MITSUBISHI ELECTRIC

Programmable Controller

MELSEC-F

FX3GC SERIES PROGRAMMABLE CONTROLLERS

USER'S MANUAL

Hardware Edition

Main Unit

FX3GC-32MT/D

FX3GC-32MT/DSS

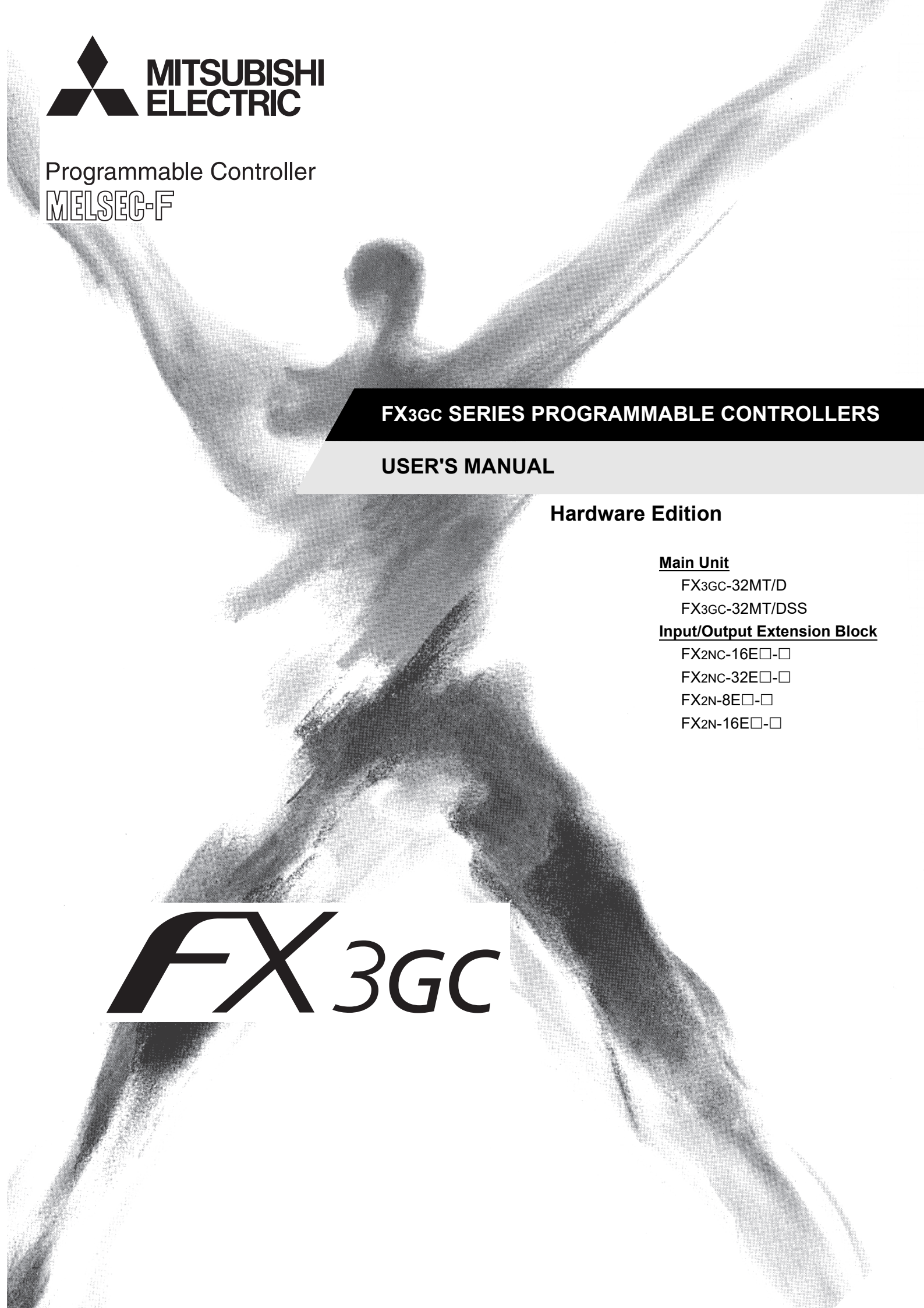
Input/Output Extension Block

FX2NC-16E□-□

FX2NC-32E□-□

FX2N-8E□-□

FX2N-16E□-□



Safety Precautions

(Read these precautions before use.)

Before installation, operation, maintenance or inspection of this product, thoroughly read through and understand this manual and all of the associated manuals. Also, take care to handle the module properly and safely.
If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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 medium or slight personal injury or physical 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 taken out and read whenever necessary. Always forward it to the end user.

1. DESIGN PRECAUTIONS

⚠WARNING	Reference
• Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure. Otherwise, malfunctions may cause serious accidents. 1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits). 2) Note that when the PLC CPU 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 PLC CPU occurs in an input/output control block, output control may be disabled. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case. 3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.	72 93 99 128 147 164

⚠CAUTION	Reference
• Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line. Noise may cause malfunctions. • Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors. Failure to do so may result in wire damage/breakage or PLC failure.	72 93 99 128 147 164

2. SECURITY PRECAUTIONS

⚠WARNING	Reference
• To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.	72 93 99 128 147 164

3. INSTALLATION PRECAUTIONS

⚠ WARNING	Reference
• 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.	72 164

⚠ CAUTION	Reference
• Use the product within the generic environment specifications described in Section 3.1 of this manual. Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl2, H2S, SO2 or NO2), 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. • Do not touch the conductive parts of the product directly. Doing so may cause device failures or malfunctions. • Install the product securely using a DIN rail or mounting screws. Main unit, FX2NC Series I/O extension blocks, FX2NC/FX3UC Series special function blocks, special adapter, extension power supply unit, FX2NC-CNV-IF, FX Series terminal blocks — DIN rail only FX2N Series I/O extension blocks, FX2N/FX3U Series special function blocks — DIN rail or direct mounting • 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. • When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits. Failure to do so may cause fire, equipment failures or malfunctions. • Be sure to remove the dust proof sheet from the PLC's ventilation port when installation work is completed. Failure to do so may cause fire, equipment failures or malfunctions. • Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors. Loose connections may cause malfunctions. • Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions. - Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery	73 165

4. WIRING PRECAUTIONS

⚠ WARNING	Reference
• 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, offered as an accessory, before turning on the power or initiating operation after installation or wiring work. Failure to do so may cause electric shock.	73 88 90 93 99 128 147 165

⚠CAUTION	Reference
• Connect the DC 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 damage the product.	
• Perform class D grounding (grounding resistance: 100 Ω or less) to the grounding terminal on the main unit. Do not use common grounding with heavy electrical systems.	74
• When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits. Failure to do so may cause fire, equipment failures or malfunctions.	88 90
• Make sure to properly wire the FX2N/FX3U Series extension equipment 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. - The disposal size of the cable end 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 6mm (0.24”) or less). Make sure that the screwdriver does not touch the partition part of the terminal block.	94 100 108 109 110 112 114
• Make sure to properly wire to 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. - The disposal size of the cable end should follow the dimensions described in the manual. - Tightening torque should follow the specifications in the manual. - Twist the end of strand wire 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.	129 137 138 143 146 148 165 174 175
• Make sure to properly wire to the FX Series terminal blocks 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. - The disposal size of the cable end 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 6mm (0.24”) or less). Make sure that the screwdriver does not touch the partition part of the terminal block.	177 178

5. STARTUP AND MAINTENANCE PRECAUTIONS

⚠WARNING	Reference
• 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.	
• Use the battery for memory backup correctly in conformance to this manual. - Use the battery only for the specified purpose. - 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 forces (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 heat excessive generation, bursting, ignition, liquid leakage or deformation, and lead to injury, fire or failures and malfunctions of facilities and other equipment. - When replacing the battery, make sure to use our specified product (FX3U-32BL). - When a battery error occurs ("ALM" LED is lit in red), follow the description in this manual.	200 205
• Before modifying or disrupting the program in operation or running the PLC, carefully read through this manual and the associated manuals and ensure the safety of the operation. 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 a programming tool and a GOT) Doing so may cause destruction or malfunction of the PLC program.	

⚠CAUTION	Reference
• Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions. For repair, contact your local Mitsubishi Electric representative. • Turn off the power to the PLC before connecting or disconnecting any extension cable. Failure to do so may cause equipment failures or malfunctions. • Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions. - Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery • Do not use the chemicals for cleaning. • If there is the possibility of touching the PLC inside a control panel in maintenance, make sure to discharge to avoid the influence of static electricity.	200 205

6. DISPOSAL PRECAUTIONS

⚠CAUTION	Reference
• 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 of the Battery Directive in EU countries, refer to Appendix G.)	200 205

7. TRANSPORTATION AND STORAGE PRECAUTIONS

⚠CAUTION	Reference
• When transporting the FX3GC Series PLC incorporating the optional battery, turn on the PLC before shipment, confirm that the battery mode is set using a parameter and the ALM LED is OFF, and check the battery life. If the PLC is transported with the ALM LED on or the battery exhausted, the battery-backed data may be unstable during transportation. • The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in Section 3.1. Failure to do so may cause failures in the PLC. After transportation, verify the operations of the PLC. • When transporting lithium batteries, follow required transportation regulations. (For details of the regulated products, refer to Appendix F.)	200 205

FX3GC Series Programmable Controllers

User's Manual - Hardware Edition

Manual number	JY997D45401
Manual revision	K
Date	8/2022

Foreword

This manual contains text, diagrams and explanations which will guide the reader in the correct installation, safe use and operation of the FX3GC Series Programmable Controllers and should be read and understood before attempting to install or use the unit.

And, store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

Outline Precautions

- This manual provides information for the use of the FX3GC Series Programmable Controllers. The manual has been written to be used by trained and competent personnel. The definition of such a person or persons is as follows;
  a) Any engineer who is responsible for the planning, design and construction of automatic equipment using the product associated with this manual should be of a competent nature, trained and qualified to the local and national standards required to fulfill that role. These engineers should be fully aware of all aspects of safety with regards to automated equipment.
  b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local and national standards required to fulfill that job. These engineers should also be trained in the use and maintenance of the completed product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices.
  c) All operators of the completed equipment should be trained to use that product in a safe and coordinated manner in compliance to established safety practices. The operators should also be familiar with documentation which is connected with the actual operation of the completed equipment.

  Note: The term 'completed equipment' refers to a third party constructed device which contains or uses the product associated with this manual
- 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 with 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.
- When combining this product with other products, please confirm the standard and the code, or regulations with which the user should follow. Moreover, please confirm the compatibility of this product to the system, machine, and apparatus with which a user is using.
- If in doubt at any stage during the installation of the product, always consult a professional electrical engineer who is qualified and trained to the local and national standards. If in doubt about the operation or use, please consult your local 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 have noticed a doubtful point, a doubtful error, etc., please contact your local Mitsubishi Electric representative.

Registration

Table of Contents

Standards

Certification of UL, cUL standards

FX3GC series main units, FX3U series special adapters, extension power supply unit and FX2N/FX2NC series input/output extension blocks supporting UL, cUL standards are as follows:

UL, cUL file number : E95239

Models : MELSEC FX3GC series manufactured

FX3GC-32MT/D	FX3GC-32MT/DSS

Models : MELSEC FX3U series manufactured

FX3U-232ADP(-MB)	FX3U-485ADP(-MB)	FX3U-ENET-ADP	
FX3U-4AD-ADP	FX3U-4DA-ADP	FX3U-3A-ADP	FX3U-4AD-PT-ADP
FX3U-4AD-PTW-ADP	FX3U-4AD-PNK-ADP	FX3U-4AD-TC-ADP	
FX3UC-1PS-5V			

Models : MELSEC FX2NC series manufactured

FX2NC-16EX(-DS)	FX2NC-32EX(-DS)	FX2NC-16EYT(-DSS)	FX2NC-32EYT(-DSS)
FX2NC-16EX-T(-DS)	FX2NC-16EYR-T(-DS)		

Models : MELSEC FX2N series manufactured

FX2N-8ER-ES/UL	FX2N-8EX-ES/UL	FX2N-8EYR-ES/UL	FX2N-8EYR-S-ES/UL
FX2N-8EYT-ESS/UL	FX2N-8EX-UA1/UL		
FX2N-16EX-ES/UL	FX2N-16EYR-ES/UL	FX2N-16EYT-ESS/UL	FX2N-16EYS

Compliance with EC directive (CE Marking)

This product complies with EC directive, however, this document does not guarantee that a mechanical system including this product will comply with EC directive.
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 (2014/30/EU) when used as directed by the appropriate documentation.

Type : Programmable Controller (Open Type Equipment)
Models : MELSEC FX3GC/FX3U(C)/FX2NC series manufactured

from June 1st, 2005	FX3U-232ADP	FX3U-485ADP		
	FX3U-4AD-ADP	FX3U-4DA-ADP	FX3U-4AD-PT-ADP	FX3U-4AD-TC-ADP
from April 1st, 2007	FX3U-232ADP-MB	FX3U-485ADP-MB		
from October 1st, 2007	FX3UC-1PS-5V			
	FX2NC-★★EX	FX2NC-★★EYT	FX2NC-★★EX-DS	FX2NC-★★EYT-DSS
	Where ★★ indicates:16,32			
	FX2NC-16EX-T	FX2NC-16EX-T-DS		
from December 1st, 2007	FX3U-4AD-PTW-ADP	FX3U-4AD-PNK-ADP		
from June 1st, 2009	FX3U-3A-ADP			
from January 1st, 2012	FX3GC-32MT/D	FX3GC-32MT/DSS		
from February 1st, 2012	FX3U-ENET-ADP			

Standard	Remark
EN61131-2:2007 Programmable controllers - Equipment requirements and tests	Compliance with all relevant aspects of the standard. EMI • Radiated Emission • Conducted Emission EMS • Radiated electromagnetic field • Fast transient burst • Electrostatic discharge • High-energy surge • Voltage drops and interruptions • Conducted RF • Power frequency magnetic field

Models : MELSEC FX2NC series manufactured

from March 1st, 1999	FX2NC-★★EX-DS	FX2NC-★★EYT-DSS
	Where ★★ indicates:16,32	
from August 1st, 1999	FX2NC-16EX-T-DS	FX2N-16EYR-T-DS
from October 1st, 2007	FX2NC-★★EX	FX2NC-★★EYT
	Where ★★ indicates:16,32	
	FX2NC-16EX-T	FX2NC-16EYR-T

Standard	Remark
EN61000-6-4:2007 - Generic emission standard Industrial environment EN50081-2:1993 Electromagnetic compatibility	Compliance with all relevant aspects of the standard. • Emission-Enclosure port • Emission-Low voltage AC mains port • Emission-Telecommunications/network port
EN61000-6-2:2005 - Generic immunity standard Industrial environment	Compliance with all relevant aspects of the standard. • RF Immunity • Fast Transients • ESD • Conducted • Surge • Power magnetic fields • Voltage drops and Voltage interruptions

Models : MELSEC FX2N series manufactured

from July 1st, 1997	FX2N-16EX-ES/UL	FX2N-16EYR-ES/UL	FX2N-16EYT-ESS/UL
from August 1st, 2005	FX2N-8ER-ES/UL	FX2N-8EX-ES/UL	FX2N-8EYR-ES/UL
	FX2N-8EYT-ESS/UL		
from September 1st, 2010	FX2N-8EYR-S-ES/UL		

For the products above, PLCs manufactured
before March 31st, 2002 are compliant with EN50081-2 (EN61000-6-4) and EN50082-2
from April 1st, 2002 to April 30th, 2006 are compliant with EN50081-2 (EN61000-6-4) and EN61131-2:1994 +A11:1996+A12:2000
after May 1st, 2006 are compliant with EN61131-2:2007

Standard		Remark
EN61000-6-4:2007	- Generic emission standard Industrial environment	Compliance with all relevant aspects of the standard. • Emission-Enclosure port • Emission-Low voltage AC mains port • Emission-Telecommunications/network port
EN50081-2:1993	Electromagnetic compatibility	
EN50082-2:1995	Electromagnetic compatibility - Generic immunity standard Industrial environment	Compliance with all relevant aspects of the standard. • RF immunity • Fast Transients • ESD • Conducted • Power magnetic fields
EN61131-2:1994 /A11:1996 /A12:2000	Programmable controllers - Equipment requirements and tests	Compliance with all relevant aspects of the standard. • Radiated electromagnetic field • Fast transient burst • Electrostatic discharge • Damped oscillatory wave
EN61131-2:2007	Programmable controllers - Equipment requirements and tests	Compliance with all relevant aspects of the standard. EMI • Radiated Emission • Conducted Emission EMS • Radiated electromagnetic field • Fast transient burst • Electrostatic discharge • High-energy surge • Voltage drops and interruptions • Conducted RF • 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 (2014/35/EU) when used as directed by the appropriate documentation.

Type : Programmable Controller (Open Type Equipment)
Models : MELSEC FX2NC series manufactured

from August 1st, 1999	FX2NC-16EYR-T-DS
from October 1st, 2007	FX2NC-16EYR-T

For the products above, PLCs manufactured
before April 30th, 2018 are compliant with EN61131-2: 2007,
PLCs manufactured after May 1st, 2018 are compliant with EN61131-2: 2007 and EN61010-2-201: 2013.*1

*1. For some models, PLCs manufactured in March, 2018 are compliant with LVD directive successively.

Standard		Remark
IEC1010-1:1990 /A1:1992	Safety requirements for electrical equipment for measurement, control, and laboratory use - General requirements	The equipment has been assessed as a component for fitting in a suitable control box which meets the requirements of IEC 1010-1:1990+A1:1992
BSEN61010-1 :1993 *2		
EN61010-2-201:2013	Safety of electrical equipment for measurement, control, and test	The equipment has been assessed as a component for fitting in a suitable control box which meets the requirements of EN61010-2-201: 2013

*2. Compliance to BSEN61010-1 is claimed through virtue of direct compliance to IEC1010-1 and Amendment 1.

Models : MELSEC FX2N series manufactured

from July 1st, 1997	FX2N-16EYR-ES/UL	
from August 1st, 2005	FX2N-8ER-ES/UL	FX2N-8EYR-ES/UL
from September 1st, 2010	FX2N-8EYR-S-ES/UL	

For the products above, PLCs manufactured
before March 31st, 2002 are compliant with IEC1010-1
from April 1st, 2002 to April 30th, 2006 are compliant with EN61131-2:1994+A11:1996+A12:2000
from May 1st, 2006 to April 30th, 2018 are compliant with EN61131-2:2007
after May 1st, 2018 are compliant with EN61131-2: 2007 and EN61010-2-201:2013.*1

*1. For some models, PLCs manufactured in March, 2018 are compliant with LVD directive successively.

Standard		Remark
IEC1010-1:1990 /A1:1992	Safety requirements for electrical equipment for measurement, control, and laboratory use - General requirements	The equipment has been assessed as a component for fitting in a suitable control box which meets the requirements of IEC 1010-1:1990+A1:1992
EN61131-2:1994 /A11:1996 /A12:2000	Programmable controllers - Equipment requirements and tests	The equipment has been assessed as a component for fitting in a suitable control box which meets the requirements of EN61131-2:1994+A11:1996+A12:2000
EN61131-2:2007	Programmable controllers - Equipment requirements and tests	The equipment has been assessed as a component for fitting in a suitable control box which meets the requirements of EN61131-2:2007
EN61010-2-201:2013	Safety of electrical equipment for measurement, control, and test	The equipment has been assessed as a component for fitting in a suitable control box which meets the requirements of EN61010-2-201: 2013

Caution for compliance with EC Directive

- Please use the FX3GC Series programmable controllers while installed in conductive shielded control panels under a general industrial environment.
- Programmable controllers are open-type devices that must be installed and used within conductive control panels. Please secure the control box lid to the control box (for conduction). Installation within a control box greatly affects the safety of the system and aids in shielding noise from the programmable controller.
- For the control panel, use the product having sufficient strength, fire protectiveness and shielding property to an installation environment.
- 24 V DC of the power supply must be supplied from the circuit double/reinforced insulated from the main power supply (MAINS).

Caution for compliance with the LVD directive (EN61010-2-201:2013)*1

- To an external connection port other than AC power supply terminal and AC input/output terminal, connect the circuit separated from a dangerous voltage by a double/reinforced insulation.
- Between the commons having the adjacent relay output terminals, if an external power supply is higher than 120 V AC, the insulation is basic.
  Therefore, when using 120 V AC or higher external power supply and 30 V DC/AC or lower external power supply between the adjacent commons, do not handle 30 V DC/ AC or lower external power supply as a touchable part, (When handling 30 V DC/AC or lower external power supply as a touchable part, add a basic insulation.)
- Do not wire two or more crimp terminals to one terminal. (If the wiring with two or more wires is needed, take an appropriate action such as adding an external terminal.)
- For crimp terminals to be used for the wiring applied with 30 V AC or higher, use the products with insulating sleeves.
- Cutoff device such as a breaker or a circuit protector should be installed in accordance with the following precautions.
  - Use EN60947-1 or EN60947-3 standards.
  - Place the cutoff device so that it can be operated easily.
  - Specify that the cutoff device is for this equipment.

*1. For the time of compliance with the LVD directive (EN61010-2-201:2013), refer to Requirement for Compliance with LVD directive.

Caution for Analog Products in use

The analog products have been found to be compliant to the European standards in the aforesaid manual and directive. However, for the very best performance from what are in fact delicate measuring and controlled output devices, Mitsubishi Electric would like to make the following points;
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 or accuracy between +10% / -10% in very heavy industrial areas.
However, Mitsubishi Electric suggests that if adequate EMC precautions are followed for the users complete control system.

- 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 accuracy can be improved by averaging the readings. This can be achieved either through functions on the analog products or through a user's program in the FX3GC Series PLC main unit.

Compliance with UKCA marking

The requirements for compliance with the UKCA marking are the same as those with the EC Directive (CE marking).

Associated Manuals

FX3GC Series PLC main units supplied only with the hardware manual.
For the details of the hardware of FX3GC Series, refer to this manual.
For instructions for programming and hardware information on special function devices, refer to the relevant manuals.

⊙: Indispensable manuals ✓: Manuals necessary for some purposes △: Manuals with separate volumes for details

		Manual Name	Manual Number	Contents	Model Code
Manuals for PLC main unit					
■FX3GC PLC main unit					
△	Supplied with product	FX3GC Series HARDWARE MANUAL	JY997D45101	Excerpts from the FX3GC Series User's Manual - Hardware Edition describing input/output specifications, wiring and installation of FX3GC Series PLC main units. For a detailed explanation, refer to this manual.	-
⊙	Separate volume	FX3GC Series User's Manual - Hardware Edition (this manual)	JY997D45401	Detailed explanations of the FX3GC Series PLC hardware, including input/output specifications, wiring, installation and maintenance.	09R533
■Programming					
⊙	Separate volume	FX3S/FX3G/FX3GC/FX3U/FX3UC Series Programming Manual - Basic & Applied Instruction Edition	JY997D16601	Details on sequence programming for the FX3GC Series, including explanations of basic instructions, applied instructions, and PLC devices.	09R517
✓	Additional Manual	MELSEC-Q/L/F Structured Programming Manual (Fundamentals)	SH-080782	Programming methods, specifications, functions, etc. required to create structured programs.	13JW06
✓	Additional Manual	FXCPU Structured Programming Manual [Device & Common]	JY997D26001	Devices, parameters, etc. provided in structured projects of GX Works2.	09R925
✓	Additional Manual	FXCPU Structured Programming Manual [Basic & Applied instruction]	JY997D34701	Sequence instructions provided in structured projects of GX Works2.	09R926
✓	Additional Manual	FXCPU Structured Programming Manual [Application Functions]	JY997D34801	Application functions provided in structured projects of GX Works2.	09R927
■FX Series terminal block					
✓	Supplied with product	FX INPUT AND OUTPUT TERMINAL BLOCKS USER'S GUIDE	JY992D50401	Details on handling FX Series terminal blocks.	-
Manuals for communication control					
■Common					
✓	Separate volume	FX Series User's Manual - Data Communication Edition	JY997D16901	Details on N:N Network, Parallel Link, Computer Link, and Non-Protocol communication (RS and RS2 instructions, and FX2N-232IF)	09R715
✓	Separate volume	FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - MODBUS Serial Communication Edition	JY997D26201	Details on MODBUS serial communication in FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs.	-
■RS-232C/RS-422/RS-485 communication When using each product, refer also to the User's Manual - Hardware Edition for the PLC main unit to be installed and FX Series User's Manual - Data Communication Edition. For the MODBUS communication, refer to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - MODBUS Serial Communication Edition.					
△	Supplied with product	FX3U-232ADP-MB Installation Manual	JY997D26401	Details on handling the RS-232C communication special adapter.	-
△	Supplied with product	FX3U-232ADP Installation Manual	JY997D13701	Details on handling the RS-232C communication special adapter.	-
△	Supplied with product	FX3U-485ADP-MB Installation Manual	JY997D26301	Details on handling the RS-485 communication special adapter.	-
△	Supplied with product	FX3U-485ADP Installation Manual	JY997D13801	Details on handling the RS-485 communication special adapter.	-

		Manual Name	Manual Number	Contents	Model Code
■**Ethernet, CC-Link, CC-Link/LT, AnyWireASLINK, PROFIBUS-DP** When using each product, refer also to the User's Manual - Hardware Edition for the PLC main unit to be installed.					
△	Supplied with product	FX3U-ENET-ADP Installation Manual	JY997D47401	Details on handling the FX3U-ENET-ADP Ethernet communication special adapter. When using, refer also to the FX3U-ENET-ADP User's Manual.	-
✓	Separate volume	FX3U-ENET-ADP User's Manual	JY997D45801	Details on the FX3U-ENET-ADP Ethernet communication special adapter.	09R725
△	Supplied with product	FX3U-16CCL-M Installation Manual	JY992D43401	Details on handling the CC-Link master special function block. When using, refer also to the FX3U-16CCL-M User's Manual.	-
✓	Separate volume	FX3U-16CCL-M User's Manual	JY992D43601	Details on the CC-Link master special function block	09R724
△	Supplied with product	FX2N-16CCL-M Hardware Manual	JY992D93201	Details on handling the CC-Link master special function block. When using, refer also to the FX2N-16CCL-M User's Manual.	-
✓	Separate volume	FX2N-16CCL-M User's Manual	JY992D93101	Details on the CC-Link master special function block	09R710
△	Supplied with product	FX3U-64CCL Installation Manual	JY997D29801	Details on handling the CC-Link intelligent device station special function block. When using, refer also to the FX3U-64CCL User's Manual.	-
✓	Separate volume	FX3U-64CCL User's Manual	JY997D30401	Details on the CC-Link intelligent device station special function block.	09R718
△	Supplied with product	FX2N-32CCL Installation Manual	JY997D52401	Details on handling the CC-Link remote device station special function block. When using, refer also to the FX2N-32CCL User's Manual.	-
✓	Separate volume	FX2N-32CCL User's Manual	JY992D71801	Details on the CC-Link remote device station special function block.	09R711
✓	Supplied with product	Remote I/O station, remote device station and intelligent device station for CC-Link	For details on CC-Link remote I/O stations, remote device stations and intelligent device station, refer to the relevant manuals and related documents.		-
△	Supplied with product	FX2N-64CL-M User's Manual - Hardware Volume	JY997D05401	Details on handling the CC-Link/LT master special function block. When using, refer also to the FX2N-64CL-M User's Manual - Detailed Volume.	-
✓	Separate volume	FX2N-64CL-M User's Manual - Detailed Volume	JY997D08501	Details on the CC-Link/LT master special function block	-
✓	Supplied with product	Remote device station, remote I/O station, power supply adapter and power supplies for CC-Link/LT	For details on CC-Link/LT remote I/O stations, remote device stations, power supply adapters, and CC-Link/LT dedicated power supplies, refer to the relevant manuals and related documents.		-
△	Supplied with product	FX3U-128ASL-M Installation Manual	JY997D51901	Details on handling the FX3U-128ASL-M AnyWireASLINK master block. When using, refer also to the FX3U-128ASL-M User's Manual.	-
✓	Separate volume	FX3U-128ASL-M User's Manual	JY997D52101	Details on the FX3U-128ASL-M AnyWireASLINK master block.	09R731
△	Supplied with product	FX3U-32DP Installation Manual	JY997D24901	Details on handling the FX3U-32DP PROFIBUS-DP interface block. When using, refer also to the FX3U-32DP User's Manual.	-
✓	Separate volume	FX3U-32DP User's Manual	JY997D25201	Details on the FX3U-32DP PROFIBUS-DP Interface block.	09R633

		Manual Name	Manual Number	Contents	Model Code
Manuals for analog/temperature control					
■Common					
✓	Separate volume	FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition	JY997D16701	Details on analog special function blocks (FX3U-4AD, FX3U-4DA, FX3UC-4AD) and analog special adapters (FX3U-***-***-ADP).	09R619
■Analog input, temperature input and temperature control When using each product, refer also to the User's Manual - Hardware Edition for the PLC main unit to be installed.					
✓	Supplied with product	FX2N-2AD User's Guide	JY992D74701	Details on handling the 2-ch analog input special function block.	-
△	Supplied with product	FX3U-4AD Installation Manual	JY997D20701	Details on handling the 4-ch analog input special function block. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
△	Supplied with product	FX3U-4AD-ADP User's Manual	JY997D13901	Details on handling the 4-ch analog input special adapter. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
△	Supplied with product	FX3UC-4AD Installation Manual	JY997D14901	Details on handling the 4-ch analog input special function block. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
✓	Supplied with product	FX2N-4AD User's Guide	JY992D65201	Details on handling the 4-ch analog input special function block.	-
✓	Supplied with product	FX2NC-4AD User's Manual	JY997D07801	Details on handling the 4-ch analog input special function block.	-
✓	Supplied with product	FX2N-8AD User's Manual	JY992D86001	Details on handling the 8-ch analog input special function block (also used for thermocouple input).	09R608
△	Supplied with product	FX3U-4AD-PT-ADP User's Manual	JY997D14701	Details on handling the 4-ch Pt100 temperature sensor input special adapter. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
△	Supplied with product	FX3U-4AD-PTW-ADP User's Manual	JY997D29101	Details on handling the 4-ch Pt100 temperature sensor input special adapter. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
△	Supplied with product	FX3U-4AD-PNK-ADP User's Manual	JY997D29201	Details on handling the 4-ch Pt1000/Ni1000 temperature sensor input special adapter. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
✓	Supplied with product	FX2N-4AD-PT User's Guide	JY992D65601	Details on handling the 4-ch Pt100 temperature sensor input special function block.	-
△	Supplied with product	FX3U-4AD-TC-ADP User's Manual	JY997D14801	Details on handling the 4-ch thermocouple input special adapter. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
✓	Supplied with product	FX2N-4AD-TC User's Guide	JY992D65501	Details on handling the 4-ch thermocouple input special function block.	-
△	Supplied with product	FX3U-4LC Installation Manual	JY997D38901	Details on handling the 4-ch temperature control special function block. When using, refer also to the FX3U-4LC User's Manual.	-
✓	Additional Manual	FX3U-4LC User's Manual	JY997D39101	Detail on the 4-ch temperature control special function block.	09R625
△	Supplied with product	FX2N-2LC User's Guide	JY992D85601	Details on handling the 2-ch temperature control special function block. When using, refer also to the FX2N-2LC User's Manual.	-
✓	Separate volume	FX2N-2LC User's Manual	JY992D85801	Details on the 2-ch temperature control special function block.	09R607

		Manual Name	Manual Number	Contents	Model Code
■Analog output					
When using each product, refer also to the User's Manual - Hardware Edition for the PLC main unit to be installed.					
✓	Supplied with product	FX2N-2DA User's Guide	JY992D74901	Details on handling the 2-ch analog output special function block.	-
△	Supplied with product	FX3U-4DA Installation Manual	JY997D20801	Details on handling the 4-ch analog output special function block. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
△	Supplied with product	FX3U-4DA-ADP User's Manual	JY997D14001	Details on handling the 4-ch analog output special adapter. When using, refer also to the FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
✓	Supplied with product	FX2N-4DA User's Guide	JY992D65901	Details on handling the 4-ch analog output special function block.	-
✓	Supplied with product	FX2NC-4DA User's Manual	JY997D07601	Details on handling the 4-ch analog output special function block.	-
■Analog input/output (mixed)					
When using each product, refer also to the User's Manual - Hardware Edition for the PLC main unit to be installed.					
✓	Supplied with product	FX2N-5A User's Manual	JY997D11401	Details on handling the 4-ch analog input and 1-ch analog output special function block.	09R616
△	Supplied with product	FX3U-3A-ADP User's Manual	JY997D35601	Details on handling the 2-ch analog input and 1-ch analog output special adapter When using, refer also to FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition.	-
Manuals for positioning control					
■Common					
✓	Separate volume	FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Positioning Control Edition	JY997D16801	Details on the positioning functions of FX3S/FX3G/FX3GC/FX3U/FX3UC Series.	09R620
Manuals for FX-30P					
△	Supplied with product	FX-30P Installation Manual	JY997D34201	Details on handling the FX-30P Handy Programming Panel. When using, refer also to the FX-30P Operation manual.	-
✓	Separate volume	FX-30P Operation Manual	JY997D34401	Details on the FX-30P Handy Programming Panel.	09R924
Other manuals					
When using each product, refer also to the User's Manual - Hardware Edition for the PLC main unit to be installed.					
■Extension power supply unit					
△	Supplied with product	FX3UC-1PS-5V Installation Manual	JY997D12201	Details on handling the FX3UC-1PS-5V extension power supply unit.	-
■Battery (option)					
△	Supplied with product	FX3U-32BL Battery	JY997D14101	Details on battery life and handling procedures.	-

Generic Names and Abbreviations Used in Manuals

Generic Name and Abbreviation	Description
PLCs	
FX3G Series	Generic name for FX3G Series PLCs
FX3GC Series	Generic name for FX3GC Series PLCs
FX3U Series	Generic name for FX3U Series PLCs
FX3UC Series	Generic name for FX3UC Series PLCs
FX2N Series	Generic name for FX2N Series PLCs
FX2NC Series	Generic name for FX2NC Series PLCs
Main unit	Abbreviation of FX3GC Series PLCs
Input/output extension block	Generic name for FX2N Series input/output extension block, FX2NC Series input/output extension block
FX2N Series input/output extension blocks	Generic name for the following models FX2N-8ER, FX2N-8EX, FX2N-8EX-UA1/UL, FX2N-8EYR, FX2N-8EYT, FX2N-8EYT-H, FX2N-16EX, FX2N-16EX-C, FX2N-16EXL-C, FX2N-16EYR, FX2N-16EYT, FX2N-16EYS, FX2N-16EYT-C, FX2N-8ER-ES/UL, FX2N-8EX-ES/UL, FX2N-8EYR-ES/UL, FX2N-8EYR-S-ES/UL, FX2N-8EYT-ESS/UL, FX2N-16EX-ES/UL, FX2N-16EYR-ES/UL, FX2N-16EYT-ESS/UL
FX2NC Series input/output extension blocks	Generic name for the following models FX2NC-16EX-T, FX2NC-16EX, FX2NC-32EX, FX2NC-16EYR, FX2NC-16EYR-T, FX2NC-16EYT, FX2NC-32EYT, FX2NC-16EX-T-DS, FX2NC-16EX-DS, FX2NC-32EX-DS, FX2NC-16EYR-T-DS, FX2NC-16EYT-DSS, FX2NC-32EYT-DSS
Special adapters	Generic name for communication special adapters and analog special adapters
Communication special adapters	Generic name for the following models FX3U-232ADP(-MB), FX3U-485ADP(-MB), FX3U-ENET-ADP
Analog special adapters	Generic name for the following models FX3U-4AD-ADP, FX3U-4DA-ADP, FX3U-3A-ADP, FX3U-4AD-PT-ADP, FX3U-4AD-PTW-ADP, FX3U-4AD-PNK-ADP, FX3U-4AD-TC-ADP
Special function blocks	Generic name for FX2N Series special function block, FX2NC Series special function block, FX3UC Series special function block, FX3U Series special function block
FX2N Series special function blocks	Generic name for the following models FX2N-16CCL-M, FX2N-32CCL, FX2N-64CL-M, FX2N-2AD, FX2N-4AD, FX2N-8AD, FX2N-2LC, FX2N-4AD-PT, FX2N-4AD-TC, FX2N-2DA, FX2N-4DA, FX2N-5A
FX3U Series special function blocks	Generic name for the following models FX3U-16CCL-M, FX3U-64CCL, FX3U-128ASL-M, FX3U-32DP, FX3U-4AD, FX3U-4LC, FX3U-4DA
FX2NC Series special function blocks	Generic name for the following models FX2NC-4AD, FX2NC-4DA
FX3UC Series special function blocks	Generic name for the following models FX3UC-4AD
Extension power supply unit	Abbreviation of model FX3UC-1PS-5V extension power supply unit
Battery	Abbreviation of model FX3U-32BL battery
FX Series terminal blocks	Generic name for the following models FX-16E-TB, FX-32E-TB, FX-16EX-A1-TB, FX-16EYR-TB, FX-16EYT-TB, FX-16EYS-TB, FX-16E-TB/UL, FX-32E-TB/UL, FX-16EYR-ES-TB/UL, FX-16EYT-ES-TB/UL, FX-16EYT-ESS-TB/UL, FX-16EYS-ES-TB/UL
Extension cables	Generic name for the following models FX0N-30EC, FX0N-65EC
Input/output cables	Generic name for the following models FX-16E-500CAB-S, FX-16E-□□□CAB, FX-16E-□□□CAB-R, FX-A32E-□□□CAB 150, 300 or 500 is entered in □□□.
Connectors for input/output	Generic name for the following models FX2C-I/O-CON, FX2C-I/O-CON-S, FX2C-I/O-CON-SA
Power cable	Generic name for the following models FX2NC-100MPCB, FX2NC-100BPCB, FX2NC-10BPCB1
CC-Link master	Generic name for the following models FX3U-16CCL-M, FX2N-16CCL-M
CC-Link/LT master	Abbreviation of FX2N-64CL-M master block
Intelligent device stations	Abbreviation of FX3U-64CCL interface block
Remote device stations	Abbreviation of FX2N-32CCL interface block

Generic Name and Abbreviation	Description
Remote I/O stations	Remote stations that handle information in bit units only
AnyWireASLINK master	Abbreviation of model FX3U-128ASL-M AnyWireASLINK master block
Peripheral devices	Generic name for programming software, handy programming panel (HPP) and indicator
Programming software	Generic name for the following models GX Works2, GX Developer, FX-PCS/WIN
GX Works2	Abbreviation of programming software packages SW□DNC-GXW2-J and SW□DNC-GXW2-E
GX Developer	Abbreviation of programming software packages SW□D5C-GPPW-J and SW□D5C-GPPW-E
FX-PCS/WIN	Abbreviation of programming software packages FX-PCS/WIN and FX-PCS/WIN-E
Handy programming panels	Generic name for the following models FX-30P, FX-20P, FX-20P-E
Indicators	
GOT1000 Series	Generic name for GT16, GT15, GT14, GT11 and GT10
GOT-F900 Series	Generic name for GOT-F900 Series
Manuals	
FX3GC Hardware Edition	Abbreviation of FX3GC Series User's Manual - Hardware Edition
Programming manual	Abbreviation of FX3S/FX3G/FX3GC/FX3U/FX3UC Series Programming Manual - Basic & Applied Instruction Edition
Data Communication Edition	Abbreviation of FX Series User's Manual - Data Communication Edition
MODBUS Serial Communication Edition	Abbreviation of FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - MODBUS Serial Communication Edition
Analog Control Edition	Abbreviation of FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition
Positioning Control Edition	Abbreviation of FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Positioning Control Edition

1. Outline

1.1 Major Features

1. Basic functions

[Up to 256 input/output points]
The total number of inputs and outputs (128 points maximum) directly connected to the PLC and remote inputs and outputs (128 points maximum) of the CC-Link, etc. can be extended to 256 points.
→ **Refer to 1.8 Number of I/O Points and Maximum Number of I/O Points.**

[Program memory]
The PLC has a 32 K-step EEPROM memory.

[Built-in USB port]
The PLC has a built-in USB port for the programming communication function to enable high-speed communication at 12Mbps.

[Built-in RUN/STOP switch]
The PLC can be started and stopped with the built-in switch.
RUN and STOP commands can be given to the PLC through a general-purpose input terminal or peripheral device.

[Writing during RUN]
The programming software for personal computer enables you to modify the program while the PLC is running.

[Built-in clock function]
The PLC has a clock function to control the time.

[Programming tool]
Use a version of a programming tool supporting the FX3GC.
*For peripheral devices not applicable to the FX3GC Series, specify FX3G Series or FX1N Series for the model selection, and you can program the sequence. In this case, use instructions and devices within the ranges common to FX3GC Series and the selected model of PLC.

[Remote debugging of program]
Programming software enables you to remotely transfer programs and monitor PLC operation through a modem connected to the RS-232C communication special adapter.

2. Input/output high-speed processing functions of main unit

[High-speed counter function]
Input terminals of main unit
- Input of open collector transistor output
- 1-phase 60 kHz × 4 points + 10 kHz × 2 points
- 2-phase 30 kHz × 2 points + 5 kHz × 1 points

→ **Refer to 5. Input Specifications and External Wiring in this manual and Programming Manual.**

[Pulse catch function]
Signals with short ON width or OFF width can be captured without a complicated program.
→ **Refer to 5. Input Specifications and External Wiring in this manual and Programming Manual.**

Input terminal	Signal ON/OFF width
X000, X001, X003, X004	10 μs
X002, X005, X006, X007	50 μs

[Input interruption function]
The PLC can process interruption routines with higher priority using external signals whose minimum ON duration or OFF duration is 10 μs (X000, X001, X003 and X004) or 50 μs (X002 and X005).
(The timer interruption function is also provided.)
→ **Refer to 5. Input Specifications and External Wiring in this manual and Programming Manual.**

[Pulse width/period measurement function]
The width/period of pulses from input terminals (X000, X001, X003 and X004) of the main unit can be measured in units of 10 μs.
→ **Refer to 5. Input Specifications and External Wiring in this manual and Programming Manual.**

[Pulse output function]
When output terminals in the transistor output type main unit are used, pulses of up to 100 kHz can be output simultaneously to 2 axes (Y000 and Y001).
Using a number of instructions programming is simplified.
→ **Refer to Positioning Control Edition.**

[Various positioning instructions]
→ **Refer to Positioning Control Edition.**

Instruction	Description
DSZR	Mechanical zero return instruction with DOG search function
ABS	Instruction to read the current value from our servo amplifier with absolute position (ABS) detecting function
DRVI	Positioning (relative positioning) to specify the movement from the current position
DRVA	Positioning (absolute positioning) to specify the target position based on the current value 0
PLSV	Instruction to change the pulse train output frequency
TBL	Instruction for positioning based on batch setting of positioning operation, moving distance and speed

3. Communication and network functions

The special adapter or special function block for each communication function can be connected.

[Kinds of communication functions]

- Programming communication (RS-232C/RS-422/USB)
- N:N Network
- Parallel link
- Computer link
- Inverter communication
- Non-protocol communication (Built-in RS-422/RS-232C/RS-485)
  → **Refer to the Data Communication Edition.**
- MODBUS communication
  → **Refer to MODBUS Serial Communication Edition.**
- Ethernet (Supported in Ver. 2.00 or later)
  → **Refer to FX3U-ENET-ADP User's Manual.**
- CC-Link
  - Master station (Compatible with CC-Link Ver. 2.00 and Ver. 1.10) FX3U-16CCL-M
  - Intelligent device station FX3U-64CCL
  - Remote device station FX2N-32CCL
    → **Refer to the manual for each product.**
- CC-Link/LT
  - Master station FX2N-64CL-M
  - Remote I/O station, Remote device station
    → **Refer to the manual for each product.**
- AnyWireASLINK
  - Master station FX3U-128ASL-M*1
  - Slave station
    → **Refer to the manual for each product.**

*1. Note that the warranty, etc. on this product differs from that on other programmable controller products. For details, refer to FX3U-128ASL-M User's Manual.

- PROFIBUS-DP
  - Master station
  - Slave station FX3U-32DP
    → **Refer to the manual for each product.**

4. Analog functions

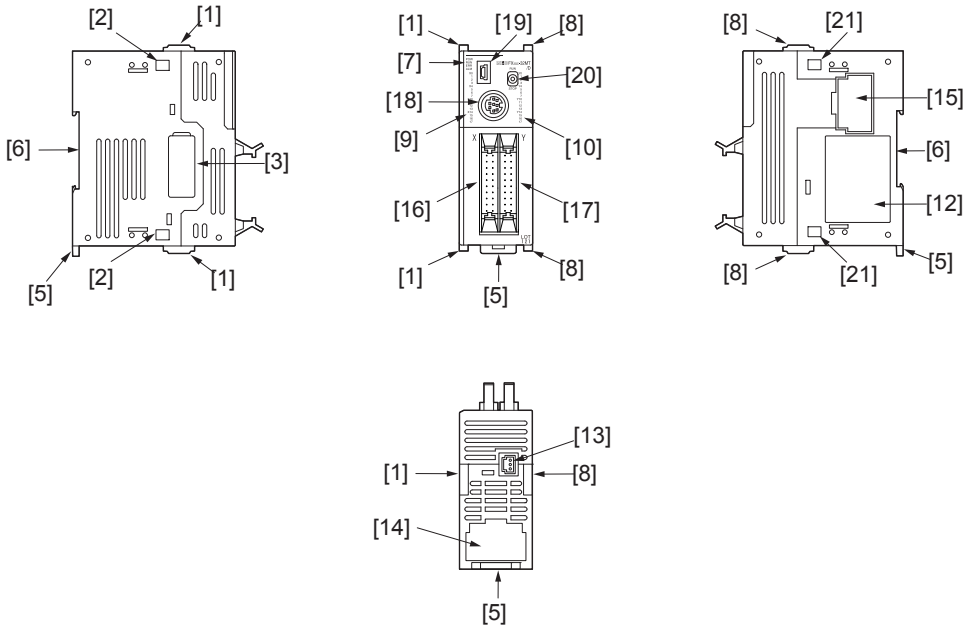
The special adapter and special function block for each analog function are connected.
→ **Refer to Analog Control Edition.**

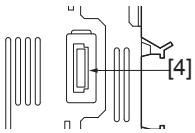
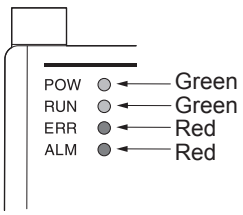
[Types of analog functions]

- Voltage/current input
- Voltage/current output
- Temperature sensor input (thermocouple and platinum resistance thermometer sensor)
- Temperature control

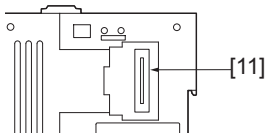
1.2 Part Names

1.2.1 FX3GC-32MT/D(SS)

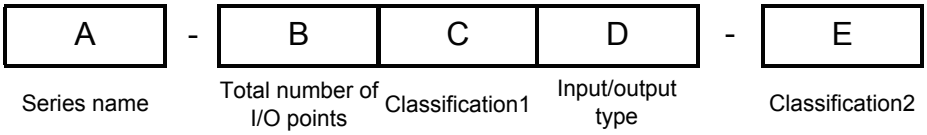


No.	Description
[1]	Special adapter connecting hooks
[2]	Special adapter connecting holes
[3]	Special adapter connector cover When special adapter connector cover is removed 
[4]	Special adapter connector
[5]	DIN rail mounting hooks
[6]	DIN rail mounting groove [DIN rail:DIN46277(35 mm(1.38") wide)]
[7]	Display LEDs 

[7]	POW LED	On while the PLC power is ON.
	RUN LED	On while the PLC is RUN.
	ERR LED	Flashing when a program error occurs.
		Turns ON when a CPU error occurs.
	ALM LED	Turns ON when the battery voltage drops. (When the optional battery is used)

No.	Description
[8]	FX3UC/FX2NC extension block connecting hooks
[9]	Input LED
[10]	Output LED
[11]	FX3UC/FX2NC extension block connector
[12]	Nameplate
[13]	Power connector for main unit
[14]	Battery cover
[15]	FX3UC/FX2NC extension block connecting connector cover Extension block connector cover 
[16]	Input connector
[17]	Output connector
[18]	Peripheral device connector (RS-422)
[19]	Peripheral device connector (USB)
[20]	RUN/STOP switch
[21]	FX3UC/FX2NC extension block connecting holes

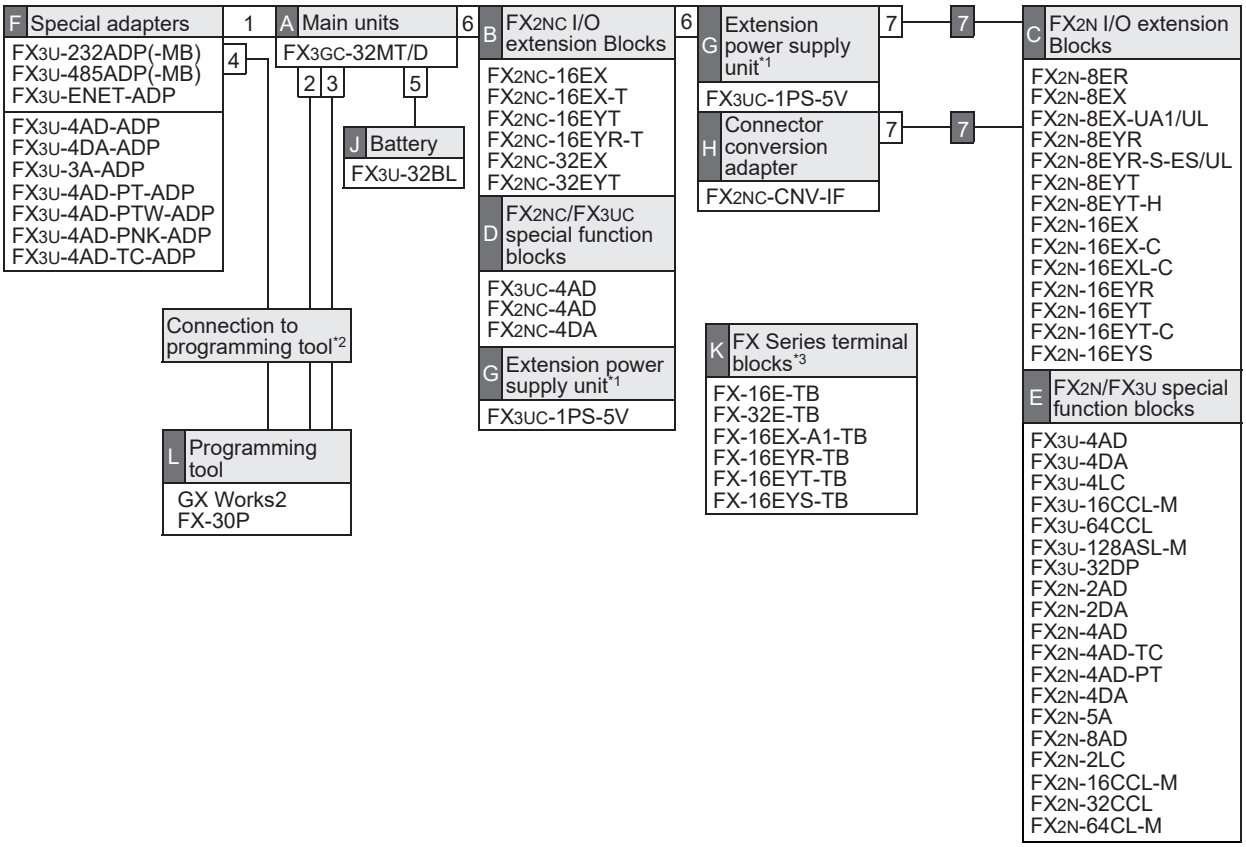
1.3 Interpretation of Model Names (Main Units, I/O Extension Blocks)



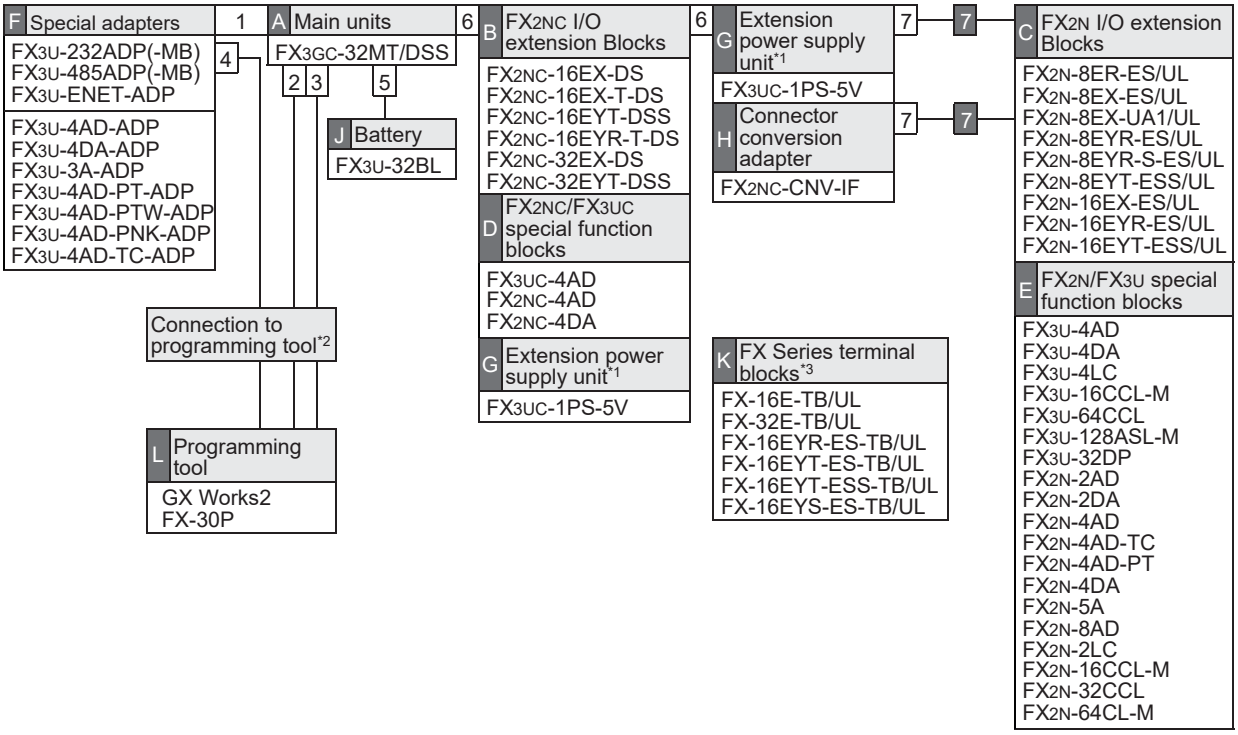
	Classification	Symbol	Description
A	Series name	FX3GC	FX3GC Series
		FX2NC	FX2NC Series
		FX2N	FX2N Series
B	Total number of I/O points	8	8 Points
		16	16 Points
		32	32 Points
C	Classification 1	M	Main units
		E	Input/output extension blocks
D	Input/output type	R	Input/output mixed Input : 24 V DC (Sink) Output : Relay
		T T/D	Input/output mixed Input : 24 V DC (Sink) Output : Transistor (Sink)
		T/DSS	Input/output mixed Input : 24 V DC (Sink / Source) Output : Transistor (Source)
		X	Input dedicated Classification 2 "None" : 24 V DC Input Classification 2 "UA1/UL" : 100 V AC Input
		XL	Dedicated 5 V DC Input
		YR	Dedicated relay output
		YR-S	Dedicated relay output (Separate reference terminals (Commons) type.)
		YT	Dedicated transistor output
		YS	Dedicated triac output
E	Classification 2	Non symbol	I/O connecting type • FX3GC Series : Connector • FX2NC Series : Connector • FX2N Series : Terminal block
		UA1/UL	Dedicated 100 V AC input
		C	I/O connecting type : Connector
		T	I/O connecting type : Terminal block

1.4 List of Products

1. FX3GC-32MT/D



2. FX3GC-32MT/DSS



*1. Use an extension power supply unit in either of the following positions:
- Inside the B or D group
- Between the B or D group and the C or E group

*2. For connection to a programming tool, refer to Section 1.5.

*3. For connectable models, refer to Chapter 8.

No.	Cable or connection connector
1	Special adapter connector
2	Peripheral device connector [USB] USB Mini-B connector [USB2.0]
3	Peripheral device connector [RS-422] MINI DIN 8Pin
4	FX3U-232ADP(-MB) D-SUB 9Pin [RS-232C]

No.	Cable or connection connector
5	Battery connector
6	Extension connector (FX2NC/FX3UC)
7	Extension connector (FX2N/FX3U)
7	Extension cable*1

*1. When using an extension cable (FX0N-30EC or FX0N-65EC), use only one extension cable per system. Make sure to use the FX2N-CNV-BC when the extension cable is used to connect an extension block. This extension cable is not available when the FX3U-4LC or FX2N-8AD is located at the head position.

→ **Refer to Section 3.4.**

1.4.1 Main units

A

Model name	Input		Output		Connecting type	Number of input/ output points	Drive power supply	Current Capacity 5 V DC (mA)
	Points	Type	Points	Type				
FX3GC-32MT/D	16	24 V DC (Sink)	16	Transistor (sink)	Connector	32	24 V DC	400
FX3GC-32MT/DSS	16	24 V DC (Sink/Source)	16	Transistor (source)	Connector	32	24 V DC	400

1.4.2 I/O Extension Blocks

1. FX2NC Series I/O Extension Blocks

B

Model name	Input		Output		Connecting type	Number of input/ output points	5 V DC current consumption (mA)
	Points	Type	Points	Type			
FX2NC-16EX	16	24 V DC (Sink)	-	-	Connector	16	30
FX2NC-16EX-DS	16	24 V DC (Sink/Source)	-	-	Connector	16	30
FX2NC-16EX-T	16	24 V DC (Sink)	-	-	Terminal block	16	30
FX2NC-16EX-T-DS	16	24 V DC (Sink/Source)	-	-	Terminal block	16	30
FX2NC-16EYT	-	-	16	Transistor (sink)	Connector	16	50
FX2NC-16EYT-DSS	-	-	16	Transistor (source)	Connector	16	50
FX2NC-16EYR-T	-	-	16	Relay	Terminal block	16	50
FX2NC-16EYR-T-DS	-	-	16	Relay	Terminal block	16	50
FX2NC-32EX	32	24 V DC (Sink)	-	-	Connector	32	60
FX2NC-32EX-DS	32	24 V DC (Sink/Source)	-	-	Connector	32	60
FX2NC-32EYT	-	-	32	Transistor (sink)	Connector	32	100
FX2NC-32EYT-DSS	-	-	32	Transistor (source)	Connector	32	100

2. FX2N Series I/O Extension Blocks

When connected to one of the FX2N I/O extension blocks listed in the following table, the FX2NC-CNV-IF or FX3UC-1PS-5V is required.

C

Model name	Input		Output		Connecting type	Number of input/ output points	5 V DC current consumption (mA)
	Points	Type	Points	Type			
FX2N-8ER	4	24 V DC (Sink)	4	Relay	Terminal block	16*1	25
FX2N-8ER-ES/UL	4	24 V DC (Sink/Source)	4		Terminal block	16*1	25
FX2N-8EX	8	24 V DC (Sink)	-	-	Terminal block	8	25
FX2N-8EX-ES/UL	8	24 V DC (Sink/Source)	-	-	Terminal block	8	25
FX2N-8EX-UA1/UL	8	100 V AC	-	-	Terminal block	8	25
FX2N-8EYR	-	-	8	Relay	Terminal block	8	30
FX2N-8EYR-ES/UL	-	-	8		Terminal block	8	30
FX2N-8EYR-S-ES/UL	-	-	8		Terminal block	8	30
FX2N-8EYT	-	-	8	Transistor (sink)	Terminal block	8	30
FX2N-8EYT-ESS/UL	-	-	8	Transistor (source)	Terminal block	8	30
FX2N-8EYT-H	-	-	8	Transistor (sink)	Terminal block	8	30
FX2N-16EX	16	24 V DC (Sink)	-	-	Terminal block	16	45
FX2N-16EX-ES/UL	16	24 V DC (Sink/Source)	-	-	Terminal block	16	45
FX2N-16EX-C	16	24 V DC (Sink)	-	-	Connector	16	40
FX2N-16EXL-C	16	5 V DC	-	-	Connector	16	35
FX2N-16EYR	-	-	16	Relay	Terminal block	16	40
FX2N-16EYR-ES/UL	-	-	16		Terminal block	16	40
FX2N-16EYT	-	-	16	Transistor (sink)	Terminal block	16	180
FX2N-16EYT-ESS/UL	-	-	16	Transistor (source)	Terminal block	16	180
FX2N-16EYT-C	-	-	16	Transistor (sink)	Connector	16	180
FX2N-16EYS	-	-	16	Triac	Terminal block	16	160

*1. Four inputs and four outputs are occupied as unused numbers.

1.4.3 Special function blocks

For details on each product, refer to the appropriate product manual.

1. Analog control

a) FX2NC/FX3UC Series

D

Model name	Description	Number of input/output points	5 V DC current consumption (mA)
FX3UC-4AD	4-ch Voltage/current input	8	100
FX2NC-4AD	4-ch Voltage/current input	8	50
FX2NC-4DA	4-ch Voltage/current output	8	30

b) FX2N/FX3U Series
When connected to the special function blocks of the following table, the FX2NC-CNV-IF or FX3UC-1PS-5V is required.

E

Model name	Description	Number of input/output points	5 V DC current consumption (mA)
FX3U-4AD	4-ch Voltage/current input	8	110
FX3U-4DA	4-ch Voltage/current output	8	120
FX3U-4LC	4 loop Temperature control (resistance thermometer sensor/thermocouple/micro voltage input)	8	160
FX2N-2AD	2-ch Voltage/current input	8	20
FX2N-2DA	2-ch Voltage/current output	8	30
FX2N-4AD	4-ch Voltage/current input	8	30
FX2N-4AD-PT	4-ch Temperature (resistance thermometer sensor) input	8	30
FX2N-4AD-TC	4-ch Temperature (thermocouple) input	8	30
FX2N-4DA	4-ch Voltage/current output	8	30
FX2N-5A	4-ch Voltage/current input 1-ch Voltage/current output	8	70
FX2N-8AD	8-ch Voltage/current/temperature (thermocouple) input	8	50
FX2N-2LC	2 loop Temperature control (resistance thermometer sensor/thermocouple)	8	70

2. Data link and communication functions

When connected to the special function blocks in the following table, the FX2NC-CNV-IF or FX3UC-1PS-5V is required.

E

Model name	Description	Number of input/output points	5 V DC current consumption (mA)
FX3U-16CCL-M	Master for CC-Link (Compatible With CC-Link Ver. 2.00 and Ver. 1.10) Connectable stations: Remote I/O station, Remote device station, Intelligent device station	*1	-
FX3U-64CCL	Intelligent device station for CC-Link [1 to 4 stations occupied]	8	-
FX2N-16CCL-M	Master for CC-Link (Compatible With CC-Link Ver. 1.10) Connectable stations: Remote I/O station, Remote device station	*1	-
FX2N-32CCL	Remote device station for CC-Link [1 to 4 stations occupied]	8	130
FX2N-64CL-M	Master for CC-Link/LT	*2	190
FX3U-128ASL-M	Master for AnyWireASLINK	*3	130
FX3U-32DP	Slave station for PROFIBUS-DP	8	-

*1. The number of input/output occupied points is obtained using the following formula.
Number of input/output occupied points = Number of remote I/O stations × 32 points + 8 points

*2. The number of input/output occupied points is obtained using the following formula.
Number of input/output occupied points = Total number of input/output points in remote I/O stations + 8 points

*3. The number of input/output occupied points is obtained using the following formula.
Number of input/output occupied points = Set value of rotary switch + 8 points

1.4.4 Special adapters

1. Analog functions

F

Model name	Description	Number of input/output points	5 V DC current consumption (mA)
FX3U-4AD-ADP	4-ch Voltage/current input	0	15
FX3U-4DA-ADP	4-ch Voltage/current output	0	15
FX3U-3A-ADP	2-ch Voltage/current input 1-ch Voltage/current output	0	20
FX3U-4AD-PT-ADP	4-ch Temperature (platinum resistance thermometer sensor) input (-50 to 250 °C)	0	15
FX3U-4AD-PTW-ADP	4-ch Temperature (platinum resistance thermometer sensor) input (-100 to 600 °C)	0	15
FX3U-4AD-PNK-ADP	4-ch Temperature (Pt1000/Ni1000 resistance thermometer sensor) input	0	15
FX3U-4AD-TC-ADP	4-ch Temperature (thermocouple) input	0	15

2. Communication functions

F

Model name	Description	Number of input/output points	5 V DC current consumption (mA)
FX3U-232ADP(-MB)	RS-232C communication	0	30
FX3U-485ADP(-MB)	RS-485 communication	0	20
FX3U-ENET-ADP*1	Ethernet communication	0	30

*1. FX3U-ENET-ADP is supported in FX3GC Ver. 2.00 or later.

1.4.5 Extension power supply unit

G

Model name	Description	Drive power supply	Current Capacity DC
FX3UC-1PS-5V*1	5 V DC extension power supply	24 V DC	5 V DC 1 A

*1. Only one FX3UC-1PS-5V unit can be connected in a system.

1.4.6 Connector conversion adapter

H

Model name	Description	5 V DC current consumption (mA)
FX2NC-CNV-IF H	Connector conversion adapter to connect an "I/O extension block for FX2N" or "special function block for FX2N/FX3U"	-
FX2N-CNV-BC	Connector conversion adapter to connect an "I/O extension block for FX2N" or "special function block for FX2N/FX3U" and the extension cable FX0N-30/65EC	-

1.4.7 Battery/Extension cables

J

7

Classification	Model name		Description
Battery J	FX3U-32BL		This battery backs up the following data. • General devices (Parameter setting is required.) - M1536 to M7679 - D1100 to D7999 - S1000 to S4095 - R0 to R23999 • Time on clock
Extension cables 7	FX0N-65EC	0.65 m (2'1")	These cables are used to mount input/output extension blocks for FX2N and special function blocks*1 for FX2N/FX3U away from the main unit.
	FX0N-30EC	0.3 m (0'11")	

*1. When using an extension cable (FX0N-30EC or FX0N-65EC), use only one extension cable per system. Make sure to use the FX2N-CNV-BC when the extension cable is used to connect an extension block. This extension cable is not available when the FX3U-4LC or FX2N-8AD is located at the head position.

→ **Refer to Section 3.4.**

1.4.8 FX Series terminal blocks

K

Model name	Input points	Output points	Function	Drive power supply
FX-16E-TB	16 input points or 16 output points		To be directly connected to the PLC input/output connector	*1
FX-32E-TB	32 input points, 32 output points or 16 input/output points			
FX-16EX-A1-TB*2	16	-	100 V AC input type	*4
FX-16EYR-TB*3	-	16	Relay output type	24 V DC 80 mA
FX-16EYT-TB*3	-	16	Transistor output type (Sink output)	24 V DC 112 mA
FX-16EYS-TB*3	-	16	Triac output type	24 V DC 112 mA
FX-16E-TB/UL	16 input points or 16 output points		To be directly connected to the PLC input/output connector	*1
FX-32E-TB/UL	32 input points, 32 output points or 16 input/output points			
FX-16EYR-ES-TB/UL*3	-	16	Relay output type	24 V DC 80 mA
FX-16EYT-ES-TB/UL*3	-	16	Transistor output type (Sink output)	24 V DC 112 mA
FX-16EYT-ESS-TB/UL*3	-	16	Transistor output type (Source output)	24 V DC 112 mA
FX-16EYS-ES-TB/UL*3	-	16	Triac output type	24 V DC 112 mA

*1. The table below shows the drive power supply for each connection destination.

Connection destination	Power Supply Voltage	Current Consumption
Input connector		
FX3GC-32MT/D, FX2NC-□□EX	Not required	
FX3GC-32MT/DSS, FX2NC-□□EX-DS, FX2N-16EX-C	24 V DC	112 mA / 16 points
Output connector		
FX3GC-32MT/D, FX3GC-32MT/DSS, FX2NC-□□EYT, FX2NC-□□EYT-DSS, FX2N-16EYT-C	Power supply suitable to connected load is required.	

*2. The applications shown below are not supported.

	Unsupported Applications
High-speed processing	High-speed counter, input interruption, pulse catch, pulse width/pulse period measurement function, speed detection (SPD) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Other	Absolute current value read (ABS) instruction

*3. The applications shown below are not supported.

	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, zero return (ZRN) instruction, DOG search zero return (DSZR) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction, variable speed pulse output (PLSV) instruction, absolute current value read (ABS) instruction, batch data positioning mode (TBL) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

*4. The table below shows the drive power supply for each connection destination.

Connection destination	Power Supply Voltage	Current Consumption
FX3GC-32MT/D, FX2NC-□□EX	24 V DC	48 mA
FX2N-16EX-C	24 V DC	160 mA

1.4.9 Input/output cable • Input/output connector • Power cable

Classification	Model name	Description	
Input/output cables	FX-16E-500CAB-S	5 m (16'4")	• Single wire (Wire color: red) • PLC side: A 20-pin connector
	FX-16E-150CAB	1.5 m (4'11")	• Flat cables (with tube) • A 20- pin connector at both ends
	FX-16E-300CAB	3 m (9'10")	
	FX-16E-500CAB	5 m (16'4")	
	FX-16E-150CAB-R	1.5 m (4'11")	• Round multicore cables • A 20-pin connector at both ends
	FX-16E-300CAB-R	3 m (9'10")	
	FX-16E-500CAB-R	5 m (16'4")	
	FX-A32E-150CAB	1.5 m (4'11")	• Flat cables (with tube) • PLC side: Two 20-pin connectors in 16-point units. • Terminal block side: A dedicated connector • One common terminal covers 32 input/output terminals.
	FX-A32E-300CAB	3 m (9'10")	
	FX-A32E-500CAB	5 m (16'4")	
Input/output connector	FX2C-I/O-CON	10-piece set	Input/output connector for flat cable
	FX2C-I/O-CON-S	5-piece set	Input/output connector for bulk wire for 0.3 mm^2 [AWG22]
	FX2C-I/O-CON-SA	5-piece set	Input/output connector for bulk wire for 0.5 mm^2 [AWG20]
Power cable	FX2NC-100MPCB	1 m (3'3")	Power cable for main unit
	FX2NC-100BPCB	1 m (3'3")	Input power cable for FX2NC Series input extension blocks
	FX2NC-10BPCB1	0.1 m (0'3")	Input power crossover cable for FX2NC Series input extension blocks

1.4.10 Power supply unit

Model name	Description	Drive power supply	Current Capacity DC
FX2N-20PSU	24 V DC power supply	100 to 240 V AC	24 V DC 2 A

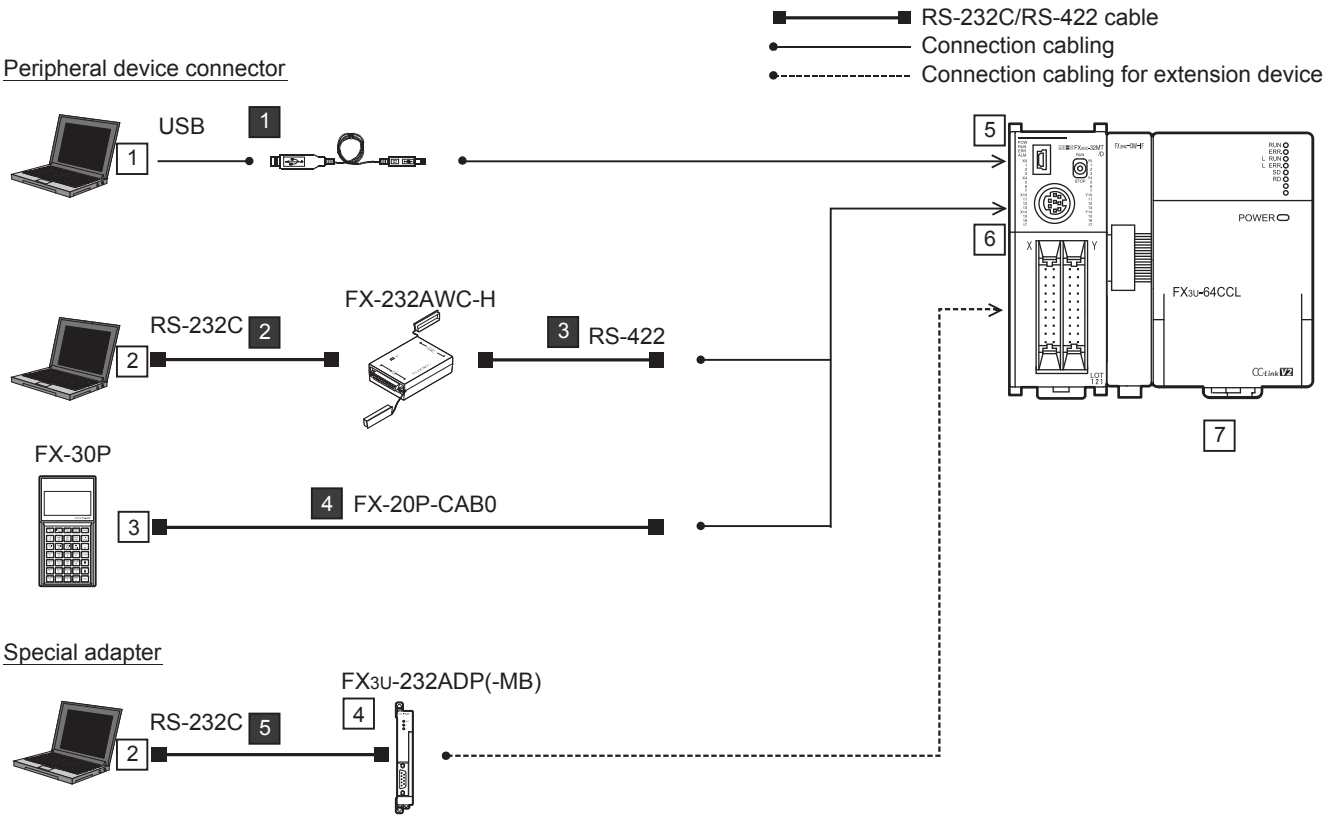
1.4.11 Programming tool

The following programming tool supports FX3GC Series PLCs.
For inapplicable programming tools and versions, refer to Appendix A-2-2.

L

Model name	Description
GX Works2	Version 1.77F or later of SW□DNC-GXW2-E supports the FX3GC.
FX-30P	Version 1.30 or later of FX-30P supports the FX3GC.

1.5 Connection to Programming Tool



No.	Shape of connector or combination with cable	
1	USB A connector	1 USB cable*1
2	D-SUB 9Pin	2 "F2-232CAB-1" + "FX-232AW, FX-232AWC, FX-232AWC-H"*2 + 3 "FX-422CAB0"
		5 FX-232CAB-1
	Half pitch 14Pin	2 "F2-232CAB-2" + "FX-232AW, FX-232AWC, FX-232AWC-H"*2 + 3 "FX-422CAB0"
		5 FX-232CAB-2
	D-SUB 25Pin	2 "F2-232CAB" + "FX-232AW, FX-232AWC, FX-232AWC-H"*2 + 3 "FX-422CAB0"
		5 F2-232CAB-1

No.	Shape of connector or combination with cable	
3	FX-30P MINI DIN 8Pin [RS-422]	4 FX-20P-CAB0
4	FX3U-232ADP(-MB) D-SUB 9Pin [RS-232C]	
5	Peripheral device connector [USB] USB Mini-B connector [USB2.0]	
6	Peripheral device connector [RS-422] MINI DIN 8Pin	
7	FX3U-64CCL CC-Link connection terminal block Accessing the other station from CC-Link is used. → **Subsection 1.5.1**	

*1. The following USB cables are applicable.

Model name	Description
MR-J3USBCBL3M	USB cable 3 m (9'10")
GT09-C30USB-5P	USB cable to transfer personal computer data (USB A plug) 3 m (9'10")

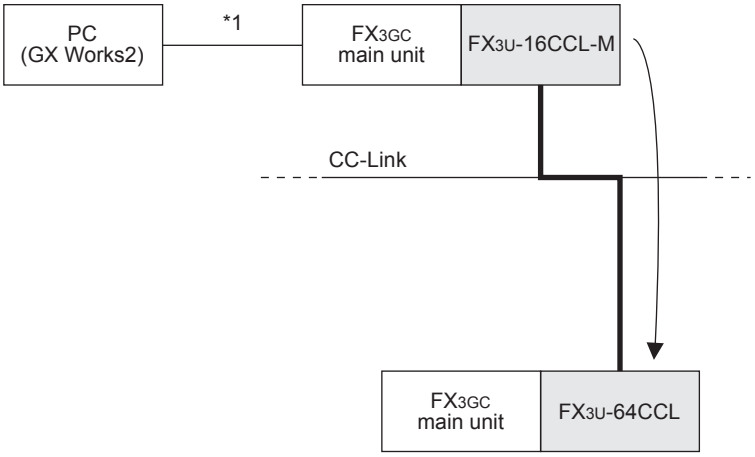
*2. When FX-232AW or FX-232AWC is used, the communication baud rate is 19,200 bps or less.

