
| Y2 | Y12 |
| Y3 | Y13 |
| Y4 | Y14 |
| Y5 | Y15 |
| Y6 | Y16 |
| Y7 | Y17 |
| COM0 | COM0 |
| • | • |

Notch

FX5UC-32MT/DSS

| Input | |
|-----|-----|
| X0 | X10 |
| X1 | X11 |
| X2 | X12 |
| X3 | X13 |
| X4 | X14 |
| X5 | X15 |
| X6 | X16 |
| X7 | X17 |
| COM0 | COM0 |
| • | • |

Notch

| Output | |
|-----|-----|
| Y0 | Y10 |
| Y1 | Y11 |
| Y2 | Y12 |
| Y3 | Y13 |
| Y4 | Y14 |
| Y5 | Y15 |
| Y6 | Y16 |
| Y7 | Y17 |
| +V0 | +V0 |
| • | • |

Notch
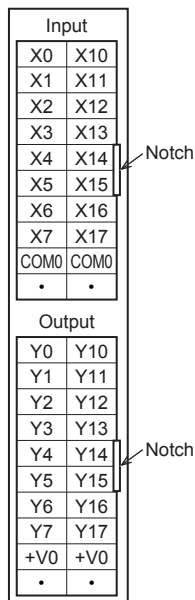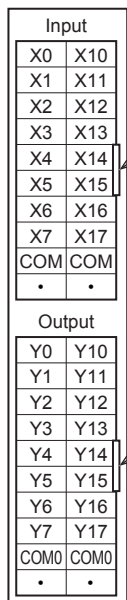
## Power connector
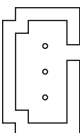
1 ⊕ (Red)
2 ⊖ (Black)
3 Ground (Green)

# 3 PRODUCT LIST

The following shows the system configuration equipment of the FX5UC.

## 3.1 Overall Configuration

**Expansion adapter**

Analog
• FX5-4AD-ADP
• FX5-4DA-ADP

Communication
• FX5-232ADP
• FX5-485ADP

**CPU module**
• FX5UC-32MT/D
• FX5UC-32MT/DSS

**Battery**
• FX3U-32BL

**I/O module**

| Input | Output |
|---|---|
| • FX5-C32EX/D | • FX5-C32EYT/D |
| • FX5-C32EX/DS | • FX5-C32EYT/DSS |

Input/output
• FX5-C32ET/D
• FX5-C32ET/DSS

**Terminal module**

| | |
|---|---|
| • FX-16E-TB | • FX-16E-TB/UL |
| • FX-32E-TB | • FX-32E-TB/UL |
| • FX-16EX-A1-TB | • FX-16EYR-ES-TB/UL |
| • FX-16EYR-TB | • FX-16EYT-ES-TB/UL |
| • FX-16EYT-TB | • FX-16EYR-ESS-TB/UL |
| • FX-16EYS-TB | • FX-16EYS-ES-TB/UL |

**Bus conversion module**
• FX5-CNV-BUSC

**Connector conversion module**
• FX5-CNV-IFC

□━□ Connector
●━● Cable

**I/O module**

| Input | Output |
|---|---|
| • FX5-8EX/ES | • FX5-8EYR/ES |
| • FX5-16EX/ES | • FX5-8EYT/ES |
| | • FX5-8EYT/ESS |
| | • FX5-16EYR/ES |
| | • FX5-16EYT/ES |
| | • FX5-16EYT/ESS |

**Intelligent function module**

Positioning
• FX5-40SSC-S

**Bus conversion module**
• FX5-CNV-BUS

**FX3 intelligent function module**

| Analog | Network |
|---|---|
| • FX3U-4AD | • FX3U-16CCL-M |
| • FX3U-4DA | • FX3U-64CCL |
| • FX3U-4LC | • FX3U-128ASL-M |

Positioning
• FX3U-1PG

High-speed counter
• FX3U-2HC

Remote I/O

# 3.2    CPU Module

The CPU module incorporates a CPU, memory, input/output terminals, and power supply.

FX5UC – ◯ ◯ M □ / □

- Power supply, input/output type: Connection on connector
  - T/D: DC power supply/24 V DC (sink) input/Transistor (sink) output
  - T/DSS: DC power supply/24 V DC (sink/source) input/Transistor (source) output

Total number of input/output points

CPU module
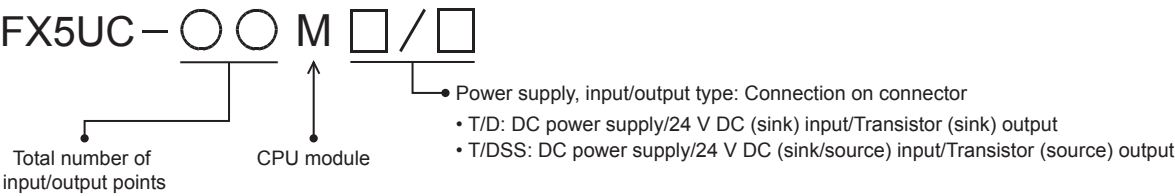
## 24 V DC sink and source input type

| Model | No. of input/output points | | | Input type | Output type | Connection type | Power supply capacity | |
|---|---|---|---|---|---|---|---|---|
| | Total No. of points | No. of input points | No. of output points | | | | 5 V DC power supply | 24 V DC power supply |
| FX5UC-32MT/D | 32 points | 16 points | 16 points | 24 V DC (sink) | Transistor (sink) | Connector | 720 mA | 500 mA |
| FX5UC-32MT/DSS | | | | 24 V DC (sink/source) | Transistor (source) | | | |

**Point**

The model name of the CPU module can be checked on the nameplate on the right side. After extension devices are connected, the nameplate cannot be seen. Check the model name in the following places.

Model name
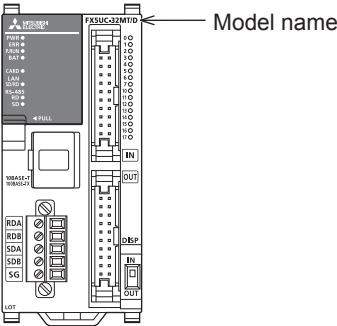
# 3.3 Extension Module

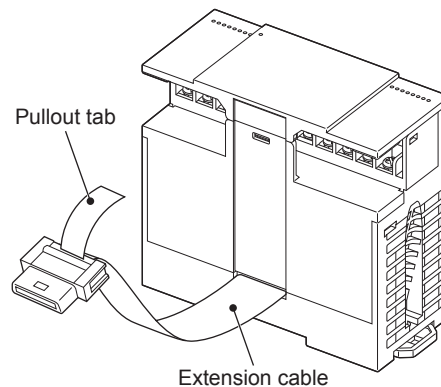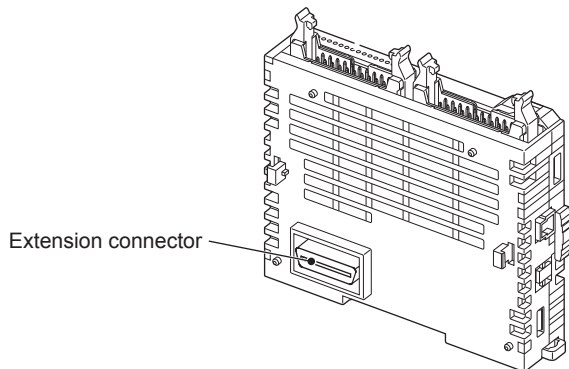Extension modules are used to expand inputs/outputs, functions, and others.

The two connection types, extension connector type and extension cable type, are provided for extension modules.
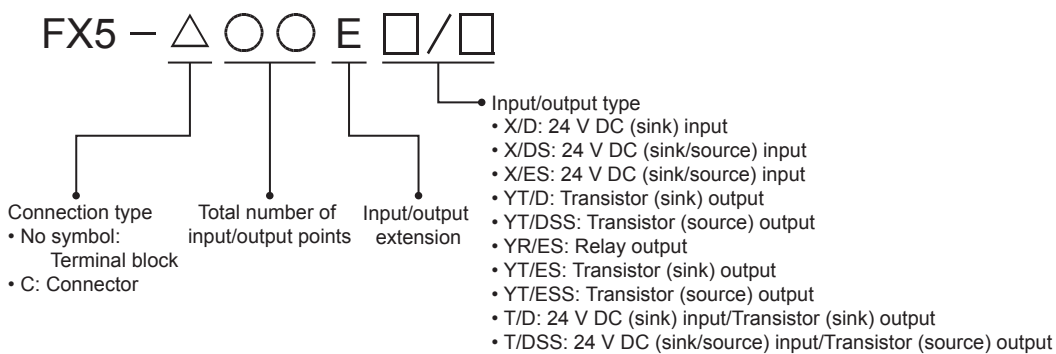
・ Extension connector type　　　　　　　　　　・ Extension cable type



Extension connector

Pullout tab

Extension cable

## I/O module

I/O modules are used to expand inputs/outputs.

For details, refer to ☞ Page 112 I/O Module.



FX5 − △ ○ ○ E □ / □

Connection type
• No symbol:
  Terminal block
• C: Connector

Total number of input/output points

Input/output extension

Input/output type
• X/D: 24 V DC (sink) input
• X/DS: 24 V DC (sink/source) input
• X/ES: 24 V DC (sink/source) input
• YT/D: Transistor (sink) output
• YT/DSS: Transistor (source) output
• YR/ES: Relay output
• YT/ES: Transistor (sink) output
• YT/ESS: Transistor (source) output
• T/D: 24 V DC (sink) input/Transistor (sink) output
• T/DSS: 24 V DC (sink/source) input/Transistor (source) output

### Input module

Input modules are used to expand inputs.

#### ■Extension connector type

| Model | Number of input/output points | | | Input type | Output type | Connection type | Current consumption | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total No. of points | No. of input points | No. of output points | | | | 5 V DC power supply | 24 V DC power supply | External 24 V DC power supply (24 V DC power supply for input circuits) |
| FX5-C32EX/D | 32 points | 32 points | — | 24 V DC (sink) | — | Connector | 120 mA | — | 130 mA |
| FX5-C32EX/DS | | | | 24 V DC (sink/source) | | | | | |

#### ■Extension cable type

| Model | Number of input/output points | | | Input type | Output type | Connection type | Current consumption | |
|---|---|---|---|---|---|---|---|---|
| | Total No. of points | No. of input points | No. of output points | | | | 5 V DC power supply | 24 V DC power supply |
| FX5-8EX/ES | 8 points | 8 points | — | 24 V DC (sink/source) | — | Terminal block | 75 mA | (50 mA)[1] |
| FX5-16EX/ES | 16 points | 16 points | | | | | 100 mA | (85 mA)[1] |

*1  Since external power supply is used for input circuit in FX5UC CPU module systems, power supply from CPU module is not included.

# Output module

Output modules are used to expand outputs.

## ■Extension connector type

| Model | Number of input/output points | | | Input type | Output type | Connection type | Current consumption | |
|---|---|---|---|---|---|---|---|---|
| | Total No. of points | No. of input points | No. of output points | | | | 5 V DC power supply | 24 V DC power supply |
| FX5-C32EYT/D | 32 points | — | 32 points | — | Transistor (sink) | Connector | 120 mA | 200 mA |
| FX5-C32EYT/DSS | | | | | Transistor (source) | | | |

## ■Extension cable type

| Model | Number of input/output points | | | Input type | Output type | Connection type | Current consumption | |
|---|---|---|---|---|---|---|---|---|
| | Total No. of points | No. of input points | No. of output points | | | | 5 V DC power supply | 24 V DC power supply |
| FX5-8EYR/ES | 8 points | — | 8 points | — | Relay | Terminal block | 75 mA | 75 mA |
| FX5-8EYT/ES | | | | | Transistor (sink) | | | |
| FX5-8EYT/ESS | | | | | Transistor (source) | | | |
| FX5-16EYR/ES | 16 points | — | 16 points | — | Relay | Terminal block | 100 mA | 125 mA |
| FX5-16EYT/ES | | | | | Transistor (sink) | | | |
| FX5-16EYT/ESS | | | | | Transistor (source) | | | |

# Input/output module

Input/output modules are used to expand inputs/outputs.

| Model | Number of input/output points | | | Input type | Output type | Connection type | Current consumption | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total No. of points | No. of input points | No. of output points | | | | 5 V DC power supply | 24 V DC power supply | External 24 V DC power supply (24 V DC power supply for input circuits) |
| FX5-C32ET/D | 32 points | 16 points | 16 points | 24 V DC (sink) | Transistor (sink) | Connector | 120 mA | 100 mA | 65 mA |
| FX5-C32ET/DSS | | | | 24 V DC (sink/source) | Transistor (source) | | | | |

# Intelligent function module

Intelligent function modules, such as simple motion modules, have functions other than input/output.

For details, refer to manuals of each module.

## FX5 intelligent function module

The following FX5 intelligent function module can be used in FX5UC CPU module systems using connector conversion modules.

For the connector conversion modules to be connected, refer to ☞ Page 31 Connector conversion module.

### ■Positioning

| Model | Function | No. of occupied input/output points | Current consumption | | |
|---|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply | External 24 V DC power supply |
| FX5-40SSC-S | 4-axis control (compatible with SSCNET Ⅲ/H) | 8 points | — | — | 250 mA |

## FX3 intelligent function module

The following FX3 intelligent functions modules can be used in FX5UC CPU module systems by using bus conversion modules.

For the bus conversion modules to be connected, refer to ☞ Page 31 Bus conversion module.

To use the modules, refer to ☞ Page 35 Bus conversion module.

### ■Analog

| Model | Function | No. of occupied input/output points | Current consumption | | |
|---|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply | External 24 V DC power supply |
| FX3U-4AD | 4-CH voltage/current input | 8 points | 110 mA | — | 90 mA |
| FX3U-4DA | 4-CH voltage/current output | | 120 mA | — | 160 mA |
| FX3U-4LC | 4-CH temperature control (resistance thermometer/thermocouple/low voltage) 4 transistor output points | | 160 mA | — | 50 mA |

### ■Positioning

| Model | Function | No. of occupied input/output points | Current consumption | | |
|---|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply | External 24 V DC power supply |
| FX3U-1PG | Pulse output for independent 1-axis control | 8 points | 150 mA | — | 40 mA |

### ■High-speed counter

| Model | Function | No. of occupied input/output points | Current consumption | |
|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply |
| FX3U-2HC | 2-CH high-speed counter | 8 points | 245 mA | — |

■**Network**

| Model | Function | No. of occupied input/output points | Current consumption | | |
|---|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply | External 24 V DC power supply |
| FX3U-16CCL-M[*1] | Master for CC-Link (compatible with Ver. 2.00 and Ver. 1.10) | 8 points[*2] | — | — | 240 mA |
| FX3U-64CCL[*1] | Intelligent device station for CC-Link | 8 points | — | — | 220 mA |
| FX3U-128ASL-M[*1][*5] | Master for AnyWireASLINK | 8 points[*3] | 130 mA | — | 100 mA[*4] |

*1 GX Works3 does not support this module. When using this module, configure the settings with the buffer memory.
*2 The number of remote I/O points is added. For details, refer to ☞ Page 39 Calculation of the number of remote I/O points.
*3 The number of input/output points set by the rotary switch is added. For details, refer to FX3U-128ASL-M USER'S MANUAL.
*4 This value does not include the supply current to slave modules. For details, refer to FX3U-128ASL-M USER'S MANUAL.
*5 Note that the warranty for this model differs from the ones for other PLCs. For details, refer to FX3U-128ASL-M USER'S MANUAL.

# Bus conversion module

Bus conversion modules are used to connect FX3 intelligent functions modules in FX5UC CPU module systems. For details of the specifications of each bus conversion module, refer to the hardware manual of each product.

| Model | Function | No. of occupied input/output points | Current consumption | |
|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply |
| FX5-CNV-BUSC | Bus conversion from CPU module or extension modules (extension connector type) | 8 points | 150 mA | — |
| FX5-CNV-BUS | Bus conversion from CPU module or extension modules (extension cable type) or FX5 intelligent function modules | 8 points | 150 mA | — |

# Connector conversion module

Connector conversion modules are used to connect FX5 I/O modules (extension cable type) or FX5 intelligent functions modules in FX5UC CPU module systems.

| Model | Function | No. of occupied input/output points | Current consumption | |
|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply |
| FX5-CNV-IFC | Connector conversion from CPU module or extension modules (extension connector type) | — | — | — |

# 3.4　Expansion Adapter

Expansion adapters are used to expand functions and are connected on the left side of the FX5UC CPU module.
For details of the specifications of each expansion adapter, refer to the hardware manual of each product.

| Model | Function | No. of occupied input/output points | Current consumption | | |
|---|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply | External 24 V DC power supply |
| FX5-4AD-ADP | 4-CH voltage/current input | — | 10 mA | 20 mA | — |
| FX5-4DA-ADP | 4-CH voltage/current output | — | 10 mA | — | 160 mA |
| FX5-232ADP | For RS-232C communication | — | 30 mA | 30 mA | — |
| FX5-485ADP | For RS-485 communication | — | 20 mA | 30 mA | — |

# 3.5 Terminal Module

For details of the terminal modules, refer to ☞ Page 125 Terminal Module.

| Model | Function | No. of occupied input/output points | Current consumption | | |
|---|---|---|---|---|---|
| | | | 5 V DC power supply | 24 V DC power supply | External 24 V DC power supply |
| FX-16E-TB | Directly connected to the I/O connector of a PLC. | — | — | — | 112 mA |
| FX-32E-TB | | — | — | — | 112 mA/16 points |
| FX-16EX-A1-TB | 100 V AC input type | — | — | — | 48 mA |
| FX-16EYR-TB | Relay output type | — | — | — | 80 mA |
| FX-16EYT-TB | Transistor output type (sink output) | — | — | — | 112 mA |
| FX-16EYS-TB | Triac output type | — | — | — | 112 mA |
| FX-16E-TB/UL | Directly connected to the I/O connector of a PLC. | — | — | — | 112 mA |
| FX-32E-TB/UL | | — | — | — | 112 mA/16 points |
| FX-16EYR-ES-TB/UL | Relay output type | — | — | — | 80 mA |
| FX-16EYT-ES-TB/UL | Transistor output type (sink output) | — | — | — | 112 mA |
| FX-16EYT-ESS-TB/UL | Transistor output type (source output) | — | — | — | 112 mA |
| FX-16EYS-ES-TB/UL | Triac output type | — | — | — | 112 mA |

# 3.6 SD Memory Card

For details of the SD memory card, refer to ☞ Page 123 SD Memory Card.

| Model | Function |
|---|---|
| NZ1MEM-2GBSD | SD memory card (Mitsubishi product) |
| NZ1MEM-4GBSD | |
| L1MEM-2GBSD | |
| L1MEM-4GBSD | |

# 3.7 Battery

For details of the battery, refer to ☞ Page 97 Battery.

| Model | Function |
|---|---|
| FX3U-32BL | Battery |

# 3.8 Communication Cable

Use a communication cable to connect a PLC with a personal computer by RS-232C communication.

| Model | Function |
|---|---|
| FX-232CAB-1 | FX5-232ADP⇔Personal computer |

# 3.9 Engineering Tool

For design and programming of FX5UC CPU module systems, use GX Works3.
For the operation method, refer to the 📖GX Works3 Operating Manual.

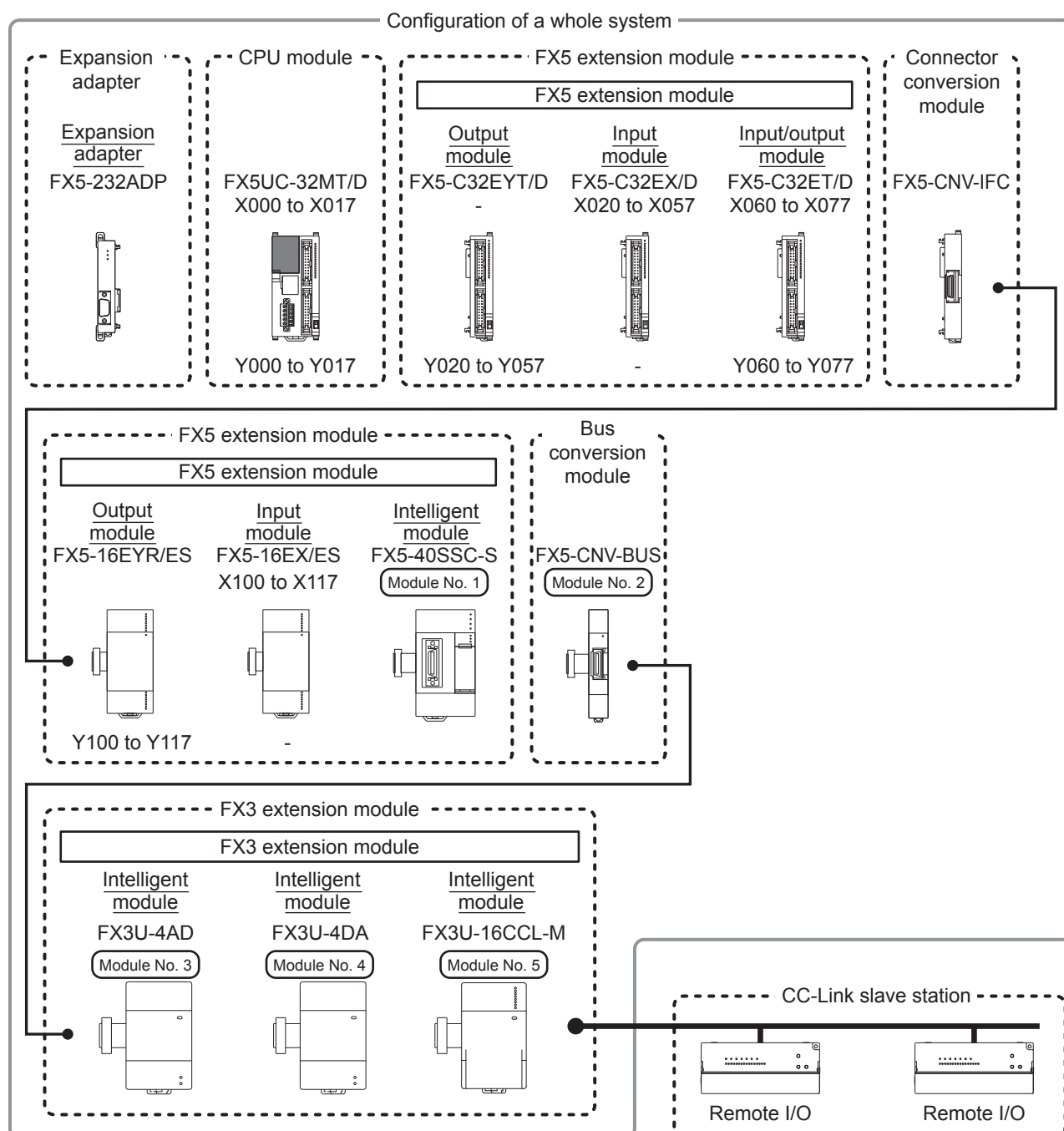| Model | Function |
|---|---|
| GX Works3 | MELSEC PLC software package |

# 4 SYSTEM CONFIGURATION

## Configuration of a whole system

The configuration of an entire system is shown below as an example.

For assignment of the module numbers for extension module, refer to

Ex.



Configuration of a whole system

Expansion adapter

Expansion adapter
FX5-232ADP

CPU module

FX5UC-32MT/D
X000 to X017

Y000 to Y017

FX5 extension module

FX5 extension module

| Output module | Input module | Input/output module |
| --- | --- | --- |
| FX5-C32EYT/D | FX5-C32EX/D | FX5-C32ET/D |
| - | X020 to X057 | X060 to X077 |
| Y020 to Y057 | - | Y060 to Y077 |

Connector conversion module

FX5-CNV-IFC

FX5 extension module

FX5 extension module

| Output module | Input module | Intelligent module |
| --- | --- | --- |
| FX5-16EYR/ES | FX5-16EX/ES | FX5-40SSC-S |
| | X100 to X117 | Module No. 1 |
| Y100 to Y117 | - | |

Bus conversion module

FX5-CNV-BUS
Module No. 2

FX3 extension module

FX3 extension module

| Intelligent module | Intelligent module | Intelligent module |
| --- | --- | --- |
| FX3U-4AD | FX3U-4DA | FX3U-16CCL-M |
| Module No. 3 | Module No. 4 | Module No. 5 |

CC-Link slave station

Remote I/O   Remote I/O

# 4.1 Rules of System Configuration

The system configuration must meet the following four requirements.

## Number of connected extension devices

The number of extension devices that can be connected to a single system of FX5UC CPU modules is limited.

For details, refer to ☞ Page 36 Limitations on the Number of Connected Extension Devices.

Ex.

Up to 12 modules$^{*1}$

| Expansion adapter (Analog) | Expansion adapter (Communi-cation) | CPU module | Input module, Output module | Connector conversion module | Input module, Output module | FX5 intelligent module | Bus conversion module | FX3 intelligent module |
|---|---|---|---|---|---|---|---|---|

Up to 4 modules | Up to 2 modules

Up to 1 module

Up to 1 module | Up to 6 modules

Up to 8 modules
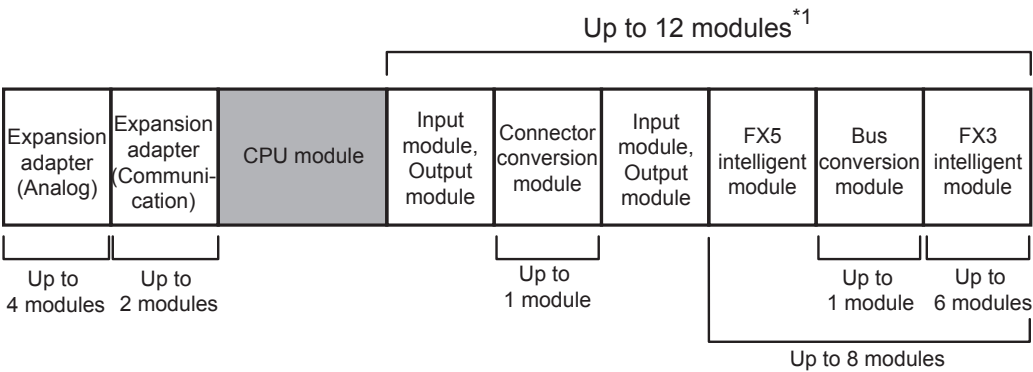
*1 Connector conversion modules are not included in the number of connected extension devices.

## Number of input/output points

With the FX5UC CPU modules, a total of up to 512 points or less including the number of input/output points of extension devices (max. 256 points) and number of remote I/O points (max. 384 points) can be controlled.

For details on the number of input/output points, refer to ☞ Page 38 Limitation on the Number of Input/Output Points.

| Number of input/output points on whole system | Up to 512 points |
|---|---|

| 1. Number of input/output points (including input/output occupied points) | Up to 256 points |
|---|---|

| Expansion adapter | CPU module | I/O module | Connector conversion module | FX5 Intelligent module | FX5 Intelligent module | Bus conversion module | • CC-Link master • AnyWireASLINK master |
|---|---|---|---|---|---|---|---|

| 2. Number of remote I/O points for CC-Link/AnyWireASLINK | Up to 384 points |
|---|---|

CC-Link/AnyWireASLINK system

| Remote I/O station | Remote I/O station | Remote I/O station | Remote I/O station |
|---|---|---|---|

## Current consumption

The power to the extension devices is supplied from a CPU module.

The number of extension devices that can be connected must be determined from the power supply capacity of the CPU module.

For details on the current consumption, refer to ☞ Page 41 Limitation on Current Consumption.

| Expansion adapter | CPU module | Input module[*1], Output module | Connector conversion module | Input module[*1], Output module | Bus conversion module | FX3 intelligent module |
|---|---|---|---|---|---|---|

Power is supplied from the CPU module.
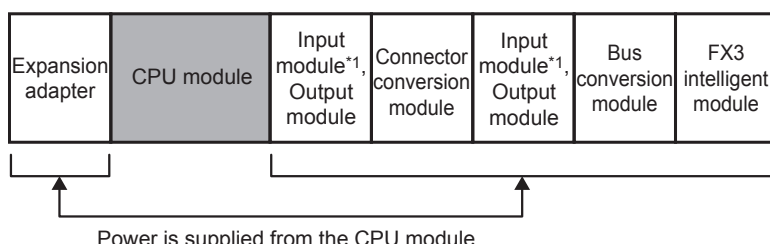
*1    The power to the input circuit of the input module is supplied from the external power supply.

## Limitations when using FX3 extension devices

### ■Bus conversion module

- A bus conversion module is required to use FX3 extension module. FX3 extension modules can be connected to the right side of the bus conversion module only.
- For limitations on the number of connected extension devices, refer to ☞ Page 37 Connection to the bus conversion module (connection with FX3 extension devices).

### ■Limitations on intelligent function modules

Note that some FX3 intelligent function modules have limitations on the number of modules and order in which they are added for each individual module.

| Model | Limitation |
|---|---|
| FX3U-2HC | Up to two modules connectable per system. Connect a module of this type immediately after the bus conversion module. |
| FX3U-16CCL-M | Only one module may be connected per system. |
| FX3U-64CCL | Only one module may be connected per system. |
| FX3U-128ASL-M | Only one module may be connected per system. |

# 4.2 Limitations on the Number of Connected Extension Devices

## Number of connected expansion adapters

There is a limitation on the number of expansion adapters connected to the FX5UC CPU module as follows.

| Type | Limitation |
|---|---|
| Communication adapter | Up to 2 adapters can be connected |
| Analog adapter | Up to 4 adapters can be connected |



| | |
|---|---|
| Up to 2 modules | FX5-232ADP  FX5-485ADP |
| Up to 4 modules | FX5-4AD-ADP  FX5-4DA-ADP |
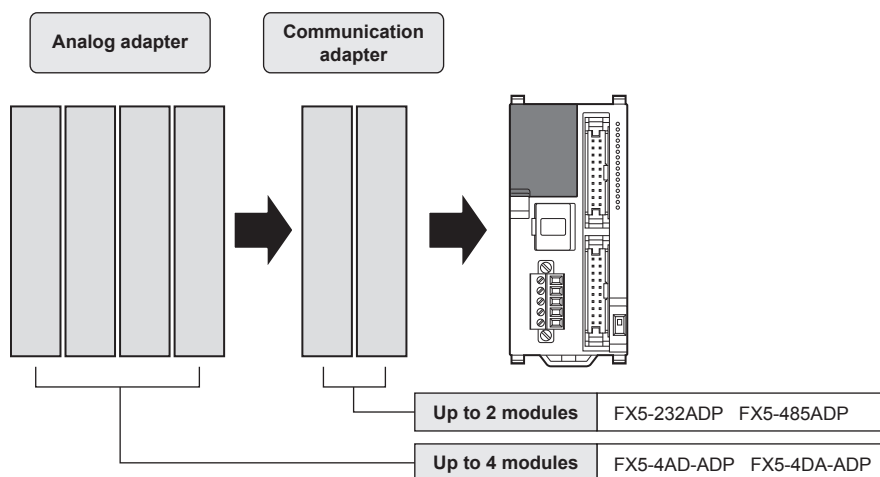
## Number of connected extension modules

### Overall system limitation

There is a limitation on the number of connected extension modules in a whole system as follows.

| Type | Limitation |
|---|---|
| Extension module | Up to 12 modules can be connected to a system.<br>(excluding connector conversion modules) |
| Connector conversion module | Only 1 module can be connected to a system. |
| Bus conversion module | Only 1 module can be connected to a system. |
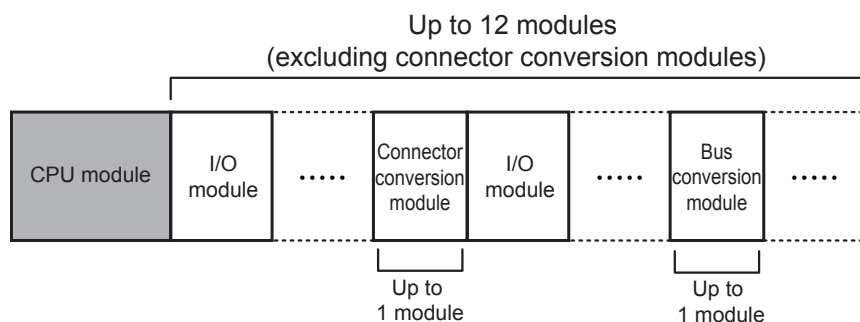
## Connection to the CPU module

There is a limitation on the number of extension modules connected to the FX5UC CPU module as follows.

The number of modules connected on the right side of the CPU module must be as follows.

| Type | Limitation |
|---|---|
| Total No. of input modules, output modules, intelligent function modules, and bus conversion modules | Up to 12 modules can be connected. |
| Total No. of FX5 intelligent function modules, bus conversion module, FX3 intelligent function modules | Up to 8 modules can be connected. |
| Total No. of FX3 intelligent function modules | Up to 6 modules can be connected. |
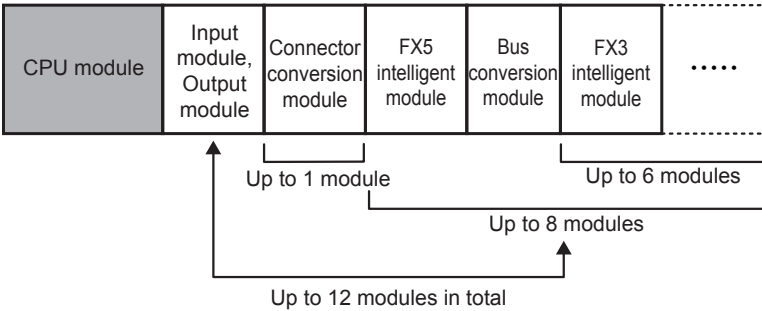


## Connection to the bus conversion module (connection with FX3 extension devices)

There is a limitation on the number of extension modules connected to the bus conversion module as follows.

The number of modules connected on the right side of the bus conversion module must be as follows.

| Type | Limitation |
|---|---|
| Total No. of intelligent function modules | Up to 6 modules can be connected. |
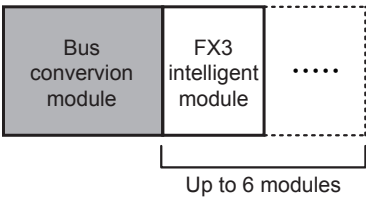


### Precautions

FX5 extension modules cannot be connected on the right side of the bus conversion module.

# 4.3 Limitation on the Number of Input/Output Points

With the FX5UC CPU modules, a total of 512 points including the number of input/output points of extension devices (max. 256 points) and the number of remote I/O points (max. 384 points) can be controlled.
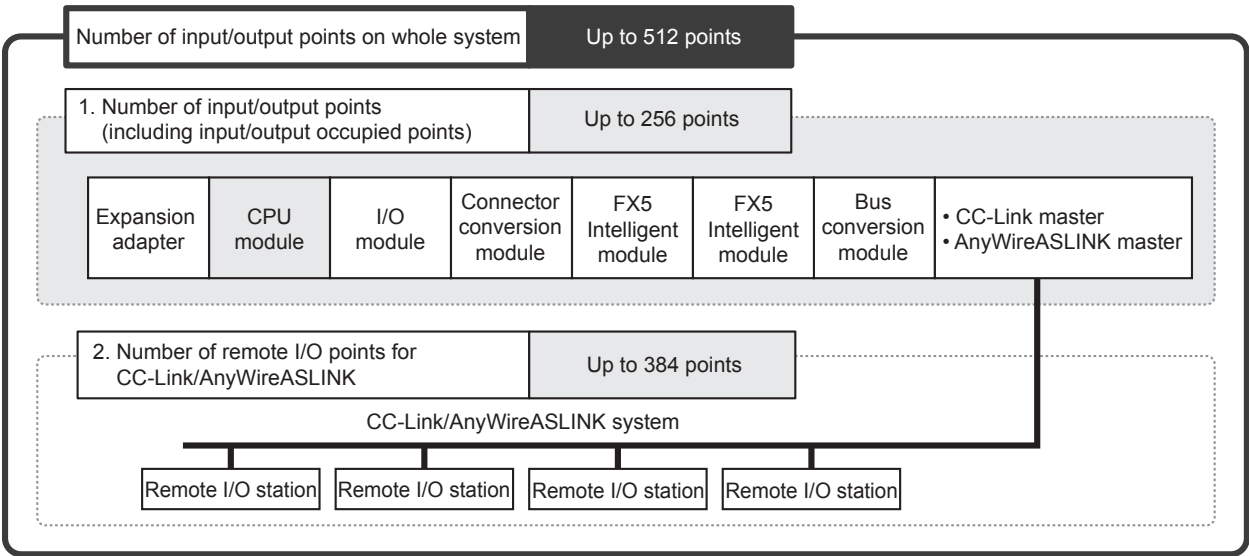


## Total number of I/O points and remote I/O points

With the FX5UC CPU module, a total of 512 points or less including the number of input/output points of extension devices and number of remote I/O points can be controlled.

The total number of I/O points and remote I/O points must not exceed 512 points.
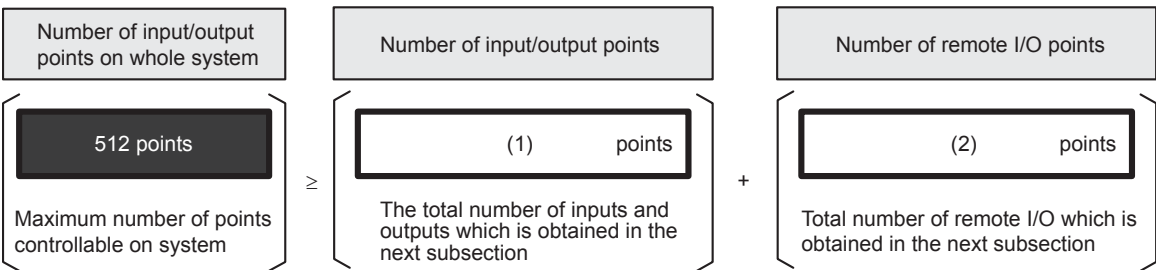
# Calculation of the number of input/output points

The number of input/output points is a total of the number of input/output points of the CPU module, I/O module, and the number of occupied input/output points of intelligent function modules.

The total number of input/output points must not exceed 256 points.

| Maximum number of input/output points | | Number of input/output points | | Number of input/output points on CPU module and I/O module | | Number of occupied input/output points |
|---|---|---|---|---|---|---|
| 256 points | ≥ | (1) | = | (A) + (B) | + | (C) modules × 8 points |
| | | | | Total number of input/output points of CPU module and I/O module | | The intelligent module and bus conversion module occupy 8 input/output points/device. |

(A): Number of input/output points of CPU module  (B): Number of input/output points of I/O module
(C): Number of intelligent function modules and bus conversion modules

## Total number of input/output points of the CPU module and I/O modules

Count the total number of input/output points of the CPU module and I/O modules.

To obtain the total number of input/output points, count the input points (X000 and more) and output points (Y000 and more) of the CPU module and I/O modules.

For details of the number of input/output points by models, refer to the following.

☞ Page 27 CPU Module
☞ Page 28 I/O module

## Number of occupied input/output points of intelligent function modules

Count the number of occupied input/output points of intelligent function modules.

The number of occupied input/output points per module is 8.

For details on the number of occupied input/output points by models, refer to ☞ Page 30 Intelligent function module.

# Calculation of the number of remote I/O points

If the master module of the network is used, calculate the number of remote I/O points connected on the network.

The total number of remote I/O points must not exceed 384 points.

| Maximum number of remote I/O points | | Remote I/O points | | The total number of remote I/O points in CC-Link and AnyWireASLINK |
|---|---|---|---|---|
| 384 points | ≥ | (2) | = | (a) + (b) points |
| | | | | The total number of the remote I/O points connected on the network |

(a) CC-Link remote I/O
(b) AnyWireASLINK remote I/O
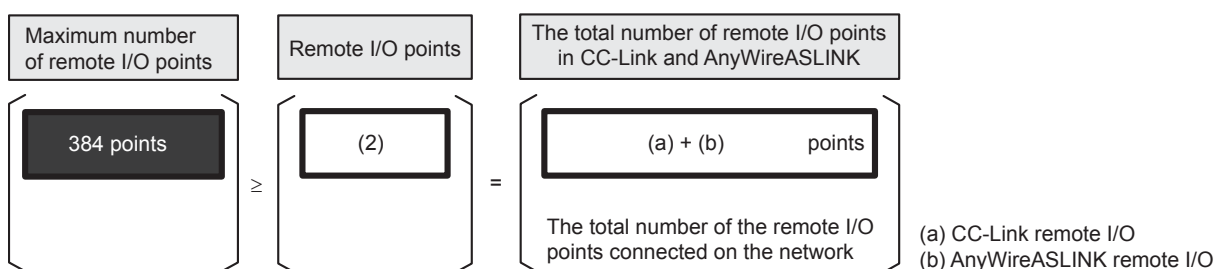
The maximum number of remote I/O points differs according to type of the network.

### Precautions

Precautions when using CC-Link master (FX3U-16CCL-M) and AnyWireASLINK master (FX3U-128ASL-M) together
When using FX3U-16CCL-M and FX3U-128ASL-M together, connect FX3U-128ASL-M on the left side. In the FX5UC CPU module, FX3U-16CCL-M parameters are set up by PLC program and will occupy up to 256 remote I/O points. Therefore, the remote I/O points of FX3U-128ASL-M that is connected to the right side may be less than 128 points when FX3U-16CCL-M is connected to the left side.