1.5.1 The accessing path to the FX3GC from CC-Link

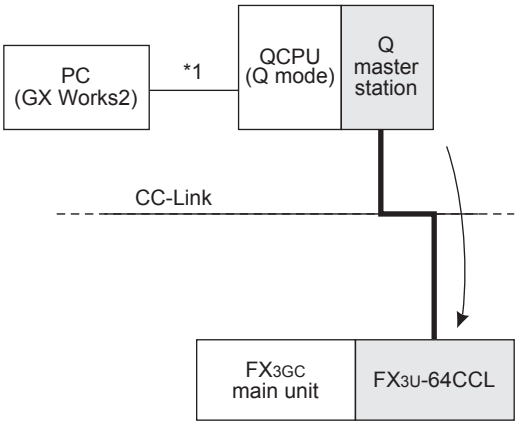
The FX3GC connected to the FX3U-64CCL can be accessed via CC-Link from the FX master station (FX3U-16CCL-M) and Q CPU (Q mode) master/local station when GX Works2 is used.
Accessing permits read, write, verify, device batch monitoring and device test.
The communication path of CC-Link is illustrated as follows.

→ **For details, refer to the manual of GX Works2**

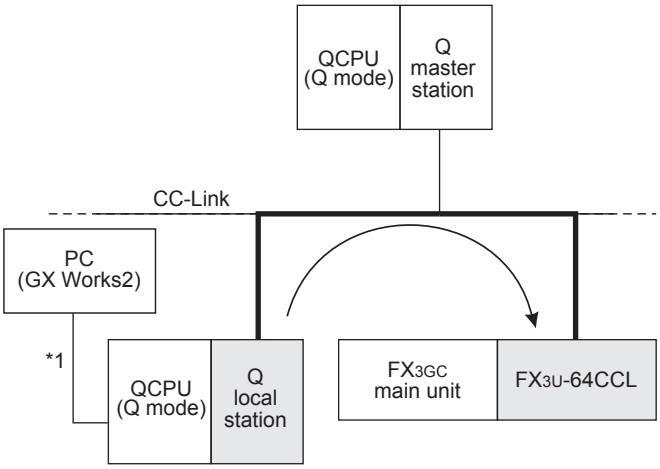
1) The path when accessing from the FX3U-16CCL-M



2) The path when accessing from the master QCPU (Q mode) station



3) The path when accessing from a local QCPU (Q mode) station

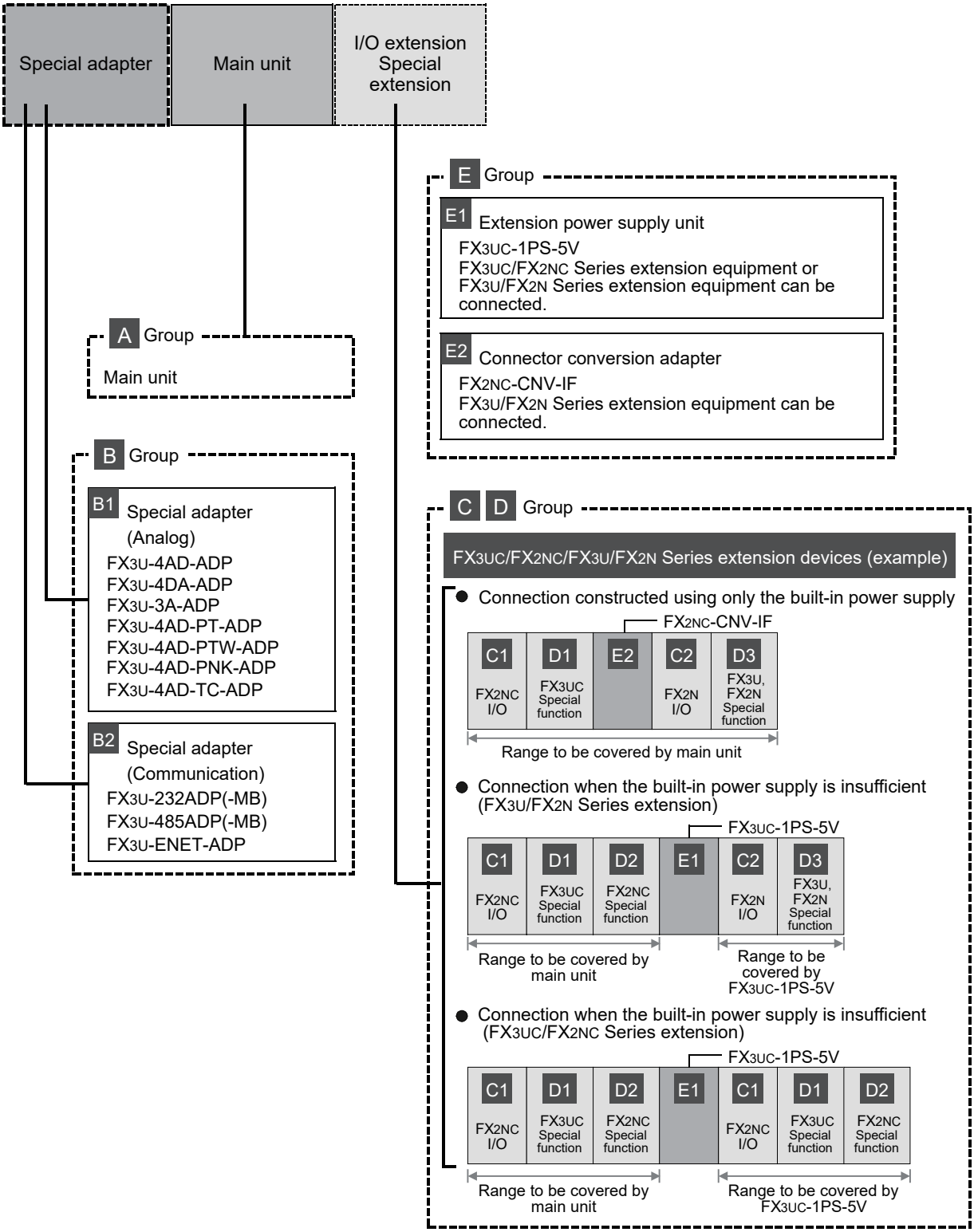


*1. Direct connection or connection using the GOT transparent mode.

1.6 System Overall Configuration

Products connectable to the FX3GC PLC are classified into the groups A to E as shown below.

For model names of products classified into the C and D groups, refer to "1.11 Number of occupied I/O points and 5 V DC current consumption".



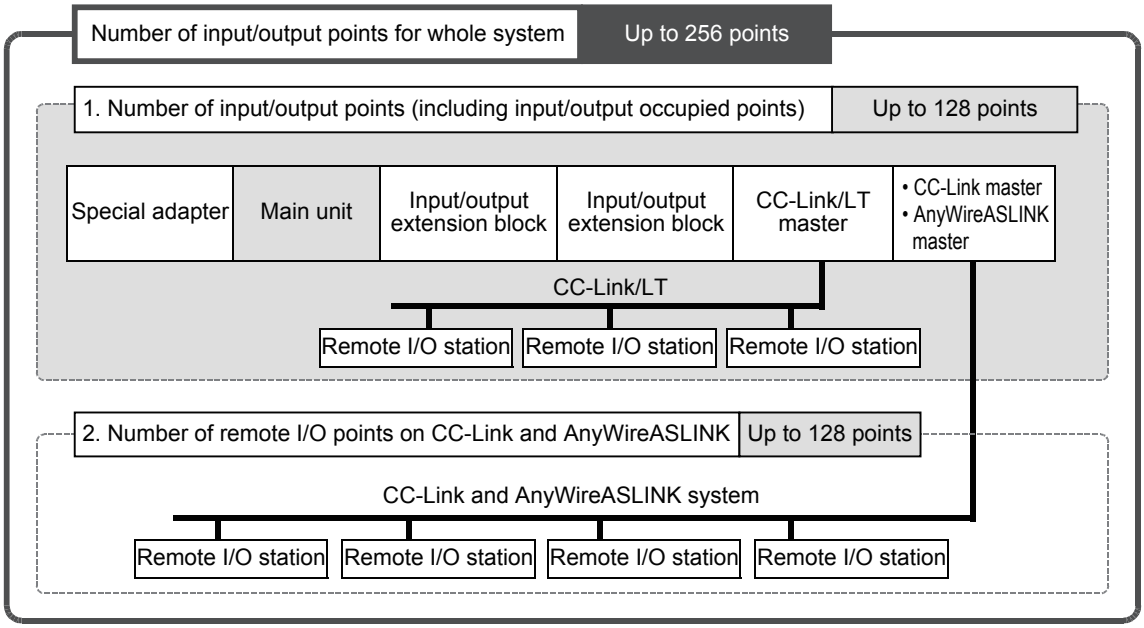
1.7 Rules of System Configuration

The system configuration must meet the following three requirements.

1. Number of input/output points

The total number of input and output points should be 256 or less in the whole system.

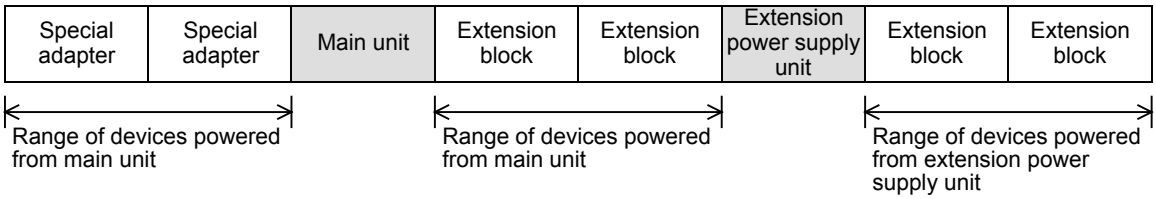
→ **For details, refer to "1.8 Number of I/O Points and Maximum Number of I/O Points".**



2. 5 V DC power supply capacity (current consumption)

The main unit built-in power supply and the extension power supply unit supply power to extension equipment respectively.

The current consumption varies depending on the type of extension equipment.

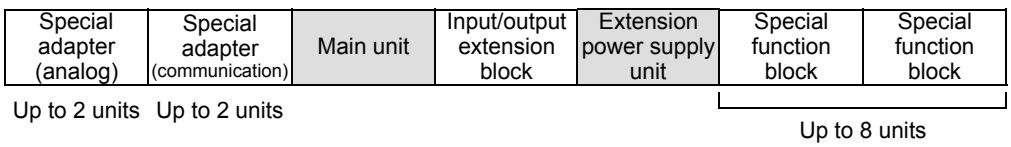


→ **For details, refer to "1.9 Calculation of 5 V DC power supply capacity (current consumption)".**

3. Restriction in number of units for each group

For special adapters, input/output extension blocks, and special function blocks, the number of units that can be connected to the main unit is restricted.

→ **For details, refer to "1.10 Restriction in number of units in each group".**



1.8 Number of I/O Points and Maximum Number of I/O Points

The number of input/output points and maximum number of input/output points varies depending on network use.

	Number of Input/Output Points	Maximum number of input/output points	Reference
When CC-Link is not used	128	128	Subsection 1.8.1
When CC-Link is used	128	256	Subsection 1.8.1 Subsection 1.8.2
When AnyWireASLINK is used			Subsection 1.8.1 Subsection 1.8.3

For the number of input/output points and maximum number of input/output points, refer to Section 1.7.

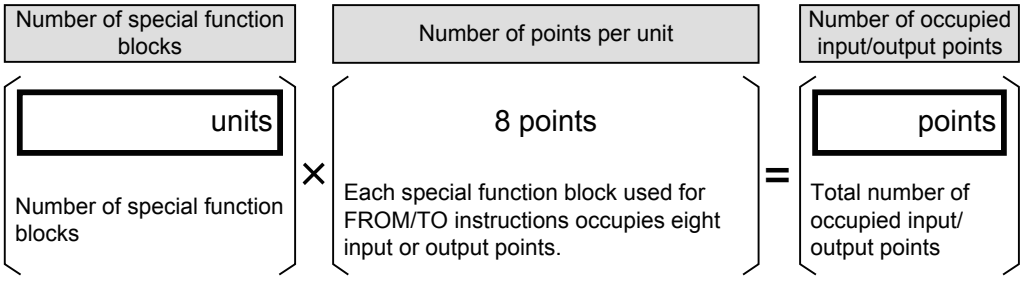
1.8.1 Calculation of number of input/output points

To obtain the total number of input/output points, count the input/output points of input/output extension blocks and the input/output occupied points of special function blocks.
The number of remote I/O points on CC-Link and AnyWireASLINK master network must be excluded.

1. **Total the number of input/output points on the main unit and the number of those on the input/output extension blocks.**
   To obtain the total number of input/output points, count the input points (X000 and higher) and output points (Y000 and higher) of the main unit and input/output extension blocks.

2. **Count the input/output points of the remote I/O stations connected to the FX2N-64CL-M.**
   Add the number of remote I/O points to the number of input/output points from the main unit and input/output extension blocks calculated in the above step.
   → **For the method of calculating the number of remote I/O points, refer to the FX2N-64CL-M manual.**

3. **Count the number of input/output occupied points of special function blocks.**
   The number of occupied input/output points per unit is 8.
   The number of occupied input/output points of each type of device can be obtained by the following formula or from the list shown below.
   → **For a list of occupied input/output points, refer to Section 1.11.**

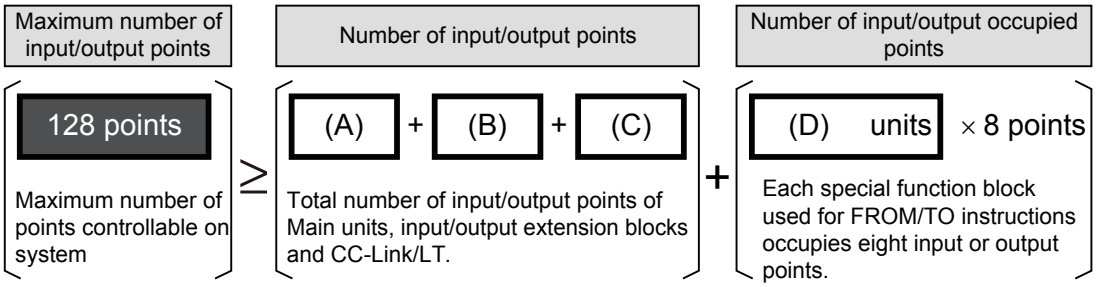


Observe the following instructions when using the following products.

- FX3U-16CCL-M (CC-Link master)
  Only one FX3U-16CCL-M unit can be connected to a single PLC main unit.
  This master cannot be used together with FX2N-16CCL-M.
- FX3U-64CCL
  Only one FX3U-64CCL unit can be connected to a single PLC main unit.
- FX2N-16CCL-M (CC-Link master)
  When more than one master station is connected, a remote I/O station cannot be connected to the 2nd and following master stations.
  This master cannot be used together with FX3U-16CCL-M and FX3U-128ASL-M.
- FX3U-128ASL-M (AnyWireASLINK master)
  Only one FX3U-128ASL-M unit can be connected to a single PLC main unit.
  This master cannot be used together with FX2N-16CCL-M.

4. Calculate the total number of input/output points.

Total the number of points counted in Steps 1, 2 and 3, and check that it does not exceed 128 points (maximum number of input/output points).



(A):Number of input/output points of main unit
(B):Number of input/output points of input/output extension blocks
(C):Number of remote I/O points of FX2N-64CL-M
(D):Number of special function blocks

5. When CC-Link or AnyWireASLINK master is used, count the remote I/O points.

When a CC-Link or AnyWireASLINK master is used, the total number of input/output points (128 points or less) of the remote I/O stations connected on the network and the number of input/output points calculated in the previous step must be 256 or less.
For details, refer to the following subsection.

1) FX3U-16CCL-M, FX2N-16CCL-M (CC-Link master)
Calculate the number of remote I/O points connected on the network in the following step.
→ **When a CC-Link master is used, refer to Subsection 1.8.2.**

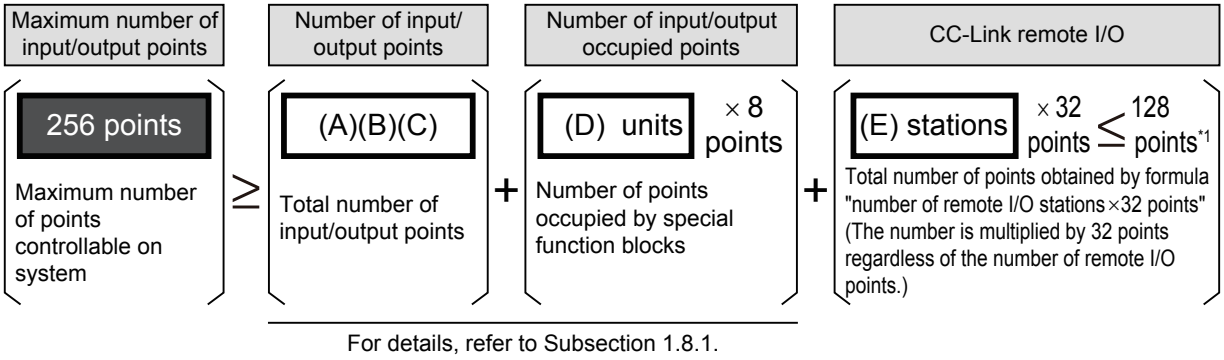
2) FX3U-128ASL-M (AnyWireASLINK master)
Calculate the number of remote I/O points connected on the network in the following step.
→ **When an AnyWireASLINK master is used, refer to Subsection 1.8.3.**

1.8.2 Maximum number of input/output points when CC-Link master is used

1. Calculation of maximum number of input/output points

The maximum number of available input/output points is as follows when CC-Link master block is used.

→ **For the method of calculating the number of I/O points, refer to Subsection 1.8.1.**

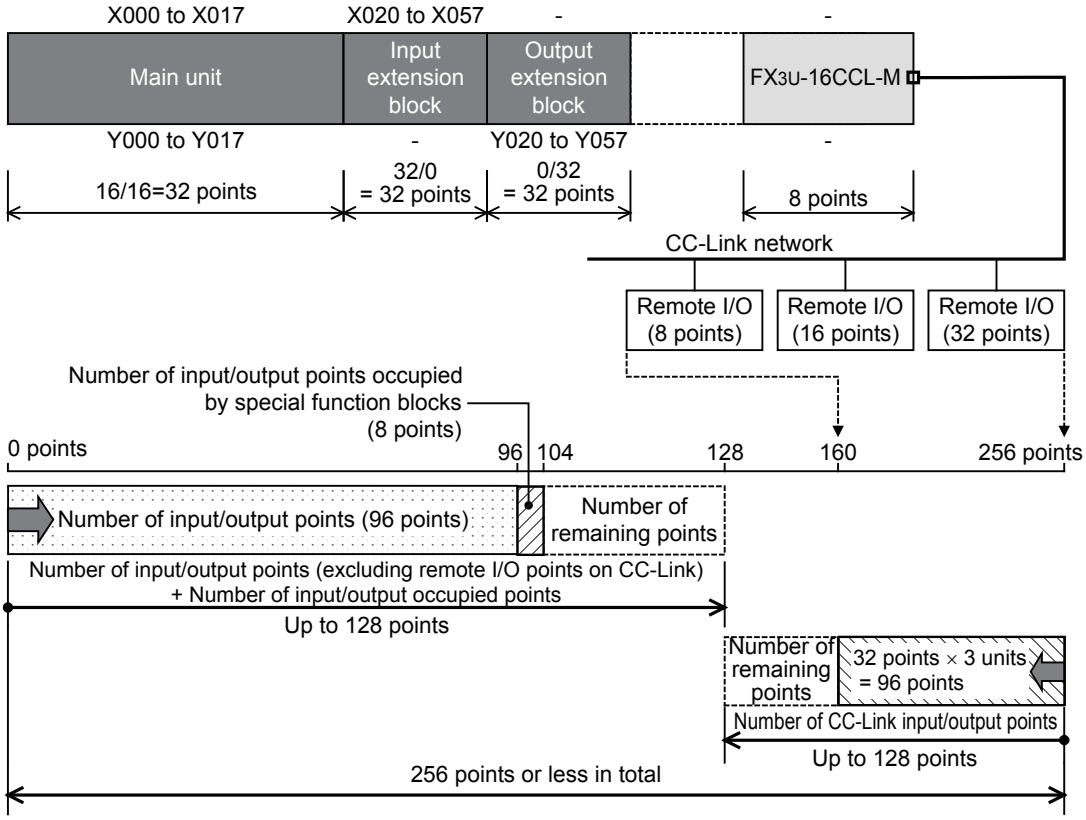


(A): Number of input/output points of main unit
(B): Number of input/output points of input/output extension blocks
(C): Number of remote I/O points of FX2N-64CL-M.
(D): Number of input/output points occupied by special function blocks
(E): Number of remote I/O stations (units) connected to CC-Link master

*1. The number of CC-Link points is calculated by the formula "32 points × number of stations" even when remote I/O stations with less than 32 points are used.
For details, refer to the manual of the CC-Link master block used.
When using together with the AnyWireASLINK master, make sure that the total number of remote I/O points in CC-Link and AnyWireASLINK master is 128 or less. When CC-Link parameters are set by a sequence program, all unused remote I/O points are occupied and become unavailable. When connecting the AnyWireASLINK master behind the CC-Link master, set CC-Link parameters using network parameters. For details, refer to FX3U-128ASL-M User's Manual.

2. Procedures for calculating number of input/output points based on example of system configuration

For the main unit, input/output extension blocks and CC-Link remote I/O stations, the number of input/output points and the total number of points are restricted.

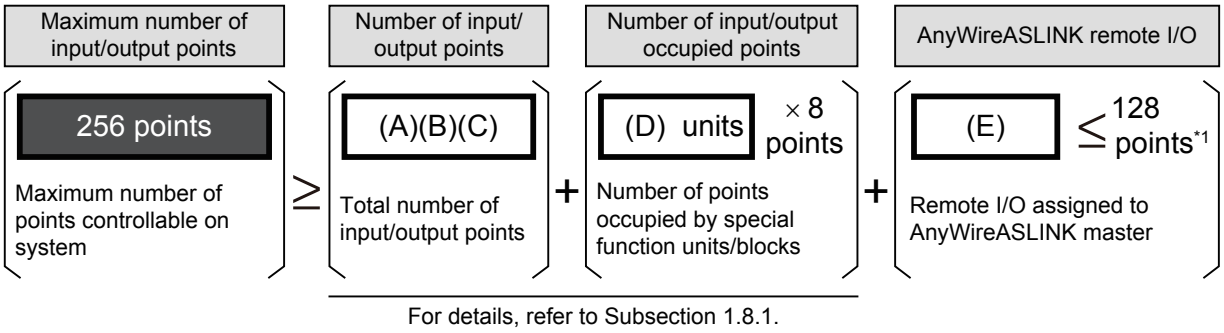


1.8.3 Maximum number of input/output points when AnyWireASLINK master is used

1. Calculation of maximum number of input/output points

The maximum number of available input/output points is as follows when AnyWireASLINK master block is used.

→ **For the method of calculating the number of I/O points, refer to Subsection 1.8.1.**

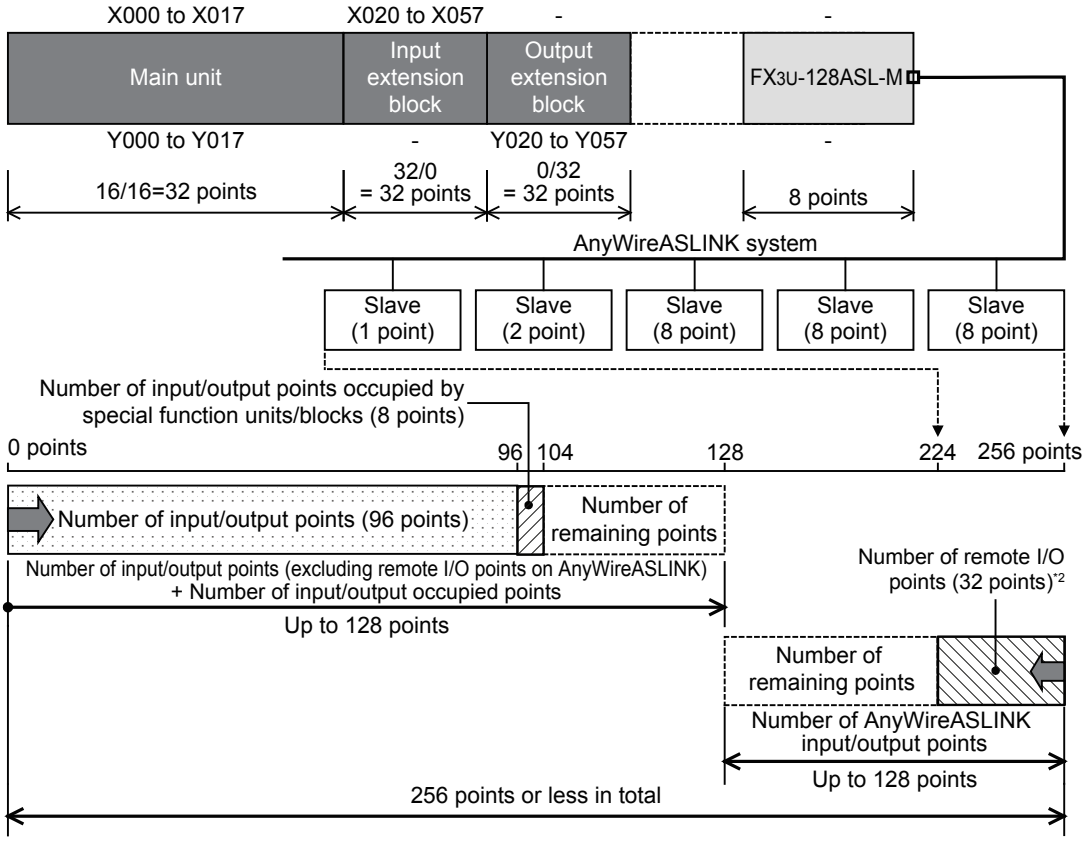


(A): Number of input/output points of main unit
(B): Number of input/output points of input/output extension blocks
(C): Number of remote I/O points of FX2N-64CL-M.
(D): Number of input/output points occupied by special function blocks
(E): Number of remote I/O points assigned to AnyWireASLINK master

*1. With regard to remote I/O of the AnyWireASLINK, input/output points set by the rotary switch of the AnyWireASLINK master are assigned.
When using together with the CC-Link master, make sure that the total number of remote I/O points in CC-Link and AnyWireASLINK master is 128 or less. For details, refer to FX3U-128ASL-M User's Manual.

2. Procedures for calculating number of input/output points based on example of system configuration

For the main unit, input/output extension blocks and AnyWireASLINK, the number of input/output points and the total number of points are restricted.

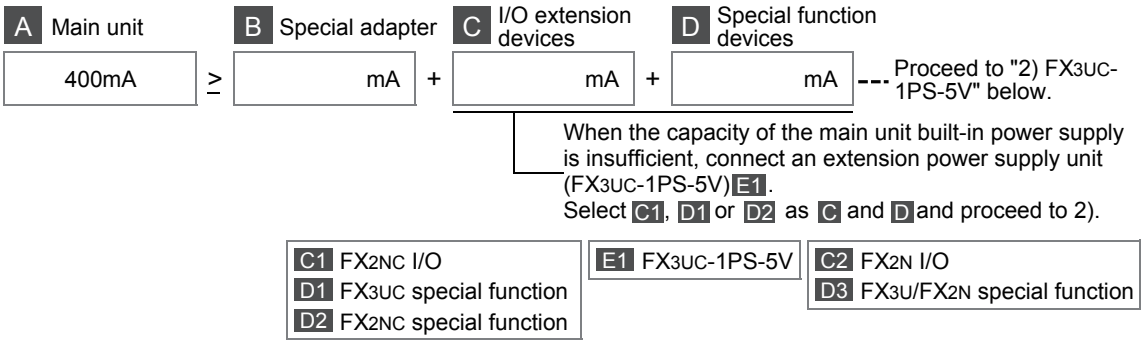


*2. When using 27 remote I/O points (8 points × 3 + 2 points + 1 point) shown above, assign 32 or more input/output points using the rotary switch of the AnyWireASLINK master.

1.9 Calculation of 5 V DC power supply capacity (current consumption)

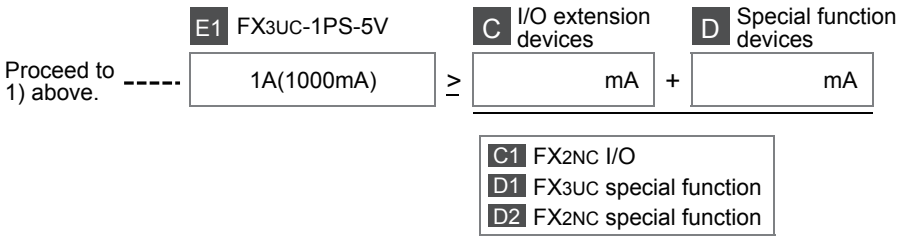
Confirm the current consumption using the following procedures.
When the main unit built-in power supply is insufficient, add an extension power supply unit (FX3UC-1PS-5V) in accordance with the necessity.
Only one extension power supply unit can be connected in a system.

1) Calculating the current in extension equipment that can receive power from the main unit built-in power supply.
Check whether the current consumption of extension equipment to be connected is not more than the capacity of the main unit built-in power supply.

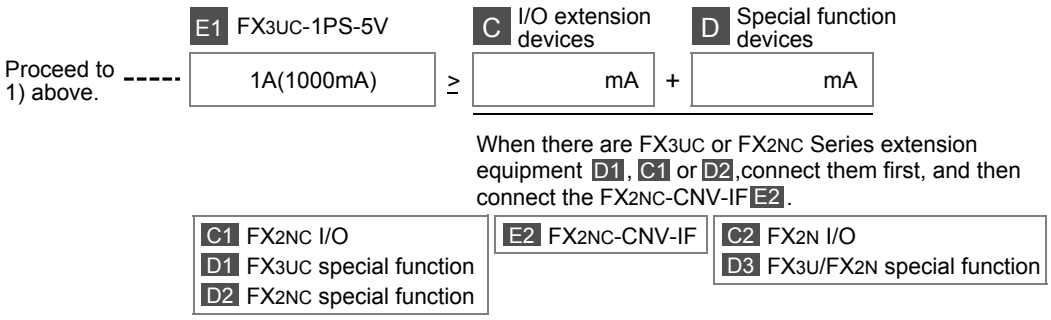


2) Calculating the current in extension equipment that can receive power from the extension power supply unit (FX3UC-1PS-5V)

a) When only FX3UC/FX2NC Series units are connected for extension:



b) When FX3UC, FX2NC, FX3U and FX2N Series equipment are connected for extension
For connection including the FX3U or FX2N Series extension equipment, the FX2NC-CNV-IF or FX3UC-1PS-5V is required:

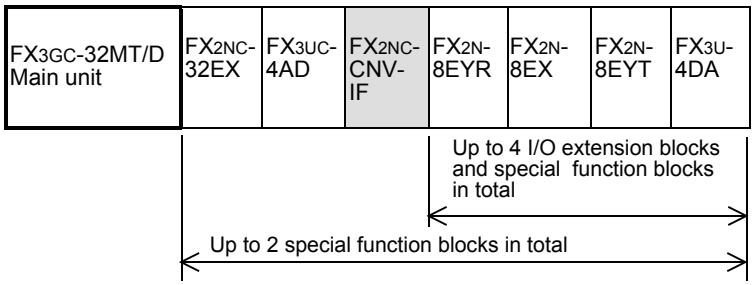


1.10 Restriction in number of units in each group

Confirm the number of units using the following procedures.

<table>
<tr><th colspan="2">Division</th><th>Contents of restrictions</th></tr>
<tr><td rowspan="2">B Special adapter</td><td>B1 Analog</td><td>Up to two units can be connected.</td></tr>
<tr><td>B2 Communication</td><td>Up to two units can be connected.

Note that the number of connectable units is restricted for the following communication special adapter.
<table>
<tr><th>Model name</th><th>Restriction</th></tr>
<tr><td>FX3U-ENET-ADP</td><td>Only one FX3U-ENET-ADP unit can be connected to a single PLC main unit.</td></tr>
</table></td></tr>
<tr><td colspan="2">C I/O extension devices
D Special function devices</td><td>• When the FX3UC-1PS-5V is used
- Up to 8 special function blocks in total can be connected in each system.
- Up to 2 special function blocks can be connected in the range where the power is supplied from the main unit.
- After the FX2NC-CNV-IF, up to 4 I/O extension blocks and special function blocks in total can be connected.
- The number of units connectable to the main unit or extension power supply unit is restricted in the following models (as shown on the next page).
• When the FX3UC-1PS-5V is not used
- Up to 2 special function blocks in total can be connected in each system.
After the FX2NC-CNV-IF, up to 4 I/O extension blocks and special function blocks in total can be connected.
- The number of units connectable to the main unit or extension power supply unit is restricted in the following models (as shown on the next page).

<Example>
 
</td></tr>
</table>

<table>
<tr><th>Division</th><th>Contents of restrictions</th></tr>
<tr><td>C I/O extension devices
D Special function devices</td><td>
In addition to the restrictions shown on the previous page, the number of units connectable to the main unit or extension power supply unit is restricted in the following models.
<table>
<tr><th rowspan="2">Model name</th><th colspan="2">Connection target and number of connectable units</th></tr>
<tr><th>Main unit
FX3GC-32MT/D</th><th>Extension power supply unit
FX3UC-1PS-5V</th></tr>
<tr><td>FX2NC-16EYR-T</td><td rowspan="9">When the FX2NC-16EYR-T is not used, up to 4 units in total can be connected.
When the FX2NC-16EYR-T is used, refer to the note*1 below.</td><td rowspan="9">Up to 5 units in total can be connected.</td></tr>
<tr><td>FX2N-8ER</td></tr>
<tr><td>FX2N-8EYR</td></tr>
<tr><td>FX2N-8EYR-S-ES/UL</td></tr>
<tr><td>FX2N-8EYT</td></tr>
<tr><td>FX2N-8EYT-H</td></tr>
<tr><td>FX2N-16EYR</td></tr>
<tr><td>FX2N-2AD*2</td></tr>
<tr><td>FX2N-2DA*2</td></tr>
</table>
<table>
<tr><th rowspan="2">Model name</th><th colspan="2">Connection target and number of connectable units</th></tr>
<tr><th>Main unit
FX3GC-32MT/DSS</th><th>Extension power supply unit
FX3UC-1PS-5V</th></tr>
<tr><td>FX2NC-16EYR-T-DS</td><td rowspan="9">When the FX2NC-16EYR-T-DS is not used, up to 4 units in total can be connected.
When the FX2NC-16EYR-T-DS is used, refer to the note*1 below.</td><td rowspan="9">Up to 5 units in total can be connected.</td></tr>
<tr><td>FX2N-8ER-ES/UL</td></tr>
<tr><td>FX2N-8EYR-ES/UL</td></tr>
<tr><td>FX2N-8EYR-S-ES/UL</td></tr>
<tr><td>FX2N-8EYT-ESS/UL</td></tr>
<tr><td>FX2N-16EYR-ES/UL</td></tr>
<tr><td>FX2N-2AD*2</td></tr>
<tr><td>FX2N-2DA*2</td></tr>
</table>
*1. When the FX2N-2AD or FX2N-2DA is used, up to 4 units in total can be connected.
When the FX2N-2AD or FX2N-2DA is not used, up to 5 units in total can be connected.
*2. Consider the restriction for the number of special function equipment.

Note that the number of connectable units is restricted for the following special function blocks.
<table>
<tr><th>Model name</th><th>Restrictions</th></tr>
<tr><td>FX3U-16CCL-M</td><td>• Only one FX3U-16CCL-M unit can be connected to a single PLC main unit.
• It cannot be used together with the FX2N-16CCL-M.</td></tr>
<tr><td>FX3U-64CCL</td><td>Only one FX3U-64CCL unit can be connected to a single PLC main unit.</td></tr>
<tr><td>FX2N-16CCL-M</td><td>• When multiple units are used, a remote I/O station cannot be connected to the second master station or later.
• It cannot be used together with the FX3U-16CCL-M and FX3U-128ASL-M.</td></tr>
<tr><td>FX3U-128ASL-M</td><td>• Only one FX3U-128ASL-M unit can be connected to a single PLC main unit.
• It cannot be used together with the FX2N-16CCL-M.</td></tr>
</table>
</td></tr>
<tr><td>E1 Extension power supply unit
FX3UC-1PS-5V</td><td>Only one extension power supply unit (FX3UC-1PS-5V) can be used for the whole system.</td></tr>
</table>

1.11 Number of occupied I/O points and 5 V DC current consumption

The table below shows the number of input/output occupied points for each model and the current consumed from the 5 V DC main unit built-in power supply or the 5 V DC FX3UC-1PS-5V power supply unit.

1. Main units

A

Model name	Number of input/output points	5 V DC current consumption (mA)
FX3GC-32MT/D	32	-
FX3GC-32MT/DSS	32	-

2. Special adapters

B

Division	Model name	Number of input/output points	5 V DC current consumption (mA)
B1	FX3U-4AD-ADP	0	15
	FX3U-4DA-ADP	0	15
	FX3U-3A-ADP	0	20
	FX3U-4AD-PT-ADP	0	15
	FX3U-4AD-PTW-ADP	0	15
	FX3U-4AD-PNK-ADP	0	15
	FX3U-4AD-TC-ADP	0	15
B2	FX3U-232ADP(-MB)	0	30
	FX3U-485ADP(-MB)	0	20
	FX3U-ENET-ADP	0	30

3. I/O extension devices

C

Division	Model name	Number of input/output points	5 V DC current consumption (mA)
C1	FX2NC-16EX	16	30
	FX2NC-16EX-DS	16	30
	FX2NC-16EX-T	16	30
	FX2NC-16EX-T-DS	16	30
	FX2NC-16EYT	16	50
	FX2NC-16EYT-DSS	16	50
	FX2NC-16EYR-T	16	50
	FX2NC-16EYR-T-DS	16	50
	FX2NC-32EX	32	60
	FX2NC-32EX-DS	32	60
	FX2NC-32EYT	32	100
	FX2NC-32EYT-DSS	32	100
C2	FX2N-8ER	16	25
	FX2N-8ER-ES/UL	16	25
	FX2N-8EX	8	25
	FX2N-8EX-ES/UL	8	25
	FX2N-8EX-UA1/UL	8	25
	FX2N-8EYR	8	30
	FX2N-8EYR-ES/UL	8	30
	FX2N-8EYR-S-ES/UL	8	30
	FX2N-8EYT	8	30
	FX2N-8EYT-ESS/UL	8	30
	FX2N-8EYT-H	8	30
	FX2N-16EX	16	45
	FX2N-16EX-ES/UL	16	45
	FX2N-16EX-C	16	40
	FX2N-16EXL-C	16	35
	FX2N-16EYR	16	40

Division	Model name	Number of input/output points	5 V DC current consumption (mA)
C2	FX2N-16EYR-ES/UL	16	40
	FX2N-16EYS	16	160
	FX2N-16EYT	16	180
	FX2N-16EYT-ESS/UL	16	180
	FX2N-16EYT-C	16	180

4. Special function devices

D

Division	Model name	Number of input/output points	5 V DC current consumption (mA)
D1	FX3UC-4AD	8	100
D2	FX2NC-4AD	8	50
	FX2NC-4DA	8	30
D3	FX3U-4AD	8	110
	FX3U-4DA	8	120
	FX3U-4LC	8	160
	FX3U-16CCL-M	*1	0
	FX3U-64CCL	8	0
	FX2N-2AD	8	20
	FX2N-2DA	8	30
	FX2N-4AD	8	30
	FX2N-4DA	8	30
	FX2N-4AD-TC	8	30
	FX2N-4AD-PT	8	30
	FX2N-8AD	8	50
	FX2N-5A	8	70
	FX2N-2LC	8	70
	FX2N-16CCL-M	*1	0
	FX2N-32CCL	8	130
	FX2N-64CL-M	*1	190
	FX3U-128ASL-M	*1	130
	FX3U-32DP	8	0

*1. For the number of input/output occupied points, refer to the table below.

Model name	Number of input/output occupied points (Use the following formula.)
FX3U-16CCL-M FX2N-16CCL-M	Remote I/O stations × 32 points + 8 points
FX2N-64CL-M	Total number of input/output points in remote I/O stations + 8 points
FX3U-128ASL-M	Set value of rotary switch + 8 points

5. Extension power supply unit/Connector conversion adapter

E

Division	Model name	Number of input/output points	5 V DC current consumption (mA)
E1	FX3UC-1PS-5V	0	-
E2	FX2NC-CNV-IF	0	-

1.12 Selection Calculation Example 1 for System Configuration

When the main unit is the FX3GC-32MT/D.

1. System equipment

FX3U-485ADP (-MB)	FX3U-232ADP (-MB)	FX3GC-32MT/D	FX2NC-16EX	FX2NC-16EYR-T	FX3UC-4AD	FX2NC-CNV-IF	FX3U-4DA	FX2N-16EX	FX2N-16EYR

2. Confirmation of system configuration availability

1) Restriction in number of input/output points

Number of input / output occupied points		
a) Main unit (Number of input / output occupied points)		Total of a)
FX3GC-32MT/D	32 points	32 points
b) I/O extension block (Number of input / output occupied points)		Total of b) 16 + 16 + 16 + 16 = 64
FX2NC-16EX	16 points	
FX2NC-16EYR-T	16 points	
FX2N-16EX	16 points	
FX2N-16EYR	16 points	64 points
c) Connector conversion adapter (Number of input / output occupied points)		Total of c)
FX2NC-CNV-IF	0 points	0 points
d) Special adapter (Number of input / output occupied points)		Total of d) 0 + 0 = 0
FX3U-232ADP(-MB)	0 points	
FX3U-485ADP(-MB)	0 points	0 points
e) Special function blocks (Number of input / output occupied points)		Total of e) 8 + 8 = 16
FX3UC-4AD	8 points	
FX3U-4DA	8 points	16 points
Total number of I/O points		a) + b) + c) + d) + e) = 32 + 64 + 0 + 0 + 16 = 112 ≤ 128 points

The I/O points restriction is satisfied since the total number of input/output points is less than 128.

OK

2) Restriction in 5 V DC power supply capacity
Calculate the 5 V DC power supply capacity for the main unit or extension power supply unit.

5 V DC power supply capacity and current consumption		
a) Supplier side		
FX3GC-32MT/D	400mA	
b) Consumer side		
FX3U-485ADP(-MB)	20mA	50mA
FX3U-232ADP(-MB)	30mA	
FX2NC-16EX	30mA	80mA
FX2NC-16EYR-T	50mA	130mA
FX3UC-4AD	100mA	230mA
FX2NC-CNV-IF	0mA	230mA
FX3U-4DA	120mA	350mA
FX2N-16EX	45mA	395mA
FX2N-16EYR	40mA	435mA
"a) Supplier side" - "b) Consumer side" = 400mA - 435mA = -35mA		

It is necessary to add an extension power supply unit since the capacity on the consumer side b) is 35 mA larger than the capacity on the supplier side a). Invalid

→ **Refer to Subsection 1.12.1.**

3) Restriction for the number of connectable units

a) Special adapter
The FX3GC-32MT/D can be connected with up to 2 communication special adapters and up to 2 analog special adapters.
There is no problem with this configuration since only 2 communication special adapters are connected. OK

b) Input/output extension block and special function block
The FX3GC-32MT/D can be connected with up to 2 special function blocks when the extension power supply unit is not used.
Up to 4 input/output extension blocks and special function blocks in total can be connected after the FX2NC-CNV-IF.

There is no problem here because only 2 special function blocks are connected, which is within the maximum number of connectable units.
There is no problem because only 3 input/output extension blocks and special function blocks in total are connected after the FX2NC-CNV-IF. OK

c) Other restrictions
In some models, only up to 4 units (or 5 units in certain conditions) can be connected to a single main unit. When connecting 5 or more units, it is necessary to add an extension power supply unit. (Refer to Section 1.10.)
This configuration includes the following equipment that fall under the restriction for the number of connectable units.
- FX2NC-16EYR-T
- FX2N-16EYR

There is no problem with this configuration since it satisfies the restriction for the number of connectable units (5 units). OK

1.12.1 Re-examination of suitability for configuration

In this configuration, it is necessary to add an extension power supply unit FX3UC-1PS-5V due to the restrictions in 5 V DC power supply capacity.
Construct the system as follows.

1. Components after countermeasures

Connect the extension power supply unit FX3UC-1PS-5V in place of the FX2NC-CNV-IF.

FX3U-485ADP (-MB)	FX3U-232ADP (-MB)	FX3GC-32MT/D	FX2NC-16EX	FX2NC-16EYR-T	FX3UC-4AD	FX3UC-1PS-5V	FX3U-4DA	FX2N-16EX	FX2N-16EYR

2. Reexamination of system configuration availability

1) Restriction for the number of input/output points
There is no problem since the number of input/output points in the new system is "112".

OK

2) Restriction for the 5 V DC power supply capacity
The 5 V DC power supply capacity is as follows after the countermeasures.

- Main unit side

5 V DC power supply capacity and current consumption			
a) Supplier side			
FX3GC-32MT/D	400mA		
b) Consumer side			
FX3U-485ADP(-MB)	20mA	50mA	230mA
FX3U-232ADP(-MB)	30mA		
FX2NC-16EX	30mA	80mA	
FX2NC-16EYR-T	50mA	130mA	
FX3UC-4AD	100mA		
"a) Supplier side" - "b) Consumer side" = 400mA - 230mA = 170mA ≥ 0mA			

There is no problem since the total current consumption is less than the capacity "400 mA" supplied by the main unit.

OK

- Extension power supply unit side

5 V DC power supply capacity and current consumption			
a) Supplier side			
FX3UC-1PS-5V	1A (1000mA)		
b) Consumer side			
FX3U-4DA	120mA	165mA	205mA
FX2N-16EX	45mA		
FX2N-16EYR	40mA		
"a) Supplier side" - "b) Consumer side" = 1000mA - 205mA = 795mA ≥ 0mA			

There is no problem since the total current consumption is less than the capacity "1 A (1000 mA)" supplied by the extension power supply unit.

OK

3) Restriction for the number of connectable units

a) Special adapter
There is no problem since the components are not changed.

OK

b) Input/output extension block and special function block
The FX3GC-32MT/D can be connected with up to 8 special function blocks when the extension power supply unit is used.
Up to 2 special function blocks can be connected in the range where the power is supplied from the main unit.
Up to 4 input/output extension blocks and special function blocks in total can be connected after the FX2NC-CNV-IF.

There is no problem since the components are not changed.

OK

c) Other restrictions
There is no problem since the components are not changed.

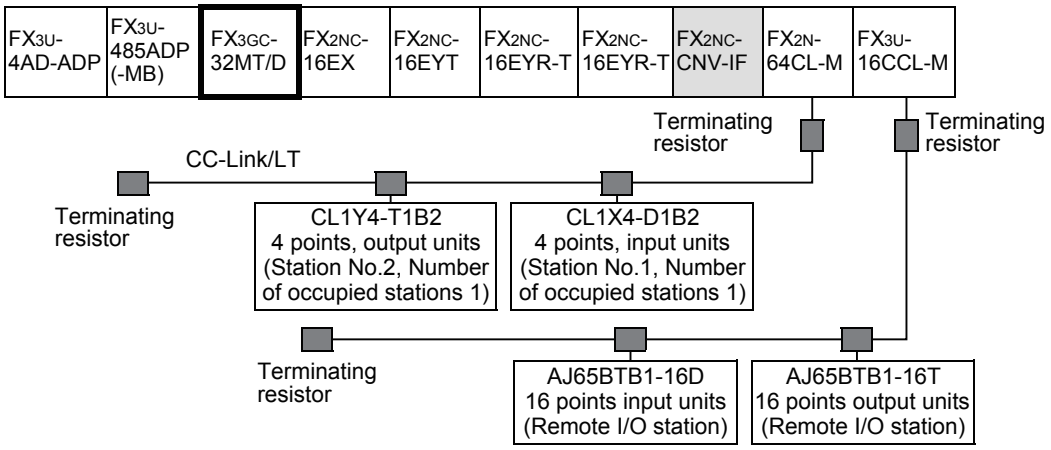
OK

The restrictions for the number of input/output points, the restriction for the 5 V DC power supply capacity, which is within the maximum number of connectable units and the configuration is valid when an extension power supply unit FX3UC-1PS-5V is connected instead of an FX2NC-CNV-IF.

1.13 Selection Calculation Example 2 for System Configuration

When the main unit FX3GC-32MT/D and CC-Link master are used.

1. Example system configuration



2. Judgment of system configuration availability

1) Restriction for the number of input/output points

Number of input / output occupied points		
a) Main unit (Number of input / output occupied points)		Total of a)
FX3GC-32MT/D	32 points	32 points
b) I/O extension block (Number of input / output occupied points)		Total of b) 16 + 16 + 16+ 16 = 64
FX2NC-16EX	16 points	
FX2NC-16EYT	16 points	
FX2NC-16EYR-T	16 points	
FX2NC-16EYR-T	16 points	64 points
c) Connector conversion adapter (Number of input / output occupied points)		Total of c)
FX2NC-CNV-IF	0 points	0 points
d) Special adapter (Number of input / output occupied points)		Total of d) 0 + 0 + 0 = 0
FX3U-485ADP(-MB)	0 points	
FX3U-4AD-ADP	0 points	0 points
e) Total number of input/output points in remote I/O stations for CC-Link/LT		Total of e) 4 + 4 = 8 points
CL1X4-D1B2	4 points	
CL1Y4-T1B2	4 points	8 points
f) Special function blocks (Number of input / output occupied points)		Total of f) 8 + 8 = 16 *1 Input/output occupied points in remote I/O stations are not included in the calculation here.
FX2N-64CL-M	8 points	
FX3U-16CCL-M	8 points*1	16 points
g) Total number of I/O points		a) + b) + c) + d) + e) + f) = g) 32 + 64 + 0 + 0 + 8 + 16 = 120 g) ≤ 128 points

The I/O points restriction is satisfied since the total number of input/output points is less than 128.

OK

2) Restriction for the number of remote I/O points

Number of input / output occupied points		
h) Number of input/output occupied points in remote I/O stations in network (CC-Link)		Total of h) 64 [Input/output occupied points in remote I/O (32 points × 2 units)] = 64
AJ65BTB1-16D	32 points	
AJ65BTB1-16T	32 points	64 points
Number of input/output occupied points in network		h) ≤ 128 points

The restriction for the number of input/output points is satisfied since the total number of input/output occupied points in the network is less than 128.

OK

3) Restriction for the 5 V DC power supply capacity
Calculate the 5 V DC power supply capacity of the main unit or extension power supply unit.

5 V DC power supply capacity and current consumption		
a) Supplier side		
FX3GC-32MT/D	400mA	
b) Consumer side		
FX3U-485ADP(-MB)	20mA	35mA
FX3U-4AD-ADP	15mA	80mA
FX2NC-16EX	45mA	130mA
FX2NC-16EYT	50mA	180mA
FX2NC-16EYR-T	50mA	230mA
FX2NC-16EYR-T	50mA	230mA
FX2NC-CNV-IF	0mA	420mA
FX2N-64CL-M	190mA	420mA
FX3U-16CCL-M	0mA	
"a) Supplier side" - "b) Consumer side" = 400mA - 420mA = -20mA		

It is necessary to add an extension power supply unit since the capacity on the consumer side b) is 20 mA larger than the capacity on the supplier side a).

Invalid

→ **Refer to Subsection 1.13.1.**

4) Restriction for the number of connectable units

a) Special adapter
The FX3GC-32MT/D can be connected with up to 2 communication special adapters and up to 2 analog special adapters.
There is no problem since this configuration includes only 1 communication special adapter and 1 special analog adapter.

OK

b) Input/output extension block and special function block
The FX3GC-32MT/D can be connected with up to 2 special function blocks when the extension power supply unit is not used.
Up to 4 input/output extension blocks and special function blocks in total can be connected after the FX2NC-CNV-IF.

There is no problem here because only 2 special function blocks are connected, which is within the maximum number of connectable units.
There is no problem because only 2 special function blocks are connected after the FX2NC-CNV-IF.

OK

c) Other restrictions
In some models, only up to 4 units (or 5 units in certain conditions) can be connected to a single main unit. When connecting 5 or more units, it is necessary to add an extension power supply unit.(Refer to Section 1.10.)
This configuration includes the following equipment that fall under the restriction for the number of connectable units.
- FX2NC-16EYR-T × 2

There is no problem with this configuration since it satisfies the restriction for the number of connectable units (5 units).

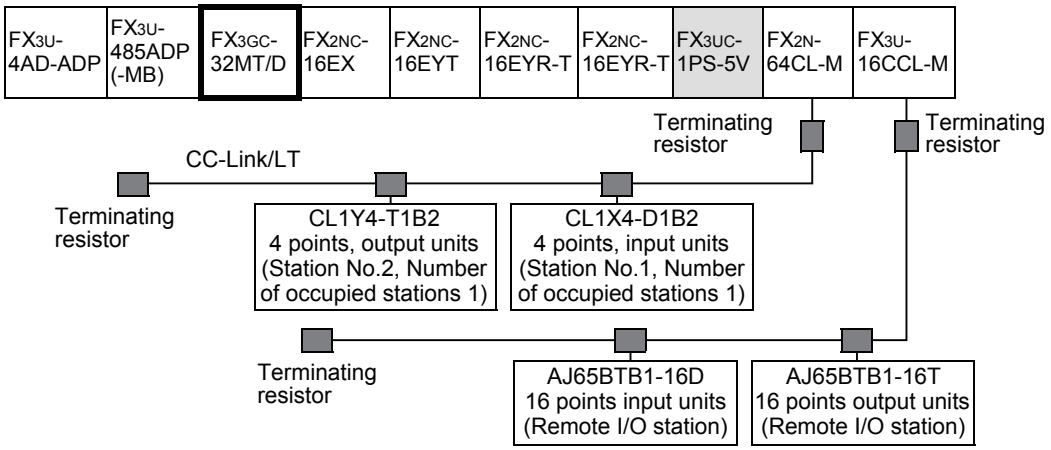
OK

1.13.1 Judgment of availability after reexamination of configuration

In this configuration, it is necessary to add an extension power supply unit FX3UC-1PS-5V due to the restrictions in the 5 V DC power supply capacity.
Construct the system as follows.

1. Example of reexamined system configuration

Connect the extension power supply unit FX3UC-1PS-5V in place of the FX2NC-CNV-IF.



2. Reexamination of system configuration availability

1) Restriction for the number of input/output points
There is no problem since the number of input/output points in the new system is "120".

OK

2) Restriction for the number of remote I/O points
There is no problem since the number of remote I/O points in the new system is "64".

OK

3) Restriction for the 5 V DC power supply capacity
The 5 V DC power supply capacity is as follows after countermeasures.

- Main unit side

5 V DC power supply capacity and current consumption		
a) Supplier side		
FX3GC-32MT/D	400mA	
b) Consumer side		
FX3U-485ADP(-MB)	20mA	35mA
FX3U-4AD-ADP	15mA	
FX2NC-16EX	45mA	80mA
FX2NC-16EYT	50mA	130mA
FX2NC-16EYR-T	50mA	180mA
FX2NC-16EYR-T	50mA	230mA
"a) Supplier side" - "b) Consumer side" = 400mA - 230mA = 170mA ≥ 0mA		

There is no problem since the total current consumption is less than the capacity "400 mA" supplied by the main unit.

OK

- Extension power supply unit side

5 V DC power supply capacity and current consumption		
a) Supplier side		
	FX3UC-1PS-5V	1A (1000mA)
b) Consumer side		
	FX2N-64CL-M	190mA
	FX3U-16CCL-M	0mA
		190mA
"a) Supplier side" - "b) Consumer side" = 1000mA - 190mA = 810mA ≥ 0mA		

There is no problem since the total current consumption is less than the capacity "1A (1000 mA)" supplied by the extension power supply unit.

OK

4) Restriction for the number of connectable units

a) Special adapter
There is no problem since the components are not changed.

OK

b) Input/output extension block and special function block
The FX3GC-32MT/D can be connected with up to 8 special function blocks when the extension power supply unit is used.
Up to 2 special function blocks can be connected in the range where the power is supplied from the main unit.
Up to 4 input/output extension blocks and special function blocks in total can be connected after the FX2NC-CNV-IF.

There is no problem since the components are not changed.

OK

c) Other restrictions
There is no problem since the components are not changed.

OK

The restrictions for the number of input/output points, the restriction for the 5 V DC power supply capacity, which is within the maximum number of connectable units and the configuration is valid when an extension power supply unit is added.

1.14 Assignment of Input/Output Numbers (X/Y)

When input/output extension blocks are connected to the main unit (CPU), octal numbers are assigned as input/output numbers (X/Y) when the power is turned ON. Accordingly, it is not usually necessary to specify input/output numbers using parameters.
It is necessary, however, to assign input/output numbers to the following special function blocks.

- FX2N-64CL-M

1.14.1 Rules for input/output number (X/Y) assignment

When the power is turned on, input/output numbers (X/Y) are assigned in accordance with the following rules.

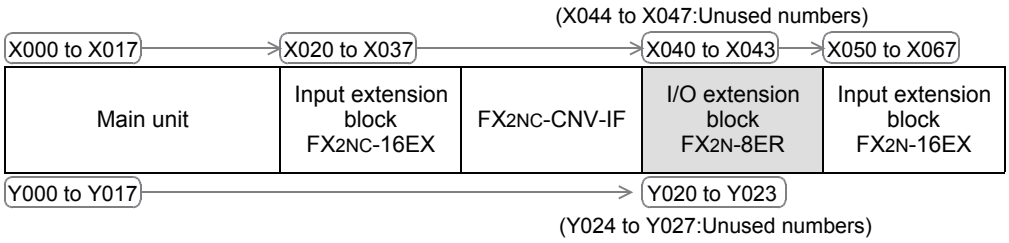
1. Input/output numbers (X/Y) are octal.

Octal numbers are assigned as input/output numbers (X/Y) 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...

2. Numbers for added input/output block

For each of the input/output extension blocks connected to the right side of the main unit or input/output extension block, input/output numbers following the input/output numbers on the main unit or extension block on the left side are assigned respectively. However, the last digit is assigned from "0".
For example, when the input number in the main unit or extension block on the left side ends at X043, input numbers starting from X050 are assigned to the extension block on the right side. (When the FX2N-8ER is used, unused numbers are generated in input/output numbers.)



1.15 Unit Numbers of Special Function Blocks

When the power is turned on, the main unit (CPU) automatically assigns the numbers 0 to 7 to special function blocks starting from the one closest to the main unit.

1.15.1 Rules of unit number assignment

Unit numbers are automatically assigned to special function blocks as follows when the power is turned ON.

1. **Special function blocks connected to the right side of the main unit**
   Unit Nos. 0, 1 • • • 7 are assigned to special function blocks (except input/output extension blocks) from the one nearest the main unit.

2. **Products to which unit numbers are not assigned**
   - Input/output extension blocks: FX2NC-16EX, FX2NC-16EYR, etc.
   - Extension power supply unit: FX3UC-1PS-5V
   - Connector conversion adapter: FX2NC-CNV-IF, FX2N-CNV-BC
   - Special adapters: FX3U-232ADP(-MB), etc.

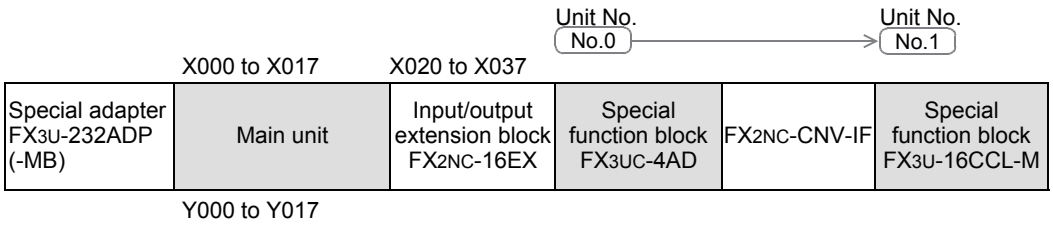
1.15.2 Example of assigning

Unit numbers are assigned to the special function blocks in the following configuration.

→ **For assignment of input/output numbers, refer to Section 1.14.**

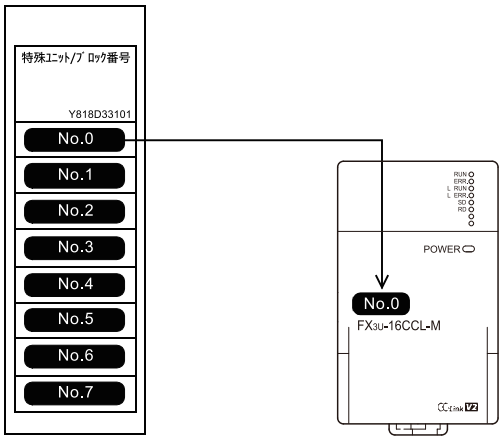
Special adapter FX3U-232ADP (-MB)	Main unit	Input/output extension block FX2NC-16EX	Special function block FX3UC-4AD	FX2NC-CNV-IF	Special function block FX3U-16CCL-M

Unit numbers are assigned to the special function blocks in the above configuration as shown below.



1.15.3 Application of unit number labels

The special function blocks come with unit number labels.
Apply the unit number labels to spaces on the enclosure (see the following figure) so that the unit numbers can be identified.

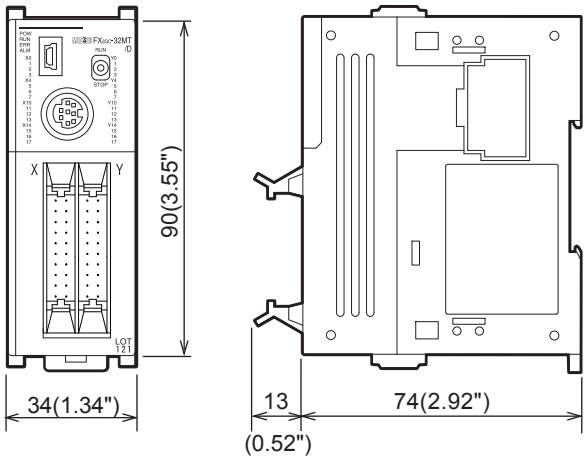


2. External Dimensions and Terminal Arrangement

2.1 External Dimensions (MASS/Installation/Accessories)

2.1.1 Main units

Unit:mm (inches)



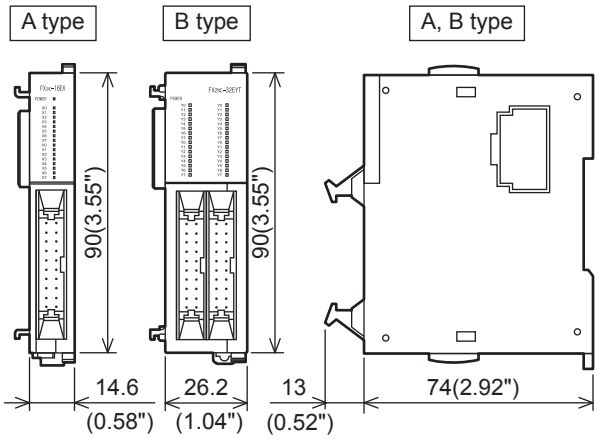
Model name	MASS (Weight): kg (lbs)
FX3GC-32MT/D	Approx. 0.2 (0.44lbs)
FX3GC-32MT/DSS	Approx. 0.2 (0.44lbs)

- Installation: DIN rail of 35 mm (1.38") in width only
- Accessories:
  1) FX3GC-32MT/D
  FX2NC-100MPCB power supply cable (1 m (3'33")),
  FX2NC-100BPCB power supply cable (1 m (3'33")),
  Manual supplied with product
  2) FX3GC-32MT/DSS
  FX2NC-100MPCB power supply cable (1 m (3'33")),
  Manual supplied with product

2.1.2 FX2NC series input/output extension block

1. Connector type

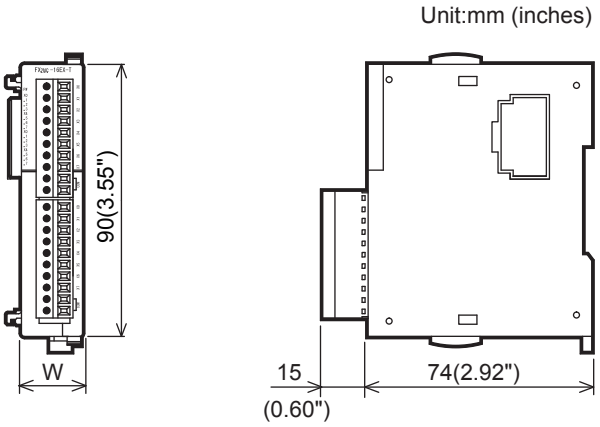
Unit:mm (inches)



Type	Model name	MASS (Weight): kg (lbs)
A	FX2NC-16EX FX2NC-16EYT FX2NC-16EX-DS FX2NC-16EYT-DSS	Approx. 0.15 (0.33lbs)
B	FX2NC-32EX FX2NC-32EYT FX2NC-32EX-DS FX2NC-32EYT-DSS	Approx. 0.2 (0.44lbs)

- Installation: DIN rail of 35 mm (1.38") in width only
- Accessories:
  1) FX2NC-□□EX
  FX2NC-10BPCB1 power crossover cable (0.1 m (0'3"))
  2) Other models
  None

2. Terminal type

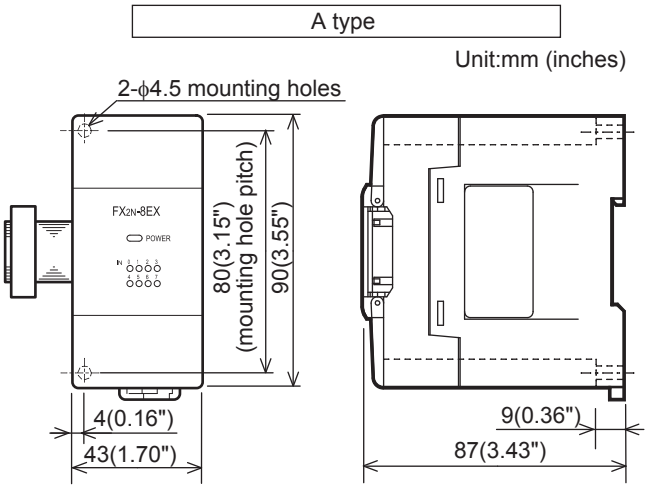


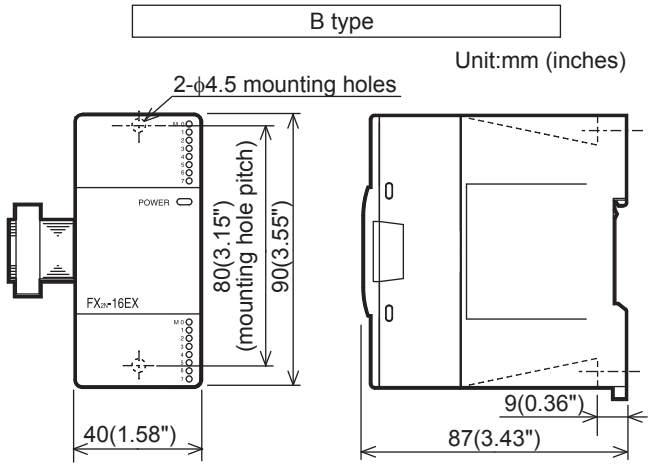
Model name	W:mm (inches)	MASS (Weight): kg (lbs)
FX2NC-16EX-T FX2NC-16EX-T-DS	20.2 (0.80")	Approx. 0.15 (0.33lbs)
FX2NC-16EYR-T FX2NC-16EYR-T-DS	24.2 (0.96")	Approx. 0.2 (0.44lbs)

- Installation: DIN rail of 35 mm (1.38") in width only
- Accessories:
  1) FX2NC-16EX-T
     FX2NC-10BPCB1 power crossover cable (0.1 m (0'3"))
  2) Other models
     None

2.1.3 FX2N series input/output extension block

1. Connector / Terminal type





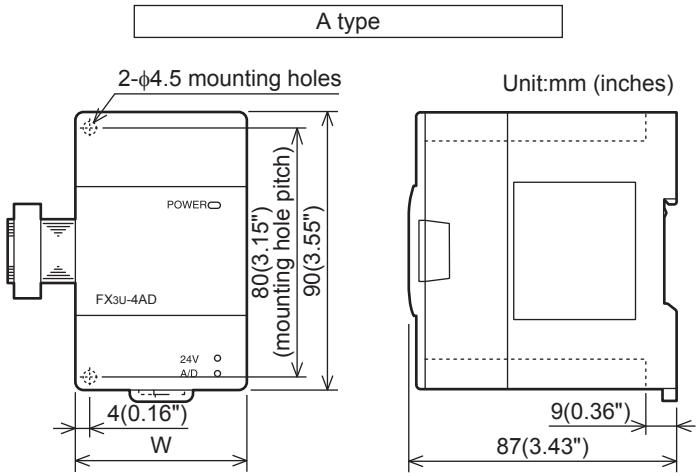
Type	Model name	MASS (Weight): kg (lbs)
A	FX2N-8ER FX2N-8EX FX2N-8EX-UA1/UL FX2N-8EYR FX2N-8EYT FX2N-8EYT-H FX2N-8ER-ES/UL FX2N-8EX-ES/UL FX2N-8EYR-ES/UL FX2N-8EYT-ESS/UL	Approx. 0.2 (0.44lbs)
B	FX2N-16EX FX2N-16EX-C FX2N-16EXL-C FX2N-16EYR FX2N-16EYT FX2N-16EYT-C FX2N-16EYS FX2N-16EX-ES/UL FX2N-8EYR-S-ES/UL FX2N-16EYR-ES/UL FX2N-16EYT-ESS/UL	Approx. 0.3 (0.66lbs)

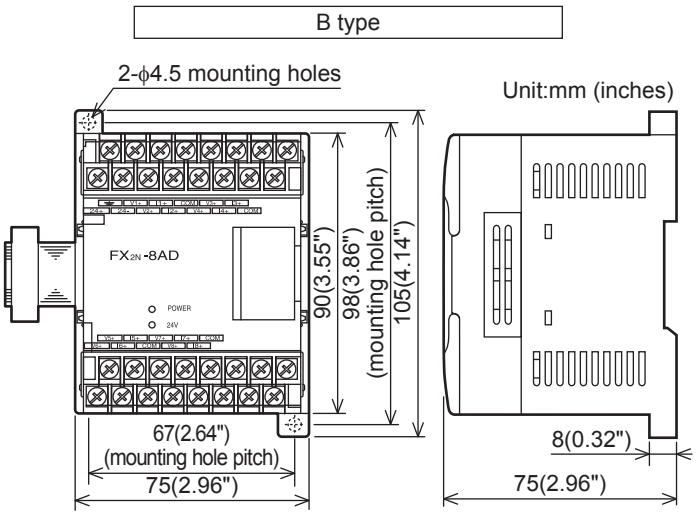
- Installation: DIN rail of 35 mm (1.38") in width or screws
- Accessories: Label for indication of I/O number
- Terminal block: M3 screws
- The extension cable is already connected to the extension block

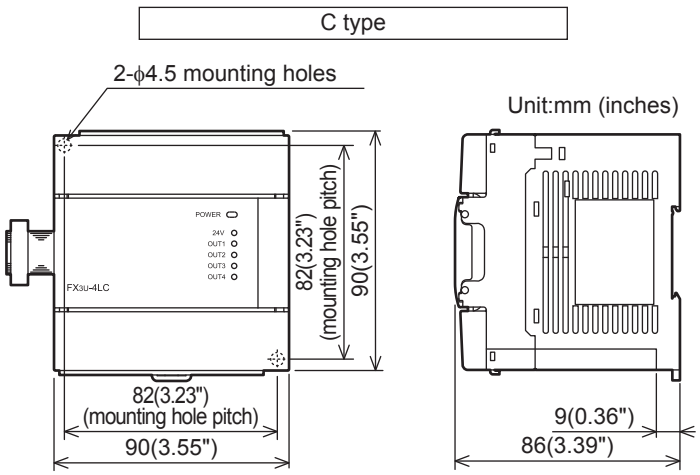
2.1.4 FX2N/FX2NC/FX3U/FX3UC series special function block

1. Analog control

FX2N/FX3U Series



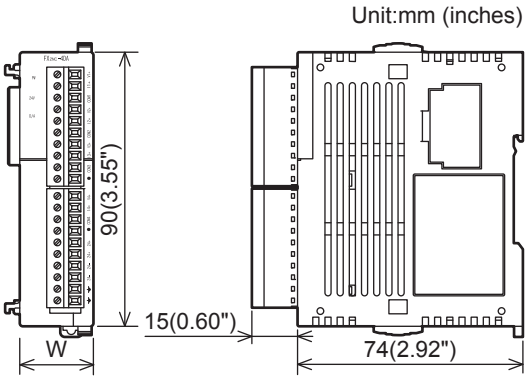




Type	Model name	W:mm (inches)	MASS(Weight): kg (lbs)
A	FX3U-4AD FX3U-4DA	55 (2.17")	Approx. 0.2 (0.44lbs)
	FX2N-2AD FX2N-2DA	43 (1.70")	Approx. 0.2 (0.44lbs)
	FX2N-4AD FX2N-4DA FX2N-4AD-PT FX2N-4AD-TC FX2N-5A FX2N-2LC	55 (2.17")	Approx. 0.3 (0.66lbs)
B	FX2N-8AD	75 (2.96")	Approx. 0.4 (0.88lbs)
C	FX3U-4LC	90 (3.55")	Approx. 0.4 (0.88lbs)

- Installation: DIN rail of 35 mm (1.38") in width or screws
- Accessories: Label for indication of special unit/block number, Dust proof protection sheet, Manual supplied with product
- Terminal block: M3 screws (FX2N-8AD is M3.5 screws)
- The extension cable is already connected to the extension block

FX2NC/FX3UC Series

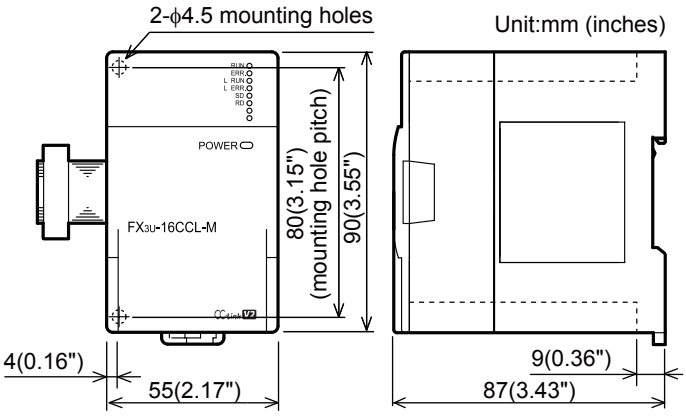


Model name	W:mm (inches)	MASS (Weight): kg (lbs)
FX3UC-4AD	20.2 (0.80")	Approx. 0.13 (0.29lbs)
FX2NC-4AD	20.2 (0.80")	Approx. 0.13 (0.29lbs)
FX2NC-4DA	24.2 (0.96")	Approx. 0.13 (0.29lbs)

- Installation: DIN rail of 35 mm (1.38") in width only
- Accessories: FX2NC-10BPCB1 power crossover cable (0.1 m (0'3")), Label for indication of special unit/block number, Manual supplied with product

2. Data link and communication functions

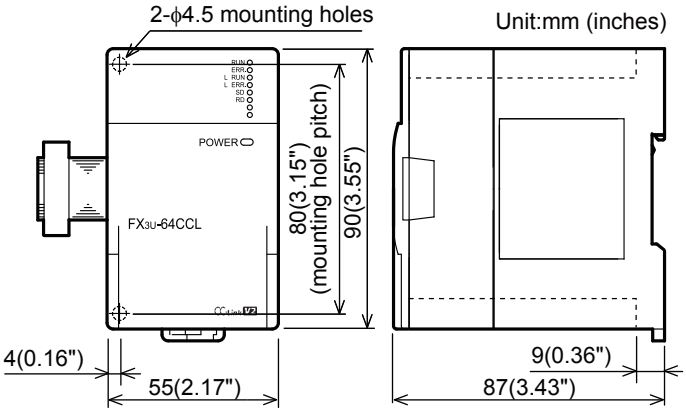
FX3U-16CCL-M



Model name	MASS (Weight): kg (lbs)
FX3U-16CCL-M	Approx. 0.3 (0.66lbs)

- Installation: DIN rail of 35 mm (1.38") in width or screws
- Accessories: Label for indication of special unit/block number, Dust proof protection sheet, Terminal resistor: 2 resistors for CC-Link dedicated cable 2 resistors for CC-Link dedicated high-performance cable, Manual supplied with product
- Terminal block: M3 screws for power supply terminal, CC-Link connection terminal M3.5 screws for CC-Link connection terminal block mounting screws (black)
- The extension cable is already connected to the extension block

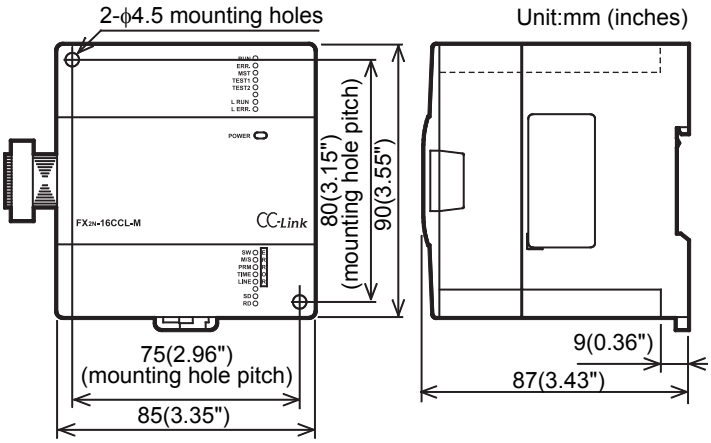
FX3U-64CCL



Model name	MASS (Weight): kg (lbs)
FX3U-64CCL	Approx. 0.3 (0.66lbs)

- Installation: DIN rail of 35 mm (1.38") in width or screws
- Accessories: Label for indication of special unit/block number, Dust proof protection sheet, Manual supplied with product
- Terminal block: M3 screws for power supply terminal, CC-Link connection terminal
  M3.5 screws for CC-Link connection terminal block mounting screws (black)
- The extension cable is already connected to the extension block

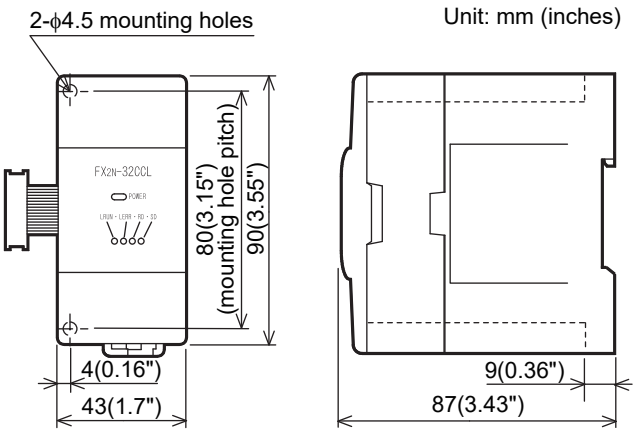
FX2N-16CCL-M



Model name	MASS (Weight): kg (lbs)
FX2N-16CCL-M	Approx. 0.4 (0.88lbs)

- Installation: DIN rail of 35 mm (1.38") in width or screws
- Accessories: Label for indication of special unit/block number, Terminal resistor:
  2 resistors for CC-Link dedicated cable
  2 resistors for CC-Link dedicated high-performance cable,
  Manual supplied with product
- Terminal block: M3 screw for power supply terminal
  M3.5 screw for signal terminal
- The extension cable is already connected to the extension block

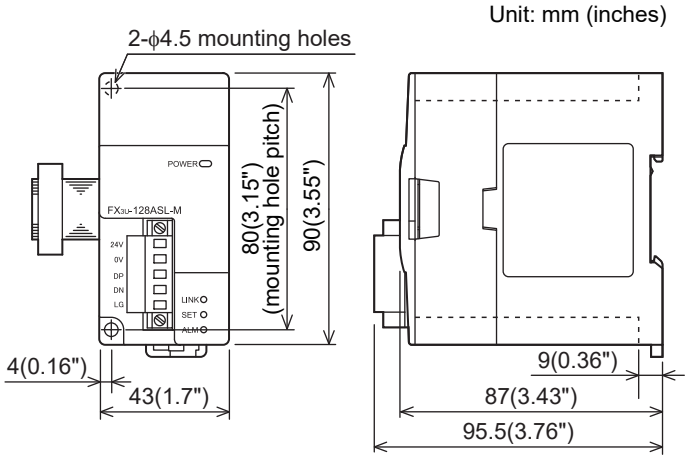
FX2N-32CCL/FX2N-64CL-M



Model name	MASS (Weight): kg (lbs)
FX2N-32CCL	Approx. 0.2 (0.44lbs)
FX2N-64CL-M	Approx. 0.15 (0.33lbs)

- Installation: DIN rail of 35 mm (1.38") in width or screws
- Accessories: Label for indication of special unit/block number, Manual supplied with product
- The terminal block of FX2N-32CCL is the M3 screw.
- The CC-Link/LT interface connector of FX2N-64CL-M is in the front panel of the product.
- The extension cable is already connected to the extension block

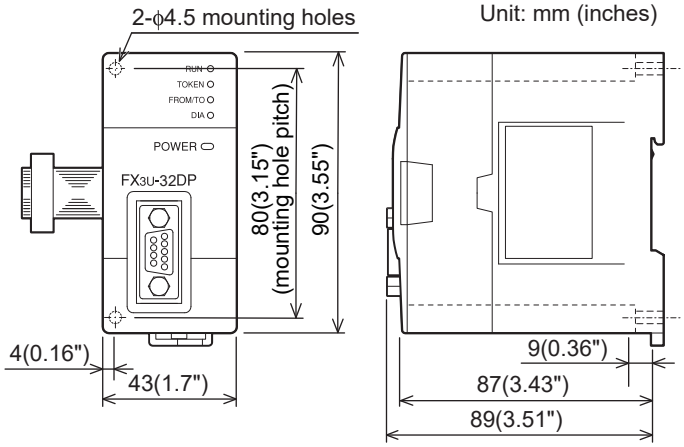
FX3U-128ASL-M



Model name	MASS (Weight): kg (lbs)
FX3U-128ASL-M	Approx. 0.2 (0.44lbs)

- Installation: DIN rail of 35 mm (1.38") in width or screws
- Accessories: Label for indication of special unit/block number, Dust proof protection sheet, Manual supplied with product
- The extension cable is already connected to the extension block

FX3U-32DP

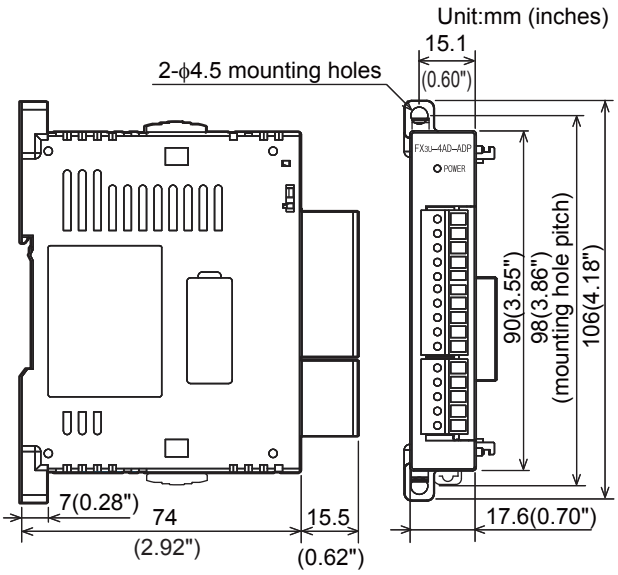


Model name	MASS (Weight): kg (lbs)
FX3U-32DP	Approx. 0.2 (0.44lbs)

- Installation: DIN rail of 35 mm (1.38") in width or screws
- Accessories: GSD file (CD-ROM), Label for indication of special unit/block number, Dust proof protection sheet, Manual supplied with product
- Connector: PROFIBUS-DP interface connector (D-SUB 9-pin, female)
- The extension cable is already connected to the extension block

2.1.5 Special adapters

1. Analog special adapters



Model name	MASS (Weight): kg (lbs)
FX3U-4AD-ADP	Approx. 0.1 (0.22lbs)
FX3U-4DA-ADP	
FX3U-3A-ADP	
FX3U-4AD-PT-ADP	
FX3U-4AD-PTW-ADP	
FX3U-4AD-PNK-ADP	
FX3U-4AD-TC-ADP	

•Installation: DIN rail of 35 mm (1.38") in width or screws*1

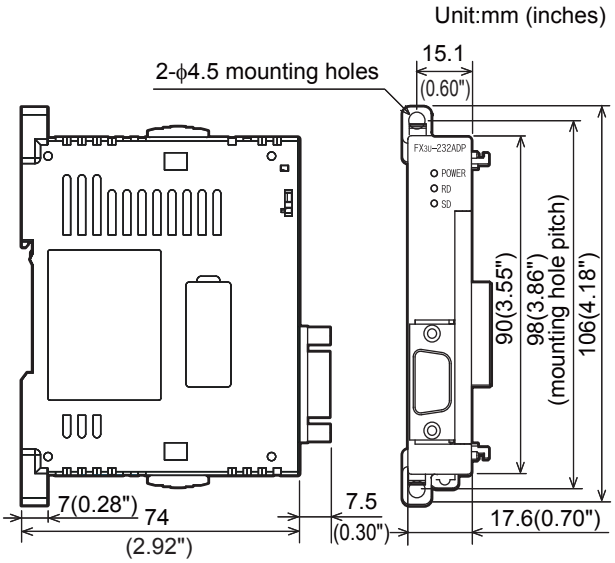
•Accessories: Manual supplied with product

•Terminal block:European type

*1.When an analog special adapter is connected to the FX3GC PLC, direct screw mounting is not possible.

2. Communication special adapters

FX3U-232ADP(-MB)



Model name	MASS (Weight): g (lbs)
FX3U-232ADP(-MB)	Approx. 80 (0.18lbs)

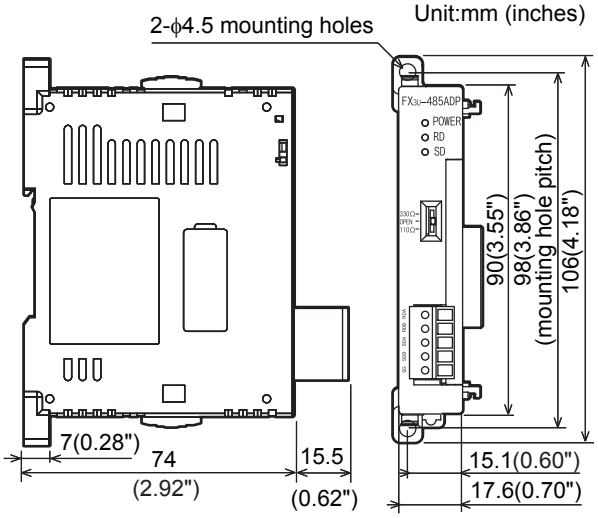
•Installation: DIN rail of 35 mm (1.38") in width or screws*1

•Accessories: Manual supplied with product

•RS-232C connector: D-SUB 9-pin, male

*1.When the FX3U-232ADP(-MB) is connected to the FX3GC PLC, direct screw mounting is not possible.

FX3U-485ADP(-MB)



Model name	MASS (Weight): g (lbs)
FX3U-485ADP(-MB)	Approx. 80 (0.18lbs)

•Installation: DIN rail of 35 mm (1.38") in width or screws*2

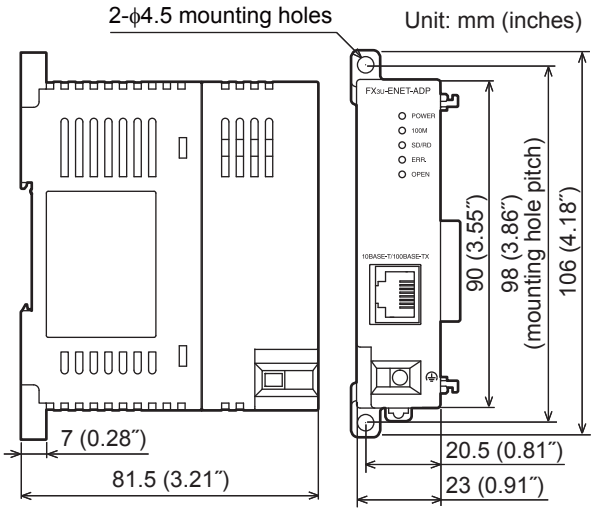
•Accessories: Label for indication of link station number, Manual supplied with product

•Terminal block:European type

•Terminal resistance: 330 Ω/110 Ω, built-in

*2.When the FX3U-485ADP(-MB) is connected to the FX3GC PLC, direct screw mounting is not possible.

FX3U-ENET-ADP



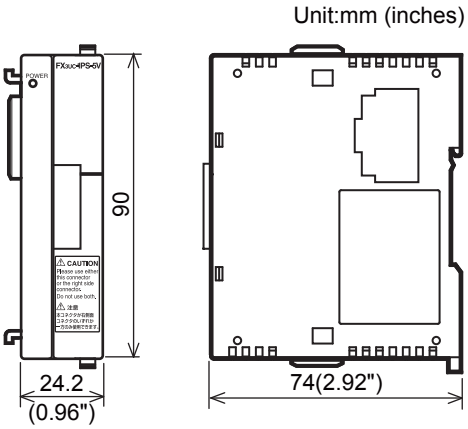
Model name	MASS (Weight): kg (lbs)
FX3U-ENET-ADP	Approx. 0.1 (0.22lbs)

- Installation: DIN rail of 35 mm (1.38") in width or screws*1
- Accessories: Manual supplied with product
- Connector: 10BASE-T/100BASE-TX (RJ45)
- Terminal block: External ground terminal (M2.5 terminal block screw)

*1. When the FX3U-ENET-ADP is connected to the FX3GC PLC, direct screw mounting is not possible.

2.1.6 Power supply unit

1. Extension Power Supply Unit



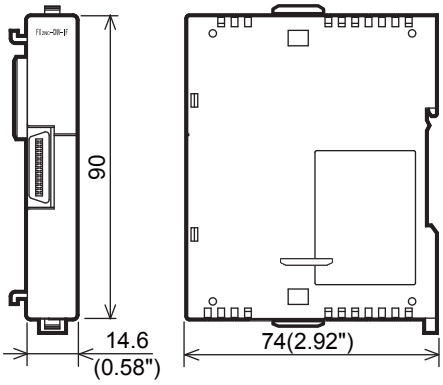
Model name	MASS (Weight): kg (lbs)
FX3UC-1PS-5V	Approx. 0.15 (0.33lbs)

- Installation: DIN rail of 35 mm (1.38") in width only
- Accessories: FX2NC-100MPCB Power supply cable (1 m (3'33")), Manual supplied with product

2.1.7 Connector conversion adapter

1. FX2NC-CNV-IF

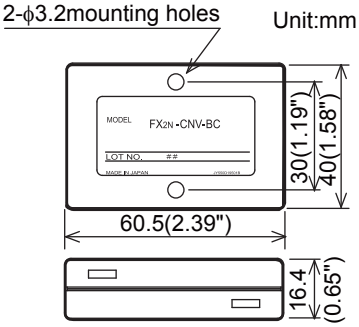
Unit:mm (inches)



Model name	MASS (Weight): g (lbs)
FX2NC-CNV-IF	Approx. 60 (0.14lbs)

- Installation: DIN rail of 35 mm (1.38") in width only

2. FX2N-CNV-BC



Model name	MASS (Weight): g (lbs)
FX2N-CNV-BC	Approx. 40 (0.09lbs)

- Installation: Direct mounting only

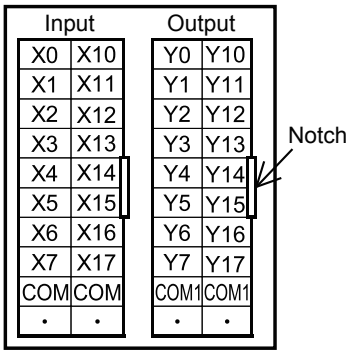
2.2 Terminal Layout

Refer to the respective special function blocks manual.

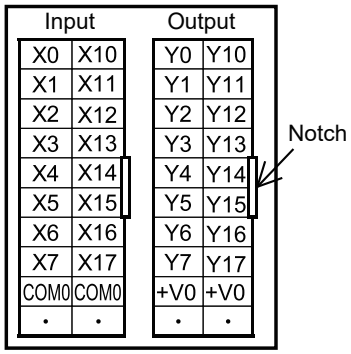
2.2.1 Main units

1. FX3GC-32MT/D, FX3GC-32MT/DSS input/output connector

- FX3GC-32MT/D

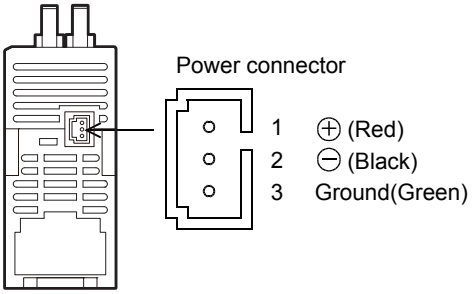


- FX3GC-32MT/DSS



" • " represents vacant terminals.

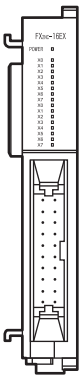
2. FX3GC-32MT/D(SS) power connector



2.2.2 FX2NC Series input/output extension block

1. Connector type

FX2NC-16EX

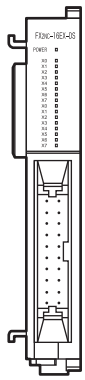


Input connector

Lower numbers	Input		Higher numbers
	X0	X0	
	X1	X1	
	X2	X2	
	X3	X3	
Notch	X4	X4	
	X5	X5	
	X6	X6	
	X7	X7	
	COM	COM	
	•	•	

"•" represents vacant terminals

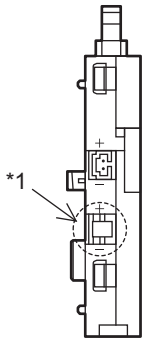
FX2NC-16EX-DS



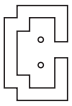
Input connector

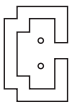
Lower numbers	Input		Higher numbers
	X0	X0	
	X1	X1	
	X2	X2	
	X3	X3	
Notch	X4	X4	
	X5	X5	
	X6	X6	
	X7	X7	
	COM0	COM0	
	•	•	

"•" represents vacant terminals

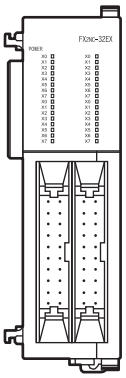


Power connector





FX2NC-32EX

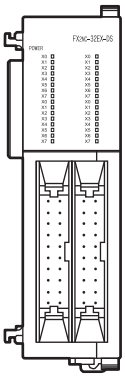


Input connector

Lower numbers	Input		Input		Higher numbers
	X0	X0	X0	X0	
	X1	X1	X1	X1	
	X2	X2	X2	X2	
	X3	X3	X3	X3	
Notch	X4	X4	X4	X4	
	X5	X5	X5	X5	
	X6	X6	X6	X6	
	X7	X7	X7	X7	
	COM	COM	COM	COM	
	•	•	•	•	

"•" represents vacant terminals

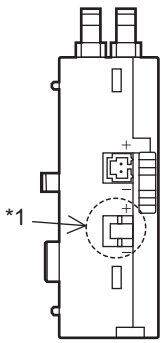
FX2NC-32EX-DS



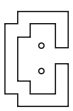
Input connector

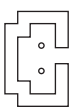
Lower numbers	Input		Input		Higher numbers
	X0	X0	X0	X0	
	X1	X1	X1	X1	
	X2	X2	X2	X2	
	X3	X3	X3	X3	
Notch	X4	X4	X4	X4	
	X5	X5	X5	X5	
	X6	X6	X6	X6	
	X7	X7	X7	X7	
	COM0	COM0	COM1	COM1	
	•	•	•	•	

"•" represents vacant terminals



Power connector



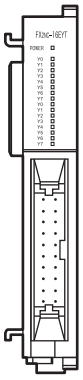


*1. For the handling, refer to Subsection 3.6.2.

Caution

A power connector is not included in the FX2NC-16EX-DS and FX2NC-32EX-DS.

FX2NC-16EYT



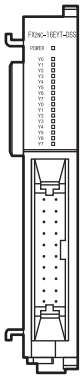
Output connector

Lower numbers	Output		Higher numbers
	Y0	Y0	
	Y1	Y1	
	Y2	Y2	
	Y3	Y3	
	Y4	Y4	
	Y5	Y5	
	Y6	Y6	
	Y7	Y7	
	COM1	COM1	
	•	•	

Notch

"•" represents vacant terminals

FX2NC-16EYT-DSS



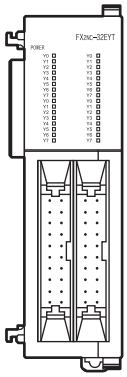
Output connector

Lower numbers	Output		Higher numbers
	Y0	Y0	
	Y1	Y1	
	Y2	Y2	
	Y3	Y3	
	Y4	Y4	
	Y5	Y5	
	Y6	Y6	
	Y7	Y7	
	+V0	+V0	
	•	•	

Notch

"•" represents vacant terminals

FX2NC-32EYT



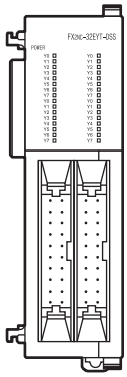
Output connector

Lower numbers	Output		Output		Higher numbers
	Y0	Y0	Y0	Y0	
	Y1	Y1	Y1	Y1	
	Y2	Y2	Y2	Y2	
	Y3	Y3	Y3	Y3	
	Y4	Y4	Y4	Y4	
	Y5	Y5	Y5	Y5	
	Y6	Y6	Y6	Y6	
	Y7	Y7	Y7	Y7	
	COM1	COM1	COM2	COM2	
	•	•	•	•	

Notch

"•" represents vacant terminals

FX2NC-32EYT-DSS



Output connector

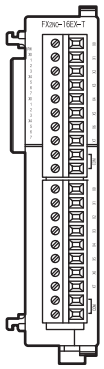
Lower numbers	Output		Output		Higher numbers
	Y0	Y0	Y0	Y0	
	Y1	Y1	Y1	Y1	
	Y2	Y2	Y2	Y2	
	Y3	Y3	Y3	Y3	
	Y4	Y4	Y4	Y4	
	Y5	Y5	Y5	Y5	
	Y6	Y6	Y6	Y6	
	Y7	Y7	Y7	Y7	
	+V0	+V0	+V1	+V1	
	•	•	•	•	

Notch

"•" represents vacant terminals

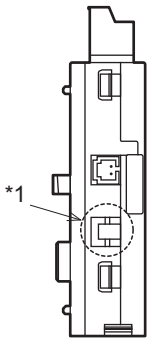
2. Terminal type

FX2NC-16EX-T



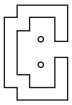
Input terminal

X0	Lower numbers
X1	
X2	
X3	
X4	
X5	
X6	
X7	
COM	
COM	
X0	Higher numbers
X1	
X2	
X3	
X4	
X5	
X6	
X7	
COM	
COM	

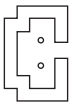


*1

Power connector

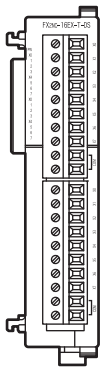


1 ⊕ (Red)
2 ⊖ (Black)



1 ⊕ (Red)
2 ⊖ (Black)

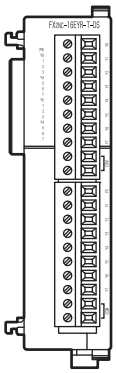
FX2NC-16EX-T-DS



Input terminal

X0	Lower numbers
X1	
X2	
X3	
X4	
X5	
X6	
X7	
COM	
COM	
X0	Higher numbers
X1	
X2	
X3	
X4	
X5	
X6	
X7	
COM	
COM	

FX2NC-16EYR-T(-DS)



Output terminal

Y0	Lower numbers
Y1	
Y2	
Y3	
Y4	
Y5	
Y6	
Y7	
COM1	
COM1	
Y0	Higher numbers
Y1	
Y2	
Y3	
Y4	
Y5	
Y6	
Y7	
COM2	
COM2	

*1. For the handling, refer to Subsection 3.6.2.

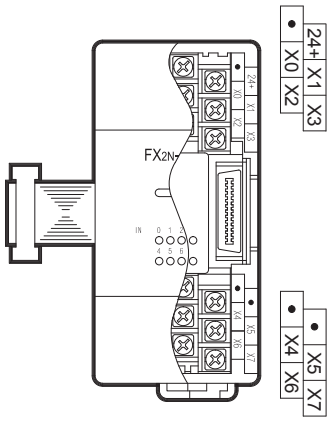
Caution

A power connector is not included in the FX2NC-16EX-T-DS.

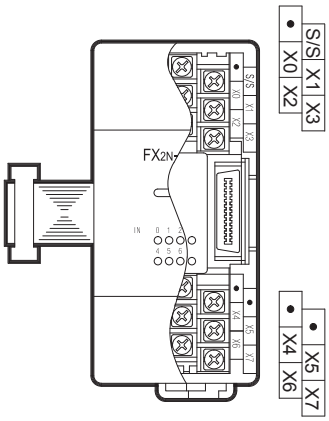
2.2.3 FX2N Series input/output extension block

1. Terminal type

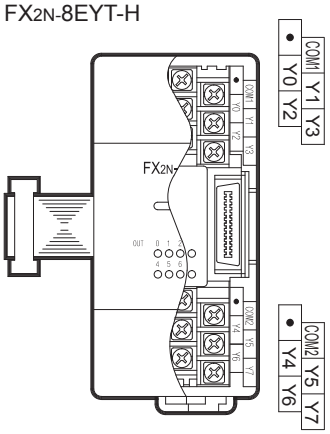
FX2N-8EX



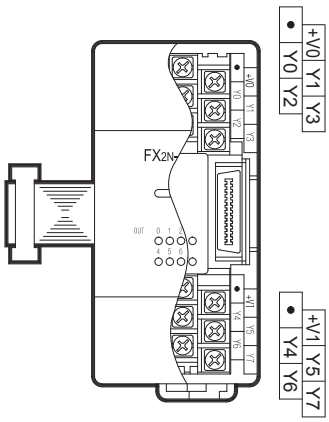
FX2N-8EX-ES/UL



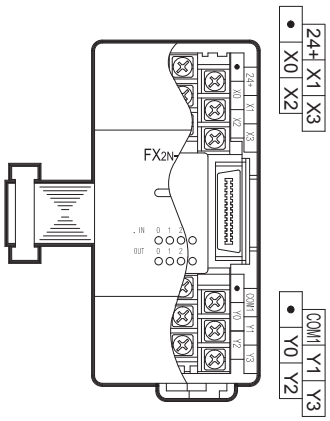
FX2N-8EYR(-ES/UL)
FX2N-8EYT
FX2N-8EYT-H



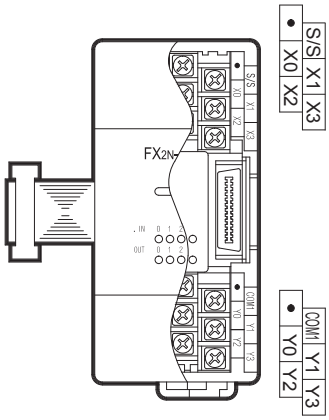
FX2N-8EYT-ESS/UL



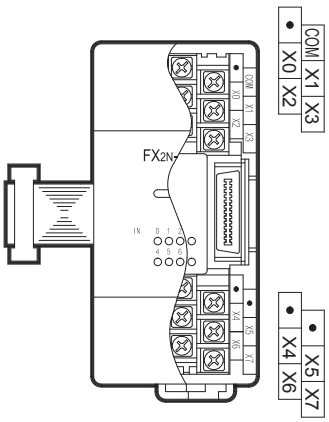
FX2N-8ER



FX2N-8ER-ES/UL

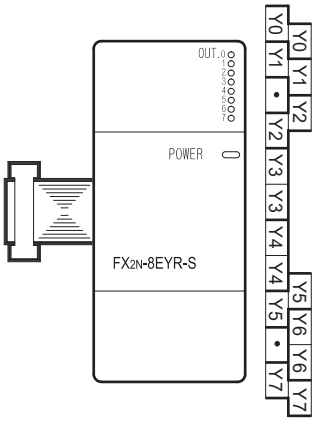


FX2N-8EX-UA1/UL

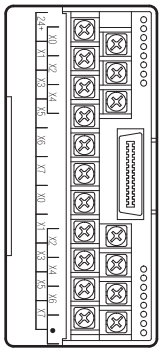


" • " represents vacant terminals.

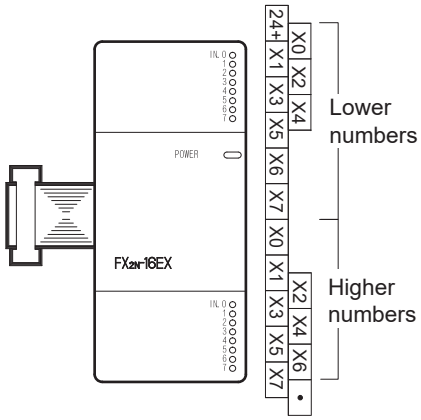
FX2N-8EYR-S-ES/UL



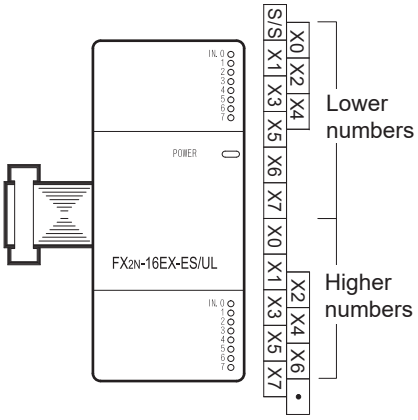
Vertical terminal block
(Example: FX2N-16EX)



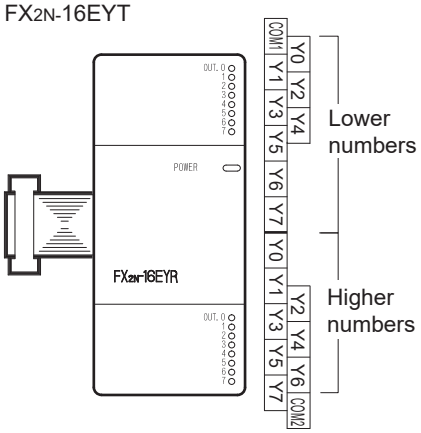
FX2N-16EX



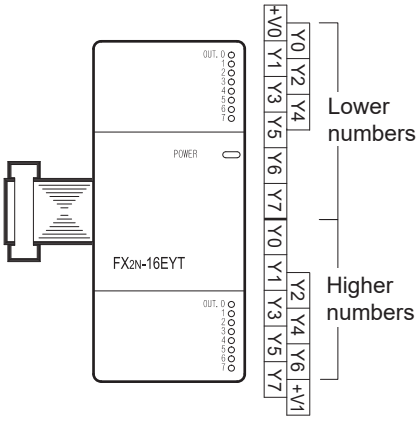
FX2N-16EX-ES/UL



FX2N-16EYR(-ES/UL)
FX2N-16EYS
FX2N-16EYT



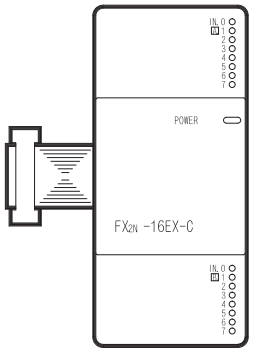
FX2N-16EYT-ESS/UL



" • " represents vacant terminals.

2. Connector type

FX2N-16EX-C

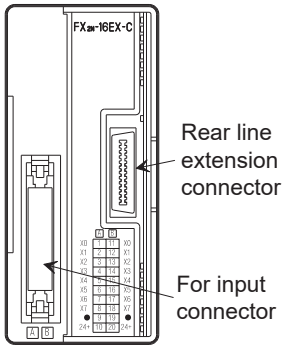


Connector pin arrangement

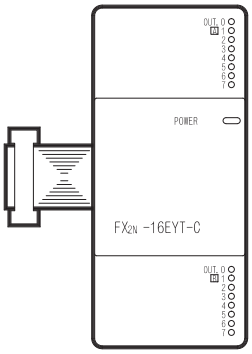
Side A	No.	No.	Side B
X0	1	11	X0
X1	2	12	X1
X2	3	13	X2
X3	4	14	X3
X4	5	15	X4
X5	6	13	X5
X6	7	17	X6
X7	8	18	X7
●	9	19	●
24+	10	20	24+

Lower numbers | Higher numbers

The connector is following places.
(Example: FX2N-16EX-C)



FX2N-16EYT-C

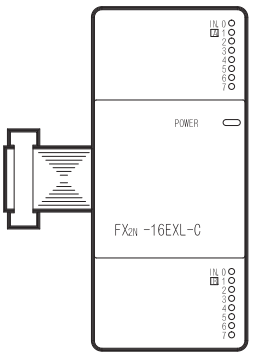


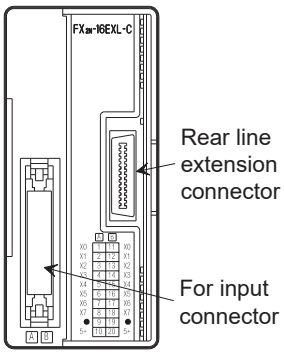
Connector pin arrangement

Side A	No.	No.	Side B
Y0	1	11	Y0
Y1	2	12	Y1
Y2	3	13	Y2
Y3	4	14	Y3
Y4	5	15	Y4
Y5	6	13	Y5
Y6	7	17	Y6
Y7	8	18	Y7
COM	9	19	COM
●	10	20	●

Lower numbers | Higher numbers

FX2N-16EXL-C





Connector pin arrangement

Side A	No.	No.	Side B
X0	1	11	X0
X1	2	12	X1
X2	3	13	X2
X3	4	14	X3
X4	5	15	X4
X5	6	13	X5
X6	7	17	X6
X7	8	18	X7
●	9	19	●
5+	10	20	5+

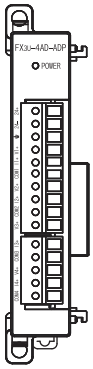
Lower numbers | Higher numbers

" • " represents vacant terminals.

2.2.4 Special adapters

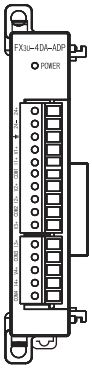
1. Analog special adapter

FX3U-4AD-ADP



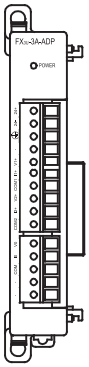
24+
24-
⏚
V1+
I1+
COM1
V2+
I2+
COM2
V3+
I3+
COM3
V4+
I4+
COM4

FX3U-4DA-ADP



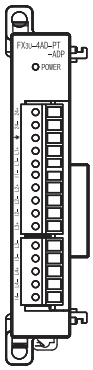
24+
24-
⏚
V1+
I1+
COM1
V2+
I2+
COM2
V3+
I3+
COM3
V4+
I4+
COM4

FX3U-3A-ADP



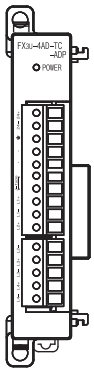
24+
24-
⏚
·
V1+
I1+
COM1
V2+
I2+
COM2
V0
I0
COM
·
·

FX3U-4AD-PT(W)-ADP
FX3U-4AD-PNK-ADP



24+
24-
⏚
L1+
L1-
I1-
L2+
L2-
I2-
L3+
L3-
I3-
L4+
L4-
I4-

FX3U-4AD-TC-ADP

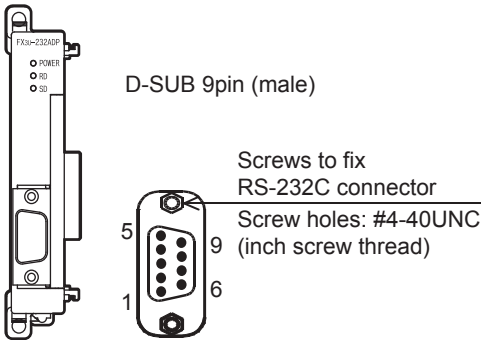


24+
24-
⏚
·
·
J-type
J-type
L1+
L1-
L2+
L2-
L3+
L3-
L4+
L4-

" • " represents vacant terminals.

2. Communication special adapter

FX3U-232ADP(-MB)

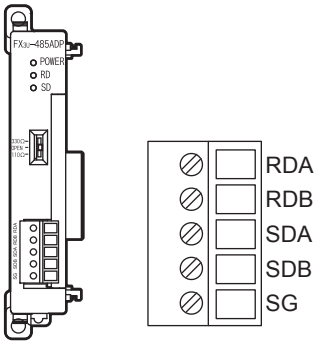


Pin No.	Signal	Name
1	CD(DCD)	Receive carrier detection
2	RD(RXD)	Receive data
3	SD(TXD)	Send data
4	ER(DTR)	Data terminal ready*1
5	SG(GND)	Signal ground
6	DR(DSR)	Data set ready*2
7, 8, 9	Not used	

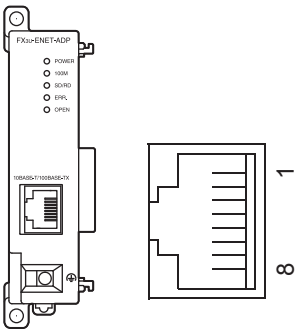
*1. Data terminal ready uses it as a request to send by the handling of the control line.

*2. Data set ready uses it as a possible to send by the handling of the control line.

FX3U-485ADP(-MB)



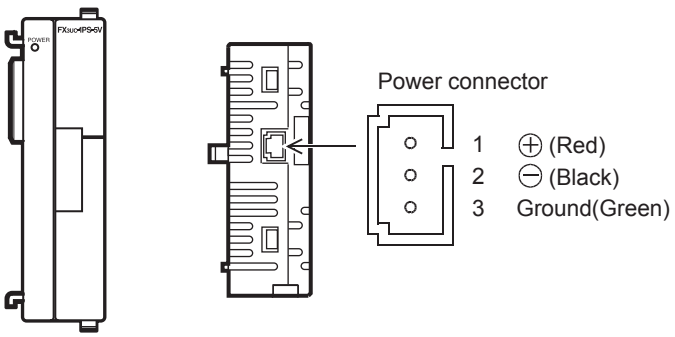
FX3U-ENET-ADP



Pin No.	Signal	Direction	Contents
1	TD+	Out	+ side of sending data
2	TD-	Out	- side of sending data
3	RD+	In	+ side of receiving data
4	Not used	-	
5	Not used	-	
6	RD-	In	- side of receiving data
7	Not used	-	
8	Not used	-	

2.2.5 Power supply unit

FX3UC-1PS-5V



3. Generic Specifications/Installation Work

DESIGN PRECAUTIONS ⚠ **WARNING**

- Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure.
  Otherwise, malfunctions may cause serious accidents.
  1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
  2) Note that when the PLC CPU 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 PLC CPU occurs in an input/output control block, output control may be disabled.
     External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.
     For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.

DESIGN PRECAUTIONS ⚠ **CAUTION**

- Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line.
  Noise may cause malfunctions.
- Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.
  Failure to do so may result in wire damage/breakage or PLC failure.

SECURITY PRECAUTIONS ⚠ **WARNING**

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

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.

INSTALLATION PRECAUTIONS ⚠CAUTION

- Use the product within the generic environment specifications described in Section 3.1 of this manual.
  Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl2, H2S, SO2 or NO2), 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.
- Do not touch the conductive parts of the product directly.
  Doing so may cause device failures or malfunctions.
- Install the product securely using a DIN rail or mounting screws.

Main unit, FX2NC Series I/O extension blocks, FX2NC/FX3UC Series special function blocks, special adapter, extension power supply unit, FX2NC-CNV-IF, FX Series terminal blocks	DIN rail only
FX2N Series I/O extension blocks, FX2N/FX3U Series special function blocks	DIN rail or direct mounting

- 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.
- When drilling screw holes or wiring, make sure cutting or write debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Be sure to remove the dust proof sheet from the PLC's ventilation port when installation work is completed.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors.
  Loose connections may cause malfunctions.
- Turn off the power to the PLC before attaching or detaching the following devices.
  Failure to do so may cause equipment failures or malfunctions.
  - Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery

Note

- When a dust proof sheet is supplied with an extension block, keep the sheet applied to the ventilation slits during installation and wiring work.

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, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.
  Failure to do so may cause electric shock.

WIRING PRECAUTIONS ⚠ **CAUTION**

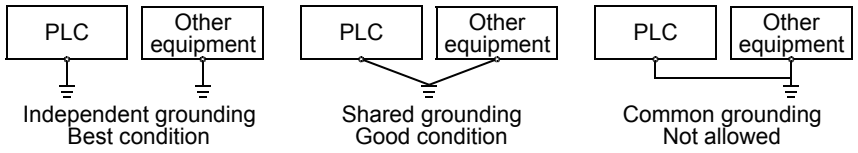
- Connect the DC power supply wiring to the dedicated terminals described in this manual.
  If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the PLC will burn out.
- Do not wire vacant terminals externally.
  Doing so may damage the product.
- Perform class D grounding (grounding resistance: 100 Ω or less) to the grounding terminal on the main unit.
  Do not use common grounding with heavy electrical systems.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to properly wire the FX2N/FX3U Series extension equipment 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
- Make sure to properly wire to 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.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire 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.
- Make sure to properly wire to the FX Series terminal blocks 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

3.1 Generic Specifications

Item	Specification				
Ambient temperature	0 to 55 °C (32 to 131 °F) when operating and -25 to 75 °C (-13 to 167 °F) when stored				
Ambient humidity	5 to 95%RH (no condensation) when operating				
Vibration resistance*1		Frequency (Hz)	Acceleration (m/s^2)	Half amplitude (mm)	Sweep Count for X, Y, Z: 10 times (80 min. in each direction)
	When installed on DIN rail	10 to 57	-	0.035	
		57 to 150	4.9	-	
	When installed directly	10 to 57	-	0.075	
		57 to 150	9.8	-	
Shock resistance*1	147 m/s^2 Acceleration, Action time: 11 ms, 3 times by half-sine pulse in each direction X, Y, and Z				
Noise resistance	By noise simulator at noise voltage of 1,000 Vp-p, noise width of 1 μs, rise time of 1 ns and period of 30 to 100 Hz				
Dielectric withstand voltage	500 V AC for one minute	Between batch of all terminals and ground terminal			
Insulation resistance	5 MΩ or higher by 500 V DC insulation resistance tester				
Grounding	Class D grounding (grounding resistance: 100 Ω or less) <Common grounding with a heavy electrical system is not allowed.>*2				
Working atmosphere	Free from corrosive or flammable gas and excessive conductive dusts				
Working altitude	< 2000 m*3				
Installation location	Inside a control panel*4				
Overvoltage category	II or less				
Pollution degree	2 or less				

*1. The criterion is shown in IEC61131-2.

*2.



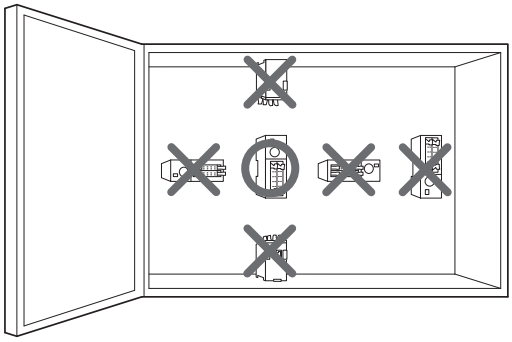
*3. The PLC cannot be used at a pressure higher than the atmospheric pressure to avoid damage.

*4. The programmable controller is assumed to be installed in an environment equivalent to indoor.

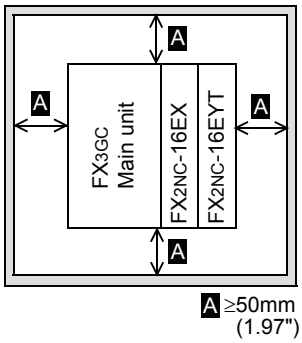
3.2 Installation location

Install the PLC in an environment conforming to the generic specifications (Section 3.1), installation precautions.

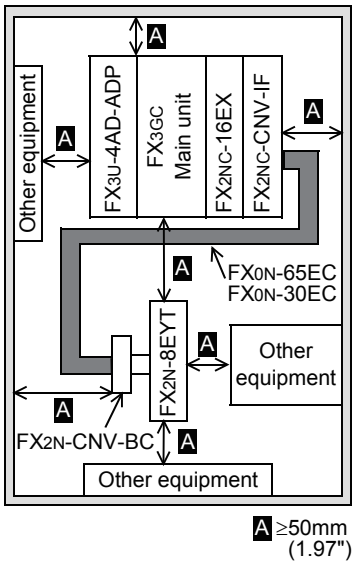
Notes
• Keep a space of 50 mm (1.97") or more between the unit main body and another device or structure. Install the unit as far away as possible from high-voltage lines, high-voltage devices and power equipment. Failure to do so may cause fire, equipment failures or malfunctions. • Do not install the PLC on a floor, a ceiling or a vertical surface. Install it horizontally on a wall as shown below.



Configuration without extension cable



Configuration with extension cable



3.3 Procedures for Installing on and Detaching from DIN Rail

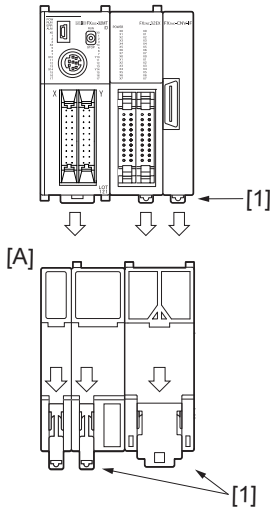
The main unit, FX2NC Series I/O extension block, FX2NC/FX3UC Series special function block, and FX3U Series special adapter can be installed on a DIN46277 rail [35 mm (1.38") wide]. (It cannot be installed directly with screws.)
The FX2N Series I/O extension block and FX2N/FX3U Series special function block can be installed on a DIN46277 rail [35 mm (1.38") wide] and directly mounted.

3.3.1 Procedures for installing to and removing from DIN rail

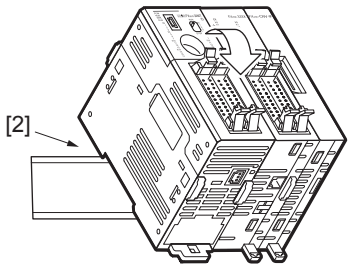
1. Main unit, FX2NC Series I/O extension block, FX2NC/FX3UC Series special function block, extension power supply unit, FX2NC-CNV-IF

1) Connect all of the main unit, FX2NC Series I/O extension blocks, FX2NC/FX3UC Series special function blocks, extension power supply unit and FX2NC-CNV-IF.
→ **For connecting method, refer to Subsection 3.4.3.**

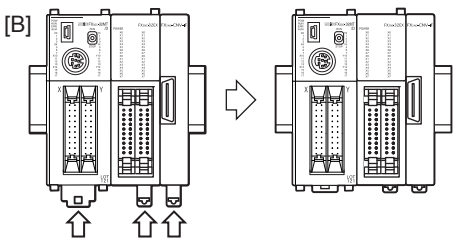
2) Push the DIN rail mounting hooks [1] of all connected units/ blocks as shown in the figure on the right [A].



3) Align the upper side of the DIN rail mounting groove with the DIN rail ([2] in the figure on the right).

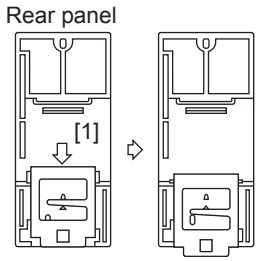


4) While pressing the main unit onto the DIN rail, lock the DIN rail mounting hooks as shown in the figure below [B].

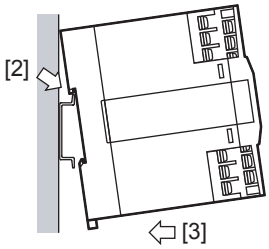


2. FX2N Series I/O extension block, FX2N/FX3U Series special function block

1) Push the DIN rail mounting hooks as shown in [1] in the figure on the right. This step is not required for FX2N Series 8-point type I/O extension blocks (except for the FX2N-8EYR-S-ES/UL) and FX2N/FX3U Series special function blocks.



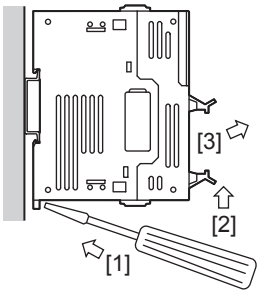
2) Align the upper side of the DIN rail mounting groove with the DIN rail ([2] in the figure on the right).
3) Press the product onto the DIN rail as shown in [3] in the figure on the right.

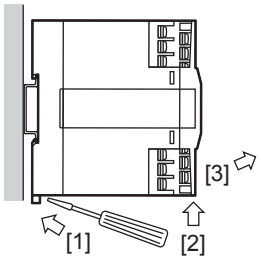


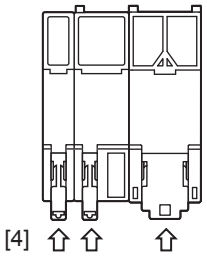
4) The extension cable is connected.
For the connection method of the extension cable, refer to Section 3.4.

3.3.2 Procedures for removal from DIN rail

1) Disconnect connection cables such as power cables, I/O cables and extension cables.
2) Hook a slotted screwdriver to the DIN rail mounting hook ([1] in the figure on the right).
3) Move the slotted screwdriver in the direction [2], pull out the DIN rail mounting hooks from all connected units/blocks, and let the DIN rail mounting hooks come off the DIN rail.
4) Remove the main unit from the DIN rail ([3] in the figure on the right).
5) Push the DIN rail mounting hooks as shown in [4] in the figure below.
This step is not required for FX2N Series 8-point type I/O extension blocks (except for the FX2N-8EYR-S-ES/UL) and FX2N/FX3U Series special function blocks.

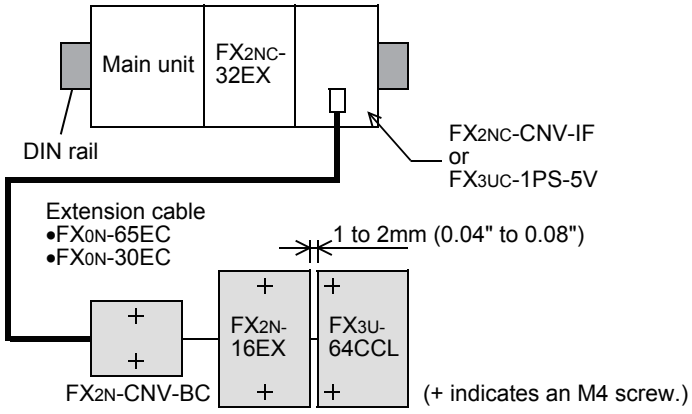






3.3.3 Direct mounting (FX2N/FX3U extension blocks)

Only I/O extension blocks for FX2N and special function blocks for FX2N/FX3U can be installed directly. Install them with screw holes M4 in reference to "2.1 External Dimensions (MASS/Installation/Accessories)". Assure the space of 1 to 2 mm(0.04" to 0.08") between units as shown below.



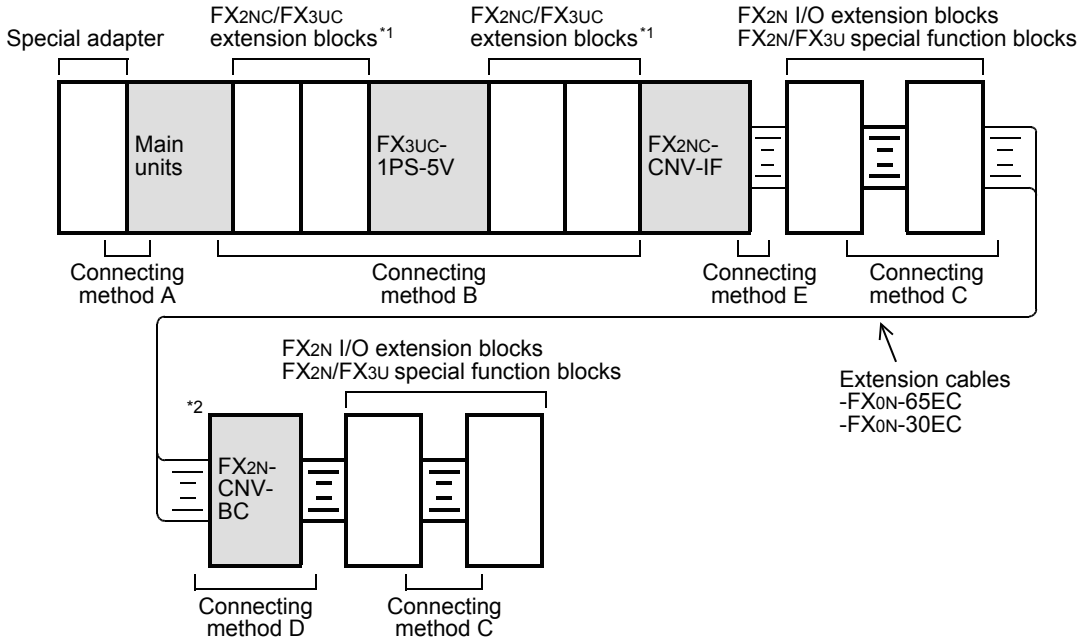
3.4 Connection between main unit and extension equipment

This section explains how to connect extension equipment.

3.4.1 Extension equipment connection configuration

The connection method among the main unit, I/O extension blocks and special function blocks varies depending on the group.

→ **For the connection method A, refer to Subsection 3.4.2.**
→ **For the connection method B, refer to Subsection 3.4.3.**
→ **For the connection method C, refer to Subsection 3.4.4.**
→ **For the connection method D, refer to Subsection 3.4.5.**
→ **For the connection method E, refer to Subsection 3.4.6.**



*1. FX2NC Series I/O extension blocks and FX2NC/FX3UC Series special function blocks

*2. Do not connect the FX3U-4LC or FX2N-8AD on the right side of the FX2N-CNV-BC. The FX2N-CNV-BC cannot be secured in this case.

3.4.2 Connecting method A (Main units and Special adapter connecting)

1. Connection procedure

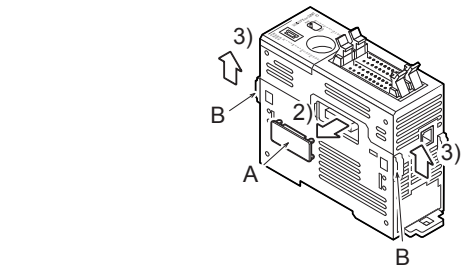
1) Turn off the power.
Disconnect all the cables connected to the PLC, and demount the PLC from the DIN rail.
→ **For the removal method, refer to Section 3.3.**

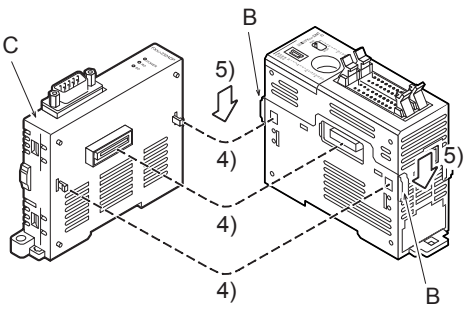
2) Remove the special adapter connector cover (fig. A).

3) Slide the special adapter slide lock (fig. B) of the main unit.
when connecting this product to another special adapter, please replace the 'main unit' in the above description with a 'special adapter' and perform the procedure as indicated.

4) Connect the special adapter (fig. C) to the main unit as shown on the right.

5) Slide back the special adapter slide lock (fig. B) of the main unit to fix the special adapter (fig. C).





Caution

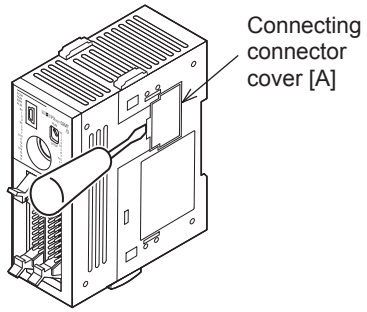
When using the FX3U-ENET-ADP, connect it to the last adapter position (leftmost position).

3.4.3 Connecting method B (Main units and Extension units/blocks connecting)

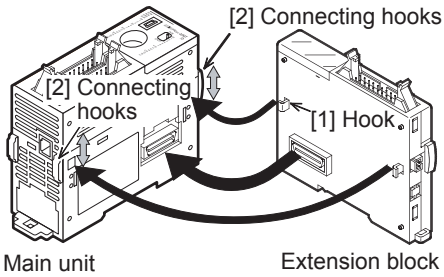
This subsection explains the procedures for connecting FX2NC/FX3UC Series extension blocks, FX2NC-CNV-IF or FX3UC-1PS-5V.

1. Connection procedure

1) Remove the connecting connector cover [A] from the right side of the main unit or existing extension block.



2) Pull up the connecting hook [2] of the main unit or existing extension block, and connect the hook [1] of the extension block to be added to the connection hole of the counterpart (main unit or existing extension block) as shown in the figure on the right.
3) Pull down the connecting hook [2] of the main unit or existing extension block to fix the extension block to be added.

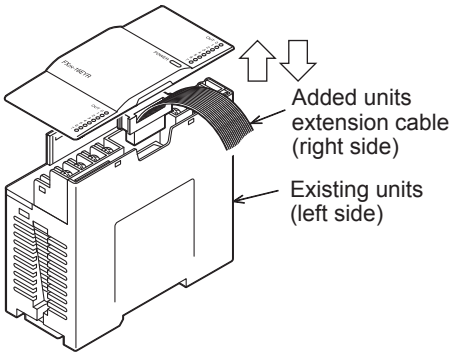


3.4.4 Connecting method C (Connection of FX2N/FX3U extension blocks)

This subsection explains the procedures for connecting FX2N I/O extension blocks or FX2N/FX3U special function blocks.

1. Connection procedure

1) Remove the top cover of the existing block (left side).
2) Connect the extension cable of the block to be connected (right side) to the existing block.
3) Fit the top cover.

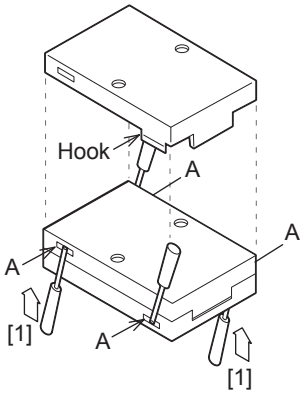


3.4.5 Connecting method D (Extension cable • FX2N-CNV-BC connecting)

This subsection explains the procedures for connecting an extension cable and FX2N-CNV-BC to the extension cable of the extension block.

1. Connection procedure

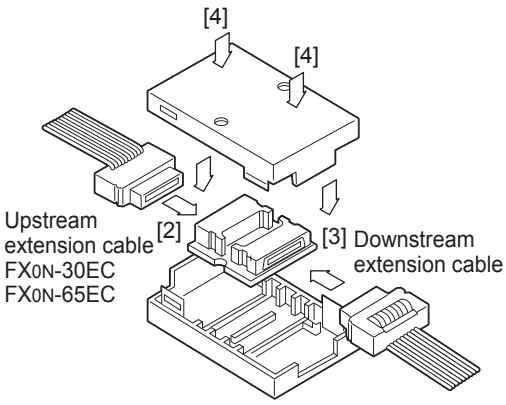
1) Separate the case of FX2N-CNV-BC into two pairs as shown right.
To separate the case, use a precision flathead screwdriver. Slightly insert the tip of the screwdriver into the part A shown in the right figure, and the hook will come off (4 places).



2) Connect the extension cable on the upstream side ([2] in the right figure).

3) Connect the extension cable on the downstream side ([3] in the right figure).

4) Fit the upper cover and the lower cover ([4] in the right figure), and press down the upper cover until it is hooked.

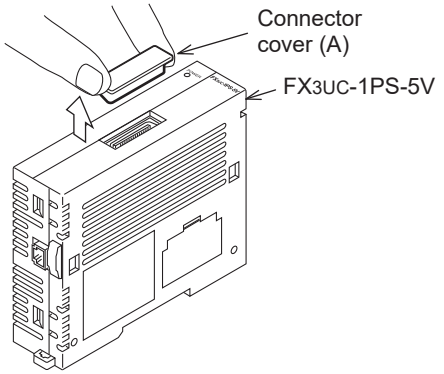


3.4.6 Connecting method E (Connection of FX3UC-1PS-5V/FX2NC-CNV-IF to right side)

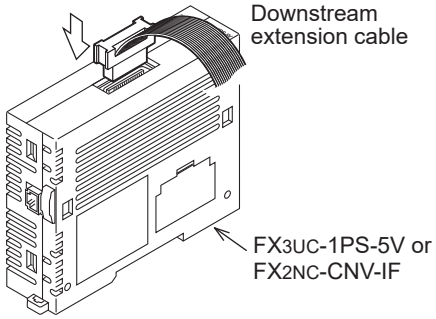
This subsection explains the procedures for connecting the extension cable to the extension power supply unit FX3UC-1PS-5V or the connector conversion interface FX2NC-CNV-IF.

1. Connection procedure

1) The connector cover (A) of the FX3UC-1PS-5V is removed as shown in the figure to the right. The FX2NC-CNV-IF does not have a connector cover.



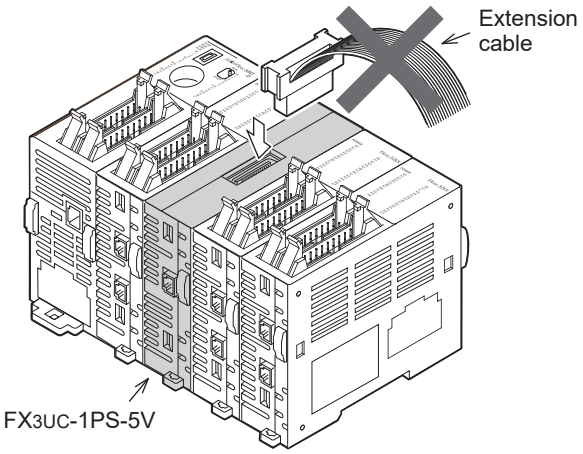
2) Connect the extension cable as shown to the right.



2. Caution on the FX3UC-1PS-5V

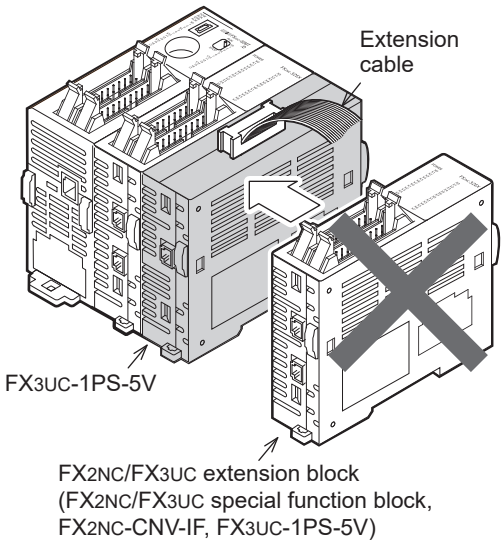
Only one connector can be used to attach extra equipment to the FX3UC-1PS-5V.

When the FX2NC/FX3UC extension connector (on the right side) of the FX3UC-1PS-5V is being used



When the FX2NC/FX3UC extension connector (on the right side) of the FX3UC-1PS-5V is being used, the FX2N/FX3U extension block connector on the top is not available.

When the FX2N/FX3U extension block connector (on the top) of the FX3UC-1PS-5V is being used



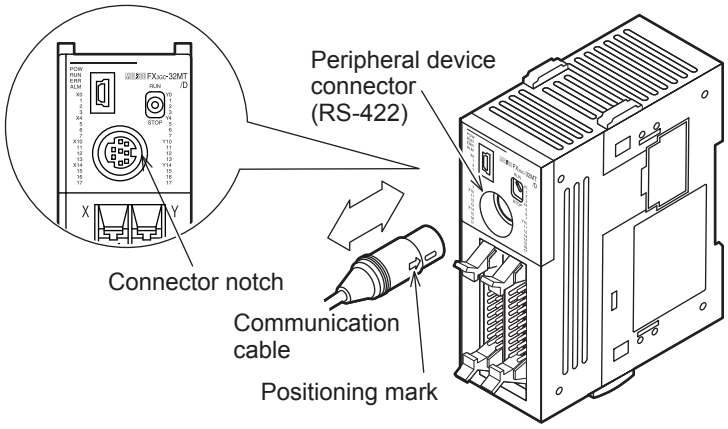
When the FX2N/FX3U extension block connector (on the top) of the FX3UC-1PS-5V is being used, the FX2NC/FX3UC extension connector on the right side is not available.

3.5 Connection to peripheral device connecting connector

This section explains how to connect and disconnect communication cables for peripheral devices.

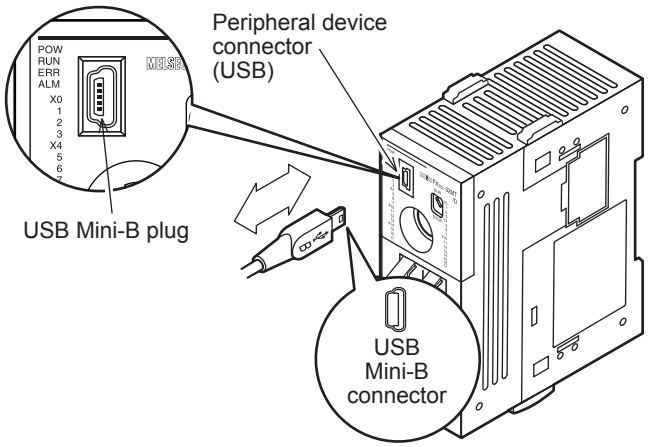
1. RS-422

When connecting a communication cable, align the "positioning mark" in the cable with the "connector notch" in the peripheral device.



2. USB

At connection, confirm the cable and connector shape.



3.6 Connection of power supply cable

3.6.1 Power Cable types

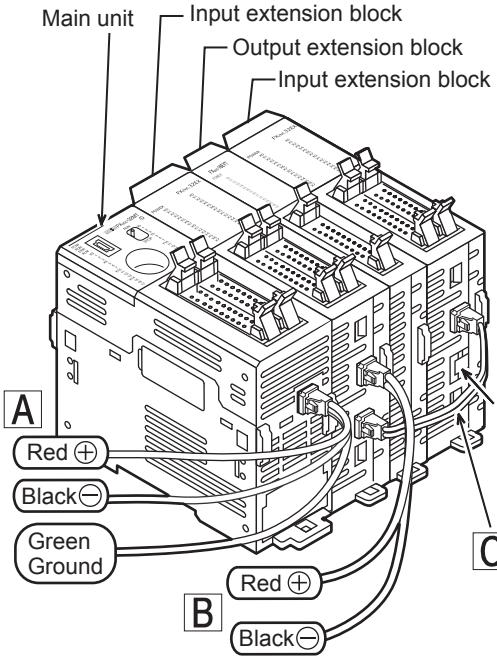
The table below shows three Power Cable types: "A", "B", and "C".

Type	Application	Model	Length	Cable supplied with
"A"	Power cable for main unit and extension power supply unit	FX2NC-100MPCB	1 m (3' 3")	FX3GC-32MT/D, FX3GC-32MT/DSS, FX3UC-1PS-5V
"B"	Input power cable for FX2NC Series input extension blocks and FX2NC/FX3UC Series special function blocks	FX2NC-100BPCB	1 m (3' 3")	FX3GC-32MT/D
"C"	Input power crossover cable for FX2NC Series input extension blocks and FX2NC/FX3UC Series special function blocks	FX2NC-10BPCB1	0.1 m (0' 3")	FX2NC-□□EX, FX2NC-16EX-T, FX2NC-4AD, FX2NC-4DA, FX3UC-4AD

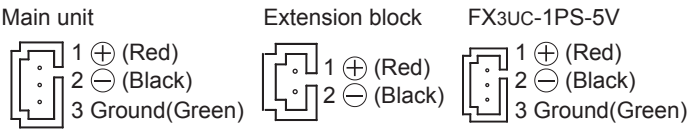
The crossover cable (type "C") can skip up to 4 16-point output blocks to connect units.
If more blocks should be skipped to supply power to an input block, use cable type "B".

3.6.2 Connection of power cable to main unit and extension block

The PLC receives and supplies power through the built-in dedicated power connector.
Power should be supplied to the main unit, FX2NC Series input extension blocks and FX2NC/FX3UC Series special function blocks.
Perform crossover wiring using two (upper and lower) power connectors for FX2NC-□□EX, FX2NC-16EX-T and FX2NC/FX3UC Series special function blocks.
The FX2NC-□□EX-DS and FX2NC-16EX-T-DS do not have a power connector, and receive power from the input connector.



The figure below shows the pin numbers of the power connectors.



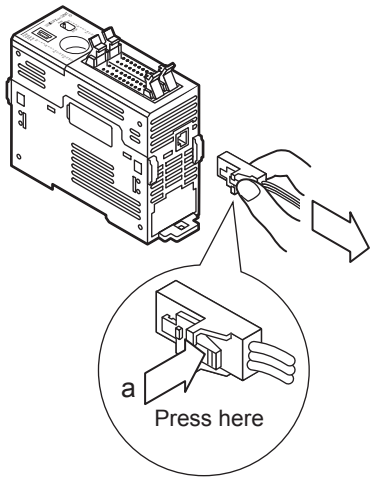
Resin cover
At shipment from the factory, a resin cover is attached to the lower connector.
Connect the upper connector first.
Remove the resin cover from the lower connector when performing crossover wiring for the later block.

C Crossover wiring between the input extension block.

- Wiring from the FX2NC-□□EX, FX2NC-16EX-T or FX2NC/FX3UC Series special function block to another block.
  Two power connectors of the FX2NC-□□EX, FX2NC-16EX-T and FX2NC/FX3UC Series special function blocks are connected in parallel inside the block, and there is no distinction between the power inlet side and the power outlet side. Either connector can be used for wiring. At shipment from the factory, a resin cover is attached to the lower connector. Use the upper connector first. Remove the resin cover from the lower connector only when performing crossover wiring for another block.
  (The FX2NC-□□EX-DS and FX2NC-16EX-T-DS do not have a power connector, and receive power from the input connector. It is not necessary to remove the resin cover.)

3.6.3 Removal of the power cable

1) Pinch the power cable connector "a" and disconnect it in the direction of the arrow



3.7 Connection to Input/Output Connector

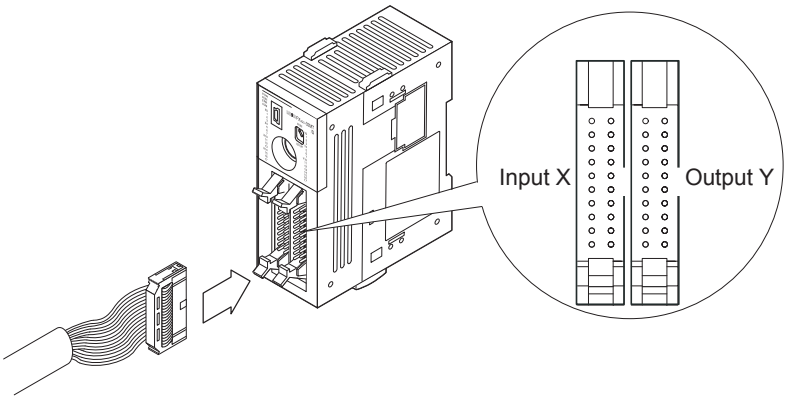
3.7.1 Input/output connector [Main unit, FX2NC Extension block]

1. Connection to input/output connector

The input and output connectors of the main unit and extension blocks for FX2NC conform to the MIL-C-83503. (Note: Some of extension blocks for FX2NC are the European terminal block type.)
Procure the input/output cables in reference to the table below and the next page.

→ **For the terminal arrangement, refer to Section 2.2.**

Example : Main unit



2. Preparation of the I/O connection connector

1) Compliant connectors (commercially available connectors)
Use a 20-pin (1-key) socket connector conforming to MIL-C-83503.
Confirm in advance that the connectors do not interfere with other parts including connector covers.

2) Input/output cables (available from Mitsubishi)
Input/output cables with attached connectors are available.

Model names	Length	Description	Shape
FX-16E-500CAB-S	5 m (16'4")	General-purpose input/output cable	• Single wire (Wire color: red) • PLC side: A 20-pin connector
FX-16E-150CAB	1.5 m (4'11")	Cables for connecting the FX Series terminal block with input/output connectors. For the connection with FX Series terminal block, refer to "Chapter 8. Terminal Block Specifications and External Wiring".	• Flat cables (with tube) • A 20-pin connector at both ends
FX-16E-300CAB	3 m (9'10")		
FX-16E-500CAB	5 m (16'4")		
FX-16E-150CAB-R	1.5 m (4'11")		• Round multicore cables • A 20-pin connector at both ends
FX-16E-300CAB-R	3 m (9'10")		
FX-16E-500CAB-R	5 m (16'4")		
FX-A32E-150CAB	1.5 m (4'11")	Cables for connecting the A Series Model A6TBXY36 connector/terminal block conversion unit and input/output connector type	• Flat cables (with tube) • PLC side: Two 20-pin connectors in 16-point units. • Terminal block side: A dedicated connector • One common terminal covers 32 input/ output terminals.
FX-A32E-300CAB	3 m (9'10")		
FX-A32E-500CAB	5 m (16'4")		

3) Connectors for user-made input/output cables (available from Mitsubishi)
Users should provide electric wires and a pressure bonding tool.

Model name and composition of input/output connector			Applicable electric wire (UL-1061 are recommended) and tool	
Our model name		Details of part (made by DDK Ltd.)	Electric wire size	Pressure bonding tool (made by DDK Ltd.)
FX2C-I/O-CON for flatcable (20-Pin)	10-piece set	Solderless connector FRC2-A020-30S	AWG28 (0.1 mm^2) 1.27 pitch, 20-core	357J-4674D Main body 357J-4664N Attachment
FX2C-I/O-CON-S for bulk wire (20-Pin)	5-piece set	Housing HU-200S2-001 Solderless contact HU-411S	AWG22 (0.3 mm^2)	357J-5538
FX2C-I/O-CON-SA for bulk wire (20-Pin)	5-piece set	Housing HU-200S2-001 Solderless contact HU-411SA	AWG20 (0.5 mm^2)	357J-13963

4) Certified connectors (commercially available connectors)
Connectors made by DDK Ltd. shown in item 3).

3.7.2 Terminal block for Europe [FX2NC/FX3UC extension block]

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, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.
  Failure to do so may cause electric shock.

WIRING PRECAUTIONS **⚠CAUTION**

- Make sure to properly wire to 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.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire 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.

1. Connection to terminal block

Terminal block type input/output extension blocks for FX2NC and terminal block type special function blocks for FX2NC/FX3UC have the European type terminal block.

2. Compliant electric wires and tightening torque

	Electric wire size (stranded wire/solid wire)	Tightening torque	End treatment
One electric wire	0.3 to 0.5 mm^2 (AWG22 to 20)	0.22 to 0.25N•m	• Remove the coating of the stranded wire, twist the core wires, and connect the wires directly. • Remove the coating from the solid wire, and connect the wire directly.
Two electric wires	0.3 mm^2 (AWG22) ×2		
Bar terminal with insulating sleeve	0.3 to 0.5 mm^2 (AWG22 to 20) (Refer to the following outline drawing of bar terminal.)		• Bar terminal with insulating sleeve (recommended product) Al 0.5-8WH : Phoenix Contact Co., Ltd • Caulking tool CRIMPFOX 6*1 : Phoenix Contact Co., Ltd (CRIMPFOX 6T-F*2 : Phoenix Contact Co., Ltd)

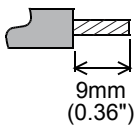
*1. Old model name: CRIMPFOX ZA 3
*2. Old model name: CRIMPFOX UD 6

3. Treatment of electric wire ends

Treat the ends of stranded wires and solid wires without coating or using bar terminals with insulating sleeve.
Tighten the terminals to a torque of 0.22 to 0.25 N•m.
Do not tighten terminal screws with a torque outside the above-mentioned range.
Failure to do so may cause equipment failures or malfunctions.

- Treatment of stranded wires and solid wires without coating
  - Twist the ends of stranded wires tightly so that loose wires will not stick out.
  - Do not solder-plate the electric wire ends.

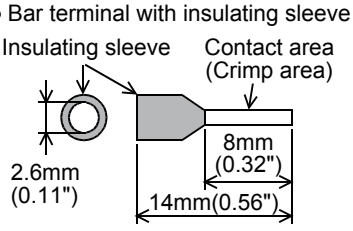
• Stranded wire/solid wire



- Treatment using bar terminal with insulating sleeve
  It may be difficult to insert the electric wire into the insulating sleeve depending on the thickness of the electric wire sheath. Select the electric wire referring to the outline drawing.
  <Reference>

Manufacturer	Model names	Caulking tool
Phoenix Contact Co., Ltd	Al 0.5-8WH	CRIMPFOX 6*3 (CRIMPFOX 6T-F*4)

• Bar terminal with insulating sleeve

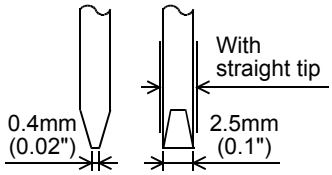


*3. Old model name: CRIMPFOX ZA 3
*4. Old model name: CRIMPFOX UD 6

4. Tool

- For tightening the terminal, use a commercially available small screwdriver having a straight form that is not widened toward the end as shown right.