**Ex.**
When input/output points are 160 points and CC-Link master are 256 points:
512 points - 160 points - 256 points = 96 points
Remote I/O points of the AnyWireASLINK master are 96 points or less.

## CC-Link remote I/O

Remote I/O points that are used in FX3U-16CCL-M are calculated as "number of stations X 32 points".

Even if using less than 32 remote I/O points, calculate as "number of stations X 32 points".
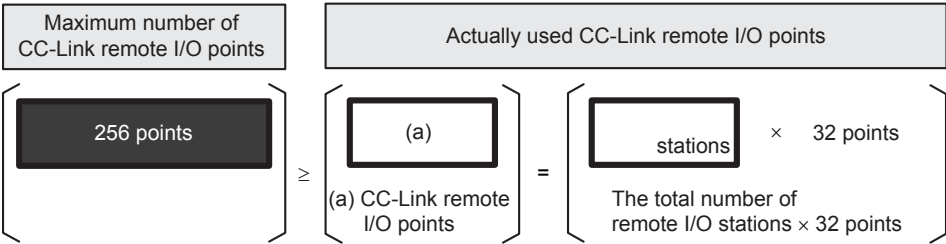
| Maximum number of CC-Link remote I/O points | Actually used CC-Link remote I/O points |
|---|---|

$$256 \text{ points} \geq (a) = \boxed{\text{stations}} \times 32 \text{ points}$$

(a) CC-Link remote I/O points

The total number of remote I/O stations × 32 points

In the FX5UC CPU module, FX3U-16CCL-M parameters are set up by PLC program and will occupy up to 256 remote I/O points.

When the total number of the number of input/output points (including occupied input/output points) and the number of remote I/O points of FX3U-128ASL-M that is connected to the left side exceeds 256 points, the difference of 512 minus that total can be used as CC-Link remote I/O points.

## AnyWireASLINK remote I/O

The number of input/output points set by the rotary switch of the AnyWireASLINK master is assigned as remote I/O of AnyWireASLINK.

Use the number of input/output points set by the rotary switch of the AnyWireASLINK master as the number of remote I/O points.

For details, refer to FX3U-128ASL-M USER'S MANUAL.

| Maximum number of AnyWire ASLINK remote I/O points | AnyWireASLINK remote I/O |
|---|---|

$$128 \text{ points} \geq (b) \text{ points}$$

(b) Number of remote I/O points assigned to AnyWireASLINK master
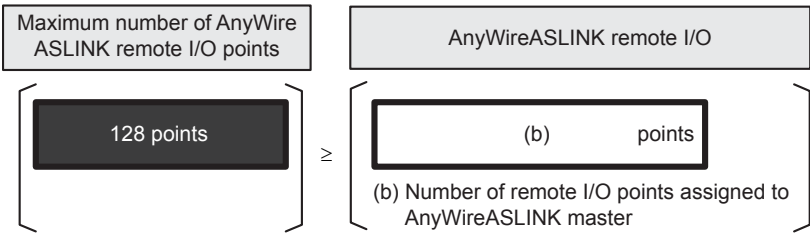
# 4.4     Limitation on Current Consumption

Power required for expansion adapters and extension modules is supplied from the CPU module. The number of extension devices that can be connected must be determined from the capacity of the power supply.

## Power supply check from the CPU module (current consumption calculation)

Check if power can be supplied to extension devices with the power supply capacity of the CPU module.

**Ex.**

| Expansion adapter | CPU module | Output module | Input module | Connector conversion module | FX5 intelligent module | Input module | Bus conversion module | FX3 intelligent module |

Power supply from the CPU module
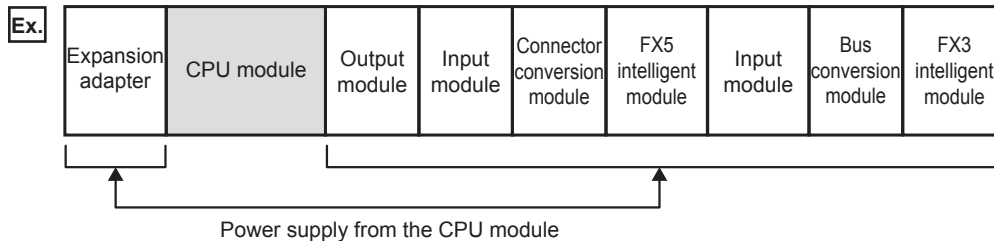
Calculate following the procedure below.

*1.* Check the power supply capacity of the CPU module used.
(☞ Page 27 CPU Module)

**Ex.**

| Type | Model | Power supply capacity | |
| --- | --- | --- | --- |
| | | **5 V DC power supply** | **24 V DC power supply** |
| CPU module | FX5UC-32MT/D | 720 mA | 500 mA |

*2.* Check the current consumption of extension devices.
(☞ Page 28 Extension Module)

**Ex.**

| Type | Model | Current consumption | |
| --- | --- | --- | --- |
| | | **5 V DC power supply** | **24 V DC power supply** |
| Expansion adapter | FX5-232ADP | 30 mA | 30 mA |
| Output module | FX5-C32EYT/D | 120 mA | 200 mA |
| Input module | FX5-C32EX/D | 120 mA | — |
| Connector conversion module | FX5-CNV-IFC | — | — |
| Simple motion module | FX5-40SSC-S | — | — |
| Input module | FX5-16EX/ES | 100 mA | — |
| Bus conversion module | FX5-CNV-BUS | 150 mA | — |
| Analog input | FX3U-4AD | 110 mA | — |

*3.* Calculate the total current consumption of each power supply.

**Ex.**

| Power supply type | Total current consumption |
| --- | --- |
| 5 V DC power supply | 630 mA |
| 24 V DC power supply | 230 mA |

**4.** Check if expansion to the CPU module is permitted.

• 5 V DC power supply

| 5 V DC power supply capacity | Current consumption | Calculation result | | |
|---|---|---|---|---|
| CPU module | Total number of extension devices | | | |
| mA | - mA | = mA | ≥ | 0 mA |

**Ex.**   720 mA          630 mA          90 mA

• 24 V DC power supply

| 24 V DC power supply capacity | Current consumption | Calculation result | | |
|---|---|---|---|---|
| CPU module | Total number of extension devices | | | |
| mA | - mA | = mA | ≥ | 0 mA |

**Ex.**   500 mA          230 mA          270 mA

# 4.5     Numbers and Assignment in System

Input/output numbers and module numbers in an FX5UC system are explained.

## Module input/output number

The input/output numbers are octal numbers. Input is assigned to "X" and output to "Y."

Input/output numbers are used for communication of ON/OFF data between I/O modules and the CPU module.

 • Input/output numbers (X/Y) are octal.

Input/output numbers (X/Y) are automatically assigned as shown below.

X000 to X007, X010 to X017, X020 to X027, ... X070 to X077, X100 to X107, ...

Y000 to Y007, Y010 to Y017, Y020 to Y027, ... Y070 to Y077, Y100 to Y107, ...

 • Numbers for added I/O module

To an added I/O module, input numbers and output numbers following the input numbers and output numbers given to the preceding device are assigned. The last digit of the assigned numbers must begin with 0.

## Module number of Extension modules

The CPU module automatically assigns numbers (1 to 16) to intelligent function modules or bus conversion module as module numbers in order of distance from the CPU module.

 • Intelligent function modules or bus conversion module connected to the CPU module

Module numbers are assigned to intelligent function modules in order of distance from the CPU module: No. 1 to No. 16.

 • Products to which module numbers are not assigned

Module numbers are not assigned to the following extension devices.

 • I/O module                    FX5-C32EX/D, FX5-C32EYT/D, etc.
 • Expansion adapter             FX5-232ADP, FX5-485ADP, etc.
 • Connector conversion module   FX5-CNV-IFC

**Ex.**

Module No.

| No. 1 | → | No. 2 | → | No. 3 |
|---|---|---|---|---|

| Expansion adapter FX5-232ADP | CPU module FX5UC-32MT/D | Input module FX5-C32EX/D | Input module FX5-C32EYT/D | Bus conversion module FX5-CNV-BUSC | Intelligent module FX3U-1PG | Intelligent module FX3U-4AD |
|---|---|---|---|---|---|---|
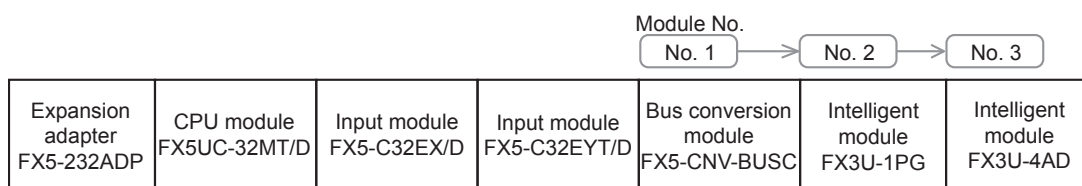
# 5 INSTALLATION

## 5.1 Installation Location

Use the PLC under the environmental conditions complying with the generic specifications (☞ Page 17 Generic Specifications).

### Installation location in enclosure

To prevent temperature rise, do not mount the PLC on the floor or ceiling, or in the vertical direction. Always mount the PLC horizontally on the wall as shown in the following figure.
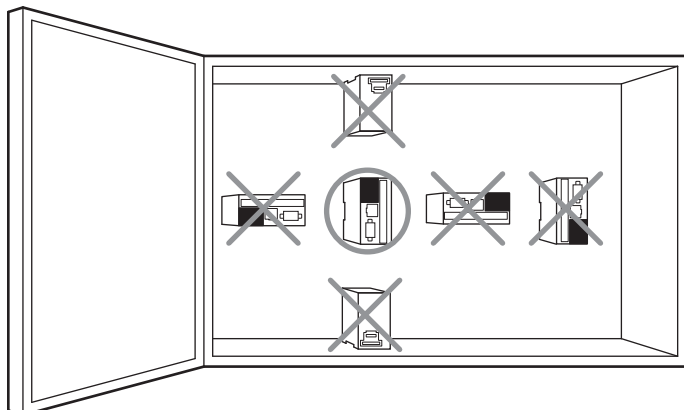


### Spaces in enclosure

Extension devices can be connected on the left and right sides of the CPU module of the PLC. Keep a space of at least 50 mm (1.97") between the module main body and other devices and structure.

If you intend to add extension devices, keep necessary spaces on the left and right sides.
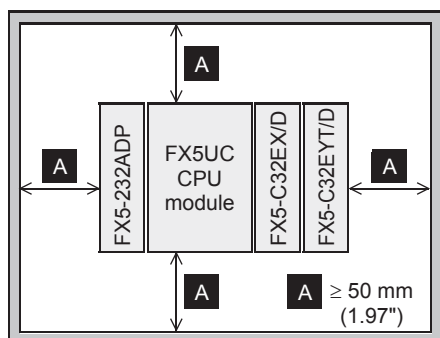


### Layout in enclosure

Keep a space of at least 50 mm (1.97") between the module main body or other devices and structure.
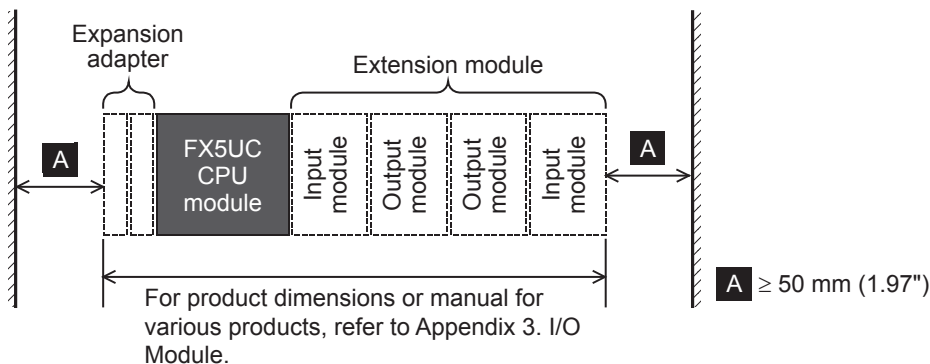
# 5.2 Examination for Installing Method in Enclosure

Examine the installation location of PLC considering the environmental conditions ( Page 17 Generic Specifications).

> **Point**
>
> When extension cables are used for the connection, install the products keeping a space of about 2 mm (0.08") between them.

## Installing on DIN rail

- The PLC can be installed on a DIN46277 rail (35 mm (1.38") wide).
- The PLC can be easily moved and removed.
- The PLC installation height is the same as the DIN rail.

For details on the procedures for installing on and detaching from DIN rail, refer to  Page 44 Procedures for Installing on and Detaching from DIN Rail.

### ■Example of installation
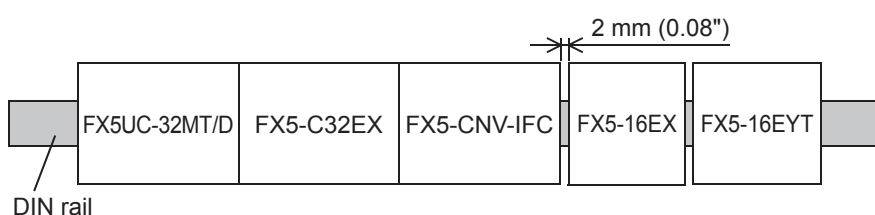


# 5.3 Procedures for Installing on and Detaching from DIN Rail

The CPU module can be installed on a DIN46277 rail (35 mm (1.38") wide).

## Preparation for installation

### Connecting extension devices

Some extension devices must be mounted on the CPU module before the module is installed in the enclosure.

- Connect expansion adapters or extension modules (extension connector type) on the CPU module before mounting the PLC in the enclosure.
- Mount extension modules (extension cable type) or terminal modules in the enclosure after mounting the CPU module in the enclosure.
- Mount (replace) a battery before mounting the CPU module.

### Affixing the dust proof sheet

The dust proof sheet should be affixed to the ventilation slits before beginning the installation and wiring work.

For the affixing procedure, refer to the instructions on the dust proof sheet.

Always remove the dust proof sheet when the installation and wiring work is completed.

# Installation of CPU module

Connect expansion adapters or extension modules (extension connector type) on the CPU module before mounting the PLC in the enclosure.

For the connection method of the expansion adapters, refer to ☞ Page 47 Connecting method A - connection of an expansion adapter.

For the connection method of the extension modules (extension connector type), refer to ☞ Page 47 Connecting method B - connection of an extension module (extension connector type).

*1.* Push out all DIN rail mounting hooks (A in the following figure).
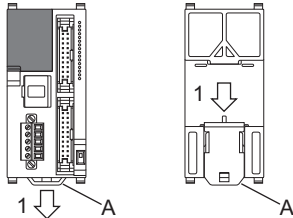


*2.* Fit the upper edge of the DIN rail mounting groove (B in the following figure) onto the DIN rail.
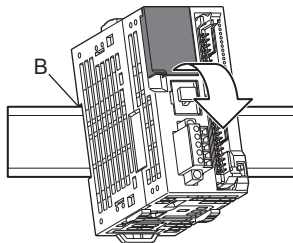


*3.* Lock the DIN rail mounting hooks (C in the following figure) while pressing the PLC against the DIN rail.
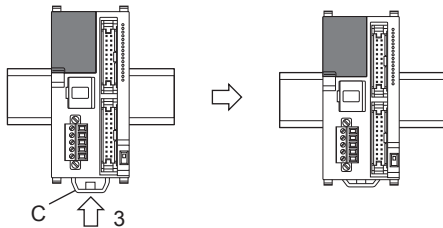


# Installation of extension modules (extension cable type)

*1.* Push out the DIN rail mounting hook (A in the right figure) of the extension module (extension cable type).


Back side
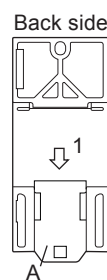
*2.* Fit the upper edge of the DIN rail mounting groove (B in the right figure) onto the DIN rail.

*3.* Push the product against the DIN rail.

*4.* Lock the DIN rail mounting hooks while pressing the product against the DIN rail.
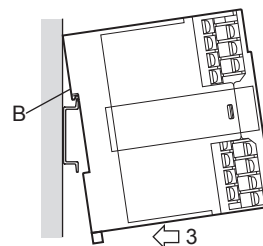


*5.* Connect the extension cable. For the connecting procedure of the extension cables, refer to ☞ Page 46 Connecting Methods for CPU Module and Extension Devices.

## Installation of terminal modules

**1.** Turn off all the power supplies connected to the CPU module, extension modules, or terminal modules.

**2.** Fit the upper edge of the DIN rail mounting groove (A in the right figure) onto the DIN rail.

**3.** Push the product against the DIN rail.
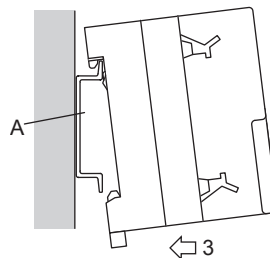
## Removal of CPU module

**1.** Remove the connection cables including power cables and I/O cables.

**2.** Insert the tip of a flathead screwdriver into the hole of the DIN rail mounting hook (B in the right figure). This step also applies for the DIN rail mounting hooks of the expansion adapters or extension modules (connector type).

**3.** Move the flathead screwdriver as shown in the right figure to draw out the DIN rail mounting hooks of all devices.

**4.** Remove the product from the DIN rail (C in the right figure).

**5.** Push in the DIN rail mounting hooks (D in the right figure).
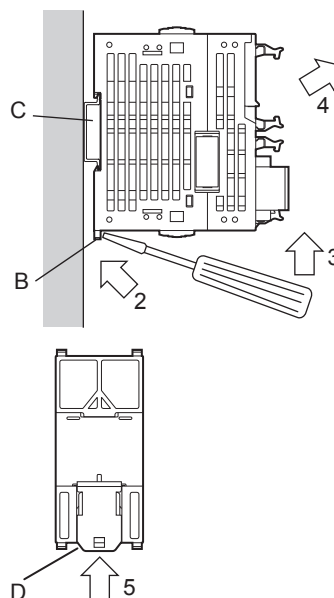
# 5.4 Connecting Methods for CPU Module and Extension Devices

This section explains the connection methods for extension devices.

## Connection of extension devices

The connection method varies depending on the combination of products, i.e., the CPU module, expansion adapters, and extension modules.

The connecting methods are explained with the following configuration example.
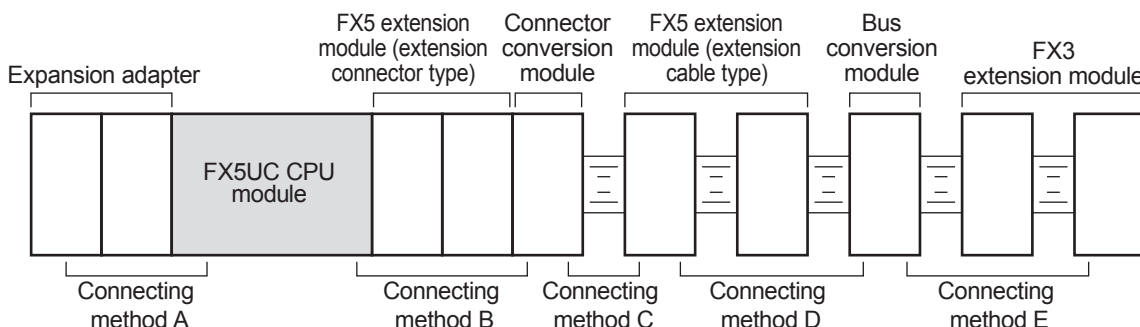
# Connecting method A - connection of an expansion adapter

This subsection explains how to connect the expansion adapter to the CPU module.

***1.*** Remove expansion adapter connector cover (A in the right figure).

***2.*** Slide the hook for coupling the expansion adapter of the CPU module (B in the right figure).
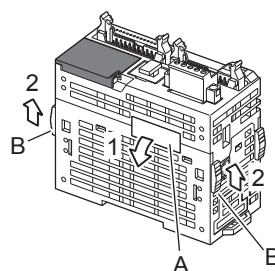
***3.*** Connect the expansion adapter to the CPU module as shown in the right figure.

***4.*** Slide the hook for coupling the expansion adapter of the CPU module (B in the right figure) to fix the expansion adapter (C in the right figure).
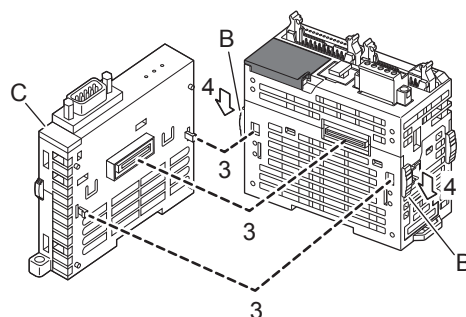
# Connecting method B - connection of an extension module (extension connector type)

This subsection explains how to connect the extension module (extension connector type).

***1.*** Slide the hook for coupling the extension module (A in the right figure) of the existing module (left side).

***2.*** Remove the subsequent extension connector cover (B in the right figure).
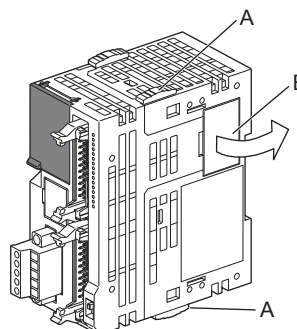
***3.*** Connect an extension module as shown in the right figure.

***4.*** Slide the hook for coupling the extension module (A in the right figure) of the existing module to fix the extension module (C in the right figure).
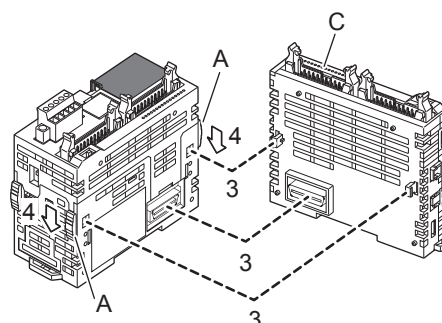
# Connecting method C - connection of a connector conversion module (extension connector type) and an extension module (extension cable type)

This subsection explains how to connect the extension module (extension cable type) to the connector conversion module (extension connector type).

**1.** Connect the extension cable (A in the right figure) from the extension module (extension cable type) to the subsequent extension connector of the connector conversion module (extension connector type).
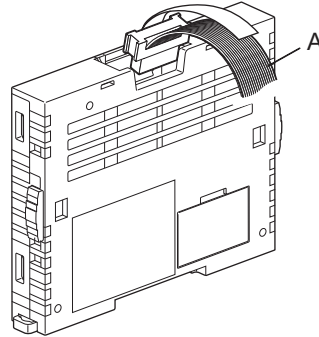


A

> **Point**
>
> Cautions on mounting and removing extension cables
> - Make sure that the pullout tab of extension cables do not touch the conductive parts of the module.
> - When removing the extension cable, pull the pullout tab of the extension cable straight up.

# Connecting method D - connection between extension modules (extension cable type)

This subsection explains how to connect extension modules (extension cable type).

**1.** Remove the top cover (B in the right figure) of the existing module (left side) (A in the right figure).

**2.** Connect the extension cable (C in the right figure) of the module to be connected (right side) to the existing module (left side) (A in the right figure).

**3.** Fit the top cover (B in the right figure).

**4.** Draw out the pullout tab (D in the right figure) of the extension cable on the right side of the top cover.
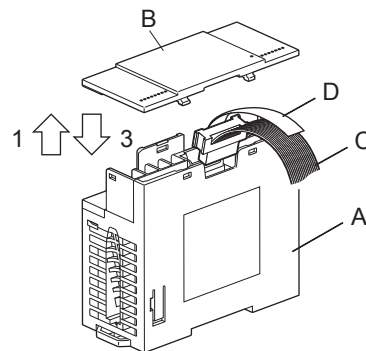


B

D

C

A

> **Point**
>
> Cautions on mounting and removing extension cables
> - Make sure that the pullout tab of extension cables do not touch the conductive parts of the module.
> - When removing the extension cable, pull the pullout tab of the extension cable straight up.

# Connecting method E - connection of a bus conversion module and an FX3 intelligent function module

This subsection explains how to connect the FX3 extension module to the bus conversion module.

*1.* Connect the extension cable (A in the right figure) from the FX3 extension module to the subsequent extension connector of the bus conversion module.

This illustration is FX5-CNV-BUSC. When FX5-CNV-BUS is used, connect the extension cable to the bus conversion module in the same way.

A

**5**
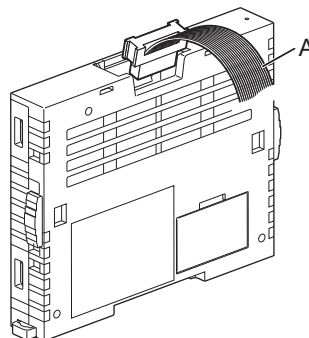
# Connection of power cables

## Power cable connection of the CPU module and I/O modules

The power must be supplied to the FX5UC CPU module, FX5-C32EX/D, and FX5-C32ET/D.

Use the power cable for CPU modules to supply the power to the FX5UC CPU module.

To supply the power to FX5-C32EX/D and FX5-C32ET/D, use two power connectors (upper and lower) on each module for crossover wiring.

FX5-C32EX/DS and FX5-C32ET/DSS do not have power connectors. Supply the power to them using input connectors.



CPU module
— Input module (extension connector type)
— Output module (extension connector type)
— I/O module

The following shows the pin numbers of the power connectors.

FX5UC-32MT/D(SS)

1: ⊕ (Red)
2: ⊖ (Black)
3: Ground (Green)

FX5-C32EX/D, FX5-C32ET/D

1: ⊕ (Red)
2: ⊖ (Black)

**C** Crossover wiring between input extension blocks

Resin cover
Since the lower connector is covered with a resin cover at shipment from the factory, use the upper connector preferentially. Remove the resin cover only when crossover wiring to a subsequent extension block is performed.

Red: ⊕
**B**
Red: ⊕
Black: ⊖
**A** Black: ⊖
Green: Ground

The following products are provided with power cables.

| Classification | Application | Model | Length | Provided with |
|---|---|---|---|---|
| A | Power cable for CPU modules | FX2NC-100MPCB | 1 m | FX5UC-32MT/D, FX5UC-32MT/DSS |
| B | Power cable for FX5-C32EX/D and FX5-C32ET/D | FX2NC-100BPCB | 1 m | FX5UC-32MT/D |
| C | Power crossover cable for FX5-C32EX/D and FX5-C32ET/D | FX2NC-10BPCB1 | 0.1 m | FX5-C32EX/D, FX5-C32ET/D |

• Wiring FX5-C32EX/D or FX5-C32ET/D to a subsequent stage

Since the two power connectors on each module of FX5-C32EX/D and FX5-C32ET/D are connected in parallel inside the module, they have no difference and can be either an inlet port or outlet port for supplying the power. Thus, cables can be connected to either of the connectors.

However, since the lower connector is covered with a resin cover at shipment from the factory, use the upper connector preferentially. Remove the resin cover only when crossover wiring to a subsequent module is performed.

(FX5-C32EX/DS and FX5-C32ET/DSS do not have power connectors and the power is supplied from using input connectors. Thus, removing the resin cover is not required.)

### Precautions

To perform crossover wiring, supply the power from the preceding module to the subsequent module. The power cannot be supplied from the subsequent module to the preceding module.

# Removal of power cables

Hold the part "a" on the connecter of the power cable with fingers, and remove the cable in the direction of the arrow.

FX5UC-32MT/D

a

Push here with fingers.
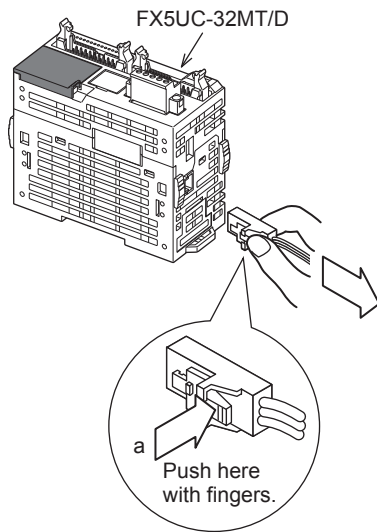
# Connection of I/O cables

## I/O connectors

### ■Cable connection to I/O connectors

I/O connectors conform to MIL-C-83503.

For I/O cables, refer to ☞ Page 52 Preparation of I/O connectors and prepare them.

- CPU module, I/O modules (extension connector type)

FX5UC-32MT/D

Input X

Notch

Output Y

• Terminal module
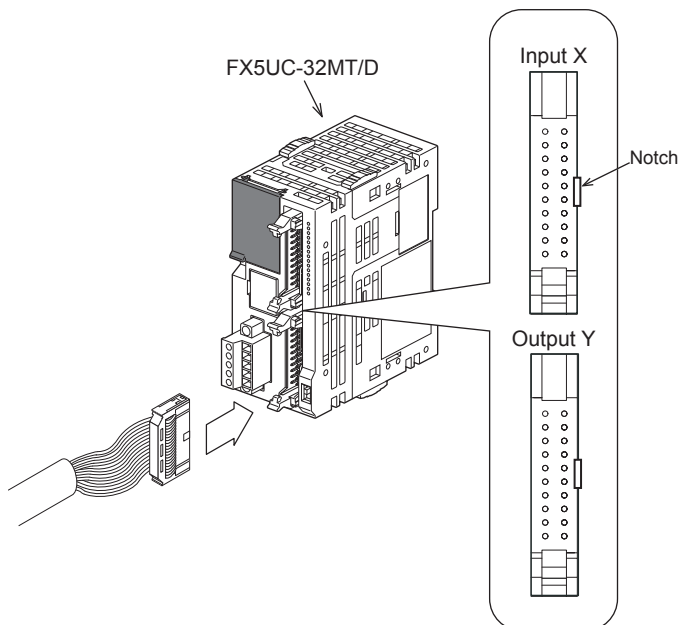


I/O cable

Terminal module
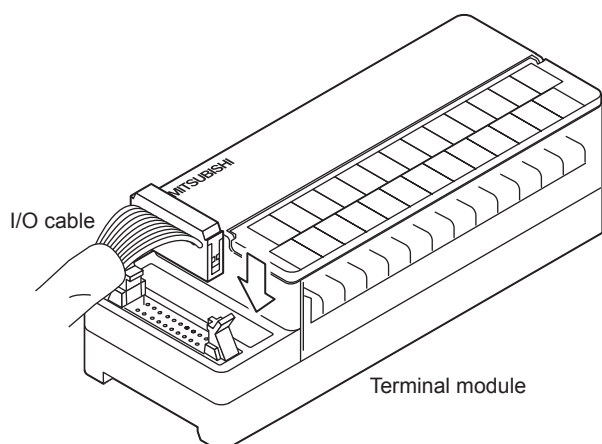
## ■Preparation of I/O connectors

• Suitable connector (commercial item)

Use 20-pin (1-key) sockets conforming to MIL-C-83503.

Check that the sockets do not interfere with peripheral parts including connector covers in advance.

• I/O cables (Mitsubishi option)

I/O cables on which connectors are attached are prepared.

| Model | Length | Description | Type |
|---|---|---|---|
| FX-16E-500CAB-S | 5 m | General-purpose I/O cable | • Single wire (Wire color: Red)<br>• CPU module side: 20-pin connector is attached. |
| FX-16E-150CAB | 1.5 m | Cables for connection of the terminal module and I/O connectors<br>For the connection with the terminal module, refer to ☞ Page 53 WIRING. | • Flat cables (with tube)<br>• On both ends, 20-pin connectors are attached. |
| FX-16E-300CAB | 3 m | | |
| FX-16E-500CAB | 5 m | | |
| FX-16E-150CAB-R | 1.5 m | | • Round multicore cables<br>• On both ends, 20-pin connectors are attached. |
| FX-16E-300CAB-R | 3 m | | |
| FX-16E-500CAB-R | 5 m | | |

• Connectors for self-making I/O cables (Mitsubishi option)

Prepare wires and crimp tools by users.

| Model and configuration of I/O connectors | | | Suitable wiring (UL-1061-compliant products are recommended) and tool | |
|---|---|---|---|---|
| Mitsubishi model | | Part description (Manufactured by DDK Ltd.) | Wire size | Crimp tool (Manufactured by DDK Ltd.) |
| FX2C-I/O-CON for flat cables | 10 sets | Crimp connector FRC2-A020-30S | AWG 28 (0.1 mm$^2$)<br>1.27-pitch 20 cores | 357J-4674D main body<br>357J-4664N attachment |
| FX2C-I/O-CON-S for single wires | 5 sets | Housing HU-200S2-001<br>Crimp contact HU-411S | AWG 22 (0.3 mm$^2$) | 357J-5538 |
| FX2C-I/O-CON-SA for single wires | 5 sets | Housing HU-200S2-001<br>Crimp contact HU-411SA | AWG 20 (0.5 mm$^2$) | 357J-13963 |

Contact for crimp tools: Fujikura Ltd.

• Certified connectors (commercially available connectors)

Connectors made by DDK Ltd. shown above

# 6 WIRING

## 6.1 Wiring Preparations

### Wiring procedure

Before wiring, make sure that the source power supply is off.

*1.* Prepare the parts for wiring.

Prepare cables and crimp terminals required for wiring. (☞ Page 54 Cable Connecting Procedure)

*2.* Connect the power cable.

Connect the cable to the power connector.

Provide the protection circuit described in this chapter for the power supply circuit. (☞ Page 57 Power Supply Wiring)

*3.* Perform class D grounding (grounding resistance: 100 Ω or less) for the ground [ ⏚ ] terminal.

Connect the grounded wire to the terminal. (☞ Page 56 Grounding)

*4.* Wire input [X] terminal.

Connect sensors and switches to the terminals. (☞ Page 59 Input Wiring)

*5.* Wire output [Y] terminal.

Connect the load to terminals.

(☞ Page 68 Output Wiring)

*6.* Wire the built-in RS-485 communication terminal blocks and Ethernet communication connectors.

📖MELSEC iQ-F FX5 User's Manual (Serial Communication)

📖MELSEC iQ-F FX5 User's Manual (MODBUS Communication)

📖MELSEC iQ-F FX5 User's Manual (Ethernet Communication)

*7.* Wire intelligent function modules and expansion adapters.

📖MELSEC iQ-F FX5 User's Manual (Serial Communication)

📖MELSEC iQ-F FX5 User's Manual (MODBUS Communication)

User's manual for each intelligent function module

# 6.2 Cable Connecting Procedure

The cable connecting procedure is explained below.

# European-type terminal block

Wire the European-type terminal block in accordance with the following specifications.

## Suitable wiring

| | Number of wires connected per terminal | Wire size | | Tightening torque |
| --- | --- | --- | --- | --- |
| | | Solid wires, stranded wire | Wire ferrule with insulation sleeve | |
| Terminal block for built-in RS-485 communication, Expansion adapter | One wire | 0.3 to 0.5 mm$^2$ (AWG22 to 20) | 0.3 to 0.5 mm$^2$ (AWG22 to 20) | 0.22 to 0.25 N·m |
| | Two wires | 0.3 mm$^2$ (AWG22) | — | |

### Precautions

Do not tighten terminal screws with torque beyond the specified range. Otherwise it may cause equipment failure or malfunction.

## Wire end treatment

Treat stranded and solid wires as they are or use wire ferrules with insulation sleeves for wiring terminals.

### ■When stranded and solid wires are treated as they are
 • Twist the end of stranded wires and make sure that there are no loose wires.
 • Do not solder-plate the electric wire ends.

**Stripping dimensions of electric wire ends**



9 mm (0.36")
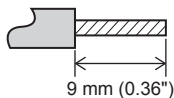
### ■When wire ferrules with insulation sleeves are used
Depending on the thickness of a wiring sheath used, it may be difficult to insert the sheath into an insulating sleeve. Refer to the external dimensions as a reference to select wires.



Insulating sleeve
Contact area (crimp area)
8 mm (0.31")
2.6 mm (0.1")
14 mm (0.55")

<Reference>
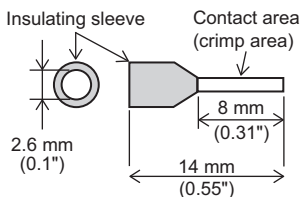
| | Manufacturer | Model | Crimp tool |
| --- | --- | --- | --- |
| Terminal block for built-in RS-485 communication, Expansion adapter | Phoenix Contact GmbH & Co. KG | AI 0.5-8 WH | CRIMPFOX 6 CRIMPFOX 6T-F |

### ■Tool
For tightening terminals, use a small, commercially-available screwdriver with a straight tip. The recommended shape is shown in the figure on the right.
■Precautions
When a precision screwdriver with a small grip is used, the specified tightening torque cannot be obtained. Use the following screwdriver or equivalent product (grip diameter: 25 mm (0.99")) to obtain the tightening torque specified above.



With straight tip
0.4 mm (0.01")
2.5 mm (0.09")

<Reference>
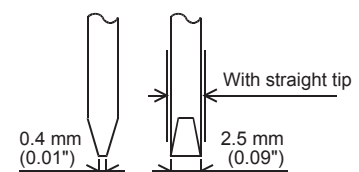
| Manufacturer | Model |
| --- | --- |
| Phoenix Contact GmbH & Co. KG | SZS 0.4×2.5 |

# Screw terminal block

Wire the screw terminal block in accordance with the following specifications.

For information concerning screw terminal blocks for intelligent function modules, refer to User's manual for each intelligent function module.

## Terminal block screw size and tightening torque

| Model | Terminal screw size | Tightening torque |
|---|---|---|
| I/O module (extension cable type) | M3 | 0.5 to 0.8 N·m |
| Terminal module | M3.5 | |
| Intelligent function module | Refer to User's manual for each product. | |

### Precautions

Do not tighten terminal screws exceeding the specified torque range. Otherwise it may cause equipment failure or malfunction.

## Wire end treatment

Crimp terminal size differs depending on terminal screw size and wiring methods used.

- Use crimp terminals of the following sizes.

### ■M3 terminal screw

- When a single wire is connected to a single terminal
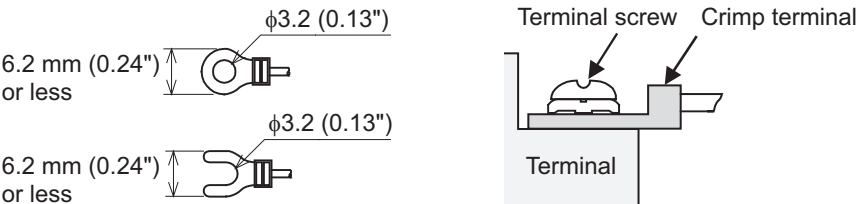


<Reference>

| Manufacturer | Model | Supported standard | Crimp tool |
|---|---|---|---|
| JST Mfg. Co., Ltd. | FV1.25-B3A | UL Listed | YA-1 (JST Mfg. Co., Ltd.) |
| | FV2-MS3 | | |

- When two wires are connected to a single terminal
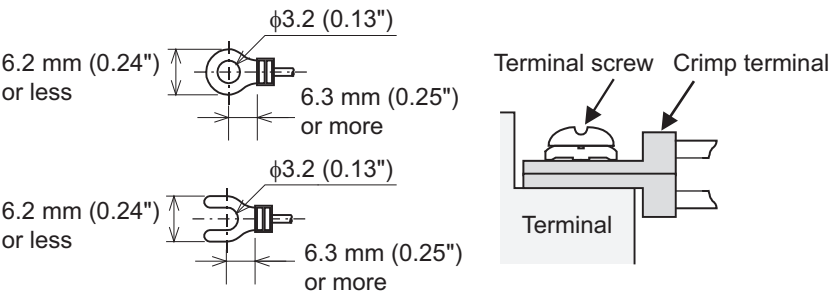


<Reference>

| Manufacturer | Model | Supported standard | Crimp tool |
|---|---|---|---|
| JST Mfg. Co., Ltd. | FV1.25-B3A | UL Listed | YA-1 (JST Mfg. Co., Ltd.) |

### ■M3.5 terminal screw

• When a single wire is connected to a single terminal

6.8 mm (0.27") or less ⌀3.7 (0.15")

6.8 mm (0.27") or less ⌀3.7 (0.15")

Terminal screw   Crimp terminal

Terminal

• When two wires are connected to a single terminal

6.8 mm (0.27") or less ⌀3.7 (0.15")
6.0 mm (0.24") or more

6.8 mm (0.27") or less ⌀3.7 (0.15")
6.0 mm (0.24") or more

Terminal screw   Crimp terminal
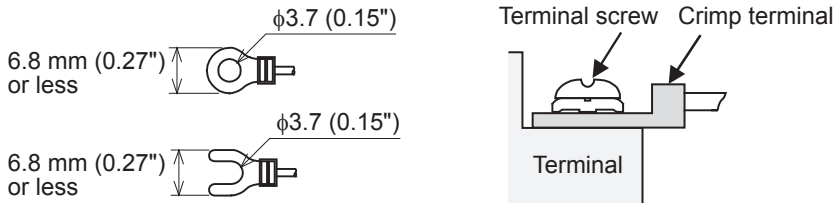
Terminal
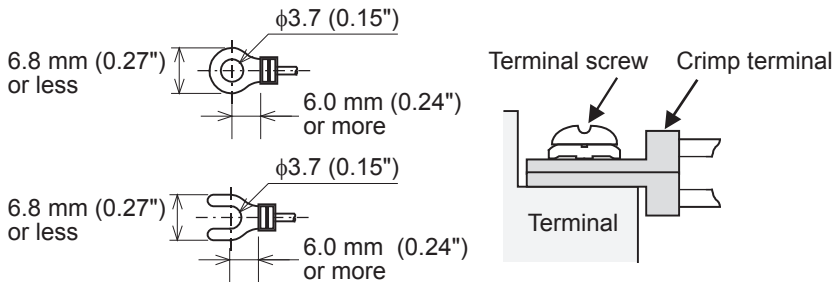
# 6.3     Grounding

Perform the following.