Note :
If the diameter of screwdriver grip is too small, tightening torque will not be able to be achieved. To achieve the appropriate tightening torque shown in the table on the previous page, use the following screwdriver or an appropriate replacement (grip diameter: approximately 25 mm (0.98")).



<Reference>

Manufacturer	Model names
Phoenix Contact Co., Ltd	SZS 0.4 x 2.5

3.7.3 Input/Output Terminal Blocks [FX2N/FX3U Extension blocks]

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, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.
  Failure to do so may cause electric shock.

WIRING PRECAUTIONS **⚠CAUTION**

- Make sure to properly wire the FX2N/FX3U Series extension equipment 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
- Make sure to properly wire to the FX Series terminal blocks 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

1. Terminal block screw size and tightening torque

The table below shows the screw size of each terminal block. For crimp terminals, refer to "2. Wire end treatment".

Product	Terminal screw	Tightening torque
FX2N extension blocks (Except for the FX2N-8AD, FX2N-16CCL-M signal terminal)	M3	0.5 to 0.8 N•m
FX Series terminal block, FX2N-20PSU, FX2N-8AD, FX2N-16CCL-M signal terminal	M3.5	
FX3U extension blocks	Refer to the manual for each product.	

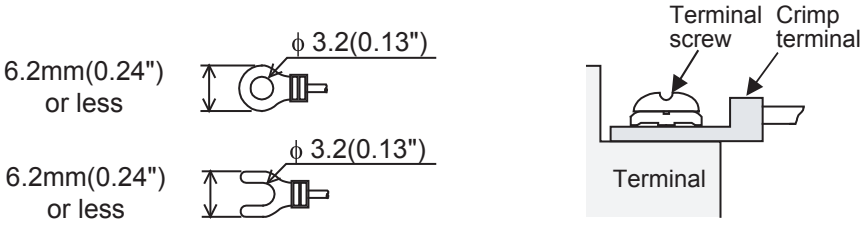
2. Wire end treatment

The solderless terminal size depends on the terminal screw size and wiring method.

- Use solderless terminals of the following size.
- Tighten the terminals to a torque of 0.5 to 0.8 N•m.
  Do not tighten terminal screws with a torque outside the above-mentioned range.
  Failure to do so may cause equipment failures of malfunctions.

In case of M3 terminal screw

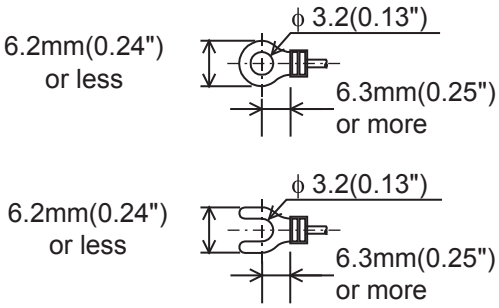
- When one wire is connected to one terminal

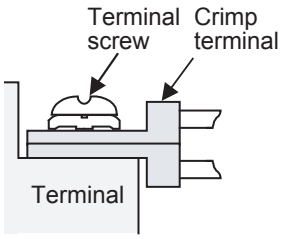


<Reference>

Terminal manufacturer	Type No.	Applicable cable	Certification	Pressure bonding tool
J.S.T. Mfg. Co., Ltd.	FV1.25-B3A	AWG22 to 16	UL Listed	YA-1 (J.S.T. Mfg. Co., Ltd.)
	FV2-MS3	AWG16 to 14		

- When two wires are connected to one terminal*1





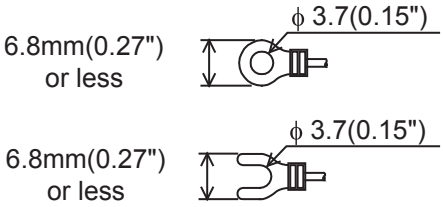
<Reference>

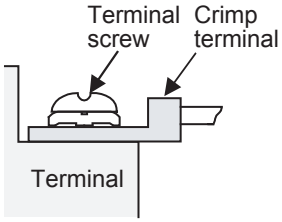
Terminal manufacturer	Type No.	Applicable cable	Certification	Pressure bonding tool
J.S.T. Mfg. Co., Ltd.	FV1.25-B3A	AWG22 to 16	UL Listed	YA-1 (J.S.T. Mfg. Co., Ltd.)

*1. To adapt the LVD directive (EN61010-2-201:2013) of the EC directive, avoid the wiring with two wires to the built-in terminal, and take an appropriate action such as adding an external terminal.
For the time of compliance with the LVD directive (EN61010-2-201:2013), refer to Requirement for Compliance with LVD directive.

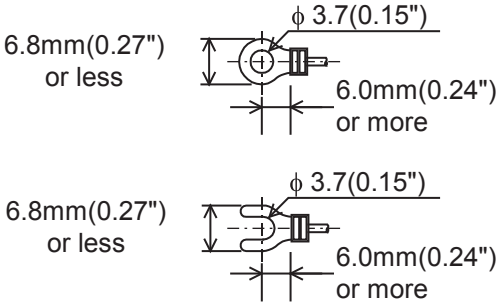
In case of M3.5 terminal screw

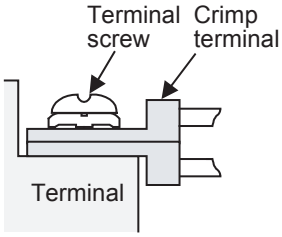
- When one wire is connected to one terminal





- When two wires are connected to one terminal





3.8 Grounding terminal of the FX3U-ENET-ADP

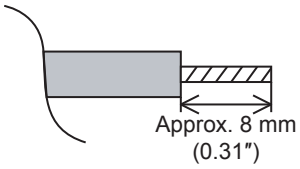
The grounding terminal of the FX3U-ENET-ADP is a M2.5 screw.

1. Applicable cables

Electric wire size
0.5 to 1.5 mm^2 (AWG 20 to 16)

2. Treatment of electric wire ends

- When using a stranded cable or solid cable as it is
  - Twist the end of the stranded cable so that loose wires will not stick out.
  - Do not solder-plate the end of the cable.



3. Tightening torque

Tighten the terminals to a torque of 0.4 to 0.5 N•m.
Do not tighten terminal screws with a torque outside the above-mentioned range.
Failure to do so may cause equipment failures or malfunctions.

Caution

When tightening a grounding terminal, use a screwdriver suitable for the terminal screw. The screwdriver which does not suit the thread groove is used, tightening torque will not be able to be achieved. To achieve the appropriate tightening torque shown in the above, use the following screwdriver or an appropriate replacement.

<Reference>

Manufacturer	Model name	Model number
Weidmuller Interface GmbH & Co. KG	SDIK PH0	9008560000
Weidmuller Interface GmbH & Co. KG	SD 0.6×3.5×100	9008330000

4. Power Supply Specifications and External Wiring

DESIGN PRECAUTIONS ⚠ **WARNING**

- Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure.
  Otherwise, malfunctions may cause serious accidents.
  1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
  2) Note that when the PLC CPU 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 PLC CPU occurs in an input/output control block, output control may be disabled.
  External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.
  For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.

DESIGN PRECAUTIONS ⚠ **CAUTION**

- Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line.
  Noise may cause malfunctions.
- Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.
  Failure to do so may result in wire damage/breakage or PLC failure.

SECURITY PRECAUTIONS ⚠ **WARNING**

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

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, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.
  Failure to do so may cause electric shock.

WIRING PRECAUTIONS **⚠CAUTION**

- Connect the DC 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 damage the product.
- Perform class D grounding (grounding resistance: 100 Ω or less) to the grounding terminal on the main unit.
  Do not use common grounding with heavy electrical systems.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to properly wire the FX2N/FX3U Series extension equipment 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
- Make sure to properly wire to 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.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire 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.
- Make sure to properly wire to the FX Series terminal blocks 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

4.1 Selection of the external DC power supply to prepare

4.1.1 Power supply specifications

This subsection explains the power supply input specification of the main unit and extension power supply unit (FX3UC-1PS-5V).
For the power consumption of special function blocks requiring the external power supply, refer to the manual of the corresponding product.

Item	Specification	
	Main unit	Extension power supply unit
Supply voltage	24 V DC	
Voltage fluctuation range*1	+20% -15%	
Allowable instantaneous power failure time	Operation can be continued upon occurrence of an instantaneous power failure for 5 ms or less.	
Power fuse	125 V 3.15 A	
Rush current	30 A max. 0.5 ms / 24 V DC	
Power consumption	8 W*2	1 W*2 (When extension blocks are connected max.25 W)
5 V DC built-in power supply (5 V DC)	400 mA	1 A

*1. The 24 V DC power changes the specifications of the voltage range by system configuration.
→ **For details, refer to "4.1.2 The input range of power supply voltage".**

*2. Power consumption changes according to the system configuration.
→ **For details, refer to "4.1.3 Power consumption of the extension equipment".**

4.1.2 The input range of power supply voltage

When connecting special function blocks shown in the table below, set the voltage supplied to the main unit as follows.

1) When Group A is connected
Please use the external power supply of "24 V DC, Voltage fluctuation range ±10 %"

2) When Group B is connected
Please use the external power supply of "24 V DC, Voltage fluctuation range +10 % -15 %"

3) When either group is not used
The external power supply of "24 V DC, Voltage fluctuation range +20 % -15 %" can be used.

Group	Model name
A	FX3UC-4AD
	FX2NC-4AD
	FX2NC-4DA
	FX3U-4AD
	FX3U-4DA
	FX2N-2AD
	FX2N-2DA
	FX2N-4AD

Group	Model name
A	FX2N-4AD-PT
	FX2N-4AD-TC
	FX2N-4DA
	FX2N-5A
	FX2N-8AD
	FX2N-32CCL
B	FX2N-2LC

4.1.3 Power consumption of the extension equipment

The power consumption shown on the previous page does not include the power consumption of connected extension blocks.
When connecting extension blocks shown below, add the power consumption shown in the table below to the power consumption of the main unit and extension power supply unit.
When you connect special function blocks other than the ones listed in the following table, refer to each manual.

Model name	Power consumption
FX2NC-16EX	2.2W
FX2NC-16EX-DS	2.2W
FX2NC-16EX-T	2.2W
FX2NC-16EX-T-DS	2.2W
FX2NC-16EYT	0.35W
FX2NC-16EYT-DSS	0.35W
FX2NC-16EYR-T	2.2W
FX2NC-16EYR-T-DS	2.2W
FX2NC-32EX	4.2W
FX2NC-32EX-DS	4.2W
FX2NC-32EYT	0.7W
FX2NC-32EYT-DSS	0.7W

Model name	Power consumption
FX2N-8ER	1.2W
FX2N-8ER-ES/UL	1.2W
FX2N-8EX	1.2W
FX2N-8EX-ES/UL	1.2W
FX2N-8EX-UA1/UL	0.2W*2
FX2N-8EYR	1.2W
FX2N-8EYR-ES/UL	1.2W
FX2N-8EYR-S-ES/UL	1.2W
FX2N-8EYT	2.0W
FX2N-8EYT-ESS/UL	2.0W
FX2N-8EYT-H	2.1W

Model name	Power consumption
FX2N-16EX	2.2W
FX2N-16EX-ES/UL	2.2W
FX2N-16EX-C	2.2W
FX2N-16EXL-C	0.3W*1
FX2N-16EYR	2.2W
FX2N-16EYR-ES/UL	2.2W
FX2N-16EYT	1.2W
FX2N-16EYT-ESS/UL	1.2W
FX2N-16EYT-C	2.2W
FX2N-16EYS	1.0W
FX2N-2AD	2.3W
FX2N-2DA	1.4W

*1. External 5V power supply is not included.

*2. AC input current is not included.

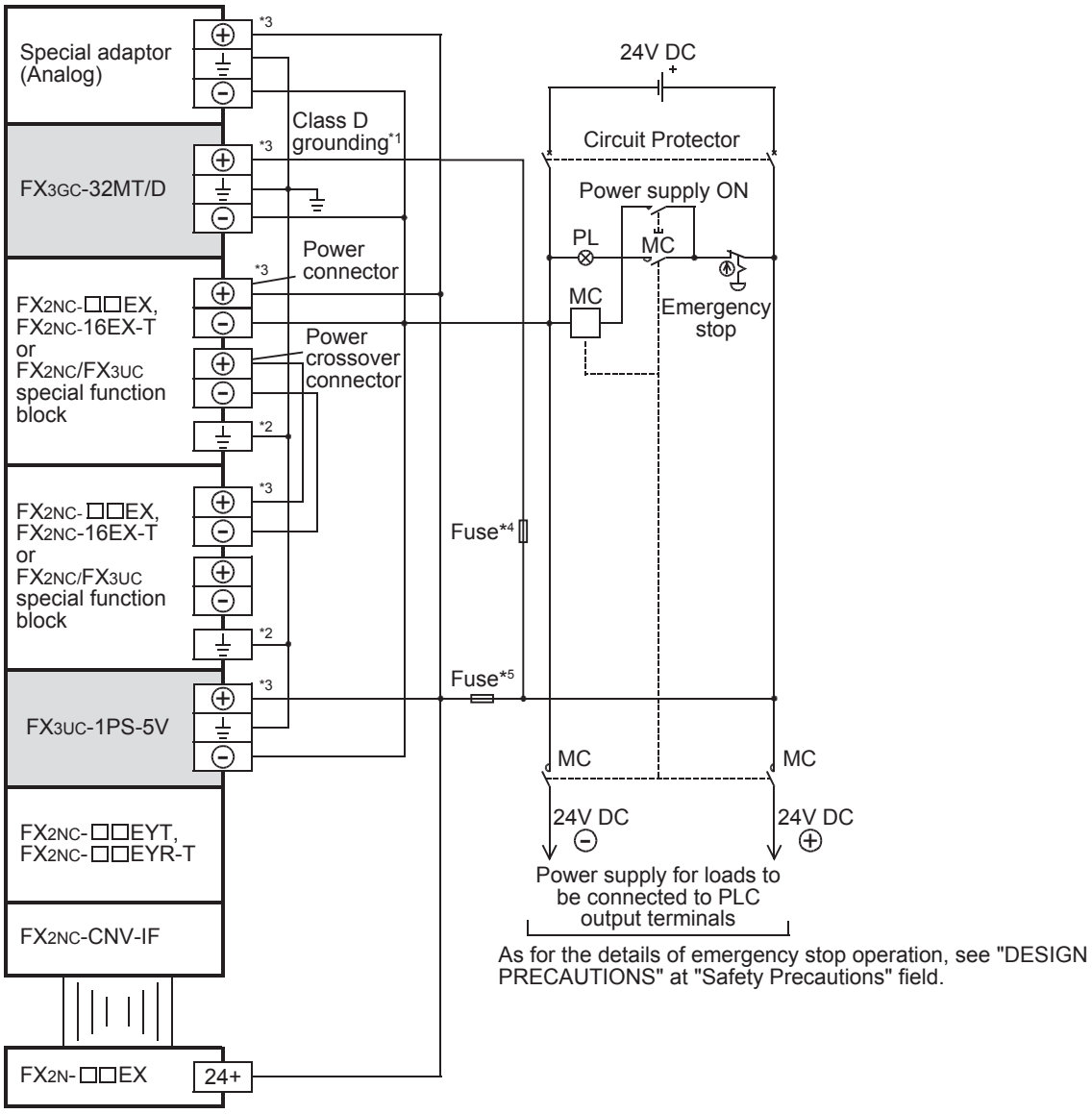
4.2 Example External Wiring

1. Example External Wiring

A 24V DC power is supplied to the main unit of the FX3GC PLC.
A dedicated connector is used for the power supply.

→ **For wiring, refer to Section 3.6.**

- Example of the FX3GC-32MT/D



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

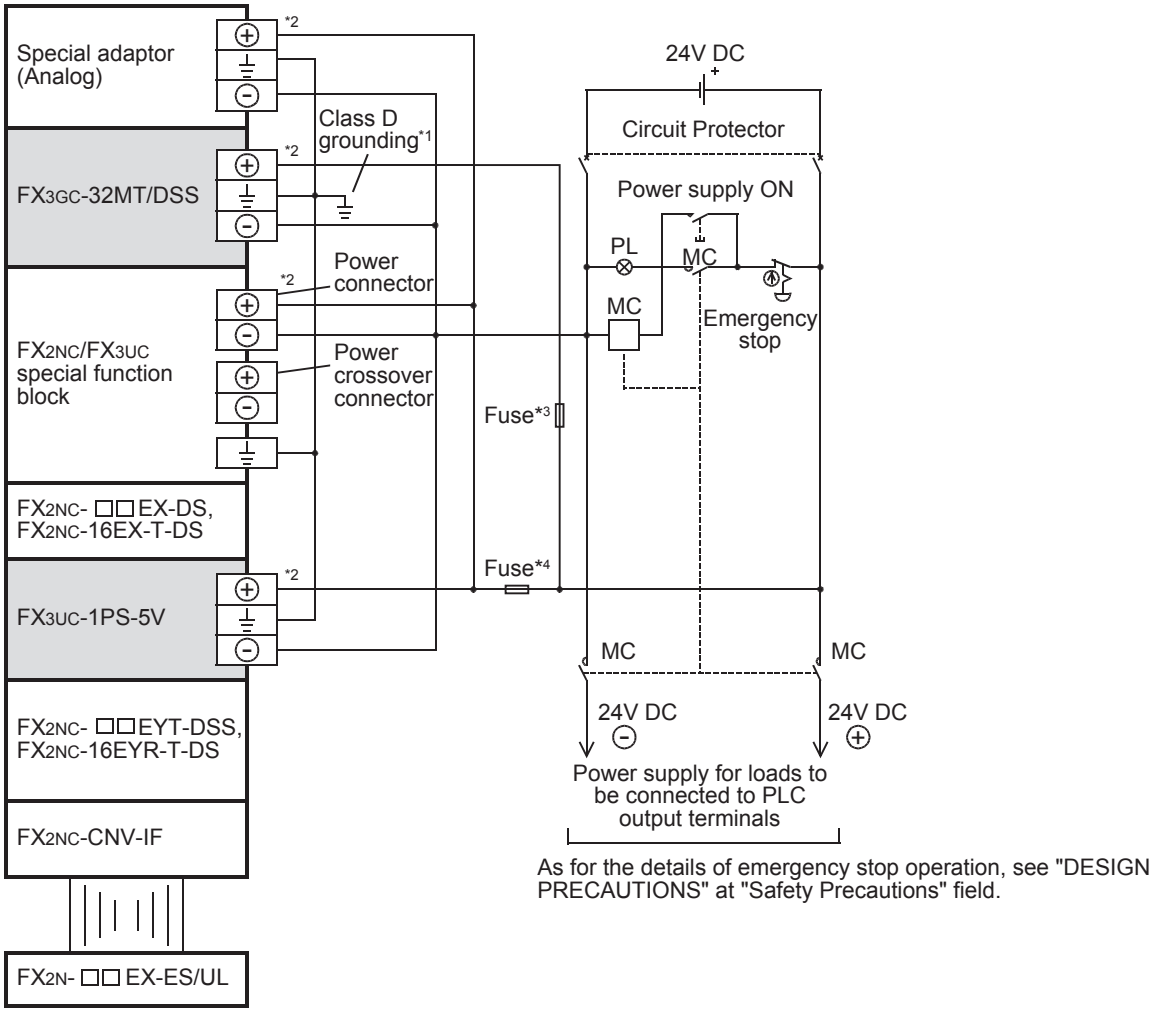
*2. ⏚ terminal is only for the FX2NC/FX3UC Series special function block.

*3. The same power source for the main unit, extension power supply units, special adapters and special function blocks is preferable.
When using the different power source from the main unit, turn ON the peripheral devices' power simultaneously, or earlier than the main unit's. When turning OFF the power, confirm the safety of the system, and then turn OFF the power of the PLC (including special extension equipment) at the same time.

*4. A UL Listed or Recognized fuse rated not higher than 3.47 A must be used with FX3GC.

*5. Use a fuse suitable for the system.

- Example of the FX3GC-32MT/DSS



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

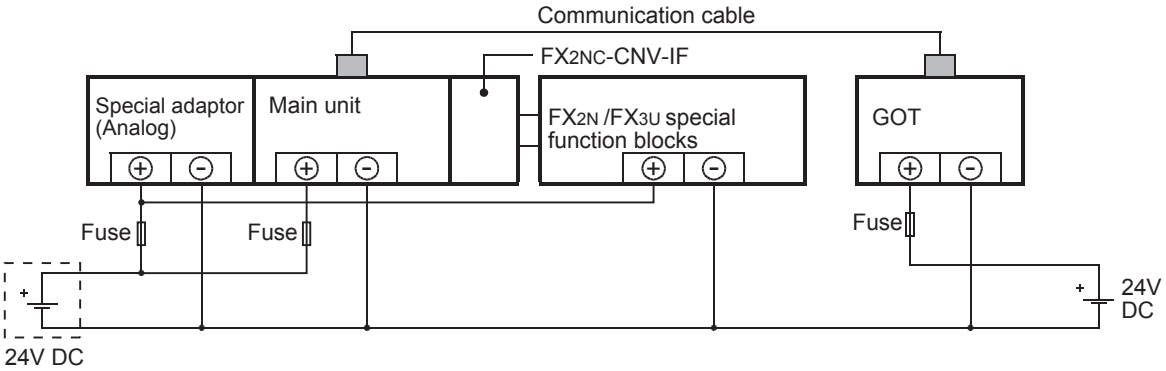
*2. The same power source for the main unit, extension power supply units, special adapters and special function blocks is preferable.
When using the different power source from the main unit, turn ON the peripheral devices' power simultaneously, or earlier than the main unit's. When turning OFF the power, confirm the safety of the system, and then turn OFF the power of the PLC (including special extension equipment) at the same time.

*3. A UL Listed or Recognized fuse rated not higher than 3.47 A must be used with FX3GC.

*4. Use a fuse suitable for the system.

2. Caution on connecting the minus line (when using two or more external DC power supplies)

When supplying power from two or more power supply units due to insufficient capacity of each DC power supply unit, connect the minus line of each power supply unit as shown in the figure below.



5. Input Specifications and External Wiring

DESIGN PRECAUTIONS ⚠ **WARNING**

- Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure.
  Otherwise, malfunctions may cause serious accidents.
  1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
  2) Note that when the PLC CPU 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 PLC CPU occurs in an input/output control block, output control may be disabled.
  External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.
  For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.

DESIGN PRECAUTIONS ⚠ **CAUTION**

- Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line.
  Noise may cause malfunctions.
- Install the product so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.
  Failure to do so may result in wire damage/breakage or PLC failure.

SECURITY PRECAUTIONS ⚠ **WARNING**

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

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, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.
  Failure to do so may cause electric shock.

WIRING PRECAUTIONS **⚠CAUTION**

- Connect the DC 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 damage the product.
- Perform class D grounding (grounding resistance: 100 Ω or less) to the grounding terminal on the main unit.
  Do not use common grounding with heavy electrical systems.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to properly wire the FX2N/FX3U Series extension equipment 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
- Make sure to properly wire to 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.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire 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.
- Make sure to properly wire to the FX Series terminal blocks 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

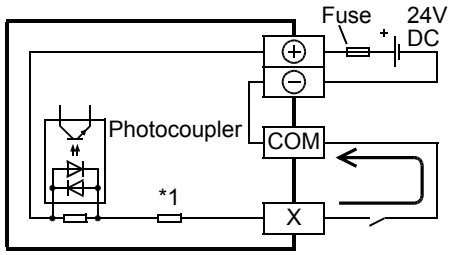
5.1 Sink and source input (24 V DC input type)

Inputs (X) in the FX3GC-32MT/D are sink input type only.
Inputs (X) in the FX3GC-32MT/DSS are sink/source common input type.
Inputs in FX2N/FX2NC Series input/output extension blocks are either sink input type only or sink/source common input type depending on the product.

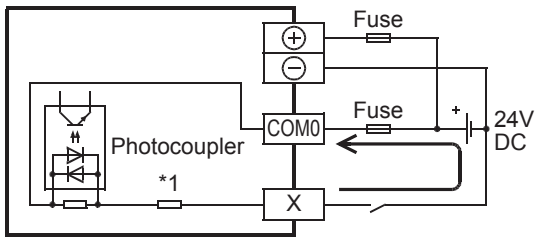
1. Sink input [-common]

An input (DC input signal) used where the current flows out of the input (X) terminal is called a sink input.
NPN open collector transistor outputs are available when transistor output type sensor outputs are connected.

- Examples of the FX3GC-32MT/D



- Examples of the FX3GC-32MT/DSS

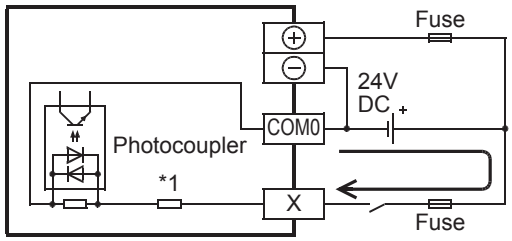


*1. Input impedance

2. Source input [+common]

An input (DC input signal) used where the current flows into the input (X) terminal is called a source input.
PNP open collector transistor outputs are available when transistor output type sensor outputs are connected.

- Examples of the FX3GC-32MT/DSS



*1. Input impedance

3. How to change a sink input for a source input for the FX3GC-32MT/DSS

Sink inputs and the source inputs can be changed over in the FX3GC-32MT/DSS by connection as follows:

- Sink input: Selected by the connection that makes the current flow out of the input (X) terminal.
- Source input: Selected by the connection that makes the current flow into the input (X) terminal.

4. Instructions for using

- Concurrent use of sink/source input
  Inputs (X) in the FX3GC-32MT/DSS can be wired either for sink inputs or source inputs.
  It is not allowed to use both sink inputs and source inputs together.
- Caution in selecting model
  Each input extension block is either sink input type only or sink/source common input type.
  It is not allowed to use both types of input extension blocks together.

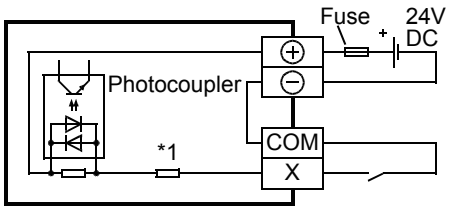
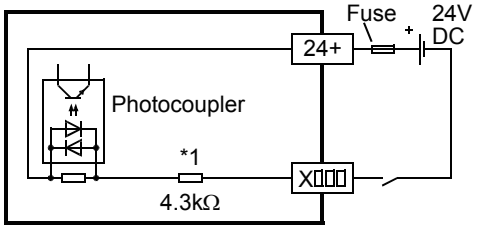
5.2 24 V DC Input Type

For 5 V DC input (FX2N-16EXL-C), refer to Section 5.3.
For AC input (FX2N-8EX-UA1/UL), refer to Section 5.4.

5.2.1 24 V DC Input Specifications

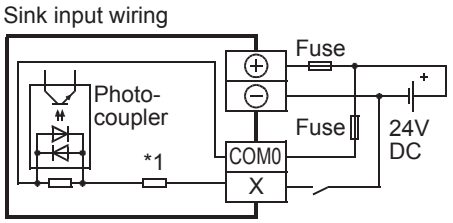
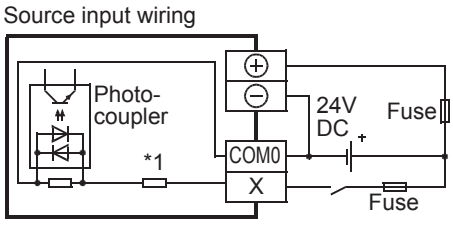
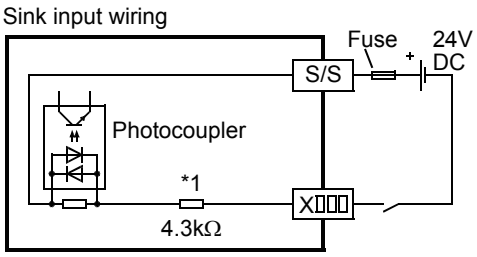
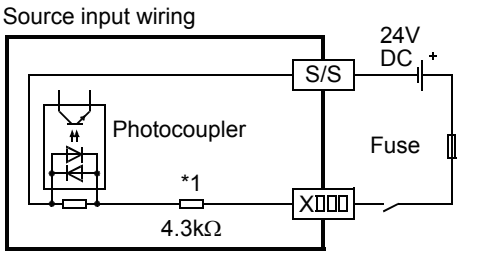
The table below shows 24 V DC input specifications.
Inputs in the main unit are restricted by the simultaneous ON ratio.
→ **For the restriction in simultaneous ON ratio, refer to Subsection 5.2.2.**

1. Sink input

Item		24 V DC Input Specifications (Sink input)			
		FX3GC-32MT/D, FX2NC-□□EX(-T)			FX2N Input extension blocks
Number of input points		FX3GC-32MT/D: 16 points FX2NC-16EX(-T): 16 points FX2NC-32EX: 32 points			FX2N-8ER: 4 points FX2N-8EX: 8 points FX2N-16EX(-C): 16 points
Input connecting type		Except for the FX2NC-16EX-T: Connector			Except for the FX2N-16EX-C: Terminal block
		FX2NC-16EX-T: Terminal block			FX2N-16EX-C: Connector
Input form		Sink input			
Input signal voltage		24 V DC, Voltage fluctuation range +20% -15%			
Input impedance		Main unit	X000 to X007	3.3 kΩ	4.3 kΩ
			X010 to X017	4.3 kΩ	
		FX2NC-□□EX(-T)		4.3 kΩ	
Input signal current		Main unit	X000 to X007	7 mA/24 V DC	5 mA/24 V DC
			X010 to X017	5 mA/24 V DC	
		FX2NC-□□EX(-T)		5 mA/24 V DC	
Input sensitivity current	ON	Main unit	X000 to X007	4.5 mA or more	3.5 mA or more
			X010 to X017	3.5 mA or more	
		FX2NC-□□EX(-T)		3.5 mA or more	
	OFF	1.5 mA or less			
Input response time		Approx. 10 ms			
Input signal form (Input sensor form)		No-voltage contact input/NPN open collector transistor			
Input circuit insulation		Photocoupler insulation			
Input operation display		Turning on the input will light the LED indicator lamp.			
Input circuit configuration					

*1. Input impedance

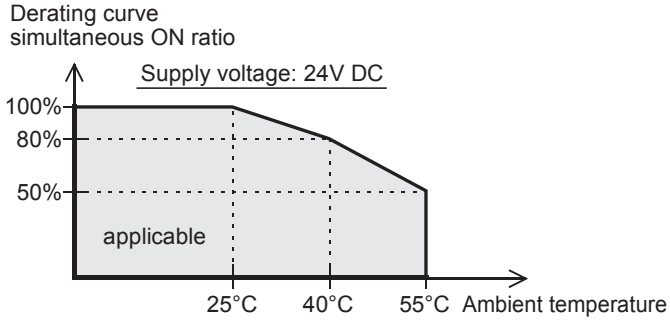
2. Sink/Source input

Item		24 V DC Input Specifications (Sink/Source input)			
		FX3GC-32MT/DSS, FX2NC-□□EX(-T)-DS			FX2N Input extension blocks
Number of input points		FX3GC-32MT/DSS: 16 points FX2NC-16EX(-T)-DS: 16 points FX2NC-32EX-DS: 32 points			FX2N-8ER-ES/UL: 4 points FX2N-8EX-ES/UL: 8 points FX2N-16EX-ES/UL: 16 points
Input connecting type		Except for the FX2NC-16EX-T-DS: Connector			Terminal block
		FX2NC-16EX-T-D: Terminal block			
Input form		Sink/Source input			
Input signal voltage		24 V DC, Voltage fluctuation range +20% -15%			
Input impedance		Main unit	X000 to X007	3.3 kΩ	4.3 kΩ
			X010 to X017	4.3 kΩ	
		FX2NC-□□EX(-T)-DS		4.3 kΩ	
Input signal current		Main unit	X000 to X007	7 mA/24 V DC	5 mA/24 V DC
			X010 to X017	5 mA/24 V DC	
		FX2NC-□□EX(-T)-DS		5 mA/24 V DC	
Input sensitivity current	ON	Main unit	X000 to X007	4.5 mA or more	3.5 mA or more
			X010 to X017	3.5 mA or more	
		FX2NC-□□EX(-T)-DS		3.5 mA or more	
	OFF	1.5 mA or less			
Input response time		Approx. 10 ms			
Input signal form (Input sensor form)		Sink input: No-voltage contact input/NPN open collector transistor Source input: No-voltage contact input/PNP open collector transistor			
Input circuit insulation		Photocoupler insulation			
Input operation display		Turning on the input will light the LED indicator lamp.			
Input circuit configuration		 			 

*1. Input impedance

5.2.2 Input Derating Curve

When extension blocks are connected, the derating curve below shows the simultaneous ON ratio of all available PLC inputs with respect to the ambient temperature. Use the PLC within the simultaneous input ON ratio range shown in the figure.

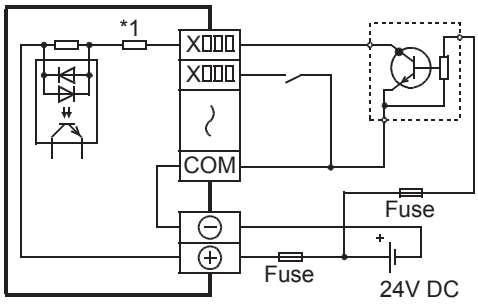


5.2.3 Handling of 24 V DC input

1. Input terminals

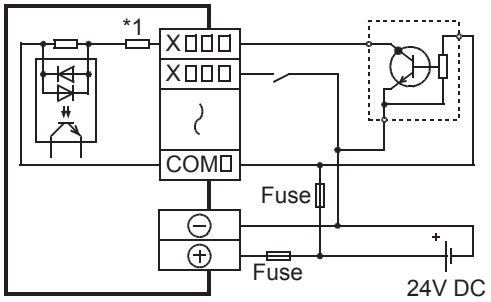
When an input turns ON, the input indicator LED turns ON in the main unit or input/output extension block for FX2N/FX2NC.
Multiple input COM terminals are connected inside the PLC.
One of the input terminals X000 to X017 of the main unit can be used as a RUN input terminal by a parameter setting.

- Dedicated to sink input types only
  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. Then, the input display LED lights.

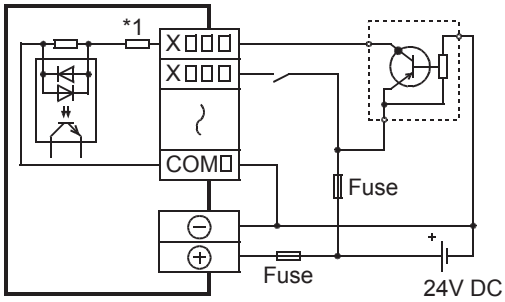


- Common to both sink and source input types
  For sink input in the sink/source common input type, connect the 24 V DC+ terminal and COM□ terminal*2, and electrically connect an input terminal and 24 V DC with a no-voltage contact or NPN open collector transistor to turn ON the input. For source input, connect the 24 V DC- terminal and COM□ terminal*2, and electrically connect an input terminal and 24 V DC with a no-voltage contact or PNP open collector transistor to turn ON the input.

Sink input wiring



Source input wiring



*1. Input impedance

*2. S/S terminal in FX2N Series extension blocks

2. Input circuit

Function of input circuit

The primary and secondary circuits for input are insulated with a 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 the input line.
There is a delay of approx. 10 ms in response to input-switching from ON to OFF and from OFF to ON.

Change of filter time

X000 to X007 have digital filters, and the filter time can be changed in increments of 1ms in the range from 0 to 15 ms through special data register (D8020). When 0 is specified for the time, the input filter values are set as shown in the following table.

Input number	Input filter value when 0 is specified
X000, X001, X003, X004	10 μs
X002, X005, X006, X007	50 μs

3. Input sensitivity

The main units input current and input sensitivity are shown in the following table.
When DC diodes or resistors are provided at input contacts or when parallel resistors or leakage current are present at input contacts, perform wiring in accordance with Subsection 5.2.4.

Item		X000 to X007	X010 to X017
Input signal voltage		24 V DC, Voltage fluctuation range +20% -15%	
Input signal current		7 mA	5 mA
Input sensitivity current	**ON**	4.5 mA or more	3.5 mA or more
	OFF	1.5 mA or less	1.5 mA or less

5.2.4 Instructions for connecting input devices

The input current of this PLC is 5 to 7 mA/24 V DC.
Use input devices applicable to this minute current.
If no-voltage contacts (switches) for large current are used, contact failure may occur.

Input number	Input current
X000 to X007	7 mA/24 V DC
X010 to X017	5 mA/24 V DC

<Example> Products of OMRON

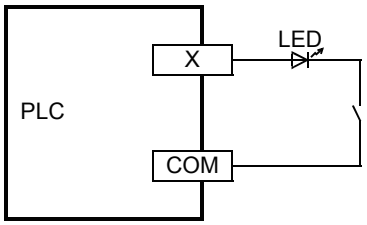
Type	Model name
Microswitch	Models Z, V and D2RV
Proximity switch	Model TL

Type	Model name
Operation switch	Model A3P
Photoelectric switch	Model E3S

1. In the case of input device with built-in series diode

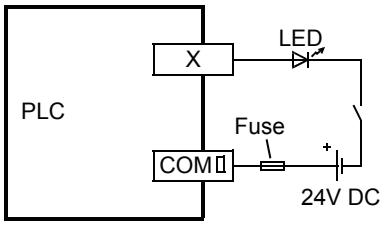
The voltage drop of the series diode should be approx. 4 V or less.
For example, when lead switches with a series LED are used, up to two switches can be connected in series.
Also make sure that the input current is over the input-sensing level while the switches are ON.

- Examples of wiring (Dedicated to sink input types only)

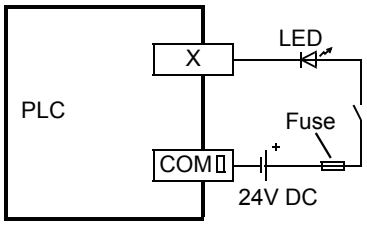


- Examples of wiring (Common to both sink and source input types)

Sink input wiring



Source input wiring

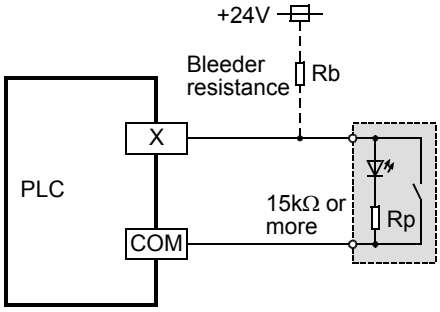


2. In the case of input device with built-in parallel resistance

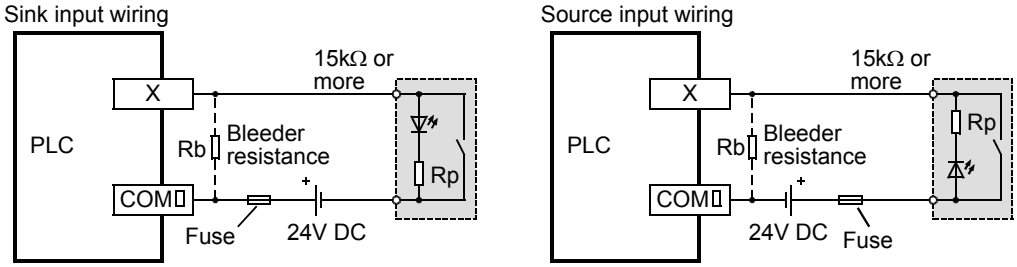
Use a device having a parallel resistance, Rp, of 15 kΩ or more.
If the resistance is less than 15 kΩ, connect a bleeder resistance, Rb(kΩ), obtained by the following formula as shown in the following figure.

$$Rb(k\Omega) \leq \frac{4Rp}{15\text{-}Rp}$$

- Examples of wiring (Dedicated to sink input types only)



- Examples of wiring (Common to both sink and source input types)

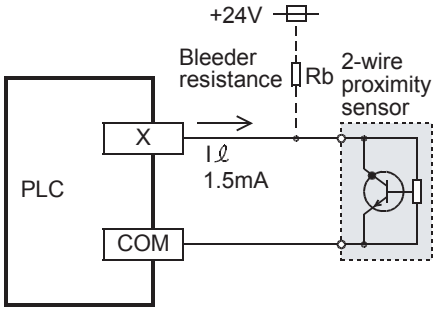


3. In the case of 2-wire proximity switch

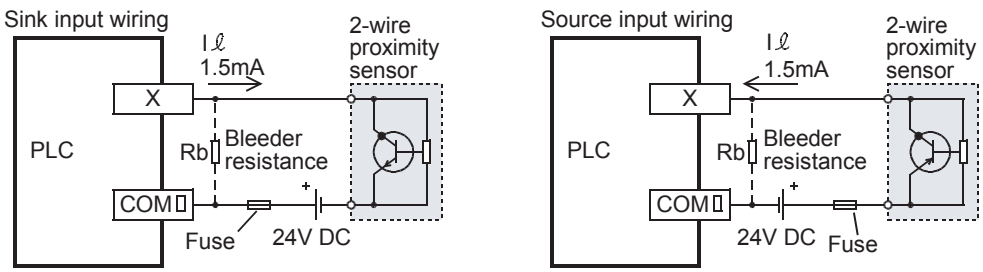
Use a two-wire proximity switch whose leakage current, Iℓ, is 1.5 mA or less when the switch is off.
When the current is larger than 1.5 mA, connect a bleeder resistance, Rb(kΩ), determined by the following formula as shown in the following figure.

$$Rb(k\Omega) \leq \frac{6}{I\ell\ \text{-}1.5}$$

- Examples of wiring (Dedicated to sink input types only)

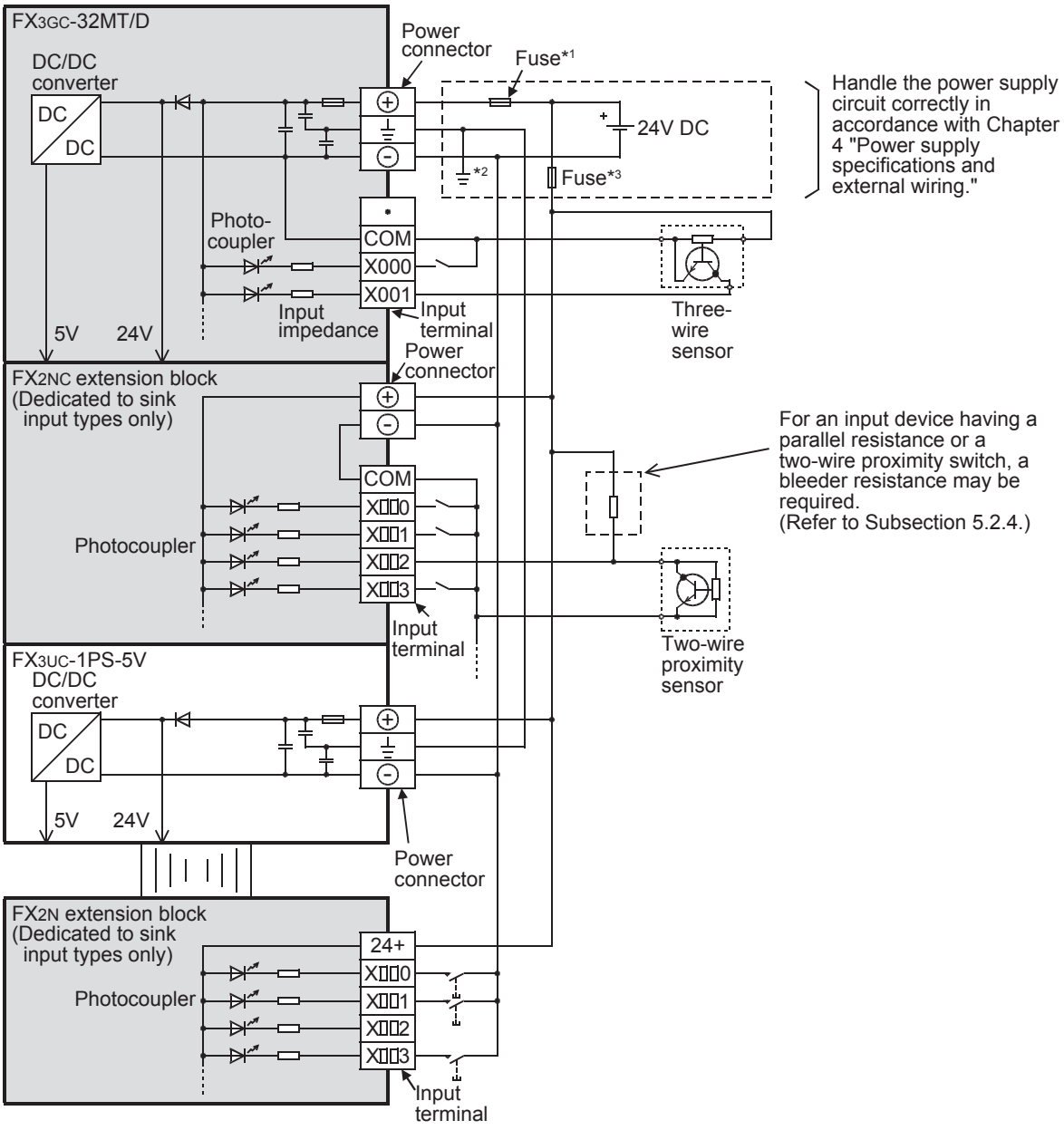


- Examples of wiring (Common to both sink and source input types)



5.2.5 Examples of external wiring

1. Examples of wiring (Dedicated to sink input types only)



*1. A UL Listed or Recognized fuse rated not higher than 3.47 A must be used with FX3GC.

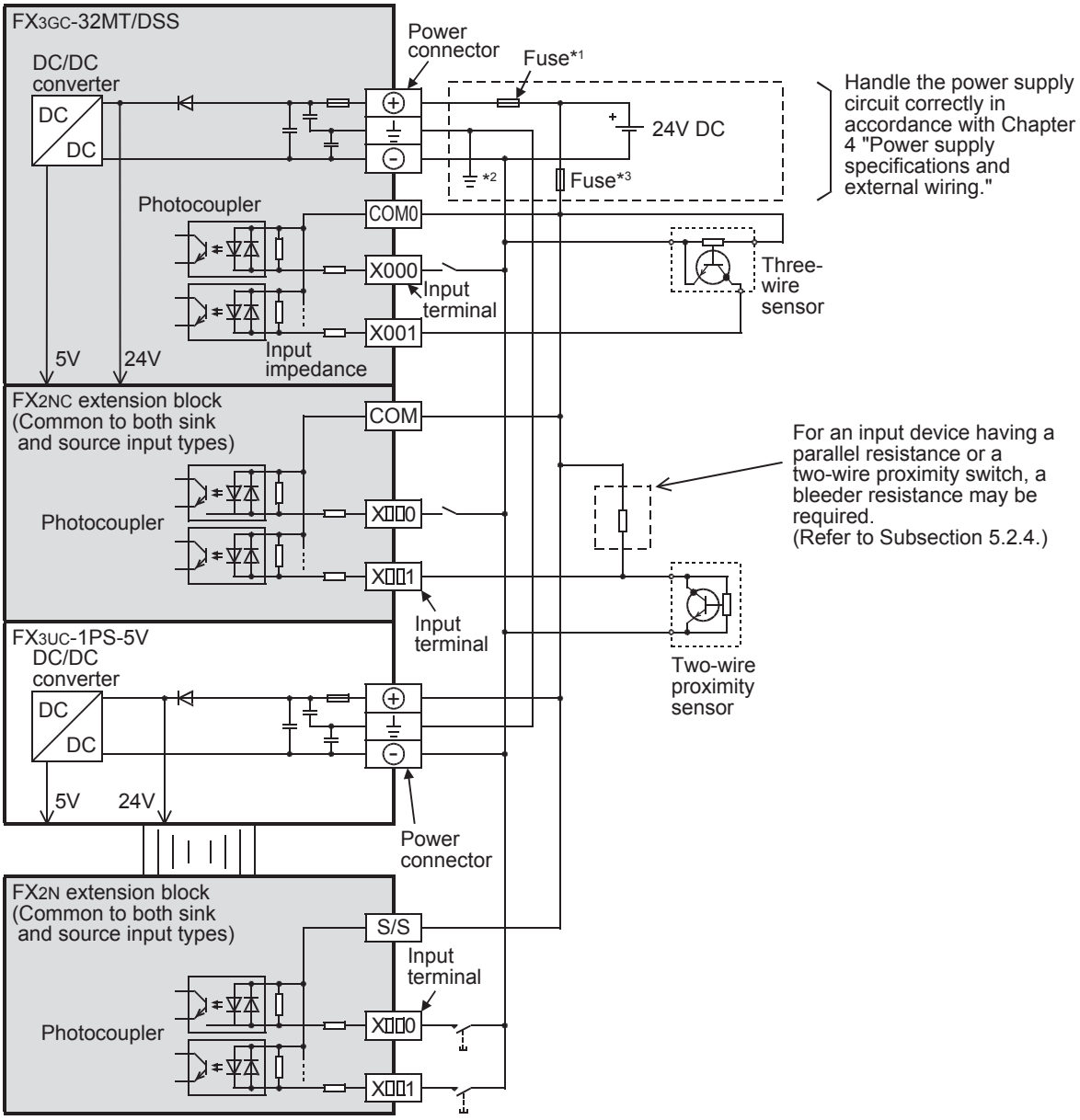
*2. Class D grounding
The grounding resistance should be 100 Ω or less.

*3. Use a fuse suitable for the system.

WIRING PRECAUTIONS ⚠**CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

2. Examples of sink input wiring (Common to both sink and source input types)



*1. A UL Listed or Recognized fuse rated not higher than 3.47 A must be used with FX3GC.

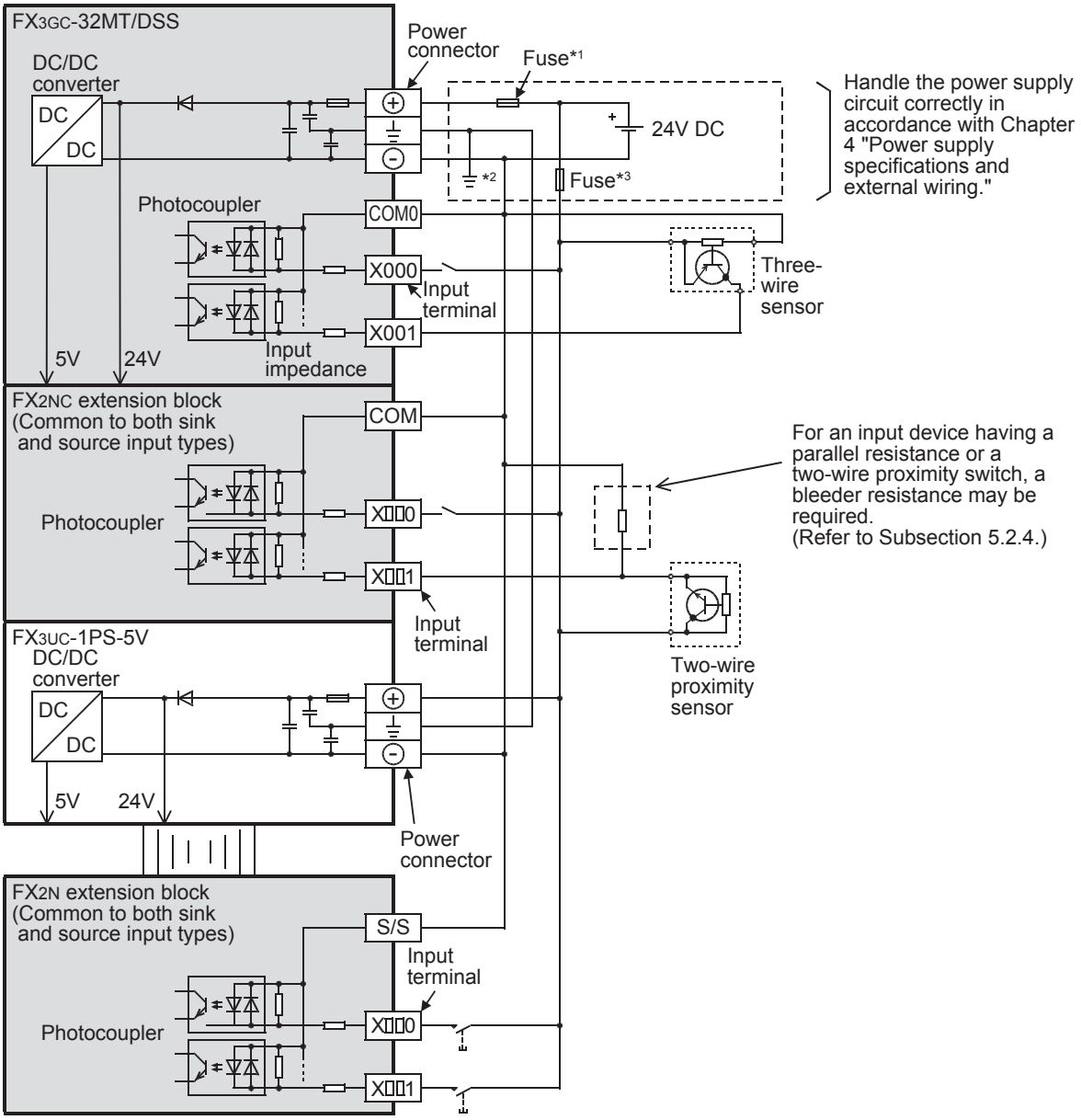
*2. Class D grounding
The grounding resistance should be 100 Ω or less.

*3. Use a fuse suitable for the system.

WIRING PRECAUTIONS **⚠CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

3. Examples of source input wiring (Common to both sink and source input types)



*1. A UL Listed or Recognized fuse rated not higher than 3.47 A must be used with FX3GC.

*2. Class D grounding
The grounding resistance should be 100 Ω or less.

*3. Use a fuse suitable for the system.

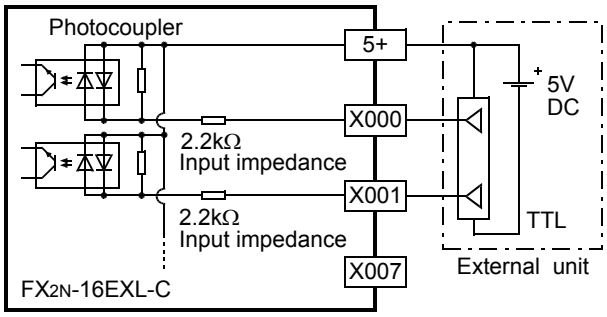
WIRING PRECAUTIONS **⚠CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

5.3 5 V DC Input [FX2N-16EXL-C]

5.3.1 5 V DC input specifications

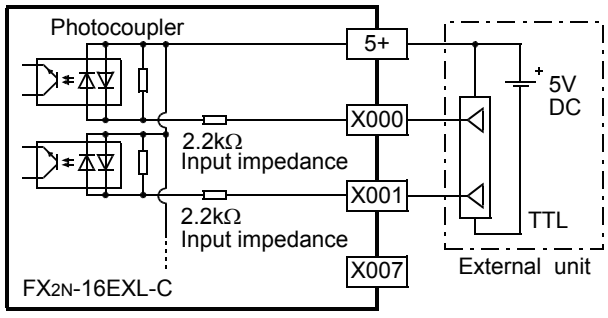
The table below shows the input specifications of the FX2N-16EXL-C.

Item		5 V DC input specifications
Input points		16 points
Connection type		Connector terminal block
Input signal voltage		5 V DC ± 5%
Input impedance		2.2 kΩ
Input signal current		Max.40 mA 5 V DC
Input sensitivity current	**ON (Low)**	1 mA or more
	OFF (High)	0.4 mA or less
Input sensitivity voltage	**ON (Low)**	1.5 V DC or less
	OFF (High)	3.5 V DC or more
Input response time	**OFF → ON (High → Low)**	1 ms +1 ms, -0.5 ms
	ON → OFF (Low → High)	1 ms +1 ms, -0.5 ms
Input signal type		TTL input
Input circuit insulation		Photo-coupler insulation
Input operation display		Turning on the input will light the LED indicator lamp.
Input circuit diagram		

5.3.2 Handling of 5 V DC Input

1. Input terminals

When an input terminal and the 5+ terminal are connected with the 5 V DC circuit (shown in the figure on the right), the input turns ON. At this time, the input indicator LED turns ON.
Multiple 5+ terminals are connected inside the PLC.



2. Input circuit

The primary and secondary circuits for input are insulated with a photocoupler. Response delay of approximately 1ms is given for a change in the input ("ON → OFF" or "OFF → ON").

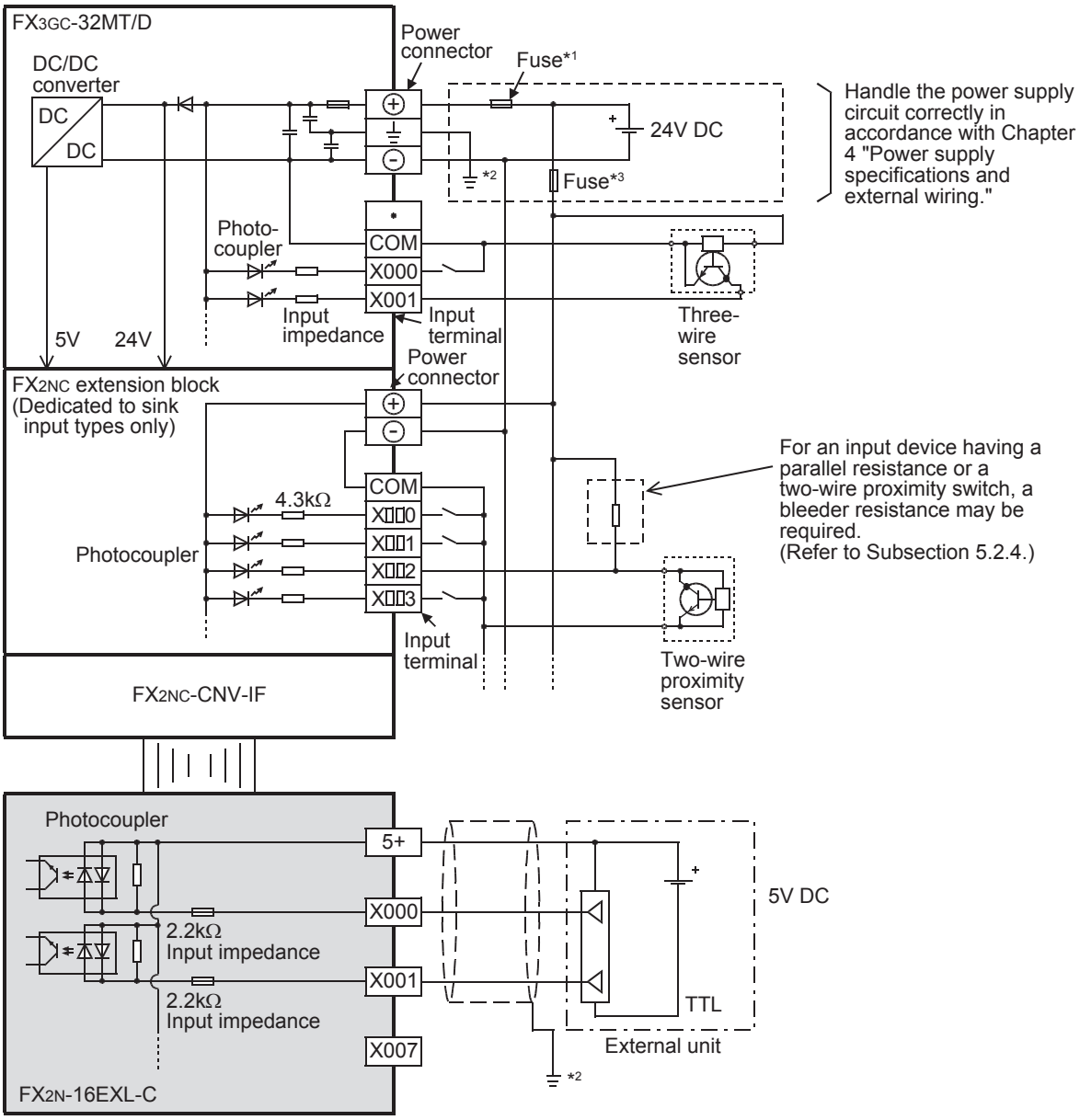
3. Input sensitivity

The table below shows the input current and input sensitivity in this PLC.

Item		Specifications
Input signal voltage		5 V DC ± 5%
Input signal current		Max.40 mA 5 V DC
Input sensitivity current	**ON (Low)**	1 mA or more
	OFF (High)	0.4 mA or less
Input sensitivity voltage	**ON (Low)**	1.5 V DC or less
	OFF (High)	3.5 V DC or more

5.3.3 Example of external wiring

Use shielded wires for wiring the 5 V DC.



*1. A UL Listed or Recognized fuse rated not higher than 3.47 A must be used with FX3GC.

*2. Class D grounding
The grounding resistance should be 100 Ω or less.

*3. Use a fuse suitable for the system.

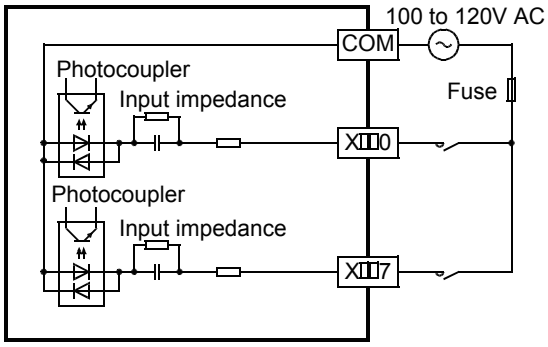
WIRING PRECAUTIONS **⚠CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

5.4 AC input [FX2N-8EX-UA1/UL]

5.4.1 AC input specifications

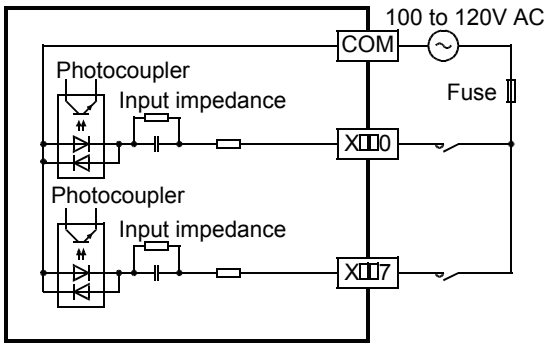
The table below shows the input specifications of the FX2N-8EX-UA1/UL.

Item		AC input specifications
Input points		8 points
Connection type		Connector terminal block
Input signal voltage		100 to 110 V AC +10%, -15% 50/60 Hz
Input impedance		Approx. 21 kΩ/50 Hz Approx. 18 kΩ/60 Hz
Input signal current		6.2 mA/110 V 60 Hz 4.7 mA/100 V 50 Hz
Input sensitivity	**ON**	3.8 mA/80 V AC or more
	OFF	1.7 mA/30 V AC or less
Input response time		30 ms or less
Input signal type		Voltage contact
Input circuit insulation		Photo-coupler insulation
Input operation display		Turning on the input will light the LED indicator lamp.
Input circuit diagram		

5.4.2 Handling of 100 V AC Input

1. Input terminals

When voltage of 100 to 120 V AC is applied between the input terminal and COM terminal, the input terminal is turned on.
The input display LED lights.
Do not connect the COM terminal of an AC input extension blocks with the COM terminal of a DC system.



2. Input circuit

The primary input circuit and the secondary input circuit are insulated with a photocoupler.
Response delay of 30 ms or less is given for a change in the input ("ON → OFF" or "OFF → ON").

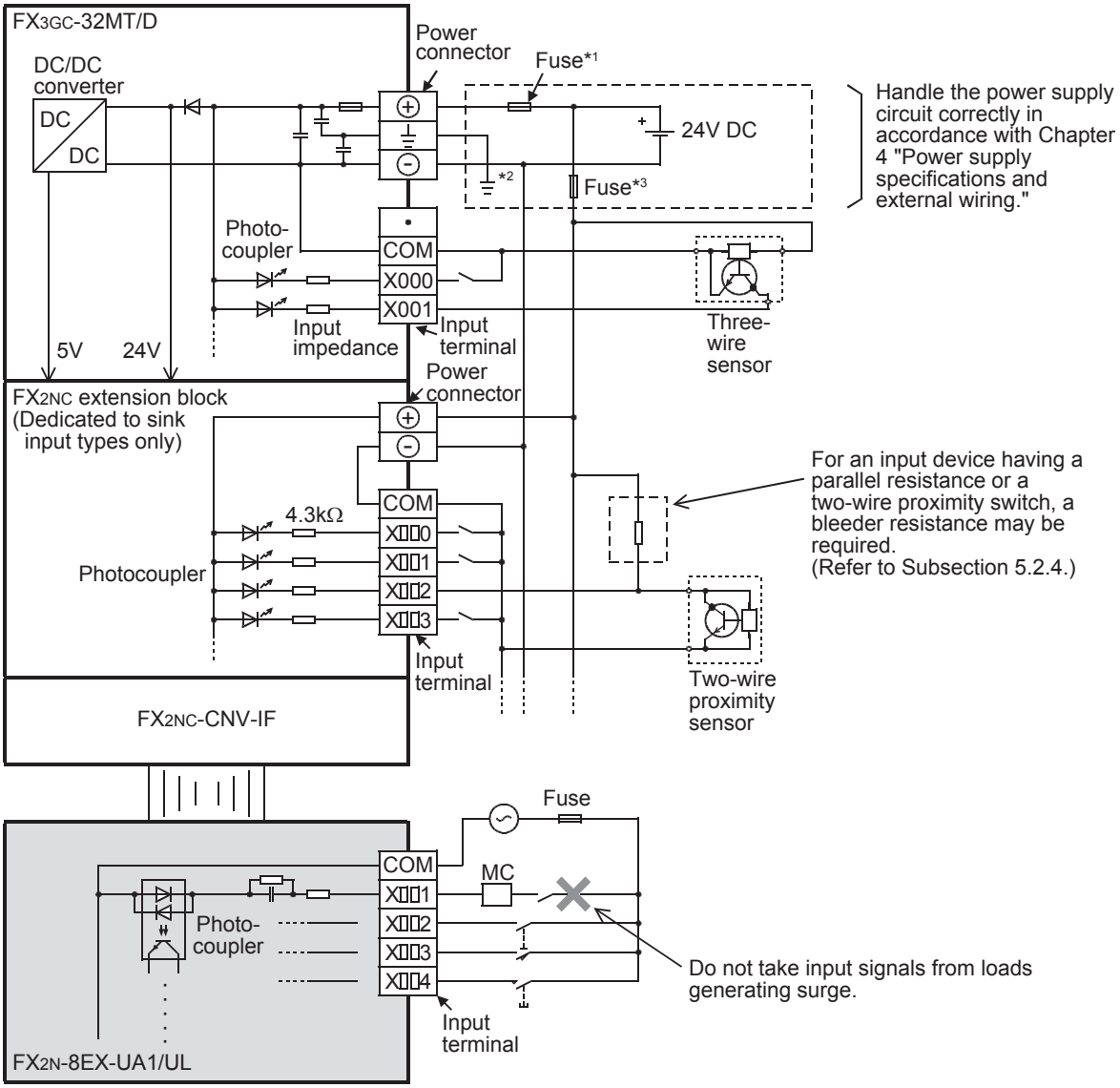
3. Input sensitivity

The input current and input sensitivity of these PLCs are shown in the following table.

Item		Specifications
Input signal voltage		100 to 110 V AC +10%, -15% 50/60 Hz
Input signal current		6.2 mA/110 V 60 Hz 4.7 mA/100 V 50 Hz
Input sensitivity	**ON**	3.8 mA/80 V AC
	OFF	1.7 mA/30 V AC

5.4.3 Example of external wiring

Do not bind or lay wires near the AC input wiring and DC input wiring.
Assure a distance of 100 mm (3.93") or more between the wires. Without wire separation, wires are easily affected by noise and power surges.



*1. A UL Listed or Recognized fuse rated not higher than 3.47 A must be used with FX3GC.

*2. Class D grounding
The grounding resistance should be 100 Ω or less.

*3. Use a fuse suitable for the system.

WIRING PRECAUTIONS **⚠CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

5.5 High-speed Counters (C235 to C255)

High-speed counters use input terminals X000 to X007 of the main unit for inputs, and offer counting up to 60kHz (1 phase).
Input terminals not used for high-speed counters are available for general-purpose inputs.

→ **For the input specifications for X000 to X007 of the main unit, refer to Section 5.2.**

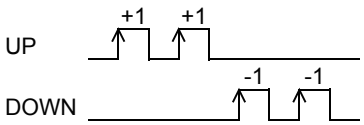
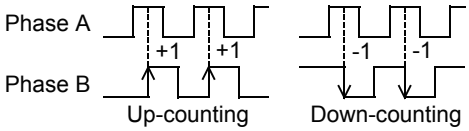
5.5.1 High-speed counter type and device number

1. High speed counter type

The main unit has built-in 32-bit high speed bi-directional counters (1-phase 1-count input, 1-phase 2-count input and 2-phase 2-count input). These high-speed counters are classified into hardware counters and software counters according to counting method.

2. High speed counter type and input signal form

The types and input signals (waveforms) of high-speed counters (1-phase 1-count input, 1-phase 2-count input and 2-phase 2-count input) are shown below.

Type of counter	Input signal form	Counting direction
1-phase 1-count input		Down-count or up-count is specified by turning on or off M8235 to M8245. ON: Down-counting OFF: Up-counting
1-phase 2-count input		Up-count or down-count The counting direction can be checked with M8246 to M8250. ON: Down-counting OFF: Up-counting
2-phase 2-count input		Automatic up-count or down-count according to change in input status of phase A/B The counting direction can be checked with M8251 to M8255. ON: Down-counting OFF: Up-counting

3. High-speed counter device notations

The input terminal assignments for FX3GC PLC high-speed counters can be switched when used in combination with a special auxiliary relay. This section classifies these high-speed counter devices under the following notations. Note that an "(OP)" input cannot be programmed.

Standard Device Numbers	Switched Device Numbers
C248	C248(OP)
C253	C253(OP)
C254	C254(OP)

4. Cautions in connecting mating device

Encoders with the output forms in the following table can be connected to the input terminals. (The encoders may not function correctly depending on electrical compatibility. Check the specifications in advance.)
Voltage output type encoders and absolute encoders cannot be connected to the high-speed counter input terminals.

→ **For wiring, refer to " 7.2 Rotary Encoder [High-speed Counters C235 to C255]".**
→ **For programming, refer to programming manual.**

Terminals for connecting	Output form that can be directly connected
Input terminals of main unit	Open collector transistor output form (applicable to 24 V DC)

5. The device list of the high speed counter

Counter type	Device No. (counter)	Response Frequency*1 (kHz)	Data length	External reset input terminal	External start input terminal
1-phase 1-count input	C235	60	32-bit bi-directional counter	None	None
	C236				
	C237	10			
	C238	60			
	C239				
	C240	10			
	C241	60		Provided	None
	C242	10			
	C243				
	C244			Provided	Provided
	C245				
1-phase 2-count input	C246 C248(OP)	60	32-bit bi-directional counter	None	None
	C247 C248	10		Provided	None
	C249 C250			Provided	Provided
2-phase 2-count input	C251 C253(OP)	30	32-bit bi-directional counter	None	None
	C254(OP)	5			
	C252 C253			Provided	None
	C254 C255			Provided	Provided

*1. When using multiple high-speed counters, make sure that the sum of used frequency does not exceed the overall frequency.

→ **For details on the overall frequency, refer to Subsection 5.5.5.**

5.5.2 Allocation of device numbers to input numbers

The high-speed counter numbers are allocated to the input terminals X000 to X007 as shown in the following table.
When high-speed counters are used, the filter constant of the corresponding input numbers automatically change (X000, X001, X003 and X004: 10 μs, X002, X005, X006 and X007: 50 μs).
The input terminals not allocated for high-speed counters can be used as general input terminals.

1. Allocation table

U: Up-count input D: Down-count input A: A-phase input B: B-phase input
R: External reset input S: External start input

Counter type	Counter No.	Input allocation							
		X000	X001	X002	X003	X004	X005	X006	X007
1-phase 1-count input	C235	U/D							
	C236		U/D						
	C237			U/D					
	C238				U/D				
	C239					U/D			
	C240						U/D		
	C241	U/D	R						
	C242			U/D	R				
	C243					U/D	R		
	C244	U/D	R					S	
	C245			U/D	R				S
1-phase 2-count input	C246	U	D						
	C247	U	D	R					
	C248				U	D	R		
	C248(OP)*1				U	D			
	C249	U	D	R				S	
	C250				U	D	R		S
2-phase 2-count input	C251	A	B						
	C252	A	B	R					
	C253				A	B	R		
	C253(OP)*1				A	B			
	C254	A	B	R				S	
	C254(OP)*1							A	B
	C255				A	B	R		S

*1. When a special auxiliary relay is driven in a program, the input terminals and their associated functions are switched.

→ **For the function switching method, refer to Subsection 5.5.7.**

2. Restriction of redundant use of input numbers

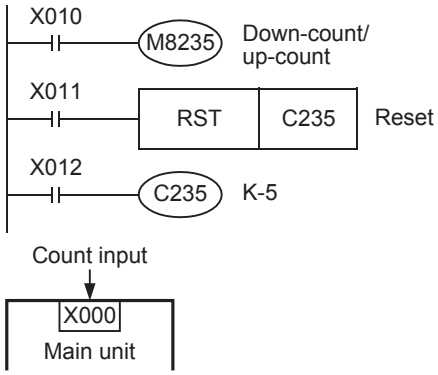
The input terminals X000 to X007 can be used for high-speed counters, input interruption, pulse catch, SPD, ZRN and DSZR instructions and general-purpose inputs. Take care not to overlap the input numbers.

5.5.3 Handling of High-speed Counters

1. 1-phase 1-count input

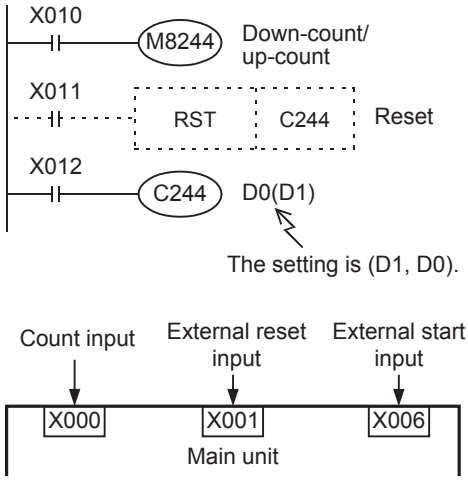
Examples of program

1) For C235



- C235 counts the number of times the input terminal X000 switches from OFF to ON while X012 is on.
- While X011 is on, the counter resets when RST instruction is executed.
- The counters C235 to C245 switch to the down-count or up-count mode by turning on or off M8235 to M8245.

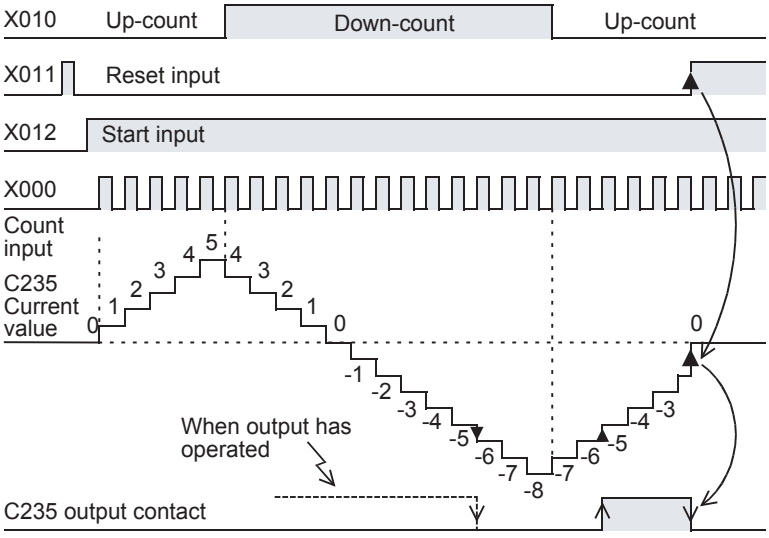
2) For C244



- C244 starts counting immediately when the input terminal X006 turns on while X012 is on. The count input terminal is X000. The setting for this example is the data of the indirectly designated data register (D1, D0).
- C244 can be reset by X011 on the sequence. For C244, X001 is allocated as the external reset input. The counter resets immediately when X001 turns on.
- The counters C235 to C245 switch to the down-count or up-count mode by turning on or off M8235 to M8245.