• Perform class D grounding (Grounding resistance: 100 $\Omega$ or less).

• Ground the PLC independently when possible.

• If the PLC cannot be grounded independently, perform the "Common grounding" shown below.

| PLC | Other equipment |
|---|---|

Independent grounding
(Best condition)

| PLC | Other equipment |
|---|---|

Shared grounding
(Good condition)

| PLC | Other equipment |
|---|---|

Shared grounding
(Not allowed)
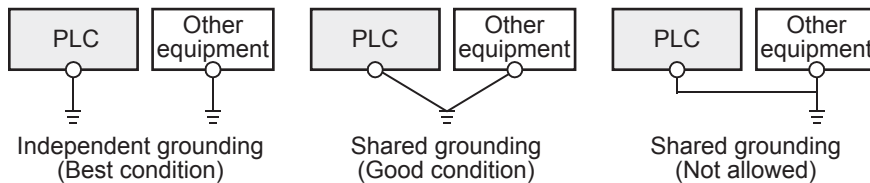
PLC extension devices (excluding communication adapters)

PLC

| Expansion adapter | CPU module | I/O module | | Other equipment |
|---|---|---|---|---|

Independent grounding
class D grounding
(grounding resistance: 100 $\Omega$ or less)
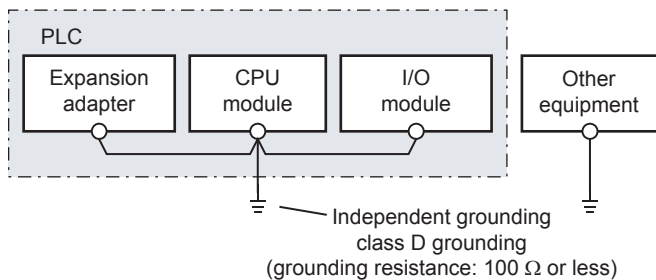
• Locate the ground point as close to the PLC as possible to minimize the length of the grounding wire.

# 6.4 Power Supply Wiring

## Examples of DC power supply wiring

Provide a 24 V DC power supply to FX5UC CPU module and other modules. Use dedicated connectors to provide the power supply. (Refer to ☞ Page 50 Connection of power cables.)

### Power supply wiring example of FX5UC-32MT/D
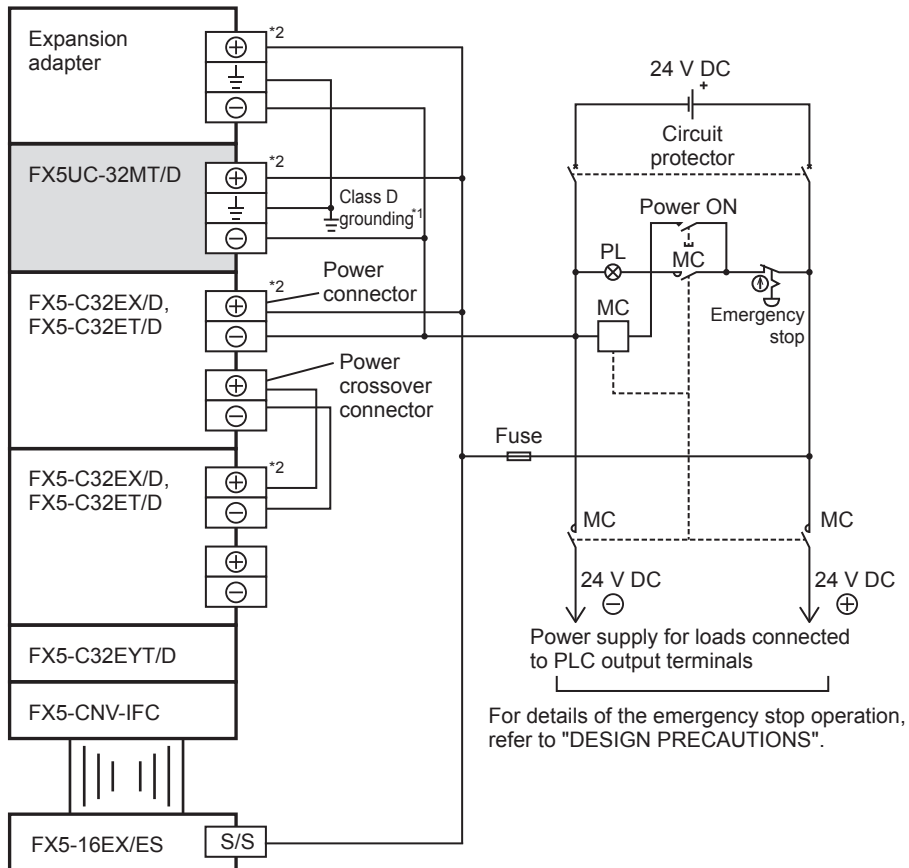


*1 The grounding resistance should be 100 Ω or less.
*2 Using the same power supply to each module and extension adapters is recommended. When a different power supply is used to them, turn on the power supply at the same time with the CPU module or earlier than the CPU module. When tuning off the power, confirm the safety of the system and turn off the CPU module at the same time. Some extension modules may not have power supply terminals.

## Power supply wiring example of FX5UC-32MT/DSS



*1    The grounding resistance should be 100 Ω or less.
*2    Using the same power supply to each module and extension adapters is recommended. When a different power supply is used to them, turn on the power supply at the same time with the CPU module or earlier than the CPU module. When tuning off the power, confirm the safety of the system and turn off the CPU module at the same time. Some extension modules may not have power supply terminals.

# 6.5    Input Wiring

The input wiring of the CPU modules, I/O modules, and terminal modules is explained below.

## 24 V DC input

For input specifications of the CPU modules, refer to ⟲ Page 18 Input Specifications.

For input specifications of the I/O modules, refer to ⟲ Page 115 Input specifications.

For input specifications of the terminal modules, refer to ⟲ Page 126 Input specifications.

### Sink and source input

#### ■Differences between the sink input circuit and the source input circuit

- Sink input [-common]
  Sink input means a DC input signal with a current flowing from the input (X) terminal. When a device such as a transistor output type sensor is connected, NPN open collector transistor output can be used.
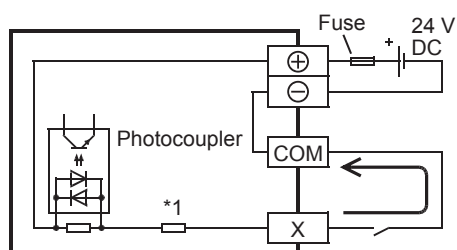
Circuit example for FX5UC-32MT/D                  Circuit example for FX5UC-32MT/DSS
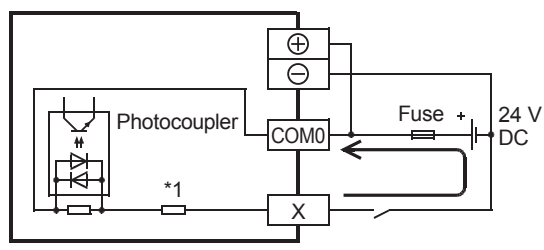


*1: Input impedance                                *1: Input impedance

- Source input [+common]
  Source input means a DC input signal with a current flowing into the input (X) terminal. When a device such as a transistor output type sensor is connected, the PNP open collector transistor output can be used.
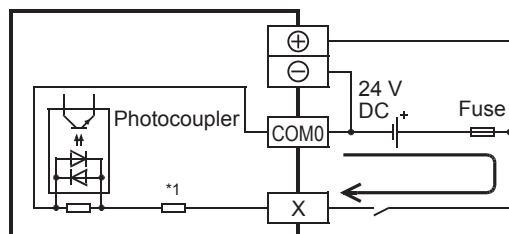


*1: Input impedance

#### ■Switching between sink/source inputs

Sink and source inputs for FX5UC-32MT/DSS are switched by changing connection methods; the connection in which the current flows from the input (X) terminal or the connection in which the current flows into the input (X) terminal.

- Sink input: The connection in which the current flows from the input (X) terminal (⟲ Page 64 Sink input wiring)
- Source input: The connection in which the current flows into the input (X) terminal (⟲ Page 65 Source input wiring)

> **Point**
>
> Inputs (X) of FX5UC-32MT/DSS can be set to either sink input or source input. However, sink and source input modes cannot be mixed.

# Handling of 24 V DC input

## ■Input terminal

- FX5UC-32MT/D

When a no-voltage contact or NPN open collector transistor output is connected between an input (X) terminal and the [COM] terminal and the circuit is closed, the input (X) turns on.

To turn on the I/O display LEDs, set the DISP switch to IN.
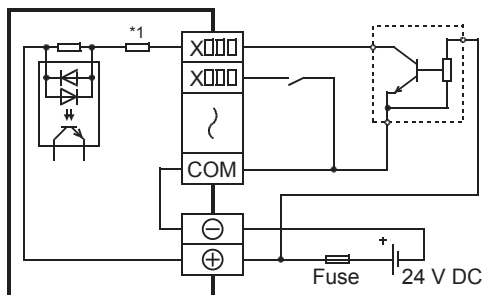


*1: Input impedance

- FX5UC-32MT/DSS

In the sink input, the input (X) is turned on by connecting 24 V DC [+] with the [COM] terminal, and connecting a no-voltage contact or NPN open collector transistor output between the input terminal and 24 V DC to close the circuit.

To turn on the I/O display LEDs, set the DISP switch to IN.
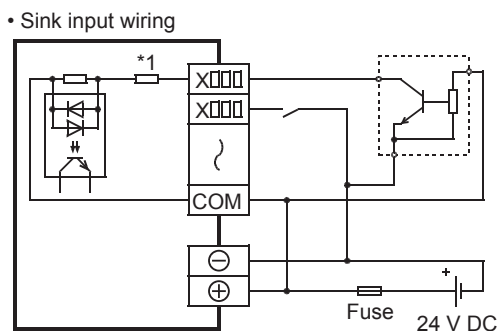
In the source input, the input (X) is turned on by connecting 24 V DC [-] with the [COM] terminal, and connecting a no-voltage contact or PNP open collector transistor output between the input terminal and 24 V DC to close the circuit.

To turn on the I/O display LEDs, set the DISP switch to IN.

- Sink input wiring



*1: Input impedance

- Source input wiring



*1: Input impedance

- RUN terminal setting

X000 to X017 of a CPU module can be used as RUN input terminals by setting parameters.

📖MELSEC iQ-F FX5 User's Manual (Application)

## ■Input circuit

- Function of an input circuit

The primary and secondary circuits for input are insulated with photocoupler, and the second circuit is provided with a C-R filter.

The C-R filter is designed to prevent malfunctions caused by chattering of the input contact and noise from input line.

Input has a response delay switching from ON to OFF and OFF to ON, shown in the following table.

| Item | | | Specifications |
|---|---|---|---|
| Input response time (H/W filter delay) | FX5UC-32MT/D, FX5UC-32MT/DSS | X000 to X005 | ON: 2.5 μs or less OFF: 2.5 μs or less |
| | | X006 to X017 | ON: 30 μs or less OFF: 50 μs or less |
| | I/O module | | ON: 50 μs or less OFF: 150 μs or less |

- Change of filter time

All input circuits have digital filters, and the input response time shown in the following table can be added by setting parameters. When using this product in an environment with much noise, set the digital filter.

| Item | Specifications |
|---|---|
| Input response time (Digital filter setting value) | None, 10 μs, 50 μs, 0.1 ms, 0.2 ms, 0.4 ms, 0.6 ms, 1 ms, 5 ms, 10 ms (initial values), 20 ms, 70 ms |

### ■Input sensitivity

For the input signal current and input sensitivity current of the CPU modules, refer to ☞ Page 18 Input Specifications.

For the input signal current and input sensitivity current of the I/O modules, refer to ☞ Page 115 Input specifications.

### ■Display of operation

With the DISP switch set to IN, the LED turns on when photocouplers are actuated.

## Precautions for connecting input devices

### ■In the case of no-voltage contact

Use input devices appropriate for low electric current.

If no-voltage contacts for high current (switches) are used, contact failure may occur.

### ■In the case of input device with built-in series diode

The voltage drop of the series diode should be the following value or less.

Also make sure that the input current is over the input-sensing level while the switches are on.

| Item | | | Specifications |
|---|---|---|---|
| Voltage drop | FX5UC-32MT/D, FX5UC-32MT/DSS | X000 to X005 | 3.9 V |
| | | X006 to X017 | 4.1 V |
| | I/O module | | 2.4 V |

### ■In the case of input device with built-in parallel resistance

Use a device with a parallel resistance Rp (kΩ) of the following value or more.

| Item | | | Specifications |
|---|---|---|---|
| Parallel resistance Rp (kΩ) | FX5UC-32MT/D, FX5UC-32MT/DSS | X000 to X005 | 14 |
| | | X006 to X017 | 15 |
| | I/O module | | 13 |

If the resistance is less than the above parallel resistance Rp (kΩ), connect a bleeder resistance Rb (kΩ) obtained by the following formula as shown in the following figure.

| Item | | | Specifications |
|---|---|---|---|
| Bleeder resistance Rb (kΩ) | FX5UC-32MT/D, FX5UC-32MT/DSS | X000 to X005 | 5Rp / (14-Rp) or less |
| | | X006 to X017 | 4Rp / (15-Rp) or less |
| | I/O module | | 6Rp / (13-Rp) or less |

• Wiring example of FX5UC-32MT/D
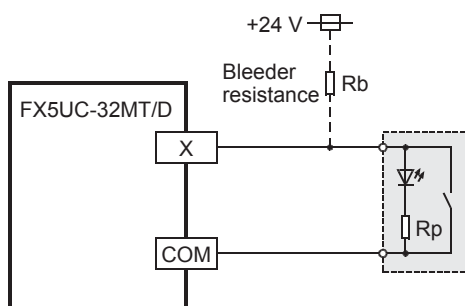


• Wiring example of FX5UC-32MT/DSS
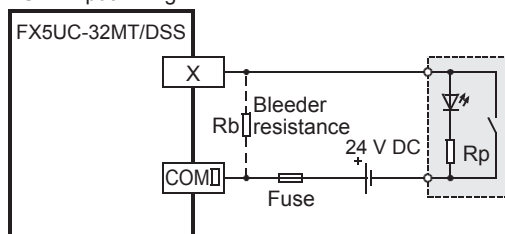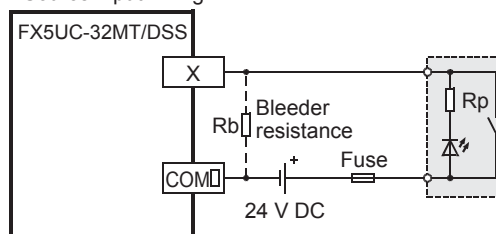
## ■ In the case of 2-wire proximity switch

Use a two-wire proximity switch whose leakage current, $I\ell$ is 1.5 mA or less when the switch is off.

If the resistance is larger than leakage current, $I\ell$ of 1.5 mA, connect a bleeder resistance Rb (kΩ), obtained by the following

formula as shown in the following figure.

| Item | | | Specifications |
|---|---|---|---|
| Bleeder resistance Rb (kΩ) | FX5UC-32MT/D, FX5UC-32MT/DSS | X000 to X005 | 7 / ($I\ell$-1.5) or less |
| | | X006 to X017 | 7 / ($I\ell$-1.5) or less |
| | I/O module | | 9 / ($I\ell$-1.5) or less |

• Wiring example of FX5UC-32MT/D
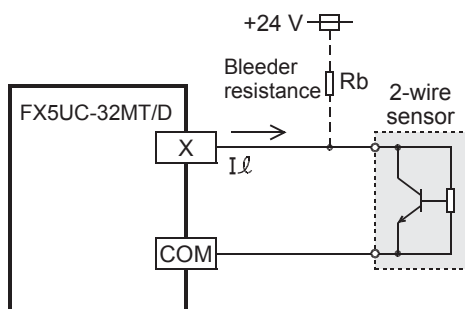


• Wiring example of FX5UC-32MT/DSS
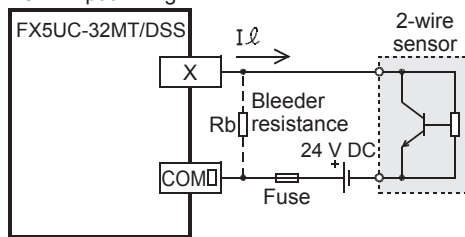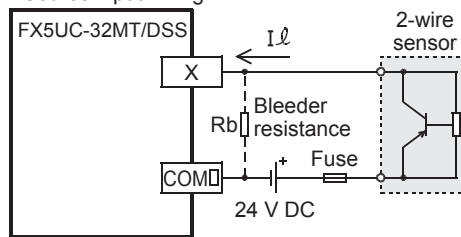


## When a high-speed pulse is captured

When capturing pulses of a response frequency of 50 to 200 kHz on using the input X000 to X005, wire the terminals as stated below.

• The wire length should be 5 m (16.4")or less.

• Use shielded twisted-pair cables for connecting cables. Ground the shield of each shielded cable only on the CPU module side.

• Connect a 1.5 kΩ (1 W or more) bleeder resistance to the input terminal, so that the sum of the load current of the open collector transistor output on the mating device and the input current of the CPU module is 20 mA or more.

The above-mentioned restrictions are due to specifications of connecting device (encoder etc.). Please adjust the cable length and load, for connecting device.

# Input wiring example

## When a sink-input-dedicated CPU module is used
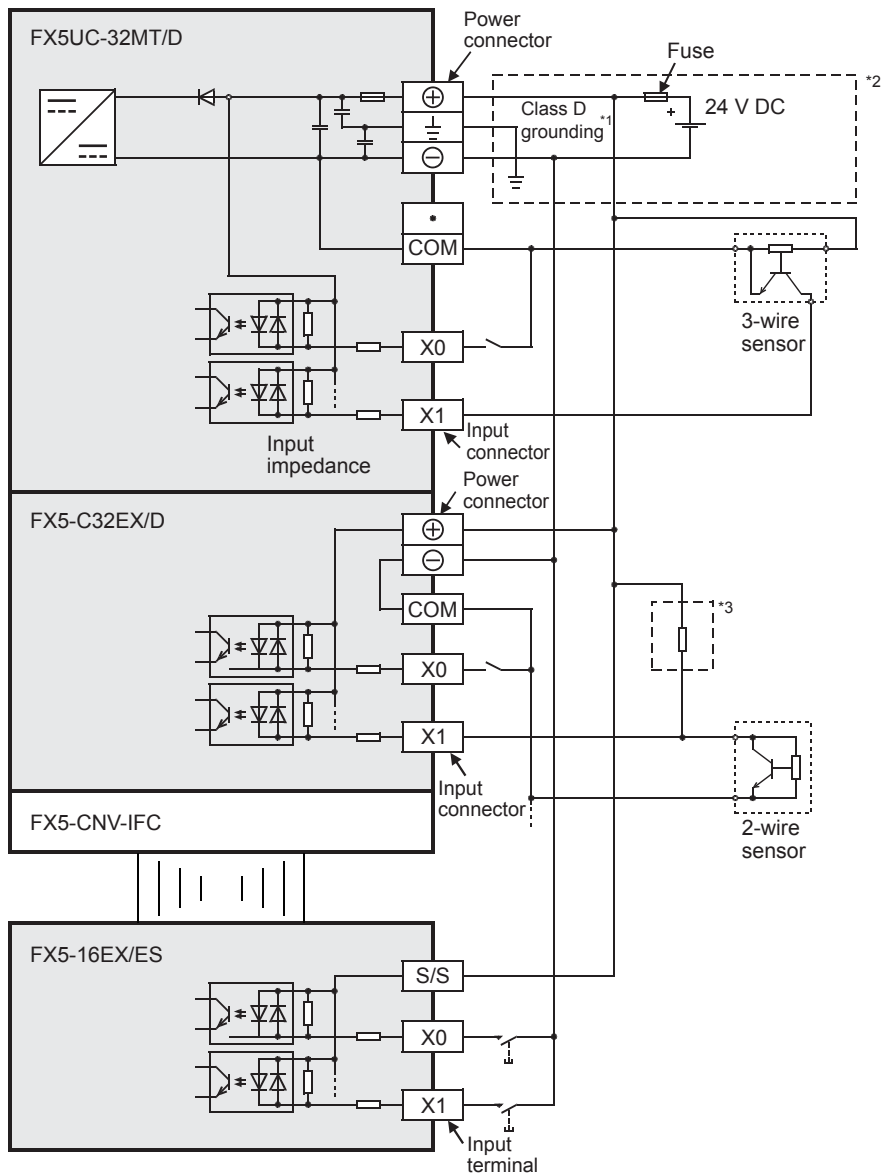


*1  The grounding resistance should be 100 Ω or less.

*2  Handle the power supply circuit properly in accordance with "Power Supply Wiring".

*3  For an input device having a parallel resistance or a two-wire proximity switch, a bleeder resistance may be required.

## When a CPU module common to sink and source inputs is used

### ■Sink input wiring
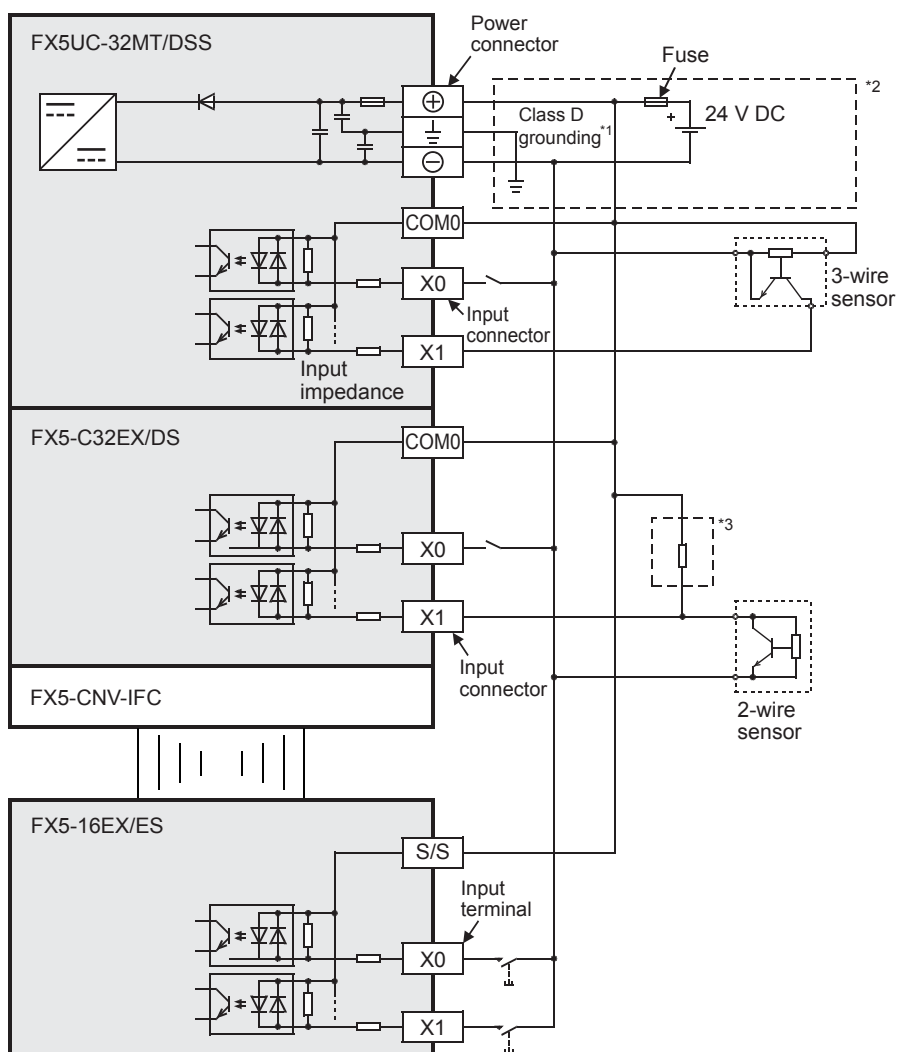


*1   The grounding resistance should be 100 Ω or less.
*2   Handle the power supply circuit properly in accordance with "Power Supply Wiring".
*3   For an input device having a parallel resistance or a two-wire proximity switch, a bleeder resistance may be required.

## ■Source input wiring



*1 The grounding resistance should be 100 Ω or less.
*2 Handle the power supply circuit properly in accordance with "Power Supply Wiring".
*3 For an input device having a parallel resistance or a two-wire proximity switch, a bleeder resistance may be required.

# Input wiring examples of terminal modules

## FX-16E-TB, FX-32E-TB

Connected models: FX5UC-32MT/D, FX5-C32EX/D, FX5-C32ET/D
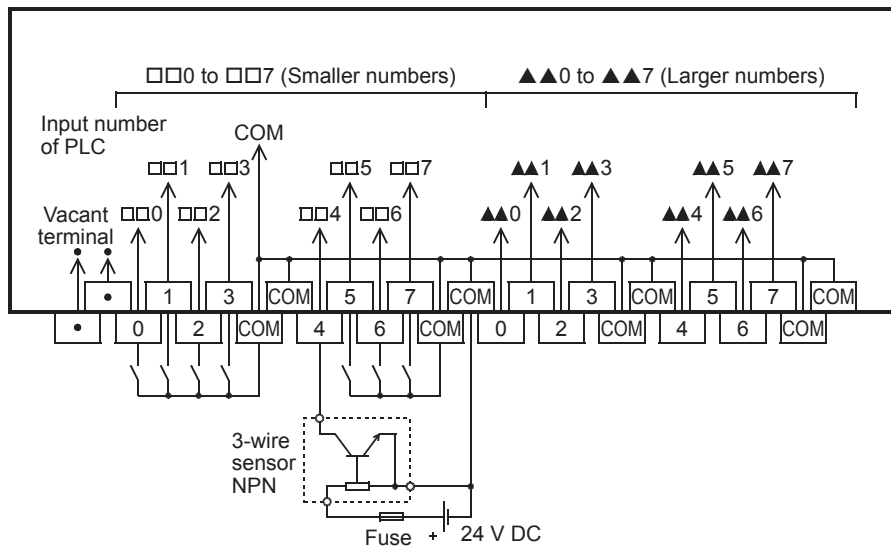


## FX-16E-TB/UL, FX-32E-TB/UL

Connected models: FX5UC-32MT/DSS, FX5-C32EX/DS, FX5-C32ET/DSS

• In the case of sink wiring
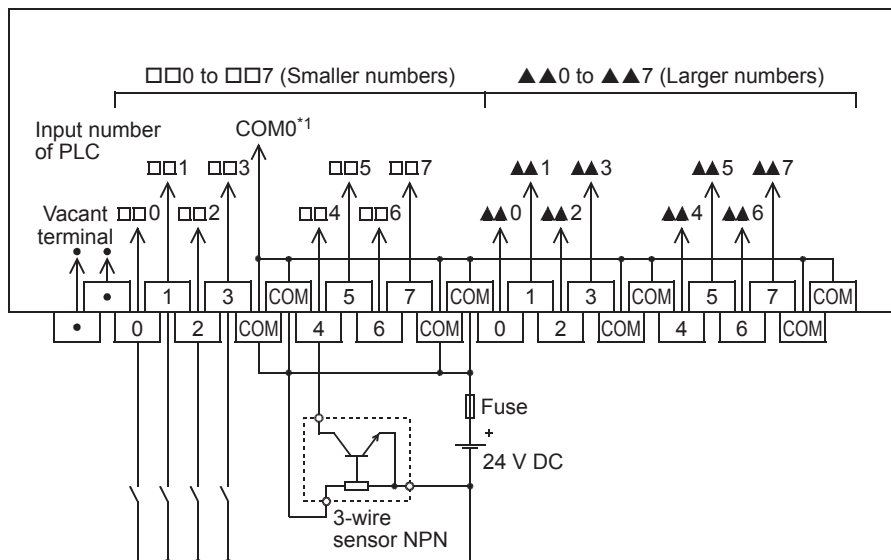


*1   Replace this number with the one of the connected connector.

• In the case of source wiring
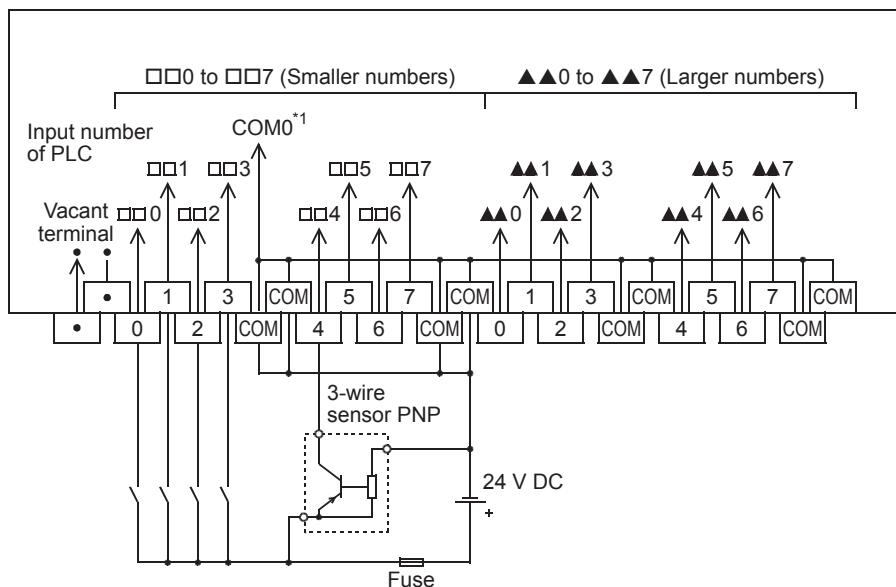


*1    Replace this number with the one of the connected connector.

## FX-16EX-A1-TB

Connected models: FX5UC-32MT/D, FX5-C32EX/D, FX5-C32ET/D
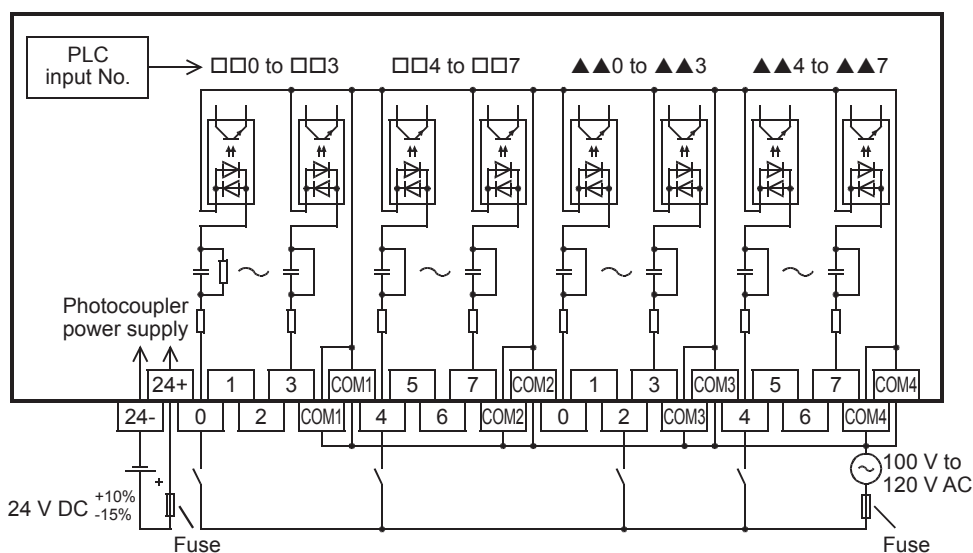
# 6.6     Output Wiring

The output wiring of the CPU modules, I/O modules, and terminal modules is explained below.

# Transistor output

For output specifications of the CPU modules, refer to ☞ Page 20 Output Specifications.

For output specifications of the I/O modules, refer to ☞ Page 116 Output specifications.

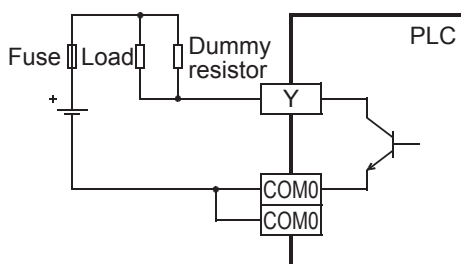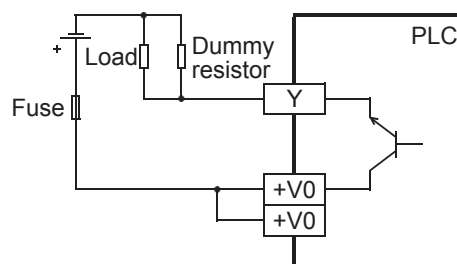For output specifications of the terminal modules, refer to ☞ Page 127 Output specifications.

## Sink and source output

Sink output and source output products are available for transistor outputs of the CPU module, I/O modules, and terminal modules.

### ■Differences in circuit

• Sink output [-common]

Output to make load current flow into the output (Y) terminal is called sink output.

• Source output [+common]

Output to make load current flow out of the output (Y) terminal is called source output.
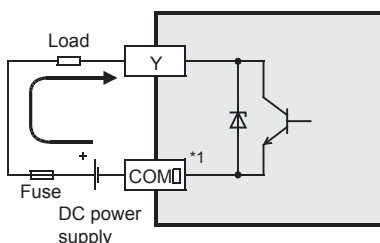


*1   The number "0" or "1" is applied in □.
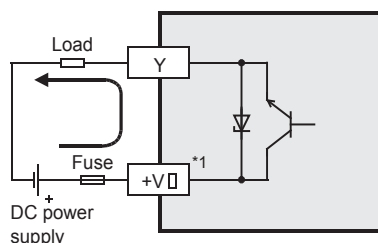
## Handling of transistor output

### ■Output terminal

8 transistor output points are covered by one common terminal.

• Sink output

The COM□ (number) terminals that are connected each other inside the PLC are prepared. For external wiring, connect the COM□ (number) terminals outside the PLC to reduce the load per one COM□ terminal.
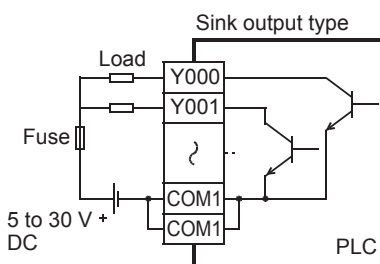
• Source output

The +V□ (number) terminals that are connected each other inside the PLC are prepared. For external wiring, connect the +V□ (number) terminals outside the PLC to reduce the load per one +V□ terminal.
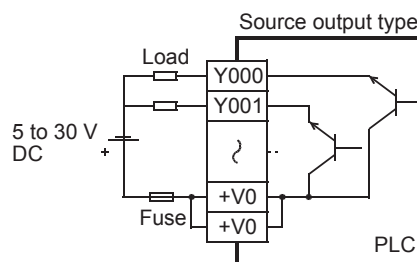


### ■External power supply

For driving the load, use a smoothing power supply of 5 to 30 V DC that can output a current two or more times the current rating of the fuse connected to the load circuit.

### ■Insulation of circuit

The internal circuit of the PLC and the output transistor are insulated with a photocoupler.

The common blocks are separated from one another.

### ■Display of operation

With the DISP switch set to OUT, the LED turns on and the output transistor turns on when photocouplers are actuated.

**■Response time**

Time taken from when the photocoupler of the module is driven (or shut off) to when the transistor is turned on (or off) differs depending on the output terminal used. For specifications of each module, refer to the following.

For output specifications of the CPU modules, refer to

For output specifications of the I/O modules, refer to

For output specifications of the terminal modules, refer to

> **Point**
>
> The transistor OFF time is longer under lighter loads. For example, under a load of 24 V DC 40 mA, the response time is approx. 0.3 ms.
>
> When response performance is required under light loads, provide a dummy resistor as shown below to increase the load current.
>
> • Sink output type          • Source output type
>
> 

**■Output current**

Maximum load differs for each module. For specifications of each module, refer to the following.

For output specifications of the CPU modules, refer to

For output specifications of the I/O modules, refer to

For output specifications of the terminal modules, refer to

When driving a semiconductor element, carefully check the input voltage characteristics of the applied element.

**■Open circuit leakage current**

0.1 mA or less.

## Wiring precautions

### ■Protection circuit for load short-circuiting

A short-circuit at a load connected to an output terminal could cause burnout at the output device or the PCB. To prevent this, a protection fuse should be inserted at the output. Use a load power supply capacity that is at least 2 times larger than the load current.
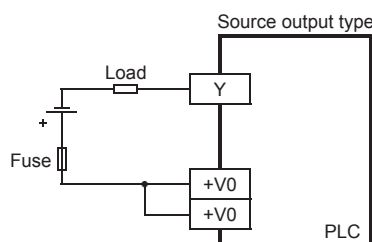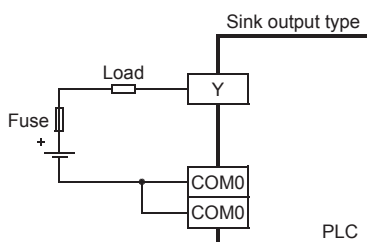
## ■Contact protection circuit for inductive loads

When an inductive load is connected, connect a diode (for commutation) in parallel with the load as necessary. The diode (for commutation) must comply with the following specifications.

| Standard | |
|---|---|
| Reverse voltage | 5 to 10 times the load voltage |
| Forward current | Load current or more |
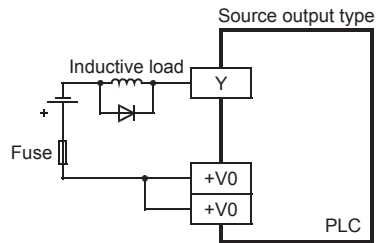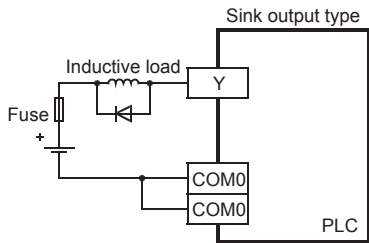


## ■Interlock

For loads such as forward/reverse contactors, etc., where a hazardous condition could result if switched ON simultaneously, an external interlock should be provided for interlocking along with an interlock in the PLC program as shown below.
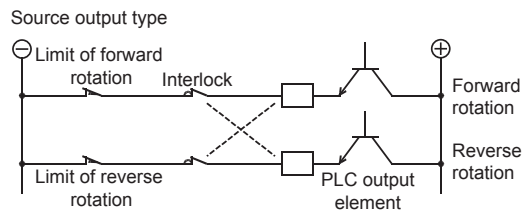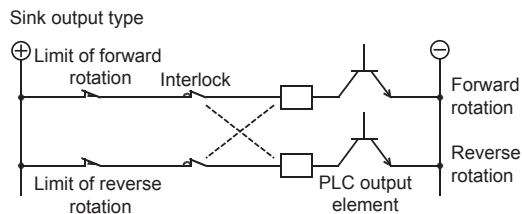
# Relay output

For output specifications of the I/O modules, refer to ☞ Page 116 Output specifications.

For output specifications of the terminal modules, refer to ☞ Page 127 Output specifications.

## Product life of relay output contacts

The product life of relay contacts varies considerably depending on the load type used.

Note that loads generating reverse electromotive force or rush current may cause poor contact or welding of contacts which may lead to considerable reduction of the contact product life.

### ■Inductive load

Inductive loads generate large reverse electromotive force between contacts at shutdown, which may cause arc discharge. At a fixed current consumption, as the power factor (phase between current and voltage) gets smaller, the arc energy gets larger. The following table shows the standard life of contacts used for inductive loads, such as contactors and solenoid valves.

| Model | Inductive load | Standard life |
|---|---|---|
| FX5-□EYR/ES | 20 VA | 500,000 times |
| Terminal module | 35 VA | |

The following table shows the approximate life of a relay based on the results of our operation life test.

- Test condition: 1 sec. ON/1 sec. OFF

| Load capacity | | Contact life |
|---|---|---|
| ■FX5-□EYR/ES | | |
| 20 VA | 0.2 A/100 V AC | 3,000,000 times |
| | 0.1 A/200 V AC | |
| 35 VA | 0.35 A/100 V AC | 1,000,000 times |
| | 0.17 A/200 V AC | |
| 80 VA | 0.8 A/100 V AC | 200,000 times |
| | 0.4 A/200 V AC | |
| ■Terminal module | | |
| 35 VA | 0.35 A/100 V AC | 3,000,000 times |
| | 0.17 A/200 V AC | |
| 80 VA | 0.8 A/100 V AC | 1,000,000 times |
| | 0.4 A/200 V AC | |
| 120 VA | 1.2 A/100 V AC | 200,000 times |
| | 0.6 A/200 V AC | |

The product life of relay contacts becomes considerably shorter than the above conditions when the rush overcurrent is shut down.

Please refer to the following measures regarding the inductive load.

☞ Page 73 Contact protection circuit for inductive loads

Some types of inductive loads generate rush current 5 to 15 times the stationary current at activation. Make sure that the rush current does not exceed the current corresponding to the maximum specified resistance load.

### ■Lamp load

Lamp loads generally generate rush current 10 to 15 times the stationary current. Make sure that the rush current does not exceed the current corresponding to the maximum specified resistance load.

### ■Capacitive load

Capacitive loads can generate rush current 20 to 40 times the stationary current. Make sure that the rush current does not exceed the current corresponding to the maximum specified resistance load.

Capacitive loads such as capacitors may be present in electronic circuit loads including inverters.

### ■Resistance load

For maximum load specifications of resistance load, refer to the following.

For output specifications of the I/O modules, refer to ☞ Page 116 Output specifications.

For output specifications of the terminal modules, refer to ☞ Page 127 Output specifications.

## Handling of relay output

### ■Output terminal
One common terminal is used for 4 or 8 relay output points.

The common terminal blocks can drive loads of different circuit voltage systems (for example: 100 V AC and 24 V DC).
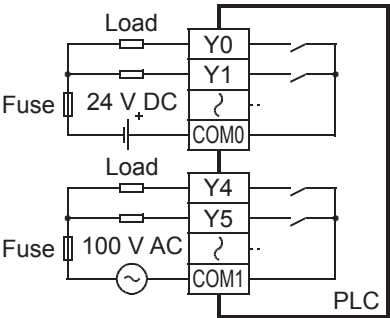


### ■External power supply
Use an external power supply of 30 V DC or less or 240 V AC or less (250 V AC or less when the module does not comply with CE, UL, or cUL standards) for loads.

### ■Insulation of circuit
The PLC internal circuit and external load circuits are electrically insulated between the output relay coil and contact.

The common terminal blocks are separated from one another.

### ■Display of operation
When power is applied to the output relay coil, the LED is lit, and the output contact is turned on.

### ■Response time
The response time of the output relay from when the power is applied to the coil until the output contact is turned on, and from when the coil is shut off until the output contact is turned off is approx. 10 ms.

### ■Output current
At a circuit voltage of 240 V AC or less (250 V AC or less when the module does not comply with CE, UL, or cUL standards), a resistance load of 2 A per point or an inductive load of 80 VA or less (100 V AC or 200 V AC) can be driven.

For the life of the contact for switching an inductive load, refer to ☞ Page 71 Inductive load.

When an inductive load is switched, connect a diode (for commutation) or a surge absorber in parallel with this load.

| DC circuit | AC circuit |
| --- | --- |
| Diode (for commutation) | Surge absorber |

### ■Open circuit leakage current
There is no leakage current when the output are OFF.

## Wiring precautions

### ■Protection circuit for load short-circuiting

A short-circuit at a load connected to an output terminal could cause burnout at the output element or the PCB. To prevent this, a protection fuse should be inserted at the output.
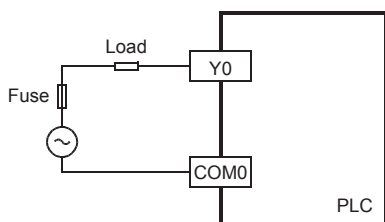


### ■Contact protection circuit for inductive loads

An internal protection circuit for the relays is not provided for the relay output circuit in this product. It is recommended to use inductive loads with built-in protection circuits. When using loads without built-in protection circuits, insert an external contact protection circuit, etc. to reduce noise and extend the product life.

• DC circuit

Connect a diode in parallel with the load. The diode (for commutation) must comply with the following specifications.

(Standard)
Reverse voltage: 5 to 10 times as high as the load voltage
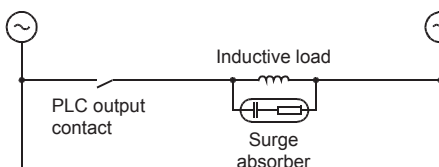Forward current: Load current or more
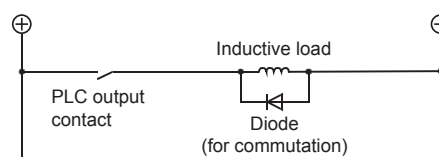


• AC circuit

Connect a surge absorber (CR composite parts such as surge killers, spark killers, etc.) parallel to the load. Select a surge absorber with voltage rating that is suitable for the output used. For other specifications, refer to the following.
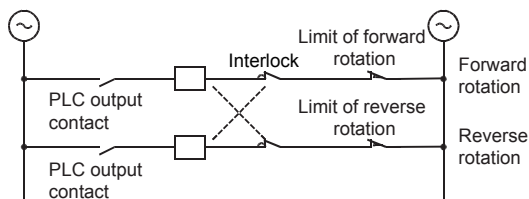
(Standard)
Electrostatic capacity: Approx. 0.1 μF
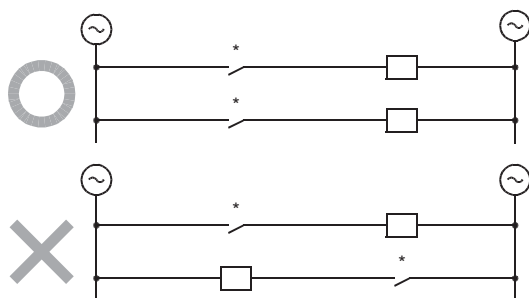Resistance: Approx. 100 to 200 Ω



### ■Interlock

For loads such as forward/reverse contactors, etc., where a hazardous condition could result if switched ON simultaneously, an external interlock should be provided for interlocking along with an interlock in the PLC program, as shown below.



### ■In-phase

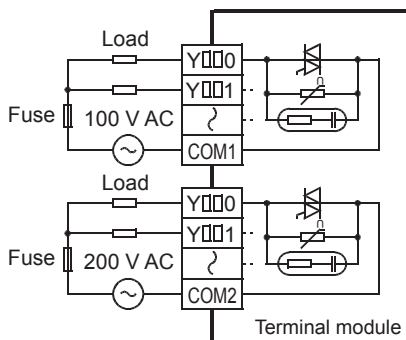PLC output contacts (*) should be used in an "in-phase" manner.

# Triac output

For output specifications of the terminal modules, refer to

## Handling of triac output

### ■Output terminal

Four triac output points are covered by one common terminal. The common terminal blocks can drive loads of different circuit voltage systems (Example: 100 V AC and 24 V DC).



### ■Insulation of circuit

The internal circuit and the output element (triac) are insulated with photothyristors.

The common blocks are separated from one another.

### ■Display of operation

The LED turns on and the output triac is turned on when photothyristors are actuated.

### ■Response time

The response time until the output triac is turned on after the photothyristors are actuated (or shut off) is 1 ms or less, and the response time until the output triac is turned off is 10 ms or less.

### ■Output current

Current of 0.3 A can flow per one output point. However, current of four output points should be 0.8 A (average of 0.2 A per one point) to suppress temperature rise. When a load with a high rush current is frequently turned on or off, the mean-square current should be 0.2 A or less.

<Example>

$$\sqrt{\frac{4^2 \times 0.02 + 0.4^2 \times 0.7}{0.02 + 0.7 + 10}} = 0.2\ A$$
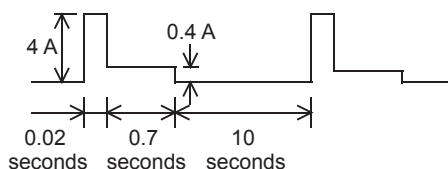


### ■Open circuit leakage current

C-R absorbers are connected in parallel at the triac output terminal for turning off the triac. Thus, open circuit leakage currents of 1 mA/100 V AC or 2 mA/200 V AC occurs. Since the triac output type has open circuit leakage currents, even after the triac output is turned off, a small relay and a minute current load with low rated operation currents may continuously operate. Therefore, the load should be equal to or more than 0.4 VA/100 V AC or 1.6 VA/200 V AC. For loads lower than these values, connect the surge absorbers described later in parallel.

## Wiring precautions

### ■Protection circuit for load short-circuiting

A short-circuit at a load connected to an output terminal could cause burnout at the output element or the PCB. To prevent this, a protection fuse should be inserted at the output.
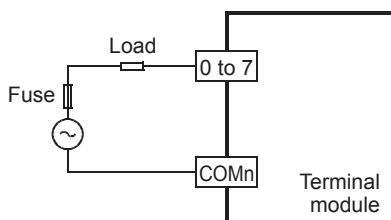


### ■Minute current load

C-R absorbers are connected in parallel at the triac output circuit for turning off the triac. When a minute current load of 0.4 VA or less/100 V AC or 1.6 VA or less/200 V AC is connected, a surge absorber must be connected in parallel with the load. Select a surge absorber with the rated voltage that is suitable for the output used. For other specifications, refer to the following.
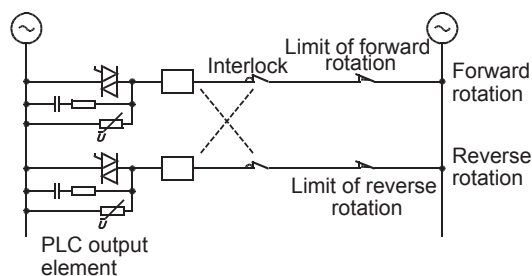
Standard
Electrostatic capacity: Approx. 0.1 $\mu$F
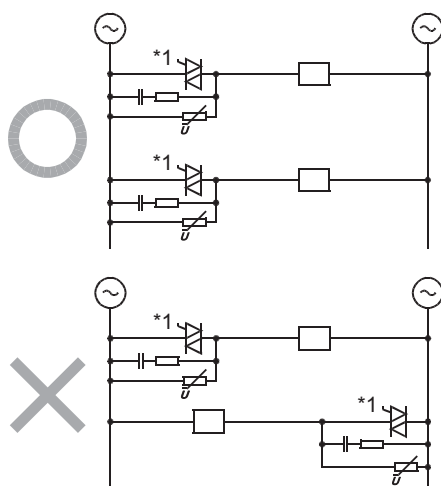Resistance: Approx. 100 to 200 $\Omega$
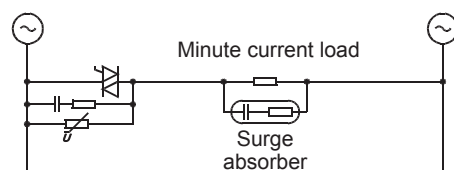


### ■Interlock

For loads such as forward/reverse contactors, etc., where a hazardous condition could result if switched ON simultaneously, an external interlock should be provided for interlocking along with an interlock in the PLC program as shown below.
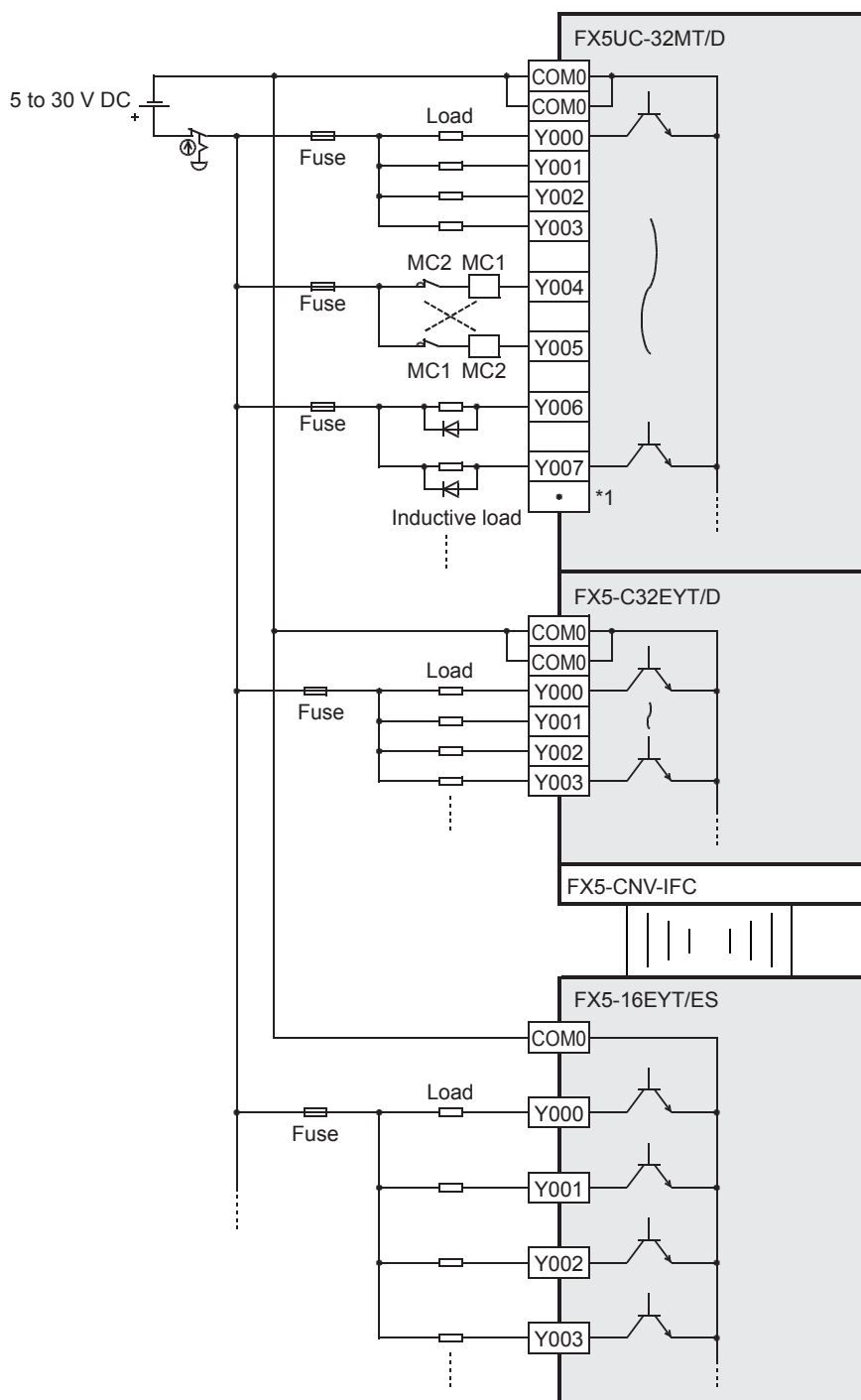


### ■In-phase

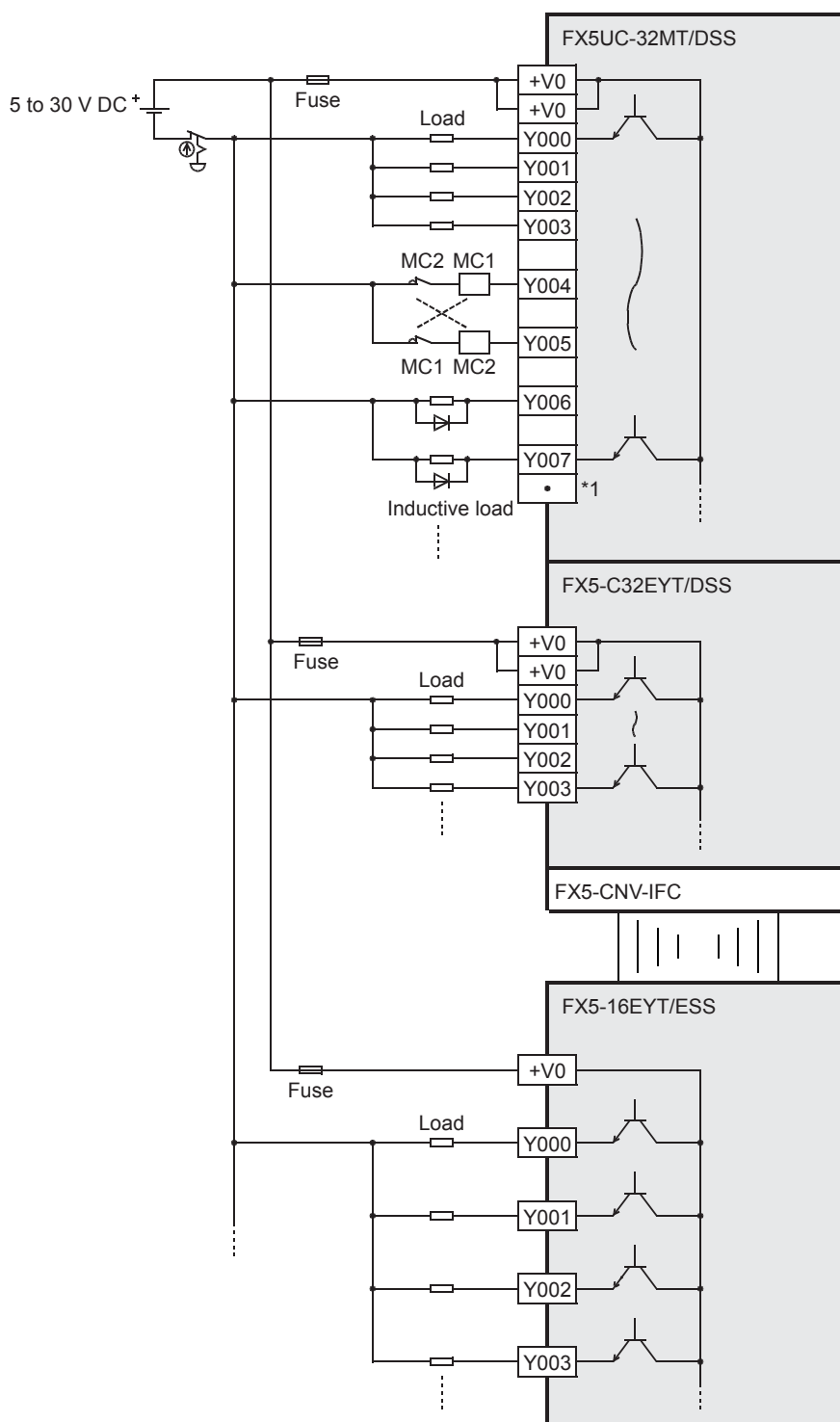PLC output contacts (*1) should be used in an "in-phase" manner.

# Output wiring example

## Transistor output

### ■Sink output type



```
FX5UC-32MT/D
COM0
COM0
Y000
Y001
Y002
Y003
Y004
Y005
Y006
Y007
•   *1
```
5 to 30 V DC
Load
Fuse
MC2  MC1
MC1  MC2
Inductive load

```
FX5-C32EYT/D
COM0
COM0
Y000
Y001
Y002
Y003
```
Load
Fuse

FX5-CNV-IFC

```
FX5-16EYT/ES
COM0
Y000
Y001
Y002
Y003
```
Load
Fuse
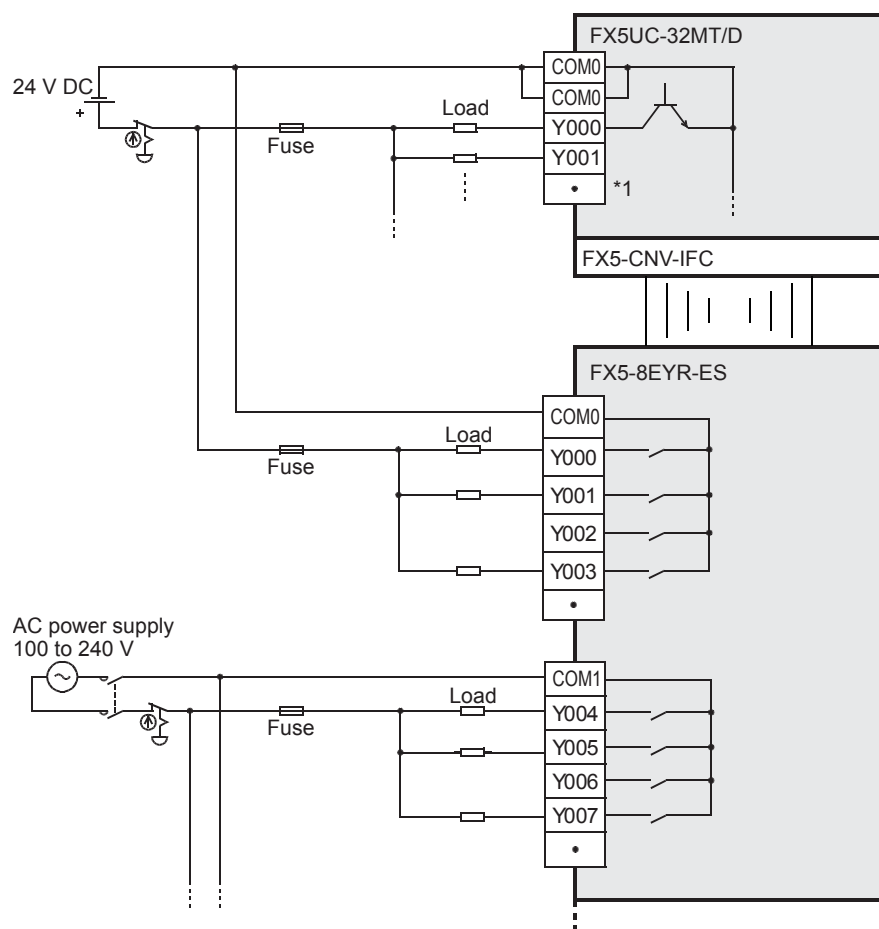
*1    "•" represents a vacant terminal.

## ■Source output type



*1 "•" represents a vacant terminal.

## Relay output


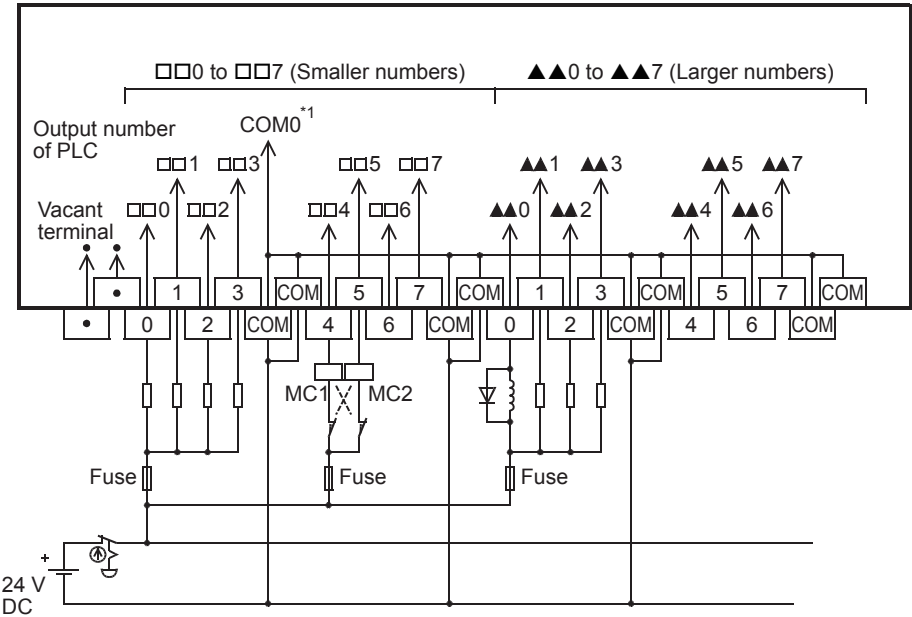
*1 "•" represents a vacant terminal.

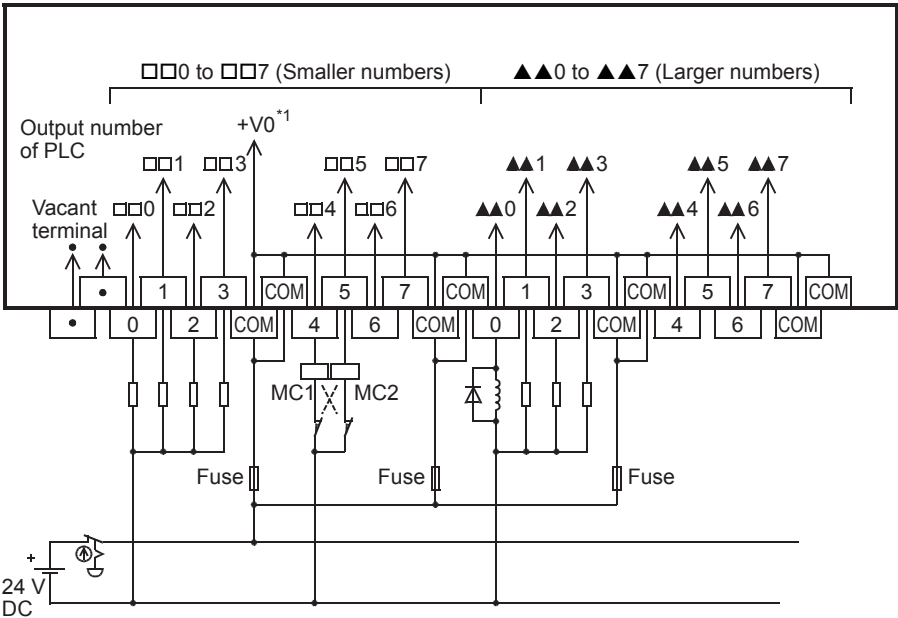# Output wiring examples of terminal modules

## FX-16E-TB, FX-32E-TB

Connected models: FX5UC-32MT/D, FX5-C32EYT/D, FX5-C32ET/D



*1    Replace this number with the one of the connected connector.
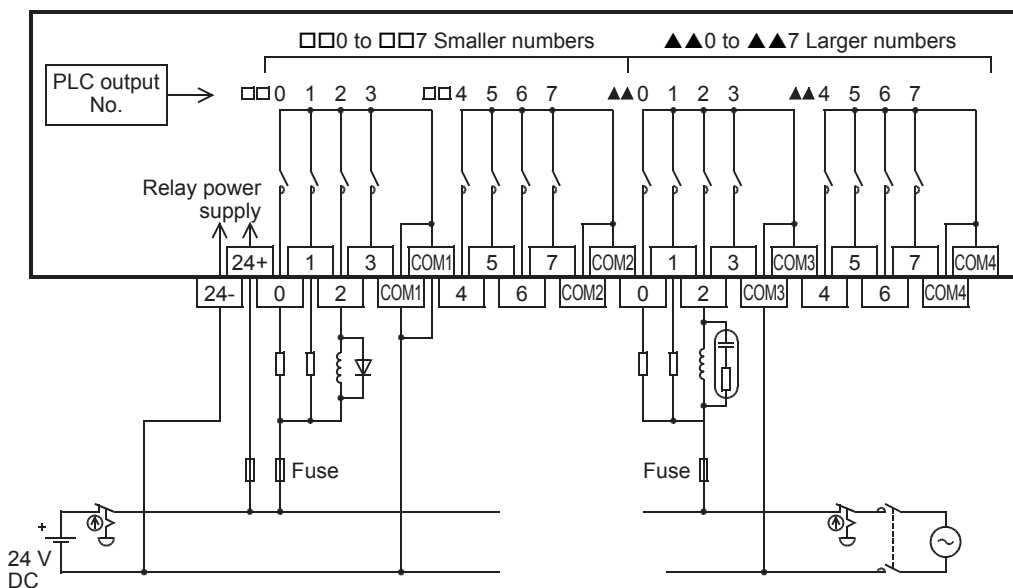
## FX-16E-TB/UL, FX-32E-TB/UL

Connected models: FX5UC-32MT/DSS, FX5-C32EYT/DSS, FX5-C32ET/DSS



*1    Replace this number with the one of the connected connector.

## FX-16EYR-TB, FX-16EYR-ES-TB/UL

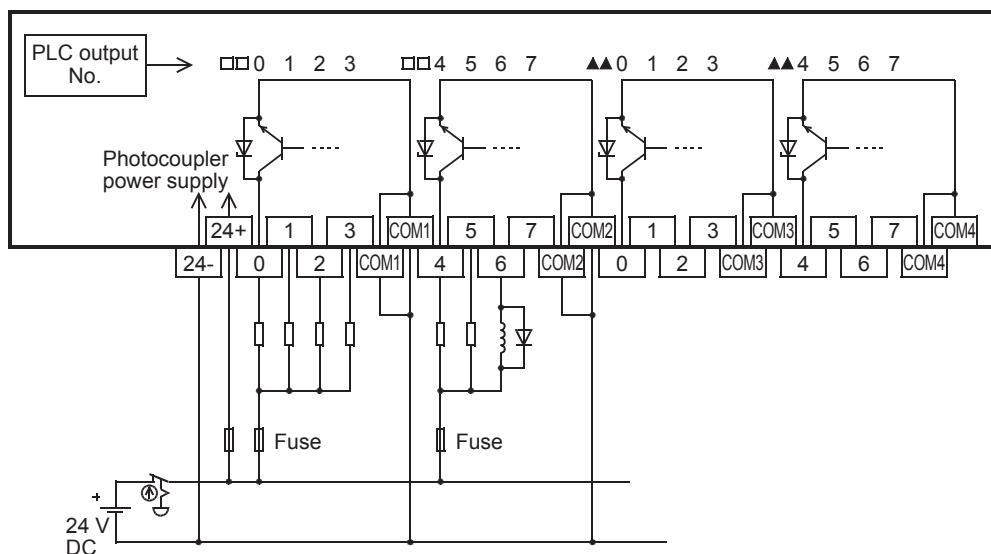Connected models: FX5UC-32MT/D, FX5-C32EYT/D, FX5-C32ET/D



For external wiring precautions, refer to ☞ Page 73 Wiring precautions.

For the life of a relay output contact, refer to ☞ Page 71 Product life of relay output contacts.

## FX-16EYT-TB

Connected models: FX5UC-32MT/D, FX5-C32EYT/D, FX5-C32ET/D



For external wiring precautions, refer to ☞ Page 69 Wiring precautions.

## FX-16EYT-ES-TB/UL

Connected models: FX5UC-32MT/DSS, FX5-C32EYT/DSS, FX5-C32ET/DSS



For external wiring precautions, refer to ☞ Page 69 Wiring precautions.

## FX-16EYT-ESS-TB/UL

Connected models: FX5UC-32MT/DSS, FX5-C32EYT/DSS, FX5-C32ET/DSS



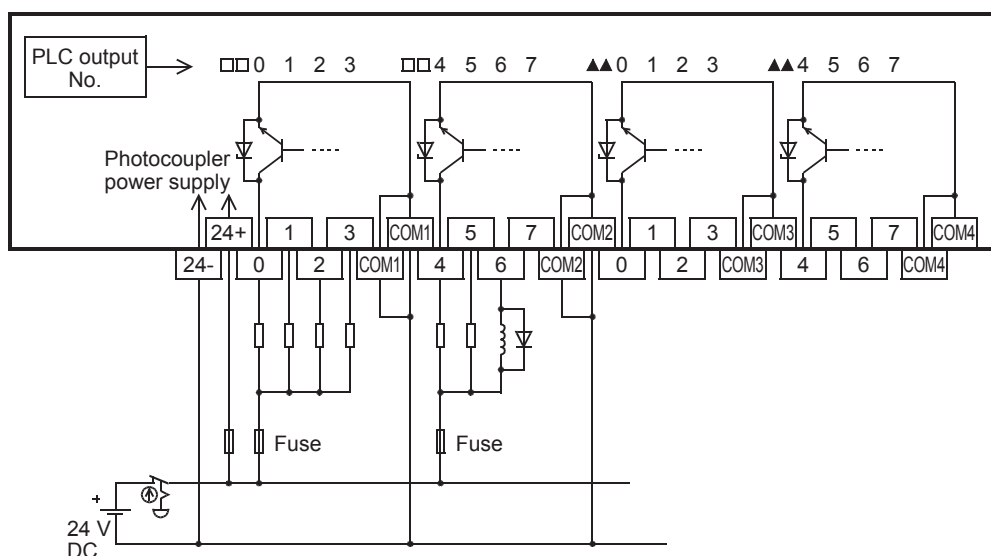For external wiring precautions, refer to ☞ Page 69 Wiring precautions.

## FX-16EYS-TB

Connected models: FX5UC-32MT/D, FX5-C32EYT/D, FX5-C32ET/D



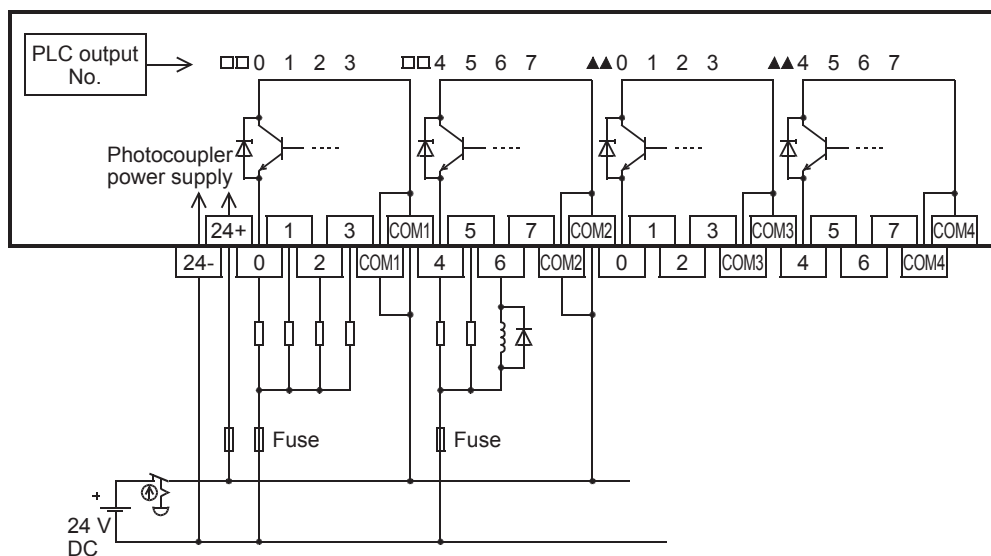For external wiring precautions, refer to ☞ Page 75 Wiring precautions.

## FX-16EYS-ES-TB/UL
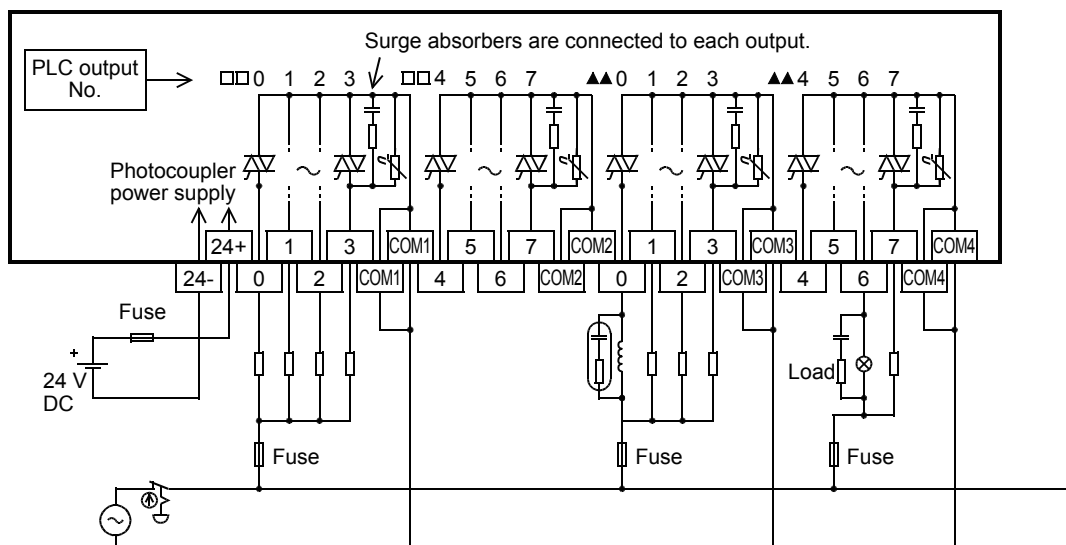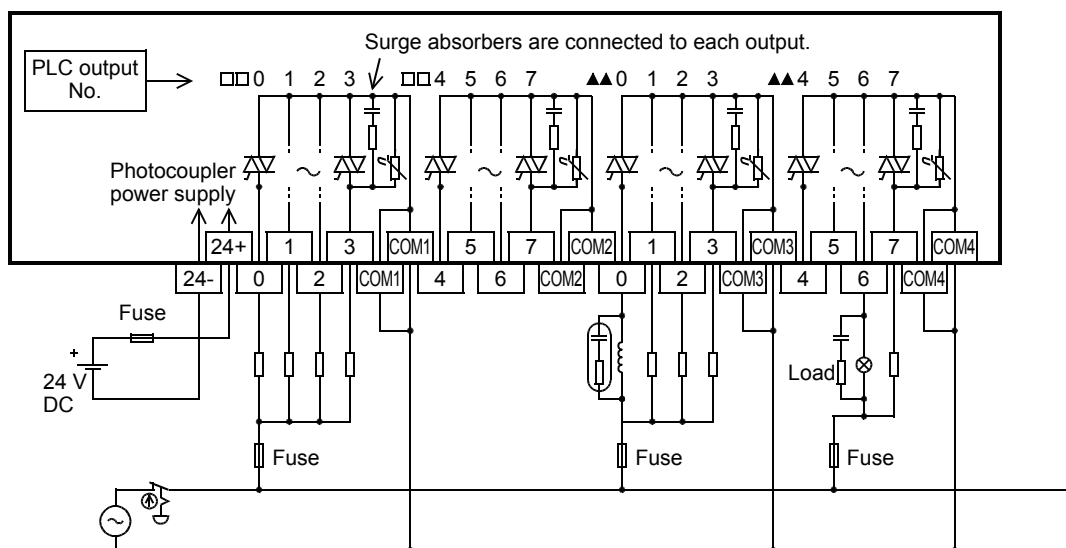
Connected models: FX5UC-32MT/DSS, FX5-C32EYT/DSS, FX5-C32ET/DSS



For external wiring precautions, refer to ☞ Page 75 Wiring precautions.

# 6.7    Examples of Wiring for Various Uses

## Notes about examples of wiring

The examples of wiring are given under the following conditions.

### ■Input/output number

The input/output numbers are the actual numbers on the program (They may differ from the numbers shown on the product terminals).

### ■Input/output specifications of products

Check the input/output specifications of products and examples of wiring.
 • There are products for sink output and for source output.

### ■Examples of program

The examples of programming (instructions) are given based on the allocation of the input/output numbers for wiring.

For the instructions, refer to ⊞MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks).

## Built-in positioning function

For wiring examples for the built-in positioning function, refer to ⊞MELSEC iQ-F FX5 User's Manual (Positioning Control).

## Communication function

For wiring of the built-in RS-485 communication terminal blocks and communication adapters, refer to the following.

⊞MELSEC iQ-F FX5 User's Manual (Serial Communication)

⊞MELSEC iQ-F FX5 User's Manual (MODBUS Communication)

For wiring of the built-in Ethernet, refer to the following.

⊞MELSEC iQ-F FX5 User's Manual (Ethernet Communication)

## High-speed counter

Examples of wiring for high-speed counters are shown below.

When capturing pulses of a response frequency of 50 to 200 kHz, refer to
For details of the high-speed counters, refer to ⊞MELSEC iQ-F FX5 User's Manual (Application).

For the programs, refer to ⊞MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks).

### 1-phase 1-count

The wiring examples in this section use the following settings. When settings other than those in the table are used, use the examples shown in the following figures as references for wiring.

| CH to be used | Pulse input mode | External preset input | External enable input | Operation mode |
|---|---|---|---|---|
| CH1 | 1-phase 1-input (S/W) | Invalid | Invalid | Normal mode |

The settings of the high-speed counters are set by using the parameter settings of the engineering tool.

For details, refer to ⊞MELSEC iQ-F FX5 User's Manual (Application).

# ■Example of wiring (NPN open collector transistor output rotary encoder)

• FX5UC-32MT/D



*1  The grounding resistance should be 100 Ω or less.

• FX5UC-32MT/DSS [Sink input wiring]



*1  The grounding resistance should be 100 Ω or less.

# ■Example of wiring (PNP open collector transistor output rotary encoder)

• FX5UC-32MT/DSS [Source input wiring]
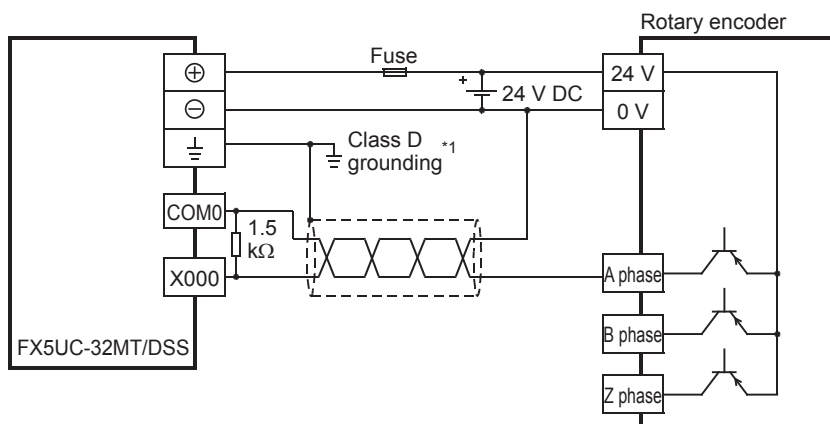


*1  The grounding resistance should be 100 Ω or less.