Example of operation

The above counter C235 operates as shown below.



C235 is set to the up-count or down-count mode through interruption by the count input X000.

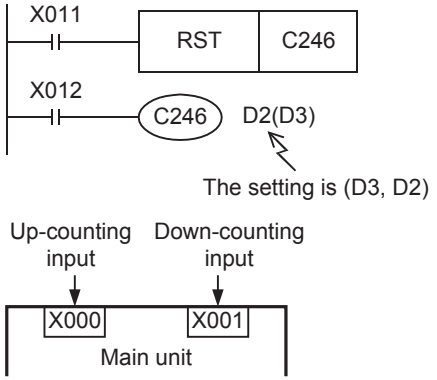
- When the current value increases from -6 to -5, the output contact is set, and when the value decreases from -5 to -6, it is reset.
- The current value increases and decreases regardless of the operation of the output contact. However, when the counter's value increments from 2,147,483,647, it changes to -2,147,483,648. In the same manner, when it decrements from -2,147,483,648, it changes to 2,147,483,647. (This type of counter is called a ring counter.)
- When RST instruction is executed after the reset input X011 turns on, the current counter's value resets to 0, and the output contact is restored.
- The current value, output contact operation and reset status of counters are backed up (kept) even if the power is turned off.

2. 1-phase 2-count input

These counters are 32-bit up-count/down-count binary counters.
The operations of the output contact according to the current value are the same as those of the above-mentioned 1-phase 1-count input high-speed counters.

Examples of program

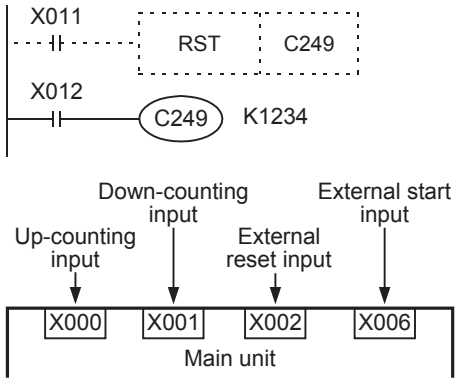
1) For C246



- While X012 is on, C246 increments the value when the input terminal X000 switches from OFF to ON and decrements the value when the input terminal X001 switches from OFF to ON.
- The down-count/up-count operations of C246 to C250 can be monitored through the ON/OFF operations of M8246 to M8250.

  ON : Down-counting
  OFF: Up-counting

2) For C249



- While X012 is on, C249 starts counting immediately when the input terminal X006 turns on.
  The up-counting input terminal is X000, and the down-counting input terminal is X001.
- C249 can be reset on the sequence by X011.
  For C249, X002 is allocated as reset input. When X002 turns on, C249 is immediately reset.
- The down-count/up-count operations of C246 to C250 can be monitored through the ON/OFF operations of M8246 to M8250.

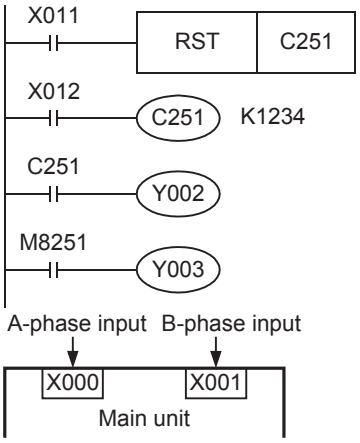
  ON : Down-counting
  OFF: Up-counting

3. 2-phase 2-count input

These counters are 32-bit up-count/down-count binary counters.
The operations of the output contact according to the current value are the same as those of the above-mentioned 1-phase 1-count input high-speed counters.

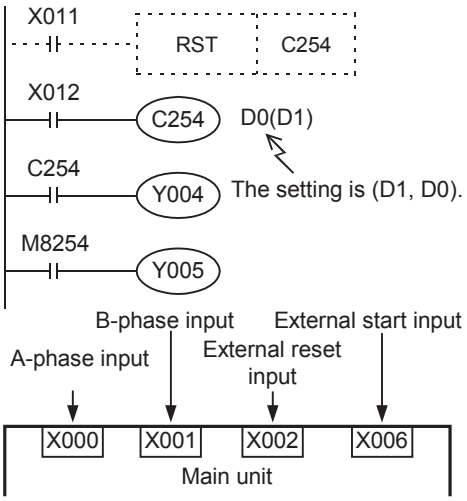
Examples of program

1) For C251



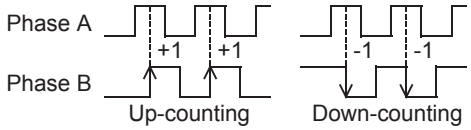
- While X012 is on, C251 counts the operation of the input terminals X000 (A-phase) and X001 (B-phase) through interruption.
- While X011 is turned on, the counter is reset when RST instruction is executed.
- When the current value exceeds the setting, Y002 turns on, and when the current value becomes lower than the setting, Y002 turns off.
- Y003 turns on (down-count) or off (up-count) according to the counting direction.

2) For C254



- C254 starts counting immediately when the input terminal X006 is turned on while X012 is on.
  The count input terminals are X000 (A-phase) and X001 (B-phase).
- C254 is reset by X011 on the sequence, and it is reset immediately when X002 is turned on.
- When the current value exceeds the setting (D1, D0), Y004 operates, and when the current value becomes lower than the setting, Y004 turns off.
- Y005 turns on (down-count) or off (up-count) according to the counting direction.

- A 2-phase encoder generates A-phase output and B-phase output between which there is a 90° phase difference. The high-speed counter automatically counts up or down according to the output as shown below.



- The down-count/up-count operations of C251 to C255 can be monitored through the ON/OFF operations of M8251 to M8255.
  ON : Down-counting
  OFF: Up-counting

5.5.4 Timing of updating of current value and comparison of current value

1. Timing of updating of current value

When pulses are input to an input terminal for a high-speed counter, the high-speed counter executes up-counting or down-counting. The current values of devices are updated when counting is input.

2. Comparison of current value

To compare and output the current value of a high-speed counter, the following two methods are available.

1) Use of comparison instruction (CMP), band comparison instruction (ZCP) or contact comparison instruction
Use the comparison instruction (CMP), band comparison instruction (ZCP) or contact comparison instruction if the comparison result is necessary at counting. Use these instructions only when high-speed processing is not required because these instructions are processed in the operation cycle of the PLC, and operation delay is generated before the comparison output result is obtained. Use the comparison instructions for high-speed counters (HSCS, HSCR and HSZ) described below if it is necessary to execute comparison and change the output contact (Y) at the same time when the current values of high-speed counters change.

2) Use of Comparison instruction for high-speed counters (HSCS/HSCR/HSZ instruction)
Comparison instructions for high-speed counters (HSCS, HSCR and HSZ instructions) perform comparison and output the comparison results with the relevant high-speed counting operation. These instructions have limitations on the number of simultaneously driven instructions as shown in the following table.
When the output relay (Y) has been designated for comparison results, the ON/OFF status of the output is affected directly until the END instruction output is refreshed.
When the PLC is a relay output type, a mechanical delay in operation (approx. 10 ms) is caused.
Therefore, it is best to use a transistor output type PLC.

Applied instruction	Limitation in number of instructions driven at same time
HSCS*1	6 instructions
HSCR*1	
HSZ*1	

*1. The overall frequency changes when the HSCS, HSCR or HSZ instruction is used.
→ **For details on the overall frequency, refer to Subsection 5.5.5.**

5.5.5 Response Frequency and Overall Frequency

1. Response frequency and overall frequency

When any of the following functions/instructions is used, the overall frequency is restricted without regard to the operand of the instruction.
Consider this restriction when examining the system or creating programs, and observe the specified overall frequency range.

- When two or more high speed counters are used.
- When the HSCS, HSCR, HSZ, PLSY, PLSR, DSZR, TBL, ZRN, PLSV, DRVI or DRVA instruction is used.
- When the pulse width/cycle measurement function is used.

Counter type		Response Frequency	Overall frequency determined by condition of used instruction	
			When HSCS, HSCR or HSZ instruction is not used	When HSCS, HSCR or HSZ instruction is used
1-phase 1-count input	C235, C236, C238, C239, C241	60 kHz	200 kHz - (Number of positioned axes*1 + Number of pulse width/cycle measurement inputs) x 40 kHz	60 kHz - (Number of positioned axes*1 x 5 kHz) - (Number of pulse width/cycle measurement inputs x 20 kHz)
	C237, C240, C242, C243, C244, C245	10 kHz		
1-phase 2-count input	C246, C248(OP)	60 kHz		
	C247, C248, C249, C250	10 kHz		
2-phase 2-count input	C251, C253(OP)	30 kHz		
	C252, C253, C254, C254(OP), C255	5 kHz		

*1. Number of axes used in the following positioning instructions:
PLSY(FNC 57), PLSR(FNC 59), DSZR(FNC150), TBL(FNC152), ZRN(FNC156), PLSV(FNC157), DRVI(FNC158), DRVA(FNC159)

2. Calculation of overall frequency

Obtain the overall frequency using the following expression:

Overall frequency ≥ [(Sum of used frequency of 1-phase counters) + (Sum of used frequency of 2-phase counters)]

3. Example of calculation

Example1:
When HSCS, HSCR or HSZ instruction is not used, and instructions related to positioning (DRVI instruction [Y000] and DRVA instruction [Y001]) are used

Overall frequency : 200 kHz - (2 axes x 40 kHz) = 120 kHz

<Counter No.>	<Contents of use>
C235(1-phase 1-count input):	50 kHz is input.
C236(1-phase 1-count input):	50 kHz is input.
C237(1-phase 1-count input):	10 kHz is input.
C253(2-phase 2-count input):	5 kHz is input.
Total	115 kHz ≤ 120 kHz (Overall frequency)

Example2:
When HSCS, HSCR or HSZ instruction is not used, and instructions related to positioning (DRVI instruction [Y000]) are used, Number of pulse width/cycle measurement inputs(X003)

Overall frequency : 200 kHz - [(1 axes + 1 input) x 40 kHz] = 120 kHz

<Counter No.>	<Contents of use>
C235(1-phase 1-counting):	50 kHz is input.
C236(1-phase 1-counting):	50 kHz is input.
Total	100 kHz ≤ 120 kHz (Overall frequency)

5.5.6 Related Devices (High-speed counter)

1. For switching 1-phase 1-count input counter mode to up-count or down-count

Counter type	Counter No.	Specifying device	Up-counting	Down-counting
1-phase 1-count input	C235	M8235	OFF	ON
	C236	M8236		
	C237	M8237		
	C238	M8238		
	C239	M8239		
	C240	M8240		
	C241	M8241		
	C242	M8242		
	C243	M8243		
	C244	M8244		
	C245	M8245		

2. For monitoring the up-count/down-count counting direction of 1-phase 2-count input and 2-phase 2-count input counters

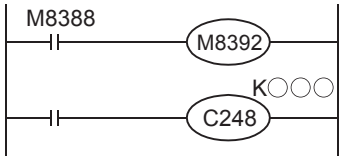
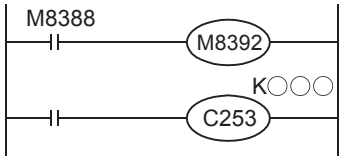
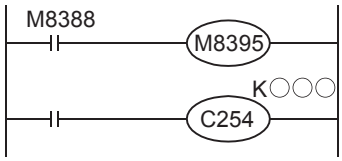
Counter type	Counter No.	Monitoring device	OFF	ON
1-phase 2-count input	C246	M8246	Up-counting	Down-counting
	C247	M8247		
	C248	M8248		
	C249	M8249		
	C250	M8250		
2-phase 2-count input	C251	M8251		
	C252	M8252		
	C253	M8253		
	C254	M8254		
	C255	M8255		

3. For switching high-speed counter function

Device No.	Name	Description	Reference
M8388	Contact for changing high-speed counter function	Changes the function of high-speed counter	-
M8392	Function switching devices	Switches the function of C248 and C253	Subsection 5.5.7
M8395	Function switching devices	Switches the function of C254	Subsection 5.5.7

5.5.7 [Function switching] Switching of allocation and functions of input terminals

When the counters C248, C253 and C254 are combined with the following special auxiliary relays, the allocation of the input terminals and functions are changed.
Program the special auxiliary relays just before the counters.

Counter No.	Function switching method	Details of change
C248(OP)		• Reset input is not given.
C253(OP)		• Reset input is not given.
C254(OP)		• The input count (2-phase 2-count) changes as follows Phase A : Changes from X000 to X006. Phase B : Changes from X001 to X007. • Reset input is not given. • Start input is not given.

5.5.8 Cautions on use

→ For programming details, refer to the Programming Manual.

- If the operation of a high-speed counter is triggered by a device such as a switch, the counter may malfunction due to extra noise from switch chattering or contact bounce.
- The input filter of an input terminal for a high-speed counter in the main unit is automatically set to 10 μs (X000, X001, X003, X004) or 50 μs (X002, X005, X006, X007).
  Accordingly, it is not necessary to use special data register D8020 (input filter adjustment).
  The input filter for input relays not being used for high-speed counters remains at 10 ms (initial value).
- The inputs X000 to X007 are used for high-speed counters, input interrupt, pulse catch, SPD/DSZR/ZRN instructions and general-purpose inputs. There should be no overlap between each input number.
- Make sure that the signal speed for high-speed counters does not exceed the response frequency described above. If an input signal exceeds the response frequency, a WDT error may occur, or the communication functions such as a parallel link may malfunction.
- The response frequency changes depending on the number of used counters, but the input filter value is fixed to 10 μs (X000, X001, X003, X004) or 50 μs (X002, X005, X006, X007).
  Note that noise above the response frequency may be counted depending on the filter value of the used input.

5.6 Input Interruption (I00□ to I50□)

The PLC (main unit) is provided with an input interruption function and has six interruption input points.
Make sure that the ON duration or OFF duration of interruption input signals is 10 μs or more (X000, X001, X003 and X004) or 50 μs or more (X002 and X005).

→ **For details on programming, refer to the programming manual.**
→ **For the wiring, refer to Section 7.3.**

5.6.1 Allocation of pointers to input numbers (input signal ON/OFF duration)

Input number	Interrupt pointer		Interrupt disable control	ON or OFF duration of input signal
	Interruption on leading edge	Interruption on trailing edge		
X000	I001	I000	M8050	10 μs or more
X001	I101	I100	M8051	
X002	I201	I200	M8052	50 μs or more
X003	I301	I300	M8053	10 μs or more
X004	I401	I400	M8054	
X005	I501	I500	M8055	50 μs or more

5.6.2 Cautions for input interruption

1. Non-overlap of input numbers

The input terminals X000 to X005 can be used for high-speed counter, input interruption, pulse catch, SPD, ZRN and DSZR instructions and general-purpose inputs.
Take care not to overlap the input numbers.

2. Cautions in wiring

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

5.7 Pulse Catch (M8170 to M8175)

The PLC (main unit) is provided with a pulse catch function and has 6 pulse catch input points.

→ **For details on programming, refer to the programming manual.**
→ **For the wiring, refer to Section 7.3.**

5.7.1 Allocation of special memories to input numbers (ON duration of input signals)

Input number	Contact on sequence program	ON duration of input signal
X000	M8170	10 μs or more
X001	M8171	
X002	M8172	50 μs or more
X003	M8173	10 μs or more
X004	M8174	
X005	M8175	50 μs or more

5.7.2 Cautions for pulse catch

1. **Non-overlap of input numbers**
   The input terminals X000 to X005 can be used for high-speed counter, input interruption, pulse catch, speed detection (SPD) instructions and general-purpose input.
   Take care not to overlap the input numbers.

2. **Cautions in wiring**
   Use shielded twisted-pair cables for connecting cables. Ground the shield of each shielded cable only on the PLC side.

5.8 Pulse width/Pulse period measurement function

Four input points in the PLC (main unit) can be used for the pulse width/period measurement function which enables measurement of the pulse width or pulse frequency in units of 10 μs.

→ **For details on programming, refer to the programming manual.**
→ **For the wiring, refer to Section 7.3.**

5.8.1 Allocation of special memories to input numbers

Input number	Pulse width/ Pulse period measurement flag	Pulse period measurement mode	Ring counter value for rising edge*1 [in units of 1/6μs]	Ring counter value for falling edge*1 [in units of 1/6μs]	Pulse width/ Pulse period*1*2 (in units of 10μs)
X000	M8076	M8080	D8075, D8074	D8077, D8076	D8079, D8078
X001	M8077	M8081	D8081, D8080	D8083, D8082	D8085, D8084
X003	M8078	M8082	D8087, D8086	D8089, D8088	D8091, D8090
X004	M8079	M8083	D8093, D8092	D8095, D8094	D8097, D8096

*1. Cleared when PLC switches from STOP to RUN.

*2. The pulse width which can be measured is a minimum of 10 μs and a maximum of 100 s.
The pulse period which can be measured is a minimum of 20 μs and a maximum of 100 s.

5.8.2 Cautions for pulse width/period measurement function

1. **Non-overlap of input numbers**
The input terminals X000, X001, X003 and X004 can be used for high-speed counter, input interruption, pulse catch, speed detection (SPD) instructions and general-purpose input.
Take care not to overlap the input numbers.
However, overlap of input numbers is allowed for input interruptions.

2. **When the pulse width/period measurement function and high-speed counters are used together, the overall frequency of high-speed counters is affected.**
→ **For more details, refer to Subsection 5.5.5.**

3. **Make sure that the total frequency of four input channels is 50 kHz or less when using the pulse width/period measurement function.**
→ **For details on programming, refer to the programming manual.**

4. **Cautions in wiring**
Use shielded twisted-pair cables for connecting cables. Ground the shield of each shielded cable only on the PLC side.

6. Output Specifications and External Wiring

DESIGN PRECAUTIONS ⚠ **WARNING**

- Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure.
  Otherwise, malfunctions may cause serious accidents.
  1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
  2) Note that when the PLC CPU 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 PLC CPU occurs in an input/output control block, output control may be disabled.
     External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.
     For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.

DESIGN PRECAUTIONS ⚠ **CAUTION**

- Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line.
  Noise may cause malfunctions.
- Install the product so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.
  Failure to do so may result in wire damage/breakage or PLC failure.

SECURITY PRECAUTIONS ⚠ **WARNING**

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

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, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.
  Failure to do so may cause electric shock.

WIRING PRECAUTIONS ⚠ **CAUTION**

- Connect the DC 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 damage the product.
- Perform class D grounding (grounding resistance: 100 Ω or less) to the grounding terminal on the main unit.
  Do not use common grounding with heavy electrical systems.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to properly wire the FX2N/FX3U Series extension equipment 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
- Make sure to properly wire to 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.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire 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.
- Make sure to properly wire to the FX Series terminal blocks 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

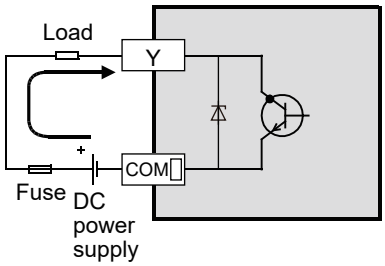
6.1 Transistor Output

6.1.1 Sink and Source Output (Transistor)

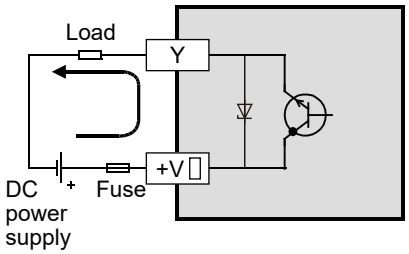
Transistor outputs in the main unit and FX2N/FX2NC Series I/O extension blocks are classified into sink output type or source output type.

1. 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.



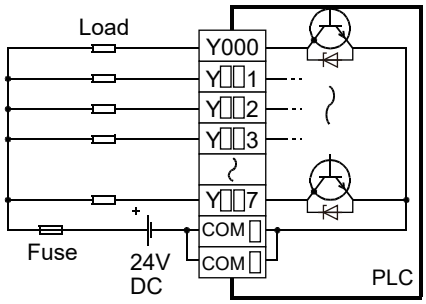
6.1.2 Transistor Output Specifications (Sink output type)

The table below shows the output specifications of the FX3GC-32MT/D, FX2N/FX2NC output extension blocks (sink output type).
Outputs in the main unit are restricted by the simultaneous ON ratio.

→ **For the restriction in simultaneous ON ratio, refer to Subsection 6.1.4.**

Item				Transistor output (sink) specifications	
Number of output points		FX3GC-32MT/D		16 points	
		FX2N-8EYT(-H)		8 points	
		FX2N-16EYT(-C), FX2NC-16EYT		16 points	
		FX2NC-32EYT		32 points	
Connecting type		FX3GC-32MT/D FX2NC-16EYT, FX2NC-32EYT FX2N-16EYT-C		Connector	
		FX2N-8EYT(-H), FX2N-16EYT		Terminal block	
Output type/form				Transistor/Sink output	
External power supply				5-30 V DC	
Max. load	Resistance load	Main unit	Y000, Y001	0.3 A/1 point	Make sure that the total load current of 8 resistance load points is 0.8 A*1 or less.
			Y002 to Y017	0.1 A/1 point	
		FX2NC-16EYT FX2NC-32EYT		0.1 A/1 point	Make sure that the total load current of 8 resistance load points is 0.8 A or less.
		FX2N-16EYT-C		0.3 A/1 point	Make sure that the total load current of 16 resistance load points is 1.6 A or less.
		FX2N-8EYT FX2N-16EYT		0.5 A/1 point	The total load current of resistance loads per common terminal should be the following value. 4points/common: 0.8 A 8points/common: 1.6 A
		FX2N-8EYT-H		1 A/1 point	Make sure that the total load current of 4 resistance load points is 2 A or less.
	Inductive load	Main unit	Y000, Y001	7.2 W/1 point (24 V DC)	Make sure that the total load of 16 inductive load points is 38.4 W/24 V DC or less.
			Y002 to Y017	2.4 W/1 point (24 V DC)	
		FX2NC-16EYT, FX2NC-32EYT		2.4 W/1 point (24 V DC)	
		FX2N-16EYT-C		7.2 W/1 point (24 V DC)	
		FX2N-8EYT, FX2N-16EYT		12 W/1 point (24 V DC)	
		FX2N-8EYT-H		24 W/1 point (24 V DC)	
Open circuit leakage current				0.1 mA or less/30 V DC	
ON voltage				1.5 V or less	

*1. When the two COM1 terminals are connected outside the PLC, resistance load is 1.6 A or less.

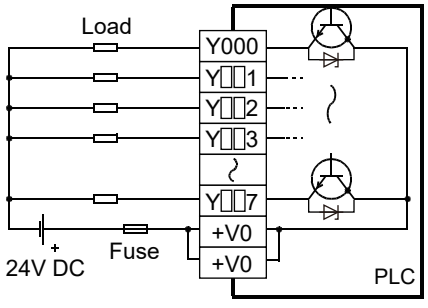
Item				Transistor output (sink) specifications
Response time	**OFF → ON**	**Main unit**	**Y000, Y001**	5 μs or less/10 mA or more (5-24 V DC)
			Y002 to Y017	0.2 ms or less/100 mA (24 V DC)
		Extension block	**For FX2NC Series**	0.2 ms or less/100 mA
			For FX2N Series[*1]	0.2 ms or less/200 mA
	ON → OFF	**Main unit**	**Y000, Y001**	5 μs or less/10 mA or more (5-24 V DC)
			Y002 to Y017	0.2 ms or less/100 mA (24 V DC)
		Extension block	**For FX2NC Series**	0.2 ms or less/100 mA
			For FX2N Series[*1]	0.2 ms or less/200 mA
Output circuit insulation				Photocoupler insulation
Output operation display				LED on panel lights when photocoupler is driven.
Output circuit configuration				

*1. The response time is as follows in the FX2N-8EYT-H.
OFF → ON: 0.2 ms or less/1 A
ON → OFF: 0.4 ms or less/1 A

6.1.3 Transistor Output Specifications (Source output type)

The table below shows the output specifications of the FX3GC-32MT/DSS, FX2N/FX2NC output extension blocks (source output type).
Outputs in the main unit are restricted by the simultaneous ON ratio.

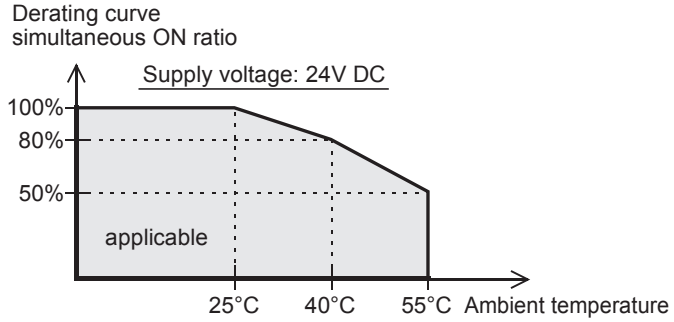
→ **For the restriction in simultaneous ON ratio, refer to Subsection 6.2.3.**

Item				Transistor output (source) specifications	
Number of output points		**FX3GC-32MT/DSS**		16 points	
		FX2N-8EYT-ESS/UL		8 points	
		FX2N-16EYT-ESS/UL **FX2NC-16EYT-DSS**		16 points	
		FX2NC-32EYT-DSS		32 points	
Connecting type		**FX3GC-32MT/DSS** **FX2NC-16EYT-DSS, FX2NC-32EYT-DSS**		Connector	
		FX2N-8EYT-ESS/UL, FX2N-16EYT-ESS/UL		Terminal block	
Output type/form				Transistor/Source output	
External power supply				5-30 V DC	
Max. load	**Resistance load**	**Main unit**	**Y000, Y001**	0.3 A/1 point	Make sure that the total load current of 8 resistance load points is 0.8A*1 or less.
			Y002 to Y017	0.1 A/1 point	
		FX2NC-16EYT-DSS **FX2NC-32EYT-DSS**		0.1 A/1 point	Make sure that the total load current of 8 resistance load points is 0.8A or less.
		FX2N-8EYT-ESS/UL **FX2N-16EYT-ESS/UL**		0.5 A/1 point	The total load current of resistance loads per common terminal should be the following value. 4points/common: 0.8 A 8points/common: 1.6 A
	Inductive load	**Main unit**	**Y000, Y001**	7.2 W/1 point (24 V DC)	Make sure that the total load of 16 inductive load points is 38.4 W/24 V DC or less.
			Y002 to Y017	2.4 W/1 point (24 V DC)	
		FX2NC-16EYT-DSS, FX2NC-32EYT-DSS		2.4 W/1 point (24 V DC)	
		FX2N-8EYT-ESS/UL, FX2N-16EYT-ESS/UL		12 W/1 point (24 V DC)	
Open circuit leakage current				0.1 mA or less/30 V DC	
ON voltage				1.5 V or less	
Response time	**OFF → ON**	**Main unit**	**Y000, Y001**	5 μs or less/10 mA or more (5-24 V DC)	
			Y002 to Y017	0.2 ms or less/100 mA (24 V DC)	
		Extension blocks	**For FX2NC Series**	0.2 ms or less/100 mA	
			For FX2N Series	0.2 ms or less/200 mA	
	ON → OFF	**Main unit**	**Y000, Y001**	5 μs or less/10 mA or more (5-24 V DC)	
			Y002 to Y017	0.2 ms or less/100 mA (24 V DC)	
		Extension blocks	**For FX2NC Series**	0.2 ms or less/100 mA	
			For FX2N Series	0.2 ms or less/200 mA	
Output circuit insulation				Photocoupler insulation	
Output operation display				LED on panel lights when photocoupler is driven.	
Output circuit configuration					

*1. When the two +V0 terminals are connected outside the PLC, resistance load is 1.6 A or less.

6.1.4 Output Derating Curve

When extension blocks are connected, the derating curve below shows the simultaneous ON ratio of all available PLC outputs with respect to the ambient temperature. Use the PLC within the simultaneous output ON ratio range shown in the figure.



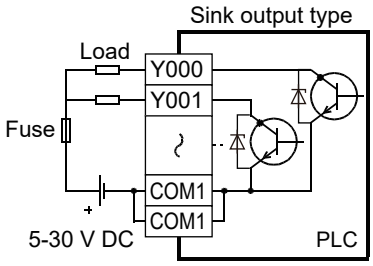
6.1.5 Handling of transistor output

1. Output terminals

4, 8, 16 or 32 transistor output points are covered by one common terminal.

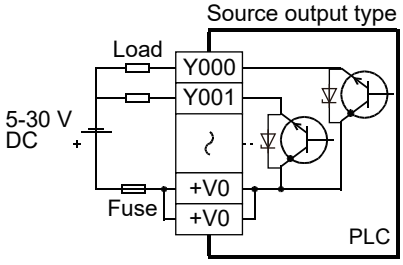
Sink output

Two COM☐ terminals connected each other inside the PLC are provided for sink outputs in the main unit, transistor output type extension blocks for FX2NC and FX2N-16EYT-C. For external wiring, connect two COM☐ terminals outside the PLC so that the load applied on each COM☐ terminal becomes smaller.



Source output

Two +V☐ terminals (connected to each other inside the PLC) are provided for sink outputs in the main unit, transistor output type extension blocks (source type) for the FX2NC. For external wiring, connect two +V☐ terminals outside the PLC so that the load applied on each +V☐ terminal becomes smaller.



2. External power supply

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

3. 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.

4. Display of operation

Operation indicator LEDs are built into the main unit and output extension blocks, and turn ON when photocouplers are actuated.

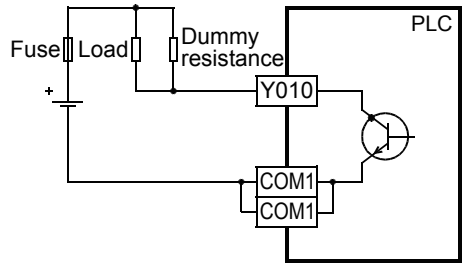
5. Response time

The time from when the PLC drives (or shuts down) the photocoupler until the transistor is turned on (or off) is shown in the following table.

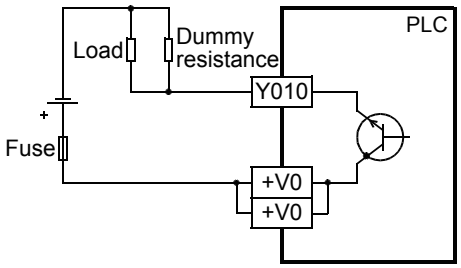
Classification		Response time	Load current	
Main units	Y000, Y001	5 μs or less	5-24 V DC 10 mA or more	When using an instruction related to pulse train output or positioning, make sure to set the load current to 10 to 100 mA (5-24 V DC).
	Y002 to Y017	0.2 ms or less	24 V DC 100 mA*1	
Extension blocks	For FX2NC Series	0.2 ms or less	24 V DC 100 mA *1	
	For FX2N Series		24 V DC 200 mA *1	

*1. 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



6. Output current

The ON voltage of the output transistor is approx. 1.5 V.
When driving a semiconductor element, carefully check the input voltage characteristics of the applied element.

Model		Output current	Limitation
Main units	Y000, Y001	0.3 A/1 point*1	Make sure that the total load current of 8 resistance load points is 0.8 A*2 or less so that temperature rise is restrained.
	Y002 to Y017	0.1 A/1 point	
Extension blocks	FX2NC-16EYT(-DSS) FX2NC-32EYT(-DSS)	0.1 A/1 point	Make sure that the total load current of 8 resistance load points is 0.8 A or less.
	FX2N-16EYT-C	0.3 A/1 point	Make sure that the total load current of 16 resistance load points is 1.6 A or less.
	FX2N-8EYT(-ESS/UL) FX2N-16EYT(-ESS/UL)	0.5 A/1 point	The total load current of resistance loads per common terminal should be the following value. 4points/common: 0.8 A 8points/common: 1.6 A
	FX2N-8EYT-H	1 A/1 point	Make sure that the total load current of 4 resistance load points is 2 A or less.

*1. When using an instruction related to pulse train output or positioning, make sure to set the load current to 10 to 100 mA (5-24 V DC).

*2. When the two COM1(+V0) terminals are connected outside the PLC, resistance load is 1.6 A or less.

7. Open circuit leakage current

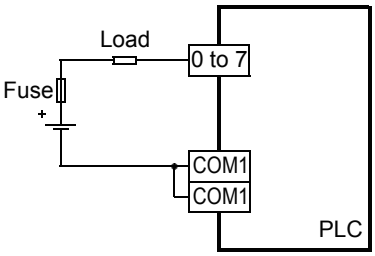
0.1 mA or less

6.1.6 External wiring precautions

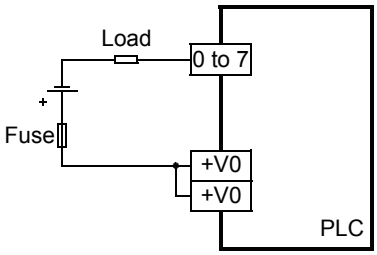
1. Protection circuit for load short-circuits

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.
Use a load power supply capacity that is at least 2 times larger than the total rated fuse capacity.

- External Wiring of Sink Output Type



- External Wiring of Source Output Type

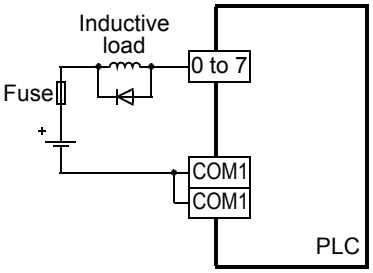


2. Contact protection circuit for inductive loads

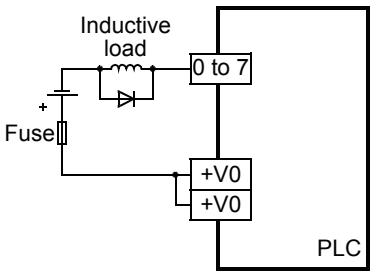
When an inductive load is connected, connect a diode (for commutation) in parallel with the load as necessary.
The diode (for commutation) must comply with the following specifications.

Reverse voltage	5 to 10 times of the load voltage
Forward current	Load current or more

- External Wiring of Sink Output Type



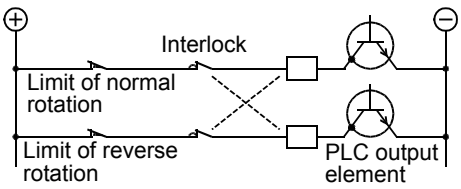
- External Wiring of Source Output Type



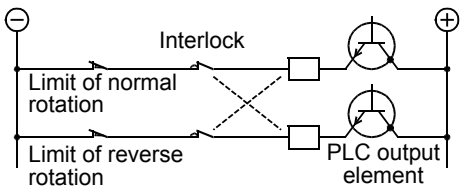
3. Interlock

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 the PLC's internal programs, as shown to the following figure.

- External Wiring of Sink Output Type

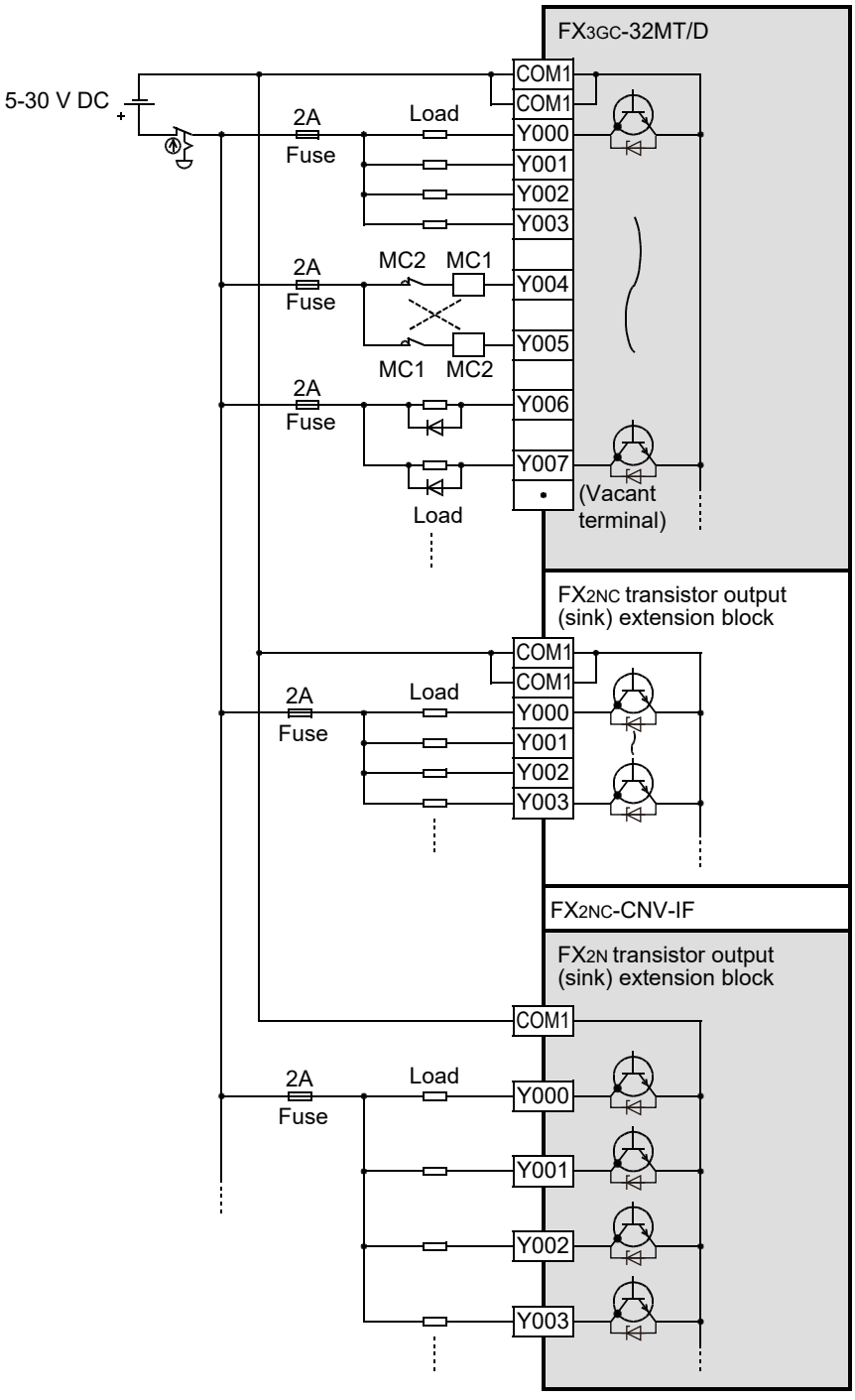


- External Wiring of Source Output Type



6.1.7 Example of external wiring

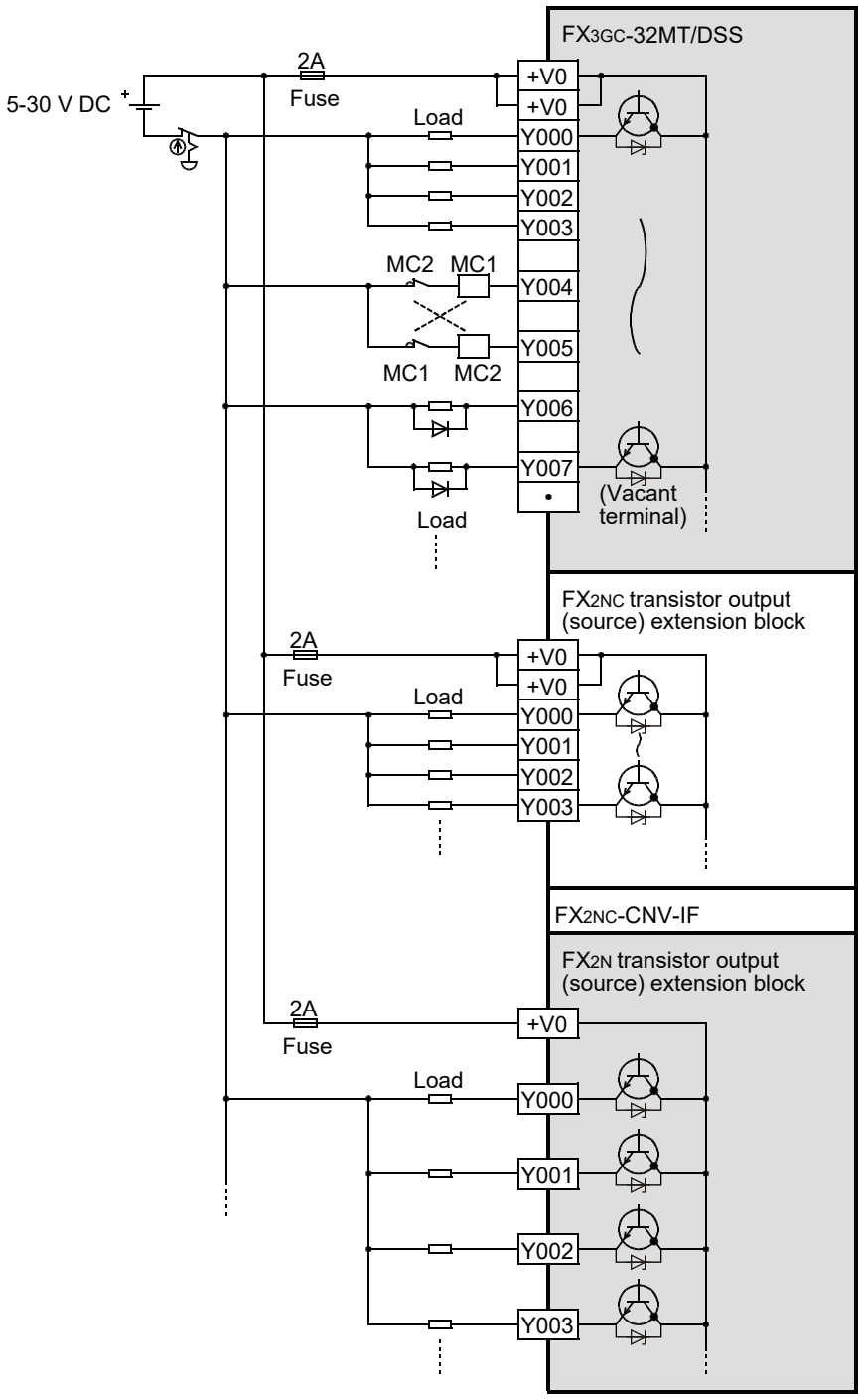
1. Transistor output (Sink)



WIRING PRECAUTIONS ⚠CAUTION

- Do not wire vacant terminals externally.
  Doing so may damage the product.

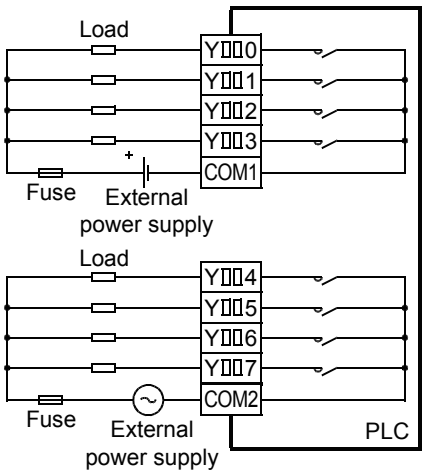
2. Transistor output (Source)



WIRING PRECAUTIONS	**⚠CAUTION**
• Do not wire vacant terminals externally. Doing so may damage the product.	

6.2 Relay Output

6.2.1 Relay output specifications

Item			Relay output specification	
Number of output points		FX2NC-16EYR-T(-DS)	16 points	
		FX2N-8ER(-ES/UL)	4 points	
		FX2N-8EYR(-ES/UL) FX2N-8EYR-S-ES/UL	8 points	
		FX2N-16EYR(-ES/UL)	16 points	
Connecting type		FX2NC-16EYR-T(-DS) FX2N-8ER(-ES/UL) FX2N-8EYR(-ES/UL) FX2N-8EYR-S-ES/UL FX2N-16EYR(-ES/UL)	Terminal block	
Output type			Relay output	
External power supply			30 V DC or less or 240 V AC or less (250 V AC or less when the unit does not comply with CE, UL or cUL standards)	
Max.load	Resistance load	FX2NC-16EYR-T (-DS)	2 A/1 point	When using one COM□ terminal, make sure that the total load current of 8 resistance load points is 4 A or less. When connecting two COM□ terminals outside the PLC, make sure that the total load current of 8 resistance load points is 8A or less.
		FX2N-8ER(-ES/UL) FX2N-8EYR(-ES/UL) FX2N-8EYR-S-ES/UL FX2N-16EYR(-ES/UL)	2 A/1 point	The total resistance load current per common should be as follows: 4 output points/common: 8A or less 8 output points/common: 8A or less
	Inductive load	FX2NC-16EYR-T(-DS) FX2N-8ER(-ES/UL) FX2N-8EYR(-ES/UL) FX2N-8EYR-S-ES/UL FX2N-16EYR(-ES/UL)	80 VA	For the product life, refer to Subsection 6.2.2. For cautions on external wiring, refer to Subsection 6.2.4.
Minimum load			5 V DC, 2 mA (reference values)	
Open circuit leakage current			-	
Response time		OFF → ON	Approx. 10 ms	
		ON → OFF	Approx. 10 ms	
Output circuit insulation			Mechanical insulation	
Output operation display			Supplying power to the relay coil will light the LED indicator lamp on panel.	
Output circuit diagram				

6.2.2 Product life of relay contacts

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

1. Inductive load

Inductive loads generate large reverse electromotive force between contacts at shutdown, which may cause arcing. At a fixed current consumption, as the power factor (phase between current and voltage) gets smaller, the arc energy gets larger.

The standard life of contacts used for Inductive loads, such as contactors and solenoid valves, is 500,000 operations at 20 VA.
The following table shows the approximate life of a relay based on the results of an operation life test.

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

Load capacity		Contact life
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	

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

→ **For precautions on using inductive loads, refer to Subsection 6.2.4-2.**

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.

2. 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.

3. Capacitive load

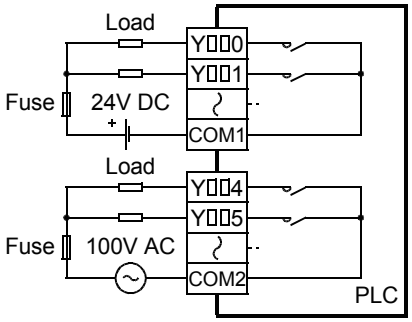
Capacitive loads can generate rush current 20 to 40 times the stationary current. Make sure that the rush current does not exceed the current corresponding to the maximum specified resistance load. Capacitive loads such as capacitors may be present in electronic circuit loads including inverters.

→ **For the maximum specified resistance load, refer to Subsection 6.2.1.**

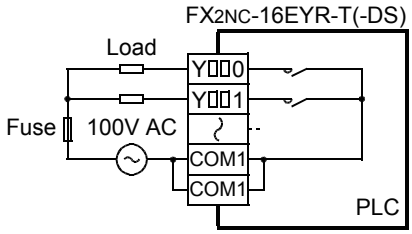
6.2.3 Handling of relay output

1. Output terminal

One common terminal is used for 1, 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).



The FX2NC-16EYR-T(-DS) has two COM terminals per 8 output points. Connect two COM terminals outside the PLC so that the load applied on each COM terminal becomes smaller.



2. 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 unit does not comply with CE, UL or cUL standards) for loads.

3. Circuit insulation

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.

4. Display of operation

When power is applied to the output relay coil, the LED is lit, and the output contact is turned on.

5. 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. 10ms.

6. Output current

At a circuit voltage of 240 V AC or less (250 V AC or less when the unit does not comply with CE, UL or cUL standards), a resistance load of 2A 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 Subsection 6.2.2.**

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

DC circuit	Diode (for commutation)
AC circuit	Surge absorber

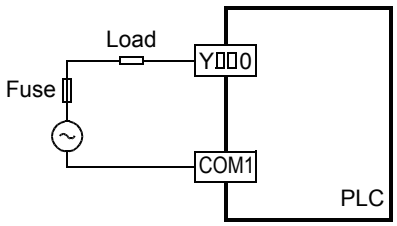
7. Open circuit leakage current

Because there is no leakage current even while output contacts are OFF, the neon ball, etc. can be driven directly.

6.2.4 External wiring precautions

1. Protection circuit for load short-circuiting

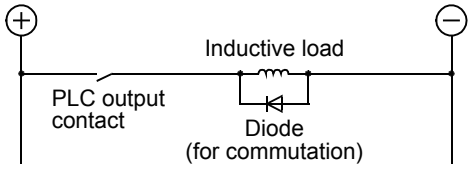
A short-circuit at a load connected to an output terminal could cause burnout at the output element or the PCB. To prevent this, a protection fuse should be inserted at the output.



2. Contact protection circuit for inductive loads

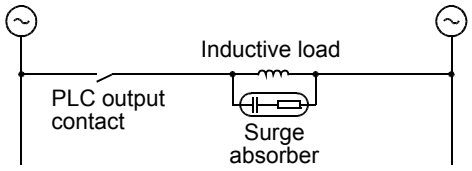
An internal protection circuit for the relays is not provided for the relay output circuit. It is recommended to use inductive loads with built-in protection circuits. When using loads without built-in protection circuits, insert an external contact protection circuit, etc. to reduce noise and extend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

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



Item	Guide
Reverse voltage	5 to 10 times the load voltage
Forward current	Load current or more

2) AC circuit
Connect the surge absorber (combined CR components such as a surge killer and spark killer, etc.) parallel to the load.
Select the rated voltage of a surge absorber that is suitable for the load being used. Refer to the table below for other specifications.



Item	Guide
Electrostatic capacity	Approx. 0.1 μF
Resistance value	Approx. 100 to 200 Ω

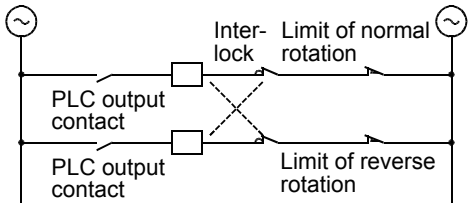
Reference

Manufacturer	Model name
Okaya Electric Industries Co., Ltd.	CR-10201

Manufacturer	Model name
Rubycon Corporation	250MCRA104100M B0325

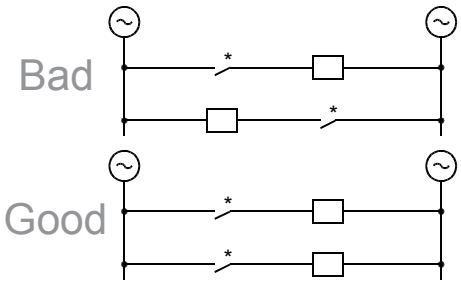
3. Interlock

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 the PLC's internal programs as shown to the right.

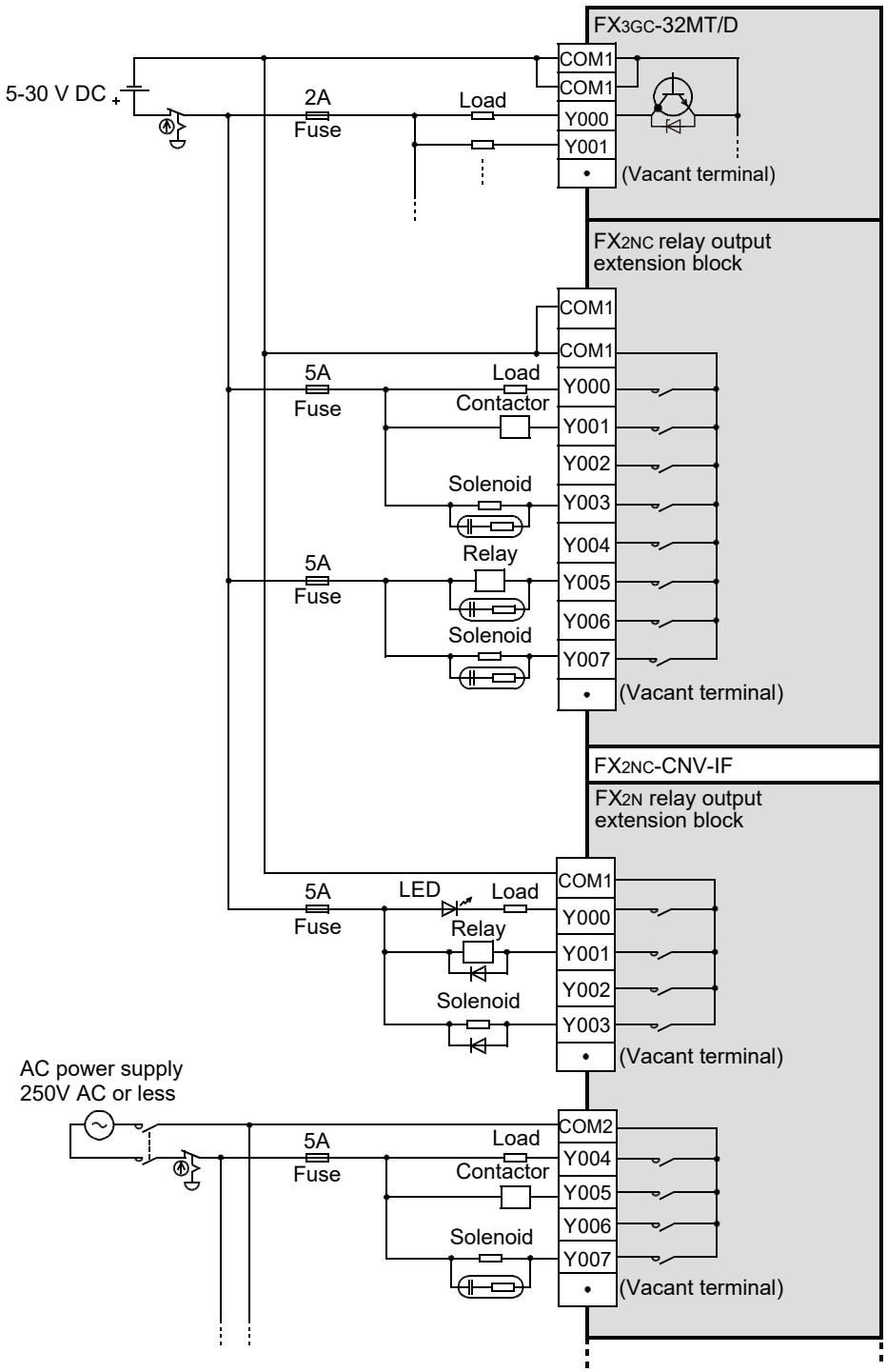


4. In-phase

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



6.2.5 Example of external wiring

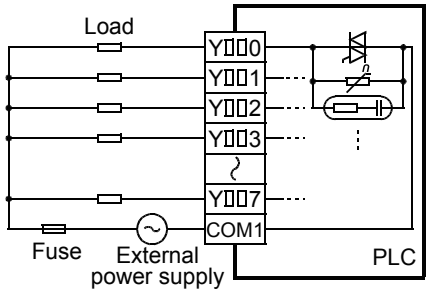


WIRING PRECAUTIONS ⚠CAUTION

- Do not wire vacant terminals externally.
  Doing so may damage the product.

6.3 Triac (SSR) Output [FX2N-16EYS]

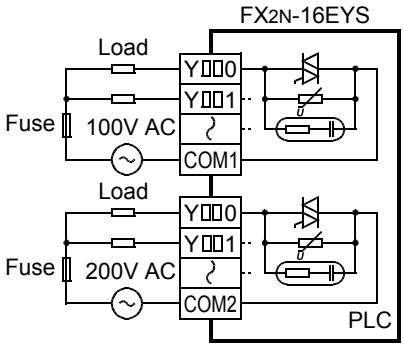
6.3.1 Specifications

Item		Triac output specification	
Number of output points		16 points	
Connecting type		Terminal block	
External power supply		85 to 242 V AC	
Output type		Triac output (SSR)	
Max.load	**Resistance load**	0.3 A/point	The total load current per common should be as follows: 8 output points/common: 0.8 A or less
	Inductive load	15 VA/100 V AC 36 VA/200 V AC	
Minimum load		0.4 VA/100 V AC 1.6 VA/200 V AC	
Open circuit leakage current		1 mA/100 V AC 2 mA/200 V AC	
Response time	**OFF → ON**	1 ms or less	
	ON → OFF	10 ms or less	
Output circuit insulation		Photo-thyristor insulation	
Output operation display		LED on panel lights when photo-thyristor is driven.	
Output circuit diagram			

6.3.2 Handling of triac output

1. Output terminals

On the triac output type blocks, one common terminal is used for 8 points.
Therefore, the common terminal blocks can drive loads of different circuit voltage systems (for example, 100 V AC and 200 V AC).



2. Circuit insulation

The PLC internal circuit and the output element (triac) are insulated with a photo-thyristor.
The common terminal blocks are separate from one another.

3. Display of operation

When the photo-thyristor is driven, the LED is lit, and the output triac is turned on.

4. Response time

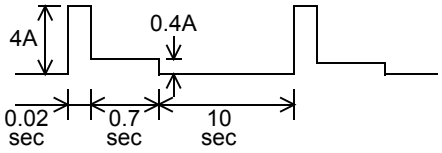
The time from when the photo-thyristor is driven or shut down until the output triac is turned on and until it is turned off is 1ms or less and 10 ms or less, respectively.

5. Output current

The max current per output point is 0.3 A. However, to restrict temperature rise, the max current per one output from four points should be 0.8 A (average per point is 0.2 A).
When a load with high rush current is turned on and off frequently, the root-mean-square current should be 0.2 A or less.

<Example>

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



6. Open circuit leakage current

A C-R absorber is connected for turn-off in parallel with the triac output terminal of this type of PLC. Therefore, when the circuit opens, a leakage current will be 1 mA at 100 V AC and 2 mA at 200 V AC.

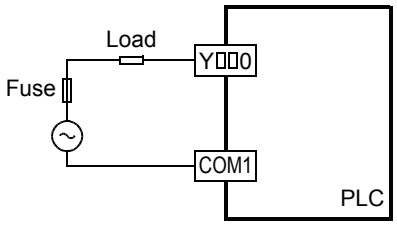
Since the triac output type devices leak current when the circuits are open, small-size relays and micro current loads having low rated operating current may keep operating even when the triac output is turned off. Therefore, use a load of 0.4 VA or more at 100 V AC or 1.6 VA or more at 200 V AC. If the load is less than this value, connect a surge absorber as stated below in parallel with the load.

→ **For the connection of the surge absorber, refer to Subsection 6.3.3.**

6.3.3 External wiring precautions

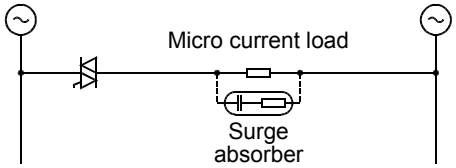
1. Protection circuit for load short-circuits

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.



2. Micro current load

The PLC's internal Triac output circuit is equipped with a turn-off C-R absorber. When connecting a very low current load of "0.4 VA/100 V AC or less, or 1.6 VA/200 V AC or less", please connect a surge absorber parallel to the load.
Select the rated voltage of a surge absorber that is suitable for the load being used. Refer to the table below for other specifications.



Item	Standard
Static electricity capacity	Approx. 0.1 μF
Resistance value	Approx. 100 to 200 Ω

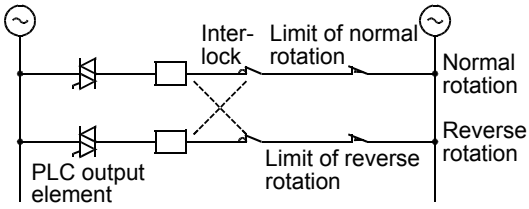
Reference

Manufacturer	Model name
Okaya Electric Industries Co., Ltd.	CR-10201

Manufacturer	Model name
Rubycon Corporation	250MCRA104100M B0325

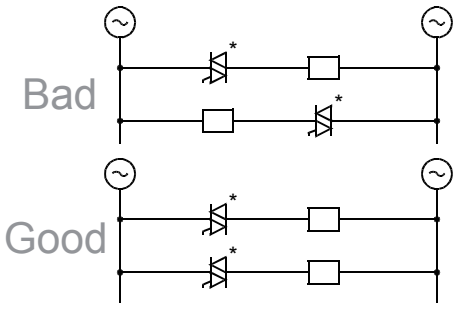
3. Interlock

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 the PLC's internal programs as shown to the right.

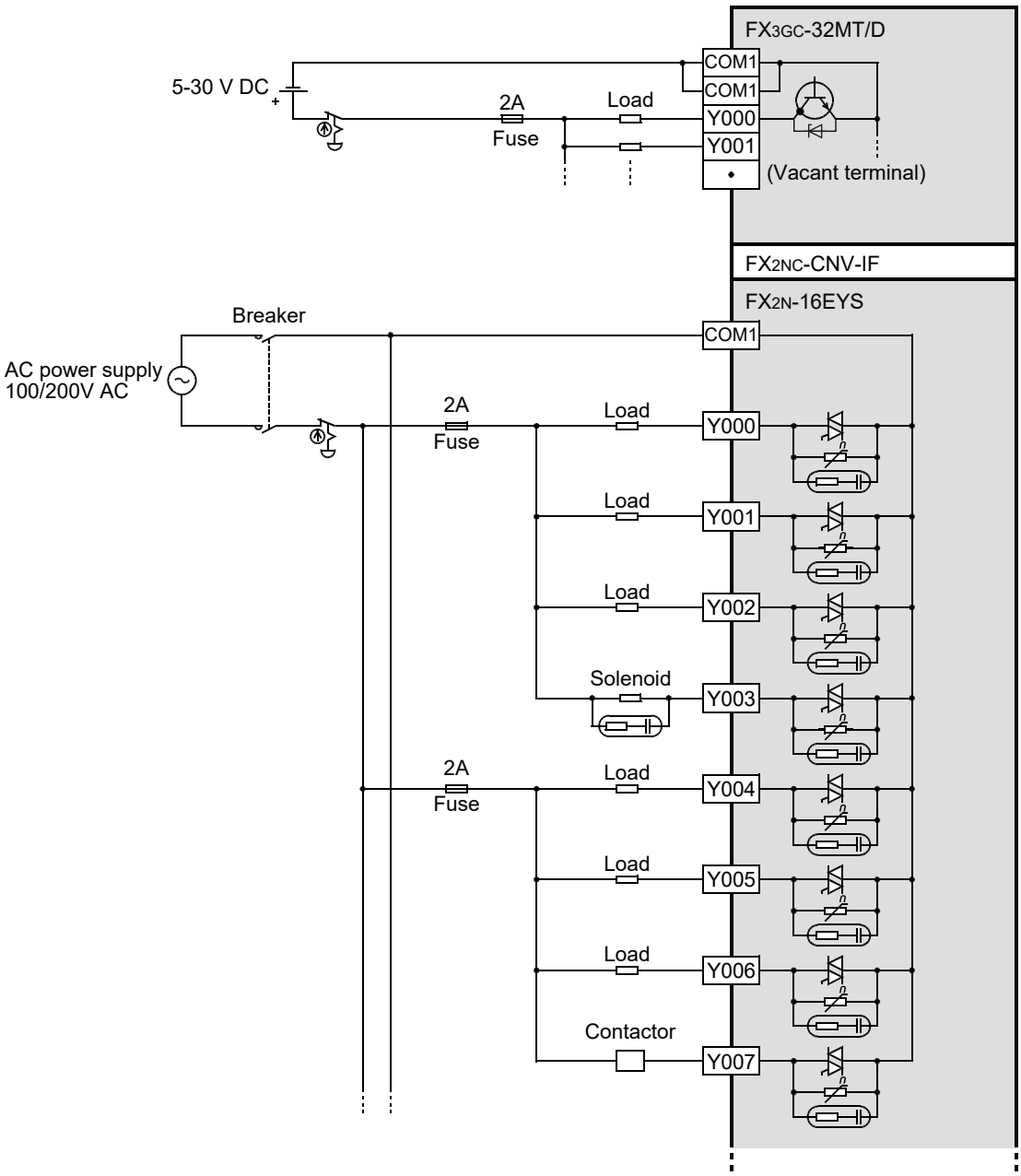


4. In-phase

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



6.3.4 Example of external wiring



WIRING PRECAUTIONS ⚠ **CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

7. Examples of Wiring for Various Uses

DESIGN PRECAUTIONS ⚠ **WARNING**

- Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure.
  Otherwise, malfunctions may cause serious accidents.
  1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
  2) Note that when the PLC CPU 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 PLC CPU occurs in an input/output control block, output control may be disabled.
  External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.
  For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.

DESIGN PRECAUTIONS ⚠ **CAUTION**

- Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line.
  Noise may cause malfunctions.
- Install the product so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.
  Failure to do so may result in wire damage/breakage or PLC failure.

SECURITY PRECAUTIONS ⚠ **WARNING**

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

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, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.
  Failure to do so may cause electric shock.

WIRING PRECAUTIONS **⚠CAUTION**

- Connect the DC 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 damage the product.
- Perform class D grounding (grounding resistance: 100 Ω or less) to the grounding terminal on the main unit.
  Do not use common grounding with heavy electrical systems.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to properly wire the FX2N/FX3U Series extension equipment 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
- Make sure to properly wire to 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.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire 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.
- Make sure to properly wire to the FX Series terminal blocks 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

7.1 Notes about Examples of Wiring

→ **For the example of positioning wiring, refer to the Positioning Control Edition.**

The examples of wiring are given under the following conditions.

- The input/output numbers are the actual numbers on the program. (They may differ from the numbers shown on the product terminals.)
- Product input/output specifications
  Check the product input/output specifications when using any example of wiring.
  - Products only for sink input and products both for sink input and for source input are available.
  - Products for sink output and products for source output are available of transistor.
- The examples of programming (applied instructions) are given based on the allocation of the input/output numbers for wiring.

→ **For the applied instructions, refer to the Programming Manual.**

7.2 Rotary Encoder [High-speed Counters C235 to C255]

7.2.1 1-phase 1-input [C235 to C245]

The following examples of wiring apply to the cases where C235 is used. When another high-speed counter number is used, wire the counter referring to the following diagrams.

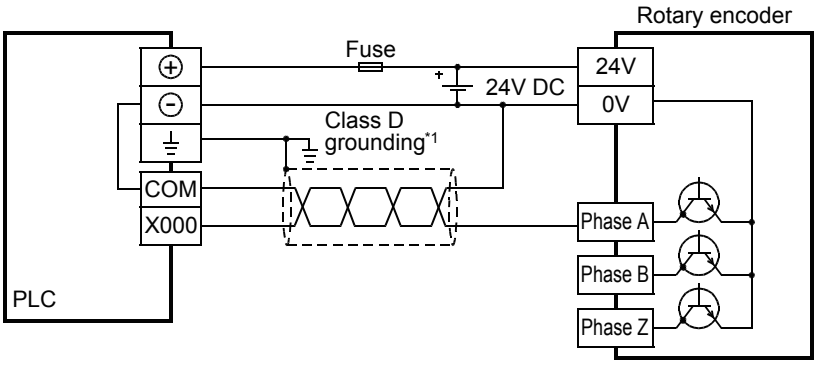
→ **For input allocation in high-speed counters, refer to Subsection 5.5.2.**

Caution

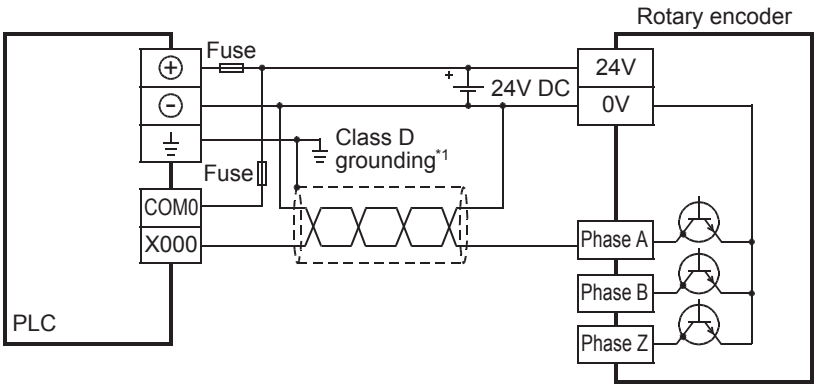
As connecting cables, use shielded twisted-pair cables. Ground the shield of each shielded cable only on the PLC side.

1. NPN open collector transistor output rotary encoder

1) FX3GC-32MT/D

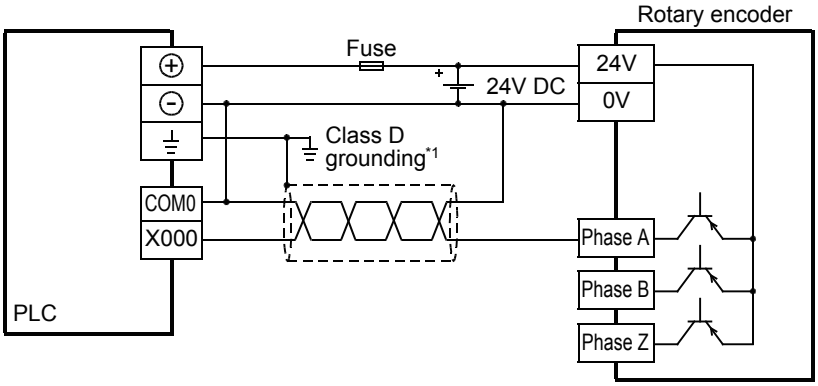


2) FX3GC-32MT/DSS [Sink input wiring]



2. PNP open collector transistor output rotary encoder

FX3GC-32MT/DSS [Source input wiring]



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

7.2.2 2-phase 2-input [C251 to C255]

The following examples of wiring apply to the cases where C251 is used. When another high-speed counter number is used, wire the counter referring to the following diagrams.

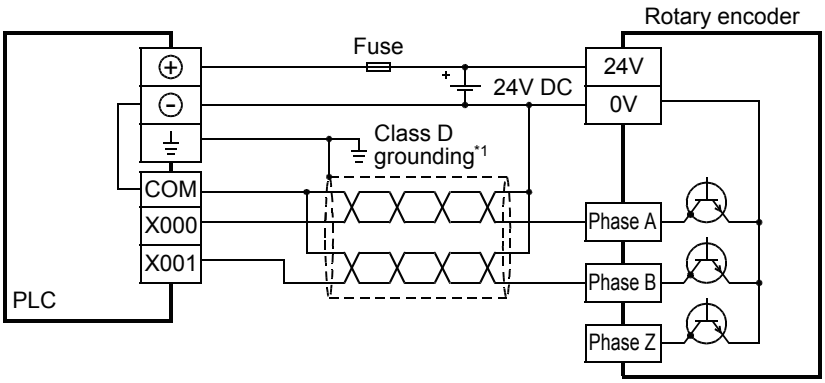
→ **For input allocation in high-speed counters, refer to Subsection 5.5.2.**

Caution

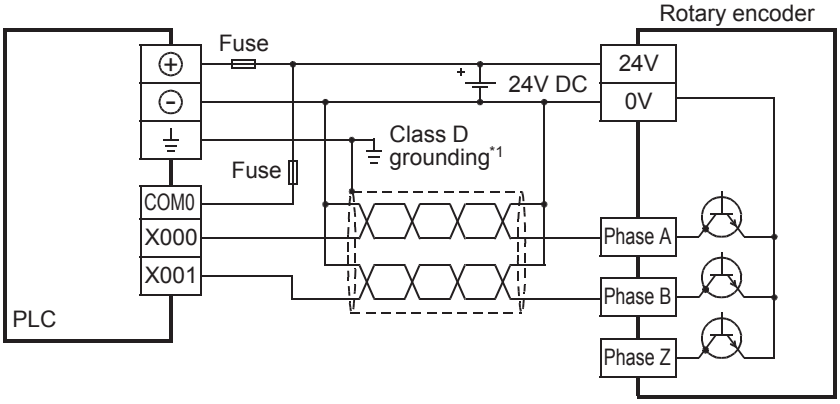
As connecting cables, use shielded twisted-pair cables. Ground the shield of each shielded cable only on the PLC side.

1. NPN open collector transistor output rotary encoder

1) FX3GC-32MT/D

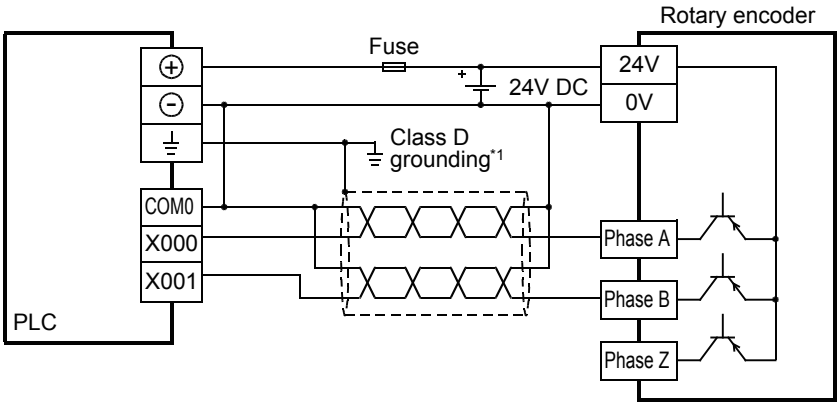


2) FX3GC-32MT/DSS [Sink input wiring]



2. PNP open collector transistor output rotary encoder

FX3GC-32MT/DSS [Source input wiring]



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

7.3 Input Interruption - With Delay Function, Pulse Catch

This section shows wiring examples for input interruption (I000 or I001) using X000.
When using another input interruption or pulse catch, perform wiring in reference to the figures below.

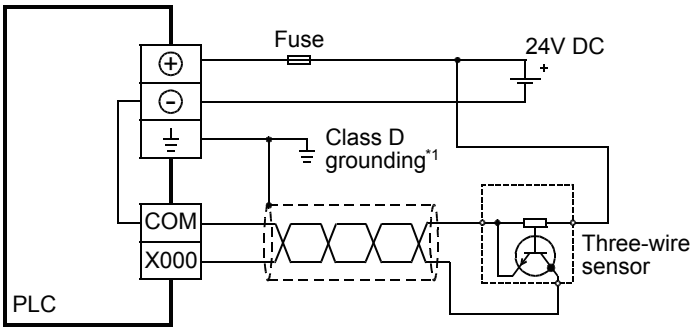
→ **For input allocation in input interruption, refer to Section 5.6.**
→ **For input allocation in pulse catch, refer to Section 5.7.**
→ **For input allocation in pulse width/pulse period measurement function, refer to Section 5.8.**

Caution

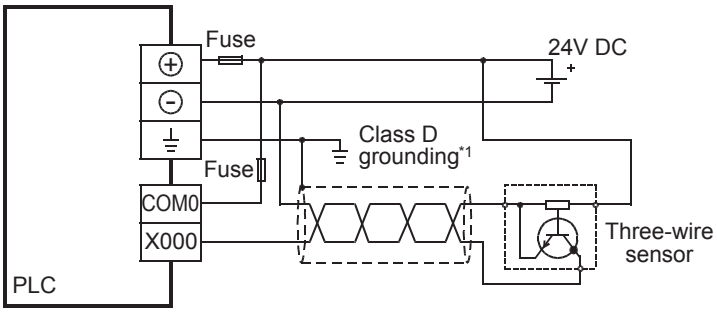
Use shielded twisted-pair cables for connecting cables. Ground the shield of each shielded cable only on the PLC side.

1. NPN open collector transistor output three-wire sensor

1) FX3GC-32MT/D

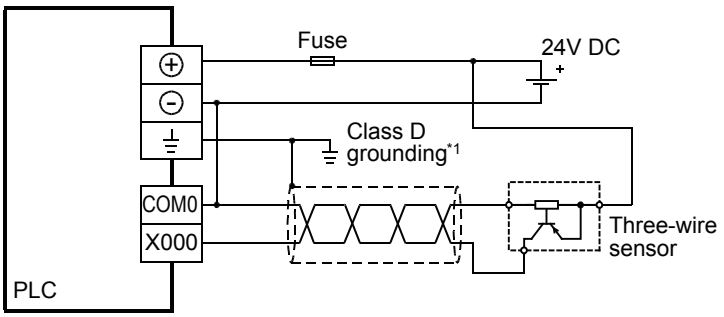


2) FX3GC-32MT/DSS [Sink input wiring]



2. PNP open collector transistor output three-wire sensor

FX3GC-32MT/DSS [Source input wiring]



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

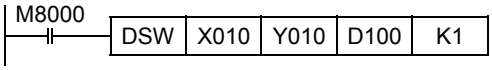
7.4 Digital Switch [DSW (FNC 72)/BIN (FNC 19)]

7.4.1 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.