## 2-phase 2-count

The wiring examples in this section use the following settings. When settings other than those in the table are used, use the examples shown in the following figures as references for wiring.
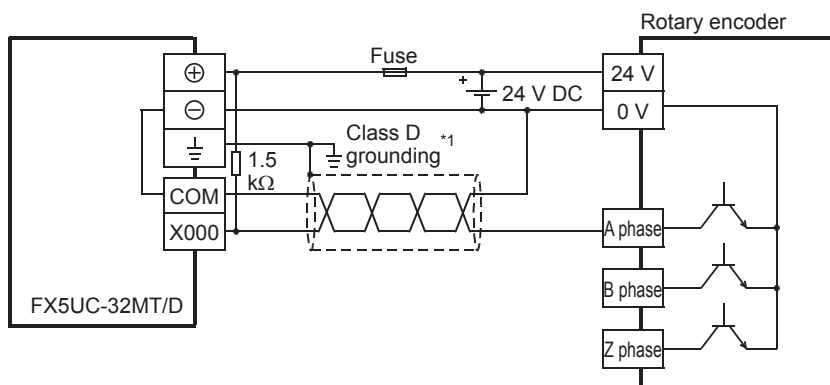
| CH to be used | Pulse input mode | External preset input | External enable input | Operation mode |
|---|---|---|---|---|
| CH2 | 2-phase 2-input | Invalid | Invalid | Normal mode |

The settings of the high-speed counters are set by using the parameter settings of the engineering tool.

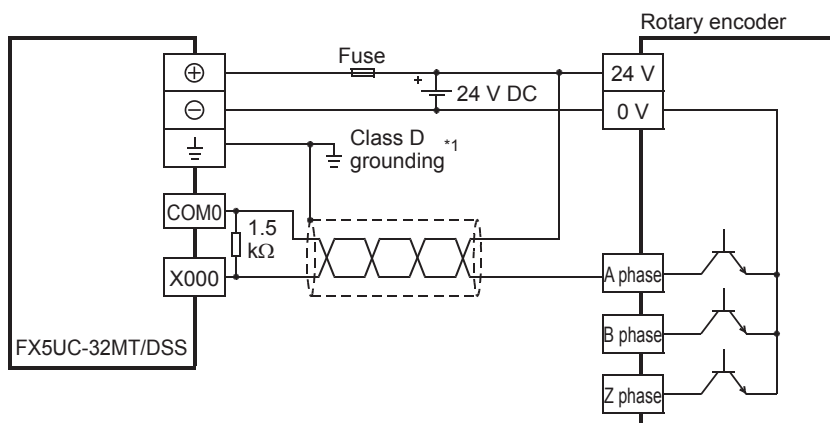For details, refer to 📖GX Works3 Operating Manual.

### ■Example of wiring (NPN open collector transistor output rotary encoder)
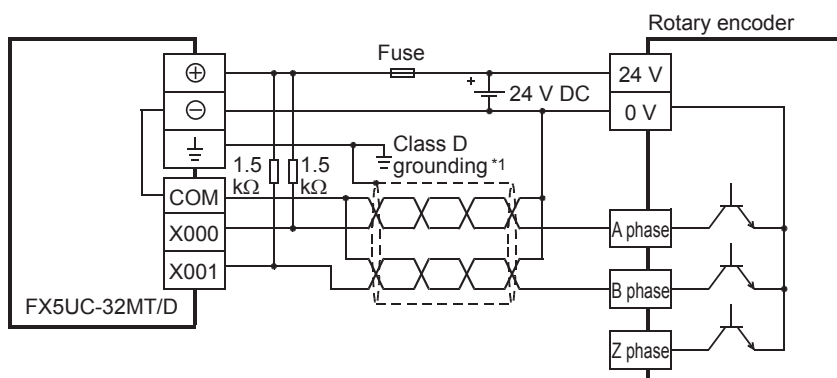
- FX5UC-32MT/D



*1    The grounding resistance should be 100 Ω or less.

- FX5UC-32MT/DSS [Sink input wiring]
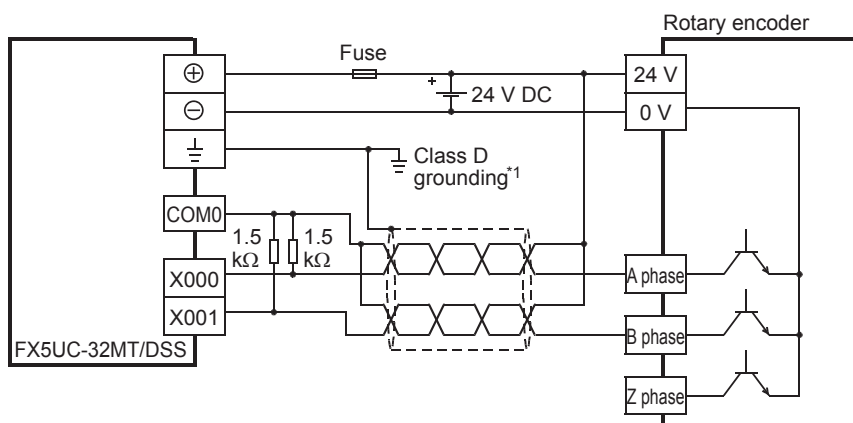


*1    The grounding resistance should be 100 Ω or less.

### ■Example of wiring (PNP open collector transistor output rotary encoder)

- FX5UC-32MT/DSS [Source input wiring]



*1    The grounding resistance should be 100 Ω or less.

# Interruption

Examples of wiring for when the input interruption function of the CPU module is used are shown below.

The same wiring is used for the pulse catch and pulse width measurement functions.

For details of the input interruption function, pulse catch function, and pulse width measurement function, refer to
📖MELSEC iQ-F FX5 User's Manual (Application).

## Example of wiring

### ■3-wire sensor of NPN open collector transistor output
 • FX5UC-32MT/D



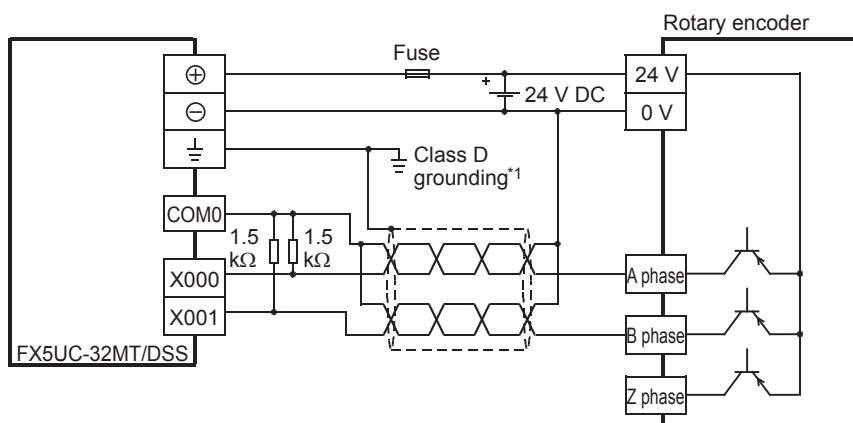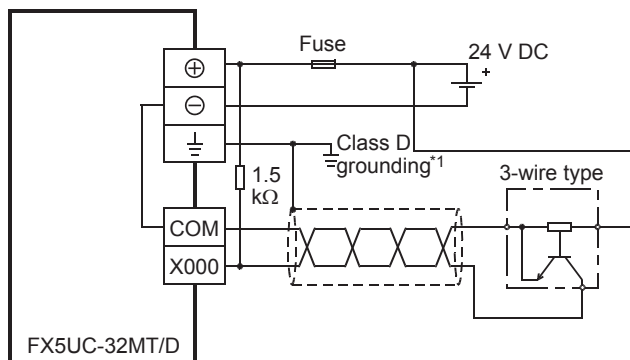*1    The grounding resistance should be 100 Ω or less.
 • FX5UC-32MT/DSS [Sink input wiring]
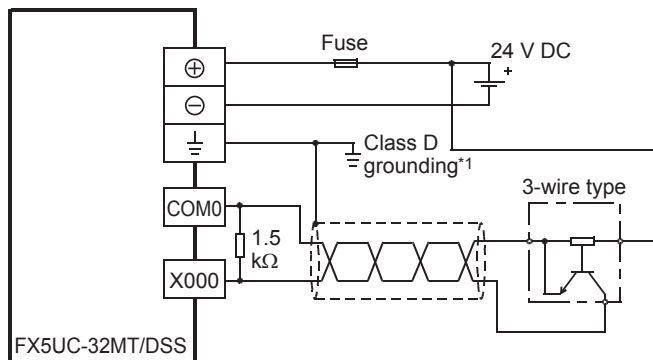


*1    The grounding resistance should be 100 Ω or less.

### ■3-wire sensor of PNP open collector transistor output
 • FX5UC-32MT/DSS [Source input wiring]
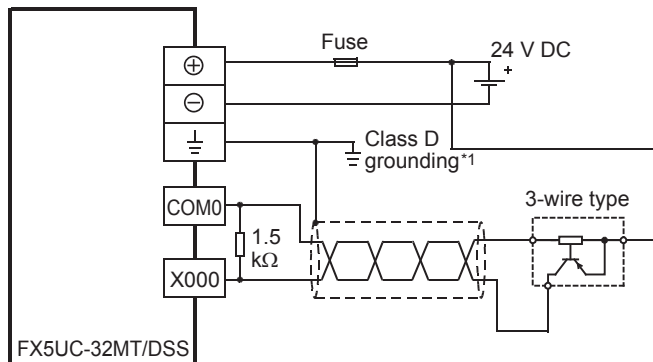


*1    The grounding resistance should be 100 Ω or less.

# Digital Switch

## When DSW instructions are used

Examples of wiring for capturing values from a 4-digit digital switch to the data register D100 are given below.

For the instructions, refer to 📖MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks).

### ■Example of program

```
 SM400
──┤├──  ┌─────┬──────┬──────┬──────┬─────┐
        │ DSW │ X010 │ Y010 │ D100 │ K1  │
        └─────┴──────┴──────┴──────┴─────┘
```
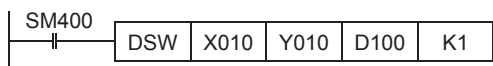
### ■Example of wiring

• Sink wiring

The example is the wiring for the input/output of the FX5UC-32MT/D.



• Source wiring

The example is the wiring for the input/output of the FX5UC-32MT/DSS.



*1 The grounding resistance should be 100 Ω or less.

## When BIN instructions are used

Examples of wiring for capturing values from a 2-digit digital switch to the data register D102 are given below.

For the instructions, refer to ▉▉MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks).

### ■Example of program



### ■Example of wiring

• Sink wiring

The example is the wiring for the input/output of the FX5UC-32MT/D.



• Source wiring

The example is the wiring for the input/output of the FX5UC-32MT/DSS.



*1   The grounding resistance should be 100 Ω or less.

# Input Matrix

Examples of wiring to take ON/OFF status of 24 switches by using MTR instructions are given below.

For the instructions, refer to 📖MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks).

## Programming examples



## Wiring examples

- Sink wiring

The example is the wiring for the input/output of the FX5UC-32MT/D.



- Source wiring

The example is the wiring for the input/output of the FX5UC-32MT/DSS.



*1   The grounding resistance should be 100 Ω or less.

# Seven Segment with Latch

For the instructions, refer to ☐MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks).

## When SEGL instructions are used

Examples of wiring for displaying the current value of D100 on the 4-digit 7-segment display are given below.

### ■Example of program

```
SM400
──┤├──   SEGL │ D100 │ Y010 │ K1
```
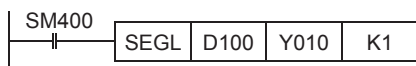
### ■Example of program wiring

 • Sink wiring

The example is the wiring for the input/output of the FX5UC-32MT/D.



7-segment display used for sink wiring
(for transistor output)

 • Source wiring

The example is the wiring for the input/output of the FX5UC-32MT/DSS.
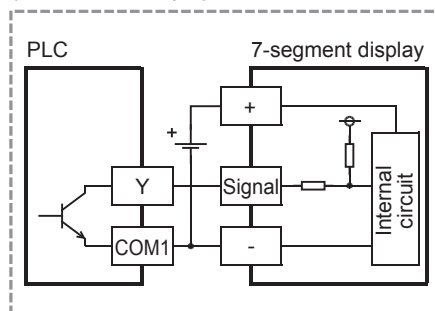


7-segment display used for source wiring
(for transistor output)

*1 Use a 7-segment display with a latch and a built-in BCD decoder.
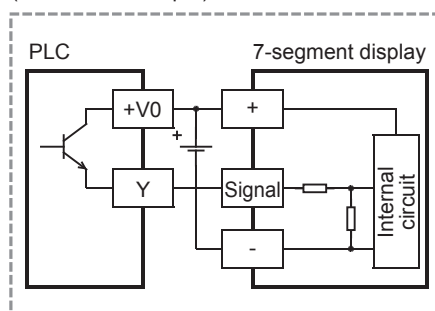
## When BCD instructions are used

Examples of wiring for displaying the current value of D100 on the 2-digit 7-segment display are given below.
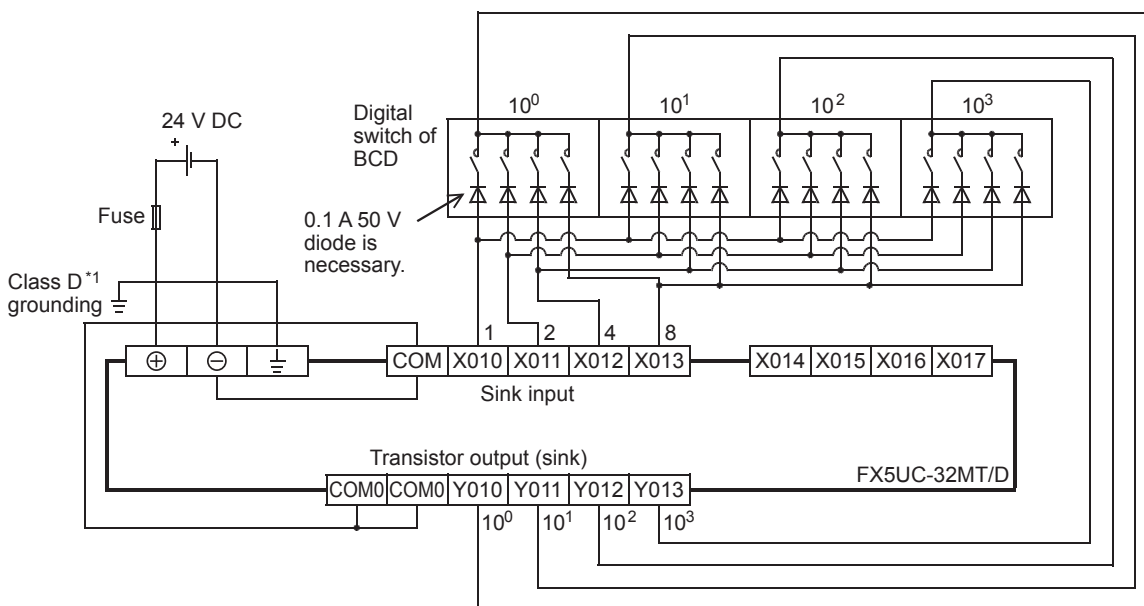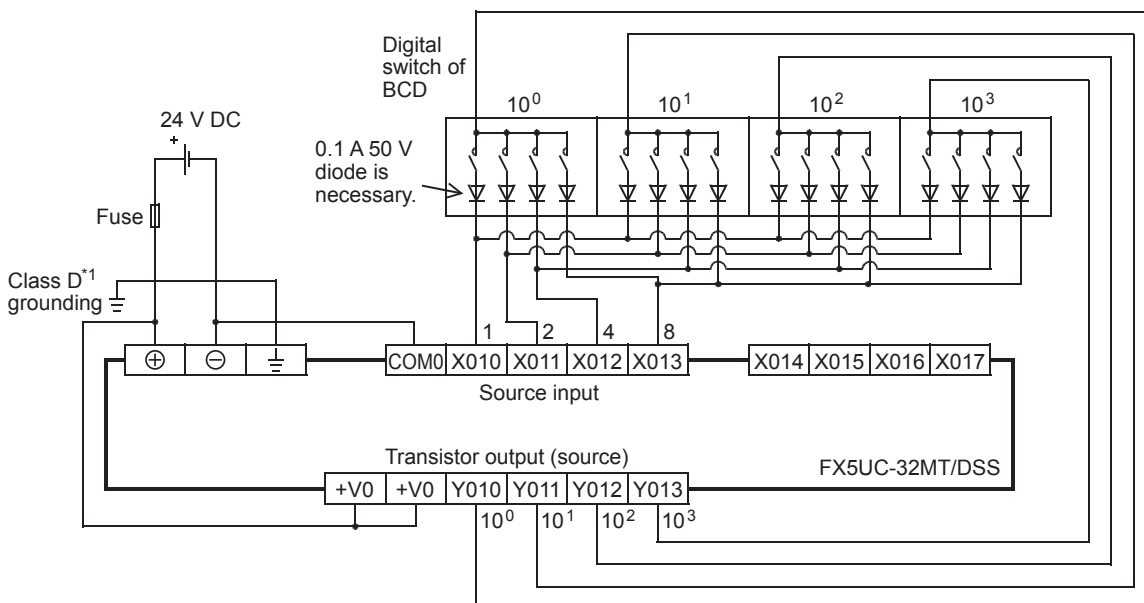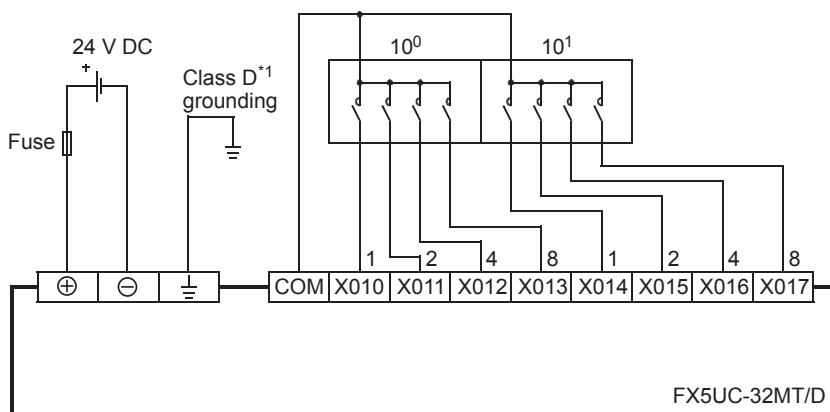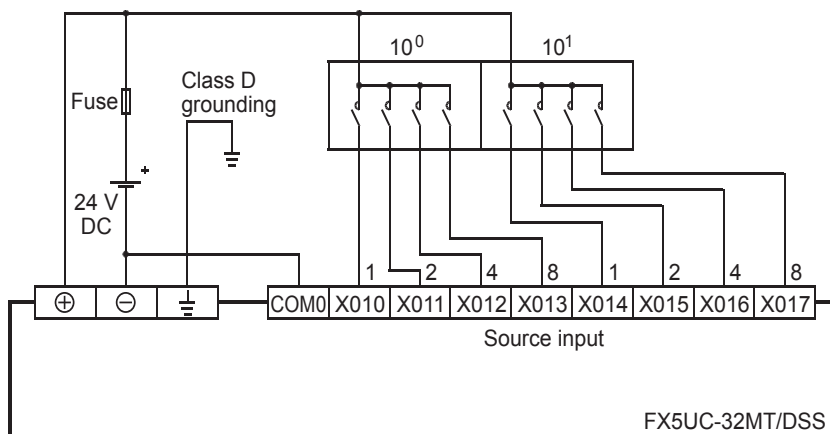
### ■Example of program
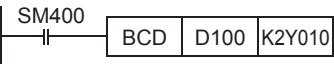


### ■Examples of wiring

• Sink wiring

The example is the wiring for the input/output of the FX5UC-32MT/D.
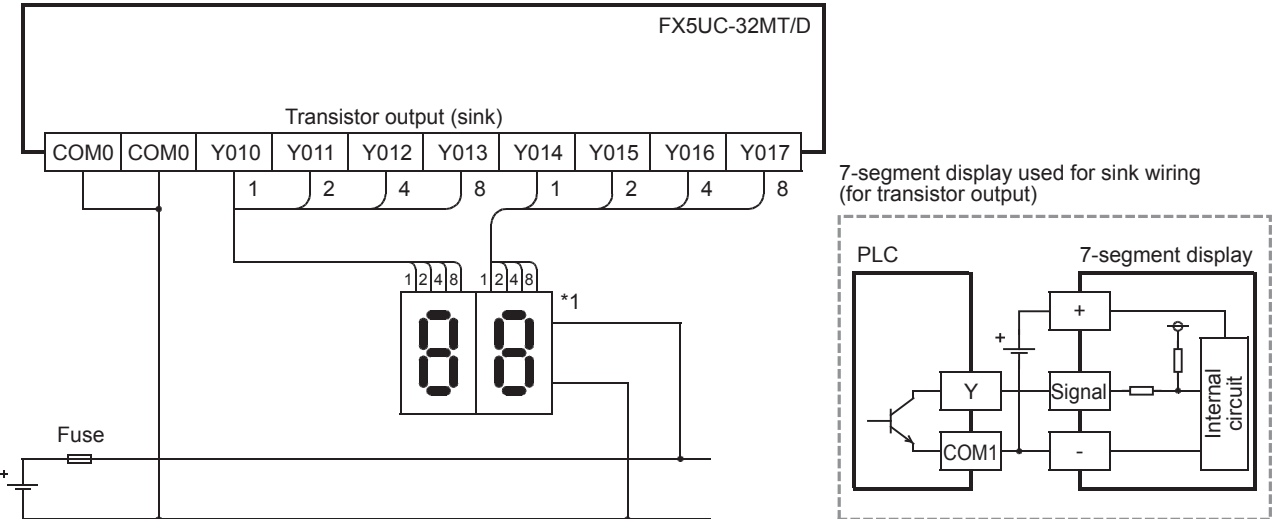


• Source wiring

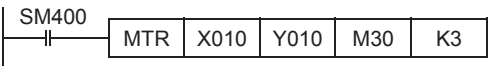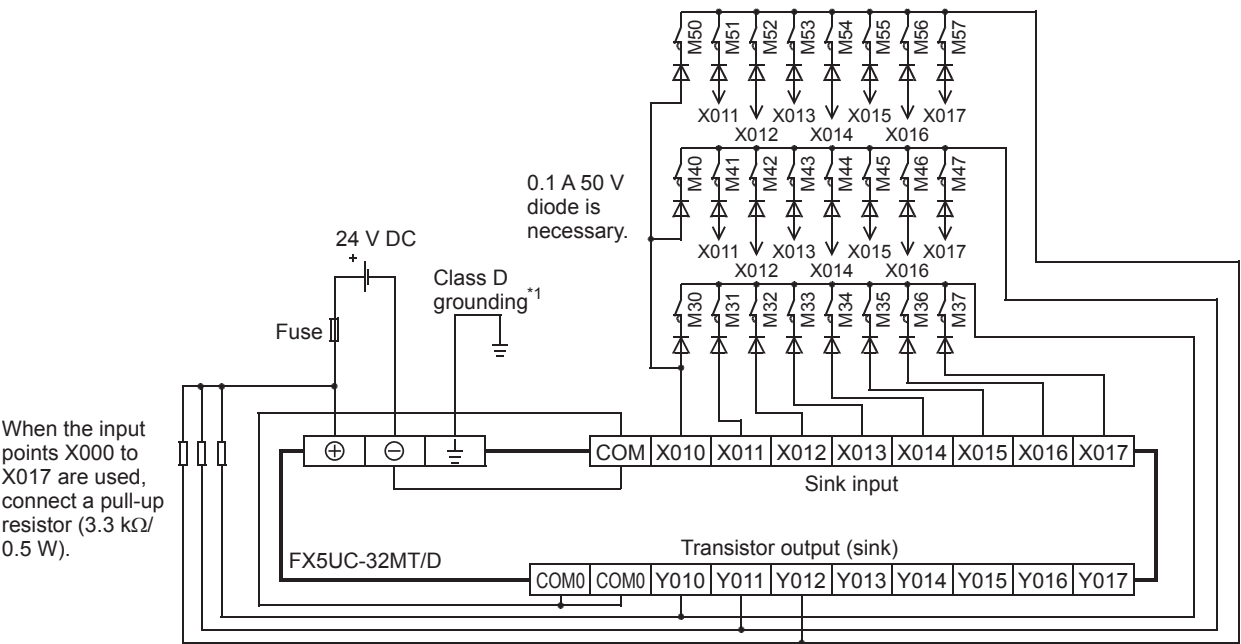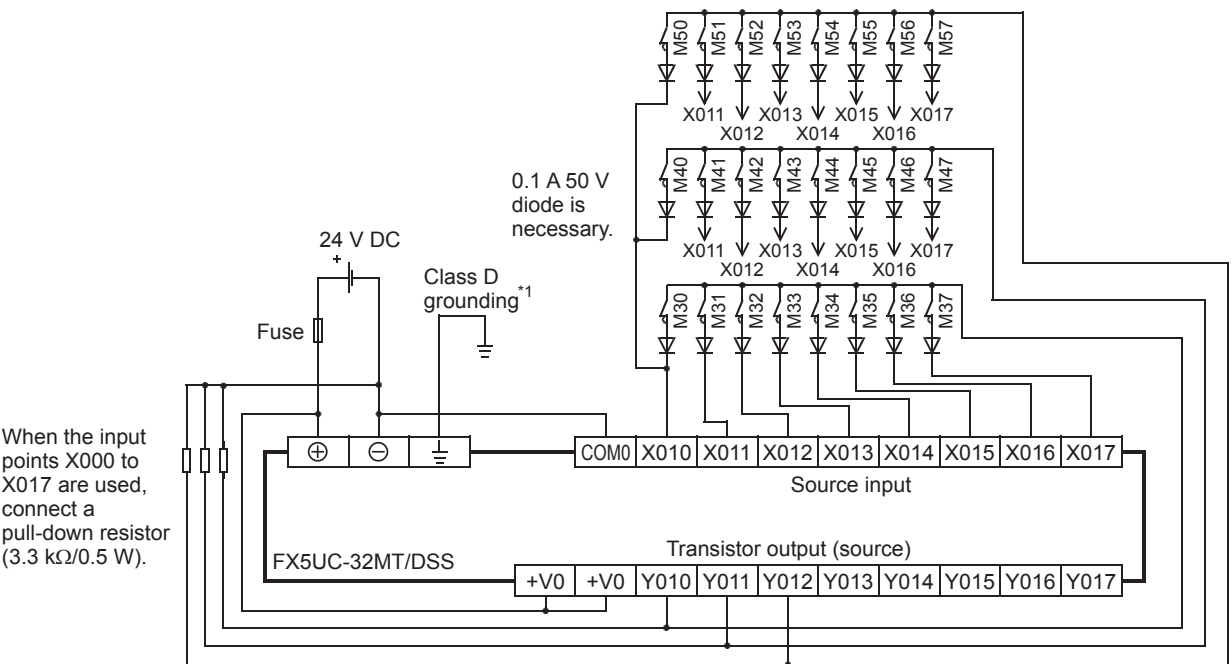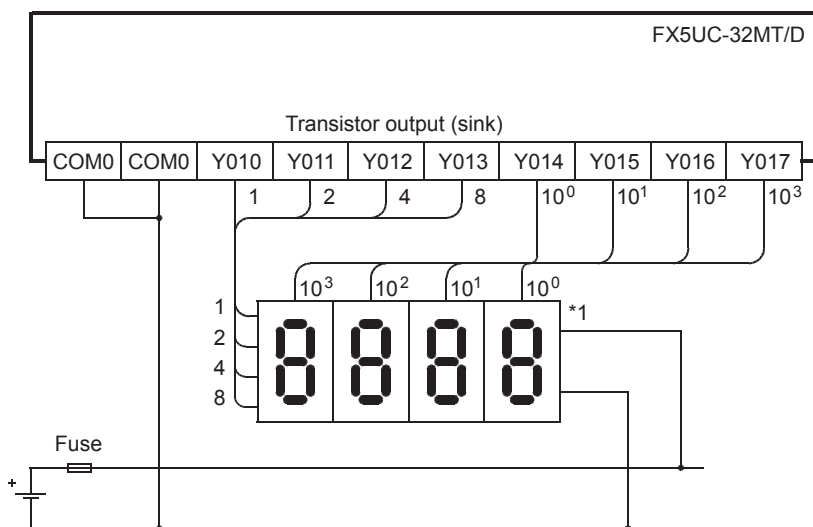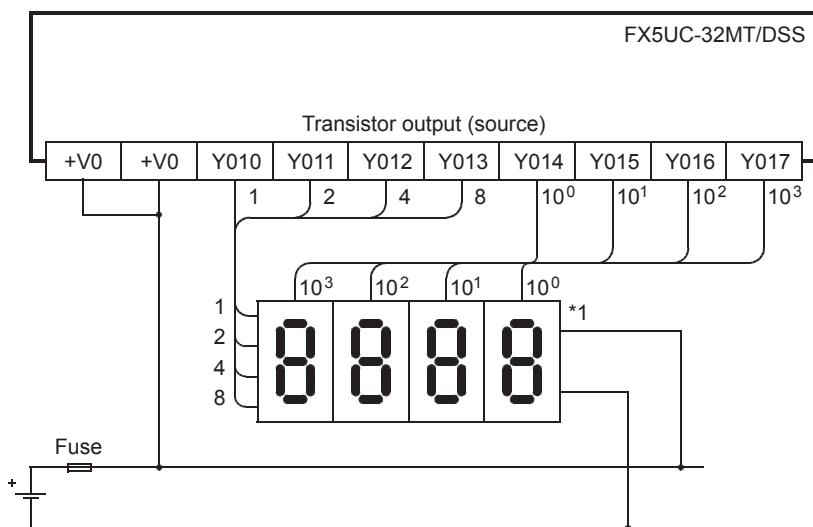The example is the wiring for the input/output of the FX5UC-32MT/DSS.
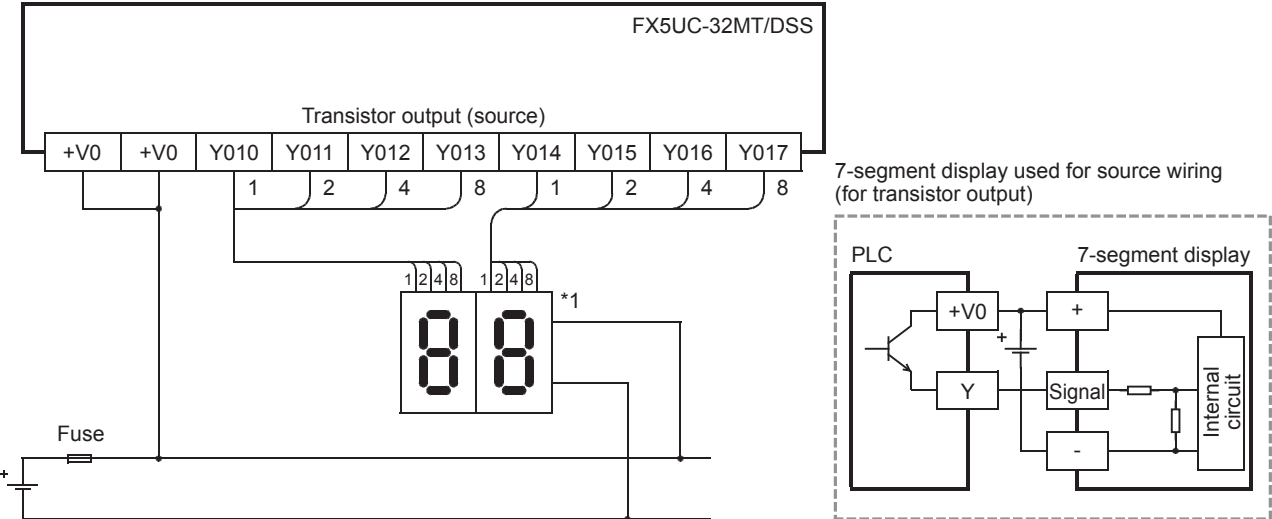


*1    Use a 7-segment display with a latch and a built-in BCD decoder.

# 7 OPERATION ADJUSTMENT

## 7.1 Preparation for Operation

### Preliminary inspection

Incorrect connection of the power supply terminal, contact of the DC input wire and power supply wire, or short-circuiting of output wires may result in serious damage.

Before applying power, check that the power supply and ground terminals are connected correctly and input/output devices are wired properly.

#### Dielectric withstand voltage test and insulation resistance test

The dielectric withstand voltage and insulation resistance test of the PLC should be measured in accordance with the following procedure.

*1.* Remove all input/output wires and power supply wires from the PLC.

*2.* Connect a crossing wire to each of the PLC terminals (power supply terminal, input terminals and output terminals) except the ground terminal. For the dielectric withstand voltage test of each terminal, refer to the general specifications for the product (refer to ☞ Page 17 Generic Specifications).

*3.* Measure the dielectric withstand voltage and insulation resistance between each terminal and the ground terminal.
- Dielectric withstand voltage      1.5 kV AC or 500 V AC for 1 min (The terminals vary in dielectric withstand voltage.)
- Insulation resistance      10 MΩ or higher by 500 V DC insulation resistance tester

### Procedure until operation

The procedure until operation is explained below.

*1.* Turn on the power of the system.
Check the following items before turning on the power of the system. When the CPU module with the factory default setting is powered on, the ERR LED flashes because the module has no programs.
- The power connector is connected correctly.
- The power supply voltage is within the specified range.
- The CPU module is in the stopped status.

*2.* Connection with a personal computer
Connect the CPU module with a personal computer on which an engineering tool has been installed. (☞ Page 93 Connection with a personal computer)

*3.* Format the CPU built-in memory.
Format the CPU built-in memory using the engineering tool. (📖GX Works3 Operating Manual)

*4.* Parameter setting
Set the parameters needed for startup.
(📖GX Works3 Operating Manual)
- System parameters
- CPU parameters
- Module parameters

*5.* Programming
Create a program using the engineering tool. (📖MELSEC iQ-F FX5 User's Manual (Application))

*6.* Write the parameters and the program.
Write the parameters and the program set with the engineering tool into the CPU module.
(📖GX Works3 Operating Manual)

## 7. Reboot the system.

Reboot the system by any of the following methods.

 • Turning off and on the power
 • Resetting the CPU module ( ☞ Page 95 Resetting method)

## 8. Check errors.

Check the ERR LED of the CPU module. If an error has occurred, check the contents of the error with Module Diagnostics (CPU Diagnostics) of the engineering tool and eliminate its cause.

## 9. Run the program.

Set the CPU module to the RUN status and make sure that the P.RUN LED of the CPU module lights up.

# Connection with a personal computer

Connect the CPU module with a personal computer on which an engineering tool has been installed.

The system configuration examples and GX Works3 settings are described below.

For details, refer to 📖 GX Works3 Operating Manual.

## Direct connection

Setting examples for accessing the CPU module that is directly connected with a personal computer are shown below.

### ■Ethernet connection
 • Ethernet port direct connection
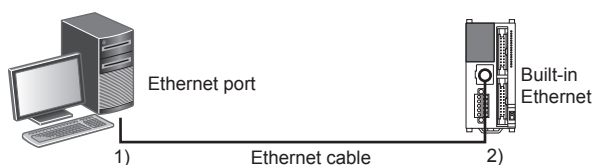


GX Works3 settings

| No. | Item | Selection item | Internal setting | Input value |
|---|---|---|---|---|
| 1) | PC side I/F | Ethernet Board | — | — |
| 2) | PLC side I/F | PLC Module | | Ethernet Port Direct Connection |
| | Other Station Setting | No Specification | Check at Communication Time | 30 seconds |
| | | | Retry Times | 0 times |

**Point**

For the FX5 CPU module, the Ethernet adapter on the personal computer side used for the Ethernet port direct connection can be specified. Click the [CPU Module Direct Coupled Setting] button on the "Specify Connection Destination Connection" window to display the "CPU Module Direct Coupled Setting" window. Select the adapter on the window.

 • Connection via HUB
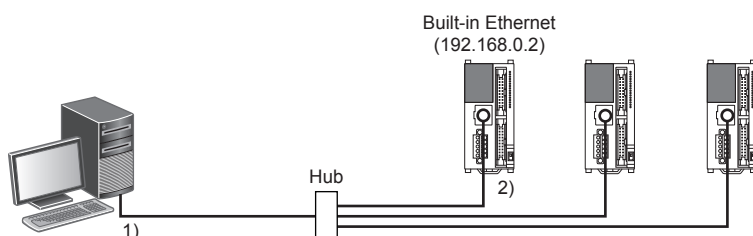


GX Works3 settings

| No. | Item | Selection item | Internal setting | | Input value |
|---|---|---|---|---|---|
| 1) | PC side I/F | Ethernet Board | — | | — |
| 2) | PLC side I/F | PLC Module | Connection via HUB | IP Address | 192.168.0.2 |
| | | | | Response Waiting Time | 2 seconds |
| | Other Station Setting | No Specification | Check at Communication Time | | 30 seconds |
| | | | Retry Times | | 0 times |

**■Serial connection**

FX5-232ADP



COM port
(COM1)

1)    RS-232 cable       2)
     (FX-232CAB-1)
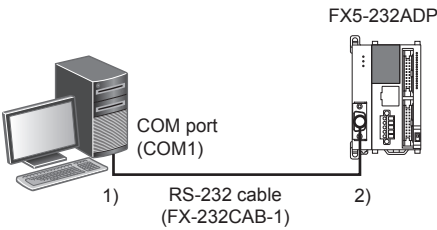
GX Works3 settings

| No. | Item | Selection item | Internal setting | Input value |
|-----|------|----------------|------------------|-------------|
| 1) | PC side I/F | Serial/USB | RS-232C | — |
| | | | COM Port | COM1 |
| | | | Transmission Speed | 115.2Kbps |
| 2) | PLC side I/F | PLC Module | PLC Mode | FX5CPU |
| | Other Station Setting | No Specification | Check at Communication Time | 30 seconds |
| | | | Retry Times | 0 times |

# 7.2    Operation and Test

## Self-diagnostic function

When the power of the CPU module is turned on, the self-diagnostic function to check for errors starts in the module. The CPU module boots when there is no error with the hardware, parameters, and program.

When there are no errors, the module enters the RUN status (the P.RUN LED turns on) in response to the RUN instruction (☞ Page 95 Running, Stopping, and Resetting). If any error is detected, the "ERR" LED flashes or lights up.

## Monitoring and debugging

The ON/OFF status of PLC's devices, current values or set values can be monitored or changed by using engineering tools. For details, refer to ⚏GX Works3 Operating Manual.

# 7.3 Running, Stopping, and Resetting

## Methods of running, stopping, and resetting

The following two methods of running, stopping, and resetting the FX5UC CPU modules are provided.

### Using the RUN/STOP/RESET switch

The operation status of the CPU module can be changed with the RUN/STOP/RESET switch.
Setting the RUN/STOP/RESET switch to the RUN position runs the program. Setting the switch to the STOP position stops the program.

#### ■Resetting method

Resetting can be performed with the RUN/STOP/RESET switch. Resetting is not performed immediately after the RUN/STOP/RESET switch is set to the RESET position.
Perform the following procedure to reset with the RUN/STOP/RESET switch.
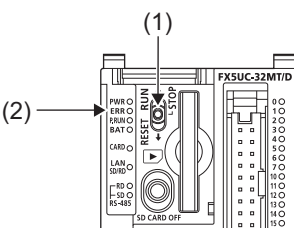


**1.** Set the RUN/STOP/RESET switch (1) to the RESET position for at least one second.

**2.** Make sure that the ERR LED (2) flashes several times and the light goes off.

**3.** Return the RUN/STOP/RESET switch to the STOP position.

### Remote operation

The operation status of the CPU module can be changed externally with the RUN/STOP/RESET switch set to the RUN position. The operation status of the CPU module can be set to the PAUSE status.
Remote operation can be performed by either of the following methods.
- Using contacts (□MELSEC iQ-F FX5 User's Manual (Application))
- Using engineering tools (□GX Works3 Operating Manual)
- Using external devices using SLMP (□MELSEC iQ-F FX5 User's Manual (SLMP))

### Use of several running/stopping methods

#### ■When the RUN/STOP/RESET switch and RUN contact are used
- The RUN/STOP status of the PLC is determined by the conditions shown in the following table.

| RUN/STOP/RESET switch status | Condition of the input specified as the RUN terminal by parameters | CPU module status |
|---|---|---|
| RUN | RUN | RUN |
| | STOP | STOP |
| STOP | RUN | STOP |
| | STOP | STOP |

# 8 MAINTENANCE AND INSPECTION

## 8.1 Daily Inspection

Perform the following inspections on a daily basis.

| Item | Inspection item | | Description |
|---|---|---|---|
| 1 | Installation status of the module | Mounting status of the module | The module should be securely mounted. |
| | | Looseness of cover | The cover should not be off. |
| 2 | Connection status | Looseness of terminal screws | Retighten the terminal screws. |
| | | Proximity of crimp terminals | Check the proximity between crimp terminals and correct the clearance. |
| | | Looseness of connectors | Connect cable connectors securely. |
| 3 | LED status | | Check that the LED status is normal.<br>☞ Page 101 Checking with LEDs<br>User's manuals for each module |

## 8.2 Periodic Inspection

Perform the following inspections once or twice every 6 months to a year.

Also perform the inspections when facilities have been relocated or modified or when wiring has been changed.

| Item | Inspection item | | Description |
|---|---|---|---|
| 1 | Ambient environment | Operating ambient temperature | The temperature in the panel should be 0 to 55℃ (32 to 131℉). |
| | | Operating ambient humidity | The humidity in the panel should be 5 to 95%RH. |
| | | Working atmosphere | Free from corrosive or flammable gas and excessive conductive dust |
| 2 | Power supply voltage | | Voltage within the specified range should be supplied. |
| 3 | Installation status | Dirt, foreign matter | Wipe away any dirt or foreign matter. Clean the module. |
| 4 | Connection status | Looseness of terminal screws | Retighten the terminal screws. |
| | | Proximity of crimp terminals | Check the proximity between crimp terminals and correct the clearance. |
| | | Looseness of connectors | Connect cable connectors securely. |
| 5 | Battery | BAT LED | The BAT LED should be turned off.<br>When the BAT LED lights up, replace the battery with new one. |
| | | Period following the battery purchase | Replace the battery with new one if 5 years or more have passed since the battery was purchased. |
| | | OFF status of SM51 (SM8005) and SM52 (SM8006) | SM51 (SM8005) and SM52 (SM8006) should be off.<br>If SM51 (SM8005) and SM52 (SM8006) are on, replace the battery with new one. |
| 6 | Module Diagnostics (CPU Diagnostics) | | The normal status of the system should be checked with the Module Diagnostics (CPU Diagnostics).<br>☞ Page 103 Module Diagnostics (CPU Diagnostics) |
| 7 | Relay contacts | | Check the product life of relay outputs.<br>☞ Page 71 Product life of relay output contacts |

**Point**
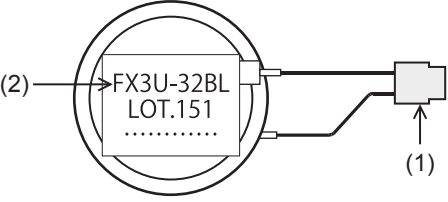
The product life of relay contacts varies considerably depending on the load type used. Note that loads generating reverse electromotive force or rush current may cause poor contact or deposition of contacts which may lead to considerable reduction of the contact product life.
☞ Page 71 Product life of relay output contacts

# 8.3 Battery

## Part names

The Latch device memory and clock data upon power interruption. The battery is not incorporated in the CPU module during shipment from the factory. Order it if necessary. Parameter setting is required to back up the device memory and clock data. (☞ Page 98 Setting an optional battery using the engineering tool)

| External appearance | No. | Name | Description |
|---|---|---|---|
|  | (1) | Connector | Connected to the battery connector of the CPU module. |
| | (2) | Nameplate | Displays the model name and lot number. |

## Specifications

The following shows functional specifications of the battery.

| Item | FX3U-32BL |
|---|---|
| Battery type | Lithium manganese dioxide battery |
| Nominal voltage | 3.0 V |
| Life | Standard life: 5 years (at ambient temperature of 25℃ (77℃))[1] |

[1] The life of the battery changes with respect to ambient temperature. (☞ Page 98 Battery life and replacement guidelines)

## Battery attachment

The battery is not incorporated in the CPU module during shipment from the factory. To use the battery, attach it following the procedure below. Parameter setting is required to back up the device memory and clock data using the battery. (☞ Page 98 Setting an optional battery using the engineering tool)

### Attachment procedure

*1.* Turn the power supply off.

*2.* Remove the battery cover (A in the figure below).
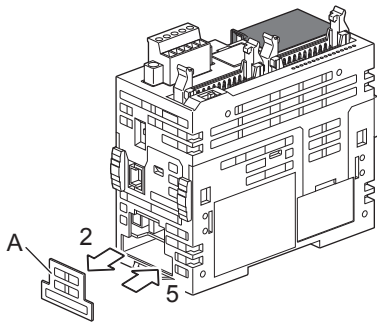


*3.* Push the battery into the battery holder (B in the figure below).

*4.* Insert the battery connector (C in the figure below) of the battery.
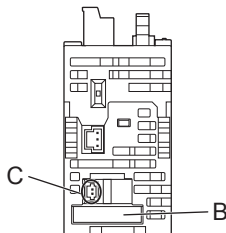


*5.* Attach the battery cover.

## Setting an optional battery using the engineering tool

The following setting is required when the capacity of the latch device/latch label is increased using the optional battery.
Note that the battery does not back up the data if the following setting is not provided.

  🖝  Select the Navigation window⇨[Parameter]⇨[FX5UCPU]⇨[CPU Parameter]⇨[Memory/Device Setting]⇨[Device/Label Memory Area Setting]⇨[Option Battery Setting]⇨[Mounted]
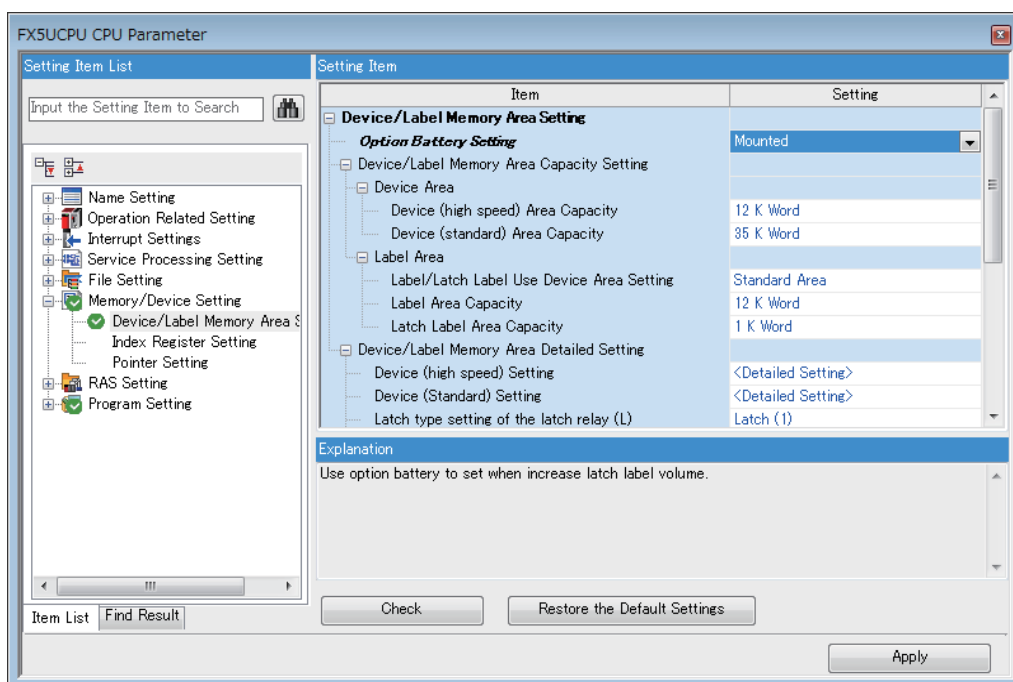


# Battery replacement

## Battery life and replacement guidelines

When the battery voltage is low, the BAT LED is lit red while the power is on, and SM51 (SM8005) and SM52 (SM8006) are turned ON. The memory can be retained for about one month after the LED turned on. However, the drop in battery voltage may not be detected immediately. Prepare a new battery and replace the battery with new one promptly.

Point🖉

Standard life of FX3U-32BL: 5 years (at ambient temperature of 25℃ (77℉))
The life of the battery changes with respect to ambient temperature.
When planning for battery replacement, please estimate the battery life according to the graph below and order replacement batteries in advance.
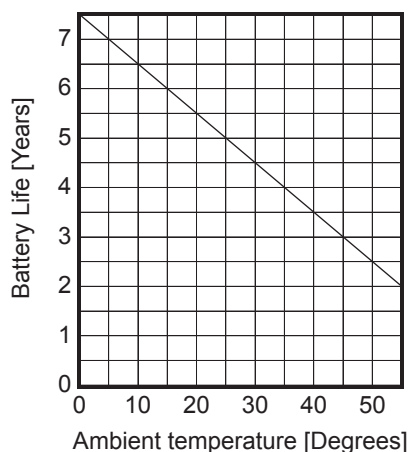
## Replacement procedure

If the battery voltage is reduced, replace it following the procedure below.

Even with the battery removed, the built-in capacitor holds the data of the memory for the power interruption time (20 sec.).

Battery replacement steps 3 and 4 must be completed within 20 seconds. If the time taken for battery replacement is longer than the power interruption time, the data of the memory may be lost.

**1.** Turn the power supply off.

**2.** Remove the battery cover (A in the figure below).
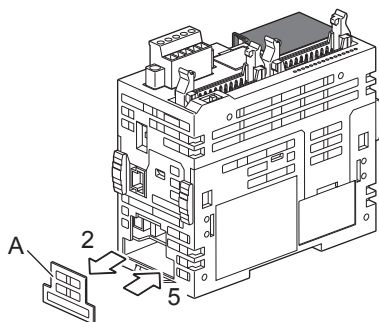


**3.** Disconnect the battery connector (B in the figure below) from the old battery, and remove the battery from the battery holder (C in the figure below).
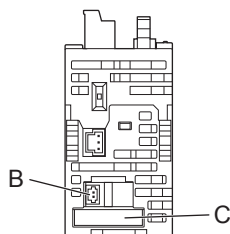


**4.** Install the new battery. ( ☞ Page 97 Battery attachment)

**5.** Attach the battery cover.

*Point*

- After replacing the battery, check whether the devices set by the latch and clock data are backed up correctly, confirm safety, and then run the PLC.
- If the devices set by the latch are not backed up correctly, clear them, and set their initial values and clock data again if necessary.

## Reading the date of manufacture

How to read the battery lot number



Month (Example: January): 1 to 9 = January to September, X = October, Y = November, Z = December

Year (Example: 2015): Last two digits of year
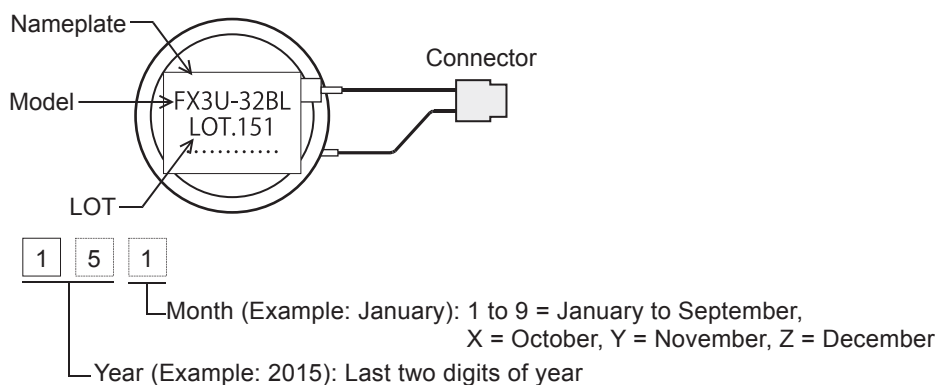
# Special relay for low battery voltage

Prepare a system which allows constant external monitoring of the battery status, using a GOT, etc.

• SM52 (SM8005)

The special relay turns ON when the battery voltage is the specified value or less.

The special relay turns OFF when the battery voltage returns is normal.

```
SM52 (SM8005)
──┤↓├──────────────( Y1 )──   Y1 is output when a battery low-voltage condition occurs.
Battery low-voltage
```
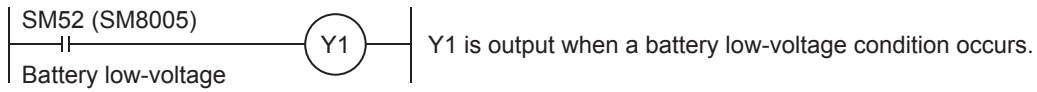
• SM51 (SM8006)

The special relay turns ON when the battery voltage is the specified value or less.

The special relay status ON even when the battery voltage is normal.

• SD8005

Battery voltage can be monitored.

# 9 TROUBLESHOOTING

Details on errors occurring in the system, their causes, and corrective actions are explained below.

For details on troubleshooting for each module, refer to the manuals for the module.

> **Point**
>
> Saving the programs and devices used at the occurrence of an error helps identifying the cause of the error.
> (🖙 Page 105 Backing Up the Data)

## 9.1 Troubleshooting Procedure

If an error occurs, perform troubleshooting in the following order.

**1.** Check that each module is properly mounted and wired.

**2.** Check the LEDs of the CPU module. (🖙 Page 101 Checking with LEDs)

**3.** Check the LEDs of each intelligent function module. (Manuals for each module)

**4.** Connect the engineering tool and execute the Module Diagnostics (CPU Diagnostics). The error cause and the action to be taken can be displayed. (🖙 Page 103 Module Diagnostics (CPU Diagnostics))

**5.** Check the cause of the error and take corrective actions.

## 9.2 Checking with LEDs

Check the module status with LEDs as a means to perform the primary diagnosis.

### Checking the PWR LED

If the PWR LED is turned off, check the following items.

| Item to check | Cause and action |
|---|---|
| Measure the voltage supplying to the CPU module. | If the power source is not supplying the proper voltage, provide a power source that does. |
| Remove extension modules and all wiring other than the one for the power supply, and turn on the power supply. | If the PWR LED turns on in this condition, or overloaded. Reconnect the modules and wire one by one to identify the cause. |

If the PWR LED still does not turn on even after the items shown above are checked, there may be a hardware issue.

Consult your local Mitsubishi Electric representative.

### Checking the BAT LED

If the BAT LED turns on, check the following items.

The LED is valid when the optional battery is installed and the LED is set to "display" for battery errors by using the parameter.

| Item to check | Cause and action |
|---|---|
| Check the installation of the battery. | Install the battery properly. |
| Check the battery voltage. | If the battery voltage is reduced, replace the battery with a new one.<br>Battery voltage can be monitored with PLC data register SD8005.<br>(🖙 Page 97 Battery) |

# Checking the ERR LED

## If the ERR LED flashes

If the ERR LED flashes, check the following items.

| Item to check | Cause and action |
|---|---|
| Write system parameters, CPU parameters, and program files, and turn on the power supply again. | Programs or parameters may not written or damaged. Since a CPU module with the factory default setting has no programs, the ERR LED flashes. |

## If the ERR LED turns on

If the ERR LED turns on, check the following items.

| Item to check | Cause and action |
|---|---|
| Set the CPU module to the STOP status and turn on the power supply again. | When the ERR LED turns off, a watchdog timer error has probably occurred. Take any of the following measures.<br>• Review the program and avoid the maximum value (SD524, SD525) of the scan time exceeding the setting value of the scan time monitoring time which was set with parameters.<br>• Check that the input used for input interruption or pulse catch is not being abnormally turned on and off in one scan.<br>• Check that the frequency of the pulse input to the high-speed counter is within the specified range.<br>• Add some WDT instructions to the program and reset the watchdog timer several times in one scan. |
| Provide a different power supply to the CPU module. | If the ERR LED turns off, noise may have affected the module. Consider taking the following measures.<br>• Check the ground wiring, and reexamine the wiring route and installation location.<br>• Fit a noise filter onto the power supply line. |

If the ERR LED still does not turn off even after the items shown above are checked, there may be a hardware issue. Consult your local Mitsubishi Electric representative.

# Checking the P.RUN LED

If the P.RUN LED is turned off, check the status of the ERR LED and take corrective actions. ()

# 9.3 Troubleshooting using the engineering tool

Check the error or history using the engineering tool, and identify the error cause. More detailed information on the error as well as the error cause and action to be taken can be checked by using the engineering tool.
The engineering tool has the following functions for troubleshooting.

| Function | Description |
|---|---|
| Module Diagnostics (CPU Diagnostics) | This function diagnoses the module. (The current error and its details can be checked.) |

For details on each function, refer to the following.
📖GX Works3 Operating Manual
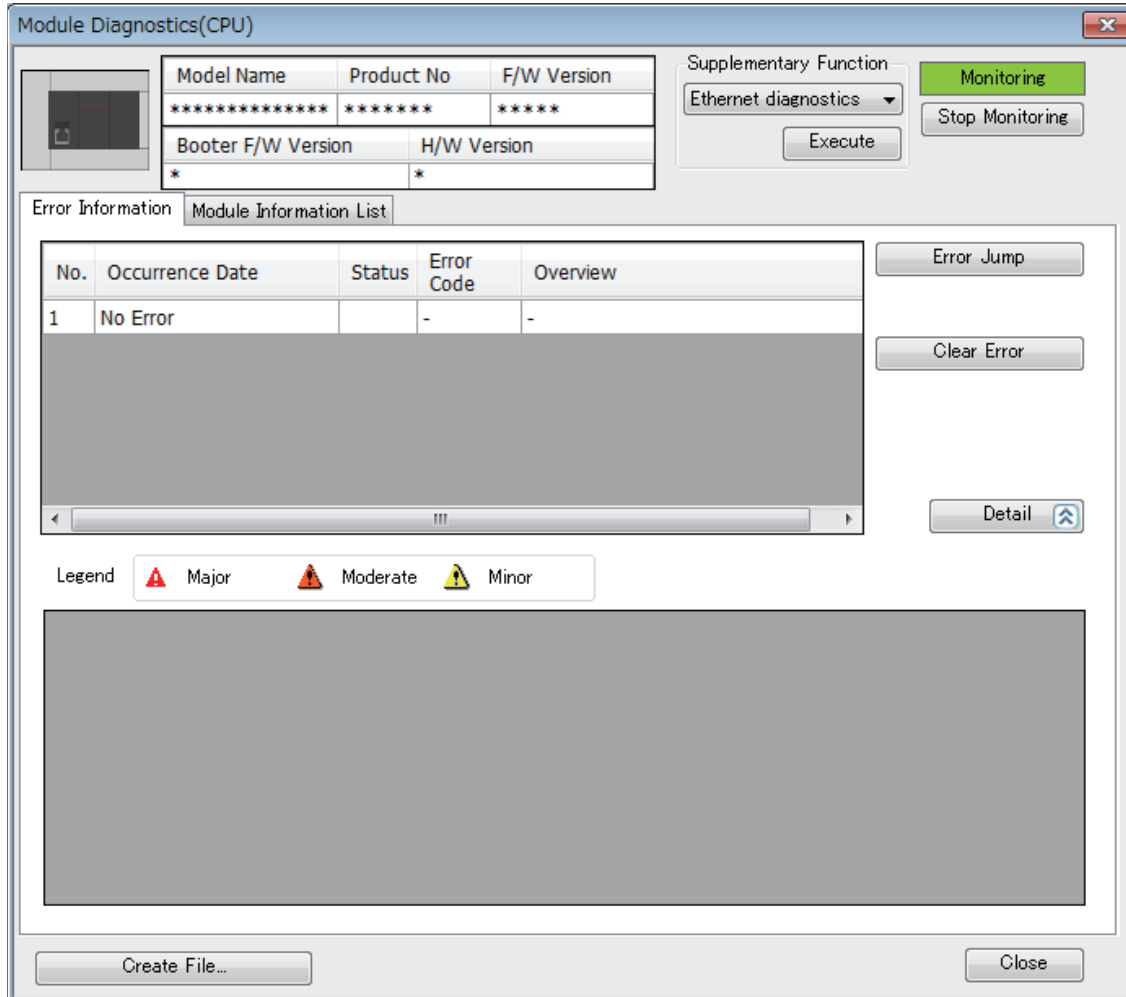
# Module Diagnostics (CPU Diagnostics)

The Module Diagnostics (CPU Diagnostics) function is used to diagnose the CPU module and expansion adapter (check the error being generated and its detailed information).

Information required for troubleshooting, such as the current error, details and cause of the error, and action to be taken, are displayed. The incorrect parameter setting and program error location can also be identified by selecting the error and clicking the [Error Jump] button. On the [Module Information List] tab, the LED status and the switch status of the targer module can be checked.

✍ [Diagnostics] ⇨ [Module Diagnostics (CPU Diagnostics)]

# 9.4 Error Status and Operations on Occurrence of an Error

When an error occurs, the CPU module performs preconfigured actions depending on the status of the error.

## Error status

Errors are classified into the following three types according to the urgency of the errors.

| Error status | Program execution status | Description | Required action |
|---|---|---|---|
| Major error | Stop | The module is unable to continue its operation due to a hardware issue. | Perform troubleshooting. If the error still persists, consult your local Mitsubishi Electric representative. |
| Moderate error | Stop | The module is unable to carry out programs or continue the data communication with stations on the network due to improper program or parameter settings and temporary noise. | To resume the execution of the program or the data communication with the stations on the network, use the engineering tool to identify the cause of the error and take corrective actions. |
| Minor error | Continue | The module has detected a minor error or alarm. However, the execution of the program and the data communication with the stations on the network are continues. | Check the details of the error with the engineering tool. If necessary, take corrective actions for the error. |

## Operation at the occurrence of an error

Errors are classified into stop errors and continuable errors.

### ■Stop error

When a stop error occurs, the CPU module stops operation and enters the STOP status.

For details of parameters, refer to 📖MELSEC iQ-F FX5 User's Manual (Application).

### ■Continuable error

When a continuable error occurs, the CPU module will keep the operation status and carry out operations.

Only continuable errors can be canceled. When a continuable error is canceled and the CPU module is restored, the CPU module returns to the status before the occurrence of the error. Continuable errors can be canceled by either of the following methods.

- Using engineering tools
- Using special relays (SM) ()

## Operation settings of the CPU module on occurrence of an intelligent function module error

The operation of the CPU module on occurrence of an intelligent function module error can be set with an engineering tool. Configure the settings with [I/O Assignment Setting] in the system parameters.

# 9.5 Backing Up the Data

Saving the following information immediately after the occurrence of an error helps analyzing the cause of the error.
- Parameters, programs, and device memory
- Error histories

## Backing up parameters, programs, and device memory

The procedure for backing up parameters, programs, and device memory by using an engineering tool is explained below.

☞ [Online] ⇨ [Read from PLC]

*1.* Check the parameters, programs, and device memory to back up.

*2.* Click the [Execute] button to read the data.

## Backing up devices and buffer memory

The procedure for backing up devices and buffer memory using the engineering tool is explained below.

☞ [Online] ⇨ [Read from PLC]

*1.* Click the "Device Memory" check box.

*2.* Click [Detail].

*3.* Input character strings in "Device Data Name" and select the devices to back up.

*4.* Select the "Buffer Memory Intelligent Module No." and input module number.

*5.* Click [OK], and then click [Execute] to read the data from the PLC.

# 9.6 Canceling Errors

Only continuable errors can be canceled.

If an error is canceled and the CPU module is recovered, the status of SM, SD, or LEDs returns to the status before the occurrence of the error. After an error is canceled and when the same error occurs again, this error is recorded again in the error history.

When all errors are cancelled at once, annunciators will also be cleared. To clear annunciators individually, use the RST instruction. Continuable errors can be canceled by the following method.

## Using special relays (SM)

Turning on and off SM50, all errors will be canceled.

# 9.7 Troubleshooting for Each Symptom

When the CPU module does not operate properly, check an appropriate item from the following and perform troubleshooting.

## I/O operation (CPU module, I/O module)

### Output does not turn on

| Item to check | Action |
|---|---|
| Check for errors with external wiring. | Connect the external wiring properly. |
| Stop the PLC, and forcibly turn on or off the inoperable output with a peripheral device or an engineering tool. | ■When the output operates<br>The output may be turned off unintentionally in the program. Review user program (Duplicate coils or RST instructions).<br>■When the output does not operate<br>Check the configuration of the connected devices and the connection of the extension cables.<br>If the configuration of the external wiring and connected devices and the connection of the extension cables are acceptable, there may be a hardware issue. Consult your local Mitsubishi Electric representative. |

### Output does not turn off

| Item to check | Action |
|---|---|
| Check for errors with external wiring. | Connect the external wiring properly. |
| Stop the PLC and check that the output turns off. | ■When the output turns off<br>The output may be turned on unintentionally in the program. Review user program (Duplicate coils or RST instructions).<br>■When the output does not turn off<br>There may be a hardware issue. Consult your local Mitsubishi Electric representative. |

### Input does not turn on

| Item to check | Action |
|---|---|
| ■FX5UC-32MT/D<br>Remove the external wiring, and short-circuit the COM terminal and the input terminal. Check that the input turns on with LEDs and peripheral devices. | ■When the input turns on<br>Check that the input device does not have a built-in diode or parallel resistance.<br>If so, refer to ☞ Page 61 Precautions for connecting input devices.<br>■When the input does not turn on<br>Remove the external wiring, and measure the voltage between the COM terminal and the input terminal with a tester to check that the voltage is 24 V DC.<br>When the input voltage is lower than 20.4 V DC, check that the PLC power supply voltage is "24 V DC +20%, -15%".<br>Check the configuration of the external wiring and connected devices and the connection of the extension cables. |
| ■FX5UC-32MT/DSS<br>Remove the external wiring, and apply 24 V DC voltage between the COM□ terminal and the input terminal. Check that the input turns on with LEDs and peripheral devices. | ■When the input turns on<br>Check that the input device does not have a built-in diode or parallel resistance.<br>If so, refer to ☞ Page 61 Precautions for connecting input devices.<br>■When the input does not turn on<br>Check that the voltage between the COM□ terminal and the input terminal is approx. 24 V DC with a tester.<br>When the input voltage is lower than 20.4 V DC, check that the external power supply voltage is "24 V DC +20%, -15%".<br>Check the configuration of the external wiring and connected devices and the connection of the extension cables. |

### Input does not turn off

| Item to check | Action |
|---|---|
| Check that there is no leakage current from input devices. | If the leakage current is 1.5 mA or more, connect a bleeder resistance.<br>(☞ Page 61 Precautions for connecting input devices) |

# PLC write, PLC read

## PLC write cannot be performed

If data cannot be written to the CPU module from the engineering tool, check the following items.

| Item to check | Action |
| --- | --- |
| Check if a password is not registered. | Authenticate a password using the engineering tool. |
| When an SD memory card is the write destination, check that the write protection is not applied to the card. | Remove the write protection from the SD memory card.<br>☞ Page 123 SD Memory Card |
| When an SD memory card is the write destination, check that the card is formatted. | Format the SD memory card. |
| Check that the size of the write data does not exceed the memory capacity. | • Ensure sufficient empty capacity.<br>• Clear the memory to which the data is to be written. |

If writing still cannot be performed even after the items shown above are checked, there may be a hardware issue. Consult your local Mitsubishi Electric representative.

## Reading from the PLC cannot be performed

If data cannot be read from the CPU module to the engineering tool, check the specification of the target memory to be read. Check the memory and reset the CPU module. Then try PLC read again.

If reading still cannot be performed, there may be a hardware issue. Consult your local Mitsubishi Electric representative.

## The program is unintentionally overwritten

The boot operation may be being performed. Read the parameters and review the boot file settings with the engineering tool.

If the boot operation is not being performed, there may be a hardware issue. Consult your local Mitsubishi Electric representative.

For details on the boot operation, refer to ☐MELSEC iQ-F FX5 User's Manual (Application).

# Boot operation

## Boot operation cannot be performed from the SD memory card

| Item to check | Action |
| --- | --- |
| Check for errors in the CPU module. | Remove the cause of the error. |
| Check that the file is set in the boot file settings of the parameters. | Set the file in the parameters. |
| Check that the file is set in the program file settings of the parameters. | |
| Check that the file to run is stored in the SD memory card. | Store the file to run. |

If the boot operation cannot be performed even after the items shown above are checked, there may be a hardware issue. Consult your local Mitsubishi Electric representative.

# APPENDIX

## Appendix 1  How to Check the Date of Manufacture

Check the date of manufacture of the product as follows.
- Nameplate
- Module front surface (CPU module only)

### Checking the nameplate

The date of manufacture of the product can be checked from the manufacturer's serial number "S/N" indicated on the nameplate of the product.. (For details of the battery, refer to ☞ Page 99 Reading the date of manufacture.)

**Ex.**
CPU module

Example nameplate
(manufacturer's serial number: 1510001)

Right side →

MITSUBISHI ELECTRIC          PROGRAMMABLE CONTROLLER
MODEL
**FX5UC-32MT/D**
24VDC          8W  MAX
OUT:5~30VDC          0.1A
MAC. ###########
S/N          1510001

MITSUBISHI ELECTRIC CORPORATION
MADE IN JAPAN

* Actual product nameplate differs from the example shown above.

| 1 | 5 | 1 | 0 | 0 | 0 | 1 |

Control number

Month (Example: January) 1 to 9 = January to September,
X = October, Y = November, Z = December

Year (Example: 2015) Last two digits of year

### Check on the module front surface

The year and month of production of the product can be checked from the manufacturer's serial number LOT on the front (at the bottom) of the CPU module.

LOT 151

| 1 | 5 | 1 |

Month (Example: January) 1 to 9 = January to September,
X = October, Y = November, Z = December

Year (Example: 2015) Last two digits of year
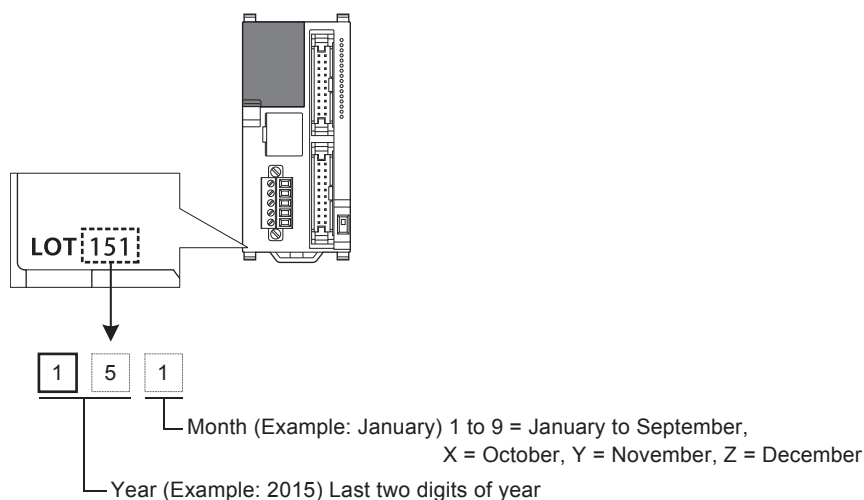
# Appendix 2 Standards

## Certification of UL, cUL standards

FX5UC CPU modules supports UL (UL, cUL) standards.

For models that support UL standards, refer to the following.

UL site http://site.ul.com

UL, cUL file number: E95239

## Compliance with EC directive (CE Marking)

This note does not guarantee that an entire machine produced in accordance with the contents of this note will comply with the following standards.

Compliance to EMC directive and LVD directive of the entire mechanical module should be checked by the user/manufacturer. For more details please contact to the local Mitsubishi Electric sales site.

## Requirement for compliance with EMC directive

The following products have shown compliance through direct testing (of the identified standards below) and design analysis (through the creation of a technical construction file) to the European Directive for Electromagnetic Compatibility (2004/108/EC) when used as directed by the appropriate documentation.

### Caution

- This product is designed for use in general industrial applications.
- The manufacturer, manufacturing location, and authorized representative in EU are as follows.

  Manufacturer: Mitsubishi Electric Corporation

  Address: 2-7-3 Marunouchi, Chiyoda-ku, Tokyo, 100-8310 Japan

  Manufacturing location: Mitsubishi Electric Corporation Himeji Works

  Address: 840 Chiyoda-machi, Himeji, Hyogo, 670-8677 Japan

  Authorized representative in EU: Mitsubishi Electric Europe B.V.

  Address: Gothaer Str. 8, 40880 Ratingen, Germany

### Product compatibility

Type: Programmable controller (open type equipment)

Models: FX5 manufactured

| from October 1st, 2014 | FX5-8EX/ES | FX5-8EYR/ES | FX5-8EYT/ES | FX5-8EYT/ESS |
| | FX5-16EX/ES | FX5-16EYR/ES | FX5-16EYT/ES | FX5-16EYT/ESS |
| | FX5-232ADP | FX5-485ADP | FX5-CNV-BUS | |
| from January 1st, 2015 | FX5UC-32MT/D | FX5UC-32MT/DSS | | |
| | FX5-C32EX/D | FX5-C32EYT/D | FX5-C32ET/D | |
| | FX5-C32EX/DS | FX5-C32EYT/DSS | FX5-C32ET/DSS | |
| | FX5-4AD-ADP | FX5-4DA-ADP | FX5-CNV-BUSC | FX5-CNV-IFC |

| Electromagnetic compatibility (EMC) directive | Remarks |
| --- | --- |
| EN61131-2:2007 Programmable controllers<br>- Equipment requirements and tests | Compliance with all relevant aspects of the standard.<br>EMI<br> • Radiated emission<br> • Conducted emission<br>EMS<br> • Radiated electromagnetic field<br> • Fast transient burst<br> • Electrostatic discharge<br> • High-energy surge<br> • Voltage drops and interruptions<br> • Conducted RF<br> • Power frequency magnetic field |

# Requirement for Compliance with LVD directive

The following products have shown compliance through direct testing (of the identified standards below) and design analysis (through the creation of a technical construction file) to the European Directive for Low Voltage (2006/95/EC) when used as directed by the appropriate documentation.

Type: Programmable controller (open type equipment)

Models: FX5 manufactured

from October 1st, 2014      FX5-8EYR/ES      FX5-16EYR/ES

| Electromagnetic compatibility (EMC) directive | Remarks |
|---|---|
| EN61131-2:2007 Programmable controllers<br> - Equipment requirements and tests | The equipment has been assessed as a component for fitting in a suitable enclosure which meets the requirements of EN61131-2:2007. |

# Caution for compliance with EC Directive

## Installation in enclosure

FX5UC CPU modules are open-type devices that must be installed and used within shielded conductive control boxes. Please use the PLCs while installed in conductive shielded control boxes. Please secure the control box lid to the control box (for conduction). Installation within a control box greatly improves the safety of the system and aids in shielding noise from the PLC.

## Caution for when analog products are used

It is recommended to perform the following when precision of measuring and control is required.

As analog devices are sensitive by nature, their use should be considered carefully. For users of proprietary cables (integral with sensors or actuators), these users should follow those manufacturers' installation requirements.

Mitsubishi Electric recommends that shielded cables be used. If no other EMC protection is provided, users may experience temporary loss of accuracy between +10%/-10% in very heavy industrial areas.

However, Mitsubishi Electric suggests that if adequate EMC precautions are followed with general good EMC practice for the user's complete control system, users should expect normal errors as specified in this manual.

 • Sensitive analog cables should not be laid in the same trunking or cable conduit as high voltage cabling. Where possible, users should run analog cables separately.
 • Good cable shielding should be used. When terminating the shield at Earth - ensure that no earth loops are accidentally created.
 • When reading analog values, EMC induced errors can be smoothed out by averaging the readings. This can be achieved either through functions on the analog special adapters/blocks or through a user's program in the FX5UC CPU module .

Perform the following when using the analog expansion adapter:

 • Installation in Enclosure
   Programmable controllers are open-type devices that must be installed and used within conductive control cabinets.
   Please use the programmable controller while installed within a conductive shielded control cabinet. Installation within a control cabinet greatly affects the safety of the system and aids in shielding noise from the programmable controller.

- Control cabinet
  - The control cabinet must be conductive.
  - Ground the control cabinet with the thickest possible grounding cable.
  - To ensure that there is electric contact between the control cabinet and its door, connect the cabinet and its doors with thick wires.
  - In order to suppress the leakage of radio waves, the control cabinet structure must have minimal openings. Also, wrap the cable holes with a shielding cover or other shielding devices.
  - The gap between the control cabinet and its door must be as small as possible by attaching EMI gaskets between them.
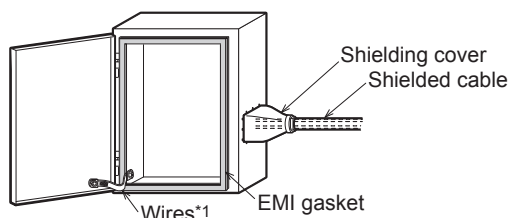


*1    These wires are used to improve the conductivity between the door and control cabinet.

- Cables
  - Make sure to use shielded cables as cables pulled out of the control cabinet.
  - Connect the shield such as shielded cables and shielding covers to the grounded control cabinet.
- It is possible that the accuracy temporarily fluctuates within ±10 %.

Perform the following when using the FX5-4AD-ADP:

- Set the number of times of winding to "2 turns" within approximately 200 mm (7.87") from terminal block of the analog cable on the FX5-4AD-ADP side, and attach a ferrite core. (Ferrite core used in our test: E04SR401938 manufactured by SEIWA ELECTRIC MFG. CO., LTD.)

Perform the following when using the FX5-4DA-ADP:

- Set the number of times of winding to "2 turns" within approximately 200 mm (7.87") from the connectors of the power cable on the FX5-4DA-ADP side, and attach a ferrite core. (Ferrite core used in our test: E04SR401938 manufactured by SEIWA ELECTRIC MFG. CO., LTD.)
- The FX5-4DA-ADP requires that the cable used for power supply is 30 m (9'85") or less.

## Caution for when the built-in Ethernet port is used

- Use a shielded twisted pair cable for the 10BASE-T or 100BASE-TX cable. Strip a part of the jacket of a shielded twisted pair cable as shown below, and ground as much of the exposed shield as possible to both sides of the cables.
- Connect a ferrite core to both ends of the cable. (Ferrite core used in tests by Mitsubishi: ZCAT2035-0930A manufactured by TDK Co.)
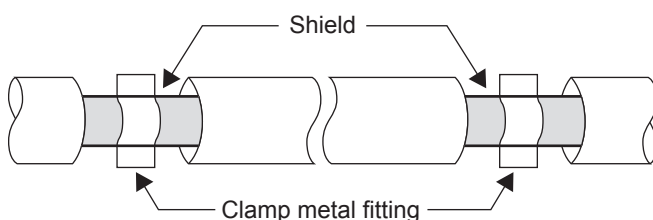
# Appendix 3  I/O Module

## Product configuration

There are various types of I/O modules. They differ in supply voltage, number of input/output points, input form, output form, and connection type.

| I/O module | | | | |
|---|---|---|---|---|
| Power supply | Number of input/output points | Input type | Output type | Connection type |
| PLC internal power | 8 | 24 V DC (sink) | Relay | Connector |
| | 16 | 24 V DC (sink/source) | Transistor (sink) | Terminal block |
| | 32 | | Transistor (source) | |
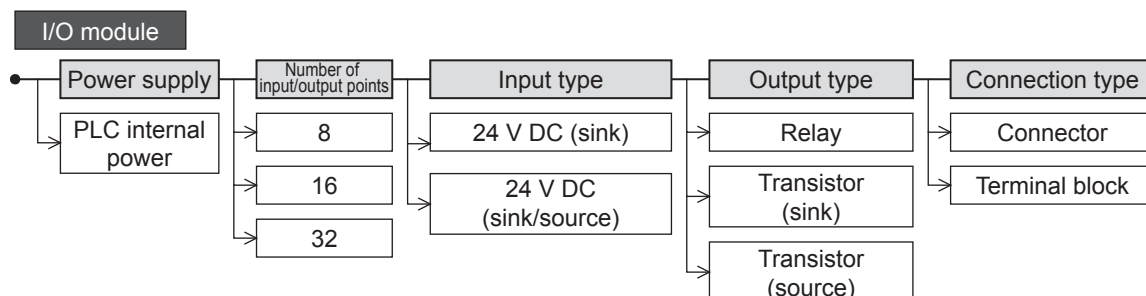
## Product list

### Input module

Sink : Sink, Source : Source

#### ■Extension connector type

| Model | Input | | | Output | | | Connection type |
|---|---|---|---|---|---|---|---|
| | Type | No. of points | Common wiring system | Type | No. of points | Common wiring system | |
| ■Input extension/sink input only | | | | | | | |
| FX5-C32EX/D | 24 V DC | 32 | Sink | — | — | — | Connector |
| ■Input extension/sink and source input type | | | | | | | |
| FX5-C32EX/DS | 24 V DC | 32 | Sink Source | — | — | — | Connector |

#### ■Extension cable type

| Model | Input | | | Output | | | Connection type |
|---|---|---|---|---|---|---|---|
| | Type | No. of points | Common wiring system | Type | No. of points | Common wiring system | |
| ■Input extension/sink and source input type | | | | | | | |
| FX5-8EX/ES | 24 V DC | 8 | Sink Source | — | — | — | Terminal block |
| FX5-16EX/ES | 24 V DC | 16 | Sink Source | — | — | — | Terminal block |

### Output module

Sink : Sink, Source : Source

#### ■Extension connector type

| Model | Input | | | Output | | | Connection type |
|---|---|---|---|---|---|---|---|
| | Type | No. of points | Common wiring system | Type | No. of points | Common wiring system | |
| ■Output extension/sink output only | | | | | | | |
| FX5-C32EYT/D | — | — | — | Transistor | 32 | Sink | Connector |
| ■Output extension/source output only | | | | | | | |
| FX5-C32EYT/DSS | — | — | — | Transistor | 32 | Source | Connector |

## ■Extension cable type

| Model | Input | | | Output | | | Connection type |
|---|---|---|---|---|---|---|---|
| | Type | No. of points | Common wiring system | Type | No. of points | Common wiring system | |
| ■Output extension/relay output type | | | | | | | |
| FX5-8EYR/ES | — | — | — | Relay | 8 | — | Terminal block |
| FX5-16EYR/ES | — | — | — | Relay | 16 | — | Terminal block |
| ■Output extension/sink output only | | | | | | | |
| FX5-8EYT/ES | — | — | — | Transistor | 8 | Sink | Terminal block |
| FX5-16EYT/ES | — | — | — | Transistor | 16 | Sink | Terminal block |
| ■Output extension/source output only | | | | | | | |
| FX5-8EYT/ESS | — | — | — | Transistor | 8 | Source | Terminal block |
| FX5-16EYT/ESS | — | — | — | Transistor | 16 | Source | Terminal block |

## Input/output module

Sink : Sink, Source : Source

| Model | Input | | | Output | | | Connection type |
|---|---|---|---|---|---|---|---|
| | Type | No. of points | Common wiring system | Type | No. of points | Common wiring system | |
| ■Input/output extension/sink input/output only | | | | | | | |
| FX5-C32ET/D | 24 V DC | 16 | Sink | Transistor | 16 | Sink | Connector |
| ■Input/output extension/sink and source input/source output only | | | | | | | |
| FX5-C32ET/DSS | 24 V DC | 16 | Sink Source | Transistor | 16 | Source | Connector |

# Specifications

The general specifications are the same as those for the CPU module. ( ☞ Page 17 Generic Specifications)

## Power Supply Specifications

### ■Input module

| Item | | Specifications |
|---|---|---|
| Voltage rating | FX5-C32EX/□ | 5 V DC (supplied from PLC) |
| | FX5-8EX/ES, FX5-16EX/ES | 24 V DC (supplied from external power supply) 5 V DC (supplied from PLC) |
| Current consumption (5 V DC) | FX5-C32EX/□ | 120 mA |
| | FX5-8EX/ES | 75 mA |
| | FX5-16EX/ES | 100 mA |
| Current consumption (24 V DC) | FX5-8EX/ES | (50 mA)[*1] |
| | FX5-16EX/ES | (85 mA)[*1] |

*1   Since external power supply is used for input circuit in FX5UC CPU module systems, power supply from CPU module is not included.