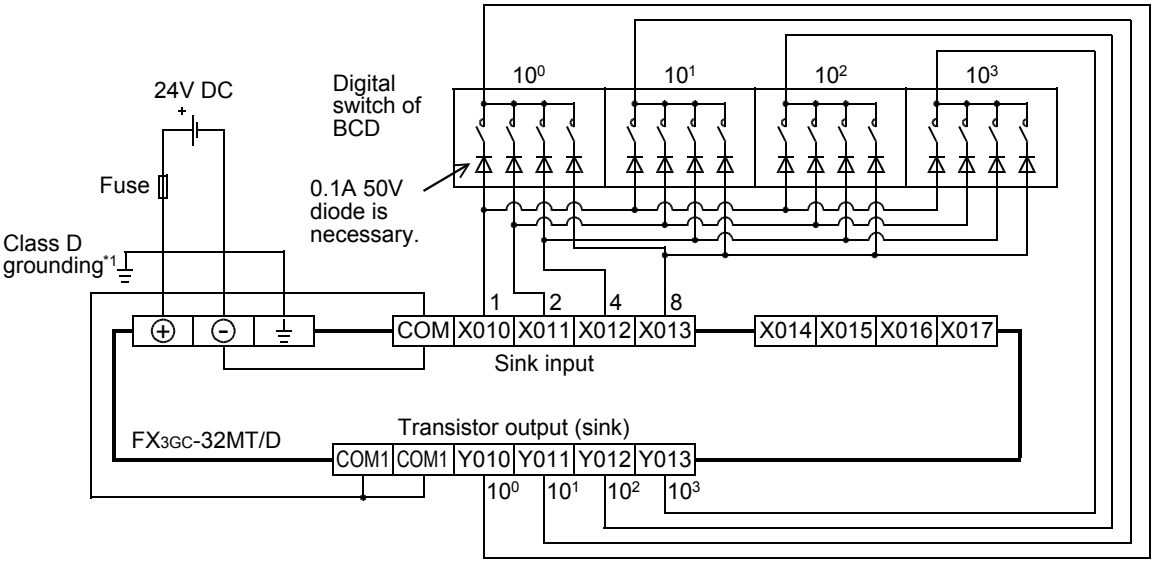
1. Main unit

Example of program

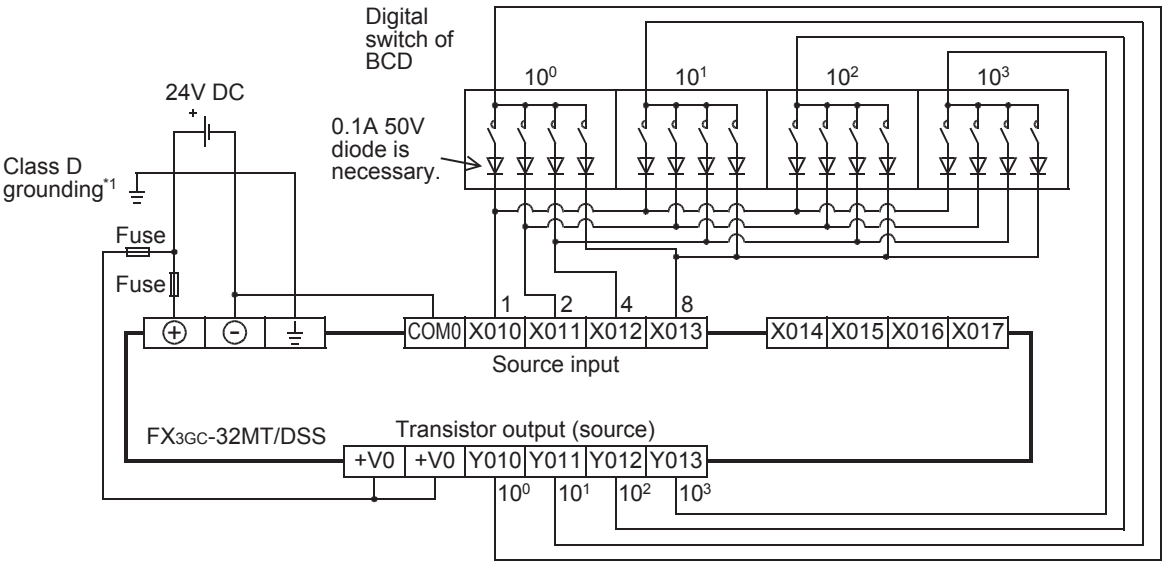


Example of wiring

1) Sink wiring
Use the sink only input, sink only output type main unit.
The wiring example is the FX3GC-32MT/D.



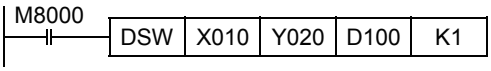
2) Source wiring
Use the sink/source common input, source only output (transistor output) type main unit.
The wiring example is the FX3GC-32MT/DSS.



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

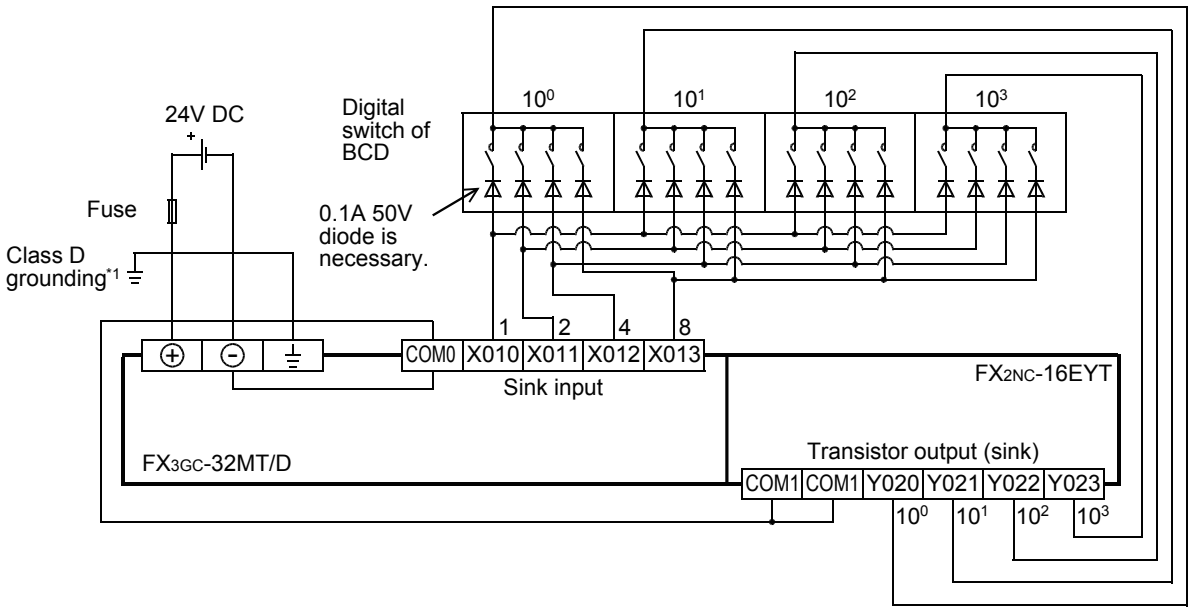
2. Main unit + Output extension block

Example of program

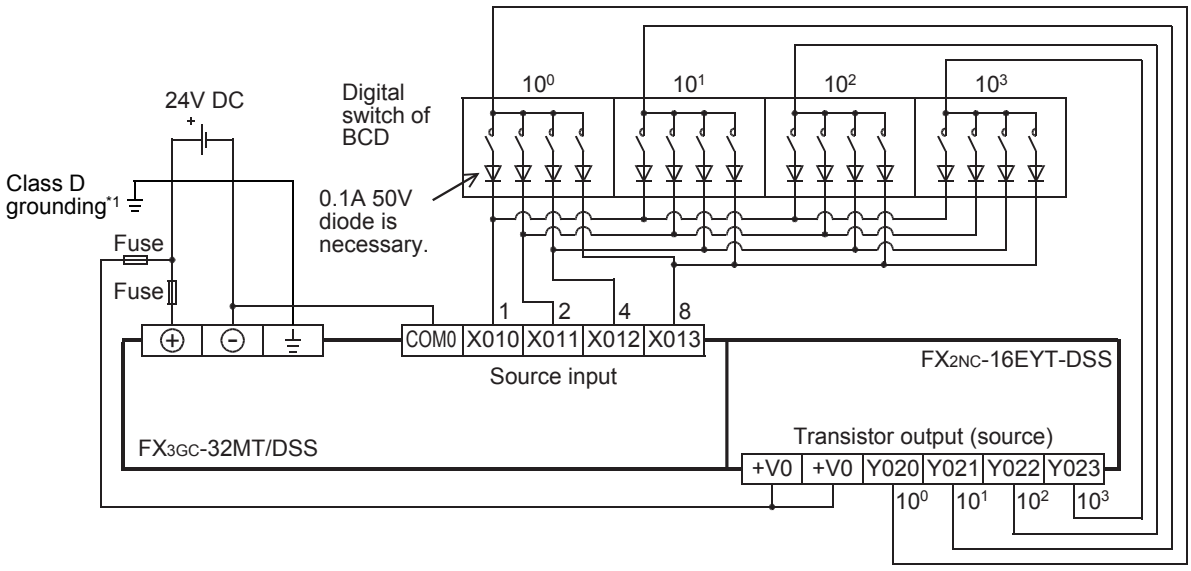


Example of wiring

1) Sink wiring
Use the sink only input, sink only output type main unit and a transistor output (sink only output) type output extension block.
The wiring example is the [FX3GC-32MT/D] + output extension block [FX2NC-16EYT].



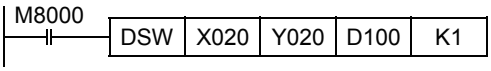
2) Source wiring
Use the sink/source common input, source only output type main unit and a transistor output (source only output) type output extension block.
The wiring example is the [FX3GC-32MT/DSS] + output extension block [FX2NC-16EYT-DSS].



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

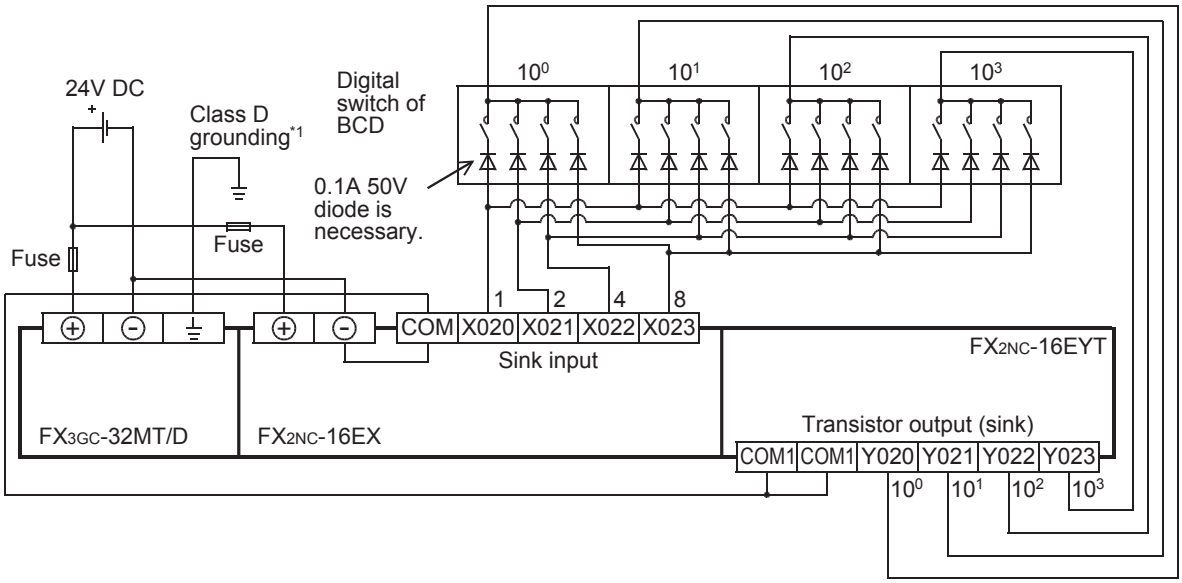
3. Input extension block + Output extension block

Example of program

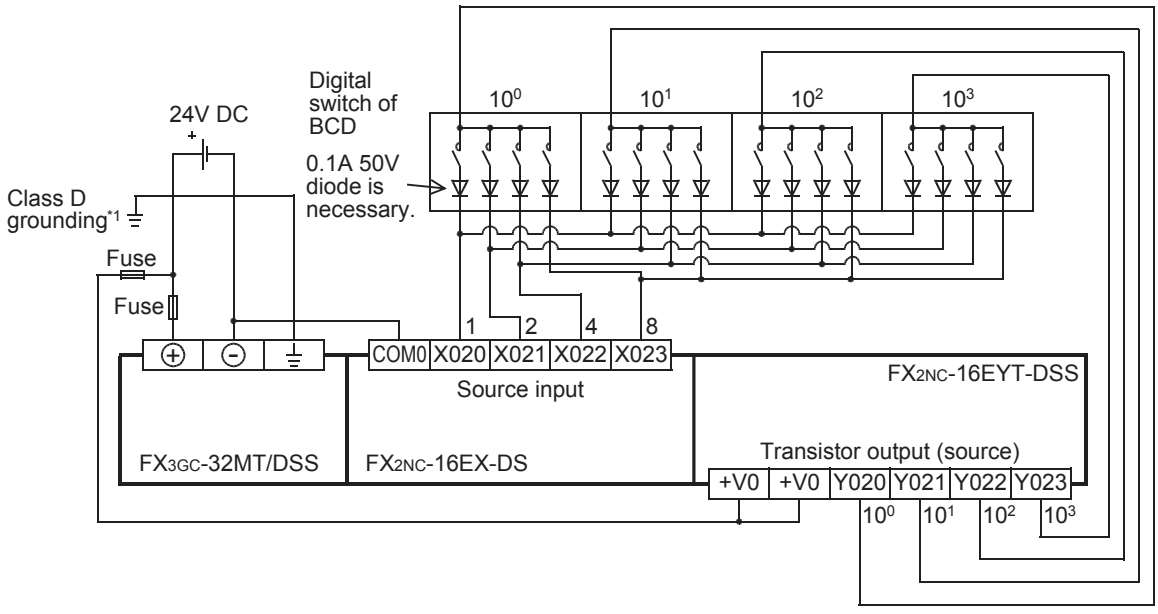


Example of wiring

1) Sink wiring
Use the sink only input, sink only output type main unit, a sink only input type input extension block and a transistor output (sink only output) type output extension block.
The wiring example is the [FX3GC-32MT/D] + input extension block [FX2NC-16EX] + output extension block [FX2NC-16EYT].



2) Source wiring
Use the sink/source common input, source only output type main unit, a sink/source common input type input extension block and a transistor output (source only output) type output extension block.
The wiring example is the [FX3GC-32MT/DSS] + input extension block [FX2NC-16EX-DS] + output extension block [FX2NC-16EYT-DSS].



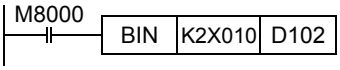
*1. The grounding resistance should be 100 Ω or less.

7.4.2 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.

1. Main unit

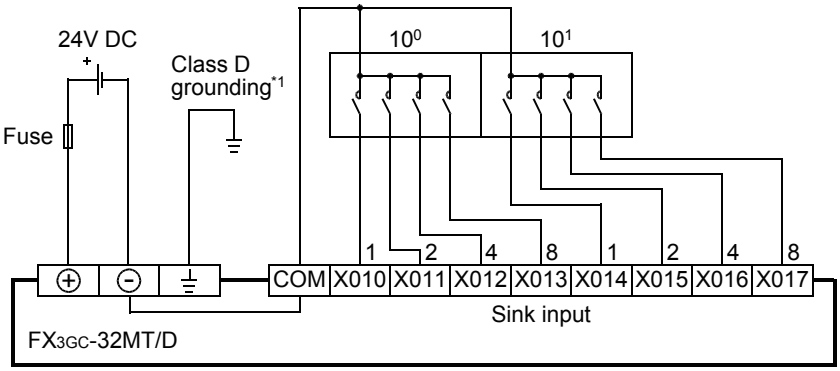
Example of program



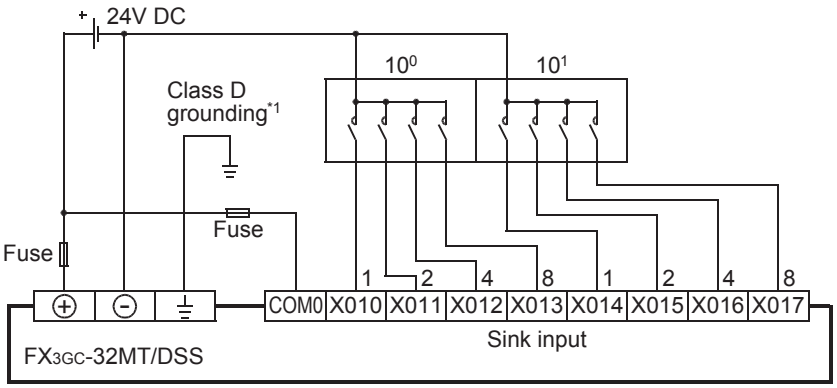
Example of wiring

1) Sink wiring

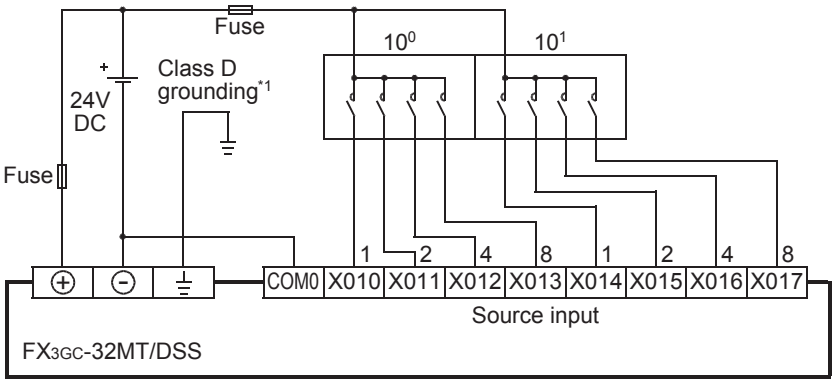
a) Sink only input type main unit
Use the sink only input, sink only output type main unit.
The wiring example is the FX3GC-32MT/D.



b) Sink/source common input type main unit
Use the sink/source common input, source only output (transistor output) type main unit.
The wiring example is the FX3GC-32MT/DSS.



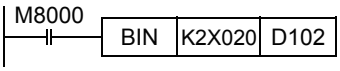
2) Source wiring
Use the sink/source common input, source only output (transistor output) type main unit.
The wiring example is the FX3GC-32MT/DSS.



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

2. Input extension block

Example of program

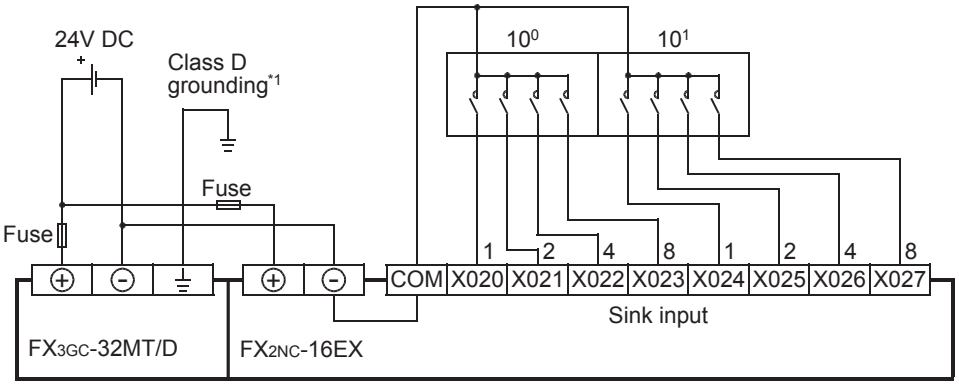


Example of wiring

1) Sink wiring

a) Sink only input type extension block

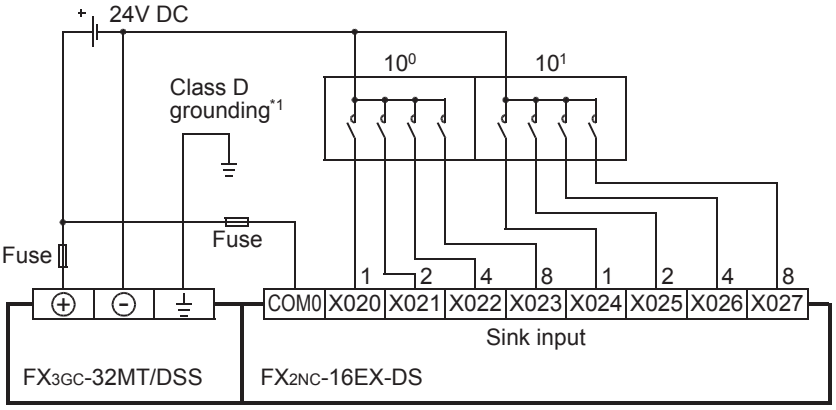
Use the sink only input, sink only output type main unit, and a sink only input type input extension block. The wiring example is the [FX3GC-32MT/D] + input extension block [FX2NC-16EX].



b) Sink/source common input type extension block

Use the sink/source common input, source only output type main unit, a sink/source common input type input extension block.

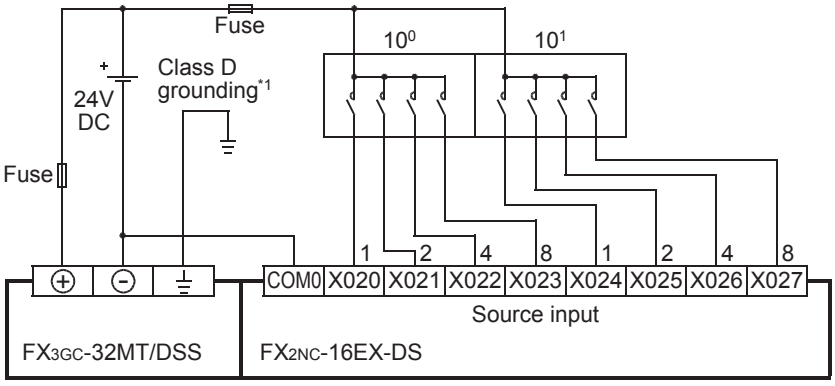
The wiring example is the [FX3GC-32MT/DSS] + input extension block [FX2NC-16EX-DS].



2) Source wiring

Use the sink/source common input, source only output type main unit, a sink/source common input type input extension block.

The wiring example is the [FX3GC-32MT/DSS] + input extension block [FX2NC-16EX-DS].



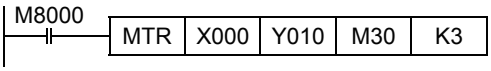
*1. The grounding resistance should be 100 Ω or less.

7.5 Input Matrix [MTR (FNC 52)]

This section gives examples of wiring for capturing the ON/OFF status of 24 switches to M30 to M37, M40 to M47 and M50 to M57 using MTR instructions.

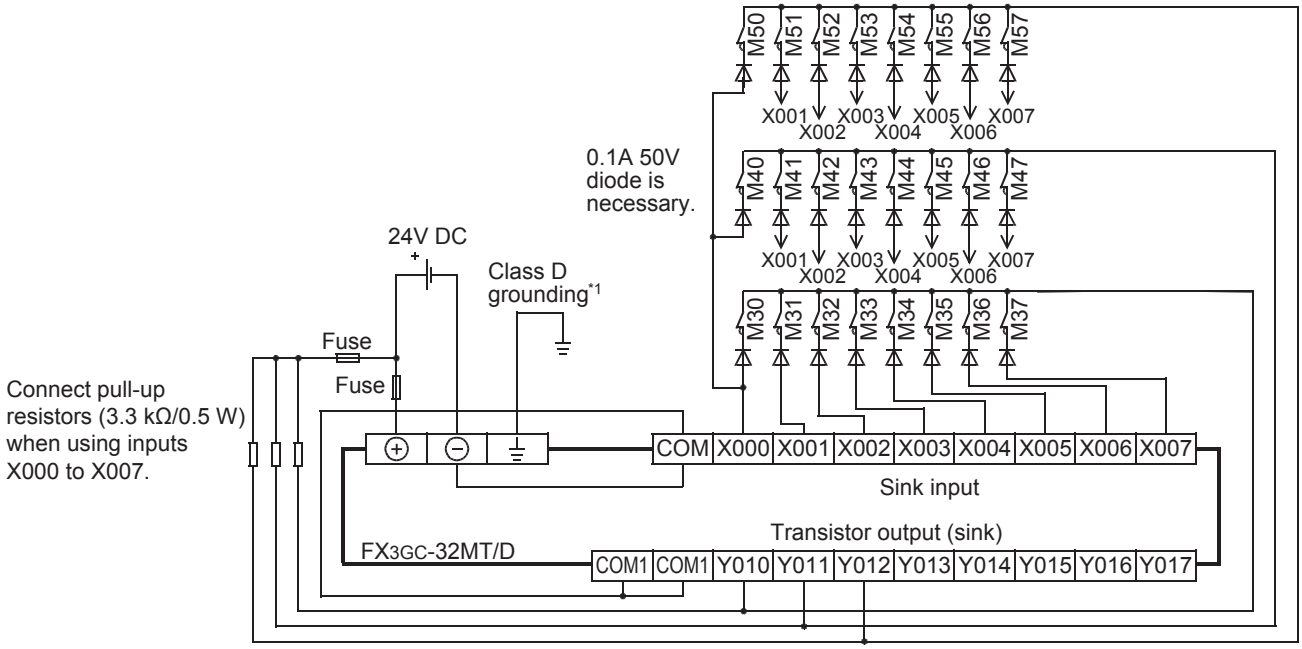
1. Main unit

Example of program

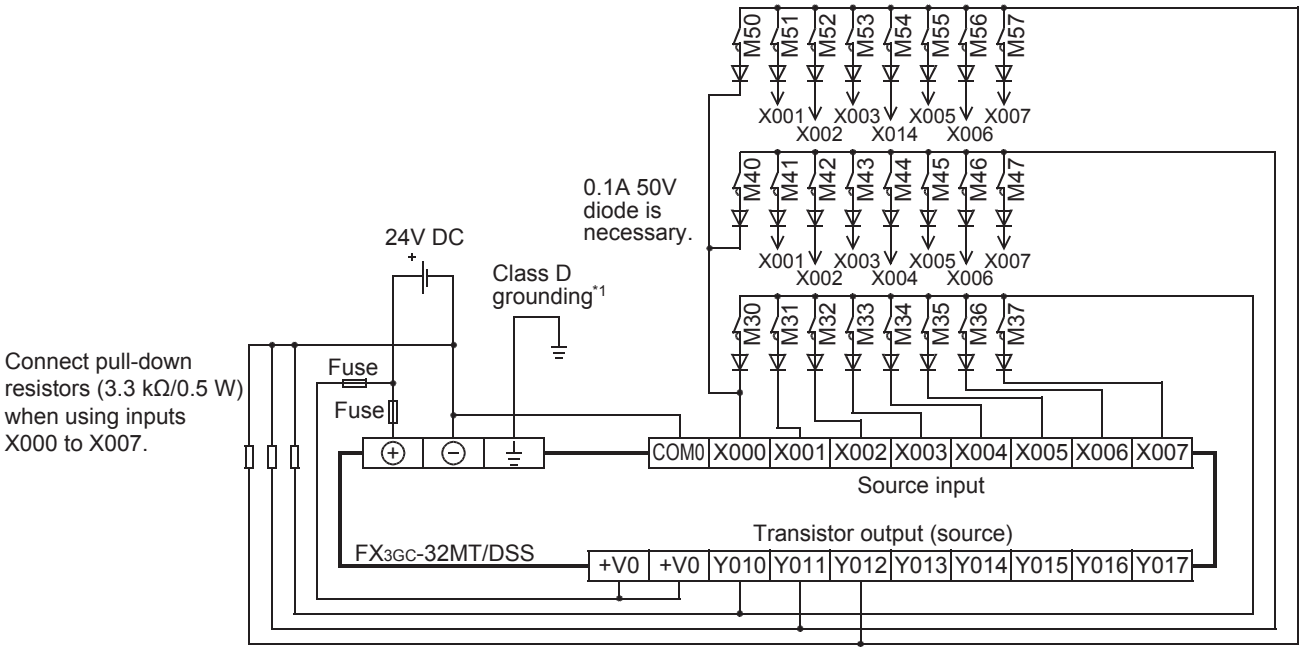


Example of wiring

1) Sink wiring
Use the sink only input, sink only output type main unit. The wiring example is the FX3GC-32MT/D



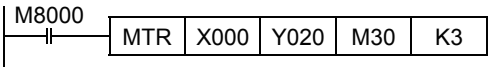
2) Source wiring
Use the sink/source common input, source only output type main unit.
The wiring example is the FX3GC-32MT/DSS.



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

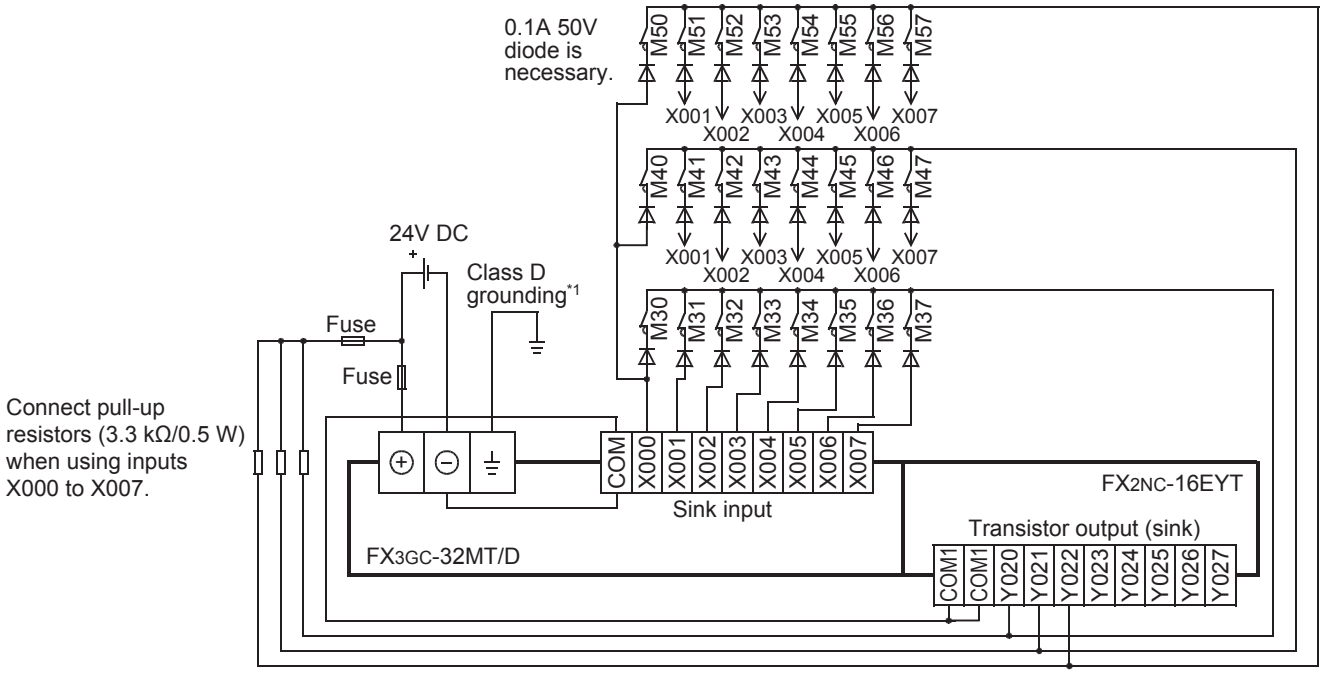
2. Main unit + Output extension block

Example of program

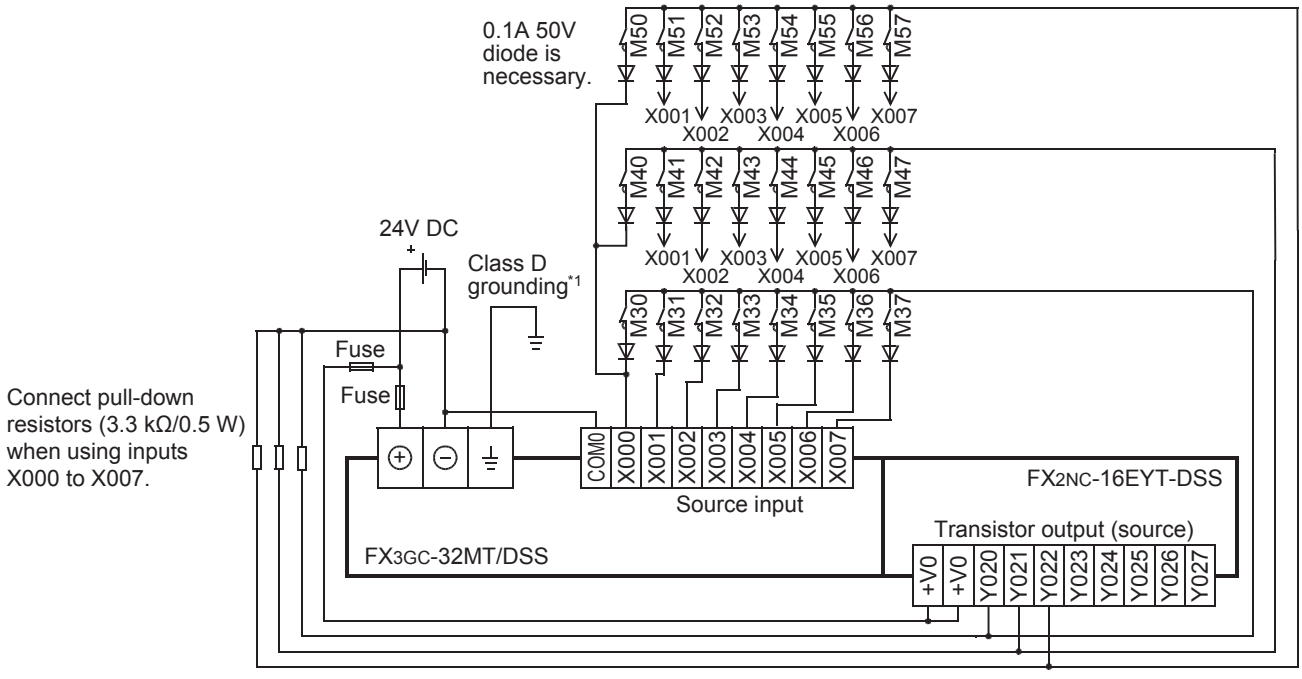


Example of wiring

1) Sink wiring
Use the sink only input, sink only output type main unit and a transistor output (sink only output) type output extension block. The wiring example is the [FX3GC-32MT/D] + output extension block [FX2NC-16EYT].



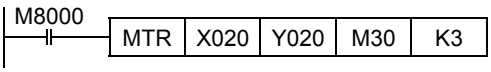
2) Source wiring
Use the sink/source common input, source only output type main unit and a transistor output (source only output) type output extension block. The wiring example is the [FX3GC-32MT/DSS] + output extension block [FX2NC-16EYT-DSS].



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

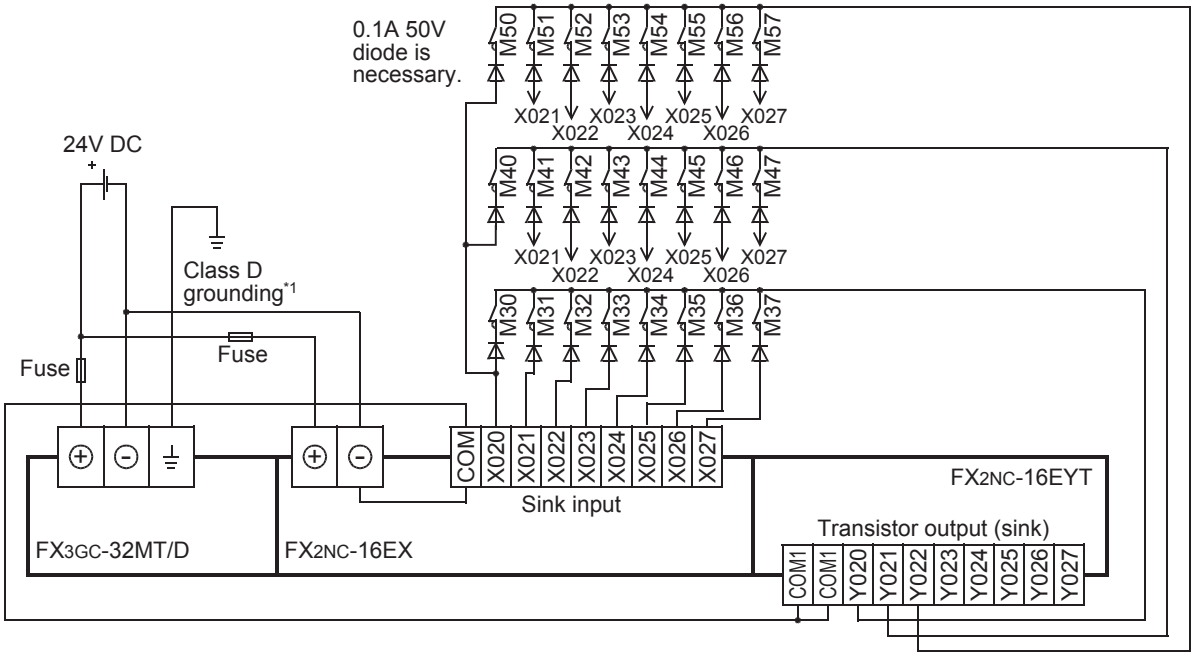
3. Input extension block + Output extension block

Example of program

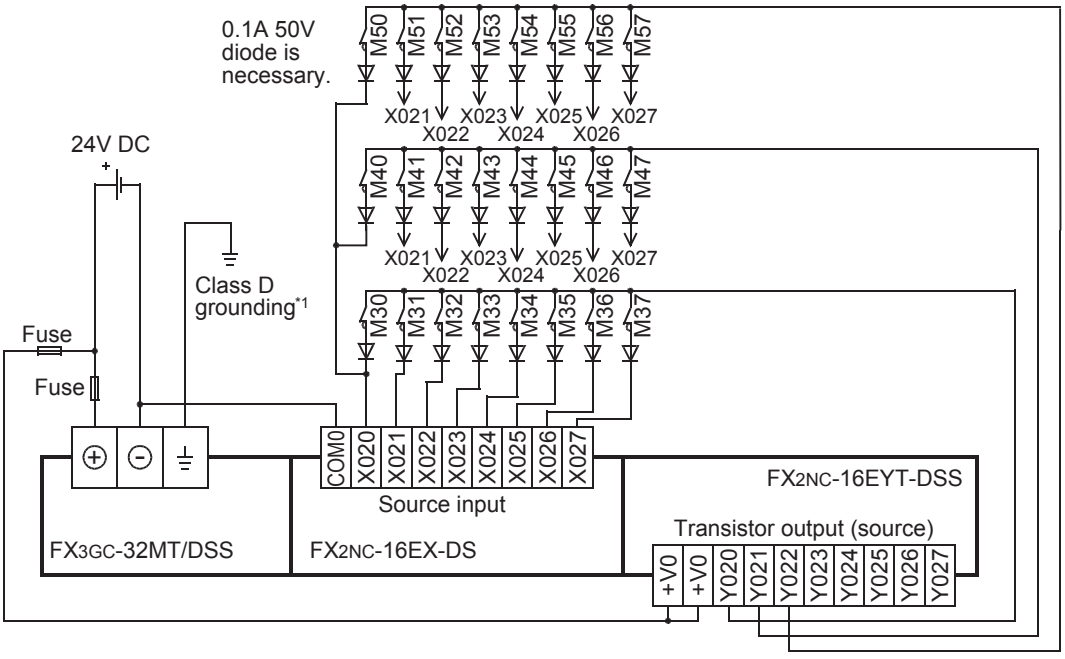


Example of wiring

1) Sink wiring
Use the sink only input, sink only output type main unit, a sink only input type input extension block and a transistor output (sink only output) type output extension block. The wiring example is the [FX3GC-32MT/D] + input extension block [FX2NC-16EX] + output extension block [FX2NC-16EYT].



2) Source wiring
Use the sink/source common input, source only output type main unit, a sink/source common input type input extension block and a transistor output (source only output) type output extension block. The wiring example is the [FX3GC-32MT/DSS] + input extension block [FX2NC-16EX-DS] + output extension block [FX2NC-16EYT-DSS].



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

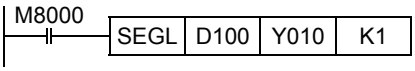
7.6 Seven Segment with Latch [SEGL (FNC 74)/BCD (FNC 18)]

7.6.1 When SEGL instructions are used

This subsection gives examples of wiring for displaying the current value of D100 on the 4-digit 7-segment display.

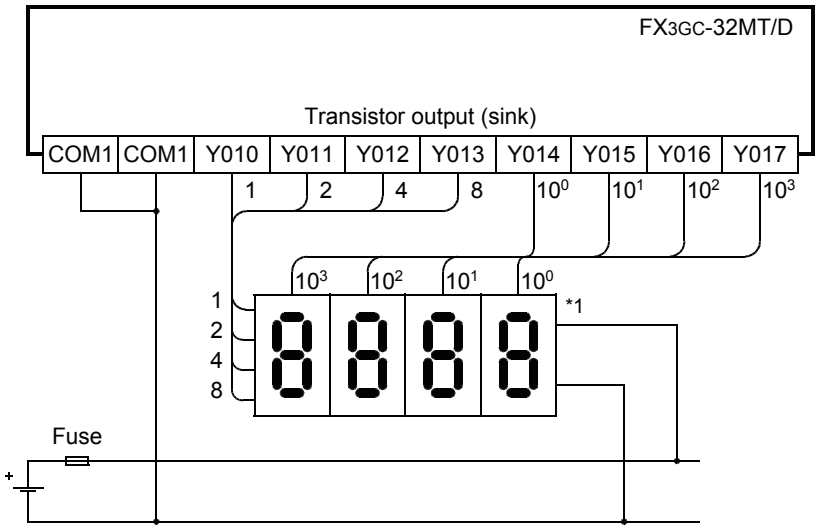
1. Main unit

Example of program

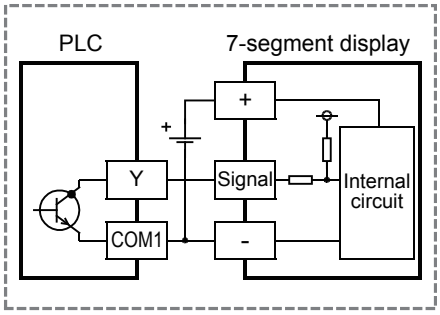


Example of wiring

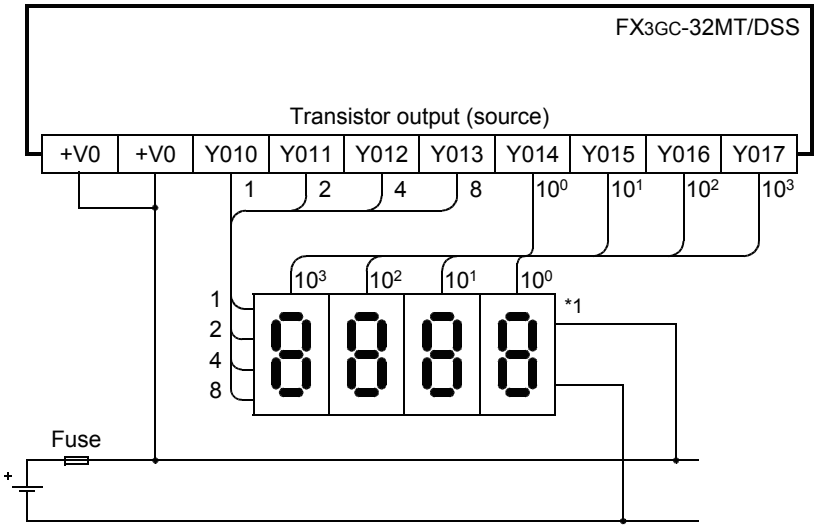
1) Sink wiring
Use the sink only input, sink only output type main unit.
The wiring example is the FX3GC-32MT/D.



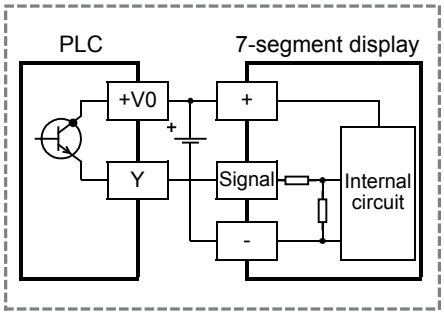
7-segment display to be used for sink wiring (in the case of transistor output)



2) Source wiring
Use the sink/source common input, source only output (transistor output) type main unit.
The wiring example is the FX3GC-32MT/DSS.



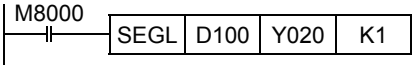
7-segment display to be used for source wiring (in the case of transistor output)



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

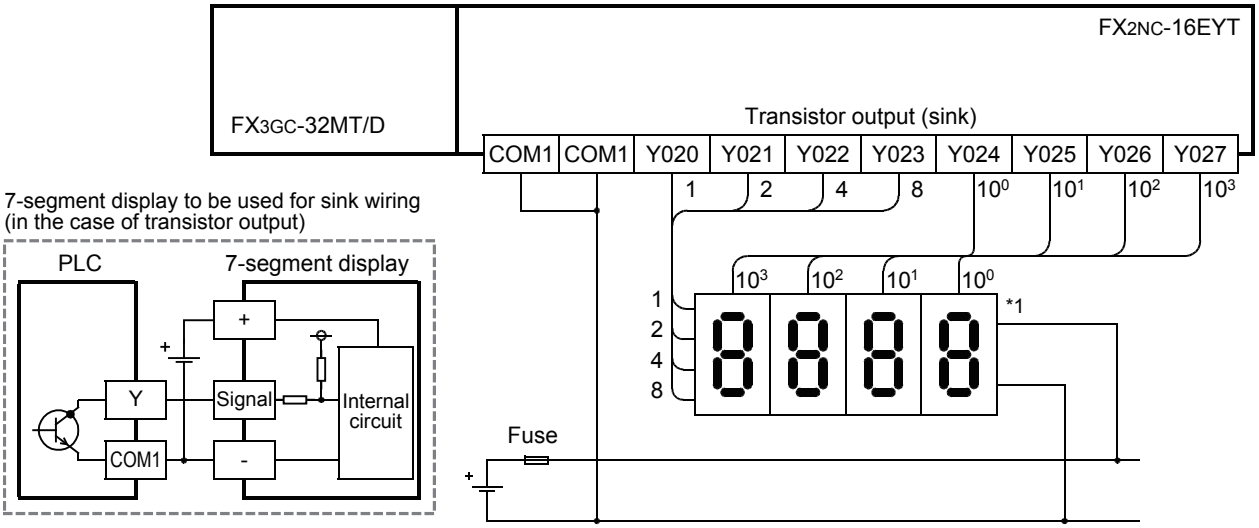
2. Output extension block

Example of program

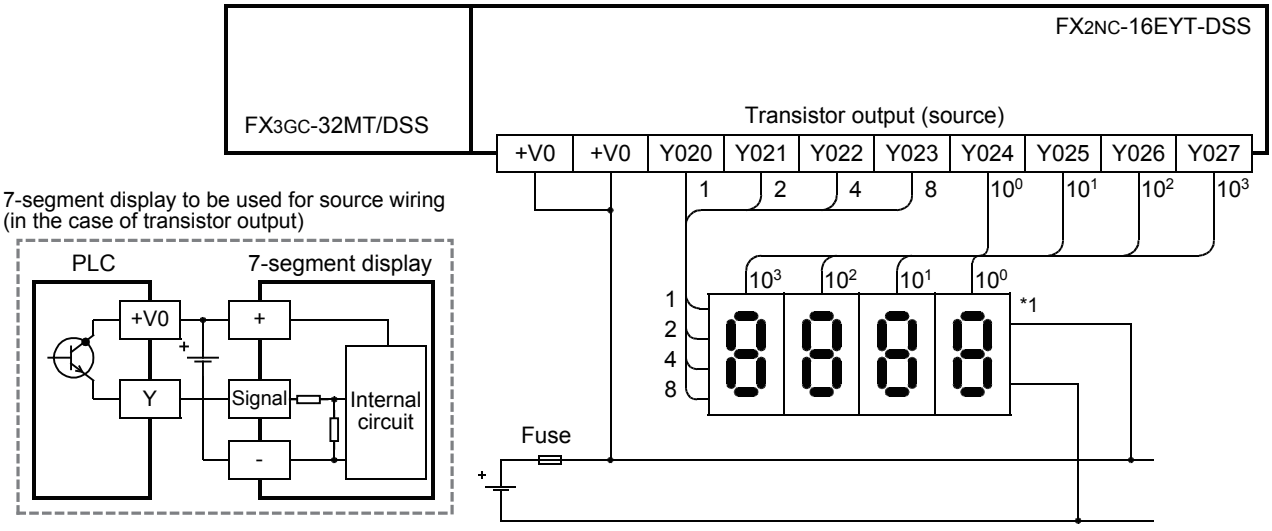


Example of wiring

1) Sink wiring
Use the sink only input, sink only output type main unit and a transistor output (sink only output) type output extension block.
The wiring example is the [FX3GC-32MT/D] + output extension block [FX2NC-16EYT].



2) Source wiring
Use the sink/source common input, source only output type main unit and a transistor output (source only output) type output extension block.
The wiring example is the [FX3GC-32MT/DSS] + output extension block [FX2NC-16EYT-DSS].



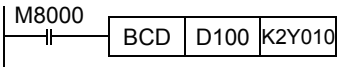
*1. Use a 7-segment display with a latch and a built-in BCD decoder.

7.6.2 When BCD instructions are used

This subsection gives examples of wiring for displaying the current value of D100 on the 2-digit 7-segment display.

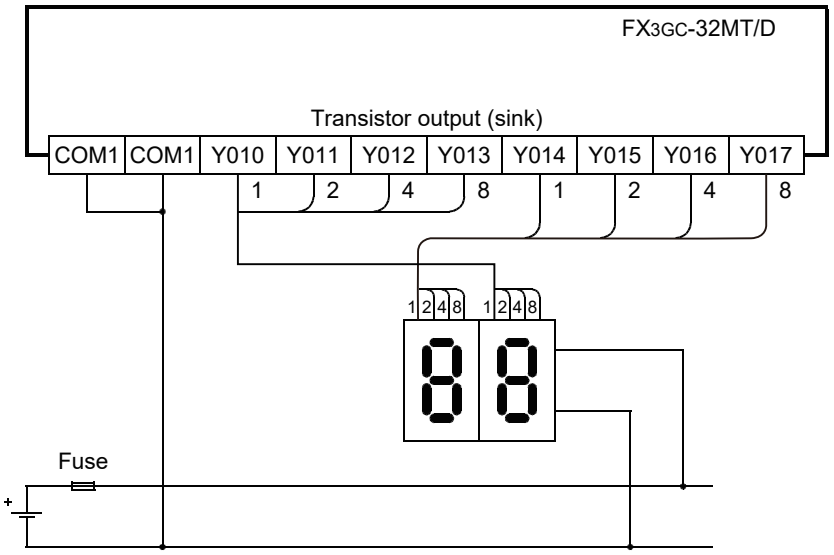
1. Main unit

Example of program

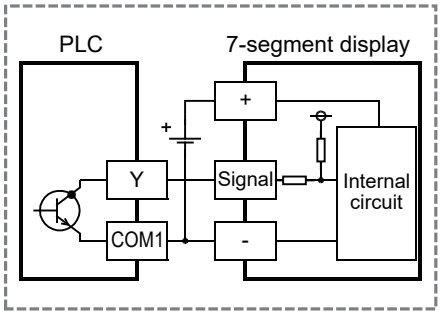


Example of wiring

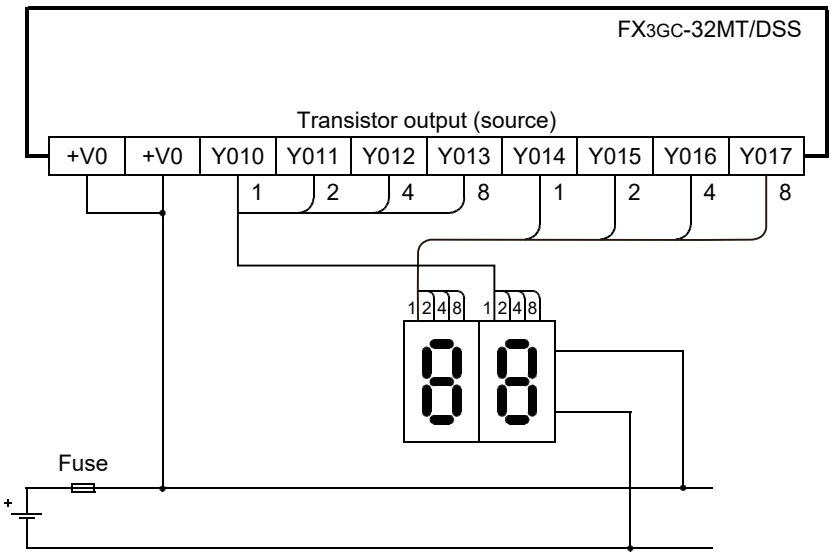
1) Sink wiring
Use the sink only input, sink only output type main unit.
The wiring example is the FX3GC-32MT/D.



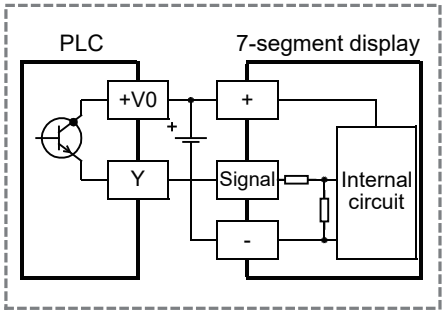
7-segment display to be used for sink wiring (in the case of transistor output)



2) Source wiring
Use the sink/source common input, source only output (transistor output) type main unit.
The wiring example is the FX3GC-32MT/DSS.

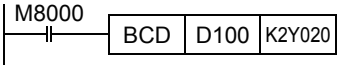


7-segment display to be used for source wiring (in the case of transistor output)



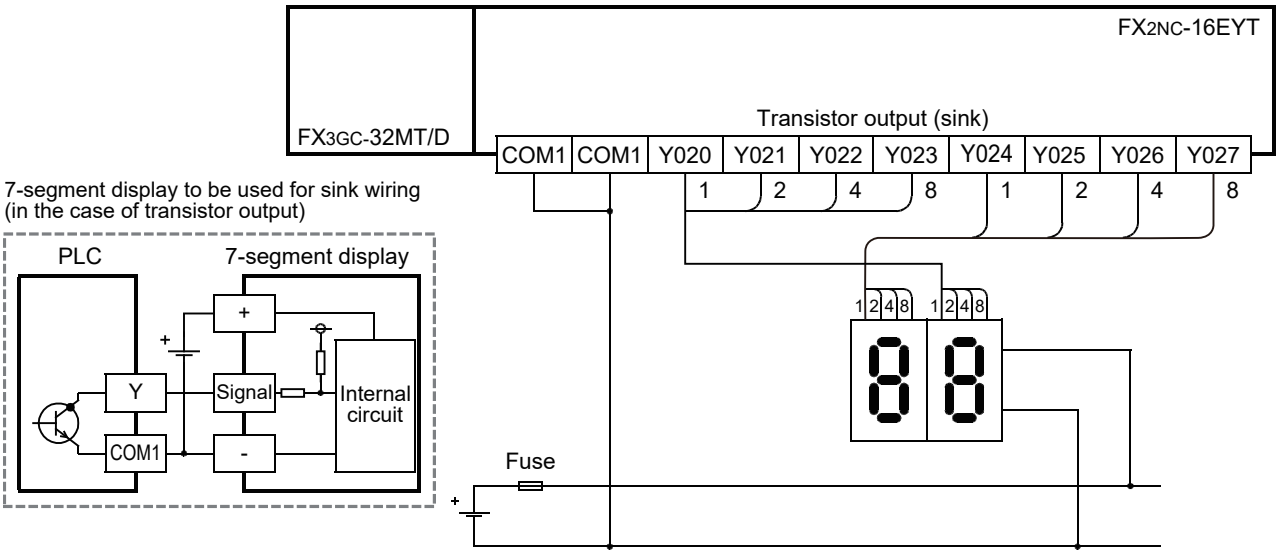
2. Output extension block

Example of program

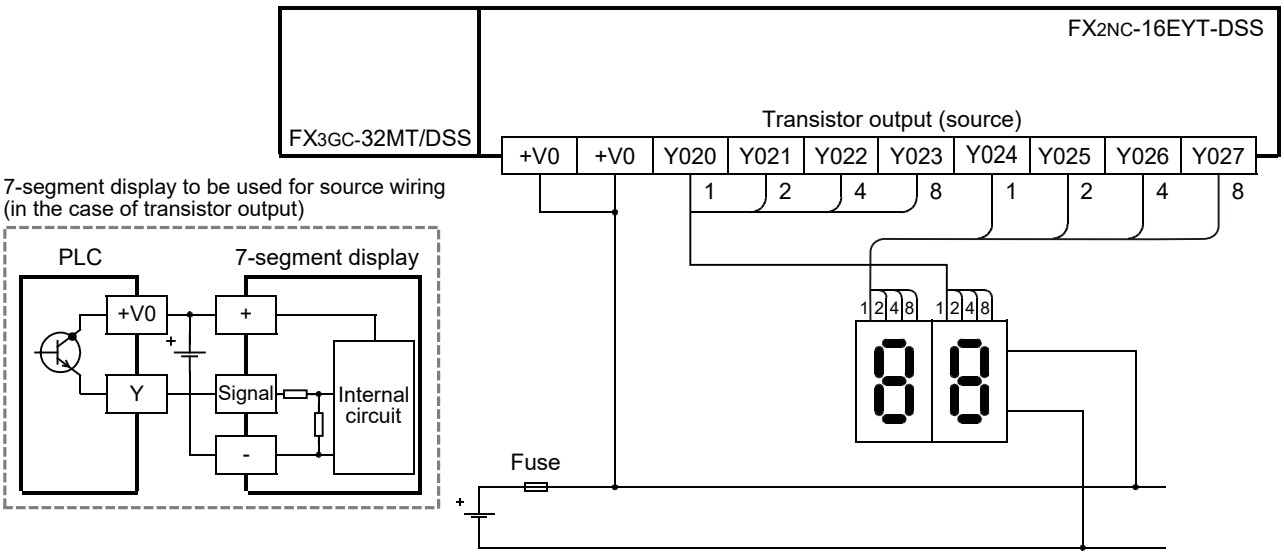


Example of wiring

1) Sink wiring
Use the sink only input, sink only output type main unit and a transistor output (sink only output) type output extension block.
The wiring example is the [FX3GC-32MT/D] + output extension block [FX2NC-16EYT].



2) Source wiring
Use the sink/source common input, source only output type main unit and a transistor output (source only output) type output extension block.
The wiring example is the [FX3GC-32MT/DSS] + output extension block [FX2NC-16EYT-DSS].



8. Terminal Block Specifications and External Wiring

DESIGN PRECAUTIONS **⚠ WARNING**

- Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems or PLC failure.
  Otherwise, malfunctions may cause serious accidents.
  1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
  2) Note that when the PLC CPU 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 PLC CPU occurs in an input/output control block, output control may be disabled.
     External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.
     For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.

DESIGN PRECAUTIONS **⚠ CAUTION**

- Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line.
  Noise may cause malfunctions.
- Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.
  Failure to do so may result in wire damage/breakage or PLC failure.

SECURITY PRECAUTIONS **⚠ WARNING**

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

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.

INSTALLATION PRECAUTIONS ⚠CAUTION

- Use the product within the generic environment specifications described in Section 3.1 of this manual.
  Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl2, H2S, SO2 or NO2), 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.
- Do not touch the conductive parts of the product directly.
  Doing so may cause device failures or malfunctions.
- Install the product securely using a DIN rail or mounting screws.

Main unit, FX2NC Series I/O extension blocks, FX2NC/FX3UC Series special function blocks, special adapter, extension power supply unit, FX2NC-CNV-IF, FX Series terminal blocks	DIN rail only
FX2N Series I/O extension blocks, FX2N/FX3U Series special function blocks	DIN rail or direct mounting

- 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.
- When drilling screw holes or wiring, make sure cutting or write debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Be sure to remove the dust proof sheet from the PLC's ventilation port when installation work is completed.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors.
  Loose connections may cause malfunctions.
- Turn off the power to the PLC before attaching or detaching the following devices.
  Failure to do so may cause equipment failures or malfunctions.
  - Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery

WIRING PRECAUTIONS ⚠WARNING

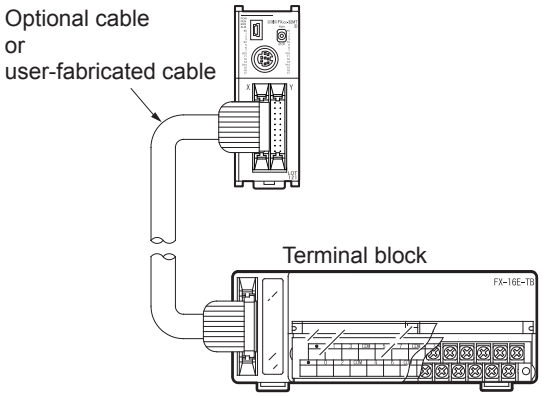
- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.
  Failure to do so may cause electric shock or damage to the product.
- Make sure to attach the terminal cover, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.
  Failure to do so may cause electric shock.

WIRING PRECAUTIONS ⚠CAUTION

- Connect the DC 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 damage the product.
- Perform class D grounding (grounding resistance: 100 Ω or less) to the grounding terminal on the main unit.
  Do not use common grounding with heavy electrical systems.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to properly wire the FX2N/FX3U Series extension equipment 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
- Make sure to properly wire to 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.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire 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.
- Make sure to properly wire to the FX Series terminal blocks 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.
  - The disposal size of the cable end 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 6mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

8.1 Overview

A terminal block is used to convert connector type input/ output terminals into a terminal block.
Moreover, dedicated input and output terminal blocks (built-in element types) can be used to receive AC input signals for conversion to relay / transistor / triac output types.



8.1.1 Product configuration

Model Name	Number of Input Points	Number of Output Points	Function	Connection Destination	Drive Power Supply
Connected to sink only input or sink only output (transistor output) type main unit or I/O extension block					
FX-16E-TB	16 input points or 16 output points		Connects directly to PLC input/ output terminals.	FX3GC-32MT/D, FX2NC-□□EX, FX2NC-□□EYT, FX2N-16EX-C, FX2N-16EYT-C	*1
FX-32E-TB	32 input points, 32 output points, or 16 input & 16 output points				
FX-16EX-A1-TB*2	16	-	100 V AC input type	FX3GC-32MT/D, FX2NC-□□EX, FX2N-16EX-C	*4
FX-16EYR-TB*3	-	16	Relay output type	FX3GC-32MT/D, FX2NC-□□EYT, FX2N-16EYT-C	24 V DC 80 mA
FX-16EYT-TB*3	-	16	Transistor output (sink) type		24 V DC 112 mA
FX-16EYS-TB*3	-	16	Triac output type		
Connected to sink/source common input type or source only output (transistor output) type main unit or I/O extension block					
FX-16E-TB/UL	16 input points or 16 output points		Connects directly to PLC input/ output terminals.	FX3GC-32MT/DSS, FX2NC-□□EX-DS FX2NC-□□EYT-DSS	*1
FX-32E-TB/UL	32 input points, 32 output points, or 16 input & 16 output points				
FX-16EYR-ES-TB/UL*3	-	16	Relay output type	FX3GC-32MT/DSS, FX2NC-□□EYT-DSS	24 V DC 80 mA
FX-16EYT-ES-TB/UL*3	-	16	Transistor output (sink) type		24 V DC 112 mA
FX-16EYT-ESS-TB/UL*3	-	16	Transistor output (source) type		
FX-16EYS-ES-TB*3	-	16	Triac output type		

*1. The table below shows the drive power supply for each connection destination.

Connection destination	Power Supply Voltage	Current Consumption
Input connector		
FX3GC-32MT/D, FX2NC-□□EX	Not required	
FX3GC-32MT/DSS, FX2NC-□□EX-DS, FX2N-16EX-C	24 V DC	112 mA/ 16 points
Output connector		
FX3GC-32MT/D, FX3GC-32MT/DSS, FX2NC-□□EYT, FX2NC-□□EYT-DSS, FX2N-16EYT-C	Power supply suitable to connected load is required.	

*2. The applications shown below are not supported.

	Unsupported Applications
High-speed processing	High-speed counter, input interruption, pulse catch, pulse width/pulse period measurement function, speed detection (SPD) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Other	Absolute current value read (ABS) instruction

*3. The applications shown below are not supported.

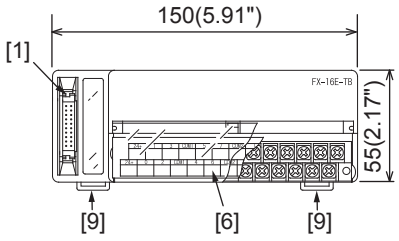
	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning mode (TBL) instruction, absolute current value read (ABS) instruction, zero return (ZRN) instruction, variable speed pulse output (PLSV) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

*4. The table below shows the drive power supply for each connection destination.

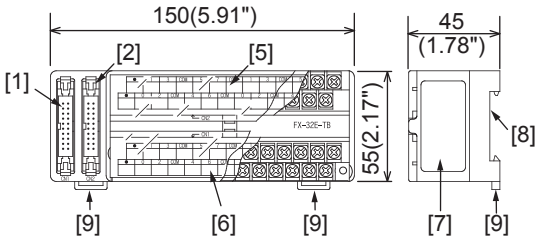
Connection destination	Power Supply Voltage	Current Consumption
FX3GC-32MT/D, FX2NC-□□EX	24 V DC	48 mA
FX2N-16EX-C	24 V DC	160 mA

8.2 External Dimensions & Component Names

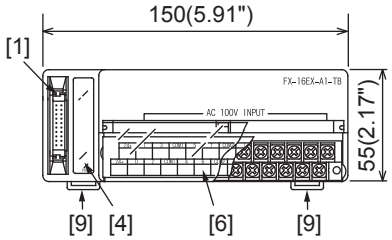
FX-16E-TB, FX-16E-TB/UL



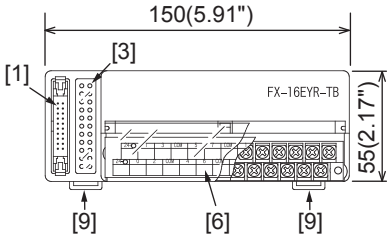
FX-32E-TB, FX-32E-TB/UL



FX-16EX-A1-TB



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



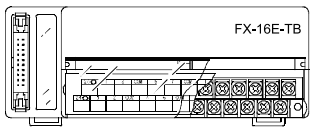
Units: mm (inches)
Accessories: Input/output No. labels, terminal block arrangement cards

No.	Name	Remarks
[1]	CN1 connector	-
[2]	CN2 connector	Present at FX-32E-TB, FX-32E-TB/UL
[3]	Operation indicator LED	Present at 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
[4]	POWER LED	Present at FX-16EX-A1-TB
[5]	CN2 terminal block (M3.5 screws)	Present at FX-32E-TB, FX-32E-TB/UL
[6]	CN1 terminal block (M3.5 screws)	-
[7]	Nameplate	-
[8]	DIN rail mounting groove (DIN rail width: 35 mm(1.38"))	-
[9]	DIN rail mounting hook	-

8.3 Terminal Arrangement

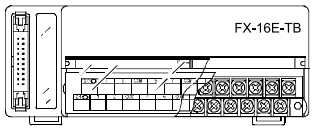
1. FX-16E-TB, FX-16E-TB/UL

When connected to the FX3UC/FX2NC I/O extension blocks (connector type) or FX2N-16EYT-C



	Lower numbers							Higher 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	

When connected to the FX2N-16EX-C



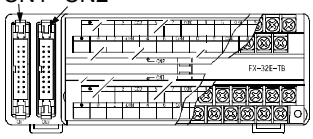
	Lower numbers							Higher numbers						
	24+	1	3	•	5	7	•	1	3	•	5	7	•
24+	0	2	•	4	6	•	0	2	•	4	6	•	

2. FX-32E-TB, FX-32E-TB/UL

When connected to the FX3UC/FX2NC I/O extension blocks (connector type) or FX2N-16EYT-C

	Lower numbers							Higher 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

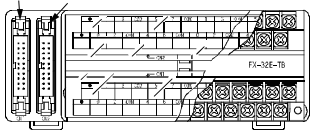


	Lower numbers							Higher numbers						
CN1	•	1	3	COM	5	7	COM	1	3	COM	5	7	COM
	•	0	2	COM	4	6	COM	0	2	COM	4	6	COM

When connected to the FX2N-16EX-C

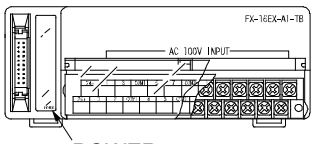
	Lower numbers							Higher numbers						
CN2	24+	1	3	•	5	7	•	1	3	•	5	7	•
	24+	0	2	•	4	6	•	0	2	•	4	6	•

CN1 CN2



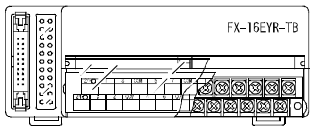
	Lower numbers							Higher numbers						
CN1	24+	1	3	•	5	7	•	1	3	•	5	7	•
	24+	0	2	•	4	6	•	0	2	•	4	6	•

3. FX-16EX-A1-TB



	Lower numbers								Higher 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		

4. 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



	Lower numbers								Higher 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		

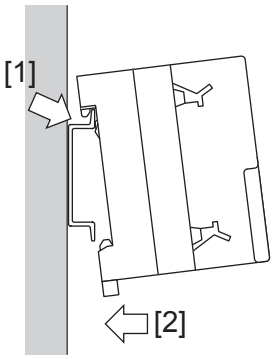
8.4 Installation Work

→ **Refer to "3.2 Installation location".**

8.4.1 Mounting/Removal

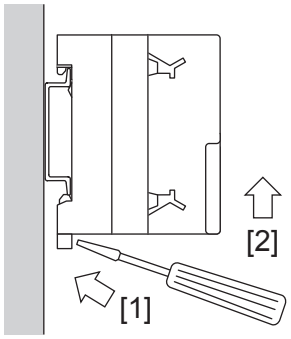
1. Mounting method

1) Turn OFF all power supplies connected to the PLC, input/output devices, and terminal blocks.
2) Align the top side of the "DIN rail mounting groove" (refer to [1] at right).
3) Press the product onto the DIN rail (refer to [2] at right).



2. Removal method

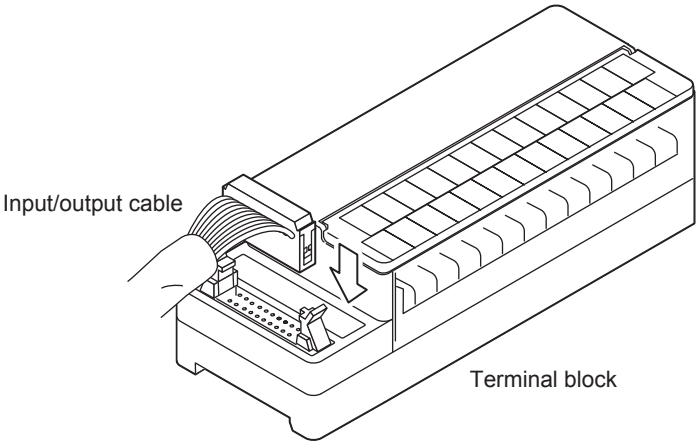
1) Turn the power supply OFF.
2) Disconnect the wiring and input/output cables.
3) Place a flathead screwdriver against the DIN rail mounting hook in the posture shown (refer to [1] at right).
4) Move the flathead screwdriver in direction shown at right (refer to [2] at right) to detach the DIN rail mounting hook from the DIN rail.
5) Remove the product from the DIN rail.



8.4.2 Input/output cable connection

The terminal block's CN1 and CN2 connectors comply with the MIL-83503 standard.

→ **Refer to "3.7 Connection to Input/Output Connector".**



8.4.3 Connection to terminal block

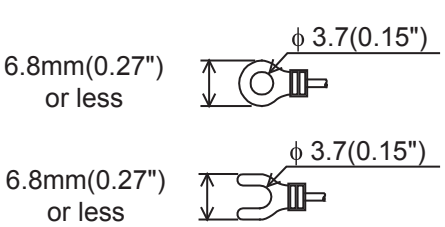
1. The product terminal screws are as shown in the table below.

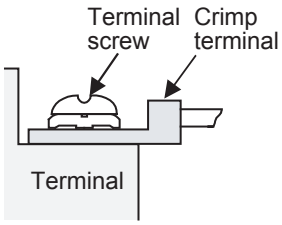
Model Name	Terminal Screw Size
FX-16E-TB, FX-16E-TB/UL, FX-32E-TB, FX-32E-TB/UL, FX-16EX-A1-TB, FX-16EYR-TB, FX-16EYR-ES-TB/UL, FX-16EYT-TB, FX-16EYT-ES-TB/UL, FX-16EYT-ESS-TB/UL, FX-16EYS-TB, FX-16EYS-ES-TB/UL	M3.5

2. Crimp terminal sizes vary according to the wiring method.

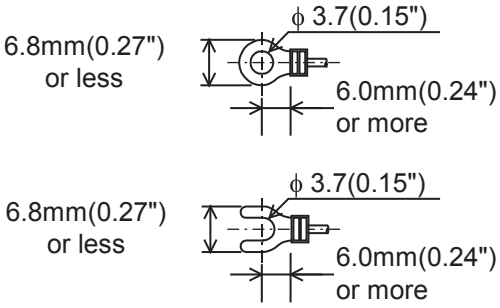
Use the sizes shown below.
Tighten the terminals to a torque of 0.5 to 0.8 N•m.
Do not tighten terminal screws with a torque outside the above-mentioned range.
Failure to do so may cause equipment failures or malfunctions.

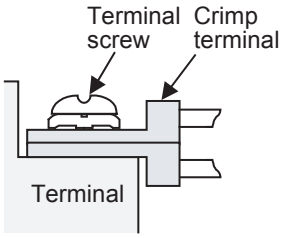
- When 1 wire is connected to 1 terminal:
  Use a crimp terminal of the size shown below, and install it as shown in the lower right figure.





- When 2 wires are connected to 1 terminal:
  Use a crimp terminal of the size shown below, and install it as shown in the lower right figure.



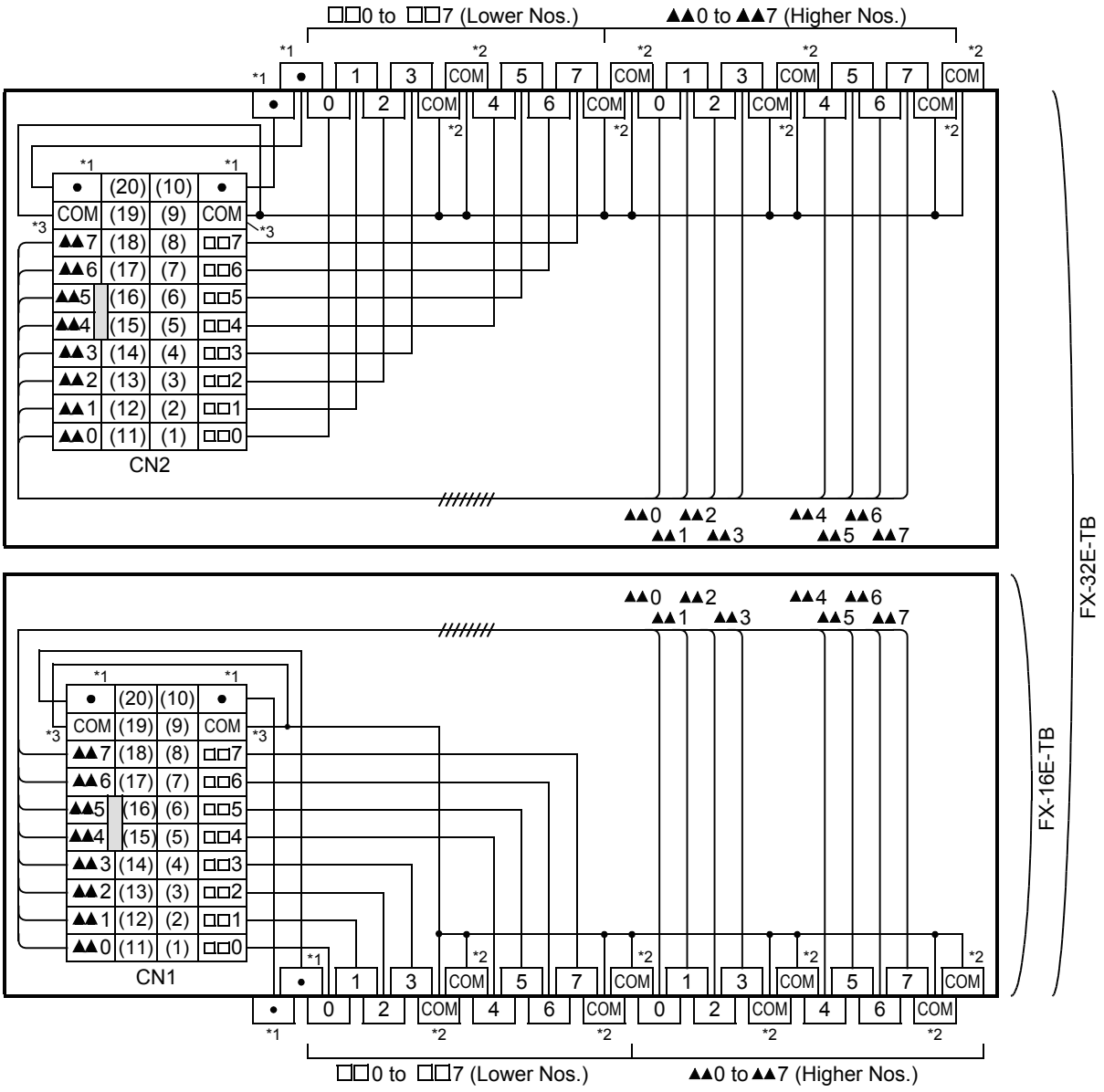


8.5 FX-16E-TB/FX-32E-TB

Connect the FX-16E-TB/FX-32E-TB to the main unit or extension block shown in the table below.