### ■Output module

| Item | | Specifications |
|---|---|---|
| Voltage rating | | 24 V DC (supplied from PLC) 5 V DC (supplied from PLC) |
| Current consumption (5 V DC) | FX5-C32EY□ | 120 mA |
| | FX5-8EY□ | 75 mA |
| | FX5-16EY□ | 100 mA |
| Current consumption (24 V DC) | FX5-C32EY□ | 200 mA |
| | FX5-8EY□ | 75 mA |
| | FX5-16EY□ | 125 mA |

### ■Input/output module

| Item | | Specifications |
|---|---|---|
| Voltage rating | Input connector | 5 V DC (supplied from PLC) |
| | Output connector | 24 V DC (supplied from PLC)<br>5 V DC (supplied from PLC) |
| Current consumption (5 V DC) | | 120 mA |
| Current consumption (24 V DC) | | 100 mA |

## Exterior color, weight, accessories

### ■Input module, Output module
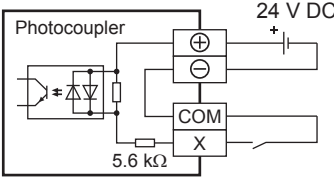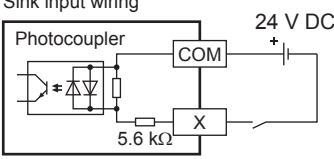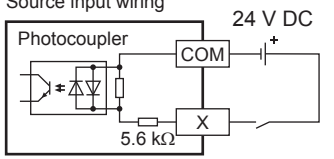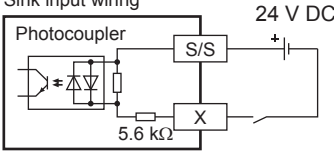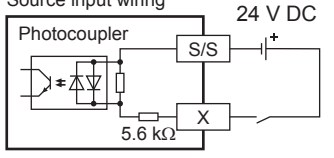
| Item | | Specifications |
|---|---|---|
| Exterior color | | Munsell 0.6B7.6/0.2 |
| Mass (weight) | FX5-C32EX/□<br>FX5-C32EYT/□ | Approx. 0.15 kg (0.33 lbs) |
| | FX5-8E□ | Approx. 0.2 kg (0.44 lbs) |
| | FX5-16E□ | Approx. 0.25 kg (0.55 lbs) |
| Accessories | FX5-C32EX/D | FX2NC-10BPCB1 |
| | FX5-8E□ | Dust proof protection sheet |
| | FX5-16E□ | |

### ■Input/output module

| Item | | Specifications |
|---|---|---|
| Exterior color | | Munsell 0.6B7.6/0.2 |
| Mass (weight) | | Approx. 0.15 kg (0.33 lbs) |
| Accessories | FX5-C32ET/D | FX2NC-10BPCB1 |

# Input specifications
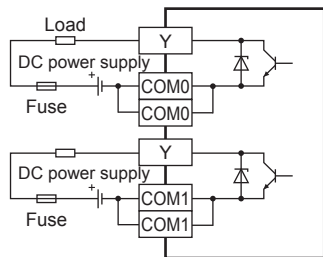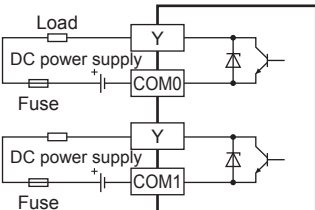
There is the simultaneous ON ratio of available PLC inputs or outputs with respect to the ambient temperature. For details, refer to ☞ Page 20 Input/Output Derating Curve.

| Item | | Specifications |
|---|---|---|
| No. of input points | FX5-C32EX□ | 32 points |
| | FX5-C32ET□ | 16 points |
| | FX5-8EX/ES | 8 points |
| | FX5-16EX/ES | 16 points |
| Connection type | FX5-C32EX□ | Connector |
| | FX5-C32ET□ | |
| | FX5-8EX/ES | Terminal block (M3 screws) |
| | FX5-16EX/ES | |
| Input type | FX5-C32EX/D, FX5-C32ET/D | Sink |
| | FX5-C32EX/DS, FX5-C32ET/DSS, FX5-8EX/ES, FX5-16EX/ES | Sink/source |
| Input signal voltage | | 24 V DC +20%, -15% |
| Input signal current | | 4 mA/24 V DC |
| Input impedance | | 5.6 kΩ |
| Input sensitivity current | ON | 3.0 mA or more |
| | OFF | 1.5 mA or less |
| Input response time | | ON: 50 μs or less<br>OFF: 150 μs or less |
| Input signal format | | No-voltage contact input<br>Sink: NPN open collector transistor<br>Source: PNP open collector transistor |
| Input circuit insulation | | Photo-coupler insulation |
| Indication of input operation | | LED is lit when input is on |
| Input circuit configuration | FX5-C32EX/D, FX5-C32ET/D |  |
| | FX5-C32EX/DS, FX5-C32ET/DSS |  |
| | FX5-8EX/ES, FX5-16EX/ES |  |
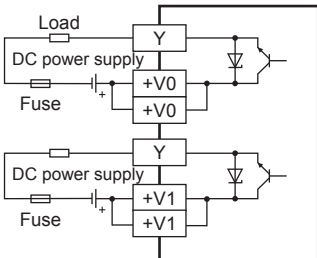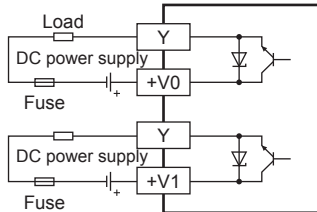
## Output specifications

There is the simultaneous ON ratio of available PLC inputs or outputs with respect to the ambient temperature. For details, refer to ☞ Page 20 Input/Output Derating Curve.

### ■Transistor output (sink output)

| Item | | Specifications |
|---|---|---|
| No. of output points | FX5-C32EYT/D | 32 points |
| | FX5-C32ET/D | 16 points |
| | FX5-8EYT/ES | 8 points |
| | FX5-16EYT/ES | 16 points |
| Connection type | FX5-C32EYT/D | Connector |
| | FX5-C32ET/D | |
| | FX5-8EYT/ES | Terminal block (M3 screws) |
| | FX5-16EYT/ES | |
| Output type | | Transistor/sink output |
| External power supply | | 5 to 30 V DC |
| Output circuit insulation | | Photo-coupler insulation |
| Indication of output operation | | LED is lit when output is on (Display of smaller and larger numbers can be switched by setting the DISP switch in F or L.) |
| Max. load | FX5-C32EYT/D | 0.1 A/point
The total load current of resistance loads per common terminal should be the following value.
 • 8 output points/common terminal: 0.8 A or less |
| | FX5-C32ET/D | |
| | FX5-8EYT/ES | 0.5 A/point
The total load current of resistance loads per common terminal should be the following value.
 • 4 output points/common terminal: 0.8 A or less
 • 8 output points/common terminal: 1.6 A or less |
| | FX5-16EYT/ES | |
| Open circuit leakage current | | 0.1 mA/30 V DC |
| Min. load | | — |
| Response time | OFF→ON | FX5-C32EYT/D, FX5-C32ET/D | 0.2 ms or less/100 mA (at 24 V DC) |
| | | FX5-8EYT/ES, FX5-16EYT/ES | 0.2 ms or less/200 mA (at 24 V DC) |
| | ON→OFF | FX5-C32EYT/D, FX5-C32ET/D | 0.2 ms or less/100 mA (at 24 V DC) |
| | | FX5-8EYT/ES, FX5-16EYT/ES | 0.2 ms or less/200 mA (at 24 V DC) |
| Voltage drop when ON | | 1.5 V or less |
| Output circuit configuration | FX5-C32EYT/D, FX5-C32ET/D | |
| | FX5-8EYT/ES, FX5-16EYT/ES | |

## ■Transistor output (source output)

| Item | | | Specifications |
|---|---|---|---|
| No. of output points | FX5-C32EYT/DSS | | 32 points |
| | FX5-C32ET/DSS | | 16 points |
| | FX5-8EYT/ESS | | 8 points |
| | FX5-16EYT/ESS | | 16 points |
| Connection type | FX5-C32EYT/DSS | | Connector |
| | FX5-C32ET/DSS | | |
| | FX5-8EYT/ESS | | Terminal block (M3 screws) |
| | FX5-16EYT/ESS | | |
| Output type | | | Transistor/source output |
| External power supply | | | 5 to 30 V DC |
| Output circuit insulation | | | Photo-coupler insulation |
| Indication of output operation | | | LED is lit when output is on (Display of smaller and larger numbers can be switched by setting the DISP switch in F or L.) |
| Max. load | FX5-C32EYT/DSS | | 0.1 A/point<br>The total load current of resistance loads per common terminal should be the following value.<br> • 8 output points/common terminal: 0.8 A or less |
| | FX5-C32ET/DSS | | |
| | FX5-8EYT/ESS | | 0.5 A/point<br>The total load current of resistance loads per common terminal should be the following value.<br> • 4 output points/common terminal: 0.8 A or less<br> • 8 output points/common terminal: 1.6 A or less |
| | FX5-16EYT/ESS | | |
| Open circuit leakage current | | | 0.1 mA/30 V DC |
| Min. load | | | — |
| Response time | OFF→ON | FX5-C32EYT/DSS, FX5-C32ET/DSS | 0.2 ms or less/100 mA (at 24 V DC) |
| | | FX5-8EYT/ESS, FX5-16EYT/ESS | 0.2 ms or less/200 mA (at 24 V DC) |
| | ON→OFF | FX5-C32EYT/DSS, FX5-C32ET/DSS | 0.2 ms or less/100 mA (at 24 V DC) |
| | | FX5-8EYT/ESS, FX5-16EYT/ESS | 0.2 ms or less/200 mA (at 24 V DC) |
| Voltage drop when ON | | | 1.5 V or less |
| Output circuit configuration | FX5-C32EYT/DSS, FX5-C32ET/DSS | |  |
| | FX5-8EYT/ESS, FX5-16EYT/ESS | |  |

## ■Relay output

| Item | | Specifications |
|---|---|---|
| No. of output points | FX5-8EYR/ES | 8 points |
| | FX5-16EYR/ES | 16 points |
| Connection type | | Terminal block (M3 screws) |
| Output type | | Relay |
| External power supply | | 30 V DC or less<br>240 V AC or less<br>(250 V AC or less when the module does not comply with CE, UL, or cUL standards) |
| Output circuit insulation | | Mechanical insulation |
| Indication of output operation | | LED is lit when output is on |
| Max. load | | 2 A/point<br>The total load current of resistance loads per common terminal should be the following value.<br> • 4 output points/common terminal: 8 A or less<br> • 8 output points/common terminal: 8 A or less |
| Open circuit leakage current | | — |
| Min. load | | 5 V DC, 2 mA (reference values) |
| Response time | OFF→ON | Approx. 10 ms |
| | ON→OFF | Approx. 10 ms |
| Output circuit configuration | |  |

# External dimensions and component names

## Input module, Output module

### ■Extension connector type



Unit: mm (inches)
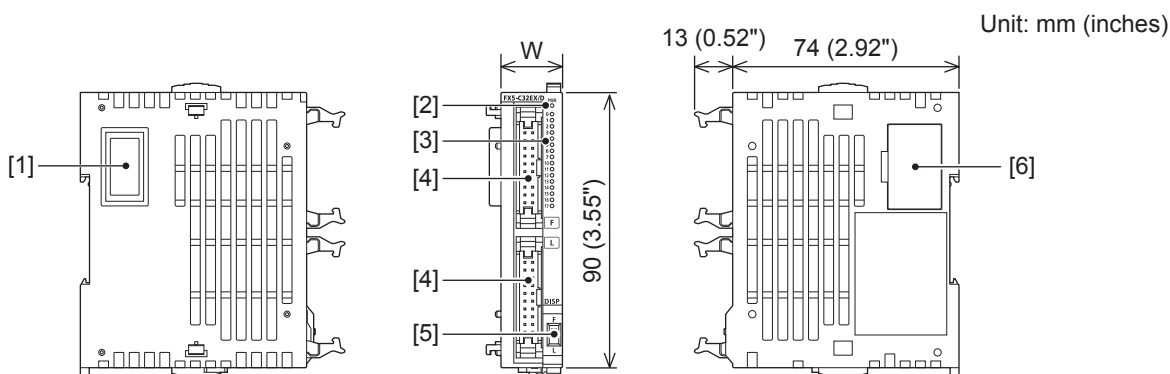
External dimensions

| Model | W: mm (inches) |
|---|---|
| FX5-C32EX/D, FX5-C32EX/DS | 20.1 (0.8") |
| FX5-C32EYT/D, FX5-C32EYT/DSS | |

Part names

| No. | Name | Description |
|---|---|---|
| [1] | Extension connector | Connector connected to extend modules |
| [2] | PWR LED | Indicates whether the input modules/output modules is powered or not. Lit: Powered Off: Not powered or hardware error |
| [3] | I/O display LED | Lit when input or output is on. |
| [4] | I/O connectors | Connector for connecting input signal cables or output signal cables |
| [5] | DISP switch | Switches the display of smaller and larger numbers of the input display LED or output display LED. Smaller number: F Larger number: L |
| [6] | Extension connector | Connector for connecting the extension connector of an extension module |

### ■Extension cable type



Unit: mm (inches)
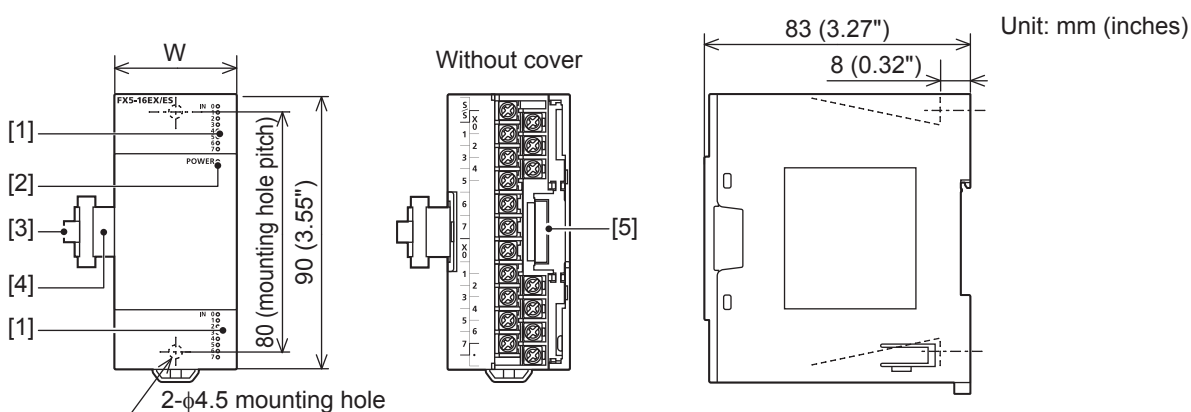
External dimensions

| Model | W: mm (inches) |
|---|---|
| FX5-8EX/ES | 40 (1.58") |
| FX5-8EYR/ES, FX5-8EYT/ES, FX5-8EYT/ESS | |
| FX5-16EX/ES | |
| FX5-16EYR/ES, FX5-16EYT/ES, FX5-16EYT/ESS | |

Part names

| No. | Name | Description |
|-----|------|-------------|
| [1] | Input display LED, output display LED | Lit when input or output is on. |
| [2] | POWER LED | Indicates whether the input modules/output modules are powered or not.<br>Lit: Powered<br>Off: Not powered or hardware error |
| [3] | Pullout tab | Tab for pulling out an extension cable. |
| [4] | Extension cable | Cable connected to extend modules. |
| [5] | Extension connector | Connector for connecting the extension cable of an extension module |

## Input/output module

Unit: mm (inches)
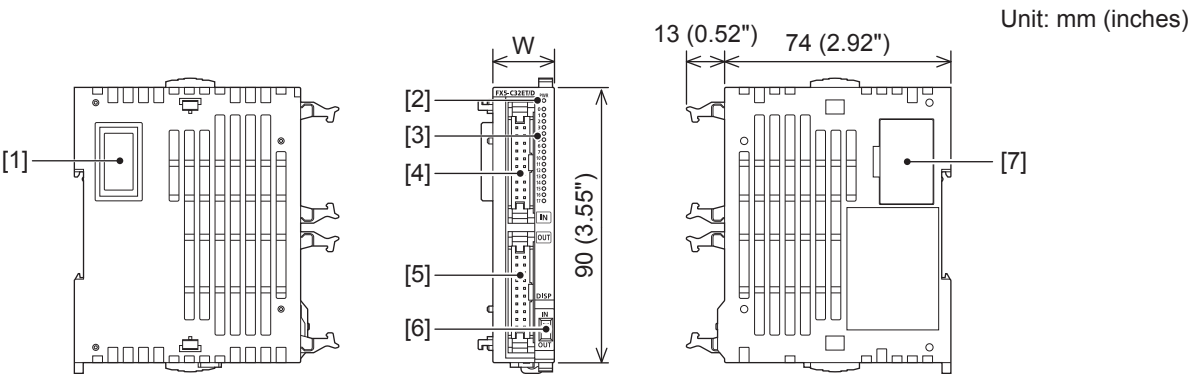


External dimensions

| Model | W: mm (inches) |
|-------|----------------|
| FX5-C32ET/D, FX5-C32ET/DSS | 20.1 (0.8") |

Part names

| No. | Name | Description |
|-----|------|-------------|
| [1] | Extension connector | Connector connected to extend modules |
| [2] | PWR LED | Indicates whether the input/output modules are powered or not.<br>Lit: Powered<br>Off: Not powered or hardware error |
| [3] | I/O display LED | Lit when input or output is on. |
| [4] | Input connector | Connector for connecting input signal cables. |
| [5] | Output connector | Connector for connecting output signal cables. |
| [6] | DISP switch | Switches input/output of the I/O display LED.<br>Input: IN<br>Output: OUT |
| [7] | Extension connector | Connector for connecting the extension connector of an extension module |

# Terminal layout

## Extension connector type

**FX5-C32EX/D**

Smaller numbers

| Input | |
|---|---|
| X0 | X0 |
| X1 | X1 |
| X2 | X2 |
| X3 | X3 |
| X4 | X4 |
| X5 | X5 |
| X6 | X6 |
| X7 | X7 |
| COM | COM |
| • | • |

Notch

Larger numbers

| Input | |
|---|---|
| X0 | X0 |
| X1 | X1 |
| X2 | X2 |
| X3 | X3 |
| X4 | X4 |
| X5 | X5 |
| X6 | X6 |
| X7 | X7 |
| COM | COM |
| • | • |

**FX5-C32EYT/D**

Smaller numbers

| Output | |
|---|---|
| Y0 | Y0 |
| Y1 | Y1 |
| Y2 | Y2 |
| Y3 | Y3 |
| Y4 | Y4 |
| Y5 | Y5 |
| Y6 | Y6 |
| Y7 | Y7 |
| COM0 | COM0 |
| • | • |

Notch

Larger numbers

| Output | |
|---|---|
| Y0 | Y0 |
| Y1 | Y1 |
| Y2 | Y2 |
| Y3 | Y3 |
| Y4 | Y4 |
| Y5 | Y5 |
| Y6 | Y6 |
| Y7 | Y7 |
| COM1 | COM1 |
| • | • |

**FX5-C32ET/D**

| Input | |
|---|---|
| X0 | X0 |
| X1 | X1 |
| X2 | X2 |
| X3 | X3 |
| X4 | X4 |
| X5 | X5 |
| X6 | X6 |
| X7 | X7 |
| COM | COM |
| • | • |

Notch

| Output | |
|---|---|
| Y0 | Y0 |
| Y1 | Y1 |
| Y2 | Y2 |
| Y3 | Y3 |
| Y4 | Y4 |
| Y5 | Y5 |
| Y6 | Y6 |
| Y7 | Y7 |
| COM0 | COM0 |
| • | • |

**FX5-C32EX/DS**

Smaller numbers

| Input | |
|---|---|
| X0 | X0 |
| X1 | X1 |
| X2 | X2 |
| X3 | X3 |
| X4 | X4 |
| X5 | X5 |
| X6 | X6 |
| X7 | X7 |
| COM0 | COM0 |
| • | • |

Notch

Larger numbers

| Input | |
|---|---|
| X0 | X0 |
| X1 | X1 |
| X2 | X2 |
| X3 | X3 |
| X4 | X4 |
| X5 | X5 |
| X6 | X6 |
| X7 | X7 |
| COM1 | COM1 |
| • | • |

**FX5-C32EYT/DSS**

Smaller numbers

| Output | |
|---|---|
| Y0 | Y0 |
| Y1 | Y1 |
| Y2 | Y2 |
| Y3 | Y3 |
| Y4 | Y4 |
| Y5 | Y5 |
| Y6 | Y6 |
| Y7 | Y7 |
| +V0 | +V0 |
| • | • |

Notch

Larger numbers

| Output | |
|---|---|
| Y0 | Y0 |
| Y1 | Y1 |
| Y2 | Y2 |
| Y3 | Y3 |
| Y4 | Y4 |
| Y5 | Y5 |
| Y6 | Y6 |
| Y7 | Y7 |
| +V1 | +V1 |
| • | • |

**FX5-C32ET/DSS**

| Input | |
|---|---|
| X0 | X0 |
| X1 | X1 |
| X2 | X2 |
| X3 | X3 |
| X4 | X4 |
| X5 | X5 |
| X6 | X6 |
| X7 | X7 |
| COM0 | COM0 |
| • | • |

Notch

| Output | |
|---|---|
| Y0 | Y0 |
| Y1 | Y1 |
| Y2 | Y2 |
| Y3 | Y3 |
| Y4 | Y4 |
| Y5 | Y5 |
| Y6 | Y6 |
| Y7 | Y7 |
| +V0 | +V0 |
| • | • |

## Extension cable type

**FX5-8EX/ES**

| S/S | |
|---|---|
| X0 | 1 |
| 2 | 3 |

| X4 | . |
| 6 | 5 |
| | 7 |

**FX5-8EYR/ES**
**FX5-8EYT/ES**

| Y0 | COM0 |
|---|---|
| | 1 |
| 2 | 3 |

| Y4 | COM1 |
| | 5 |
| 6 | 7 |

**FX5-8EYT/ESS**

| Y0 | +V0 |
|---|---|
| | 1 |
| 2 | 3 |

| Y4 | +V1 |
| | 5 |
| 6 | 7 |

**FX5-16EX/ES**

| S/S | X0 |
|---|---|
| 1 | 2 |
| 3 | 4 |
| 5 | |
| 6 | |
| 7 | |
| X0 | |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | . |

Smaller numbers

Larger numbers

**FX5-16EYR/ES**
**FX5-16EYT/ES**

| COM0 | Y0 |
|---|---|
| 1 | 2 |
| 3 | 4 |
| 5 | |
| 6 | |
| 7 | |
| Y0 | |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | COM1 |

Smaller numbers

Larger numbers

**FX5-16EYT/ESS**

| +V0 | Y0 |
|---|---|
| 1 | 2 |
| 3 | 4 |
| 5 | |
| 6 | |
| 7 | |
| Y0 | |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | +V1 |

Smaller numbers
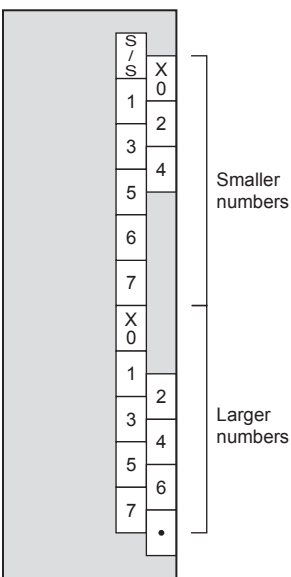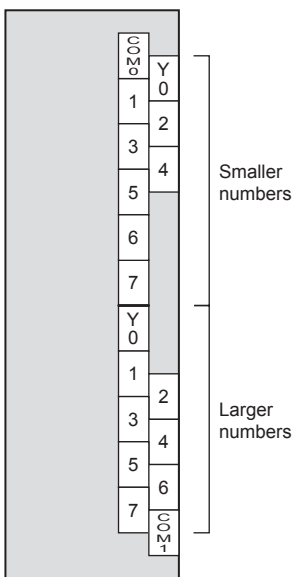
Larger numbers
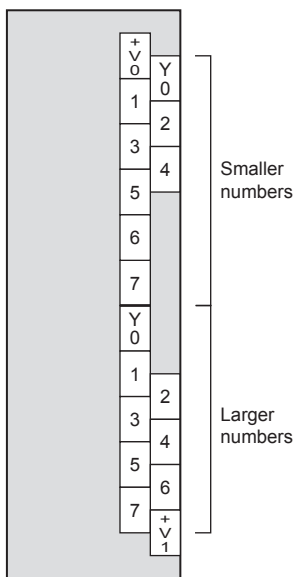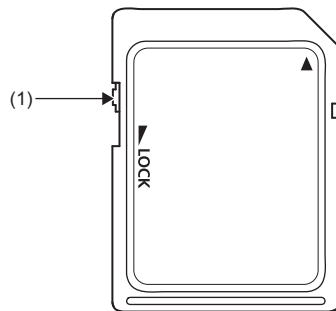
# Appendix 4  SD Memory Card

## Part names

An SD memory card is installed in the CPU module to operate the module based on the project data in the card.



| No. | Name | Description |
|-----|------|-------------|
| (1) | Write protect switch | Setting the switch in the lock position prevents the data in the SD memory card from being deleted and overwritten. |

## Specifications

The following shows functional specifications of the SD memory card.

| Item | | NZ1MEM-2GBSD | NZ1MEM-4GBSD |
|------|------|--------------|--------------|
| Type | | SD memory card | SDHC memory card |
| Capacity | | 2 Gbytes | 4 Gbytes |
| Number of writes | | 60,000 times | 100,000 times |
| External dimensions | Height | 32 mm (1.25") | |
| | Width | 24 mm (0.94") | |
| | Depth | 2.1 mm (0.08") | |
| Mass (weight) | | 2 g | |

> **Point**
>
> For L1MEM-2GBSD and L1MEM-4GBSD, refer to the following.
> (📖QCPU User's Manual(Hardware Design, Maintenance and Inspection)

## Handling of the SD memory card

- Operational compatibility of the SD memory cards manufactured by Mitsubishi (NZ1MEM-2GBSD and NZ1MEM-4GBSD) with MELSEC iQ-F series CPU modules has been checked. Use of SD memory card other than a Mitsubishi SD memory card may result in loss of the data stored in the SD memory card, or problems such as system stop.
- When mounted in the CPU module, SD memory cards manufactured by Mitsubishi are compliant with IEC61131-2.
- The SDHC memory card can be used only with devices with an SDHC logo or whose user's manual lists an SDHC logo. Note that SDHC cards cannot be used with devices that support only "SD" specifications.
- Turning off or resetting the CPU module or removing the SD memory card while the card is being accessed may corrupt the data in the SD memory card. Always turn off or reset the CPU module or remove the SD memory card after disabling access to the SD memory card. With SM606 (SD memory card forced disable instruction) and SM607 (SD memory card forced disable status flag), the SD memory card can be disabled and its usage status can be checked.
- It is recommended that important data be periodically backed up to CD, DVD, or other media.

## Formatting

To use any SD memory card in the CPU module, the card must be formatted. In the initial state after purchase, the SD memory card is not formatted. Insert the SD memory card to a CPU module and format the SD memory card using the engineering tool before use. Do not format the SD memory card using the personal computer. (📖GX Works3 Operating Manual)

# Insertion and removal of the SD memory card

The following explains insertion and removal of the SD memory card.

## Insertion procedure

Mount the SD memory card. Pay attention to the direction of the card and follow the procedure below.
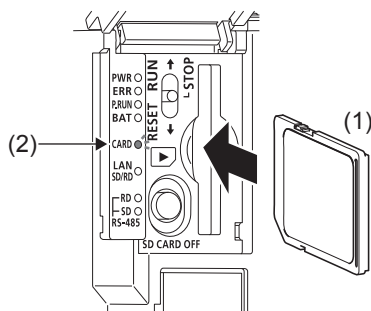
*1.* Insert the SD memory card (1) straight into the SD memory card slot. Make sure that the notch of the card is directed downward. After mounting, check that the card is mounted completely. If the card is mounted incompletely, malfunctions may occur because of poor contact.

*2.* The CARD LED (2) blinks until the SD memory card becomes available.

*3.* The CARD LED turns on when the SD memory card is available.

*4.* If the CARD LED dose not turn on even though the SD memory card is mounted, make sure that SM606 (forcibly stop using SD memory card instruction) and SM607 (forcibly stop using SD memory card flag) are OFF by using engineering tools.

## Removal procedure
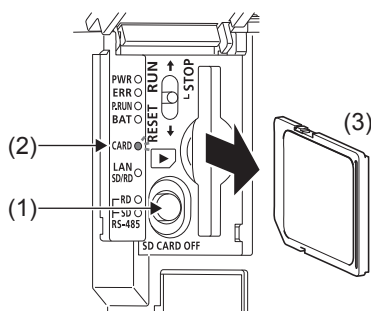
*1.* Press the SD memory card stop switch (1) for one second or more to stop access to the card. The CARD READY LED (2) blinks during the access stop operation, and then the LED is turned OFF when the operation is completed.

*2.* Insert the SD memory card (3) once, and then pull it straight.

### Precautions

• When mounting or removing the SD memory card while the power is ON, follow the above-mentioned procedure. Otherwise, the data in the card may be broken.

• When removing the SD memory card which is being accessed by any function, the CARD LED is turned OFF after the access is completed. When the CARD LED is turned OFF depends on the accessing function.

• When SM605 (mount and remove memory card disabling flag) is ON, the CARD LED is not turned OFF even if the SD memory card stop switch is pressed. If the CARD LED is not turned OFF, turn ON SM606 (instruction of forcibly stop using SD memory card) so that the SD memory card cannot be used.

# Appendix 5  Terminal Module

A

## Product configuration

Terminal modules are used to convert connector-type I/O terminals into terminal blocks. By using terminal blocks (built-in element type) dedicated to input or output, capturing of AC input signals and format conversion into the relay/transistor/triac output can be performed.



Option cable or user-created cable

Terminal module
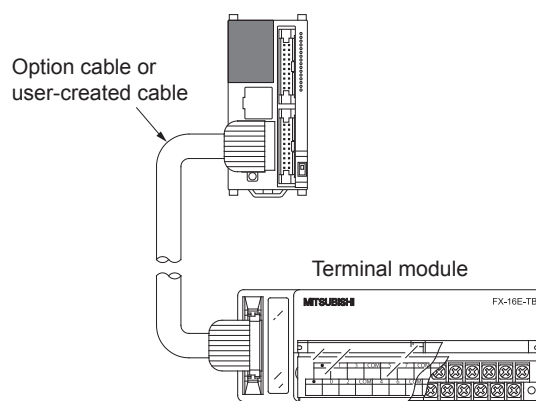
## Product list

### Sink input/sink output (transistor output)

| Model | No. of input points | No. of output points | Function | Connection destination | Driving current |
|---|---|---|---|---|---|
| ■Sink input/sink output (transistor output) | | | | | |
| FX-16E-TB | 16 input points or 16 output points | | Directly connected to I/O terminals of a PLC. | FX5UC-32MT/D, FX5-C32EX/D, FX5-C32EYT/D, FX5-C32ET/D | Refer to the following table. |
| FX-32E-TB | 32 input points, 32 output points, or 16 input points and 16 output points | | | | |
| FX-16EX-A1-TB | 16 | — | 100 V AC input type | FX5UC-32MT/D, FX5-C32EX/D, FX5-C32ET/D | 24 V DC 48 mA |
| FX-16EYR-TB | — | 16 | Relay output type | FX5UC-32MT/D, FX5-C32EYT/D, FX5-C32ET/D | 24 V DC 80 mA |
| FX-16EYT-TB | — | 16 | Transistor output type (sink) | | 24 V DC 112 mA |
| FX-16EYS-TB | — | 16 | Triac output type | | |
| ■Sink and source common input/source output (transistor output) | | | | | |
| FX-16E-TB/UL | 16 input points or 16 output points | | Directly connected to I/O terminals of a PLC. | FX5UC-32MT/DSS, FX5-C32EX/DS, FX5-C32EYT/DSS, FX5-C32ET/DSS | Refer to the following table. |
| FX-32E-TB/UL | 32 input points, 32 output points, or 16 input points and 16 output points | | | | |
| FX-16EYR-ES-TB/UL | — | 16 | Relay output type | FX5UC-32MT/DSS, FX5-C32EYT/DSS, FX5-C32ET/DSS | 24 V DC 80 mA |
| FX-16EYT-ES-TB/UL | — | 16 | Transistor output type (sink) | | 24 V DC 112 mA |
| FX-16EYT-ESS-TB/UL | — | 16 | Transistor output type (source) | | |
| FX-16EYS-ES-TB/UL | — | 16 | Triac output type | | |

• The following table shows driving current of FX-16E-TB(/UL) and FX-32E-TB(/UL) that depends on the connection destination.

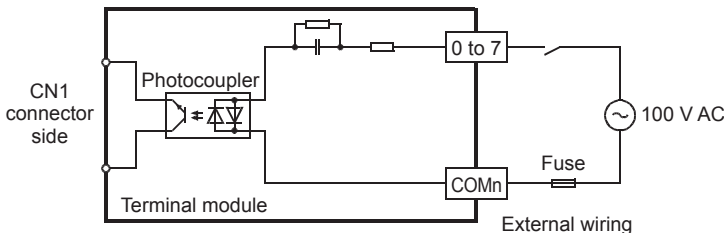| Connection destination | Power supply voltage | Current consumption |
|---|---|---|
| ■Input connector | | |
| FX5UC-32MT/D, FX5-C32EX/D, FX5-C32ET/D | Not required | |
| FX5UC-32MT/DSS, FX5-C32EX/DS, FX5-C32ET/DSS | 24 V DC | 112 mA/16 points |
| ■Output connector | | |
| FX5UC-32MT/D, FX5UC-32MT/DSS, FX5-C32EYT/D, FX5-C32EYT/DSS, FX5-C32ET/D, FX5-C32ET/DSS | The power supply appropriate to the connected load is required. | |

# Specifications

## Exterior color, accessories

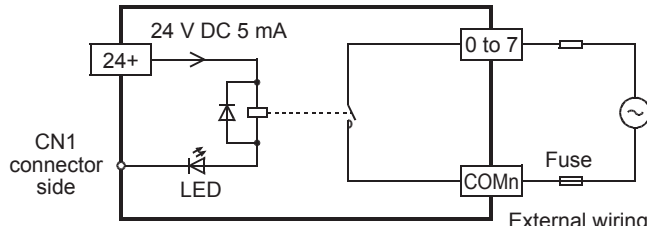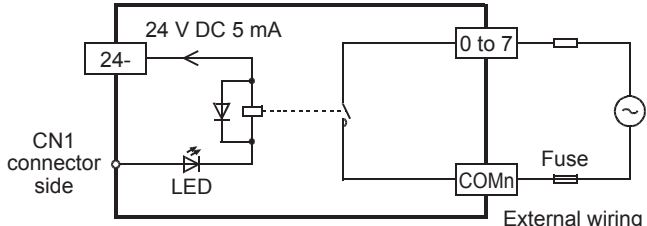| Item | Specifications |
|---|---|
| Exterior color | Munsell 0.08GY/7.64/0.81 |
| Accessories | Input/output number label, terminal block layout card |

## Input specifications

### ■FX-16EX-A1-TB

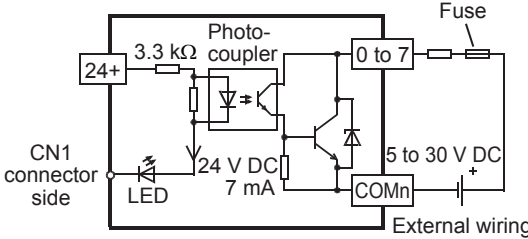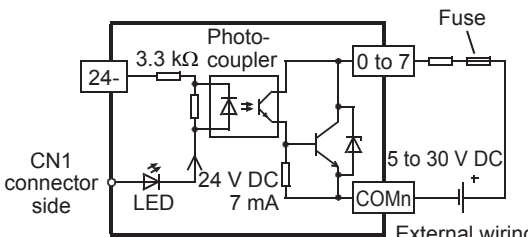| Item | | Specifications |
|---|---|---|
| Input type | | AC input |
| Input signal voltage | | 100 to 120 V AC +10% -15% 50/60 Hz |
| Input signal current | | 4.7 mA/100 V AC 50 Hz<br>6.2 mA/110 V AC 60 Hz |
| Input impedance | | Approx. 21 kΩ/50 Hz<br>Approx. 18 kΩ/60 Hz |
| Input sensitivity | ON | 3.8 mA/80 V AC or more |
| | OFF | 1.7 mA/30 V AC or less |
| Input response time[*1] | | 25 to 30 ms |
| Input signal format | | Voltage contact |
| Input circuit insulation | | Photo-coupler insulation |
| Indication of input operation | | No input LED (However, the 24 V power LED display exists.) |
| Power consumption | | 1.2 W (48 mA 24 V DC) |
| Input/output configuration circuit | |  |
| Unsupported applications | | High-speed counter, input interruption, pulse catch, Speed Detection ((D)SPD) instruction, Input Matrix (MTR) instruction, Digital Switch (DSW) instruction, ABS Current Value Read (DBS) instruction, high-speed I/O function start/stop ((D)HIOEN) instruction |

*1 The response delay time of the CPU module is not included.
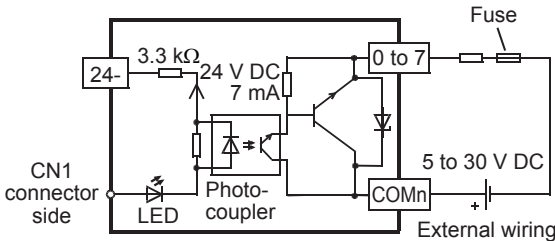
# Output specifications

## ■Relay output (FX-16EYR-TB, FX-16EYR-ES-TB/UL)

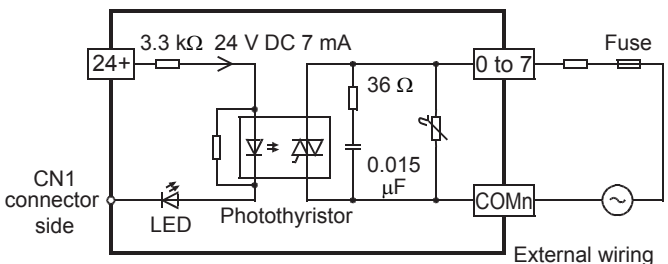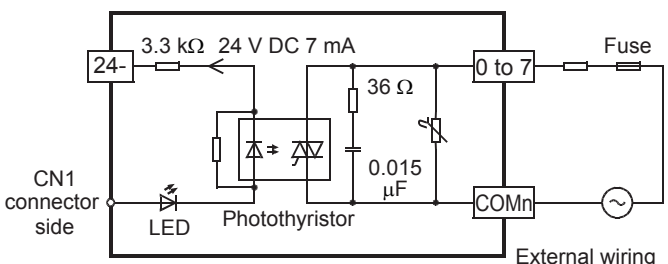| Item | | Specifications | |
|---|---|---|---|
| Output type | | Relay | |
| External voltage | | 250 V AC or less, 30 V DC or less | |
| Max. load | Resistance load | 2 A/point | The total load current per common terminals (four points) should be 8 A or less. |
| | Inductive load | 80 VA | |
| Min. load | | 5 V DC, 2 mA (reference values) | |
| Open circuit leakage current | | — | |
| Response time | | Approx. 10 ms | |
| ON voltage of output element | | 1.5 V | |
| Insulation of circuit | | Mechanical insulation | |
| Indication of output operation | | LED is lit when the power is supplied to relay coils. | |
| Power consumption | | 1.92 W (80 mA 24 V DC) | |
| Input/output configuration circuit | FX-16EYR-TB |  | |
| | FX-16EYR-ES-TB/UL |  | |
| Unsupported applications | | Positioning, Pulse Y Output ((D)PLSY) instruction, Pulse Width Modulation ((D)PWM) instruction, ABS Current Value Read (DABS) instruction, Start/stop of high-speed I/O function ((D)HIOEN) instruction, Input Matrix (MTR) instruction, Digital Switch (DSW) instruction, Seven Segment With Latch (SEGL) instruction | |