	Input connector	Output connector
Connectable models	FX3GC-32MT/D, FX2NC-□□EX, FX2N-16EX-C	FX3GC-32MT/D, FX2NC-□□EYT, FX2N-16EYT-C

8.5.1 Internal circuit



*1. "24+" when connected to FX2N-16EX-C.

*2. " • " when connected to FX2N-16EX-C.

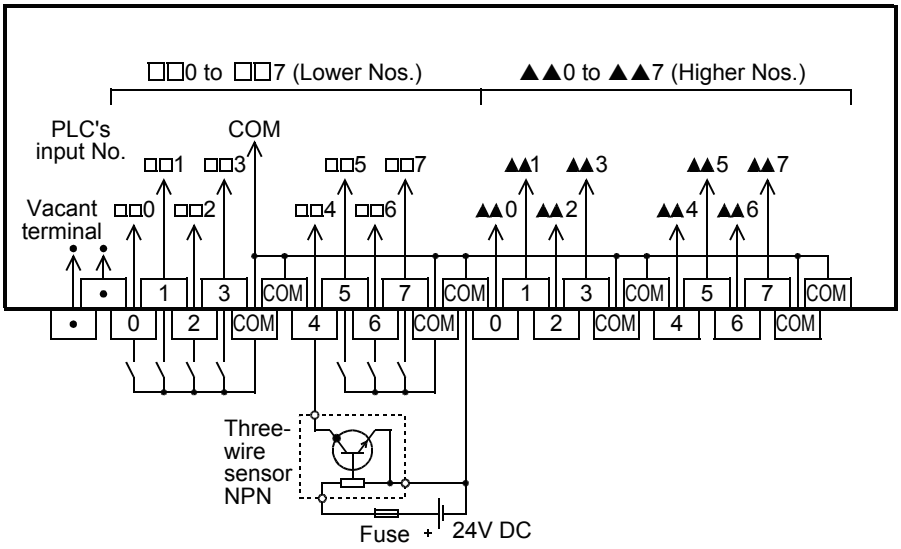
*3. " • " when connected to FX2N-16EX-C.
"COM1", "COM2" or "COM3" in accordance with the connector when connected to output connector.

8.5.2 Example of input external wiring [sink wiring]

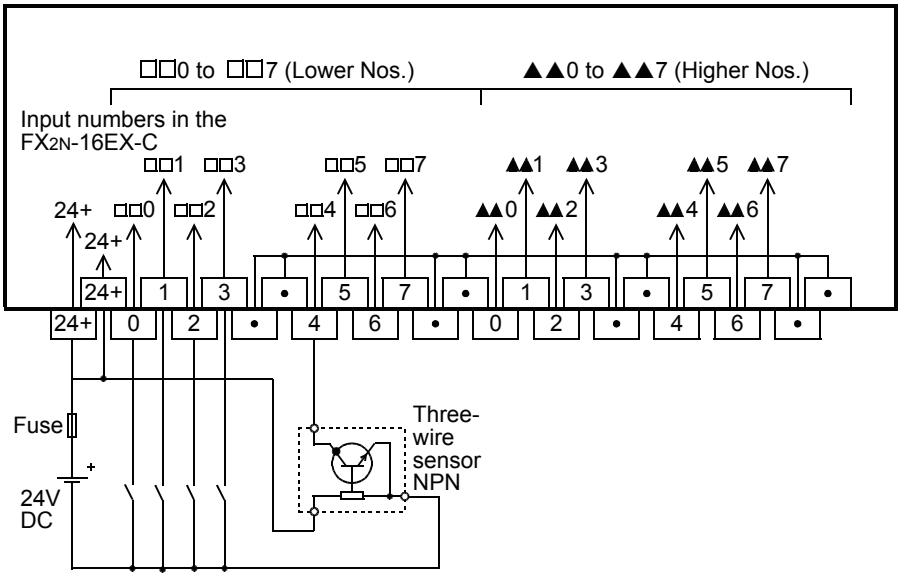
WIRING PRECAUTIONS **⚠CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

1. When connected to the FX3GC-32MT/D and FX2NC-□□EX input connector.



2. When connected to an FX2N-16EX-C input connector.

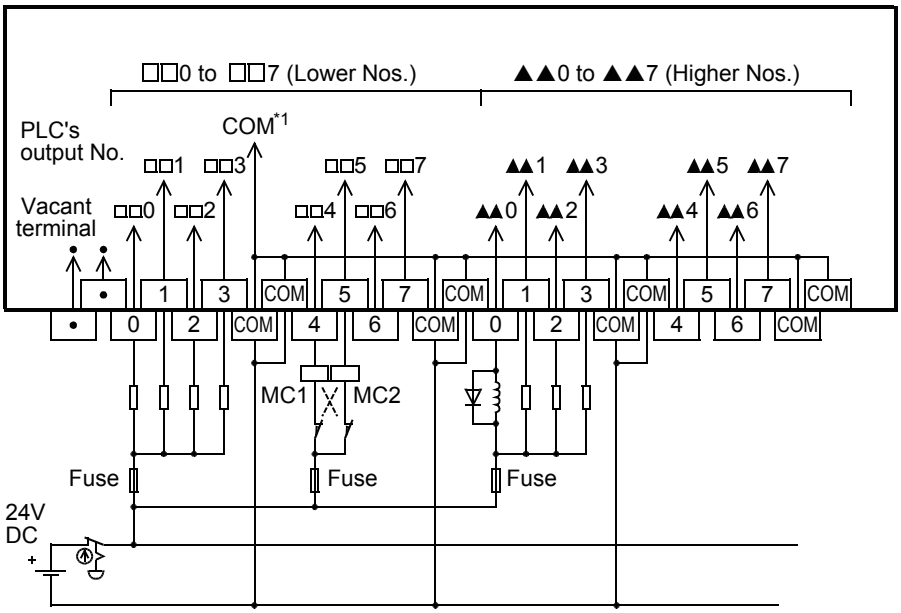


8.5.3 Example of output external wiring [sink wiring]

WIRING PRECAUTIONS ⚠ **CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

1. When connected to the FX3GC-32MT/D, FX2NC-□□EYT and FX2N-16EYT-C output connector.



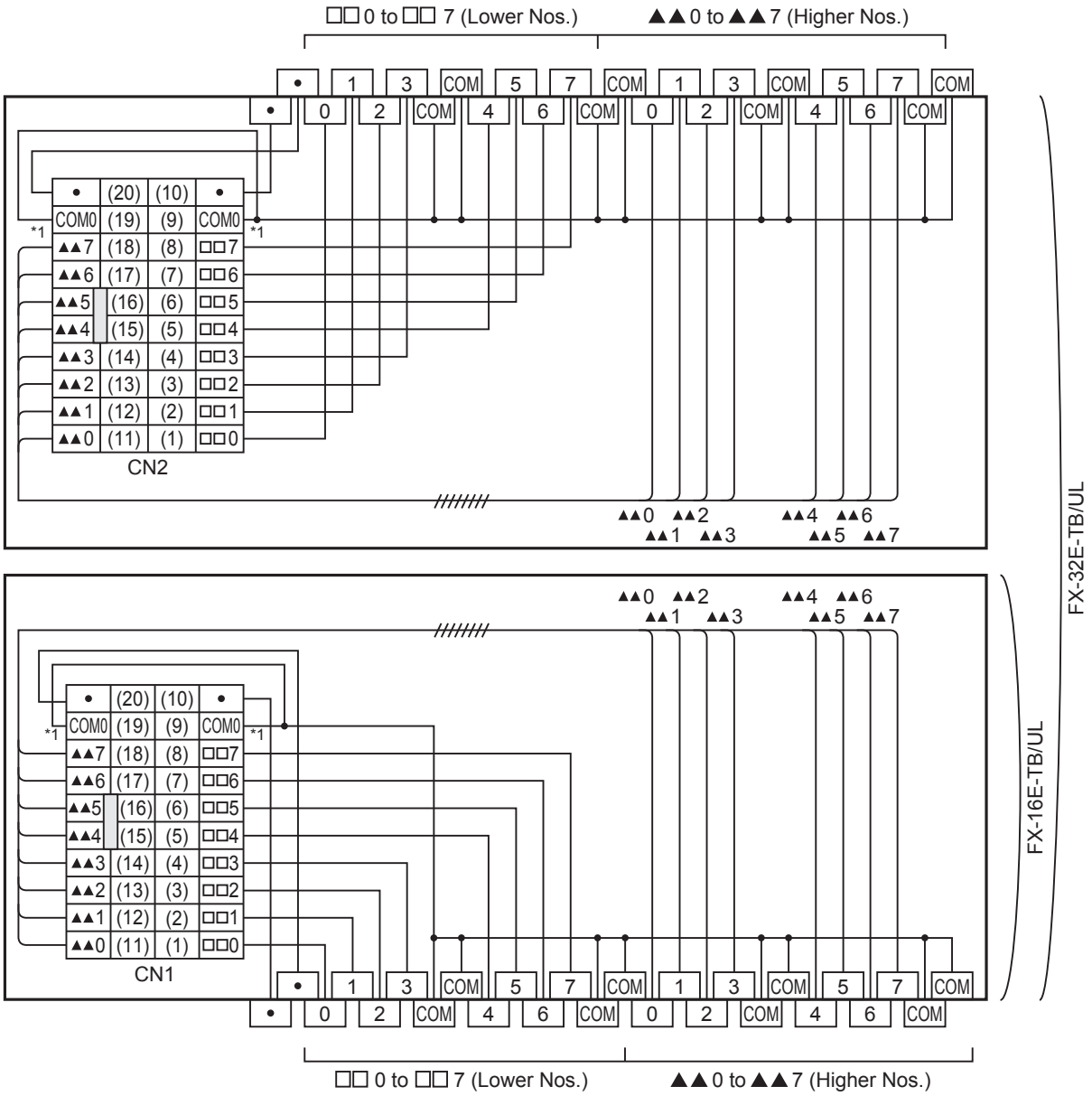
*1. "COM1", "COM2" or "COM3" in accordance with connected connector.

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

Connect the FX-16E-TB/FX-32E-TB to the main unit or extension block shown in the table below.

	Input connector	Output connector
Connectable models	FX3GC-32MT/DSS, FX2NC-□□EX-DS	FX3GC-32MT/DSS, FX2NC-□□EYT-DSS

8.6.1 Internal circuit



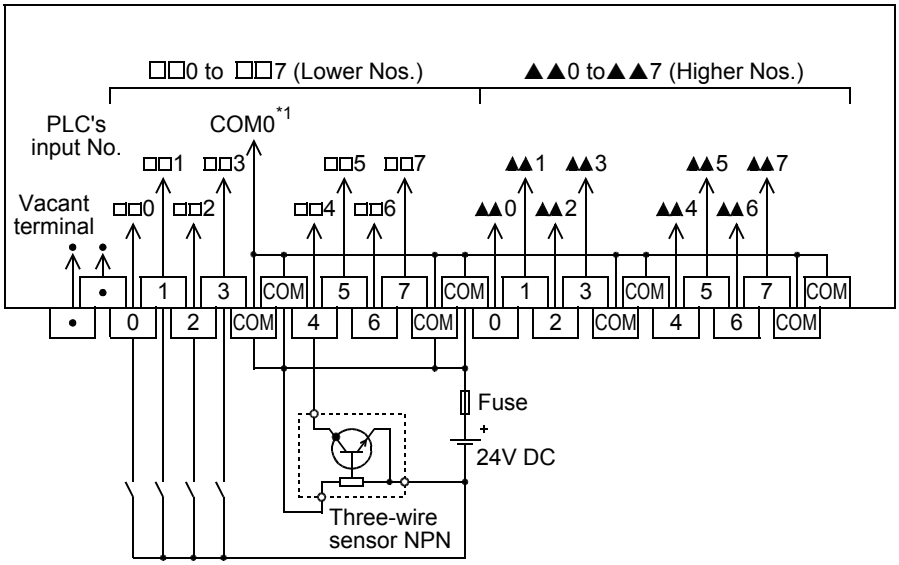
*1. Regard it as follows in accordance with the connected connector.
- Input connector : "COM1", "COM2"
- Output connector : "+V0", "+V1", "+V2"

8.6.2 Example of input external wiring [Sink/Source wiring]

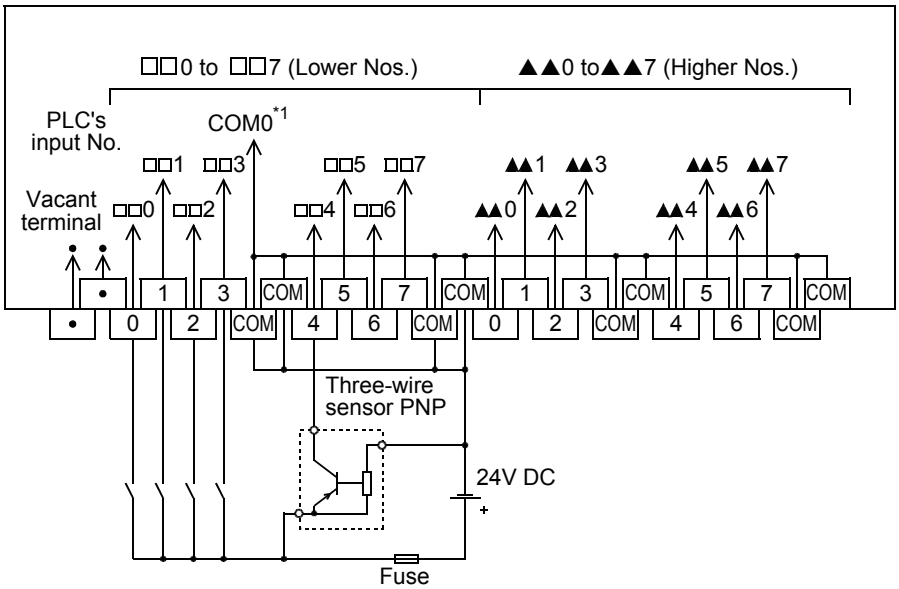
WIRING PRECAUTIONS **⚠CAUTION**

- Do not wire vacant terminals externally.
  Doing so may damage the product.

1. Connection to the input connector in the FX3GC-32MT/DSS or FX2NC-□□EX-DS for sink wiring



2. Connection to the input connector in the FX3GC-32MT/DSS or FX2NC-□□EX-DS for source wiring

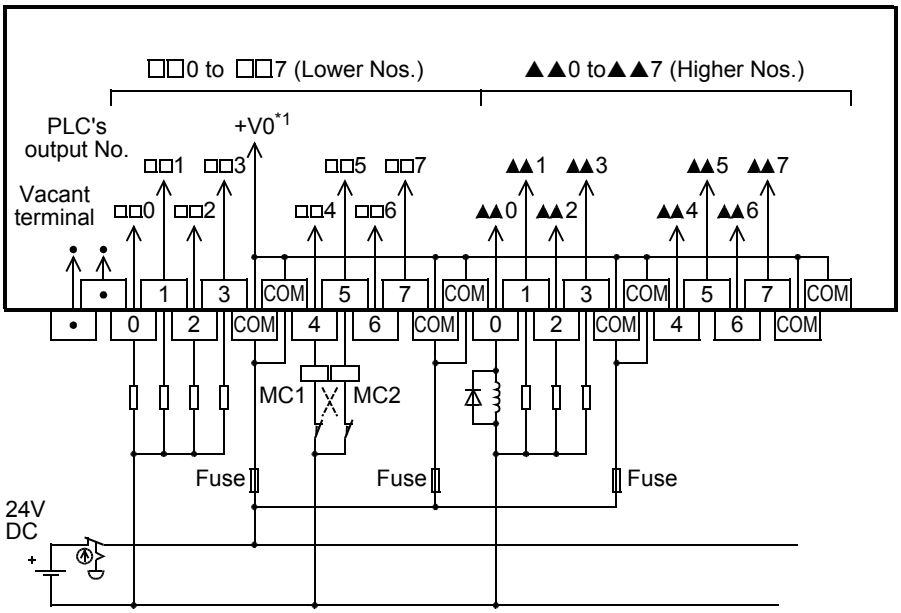


*1. "COM1" or "COM2" in accordance with connected connector

8.6.3 Example of output external wiring [Source wiring]

WIRING PRECAUTIONS	**⚠CAUTION**
• Do not wire vacant terminals externally. Doing so may damage the product.	

1. When connected to the FX3GC-32MT/DSS and FX2NC-□□EYT-DSS output connector



*1. "+V1" or "+V2" in accordance with connected connector

8.7 FX-16EX-A1-TB

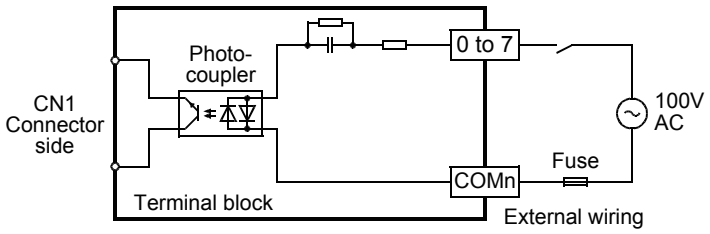
Connect the FX-16EX-A1-TB to the input connector in the main unit or extension block shown in the table below.

	Input connector
Connectable models	FX3GC-32MT/D, FX2NC-□□EX, FX2N-16EX-C

The applications shown below are not supported.

	Unsupported Applications
High-speed processing	High-speed counter, input interruption, pulse catch, pulse width/pulse period measurement function, speed detection (SPD) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Other	Absolute current value read (ABS) instruction

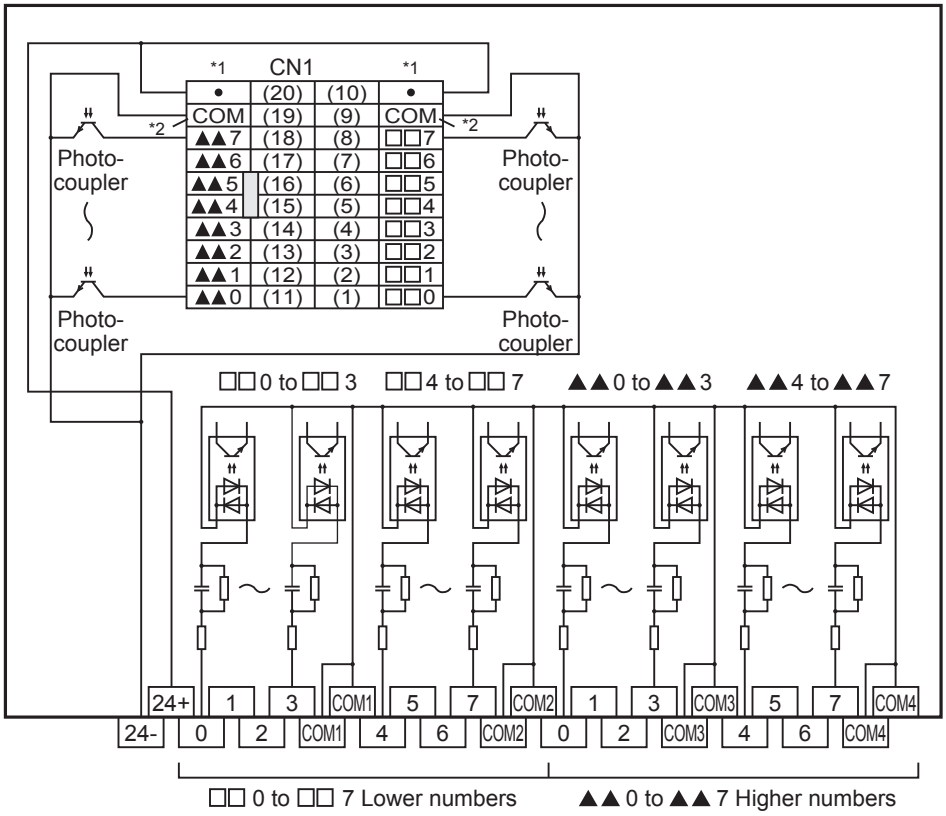
8.7.1 Specifications

Item		FX-16EX-A1-TB
Connection form		Terminal block (M3.5 screw) The connection with the PLC is the connector.
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 6.2 mA/110 V AC 60 Hz
Input impedance		Approx. 21 kΩ/50 Hz 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
Response time *1		30 ms or less
Input signal format		Voltage contact
Circuit isolation		Photocoupler isolation
Operation indicators		No input LEDs (equipped with 24 V power supply LED indicator)
Power consumption		1.2 W (48 mA 24 V DC)*2
Input/output circuitry		

*1. This response time does not include the response delay at the PLC.

*2. 3.9 W (160 mA, 24 V DC) is required when connected to the FX2N-16EX-C.

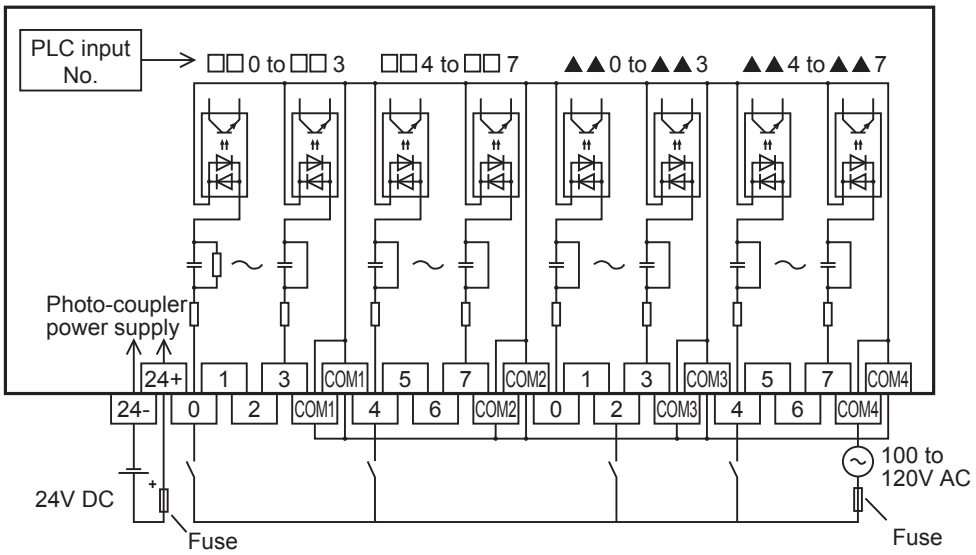
8.7.2 Internal circuit



*1. "24+" when connected to FX2N-16EX-C.

*2. " • " when connected to FX2N-16EX-C.

8.7.3 Example of input external wiring



8.8 FX-16EYR-TB

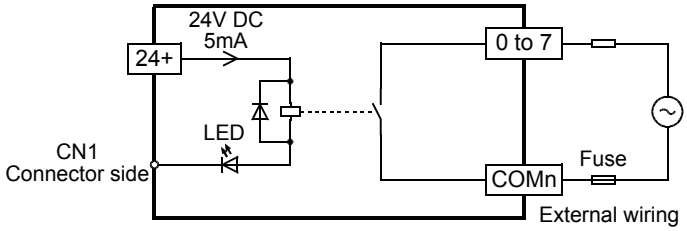
Connect the FX-16EYR-TB to the output connector in the main unit or extension block shown in the table below.

	Output connector
Connectable models	FX3GC-32MT/D, FX2NC-□□EYT, FX2N-16EYT-C

The applications shown below are not supported.

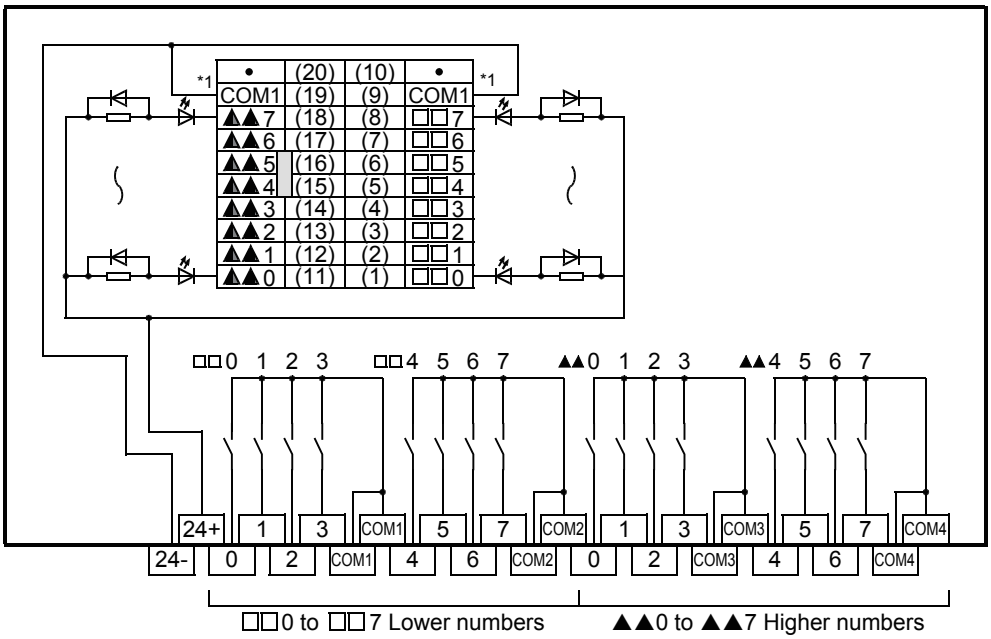
	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning mode (TBL) instruction, absolute current value read (ABS) instruction, zero return (ZRN) instruction, variable speed pulse output (PLSV) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

8.8.1 Specifications

Item		FX-16EYR-TB	
Connection form		Terminal block (M3.5 screw) The connection with the PLC is the connector.	
Output type		Relay	
External power supply		250 V AC or less, 30 V DC or less	
Max.load	**Resistance load**	2 A/1 point	Make sure that the total load current of 4 resistance load points is 8 A or less.
	Inductive load	80 VA	
Min. load		5 V DC, 2 mA Reference value	
Open-circuit leakage current		-	
Response time *1		Approx. 10 ms	
Circuit isolation		Mechanical isolation	
Operation indicators		LED lights when relay coil power is supplied	
Power consumption		1.92 W (80 mA 24 V DC)	
Input/output circuitry			

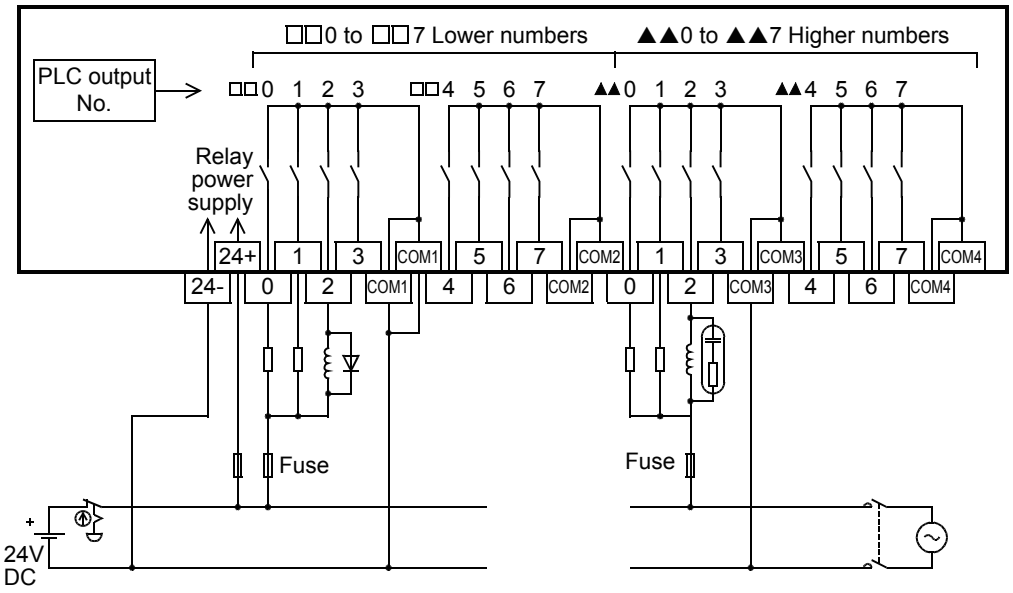
*1. This response time does not include the response delay at the PLC.

8.8.2 Internal circuit



*1. "COM2" or "COM3" in accordance with connected connector

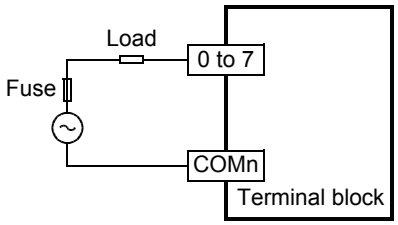
8.8.3 Example of output external wiring



8.8.4 External wiring precautions

1. Protection circuit for load short-circuits

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.



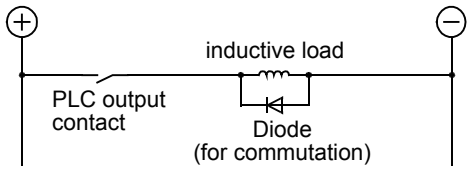
2. Contact protection circuit for inductive loads

An internal protection circuit for the relays is not provided for the relay output circuit in the terminal block. 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.

1) DC circuit

Connect a diode (for commutation) parallel to the load.

The diode (for commutation) must comply with the following specifications.

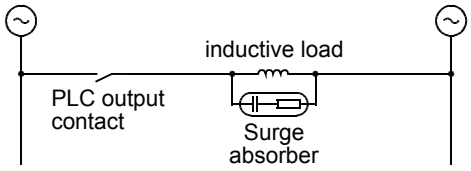


	Guide
Counter voltage	5 to 10 times of the load voltage
Forward current	Load current or more

2) AC circuit

Connect the surge absorber (combined CR components such as a surge killer and spark killer, etc.), parallel to the load.

Select the rated voltage of a surge absorber that is suitable for the load being used. Refer to the table below for other specifications.



Item	Guide
Static electricity capacity	Approx. 0.1 μF
Forward current	Approx. 100 to 200 Ω

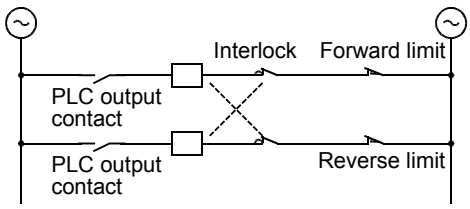
Reference

Manufacturer	Model name
Okaya Electric Industries Co., Ltd.	CR-10201

Manufacturer	Model name
Rubycon Corporation	250MCRA104100M B0325

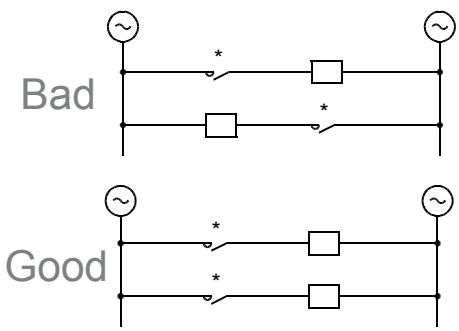
3. Interlock

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 the PLC's internal programs as shown to the right.



4. In-phase

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



8.8.5 Product life of relay contacts

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

1. Inductive load

Inductive loads generate large reverse electromotive force between contacts at shutdown, which may cause arcing. At a fixed current consumption, as the power factor (phase between current and voltage) gets smaller, the arc energy gets larger.
The standard life of contacts used for Inductive loads, such as contactors and solenoid valves, is 500,000 operations at 35 VA.
The following table shows the approximate life of a relay based on the results of an operation life test.

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

Load capacity		Contact life
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.

→ **For precautions on using inductive loads, refer to Subsection 8.8.4-2.**

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.

2. 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.

3. 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.

→ **For the maximum specified resistance load, refer to Subsection 8.8.1.**

8.9 FX-16EYR-ES-TB/UL

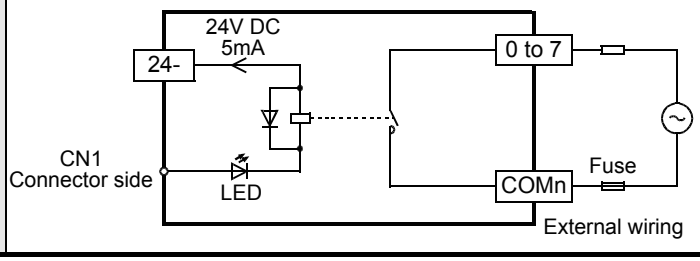
Connect the FX-16EYR-ES-TB/UL to the output connector in the main unit or extension block shown in the table below.

	Output connector
Connectable models	FX3GC-32MT/DSS, FX2NC-□□EYT-DSS

The applications shown below are not supported.

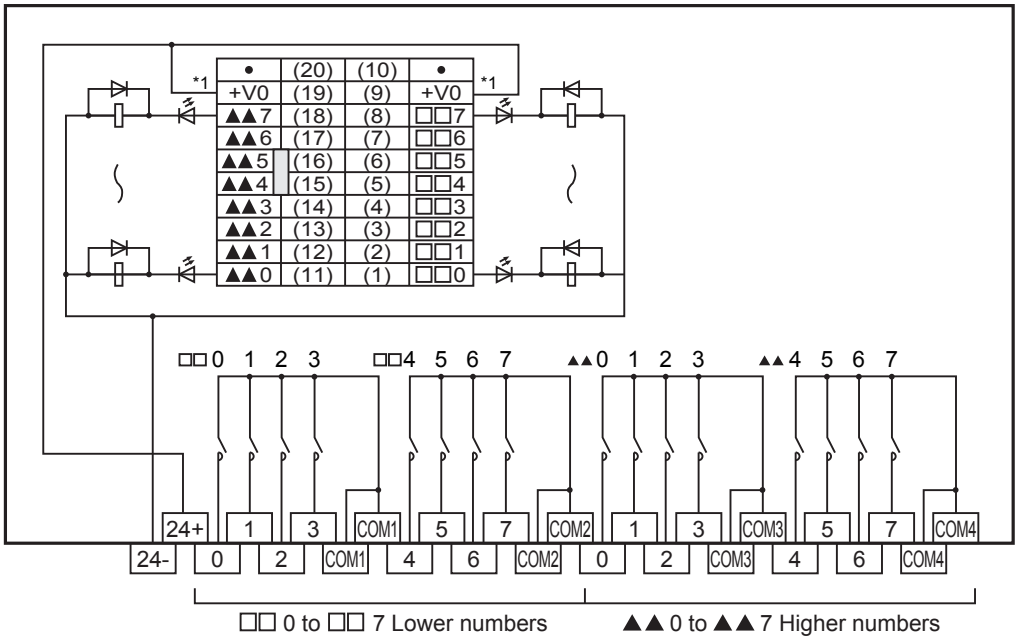
	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning mode (TBL) instruction, absolute current value read (ABS) instruction, zero return (ZRN) instruction, variable speed pulse output (PLSV) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

8.9.1 Specifications

Item		FX-16EYR-ES-TB/UL	
Connection form		Terminal block (M3.5 screw) The connection with the PLC is the connector.	
Output type		Relay	
External power supply		250 V AC or less,30 V DC or less	
Max.load	**Resistance load**	2 A/1 point	Make sure that the total load current of 4 resistance load points is 8 A or less.
	Inductive load	80 VA	
Min. load		5 V DC, 2 mA (Reference value)	
Open-circuit leakage current		-	
Response time *1		Approx. 10 ms	
Circuit isolation		Mechanical isolation	
Operation indicators		LED lights when relay coil power is supplied	
Power consumption		1.92 W (80 mA 24 V DC)	
Input/output circuitry			

*1. This response time does not include the response delay at the PLC.

8.9.2 Internal circuit



*1. "+V1" or "+V2" in accordance with connected connector

8.9.3 Example of output external wiring

The example of output external wiring is the same as FX-16EYR-TB. Refer to Subsection 8.8.3.

8.9.4 External wiring precautions

The caution on external wiring is the same as FX-16EYR-TB. Refer to Subsection 8.8.4.

8.9.5 Product life of relay contacts

Product life of relay contacts is the same as FX-16EYR-TB. Refer to Subsection 8.8.5.

8.10 FX-16EYT-TB

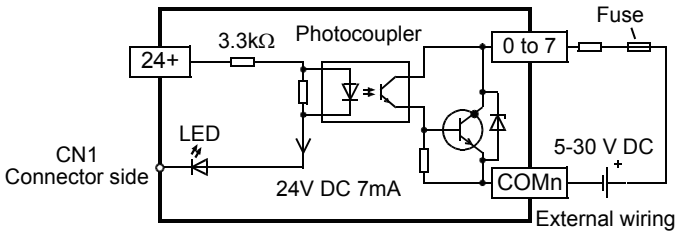
Connect the FX-16EYT-TB to the output connector in the main unit or extension block shown in the table below.

	Output connector
Connectable models	FX3GC-32MT/D, FX2NC-□□EYT, FX2N-16EYT-C

The applications shown below are not supported.

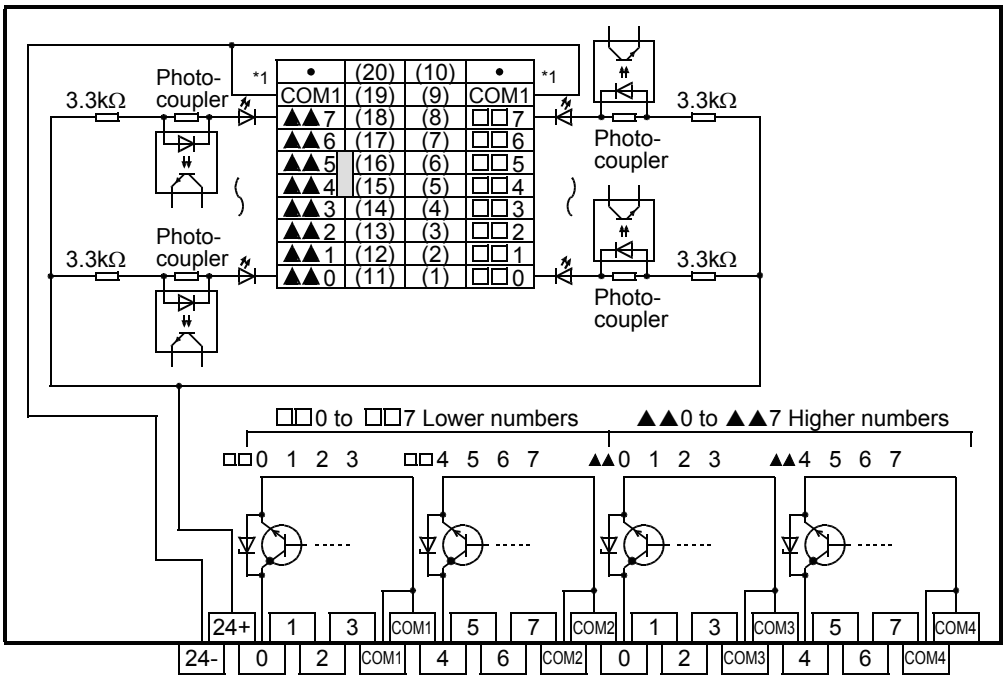
	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning mode (TBL) instruction, absolute current value read (ABS) instruction, zero return (ZRN) instruction, variable speed pulse output (PLSV) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

8.10.1 Specifications

Item		FX-16EYT-TB	
Connection form		Terminal block (M3.5 screw) The connection with the PLC is the connector.	
input type/form		Transistor/sink output	
External power supply		5-30 V DC	
Max.load	**Resistance load**	0.5 A/1 point	Make sure that the total load current of 4 resistance load points is 0.8 A or less.
	Inductive load	12 W/24 V DC	
Open-circuit leakage current		0.1 mA/30 V DC	
Response time	**OFF → ON**[*1]	0.2 ms or less/24 V DC	
	ON → OFF[*1]	1.5 ms or less/24 V DC	
Output element's ON voltage		1.5 V	
Circuit isolation		Photocoupler isolation	
Operation indicators		LED lights when photo-thyristor power is supplied	
Power consumption		2.7 W (112 mA 24 V DC)	
Input/output circuitry			

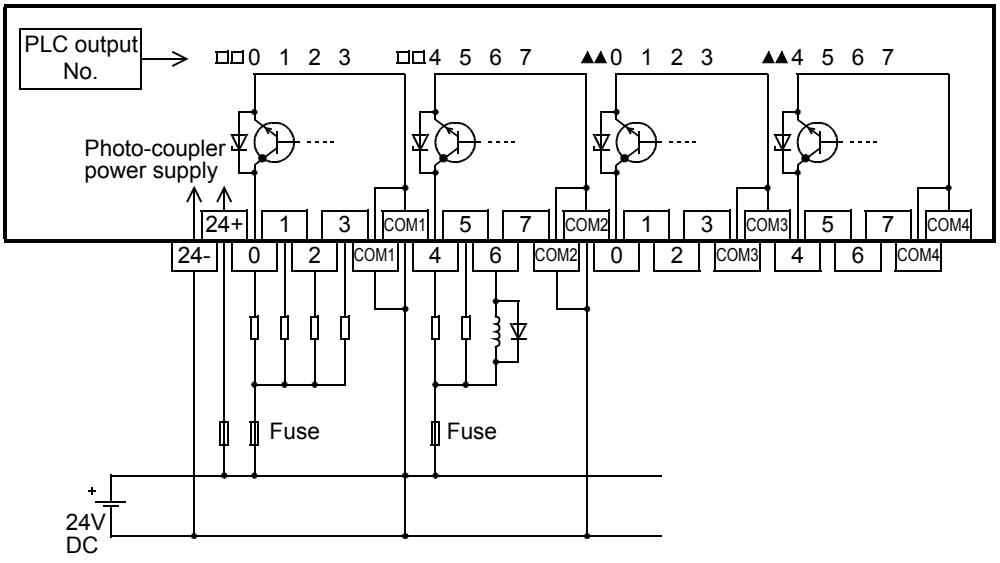
*1. This response time does not include the response delay at the PLC.

8.10.2 Internal circuit



*1. "COM2" or "COM3" in accordance with connected connector

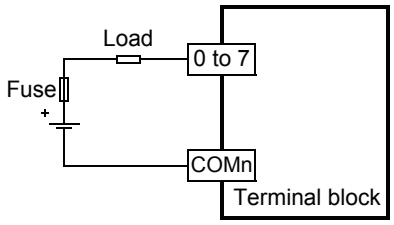
8.10.3 Example of output external wiring



8.10.4 External wiring precautions

1. Protection circuit for load short-circuits

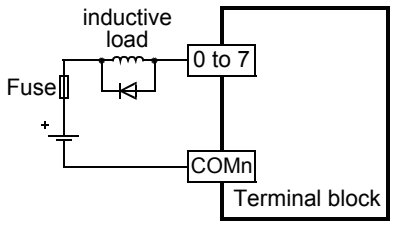
A short-circuit at a load connected to an output terminal could cause burnout at the output element or the PCB. To prevent this, a protection fuse should be inserted at the output. Use a load power supply capacity that is at least 2 times larger than the total rated fuse capacity.



2. Transistor protection circuit for inductive loads

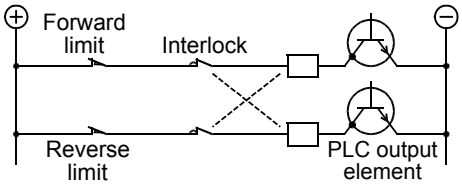
The transistor output circuit in the terminal block is equipped with a Zener diode (50 V) for protection. When an inductive load is connected, however, a diode should be connected parallel to the load when required. The diode must comply with the specifications shown below.

Counter voltage	5 to 10 times of the load voltage
Forward current	Load current or more



3. 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 the PLC's internal programs as shown to the right.



8.11 FX-16EYT-ES-TB/UL

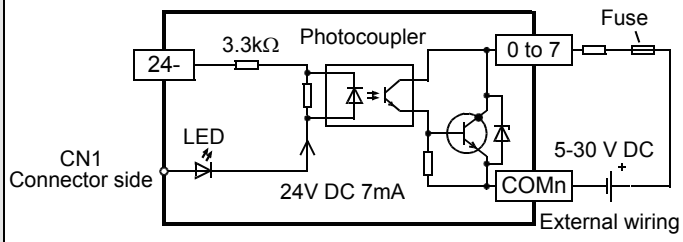
Connect the FX-16EYT-ES-TB/UL to the output connector in the main unit or extension block shown in the table below.

	Output connector
Connectable models	FX3GC-32MT/DSS, FX2NC-□□EYT-DSS

The applications shown below are not supported.

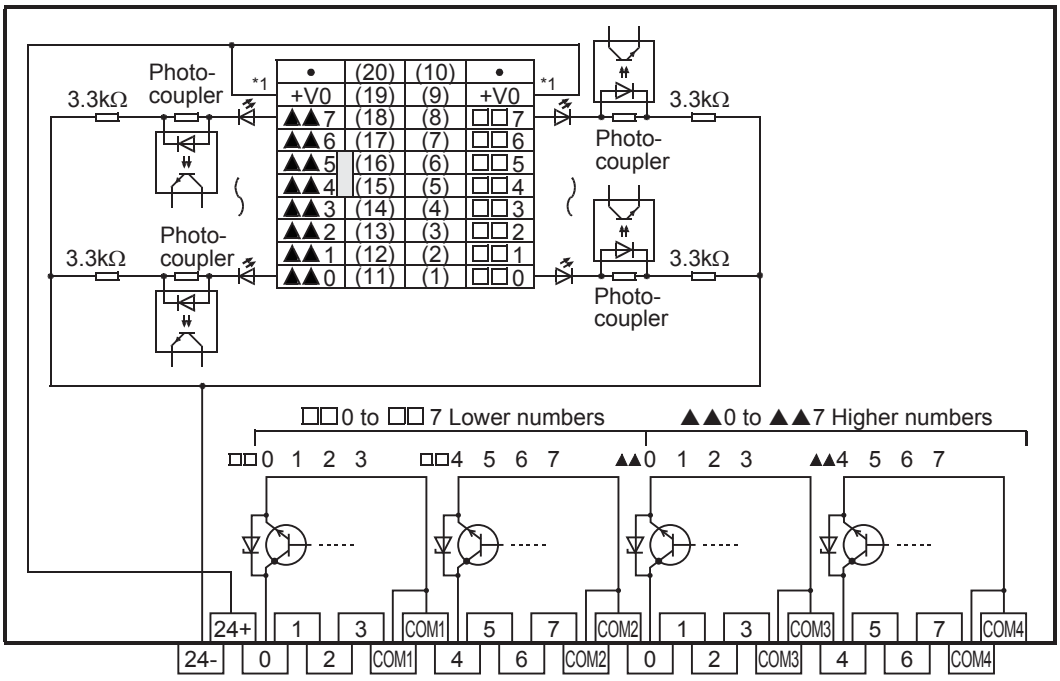
	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning mode (TBL) instruction, absolute current value read (ABS) instruction, zero return (ZRN) instruction, variable speed pulse output (PLSV) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

8.11.1 Specifications

Item		FX-16EYT-ES-TB/UL	
Connection form		Terminal block (M3.5 screw) The connection with the PLC is the connector.	
Output type		Transistor/sink output	
External power supply		5-30 V DC	
Max. load	**Resistance load**	0.5 A/1 point	Make sure that the total load current of 4 resistance load points is 0.8 A or less.
	Inductive load	12 W/24 V DC	
Open-circuit leakage current		0.1 mA/30 V DC	
Response time	**OFF → ON**[*1]	0.2 ms or less/24 V DC	
	ON → OFF[*1]	1.5 ms or less/24 V DC	
Output element's ON voltage		1.5 V	
Circuit isolation		Photocoupler isolation	
Operation indicators		LED lights when photo-thyristor power is supplied	
Power consumption		2.7 W (112 mA 24 V DC)	
Input/output circuitry			

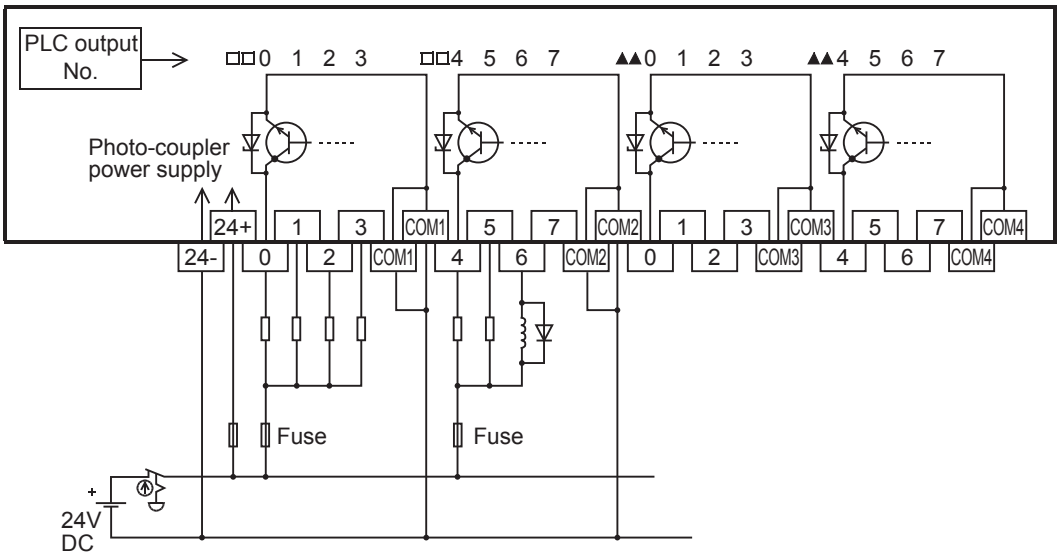
*1. This response time does not include the response delay at the PLC.

8.11.2 Internal circuit



*1. "+V1" or "+V2" in accordance with connected connector

8.11.3 Example of output external wiring



8.11.4 External wiring precautions

The caution on external wiring is the same as FX-16EYT-TB. Refer to Subsection 8.10.4.

8.12 FX-16EYT-ESS-TB/UL

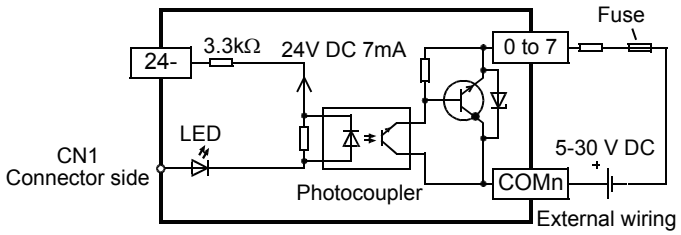
Connect the FX-16EYT-ESS-TB/UL to the output connector in the main unit or extension block shown in the table below.

	Output connector
Connectable models	FX3GC-32MT/DSS, FX2NC-□□EYT-DSS

The applications shown below are not supported.

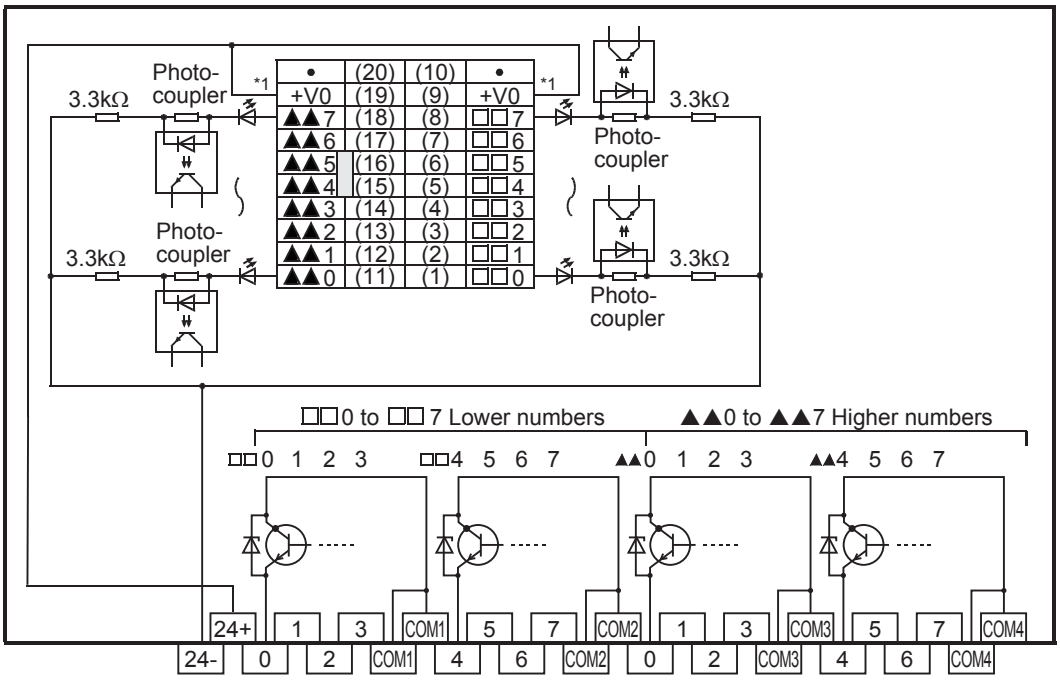
	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning mode (TBL) instruction, absolute current value read (ABS) instruction, zero return (ZRN) instruction, variable speed pulse output (PLSV) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

8.12.1 Specifications

Item		FX-16EYT-ESS-TB/UL	
Connection form		Terminal block (M3.5 screw) The connection with the PLC is the connector.	
Output type/form		Transistor/source output	
External power supply		5-30 V DC	
Max. load	**Resistance load**	0.5 A/1 point	Make sure that the total load current of 4 resistance load points is 0.8 A or less.
	Inductive load	12 W/24 V DC	
Open-circuit leakage current		0.1 mA/30 V DC	
Response time	**OFF → ON**[*1]	0.2 ms or less/24 V DC	
	ON → OFF[*1]	1.5 ms or less/24 V DC	
Output element's ON voltage		1.5 V	
Circuit isolation		Photocoupler isolation	
Operation indicators		LED lights when photo-coupler power is supplied	
Power consumption		2.7 W (112 mA 24 V DC)	
Input/output circuitry			

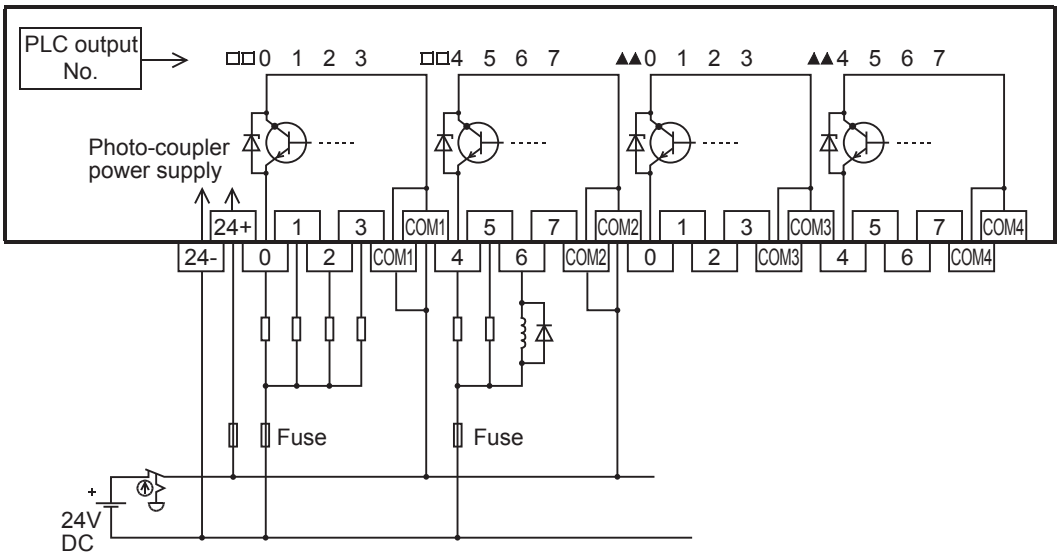
*1. This response time does not include the response delay at the PLC.

8.12.2 Internal circuit



*1. "+V1" or "+V2" in accordance with connected connector

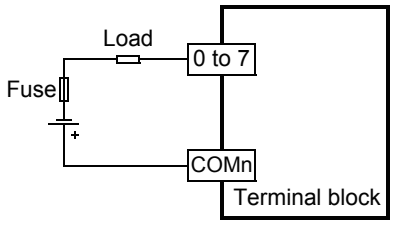
8.12.3 Example of output external wiring



8.12.4 External wiring precautions

1. Protection circuit for load short-circuits

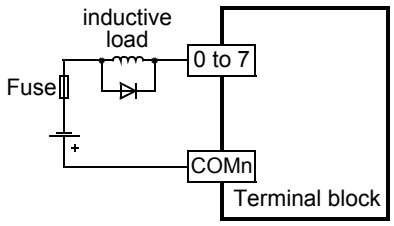
A short-circuit at a load connected to an output terminal could cause burnout at the output element or the PCB. To prevent this, a protection fuse should be inserted at the output. Use a load power supply capacity that is at least 2 times larger than the total rated fuse capacity.



2. Transistor protection circuit for inductive loads

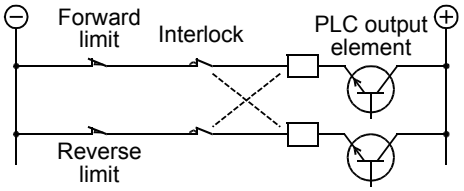
The transistor output circuit in the terminal block is equipped with a Zener diode (50 V) for protection. When an inductive load is connected, however, a diode should be connected parallel to the load when required. The diode must comply with the specifications shown below.

Counter voltage	5 to 10 times of the load voltage
Forward current	Load current or more



3. 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 the PLC's internal programs as shown to the right.



8.13 FX-16EYS-TB

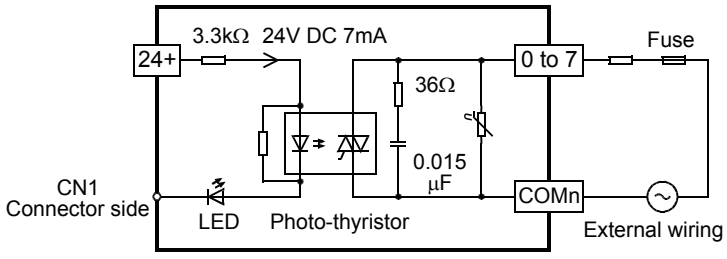
Connect the FX-16EYS-TB to the output connector in the main unit or extension block shown in the table below.

	Output connector
Connectable models	FX3GC-32MT/D, FX2NC-□□EYT, FX2N-16EYT-C

The applications shown below are not supported.

	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning mode (TBL) instruction, absolute current value read (ABS) instruction, zero return (ZRN) instruction, variable speed pulse output (PLSV) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

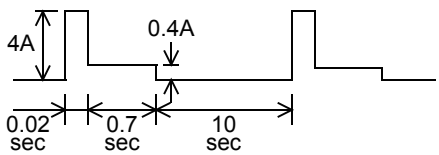
8.13.1 Specifications

Item		FX-16EYS-TB	
Connection form		Terminal block (M3.5 screw) The connection with the PLC is the connector.	
Output type		Triac (SSR)	
External power supply		85 to 242 V AC	
Max. load	Resistance load	0.3 A/point*1	Make sure that the total load current of 4 resistance load points is 0.8 A or less.
	Inductive load	15 VA/100 V AC 36 VA/200 V AC	
Min. load		0.4 VA/100 V AC 1.6 VA/200 V AC	
Open-circuit leakage current		1 mA/100 V AC 2 mA/200 V AC	
Response time*2		2 ms or less	
Circuit isolation		Photocoupler isolation	
Operation indicator		LED lights when photo-thyristor power is supplied	
Power consumption		2.7 W (112 mA 24 V DC)	
Input/output circuitry			

*1. In systems where frequent large-load ON/OFF switching occurs due to rush currents, the root mean square current should be 0.2 A or less.

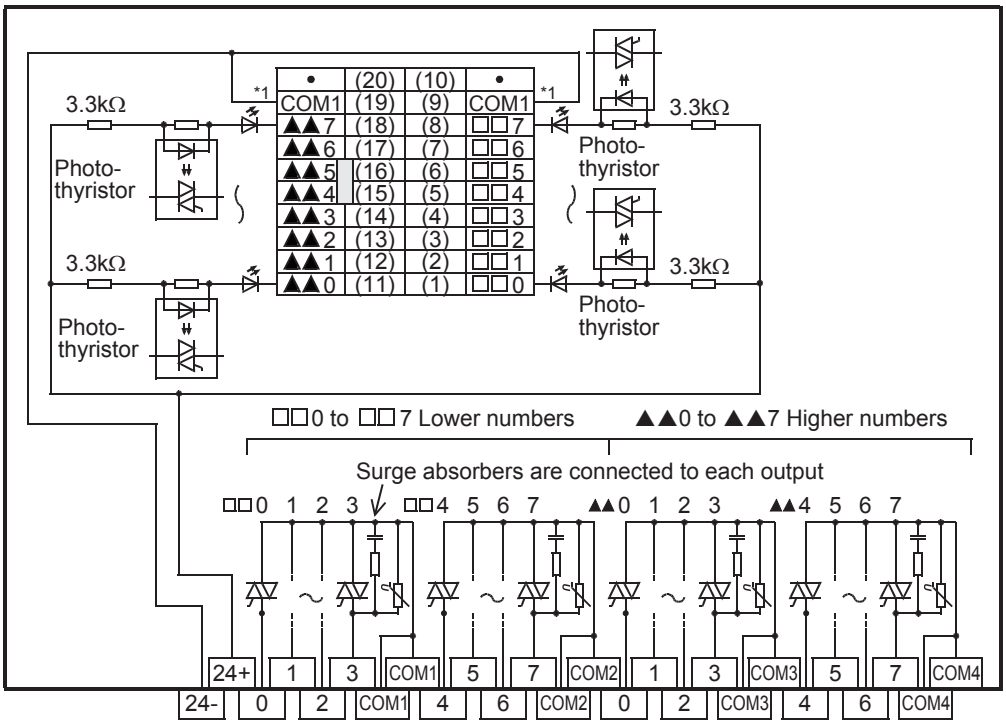
<Example>

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



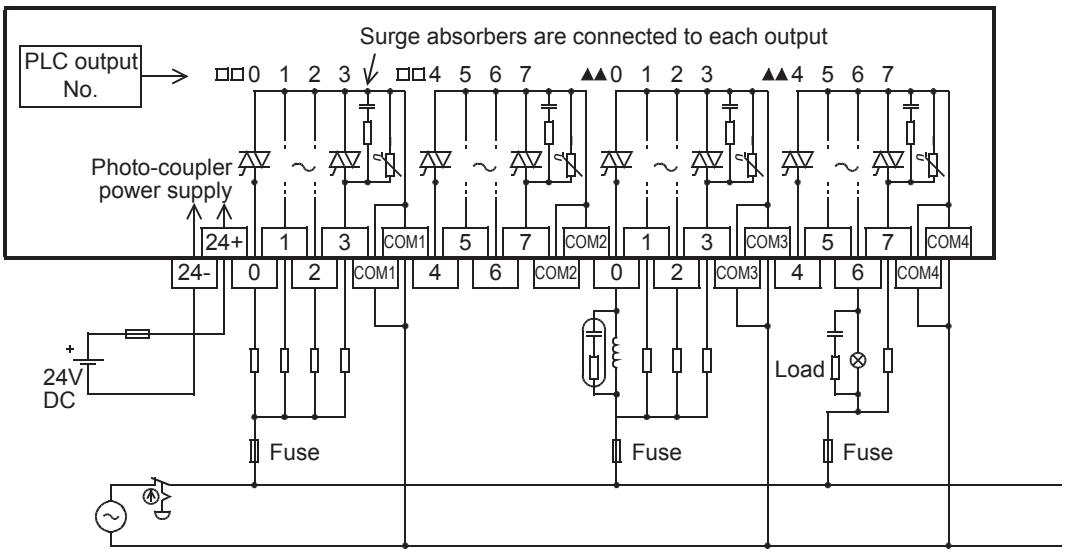
*2. This response time does not include the response delay at the PLC.

8.13.2 Internal circuit



*1. "COM2" or "COM3" in accordance with connected connector

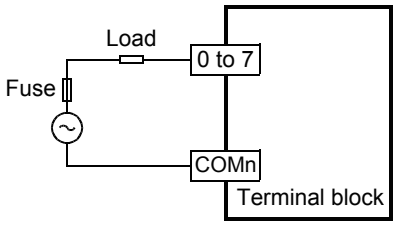
8.13.3 Example of output external wiring



8.13.4 External wiring precautions

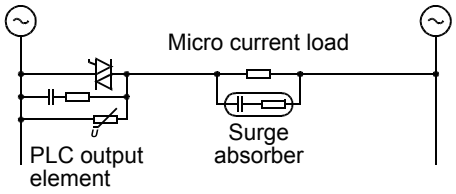
1. Protection circuit for load short-circuits

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.



2. Micro current load

The PLC's internal Triac output circuit is equipped with a turn-off C-R absorber. When connecting a very low current load of "0.4 VA/100 V AC or less or 1.6 VA/200 V AC or less", please connect a surge absorber parallel to the load.
Select the rated voltage of a surge absorber that is suitable for the load being used. Refer to the table below for other specifications.



Item	Guide
Static electricity capacity	Approx. 0.1 μF
Resistance value	Approx. 100 to 200 Ω

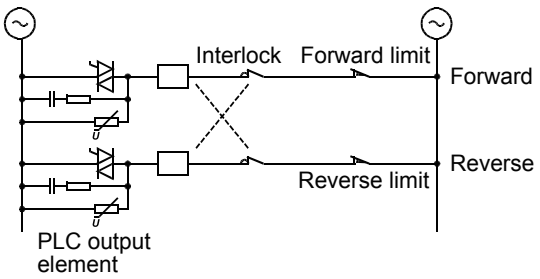
Reference

Manufacturer	Model name
Okaya Electric Industries Co., Ltd.	CR-10201

Manufacturer	Model name
Rubycon Corporation	250MCRA104100M B0325

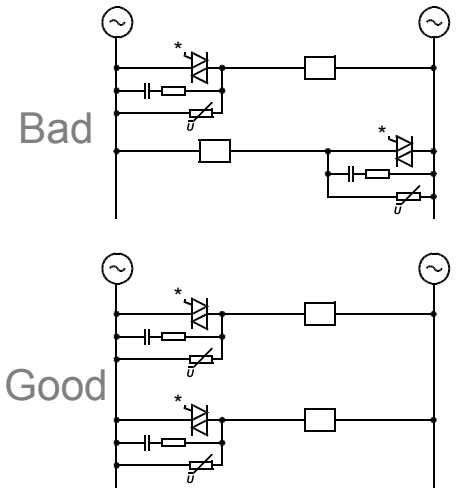
3. Interlock

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 the PLC's internal programs as shown to the right.



4. In-phase

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



8.14 FX-16EYS-ES-TB/UL

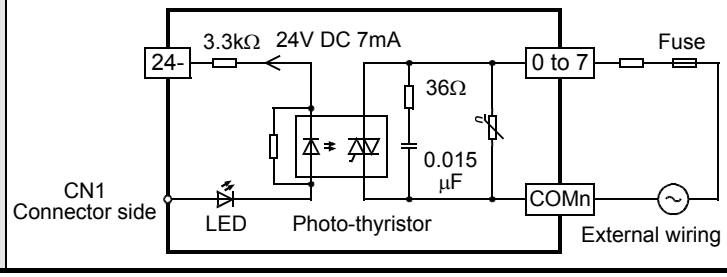
Connect the FX-16EYS-ES-TB/UL to the output connector in the main unit or extension block shown in the table below.

	Output connector
Connectable models	FX3GC-32MT/DSS, FX2NC-□□EYT-DSS

The applications shown below are not supported.

	Unsupported Applications
Pulse output	Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning mode (TBL) instruction, absolute current value read (ABS) instruction, zero return (ZRN) instruction, variable speed pulse output (PLSV) instruction, drive to increment (DRVI) instruction, drive to absolute (DRVA) instruction
Time division input	Input matrix (MTR) instruction, digital switch (DSW) instruction
Time division output	Seven segment with latch (SEGL) instruction

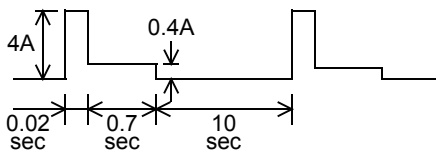
8.14.1 Specifications

Item		FX-16EYS-ES-TB/UL
Connection form		Terminal block (M3.5 screw) The connection with the PLC is the connector.
Output type		Triac (SSR)
External power supply		85 to 242 V AC
Max. load	**Resistance load**	0.3 A/point*1 Make sure that the total load current of 4 resistance load points is 0.8 A or less.
	Inductive load	15 VA/100 V AC 36 VA/200 V AC
Min. load		0.4 VA/100 V AC 1.6 VA/200 V AC
Open-circuit leakage current		1 mA/100 V AC 2 mA/200 V AC
Response time*2		2 ms or less
Circuit isolation		Photocoupler isolation
Operation indicator		LED lights when photo-thyristor power is supplied
Power consumption		2.7 W (112 mA 24 V DC)
Input/output circuitry		

*1. In systems where frequent large-load ON/OFF switching occurs due to rush currents, the root mean square current should be 0.2 A or less.

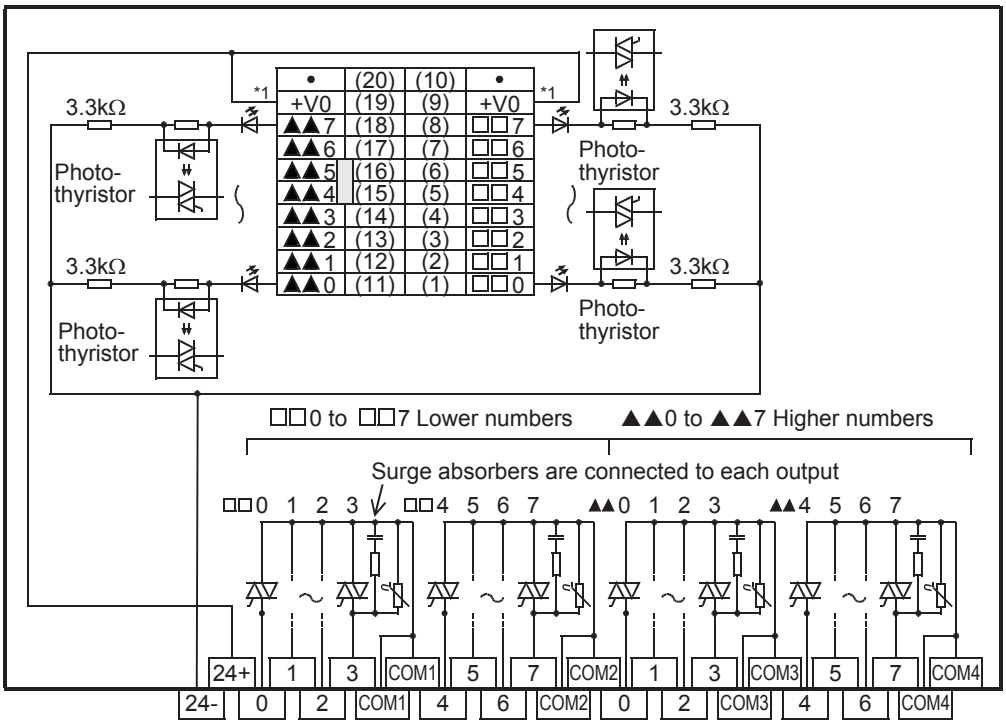
<Example>

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



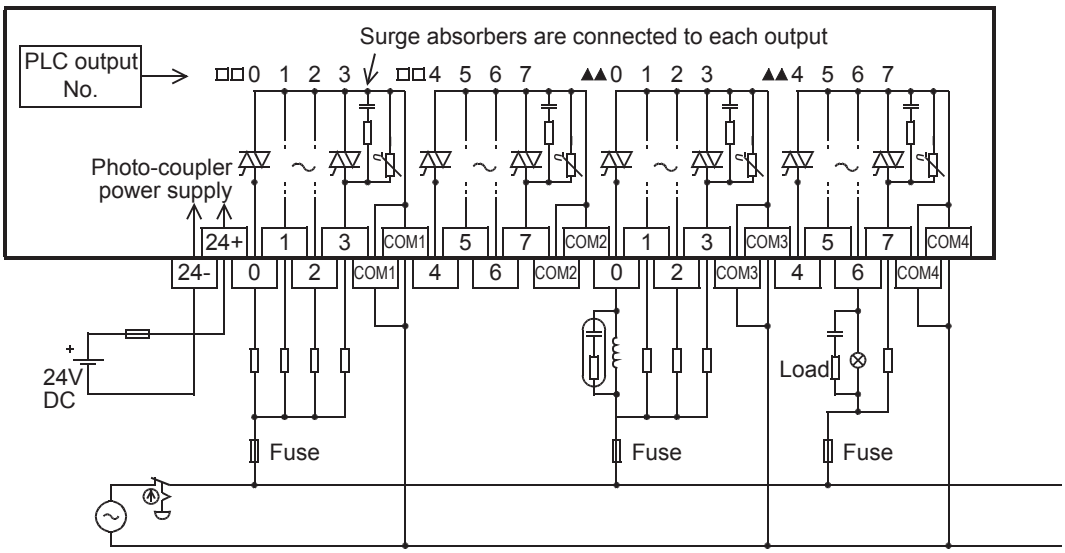
*2. This response time does not include the response delay at the PLC.

8.14.2 Internal circuit



*1. "+V1" or "+V2" in accordance with connected connector

8.14.3 Example of output external wiring



8.14.4 External wiring precautions

The caution on external wiring is the same as FX-16EYS-TB. Refer to Subsection 8.13.4.

9. Battery

STARTUP AND MAINTENANCE PRECAUTIONS **⚠WARNING**

- Use the battery for memory backup correctly in conformance to this manual.
  - Use the battery only for the specified purpose.
  - 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 forces (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 heat excessive generation, bursting, ignition, liquid leakage or deformation, and lead to injury, fire or failures and malfunctions of facilities and other equipment.
  - When replacing the battery, make sure to use our specified product (FX3U-32BL).
  - When a battery error occurs ("ALM" LED is lit in red), follow the description in this manual.

STARTUP AND MAINTENANCE PRECAUTIONS **⚠CAUTION**

- Turn off the power to the PLC before attaching or detaching the following devices.
  Failure to do so may cause equipment failures or malfunctions.
  - Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery

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 of the Battery Directive in EU countries, refer to Appendix G.)

TRANSPORTATION AND STORAGE PRECAUTIONS **⚠CAUTION**

- When transporting the FX3GC Series PLC incorporating the optional battery, turn on the PLC before shipment, confirm that the battery mode is set using a parameter and the ALM LED is OFF, and check the battery life.
  If the PLC is transported with the ALM LED on or the battery exhausted, the battery-backed data may be unstable during transportation.
- The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in Section 3.1.
  Failure to do so may cause failures in the PLC.
  After transportation, verify the operations of the PLC.
- When transporting lithium batteries, follow required transportation regulations.
  (For details of the regulated products, refer to Appendix F.)

The battery is not incorporated in the PLC main unit at shipment from the factory.
Order it if necessary.

9.1 Battery Purpose

1. Battery Purpose

The battery backs up the following contents against power interruption.
Proper parameter setting is required to back up the device memory and current time.

→ **For the parameter setting method, refer to Subsection 9.3.2.**

Item	Data Retained By Backup Battery
Device memory	Auxiliary relay M1536 to M7679, state S1000 to S4095, data register D1100 to D7999, extended register R0 to R23999
Current time*1	Current time clock

*1. The data is backed up by the large-capacity capacitor built in the PLC at shipment from the factory.