## ■Transistor/sink output (FX-16EYT-TB, FX-16EYT-ES-TB/UL)

| Item | | Specifications | |
|---|---|---|---|
| Output type | | Transistor/sink output | |
| External voltage | | 5 to 30 V DC | |
| Max. load | Resistance load | 0.5 A/point | The total load current per common terminals (four points) should be 0.8 A or less. |
| | Inductive load | 12 W/24 V DC | |
| Min. load | | — | |
| Open circuit leakage current | | 0.1 mA/30 V DC | |
| Response time | | OFF→ON | 0.2 ms or less/24 V DC |
| | | ON→OFF | 1.5 ms or less/24 V DC |
| ON voltage of output element | | 1.5 V | |
| Insulation of circuit | | Photo-coupler insulation | |
| Indication of output operation | | LED is lit when the power is supplied to photo-couplers. | |
| Power consumption | | 2.7 W (112 mA 24 V DC) | |
| Input/output configuration circuit | FX-16EYT-TB |  | |
| | FX-16EYT-ES-TB/UL |  | |
| Unsupported applications | | Positioning, Pulse Y Output ((D)PLSY) instruction, Pulse Width Modulation ((D)PWM) instruction, ABS Current Value Read (DABS) instruction, Start/stop of high-speed I/O function ((D)HIOEN) instruction, Input Matrix (MTR) instruction, Digital Switch (DSW) instruction, Seven Segment With Latch (SEGL) instruction | |

## ■Transistor/source output (FX-16EYT-ESS-TB/UL)

| Item | | Specifications | |
|---|---|---|---|
| Output type | | Transistor/source output | |
| External voltage | | 5 to 30 V DC | |
| Max. load | Resistance load | 0.5 A/point | The total load current per common terminals (four points) should be 0.8 A or less. |
| | Inductive load | 12 W/24 V DC | |
| Min. load | | — | |
| Open circuit leakage current | | 0.1 mA/30 V DC | |
| Response time | | OFF→ON | 0.2 ms or less/24 V DC |
| | | ON→OFF | 1.5 ms or less/24 V DC |
| ON voltage of output element | | 1.5 V | |
| Insulation of circuit | | Photo-coupler insulation | |
| Indication of output operation | | LED is lit when the power is supplied to photo-couplers. | |
| Power consumption | | 2.7 W (112 mA 24 V DC) | |
| Input/output configuration circuit | |  | |
| Unsupported applications | | Positioning, Pulse Y Output ((D)PLSY) instruction, Pulse Width Modulation ((D)PWM) instruction, ABS Current Value Read (DABS) instruction, Start/stop of high-speed I/O function ((D)HIOEN) instruction, Input Matrix (MTR) instruction, Digital Switch (DSW) instruction, Seven Segment With Latch (SEGL) instruction | |

## ■Triac output (FX-16EYS-TB, FX-16EYS-ES-TB/UL)

| Item | | Specifications | |
|---|---|---|---|
| Output type | | Triac (SSR) | |
| External voltage | | 85 to 242 V AC | |
| Max. load | Resistance load | 0.3 A/point | The total load current per common terminals (four points) should be 0.8 A or less. |
| | Inductive load | 15 VA/100 V AC<br>36 VA/200 V AC | |
| Min. load | | 0.4 VA/100 V AC<br>1.6 VA/200 V AC | |
| Open circuit leakage current | | 1 mA/100 V AC<br>2 mA/200 V AC | |
| Response time | | 2 ms or less | |
| ON voltage of output element | | — | |
| Insulation of circuit | | Photo-coupler insulation | |
| Indication of output operation | | LED is lit when the power is supplied to photo-thyristors. | |
| Power consumption | | 2.7 W (112 mA 24 V DC) | |
| Input/output configuration circuit | FX-16EYS-TB |  | |
| | FX-16EYS-ES-TB/UL |  | |
| Unsupported applications | | Positioning, Pulse Y Output ((D)PLSY) instruction, Pulse Width Modulation ((D)PWM) instruction, ABS Current Value Read (DABS) instruction, Start/stop of high-speed I/O function ((D)HIOEN) instruction, Input Matrix (MTR) instruction, Digital Switch (DSW) instruction, Seven Segment With Latch (SEGL) instruction | |

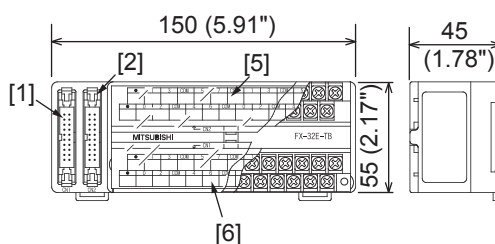# External dimensions and component names
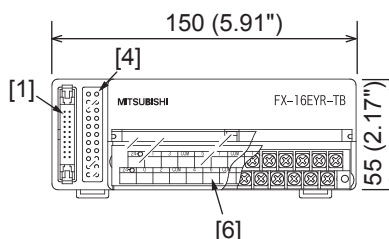
• FX-16E-TB, FX-16E-TB/UL
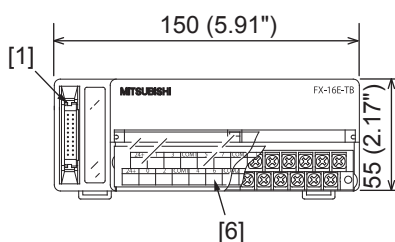


• FX-16EX-A1-TB
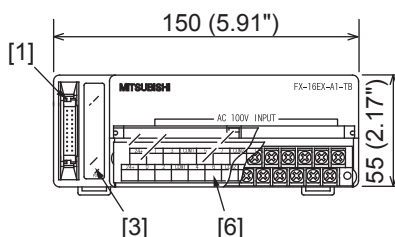


• FX-32E-TB, FX-32E-TB/UL



• FX-16EYR-TB, FX-16EYR-ES-TB/UL, FX-16EYT-TB, FX-16EYT-ES-TB/UL, FX-16EYT-ESS-TB/UL, FX-16EYS-TB, FX-16EYS-ES-TB/UL



Unit: mm (inches)

| No. | Name | Description |
|---|---|---|
| [1] | CN1 connector | Connector for connecting input signal cables or output signal cables for CN1 |
| [2] | CN2 connector | Connector for connecting input signal cables or output signal cables for CN2 (FX-32E-TB and FX-32E-TB/UL only) |
| [3] | POWER LED | Indicates the conduction status. (FX-16EX-A1-TB only) Lit: Powered Off: Not powered or hardware error |
| [4] | Operation display LED | Turns on when the output is on. (FX-16EYR-TB, FX-16EYR-ES-TB/UL, FX-16EYT-TB, FX-16EYT-ES-TB/UL, FX-16EYTESS-TB/UL, FX-16EYS-TB, and FX-16EYS-ES-TB/UL only) |
| [5] | Terminal block for CN2 (M3.5 screws) | Input/output terminals for CN2 (FX-32E-TB and FX-32E-TB/UL only) |
| [6] | Terminal block for CN1 (M3.5 screws) | Input/output terminals for CN1 |

# Terminal layout

• FX-16E-TB, FX-16E-TB/UL
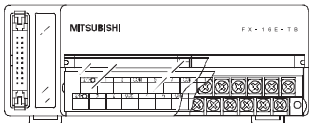


| | Smaller numbers | | | | | | Larger numbers | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| • | 1 | 3 | COM | 5 | 7 | COM | 1 | 3 | COM | 5 | 7 | COM |
| • | 0 | 2 | COM | 4 | 6 | COM | 0 | 2 | COM | 4 | 6 | COM |

• FX-32E-TB, FX-32E-TB/UL

| | | Smaller numbers | | | | | | Larger numbers | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CN2 | • | 1 | 3 | COM | 5 | 7 | COM | 1 | 3 | COM | 5 | 7 | COM |
| | • | 0 | 2 | COM | 4 | 6 | COM | 0 | 2 | COM | 4 | 6 | COM |

CN1  CN2
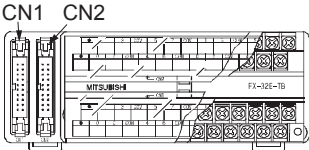


| | | Smaller numbers | | | | | | Larger numbers | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CN1 | • | 1 | 3 | COM | 5 | 7 | COM | 1 | 3 | COM | 5 | 7 | COM |
| | • | 0 | 2 | COM | 4 | 6 | COM | 0 | 2 | COM | 4 | 6 | COM |

• FX-16EX-A1-TB
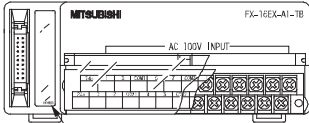


POWER

| | Smaller numbers | | | | | | Larger numbers | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24+ | 1 | 3 | COM1 | 5 | 7 | COM2 | 1 | 3 | COM3 | 5 | 7 | COM4 |
| 24- | 0 | 2 | COM1 | 4 | 6 | COM2 | 0 | 2 | COM3 | 4 | 6 | COM4 |

• FX-16EYR-TB, FX-16EYR-ES-TB/UL, FX-16EYT-TB, FX-16EYT-ES-TB/UL, FX-16EYT-ESS-TB/UL, FX-16EYS-TB, FX-16EYS-ES-TB/UL
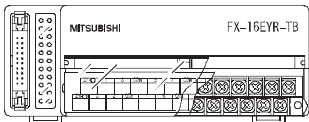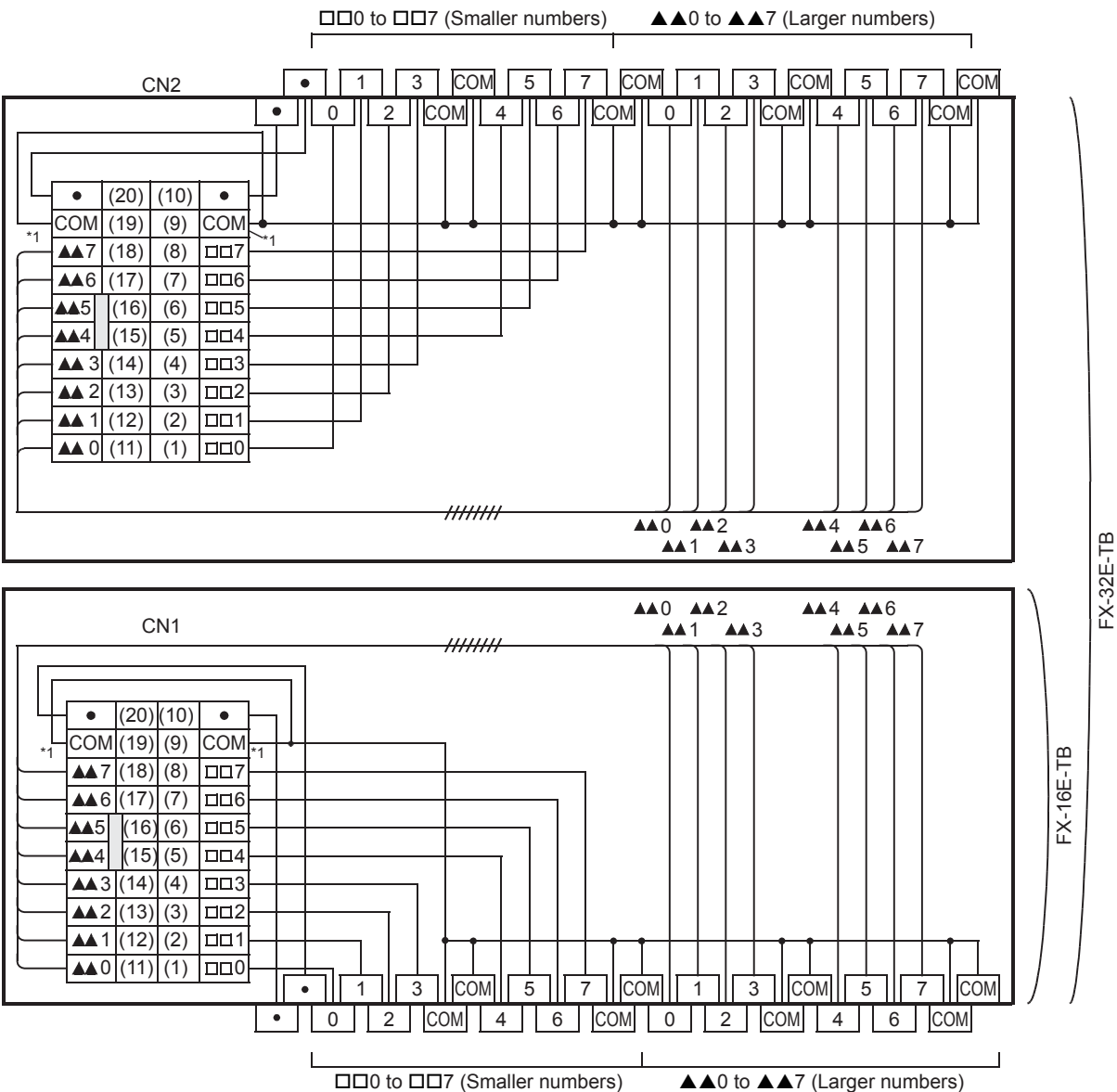


| | Smaller numbers | | | | | | Larger numbers | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24+ | 1 | 3 | COM1 | 5 | 7 | COM2 | 1 | 3 | COM3 | 5 | 7 | COM4 |
| 24- | 0 | 2 | COM1 | 4 | 6 | COM2 | 0 | 2 | COM3 | 4 | 6 | COM4 |

# Internal circuit

## FX-16E-TB, FX-32E-TB



*1 Replace this number with the one of the connected connector.
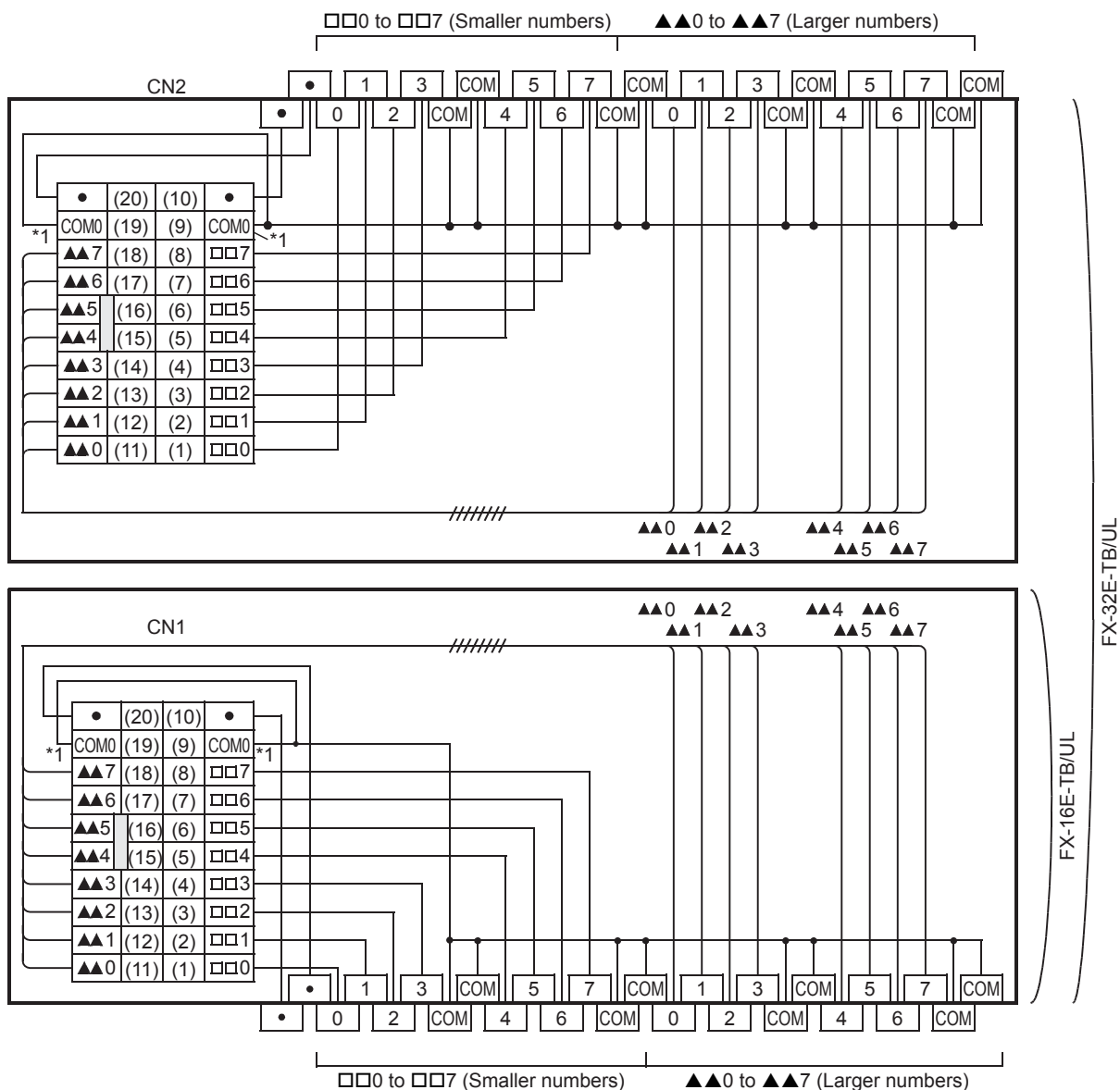
## FX-16E-TB/UL, FX-32E-TB/UL



*1    Replace this number with the one of the connected connector.

## FX-16EX-A1-TB



CN1

| COM | (20) | (10) | COM |
| △△7 | (19) | (9) | □□7 |
| △△6 | (18) | (8) | □□6 |
| △△5 | (17) | (7) | □□5 |
| △△4 | (16) | (6) | □□4 |
| △△3 | (15) | (5) | □□3 |
| △△2 | (14) | (4) | □□2 |
| △△1 | (13) | (3) | □□1 |
| △△0 | (12) | (2) | □□0 |
|      | (11) | (1) |      |

Photocoupler   Photocoupler
Photocoupler   Photocoupler

□□0 to □□3    □□4 to □□7    ▲▲0 to ▲▲3    ▲▲4 to ▲▲7

| 24+ | 1 | 3 | COM1 | 5 | 7 | COM2 | 1 | 3 | COM3 | 5 | 7 | COM4 |
| 24- | 0 | 2 | COM1 | 4 | 6 | COM2 | 0 | 2 | COM3 | 4 | 6 | COM4 |

□□0 to □□7 Smaller numbers        ▲▲0 to ▲▲7 Larger numbers

## FX-16EYR-TB



| *1 | | (20) | (10) | | *1 |
| COM0 | (19) | (9) | COM0 |
| △△7 | (18) | (8) | □□7 |
| △△6 | (17) | (7) | □□6 |
| △△5 | (16) | (6) | □□5 |
| △△4 | (15) | (5) | □□4 |
| △△3 | (14) | (4) | □□3 |
| △△2 | (13) | (3) | □□2 |
| △△1 | (12) | (2) | □□1 |
| △△0 | (11) | (1) | □□0 |

□□0 1 2 3    □□4 5 6 7    ▲▲0 1 2 3    ▲▲4 5 6 7

| 24+ | 1 | 3 | COM1 | 5 | 7 | COM2 | 1 | 3 | COM3 | 5 | 7 | COM4 |
| 24- | 0 | 2 | COM1 | 4 | 6 | COM2 | 0 | 2 | COM3 | 4 | 6 | COM4 |

□□0 to □□7 Smaller numbers        ▲▲0 to ▲▲7 Larger numbers
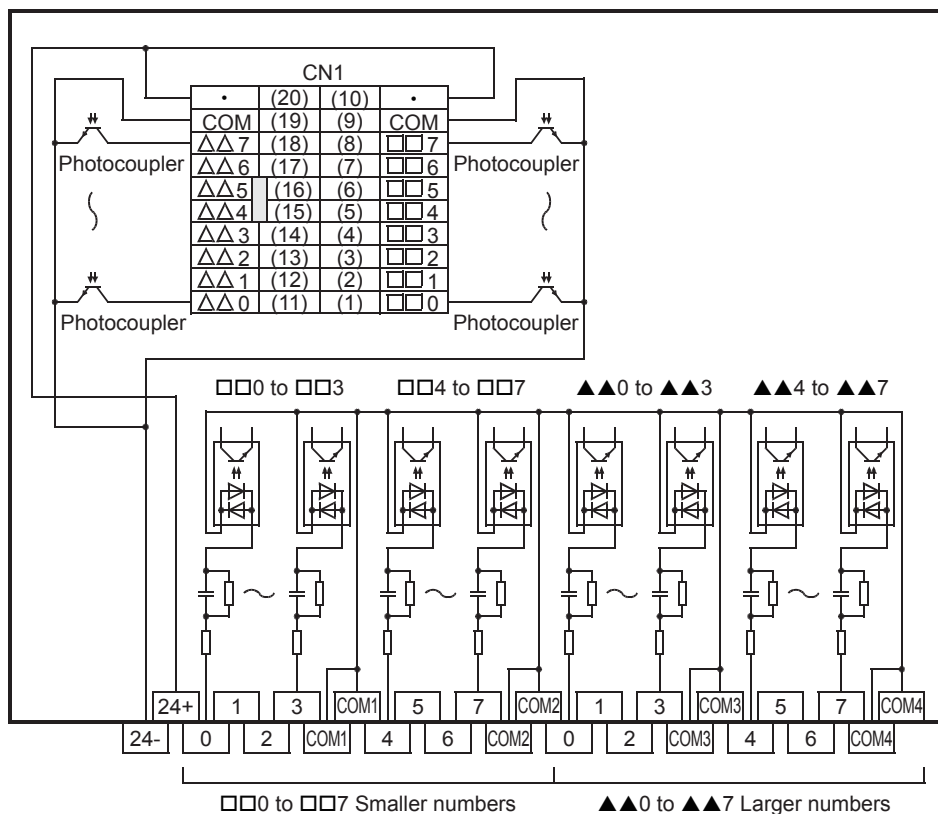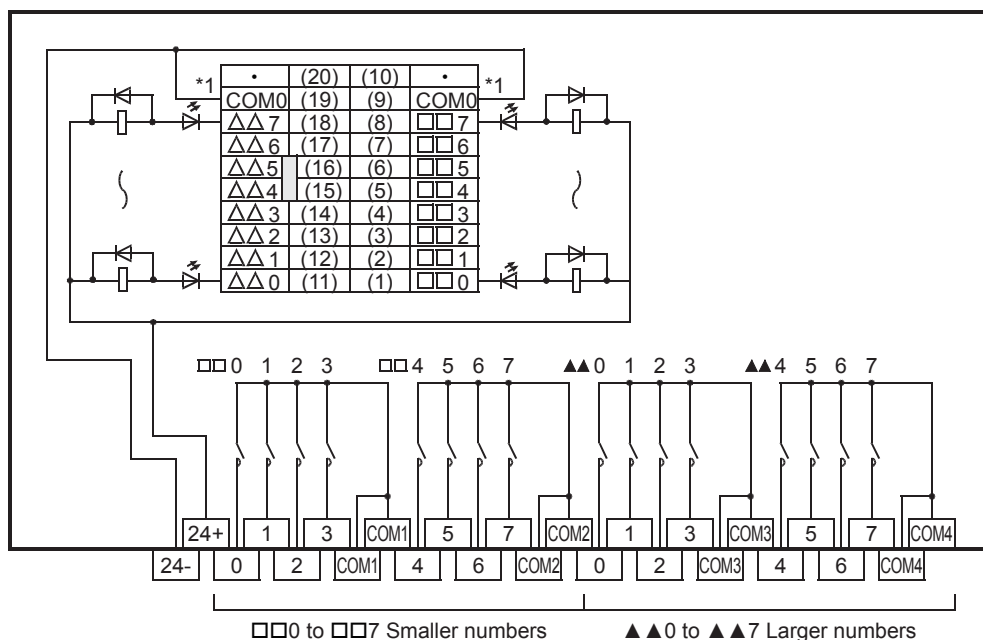
*1    Replace this number with the one of the connected connector.

## FX-16EYR-ES-TB/UL



□□0 to □□7 Smaller numbers      ▲▲0 to ▲▲7 Larger numbers

*1   Replace this number with the one of the connected connector.

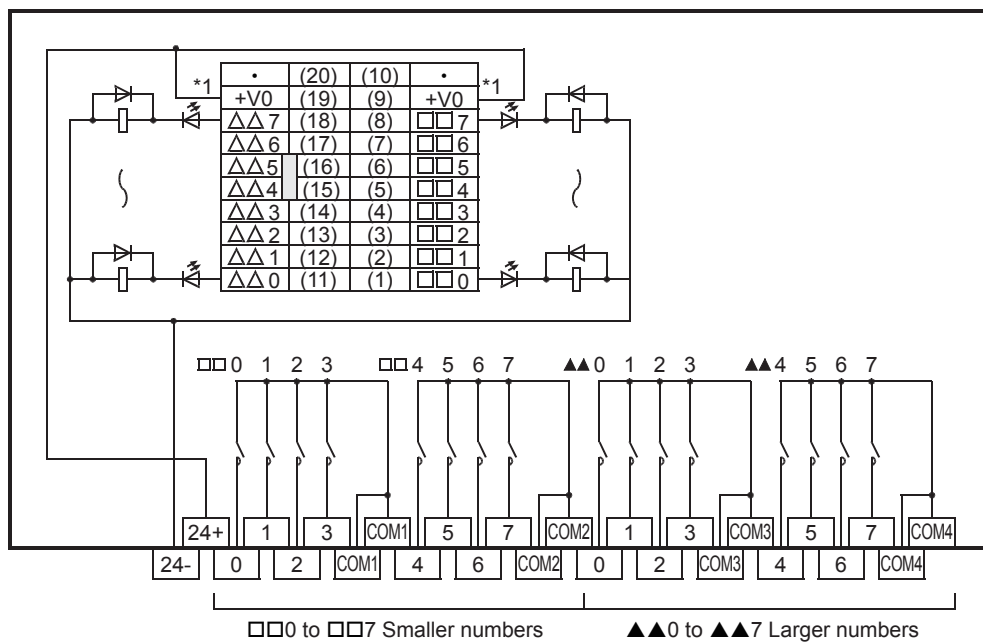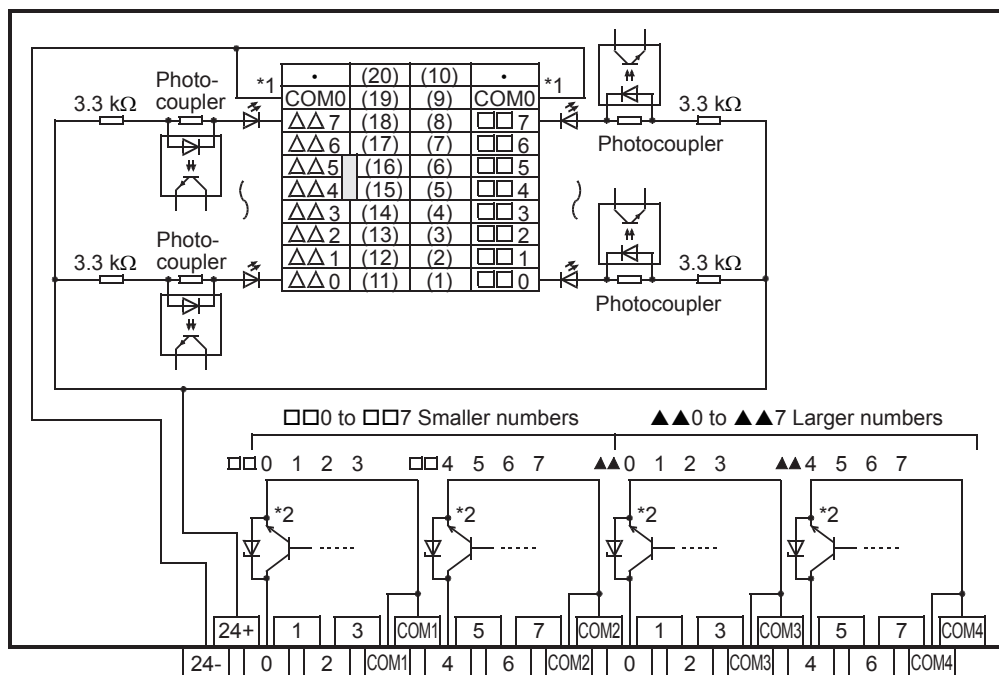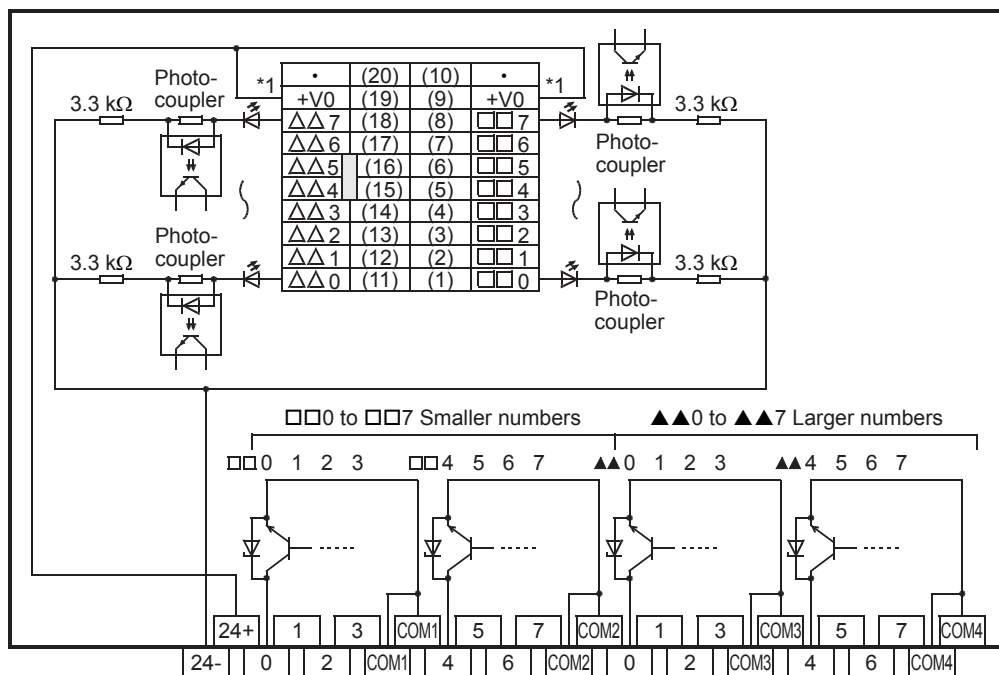## FX-16EYT-TB



*1   Replace this number with the one of the connected connector.

## FX-16EYT-ES-TB/UL



*1 Replace this number with the one of the connected connector.

## FX-16EYT-ESS-TB/UL



*1 Replace this number with the one of the connected connector.
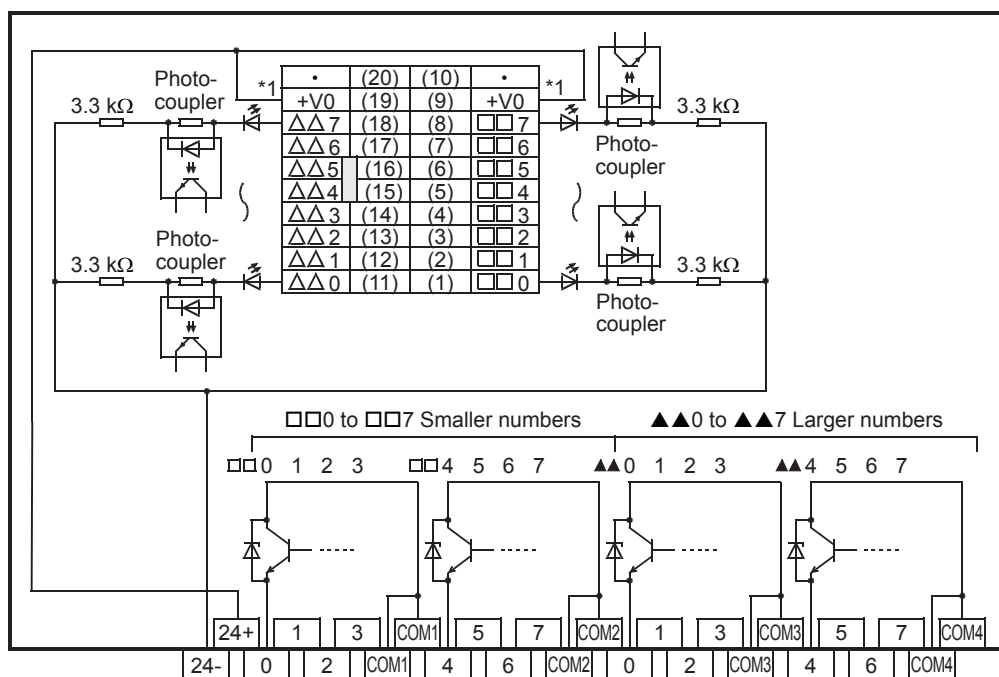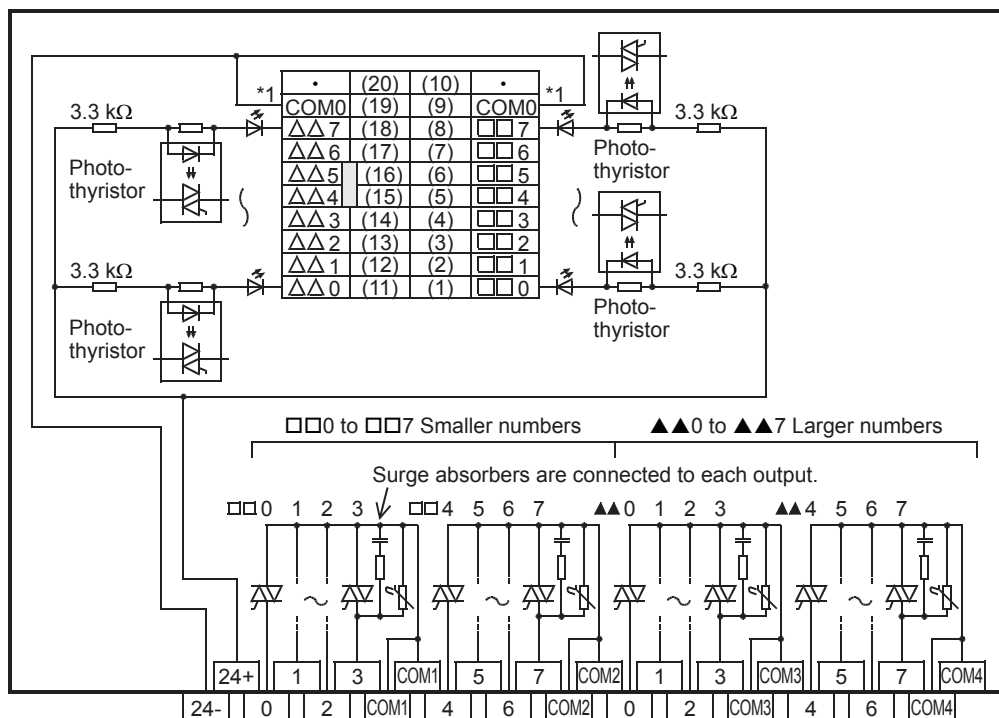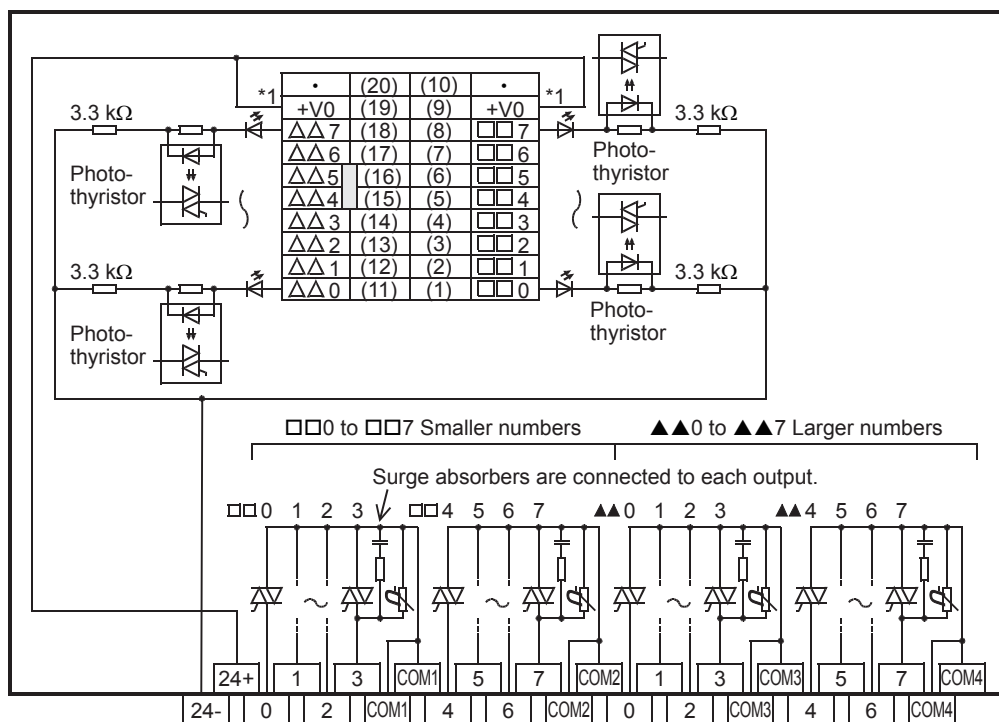
## FX-16EYS-TB



*1 Replace this number with the one of the connected connector.

## FX-16EYS-ES-TB/UL



*1 Replace this number with the one of the connected connector.

# Appendix 6 Precautions for Battery Transportation

When transporting lithium batteries, follow required transportation regulations.

Batteries used in the FX5UC CPU modules are classified as follows.

## Control-subject product

### Built-in

None (FX5UC CPU modules do not include batteries when shipped from the factory.)

### Battery only (spare parts and optional parts)

| Model | Battery type | Product form | Lithium contained (g/battery) | Weight[1] (g/battery) |
|---|---|---|---|---|
| FX3U-32BL | Lithium-metal battery | Cell | 0.15 | 30 |

*1 Weight in packaging.

## Precautions for transportation

When transporting the product above, follow IATA Dangerous Goods Regulations, IMDG Code (International Maritime Dangerous Goods Code), and domestic transportation regulations in each country. For details, contact the transportation company to be used.

# Appendix 7 Handling of Batteries and Devices with Built-in Batteries in EU Member States

This section describes the precautions for disposing of waste batteries in EU member states and exporting batteries and/or devices with built-in batteries to EU member states.

## Disposal precautions

In EU member states, there is a separate collection system for waste batteries.

Dispose of batteries properly at the local community waste collection/recycling center.

The symbol shown in the following figure is printed on the batteries and packaging of batteries and devices with built-in batteries. This symbol indicates that batteries need to be disposed of separately from other wastes.
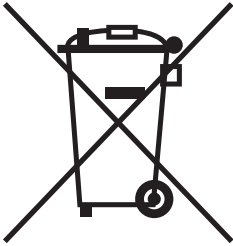


**Restriction**

This symbol is for EU member states only.

The symbol is specified in the new EU Battery Directive (2006/66/EC) Article 20 "Information for end-users" and Annex II.

## Exportation precautions

The new EU Battery Directive (2006/66/EC) requires the following when marketing or exporting batteries and/or devices with built-in batteries to EU member states.

- To print the symbol on batteries, devices, or their packaging
- To explain the symbol in the manuals of the products

### Labeling

To market or export batteries and/or devices with built-in batteries, which have no symbol, to EU member states, print the symbol shown in the figure above on the batteries, devices, or their packaging.

### Explaining the symbol in the manuals

To export devices incorporating Mitsubishi programmable controllers to EU member states, provide the latest manuals that include the explanation of the symbol. If no Mitsubishi manuals are provided, separately attach an explanatory note regarding the symbol to each manual of the devices.

**Point**

The requirements apply to batteries and/or devices with built-in batteries manufactured before the enforcement date of the new EU Battery Directive (2006/66/EC).

# INDEX

# REVISIONS

| Revision date | Revision | Description |
|---|---|---|
| January 2015 | A | First Edition |

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# WARRANTY

Please confirm the following product warranty details before using this product.

## 1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company. However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

**[Gratis Warranty Term]**

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

**[Gratis Warranty Range]**

1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
   a) Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
   b) Failure caused by unapproved modifications, etc., to the product by the user.
   c) When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
   d) Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
   e) Relay failure or output contact failure caused by usage beyond the specified life of contact (cycles).
   f) Failure caused by external irresistible forces such as fires or abnormal voltages, and failure caused by force majeure such as earthquakes, lightning, wind and water damage.
   g) Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
   h) Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

## 2. Onerous repair term after discontinuation of production

1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued.
   Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
2) Product supply (including repair parts) is not available after production is discontinued.

## 3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

## 4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user or third person by failure of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

## 5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

## 6. Product application

1) In using the Mitsubishi MELSEC programmable controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
2) The Mitsubishi programmable controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for railway companies or public service purposes shall be excluded from the programmable controller applications.
   In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable controller range of applications.
   However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the user's discretion.

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