→ **For backup by the capacitor, refer to Appendix B.**

2. Battery Handling

When the battery voltage is low, a "ALM" LED lights (red) while the power is ON, and M8005 and M8006 are switches ON. (If the battery is not installed, exact voltage can not be detected while operating in battery mode.)
Although the battery will continue to function for approximately 1 month after the "ALM" LED switches ON, a replacement battery should be ordered and installed as soon as possible.

→ **For the replacement method, refer to Subsection 9.3.1.**

9.2 Specifications

Item	Specifications	Remarks
Nominal voltage	3 V	Battery voltage can be monitored with PLC data register D8005.

9.3 Setting for Battery

The battery is not incorporated in the main unit at shipment from the factory. It is necessary to attach the optional battery if backup is required.
In addition, the battery mode is set via a parameter.

9.3.1 Procedures for replacing battery

Before replacing the battery

Note the following before replacement work.

- Turn on the power supply of the PLC for 10 seconds or more.
- Back up the data of the main unit with the programming tool.

When the battery is removed, the built-in capacitor holds the data of the memory for the power interruption time (20 seconds). Battery replacement steps 6 and 7 must be completed within the power interruption time (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 ON.

2 Back up the data of the main unit with the programming tool.

3 Turn the power OFF.

4 Remove the main unit.

Disconnect all connected cables including the power cable, I/O cable, communication cable and extension cable.

Remove the main unit from the DIN rail.

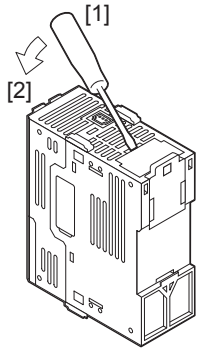
→ **For the removal method, refer to Section 3.3.**

5 Remove the battery cover.

Attach a screwdriver to the battery cover on the underside of the PLC as shown in the right figure [1].

Slightly move the [2] side of the battery cover.

Grasp the cover between your fingers and remove it.



6 Remove the old battery (if it is connected).

Remove the old battery from the battery holder, and disconnect the battery connector.

When removing the old battery, hold the end of cable and remove the battery straight out.

7 Install the new battery.

Connect the battery connector to the new battery, and insert the battery into the battery holder.

8 Attach the battery cover.

Caution

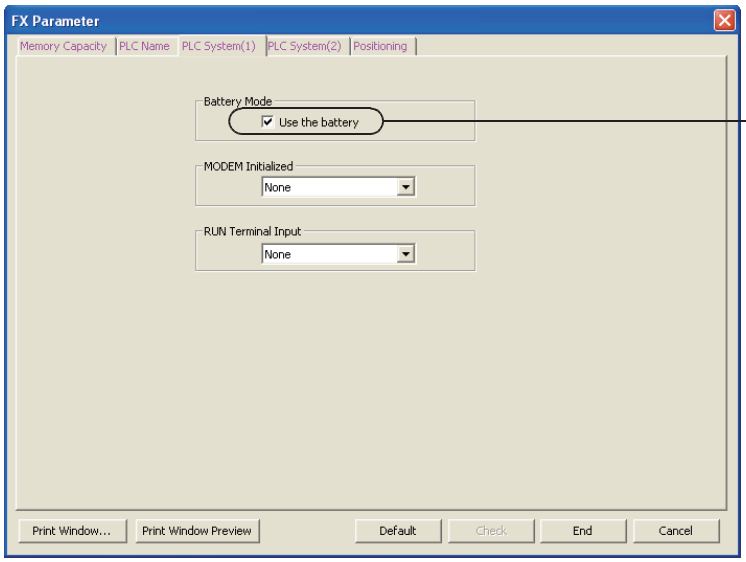
1) Battery replacement requires users to verify data integrity such as the PLC program (when a memory cassette is not used), latched (battery backed) device values and RTC values. Before switching the PLC to RUN, ensure the safety of the operation.
2) If programs or data in keeping devices becomes unstable, clear data in the keeping devices, and transfer the data again. Set the RTC and default values again if necessary.
→ **For the clear method of keeping devices, refer to the programming manual.**
3) If a long time has passed since the battery voltage reduced, the data may not be retained by the battery. Make sure to back up the data of the main unit with the programming tool before battery replacement.

9.3.2 Setting the battery mode

The following setting using a parameter is required to use the battery.
Note that the battery does not back up the data if the following setting is not provided.

→ **For the backup target data, refer to Section 9.1.**

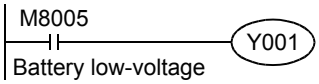
- On the «PLC System(1)» tab on the "FX Parameter" window, check the check box "Use the battery". (Refer to the window below.)



9.4 Special "battery low-voltage" device & notification program example

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

- M8005

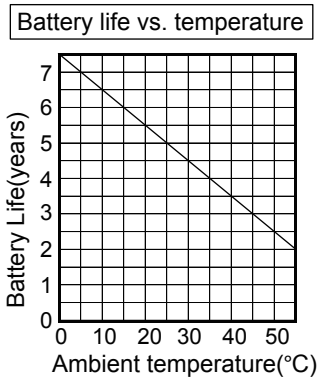


Y001 is output when a battery low-voltage condition occurs.

- M8006
  Battery low-voltage is latched.
- D8005
  Battery voltage can be monitored.

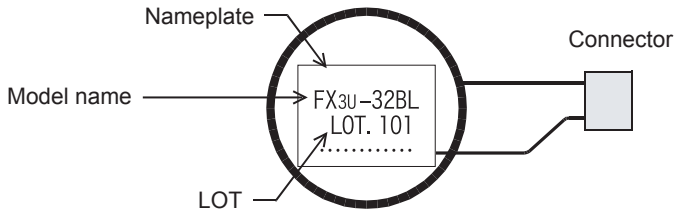
9.5 Battery life & replacement guidelines

FX3U-32BL battery life: Approx. 5 years (ambient temperature: 25 °C(77 °F))
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 to the right and order the replacement batteries in advance.

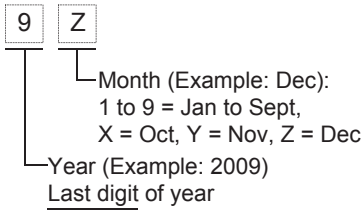


9.6 Reading the date of manufacture

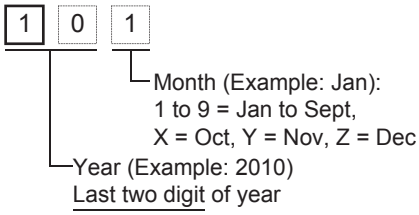
Reading the optional battery's lot No. (reference)



<Product during December, 2009 or earlier>



<Product from January, 2010>



9.7 Battery Related Precautions

1. **The FX3GC Series uses a different battery type than those used for the FX2N (F2-40BL) and FX2NC (FX2NC-32BL) Series.**
   - Not for use with the FX3GC Series.
2. **Make sure to select the battery mode using a parameter when using the battery.**

10. Test Operation, Adjustment, Maintenance and Troubleshooting

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.
- Use the battery for memory backup correctly in conformance to this manual.
  - Use the battery only for the specified purpose.
  - 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 forces (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 heat excessive generation, bursting, ignition, liquid leakage or deformation, and lead to injury, fire or failures and malfunctions of facilities and other equipment.
  - When replacing the battery, make sure to use our specified product (FX3U-32BL).
  - When a battery error occurs ("ALM" LED is lit in red), follow the description in this manual.
- Before modifying or disrupting the program in operation or running the PLC, carefully read through this manual and the associated manuals and ensure the safety of the operation.
  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 a programming tool and a GOT)
  Doing so may cause destruction or malfunction of the PLC program.

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.
- Turn off the power to the PLC before connecting or disconnecting any extension cable.
  Failure to do so may cause equipment failures or malfunctions.
- Turn off the power to the PLC before attaching or detaching the following devices.
  Failure to do so may cause equipment failures or malfunctions.
  - Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery
- Do not use the chemicals for cleaning.
- If there is the possibility of touching the PLC inside a control panel in maintenance, make sure to discharge to avoid the influence of static electricity.

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 of the Battery Directive in EU countries, refer to Appendix G.)

TRANSPORTATION AND STORAGE PRECAUTIONS ⚠ **CAUTION**

- When transporting the FX3GC Series PLC incorporating the optional battery, turn on the PLC before shipment, confirm that the battery mode is set using a parameter and the ALM LED is OFF, and check the battery life.
  If the PLC is transported with the ALM LED on or the battery exhausted, the battery-backed data may be unstable during transportation.
- The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in Section 3.1.
  Failure to do so may cause failures in the PLC. After transportation, verify the operations of the PLC.
- When transporting lithium batteries, follow required transportation regulations.
  (For details of the regulated products, refer to Appendix F.)

10.1 Preparation for Test Operation

10.1.1 Preliminary inspection [power OFF]

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.

Notes
The dielectric withstand voltage and insulation resistance test of the PLC should be measured in accordance with the following procedures. 1) Remove all input/output wires and power supply wires from the PLC. 2) Connect all terminals except the grounding terminal with a crossover wire in the PLC single unit. 3) Measure the voltage between the crossover wire and the grounding terminal. Dielectric withstand voltage: 500 V AC for 1min Insulation resistance: 5 MΩ or higher by 500 V DC insulation resistance tester

10.1.2 Connection to built-in programming connector [power ON, PLC STOP]

1 Turn on the PLC power.

Make sure that the RUN/STOP switch of the PLC is set to STOP, and turn the power on.

2 Check the program.

Check for circuit errors and grammatical errors with the program check function of the programming tool.

3 Transfer the sequence program.

Write the program to the PLC with the programming tool.

4 Verify the sequence program.

Verify that the program has been correctly written to the PLC.

5 Execute PLC diagnosis.

Check for errors in the PLC main unit with the PLC diagnostic function of the programming tool.
→ **For details on the PLC diagnosis with the GX Works2, refer to Section 10.6.**

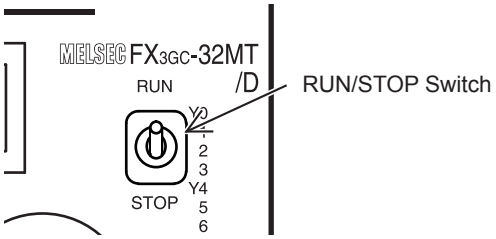
10.2 Running and Stopping Procedures [Power ON]

10.2.1 Methods of running and stopping

FX3GC PLCs can be started or stopped by any of the following three methods.
Two of the methods can be combined.

1. Operation with built-in RUN/STOP switch

Operate the RUN/STOP switch on the front panel of the main unit to start and stop the PLC (refer to the following figure).
Turn the switch to RUN, and the PLC will start. Turn it to STOP, and the PLC will stop.

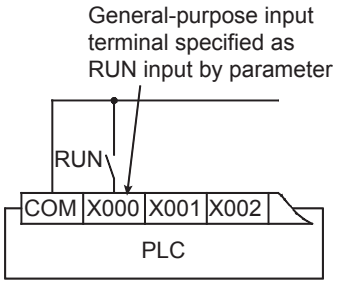


2. Running and stopping with general-purpose input (RUN terminal)

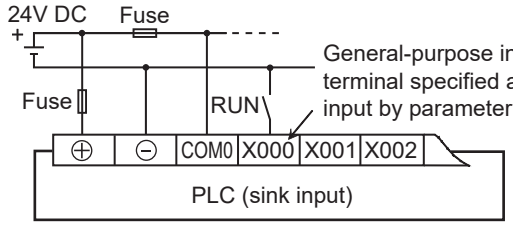
Operation with one switch (RUN)

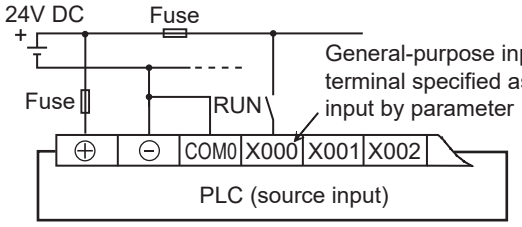
One of the input terminals X000 to X017 of the main unit can be used as a RUN input terminal by a parameter setting (refer to the figure below).
When the specified input terminal is turned on, the PLC starts. When it is turned off, the PLC is started or stopped depending on the state of the built-in RUN/STOP switch.

- FX3GC-32MT/D



- FX3GC-32MT/DSS

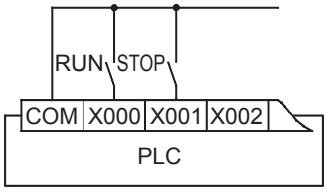




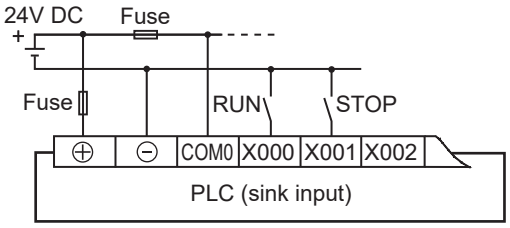
→ **For details, refer to "Kinds of Parameters and Settings" in Programming Manual.**

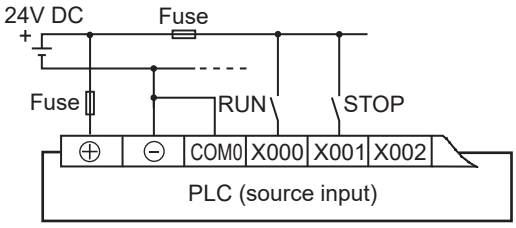
Operation with two switches (RUN and STOP)
The PLC can be started and stopped with individual RUN and STOP push button switches.
For this operation, a sequence program using M8035 to M8037 is necessary.
→ **For details, refer to "Operations of Special Devices" in Programming Manual.**

- FX3GC-32MT/D



- FX3GC-32MT/DSS





3. Starting and stopping by remote control from programming software
The programming software has a function to forcibly start and stop the PLC by remote control (remote RUN/STOP function).
However, when power is reapplied, the remote RUN/STOP function is disabled. The RUN/STOP status is then determined by the RUN/STOP switch or RUN terminal.
The remote operation for starting and stopping from the programming software is used in combination with the built-in RUN/STOP switch.

10.2.2 Use of several running/stopping methods

1. When the built-in RUN/STOP switch and the general-purpose RUN terminal are used
(without remote running/stopping operation from the programming software)
The RUN/STOP status of the PLC is determined by the conditions shown in the following table.

Condition of built-in RUN/STOP switch	Condition of general-purpose input terminal specified as RUN terminal by parameter	Status of PLC
RUN	OFF	RUN
	ON	RUN
STOP	OFF	STOP
	ON	RUN

Use either built-in RUN/STOP switch or the general input specified as RUN terminal.
(When specifying the general-purpose terminal as the RUN terminal, always set the built-in RUN/STOP switch to STOP.)

2. When the remote running/stopping operation from the programming software is performed
For this operation, keep both the built-in RUN/STOP switch and the general-purpose input RUN terminal in the STOP position.
If the stop command is given from the programming software after the PLC is started by either the built-in RUN/STOP switch or the general-purpose input RUN terminal, the PLC will be restored to the running status by giving the RUN command from the programming software. This can also be accomplished by setting the built-in RUN/STOP switch or the general-purpose input RUN terminal to STOP and then to RUN.

10.3 Operation and Test [Power ON and PLC Running]

10.3.1 Self-diagnostic function

When the PLC's power is turned on, its self-diagnostic function starts automatically. If there are no problems with the hardware, parameters or program, the PLC will start and the RUN command (refer to Section 10.2) is given (RUN LED is lit).
If any problems are found, the "ERR" LED flashes or lights.

10.3.2 Test functions

Functions of the programming tool to turn on/off the PLC devices and change the current values/settings are effective or ineffective depending on the PLC status as shown below.

✓: Effective △: Conditionally effective –: Ineffective

Item		In running status	In stopped status
Forcible ON/OFF*1	Devices used in program	△*1	✓*1
	Devices not in use	✓	✓
Change of current values of timers, counters, data registers, extension registers and file registers	Devices used in program	△*2	✓
	Devices not in use	✓	✓
Change of current values of extension file registers		–	–
Change of settings of timers and counters*3		✓	✓

*1. Forcible ON/OFF
- The forcible ON/OFF function is effective on the input relays (X), output relays (Y), auxiliary relays (M), state (S), timers (T) and counters (C).
- The forcible ON/OFF function can turn on or off the devices only for one scan.
  While the PLC is running, the function is substantially effective in clearing the current values of the timers (T), counters (C), data registers (D), index registers (Z and V) and extension registers (R) and in controlling the SET/RST circuit and self-retaining circuit. (The operation to forcibly turn on timers is effective only when the timers are driven by the program.)
- The results of forcible ON/OFF operation performed while the PLC in the stopped state or performed for devices not used in the program are retained.
  However, the results of the operation performed for the input relays (X) are not retained because the relays refresh input even while the PLC is in the stopped state. (They are updated according to the input terminal conditions.)

*2. Since the current values may be changed according to MOV instruction in the program and the operation results, the most recently obtained values are retained.

*3. Change of timer and counter settings
The settings of the timers (T) and counters (C) can be changed only when the timers are driven by the program.

10.3.3 Program modification function

The sequence program can be transferred while the PLC is running or in the stopped state as shown below.

✓: Effective –: Ineffective

Item		In running status	In stopped status
Batch writing of file registers (D) and extension file registers (ER)		–	✓
Writing of program to PLC	Partial modification of program	✓*1	✓
	Modification of whole program (batch writing)	–	✓
Writing of parameters to PLC		–	✓
Writing of comments to PLC		–	✓

*1. Since the writing function is used in running status, the programming tool must support the write during RUN function, such as GX Works2.

→ **For the writing function during running, refer to Appendix A-2-5.**

10.4 Maintenance

10.4.1 Periodic inspection

1. Battery

Part	Life
Model FX3U-32BL battery	Standard life: 5 years (at ambient temperature of 25 °C (77 °F))

→ **For details on the standard life and recommended replacement frequency, refer to Section 9.5.**

2. Other devices

When inspecting the battery, check the following points.

- Check that the temperature in the panel is not abnormally increased by other heat generating bodies or direct sunlight.
- Check that dust or conductive dust has not entered the panel.
- Check for loosening of wiring and other abnormalities.

10.4.2 Product life of relay contacts

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

1. Inductive load

Inductive loads generate large reverse electromotive force between contacts at shutdown, which may cause arcing. At a fixed current consumption, as the power factor (phase between current and voltage) gets smaller, the arc energy gets larger.

1) Input/output extension blocks

→ **For the applicable models, refer to Subsection 1.4.2.**

The standard life of contacts used for Inductive loads, such as contactors and solenoid valves, is 500,000 operations at 20 VA.
The following table shows the approximate life of a relay based on the results of an operation life test.

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

Load capacity		Contact life
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	

2) FX Series terminal blocks

→ **For the applicable models, refer to Subsection 1.4.8.**

The standard life of contacts used for Inductive loads, such as contactors and solenoid valves, is 500,000 operations at 35 VA.
The following table shows the approximate life of a relay based on the results of an operation life test.

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

Load capacity		Contact life
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.

→ **For precautions on the input/output extension block, refer to Subsection 6.2.4-2.**
→ **For precautions on inductive loads for the terminal block, refer to Subsection 8.8.4-2.**

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.

2. 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.

3. 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.

* About the maximum load specifications of the resistance load, refer to the specification for each model.

→ **For specifications on the input/output extension blocks, refer to Subsection 6.2.1.**
→ **For specifications on the terminal block, refer to Subsection 8.8.1 and Subsection 8.9.1.**

10.5 Troubleshooting with LEDs

When trouble occurs, check the LEDs on the PLC to identify the problem with the PLC.

10.5.1 POW LED [on/flashing/off]

State of LED	State of PLC	Remedies
On	Power of the specified voltage is being correctly supplied to the power supply terminal.	The power supply is normal.
Flashing	One of the following problems may have occurred. • Power of the specified voltage and current is not being supplied to the power supply terminal. • External wiring is incorrect. • Internal error of PLC	• Check the supply voltage. • After disconnecting the cables other than the power cable, re-apply power to the PLC, and check for changes in the state. If the problem persists, consult your local Mitsubishi Electric representative.
Off	One of the following problems may have occurred. • The power supply is off. • External wiring is incorrect. • Power of the specified voltage is not being supplied to the power supply terminal. • The power cable is broken.	• If the power is not off, check the power supply and the power supply route. If power is being supplied correctly, consult your local Mitsubishi Electric representative. • After disconnecting the cables other than the power cable, re-apply power to the PLC, and check for changes in the state. If the problem persists, consult your local Mitsubishi Electric representative.

10.5.2 ALM LED [on/off]

State of LED	State of PLC	Remedies
On	The battery voltage is low.	Immediately replace the battery. (Refer to Section 9.3.1)
Off	The battery voltage is higher than the value set with D8006.	Normal

→ **For details on the battery, refer to Chapter 9.**

10.5.3 ERR LED [on/flashing/off]

State of LED	State of PLC	Remedies
On	A watchdog timer error may have occurred, or the hardware of the PLC may be damaged.	1) Stop the PLC, and re-apply power. If ERR LED goes off, a watchdog timer error may have occurred. Take any of the following measures. - Review the program. The maximum value (D8012) of the scan time should not exceed the setting (D8000) of the watchdog timer. - Check that the input used for input interruption or pulse catch is not being abnormally turned on and off in one scan. - Check that the frequency of the pulse (duty of 50%) input to the high-speed counter does not exceed the specified range. - Add the WDT instructions. Add some WDT instructions to the program, and reset the watchdog timer several times in one scan. - Change the setting of the watchdog timer. Change the watchdog timer setting (D8000) in the program so that the setting is larger than the maximum value of the scan time (D8012). 2) Remove the PLC and supply power to it from another power supply on a desk. If the ERR LED goes off, noise may have affected the PLC. Take the following measures. - Check the ground wiring, and reexamine the wiring route and installation location. - Fit a noise filter onto the power supply line. 3) If the ERR LED does not go off even after the measures stated in (1) and (2) are taken, consult your local Mitsubishi Electric representative.
Flashing	One of the following errors has occurred in the PLC. • Parameter error • Syntax error • Ladder error	Perform PLC diagnosis and program check with the programming tool. For the remedies, refer to 10.6 Judgment by Error Codes and Representation of Error Codes.
Off	No errors that stop the PLC have occurred.	If the operations of the PLC are abnormal, perform PLC diagnosis and program check with the programming tool. An I/O error, Comms.error or Runtime error may have occurred.

10.6 Judgment by Error Codes and Representation of Error Codes

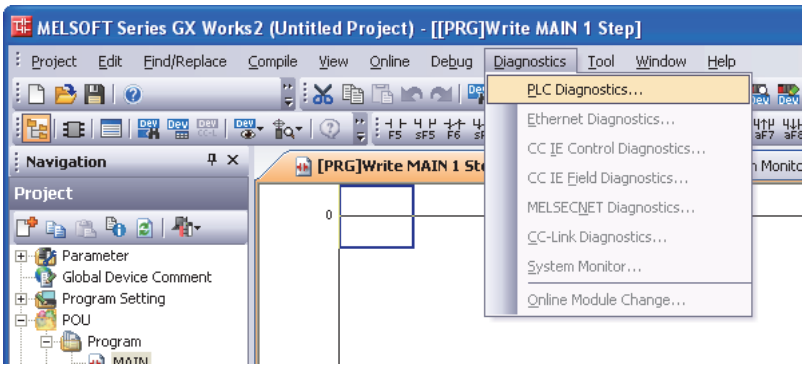
Error codes can be checked with the programming tool.

10.6.1 Operation and check by GX Works2

1 Connect the personal computer and the PLC.

2 Execute the PLC diagnosis.

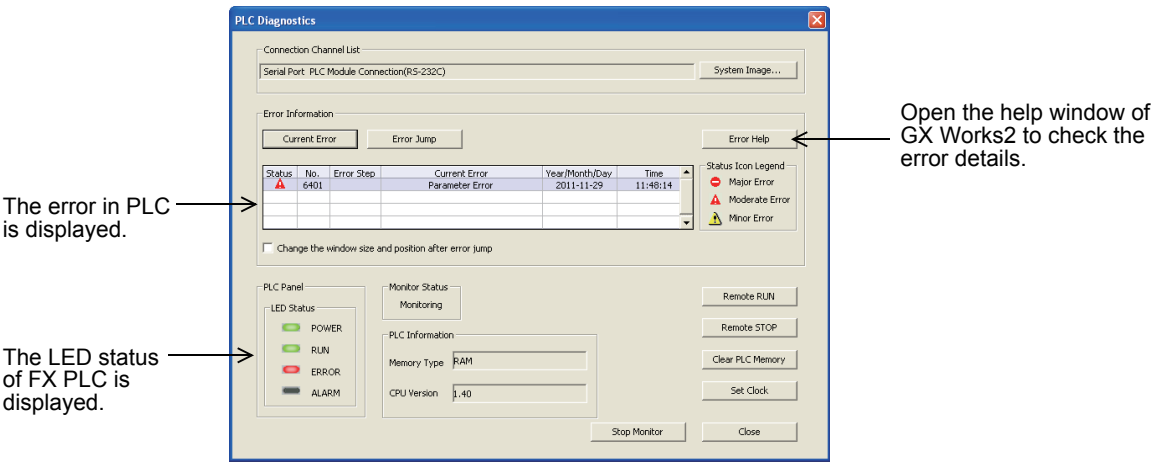
Click [Diagnostics] → [PLC Diagnostics...] on the tool menu, and the diagnosis of PLC will start.



3 Check the results of diagnosis.

Display the following window to check the errors.

Example: one error occurs



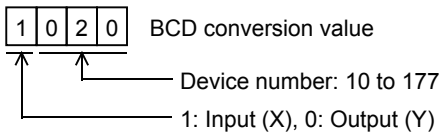
10.6.2 Representation of errors

Errors are represented in this manual and GX Works2 as shown in the following table.

This manual	GX Works2
I/O configuration error	I/O Configuration Error
PLC hardware error	PLC Hardware Error
PLC/PP communication error	PLC/PP Communication Error
Serial communication error 1 [ch1]	Link Error
Serial communication error 2 [ch2]	Serial Communication Error 2[ch2]
Parameter error	Parameter Error
Syntax error	Syntax Error
Circuit error	Ladder Error
Operation error	Operation Error
Special block error	Special Block Error
Special parameter error	Special Parameter Error

10.6.3 Error Code List and Action

When a program error occurs in the PLC, the error code is stored in special data registers D8060 to D8067, D8438 and D8449. Take action based on the following information.

Error code	PLC operation at error occurrence	Contents of error	Action
I/O configuration error [M8060(D8060)]			
Example: 1020	Continues operation	The head number of unconnected I/O device Example: When X020 is unconnected  • 1st to 3rd digits: Device number • 4th digit: I/O type (1 = input (X), 0 = output (Y)) Example: When 1020 is stored in D8060 Inputs X020 and later are unconnected.	Unconnected I/O relay numbers are programmed. The PLC continues its operation. Modify the program, check wiring connection, or add the appropriate unit/block.
Serial communication error 2 [M8438 (D8438)]			
0000	—	No error	
3801	Continues operation	Parity, overrun or framing error	• Ethernet communication, inverter communication, computer link and programming: Ensure the parameters are correctly set according to their applications. • N:N network, parallel link, MODBUS communication, etc.: Check programs according to the applications. • Remote maintenance: Ensure modem power is ON and check the settings of the AT commands. • Wiring: Check the communication cables for correct wiring.
3802		Communication character error	
3803		Communication data sum check error	
3804		Communication data format error	
3805		Command error	
3806		Communication time-out detected	
3807		Modem initialization error	
3808		N:N network parameter error	
3809		N:N network setting error	
3812		Parallel link character error	
3813		Parallel link sum error	
3814		Parallel link format error	
3820		Inverter communication error	
3821		MODBUS communication error	
3840		Special adapter connection error	Check connection of the special adapter.
PLC hardware error [M8061(D8061)]			
0000	—	No error	
6101	Stops operation	Memory access error	Something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
6102		Operation circuit error	Isolate the PLC and supply power to it using a different power supply. If the ERR LED turns OFF, noise may be affecting the PLC. Take the following measures. - Check the ground wiring, and reexamine the wiring route and installation location. - Fit a noise filter onto the power supply line. If the ERR LED does not turn OFF even after the above actions are taken, consult your local Mitsubishi Electric representative.
6103		I/O bus error (M8069 = ON)	Verify that extension cables are correctly connected.
6104		Powered extension unit 24 V failure (M8069 = ON)	
6105		Watchdog timer error	Check user program. The scan time exceeds the value stored in D8000.
6106		I/O table creation error (CPU error)	When turning the power ON to the main unit, a 24 V power failure occurs in a powered extension unit. (The error occurs if the 24 V power is not supplied for 10 seconds or more after the main power is turned ON.)
6107		System configuration error	Check the number of the connected special function blocks. For certain special function blocks, the connectable number is limited.

Error code	PLC operation at error occurrence	Contents of error	Action
PLC hardware error [M8061(D8061)]			
6108	Stops operation	Extension bus error	Verify that extension cables are correctly connected.
PLC/PP communication error (D8062)			
0000	—	No error	
6201	Continues operation	Parity, overrun or framing error	Check the cable connection between the programming panel (PP) / programming device and the PLC. This error may occur when a cable is disconnected and reconnected during PLC monitoring.
6202		Communication character error	
6203		Communication data sum check error	
6204		Data format error	
6205		Command error	
Serial communication error 1 [M8063 (D8063)]			
0000	—	No error	
6301	Continues operation	Parity, overrun or framing error	• Ethernet communication, inverter communication, computer link and programming: Ensure the parameters are correctly set according to their applications. • N:N network, parallel link, MODBUS communication, etc.: Check programs according to applications. • Remote maintenance: Ensure modem power is ON and check the settings of the AT commands. • Wiring: Check the communication cables for correct wiring.
6302		Communication character error	
6303		Communication data sum check error	
6304		Communication data format error	
6305		Command error	
6306		Communication time-out detected	
6307		Modem initialization error	
6308		N:N network parameter error	
6309		N:N network setting error	
6312		Parallel link character error	
6313		Parallel link sum error	
6314		Parallel link format error	
6320		Inverter communication error	
6321		MODBUS communication error	
6340		Special adapter connection error	Check connection of the special adapter.
Parameter error [M8064(D8064)]			
0000	—	No error	
6401	Stops operation	Program sum check error	STOP the PLC, and correctly set the parameters.
6402		Memory capacity setting error	
6403		Latched device area setting error	
6404		Comment area setting error	
6405		File register area setting error	
6406		Special unit (BFM) initial value setting, positioning instruction setting sum check error	
6407		Special unit (BFM) initial value setting, positioning instruction setting error	
6409		Other setting error	
6420		Special parameter sum check error	• STOP the PLC, and correctly set the special parameters. • Set special parameters correctly, turn OFF the power, and then turn ON the power.
6421		Special parameters setting error	• Check the contents of the special parameter error code (D8489), confirm troubleshooting for special adapters/ special blocks, and set special parameters correctly. • Set special parameters correctly, turn OFF the power, and then turn ON the power.

Error code	PLC operation at error occurrence	Contents of error	Action
Syntax error [M8065(D8065)]			
0000	—	No error	
6501	Stops operation	Incorrect combination of instruction, device symbol and device number	During programming, each instruction is checked. If a syntax error is detected, modify the instruction correctly.
6502		No OUT T or OUT C before setting value	
6503		No setting value after OUT T or OUT C Insufficient number of operands for an applied instruction	
6504		Same label number is used more than once. Same interrupt input or high-speed counter input is used more than once.	
6505		Device number is out of allowed range.	
6506		Invalid instruction	
6507		Invalid label number [P]	
6508		Invalid interrupt input [I]	
6509		Other error	
6510		MC nesting number error	
Circuit error [M8066(D8066)]			
0000	—	No error	
6610	Stops operation	LD, LDI is continuously used 9 times or more.	This error occurs when a combination of instructions is incorrect in the entire circuit block or when the relationship between a pair of instructions is incorrect. Modify the instructions in the program mode so that their mutual relationship becomes correct.
6611		More ANB/ORB instructions than LD/LDI instructions	
6612		Less ANB/ORB instructions than LD/LDI instructions	
6613		MPS is continuously used 12 times or more.	
6614		No MPS instruction	
6615		No MPP instruction	
6616		No coil between MPS, MRD and MPP, or incorrect combination	
6617		Instruction below is not connected to bus line: STL, RET, MCR, P, I, DI, EI, FOR, NEXT, SRET, IRET, FEND or END	
6618		STL, MC or MCR can be used only in main program, but it is used elsewhere (e.g. in interrupt routine or subroutine).	
6619		Invalid instruction is used in FOR-NEXT loop: STL, RET, MC, MCR, I (interrupt pointer) or IRET.	
6620		FOR-NEXT instruction nesting level exceeded	
6621		Numbers of FOR and NEXT instructions do not match.	
6622		No NEXT instruction	
6623		No MC instruction	
6624		No MCR instruction	
6625		STL instruction is continuously used 9 times or more.	
6626		Invalid instruction is programmed within STL-RET loop: MC, MCR, I (interrupt pointer), SRET or IRET.	
6627		No STL instruction	
6628		Invalid instruction is used in main program: I (interrupt pointer), SRET or IRET	
6629		No P or I (interrupt pointer)	
6630		No SRET or IRET instruction STL-RET or MC-MCR instructions in subroutine	
6631		SRET programmed in invalid location	
6632		FEND programmed in invalid location	

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
0000	—	No error	
6701	Continues operation	• No jump destination (pointer) for CJ or CALL instruction • Label is undefined or out of P0 to P4095 due to indexing. • Label P63 is executed in CALL instruction; cannot be used in CALL instruction as P63 is for jumping to END instruction.	This error occurs in the execution of operation. Review the program and check the contents of the operands used in applied instructions. Even if the syntax or circuit design is correct, an operation error may still occur. For example: "T300Z" itself is not an error. But if Z had a value of 100, the timer T400 would attempt to be accessed. This would cause an operation error since there is no T400 device available.
6702		CALL instruction nesting level is 6 or more	
6703		Interrupt nesting level is 3 or more	
6704		FOR-NEXT instruction nesting level is 6 or more.	
6705		Operand of applied instruction is inapplicable device.	
6706		Device number range or data value for operand of applied instruction exceeds limit.	
6707		File register is accessed without parameter setting of file register.	
6708		FROM/TO instruction error	This error occurs in the execution of operation. • Review the program and check the contents of the operands used in applied instructions. • Verify that the specified buffer memories exist in the counterpart equipment. • Verify that extension cables are correctly connected.
6709		Other (e.g. improper branching)	This error occurs in the execution of operation. Review the program and check the contents of the operands used in applied instructions. Even if the syntax or circuit design is correct, an operation error may still occur. For example: "T300Z" itself is not an error. But if Z had a value of 100, the timer T400 would attempt to be accessed. This would cause an operation error since there is no T400 device available.
6710		Mismatch among parameters	This error occurs when the same device is used within the source and destination in a shift instruction, etc.
6730		Incorrect sampling time (TS) (TS ≤ 0)	<PID instruction is stopped.> This error occurs in the parameter setting value or operation data executing PID instruction. Check the contents of the parameters.
6732		Incompatible input filter constant (α) (α < 0 or 100 ≤ α)	
6733		Incompatible proportional gain (KP) (KP < 0)	
6734		Incompatible integral time (TI) (TI < 0)	
6735		Incompatible derivative gain (KD) (KD < 0 or 201 ≤ KD)	
6736		Incompatible derivative time (TD) (TD < 0)	

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
6740	Continues operation	Sampling time (TS) ≤ Scan time	<Auto tuning is continued.> The operation is continued in the condition "sampling time (TS) = cyclic time (scan time)".
6742		Variation of measured value exceeds limit. (△PV < -32768 or +32767 < △PV)	<PID operation is continued.> The operation is continued with each parameter set to the maximum or minimum value.
6743		Deviation exceeds limit. (EV < -32768 or +32767 < EV)	
6744		Integral result exceeds limit. (Outside range from -32768 to +32767)	
6745		Derivative value exceeds limit due to derivative gain (KD).	
6746		Derivative result exceeds limit. (Outside range from -32768 to +32767)	
6747		PID operation result exceeds limit. (Outside range from -32768 to +32767)	
6748		PID output upper limit set value < PID output lower limit set value.	<Transpose of output upper limit value and output lower limit value. → PID operation is continued.> Check whether the target setting contents are correct.
6749		Abnormal PID input variation alarm set value or output variation alarm set value (Set value < 0)	<Alarm output is not given. → PID operation is continued.> Check whether the target setting contents are correct.
6750		<Step response method> Improper auto tuning result	<Auto tuning is finished. → PID operation is started.> • The deviation at start of auto tuning is 150 or less. • The deviation at end of auto tuning is 1/3 or more of the deviation at start of auto tuning. Check the measured value and target value, and then execute auto tuning again.
6751		<Step response method> Auto tuning operation direction mismatch	<Auto tuning is forcibly finished. → PID operation is not started.> The operation direction estimated from the measured value at the start of auto tuning was different from the actual operation direction of the output during auto tuning. Correct the relationship among the target value, output value for auto tuning, and the measured value, and then execute auto tuning again.
6752		<Step response method> Improper auto tuning result	<Auto tuning is finished. → PID operation is not started.> Because the set value was fluctuated during auto tuning, auto tuning was not executed correctly. Set the sampling time to a value larger than the output change cycle, or set a larger value for the input filter constant. After changing the setting, execute auto tuning again.
6753		<Limit cycle method> Auto tuning operation direction mismatch	<Auto tuning is forcibly finished. → PID operation is not started.> Check whether the target setting contents are correct.
6754		<Limit cycle method> Abnormal PV threshold (hysteresis) set value for auto tuning (SHPV < 0)	
6755		<Limit cycle method> Abnormal auto tuning transfer status (Data of device controlling transfer status is abnormally overwritten.)	<Auto tuning is forcibly finished. → PID operation is not started.> Ensure that devices occupied by PID instruction are not overwritten in the program.
6756		<Limit cycle method> Abnormal result due to excessive auto tuning measurement time (τon > τ, τon < 0, τ < 0)	<Auto tuning is forcibly finished. → PID operation is not started.> The auto tuning time is longer than necessary. Increase the difference (ULV - LLV) between the upper limit and lower limit of the output value for auto tuning, set a smaller value to the input filter constant (α), or set a smaller value to the PV threshold (SHPV) for auto tuning, and then check the result for improvement.
6757		<Limit cycle method> Auto tuning result exceeds proportional gain. (KP = outside range from 0 to 32767)	<Auto tuning is finished (KP = 32767). → PID operation is started.> The variation of the measured value (PV) is small compared with the output value. Multiply the measured value (PV) by "10" so that the variation of the measured value will increase during auto tuning.

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
6758	Continues operation	<Limit cycle method> Auto tuning result exceeds integral time. (TI = outside range from 0 to 32767)	<Auto tuning is finished (KP = 32767). → PID operation is started.> The auto tuning time is longer than necessary. Increase the difference (ULV - LLV) between the upper limit and lower limit of the output value for auto tuning, set a smaller value to the input filter constant (α), or set a smaller value to the PV threshold (SHPV) for auto tuning, and then check the result for improvement.
6759		<Limit cycle method> Auto tuning result exceeds derivative time. (TD = outside range from 0 to 32767)	
6760		ABS data read from servo sum check error	Check servo wiring and parameter setting. Also check ABS instruction.
6762		Port specified by inverter communication instruction is already used in another communication.	Check to make sure the port is not specified by another instruction.
6763		Input (X) specified by DSZR or ZRN instruction is already used in another instruction.	Check to make sure the input (X), as specified by DSZR or ZRN instruction, is not being used for the following purposes: - Input interrupt - High-speed counter C235 to C255 - Pulse catch M8170 to M8175 - SPD instruction
6764		Pulse output number is already used in a positioning instruction or pulse output instruction (PLSY, PWM, etc.).	Check to make sure the pulse output destination is not being driven by another positioning instruction.
6765		Number of applied instruction exceeds limit.	The number of times an applied instruction is used in the program exceeds the specified limit.
6770		Memory access error	Something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
Special block error [M8449 (D8449)]			
□020*1	Continues operation	General data sum error	Verify that extension cables are correctly connected.
□021*1		General data message error	
□022*1		System access error	
□025*1		Access sum error in other station via CC-Link	
□026*1		Message error in other station via CC-Link	
□080*1		FROM/TO error	This error occurs in the execution of operation. • Review the program and check the contents of the operands used in applied instructions. • Verify that the specified buffer memories exist in the counterpart equipment. • Verify that extension cables are correctly connected.
□090*1		Peripheral equipment access error	• Check the cable connection between the programming panel (PP) / programming device and the PLC. • Verify that extension cables are correctly connected.

*1. The unit number 0 to 7 of the special function unit/block error is put in □.

Error code	PLC operation at error occurrence	Contents of error	Action
Special parameter error [M8489 (D8489)]			
□□01*1	Continues operation	Special parameter setting time-out error	Turn OFF the power, and check the power supply and connection of special adapters/special blocks.
□□02*1		Special parameter setting error	Special parameters are set improperly. • Confirm troubleshooting for special adapters/special blocks, and set special parameters correctly. • Set special parameters correctly, turn OFF the power, and then turn ON the power.
□□03*1		Special parameter transfer target unconnected error	Special parameters are set, but special adapters/special blocks are not connected. Check whether special adapters/special blocks are connected.
□□04*1		Special parameter unsupported function	Check that special parameters with unsupported settings are not set for connected special adapters/special blocks.

*1. "□□" indicates the following values for each special adapter/special block where an error has occurred.
If an error has occurred in 2 or more special adapters/special blocks, "□□" indicates the lowest unit number among the special adapters/special blocks in which an error has occurred.

Value of □□ (decimal)	Special adapter/special block where an error has occurred
00	Unit number 0 (Special block)
10	Unit number 1 (Special block)
20	Unit number 2 (Special block)
30	Unit number 3 (Special block)
40	Unit number 4 (Special block)
50	Unit number 5 (Special block)
60	Unit number 6 (Special block)
70	Unit number 7 (Special block)
81	Communication channel 1 (Special adapter)
82	Communication channel 2 (Special adapter)

10.7 Troubleshooting

→ **For the procedures on running and stopping the PLC, refer to Section 10.2.**
→ **For the procedures on operating peripheral devices, refer to the manuals for the peripheral devices.**

10.7.1 Output does not operate (main unit and input/output extension blocks)

1. Output does not turn on.

Stop the PLC, and forcibly turn the inoperable output on then off with a peripheral device to check its operation.
Check for troubles with external wiring.

- When the output operates
  The output may be turned off unintentionally in the program. Reexamine the program.
  (Duplicate coil or RST instructions)
- When the output does not operate
  Check the configuration of the connected devices and the connection of the extension cables.
  If the configuration of the external wiring and connected devices and the connection of the extension cables are acceptable, the output circuit may be damaged.
  Consult your local Mitsubishi Electric representative.

2. Output does not turn off.

Stop the PLC, and check that the output turns off.
Check for trouble with external wiring.

- When the output turns off
  The output may be turned on unintentionally in the program.
  Check that there are no duplicate coils in the program.
- When the output does not turn off
  The output circuit may be damaged. Consult your local Mitsubishi Electric representative.

10.7.2 24 V DC input does not operate (main unit and input/output extension blocks)

→ **For inputs and outputs of special function blocks, refer to each manual.**

1. Input does not turn on.

In the FX3GC-32MT/D, remove the external wiring, short-circuit the COM terminal and an input terminal, and then check using the LED or programming tool whether the input turns ON.
In the FX3GC-32MT/DSS, remove the external wiring, and apply 24 V DC between the COM△ terminal and an input terminal in reference to Section 5.2. Check using the LED or programming tool whether the input turns ON.
After confirmation, take the countermeasures shown in the table below.

	Countermeasures
When the input turns ON	Check whether a diode or parallel resistors is not built in the input equipment. If a diode or parallel resistors is built in, refer to Subsection 5.2.4.
When the input does not turn ON	In the FX3GC-32MT/D, remove the external wiring, and confirm using the tester that the voltage between the COM terminal and an input terminal is approximately 24 V DC. • When the input voltage is less than 20.4 V DC, check whether the supply voltage in the PLC and extension power supply unit is "24 V DC, Voltage fluctuation range +20% -15%". • Check the external wiring, connected equipment configuration and extension cable connection. In the FX3GC-32MT/DSS, confirm using the tester that the voltage between the COM△ terminal and an input terminal is approximately 24 V DC. • When the input voltage is less than 20.4 V DC, check whether the supply voltage in the PLC and extension power supply is "24 V DC, Voltage fluctuation range +20% -15%". • Check the external wiring, connected equipment configuration and extension cable connection.

2. Input does not turn off.

Check for leakage current from input devices.
If the leakage current is larger than 1.5 mA, it is necessary to connect a bleeder resistance.

→ **For details on the measures, refer to Subsection 5.2.4.**

10.7.3 Cautions in registering keyword

1. **Cautions in registering keyword**
   The keyword limits access to the program prepared by the user from peripheral devices.
   Keep the keyword carefully.
   If you forget the keyword, you cannot operate the PLC online from the programming tool depending on the type of the programming tool and the registered keyword.

2. **Cautions in using peripheral devices not supporting the 2nd keyword**
   Sequence programs where the second keyword has been registered cannot be all-cleared using a peripheral device that does not support the second keyword.

3. **Cautions in using peripheral devices not supporting the customer keyword**
   Sequence programs where the customer keyword has been registered cannot be all-cleared using a peripheral device that does not support the customer keyword.

4. **Non-resettable protect function**
   When the non-resettable protect function is set, the protect function cannot be reset.

Appendix A: Version Information and Peripheral Equipment Connectability

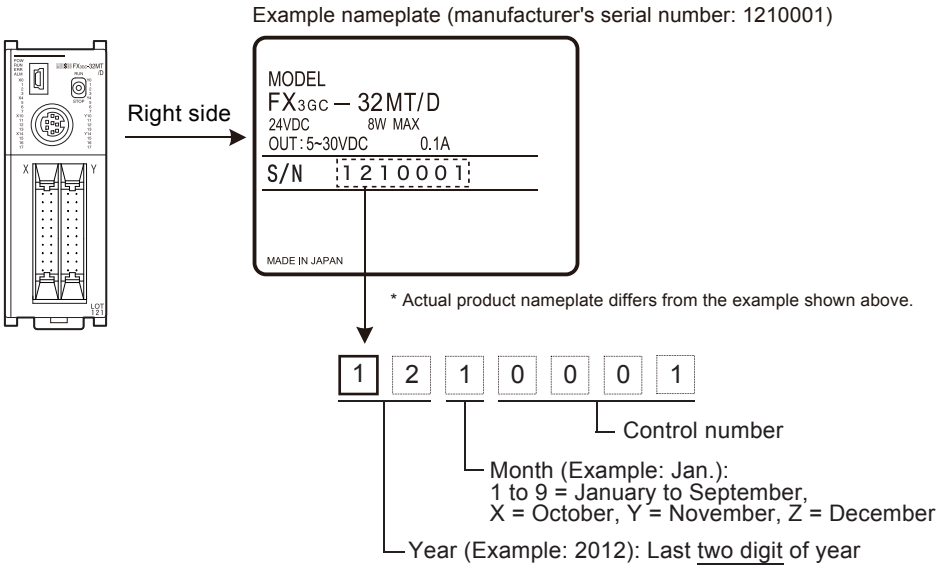
Appendix A-1 Version Upgrade History

Appendix A-1-1 How to look at manufacturer's serial number

The year and month of production of the product can be checked on the name plate, and "LOT" indicated on the front of the product.

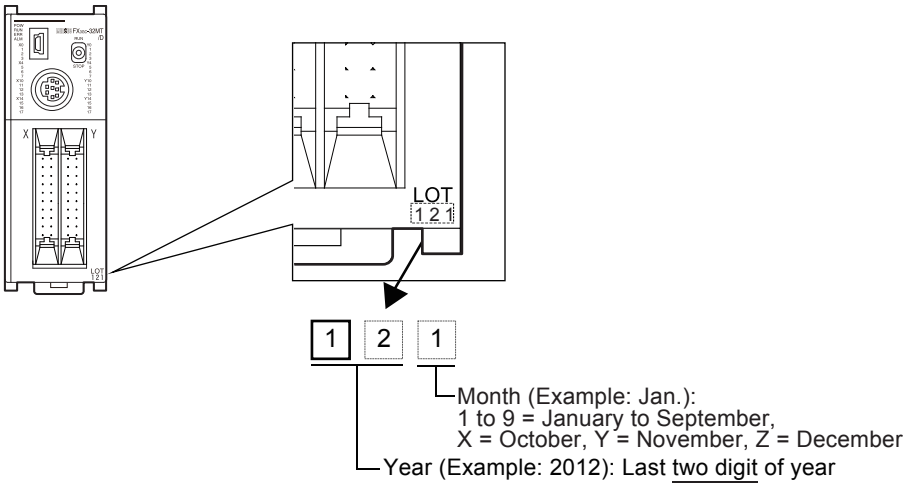
1. Checking the name plate

The year and month of production of the product can be checked from the manufacturer's serial number S/N indicated on the label adhered to the right side of the product.



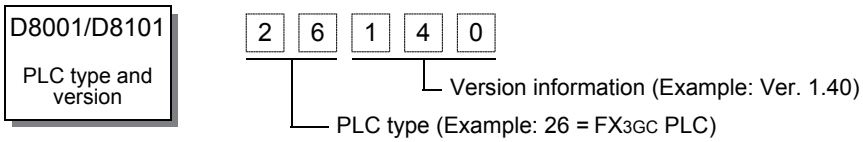
2. Checking the front of the product

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 product.



Appendix A-1-2 Version check method

The PLC version can be checked by reading the last three digits of device D8001/D8101.



Appendix A-1-3 Version upgrade history

FX3GC Series performed the following upgrade.

Version	Manufacturer's serial number	Contents of version upgrade
Ver. 1.40	121**** (January, 2012)	First product (Corresponds to FX3G PLC Ver. 1.40.)
Ver. 2.00	124**** (April, 2012)	• Supports the following functions of the FX3U-16CCL-M: - Network parameter - Accessing the other station from CC-Link - Remote device station initialization procedure registration - CC-Link diagnostics • Supports connection of FX3U-ENET-ADP. • Special parameter error (M8489 and D8489) is added.
Ver. 2.10	134**** (April, 2013)	• Supports the IP address change function of FX3U-ENET-ADP.

Appendix A-2 Programming Tool Applicability

Appendix A-2-1 Applicable versions of programming tool

- GX Works2 English version (SW□DNC-GXW2-E) is applicable to FX3GC PLCs from the following versions. Select FX3G as the PLC type when creating programs for FX3GC PLC using GX Developer (Ver. 8.72A or later).

FX3GC PLC version	Model name (Media model name is shown below.)	Applicable GX Works2 version	Remarks
Ver. 1.40	GX Works2 SW□DNC-GXW2-E	Ver. 1.77F or later	-
Ver. 2.00		Ver. 1.87R or later	

- FX-30P is applicable to FX3GC PLCs from the following version.

FX3GC PLC version	Model name	Applicable FX-30P version	Remarks
Ver. 1.40	FX-30P	Ver. 1.30 or later	The IVMC instruction is supported in FX-30P Ver. 1.50 or later.

Appendix A-2-2 In the case of programming tool (version) not applicable

Inapplicable programming tools can be used by selecting an alternative PLC model.

1. Alternative model setting

Model to be programmed	Model to be set	Priority High → Low					
FX3GC PLC	FX3GC	→	FX3G	→	FX1N*1	→	FX2N*1

*1. "FX2N" is selected when the FX-10P(-E) is used.

2. Contents of restrictions

- Programming is enabled only for the range of functionality available in the PLC selected as the alternative model, such as instructions, device ranges and program sizes. When the FX-10P(-E) is used, the range of functionality is limited to that available in the FX2N PLC.
- Use a programming tool that can select either FX3G to change parameters, i.e. memory capacity, file register capacity, etc.
- Use a programming tool that can select the FX3G model to program using the built-in USB port.

Appendix A-2-3 Program transfer speed and programming tools

1. Built-in USB communication

The FX3GC PLC has a built-in USB communication port, and performs program writing, program reading and monitoring at high speed (12 Mbps) with a personal computer that supports USB.

1) Supported programming tools*1
GX Works2 (Ver. 1.08J or later), GX Developer (Ver. 8.72A or later)

2) In programming tools not supporting USB
Communication is performed via RS-422 or RS-232C.

*1. Select FX3G when using a programming tool that does not support the FX3GC PLC.

2. RS-422/RS-232C communication

The FX3GC PLC can write and read programs and perform monitoring at 115.2 kbps through RS-422 /RS-232C communication.

1) 115.2 kbps supported programming tools*2
GX Works2 (Ver. 1.08J or later), GX Developer (Ver. 8.72A or later), FX-30P (Ver. 1.00 or later)

2) 115.2 kbps supported interfaces
- Standard built-in port (RS-422)
When the RS-232C/RS-422 converter FX-232AWC-H is connected.
- Special adapter FX3U-232ADP(-MB) for RS-232C

3) In programming tools not supporting 115.2 kbps
Communication is executed at 9,600 or 19,200 bps.

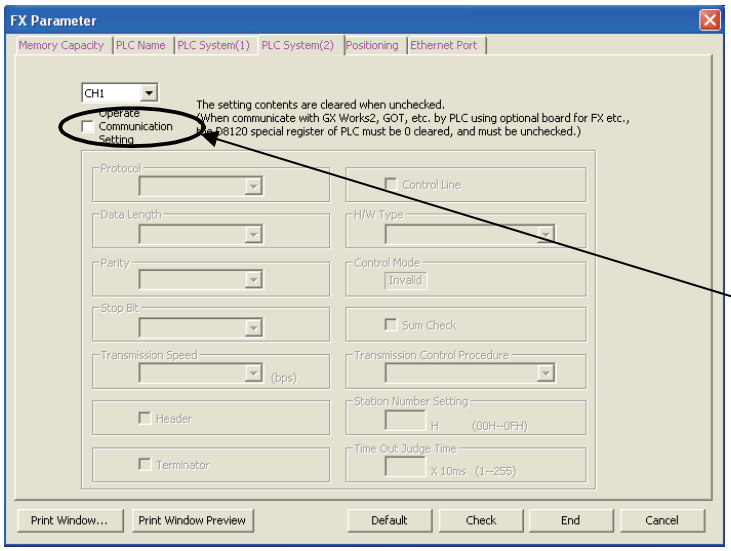
*2. Select FX3G when using a programming tool that does not support the FX3GC PLC.

Appendix A-2-4 Cautions on connecting peripheral equipment by way of special adapter.

When connecting peripheral equipment (programming tool or GOT [CPU direct connection]) by way of the FX3U-232ADP(-MB), set the connection channel (CH1 or CH2) as follows. If the connection channel is not specified with the status below, communication error may occur in the connected peripheral equipment.

→ **For details, refer to the Data Communication Edition.**

- Set to "K0" the special data register for communication format setting of the channel connecting the peripheral equipment (CH1: D8400 or D8120, CH2: D8420).
- Set the communication parameter "PLC system [2]" of the channel connecting the peripheral equipment to "Not set" (as shown in the window below).



Appendix A-2-5 Cautions on write during RUN

Programming tools supporting write during RUN

When using a programming tool that does not support the FX3GC PLC, write during RUN is enabled only for the range of functionality available in the PLC selected as the alternative model.
For operating procedure and cautions on write during RUN, refer to the following manuals.

→ **Refer to the manual of the programming tool used**
→ **Refer to the manual of the PLC selected as the alternative model**

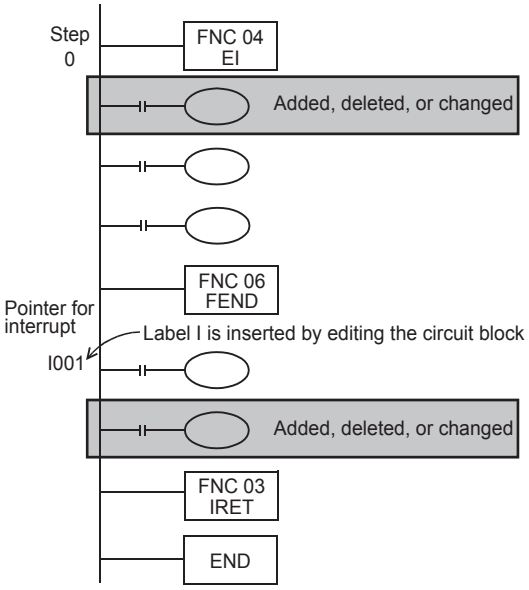
Programming tool	Version	Remarks
GX Works2*1 (SW□DNC-GXW2-E)	Ver. 1.08J or later	Writing in the instruction and device ranges during RUN is supported in FX3G PLCs earlier than Ver. 1.40.
	Ver. 1.62Q or later	Writing in the instruction and device ranges during RUN is supported in FX3G PLCs Ver. 1.40.
	Ver. 1.77F or later	Writing in the instruction and device ranges during RUN is supported in FX3GC PLCs Ver. 1.40.
GX Developer*2 (SW□D5C-GPPW-E)	Ver. 2.00A or later	Writing in the instruction and device ranges during RUN is supported in FX2N PLCs Ver. 1.00.
	Ver. 5.00A or later	Writing in the instruction and device ranges during RUN is supported in FX1N PLCs Ver. 1.00.
	Ver. 8.72A or later	Writing in the instruction and device ranges during RUN is supported in FX3G PLCs earlier than Ver. 1.10.
	Ver. 8.78G or later	Writing in the instruction and device ranges during RUN is supported in FX3G PLCs Ver. 1.10.
FX-PCS/WIN-E*2	Ver. 3.00 or later	Writing in the instruction and device ranges during RUN is supported in FX1N PLCs Ver. 1.00.

*1. Write during RUN is not possible with a SFC program.
*2. Write during RUN is not possible with a list program or a SFC program.

Cautions on write during RUN

Item	Caution
Program memories which can be written in RUN mode	Built-in EEPROM
Number of program steps which can be written for circuit change in RUN mode	256 steps or less after edition (addition/deletion) (including NOP immediately after circuit blocks except final circuit)
Circuit blocks which cannot be written in RUN mode	Circuit blocks*1 in which labels P and I are added, deleted or changed in edited circuits Circuit blocks in which 1-ms timers (T246 to T249 and T256 to T319) are added in edited circuits Circuit blocks in which the following instructions are included in edited circuits • Instruction to output high-speed counters C235 to C255 (OUT instruction) • TBL (FNC152) instruction

*1. Circuit blocks cannot be edited to insert a label as shown below when written during RUN.



<table>
<tr><th>Item</th><th>Caution</th></tr>
<tr><td rowspan="6">Circuit blocks which require attention on operation after write during RUN</td><td>Avoid write during RUN to a circuit block including the following instructions during execution.
If write during RUN is executed to such a circuit block, the PLC decelerates and stops pulse output.
• DSZR (FNC150), ZRN (FNC156), PLSV (FNC157) instructions [with acceleration/deceleration operation], DRVI (FNC158) and DRVA (FNC159) instructions</td></tr>
<tr><td>Avoid write during RUN to a circuit block including the following instruction during execution.
If write during RUN is executed to such a circuit block, the PLC immediately stops pulse output.
• PLSV (FNC157) instruction [without acceleration/deceleration operation]</td></tr>
<tr><td>Avoid write during RUN to a circuit block including the following instructions during execution.
• PLSY (FNC 50), PWM (FNC 58) and PLSR (FNC 59) instructions</td></tr>
<tr><td>Avoid write during RUN to a circuit block including the following instructions during execution of communication.
If write during RUN is executed to such a circuit block, the PLC may stop communication after that.
If the PLC stops communication, set the PLC to the STOP mode once, and then set it to the RUN mode again.
• IVCK (FNC270), IVDR (FNC271), IVRD (FNC272), IVWR (FNC273), IVMC (FNC275) and ADPRW (FNC276) instructions</td></tr>
<tr><td>• Instructions for falling edge pulse
When write during RUN is completed for a circuit including an instruction for falling edge pulse (LDF, ANDF, or ORF instruction), the instruction for falling edge pulse is not executed without regard to the ON/OFF status of the target device.
When write during RUN is completed for a circuit including an instruction for falling edge pulse (PLF instruction), the instruction for falling edge pulse is not executed without regard to the ON/OFF status of the device that is set as the operation condition.
It is necessary to set to ON the target device or operation condition device once and then set it to OFF for executing the instruction for falling edge pulse.
• Instructions for rising edge pulse
When write during RUN is completed for a circuit including an instruction for rising edge pulse, the instruction for rising edge pulse is executed if a target device of the instruction for rising edge pulse or the operation condition device is ON.
Target instructions for rising edge pulse: LDP, ANDP, ORP, and pulse operation type applied instructions (such as MOVP)
<table>
<tr><th>Contact ON/OFF status (while write during RUN is executed)</th><th>Instruction for rising edge pulse</th><th>Instruction for falling edge pulse</th></tr>
<tr><td>OFF</td><td>Not executed</td><td>Not executed</td></tr>
<tr><td>ON</td><td>Executed*1</td><td>Not executed</td></tr>
</table>
*1 The PLS instruction is not executed.</td></tr>
<tr><td>Writing in RUN mode to circuit blocks including the following instructions results in the following operation
• MEP instruction (Conversion of operation result to leading edge pulse instruction)
When completing Write during RUN to a circuit including the MEP instruction, the execution result of the MEP instruction turns ON (conducting state) if the operation result up to the MEP instruction is ON.
• MEF instruction (Conversion of operation result to trailing edge pulse instruction)
When completing Write during RUN to a circuit including the MEF instruction, the execution result of the MEF instruction turns OFF (nonconducting state) regardless of the operation result (ON or OFF) up to the MEF instruction.
When the operation result up to the MEF instruction is set to ON once and then set to OFF, the execution result of the MEF instruction turns ON (conducting state)
<table>
<tr><th>Operation result up to MEP/MEF instruction</th><th>MEP instruction</th><th>MEF instruction</th></tr>
<tr><td>OFF</td><td>OFF (nonconducting)</td><td>OFF (nonconducting)</td></tr>
<tr><td>ON</td><td>ON (conducting)</td><td>OFF (nonconducting)</td></tr>
</table></td></tr>
<tr><td>Others</td><td>• When writing during RUN with GX Works2 Ver. 1.08J or later, GX Developer Ver. 8.72A or later, the program is as follows.
When the number of program steps is reduced by deletion of contacts, coils and applied instructions, the program capacity becomes smaller by as many as the reduced number of steps.
• Errors cannot be detected in write during RUN even in a circuit which causes errors.
Errors are detected after the PLC is stopped once, and then run again.</td></tr>
</table>

Appendix A-3 Use of (Built-in USB) Programming Port

Make sure to set the contents described in this section when executing circuit monitor, device monitor, program reading/writing, etc. in the FX3GC PLC using the (built-in USB) programming port and GX Works2.
Communication using the (built-in USB) programming port is disabled when using programming software that cannot select the FX3G or FX3GC model.

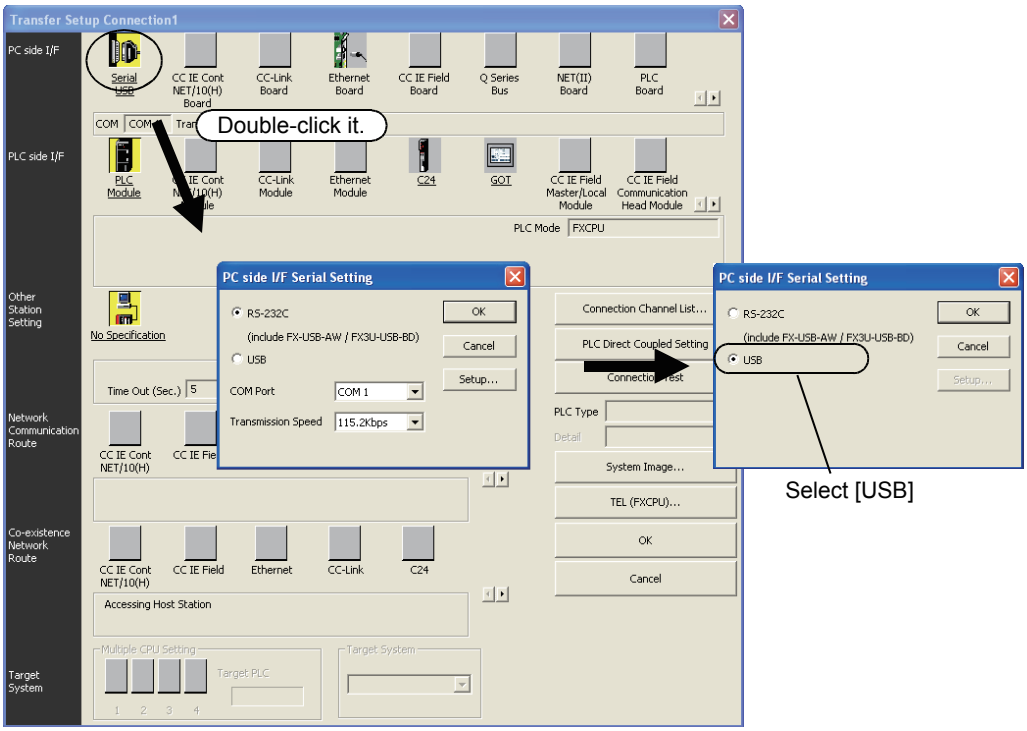
Appendix A-3-1 Installation of USB driver

It is necessary to install the USB driver to execute USB communication using the (built-in USB) programming port.
For the USB driver installation method and procedure, refer to the following manual.

→ **Refer to the GX Works2 Version 1 Operating Manual (Common)**

Appendix A-3-2 Setting in GX Works2

1. **Double-click the Connection Destination view → [Connection Destination] → [(Connection target data name)] in the Navigation window of GX Works2.**
   The [Transfer Setup Connection1] is displayed.
2. **Double-click [Serial USB] of the PC side I/F to display [PC side I/F Serial Setting].**
3. **Select [USB].**

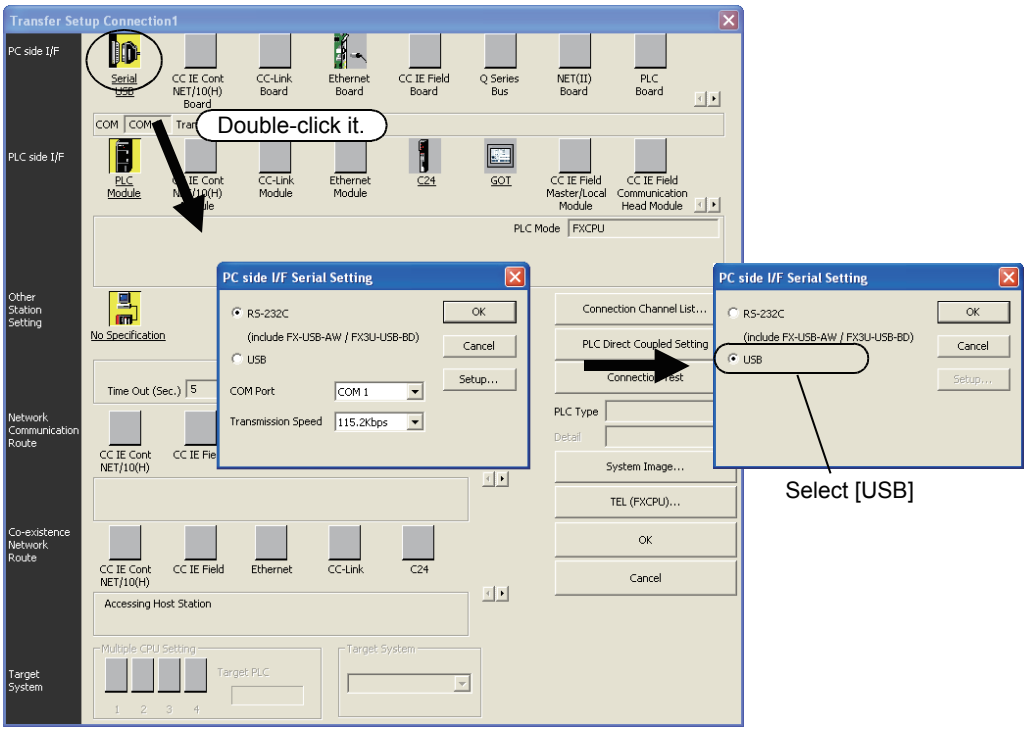


4. **Click the [OK] button to finish the setting.**

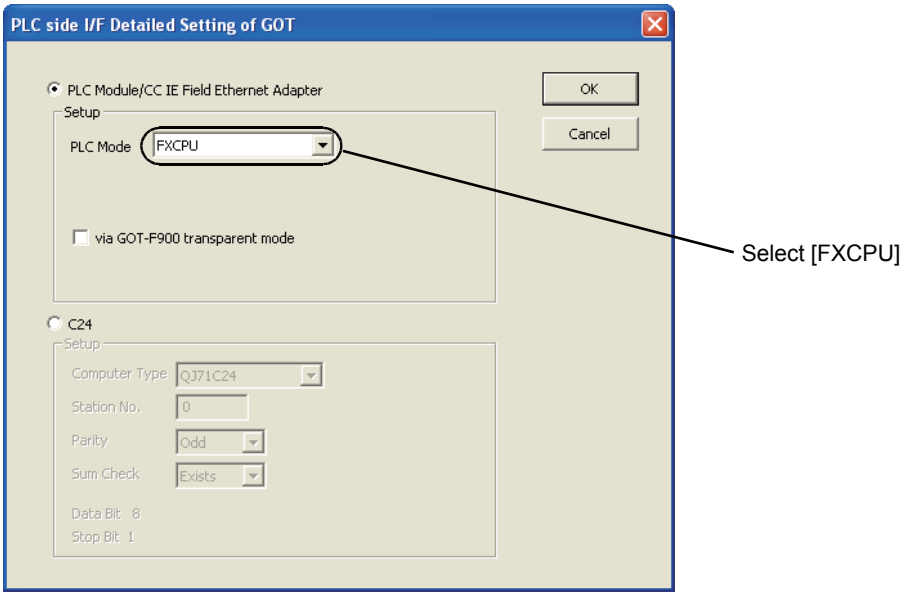
Appendix A-4 Cautions on using FA transparent function in GOT1000 Series

When monitoring circuits, device monitor, etc. or reading/writing programs in an FX3GC PLC from GX Works2 using the FA transparent function by way of USB in the GOT1000 Series, make sure to execute the following setting.

1. **Double-click the Connection Destination view → [Connection Destination] → [(Connection target data name)] in the Navigation window of GX Works2.**
   The [Transfer Setup Connection1] is displayed.
2. **Double-click [Serial USB] of the PC side I/F to display [PC side I/F Serial Setting].**
3. **Select [USB].**



4. **Double-click [GOT] of the PLC side I/F to display [PLC side I/F Detailed Setting of GOT].**
5. **Select [FXCPU].**

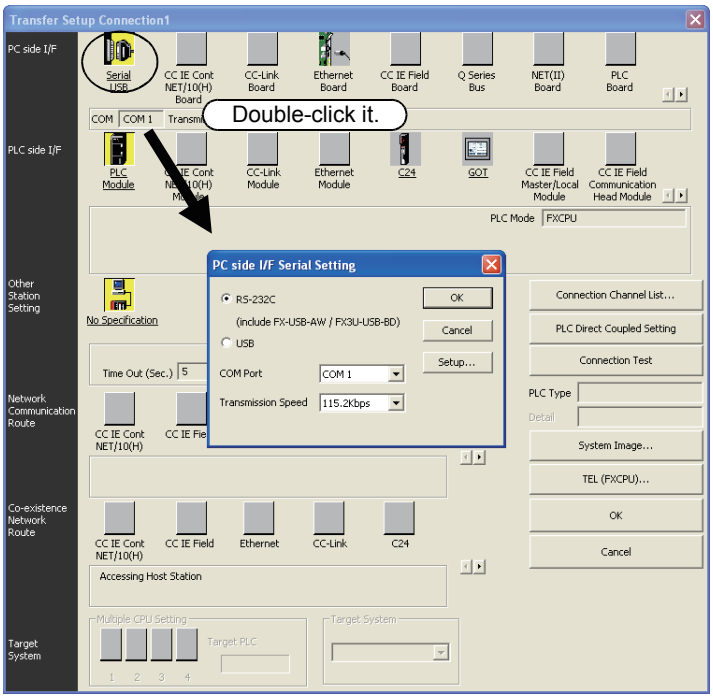


6. **Click the [OK] button to finish the setting.**

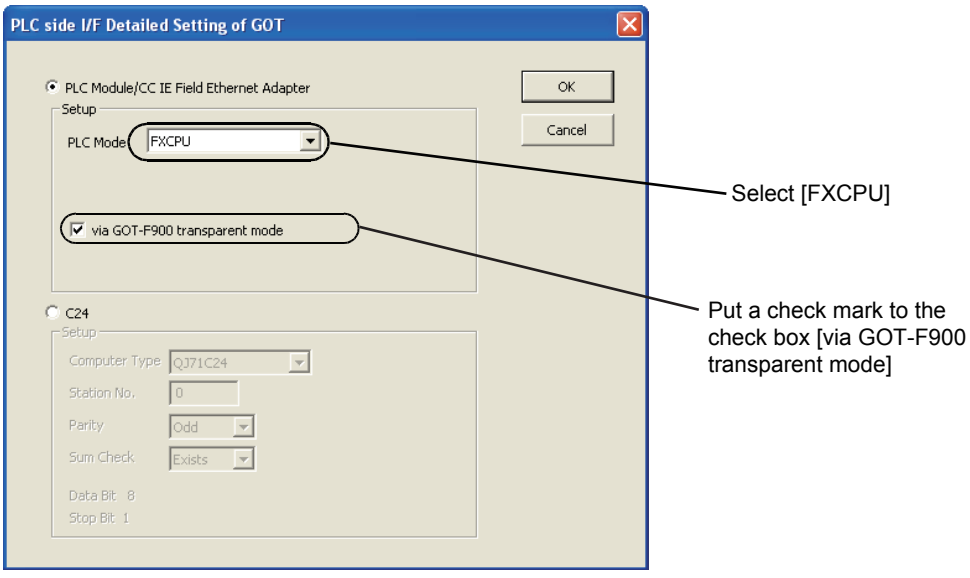
Appendix A-5 Cautions on using transparent port (2-port) function of GOT-F900 Series

When monitoring circuits, device monitor, etc. in an FX3GC PLC from GX Works2 using the transparent (2-port) function in the GOT-F900 Series, make sure to execute the following setting.

1. **Double-click the Connection Destination view → [Connection Destination] → [(Connection target data name)] in the Navigation window of GX Works2.**
   The [Transfer Setup Connection1] is displayed.
2. **Double-click [Serial USB] of the PC side I/F to display [PC side I/F Serial Setting].**
3. **Select [RS-232C] in setting shown below, and set [COM port] and [Transmission Speed].**



4. **Double-click [GOT] of the PLC side I/F to display [PLC side I/F Detailed Setting of GOT].**
5. **Select [FXCPU] in setting shown below and put a check mark to the check box [via GOT-F900 transparent mode] .**



6. **Click the [OK] button to finish the setting.**

Appendix A-6 Other Peripheral Equipment Applicability

Appendix A-6-1 Other Peripheral Equipment Applicability

Model name	Applicability	Remarks
GOT1000 Series	Applicable	Standard monitor OS, communication driver and option OS which support the FX3GC PLC are required. For details, refer to the GOT manual. This series is subject to the following restrictions when connected using unsupported standard monitor OS, communication driver or option OS. **Contents of restrictions** • When connected using standard monitor OS, communication driver and option OS which support the FX3G PLC - Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in the FX3G PLC. • When connected using standard monitor OS, communication driver and option OS which do not support the FX3G PLC - Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in the FX1N and FX1NC PLCs. - The list editor function for MELSEC-FX is not available. When using the list editor function for MELSEC-FX, upgrade the standard monitor OS, communication driver and option OS to the version compatible with the FX3GC PLC. Check the applicability of other items in the GOT manual.
F940WGOT	Not available	The following restriction applies when connected. **Contents of restrictions** Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in the FX1N and FX1NC PLCs. For applicable models, refer to the GOT manual. For connection using the 2-port interface function, refer to Appendix A-5.
F940GOT F940 Handy GOT	Not available	
F930GOT(-K)	Not available	
F920GOT(-K)	Not available	
ET-940	Not available	
FX-10DM(-SET0)	Not available	The following restriction applies when connected. **Contents of restrictions** Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in the FX1N and FX1NC PLCs. For supported models and device ranges, refer to the FX-10DM USER'S MANUAL (JY992D86401).
FX-10DU	Not available	The following restriction applies when connected. **Contents of restrictions** It is limited to the device range and function range supported by the highest class model (FX1N or FX2N) applicable in the product version. For supported models and device ranges, refer to the FX-10DU-E/FX-20DU-E User's Manual (JY992D54801).

Appendix B: Performance Specifications

Item		Performance		
Operation control system		Stored program repetitive operation system with interruption function		
Input/output control system		Batch processing system (when END instruction is executed) Input/output refresh instruction and pulse catch function are provided.		
Programming language		Relay symbol system + step-ladder system (SFC notation possible)		
Program memory	**Max. memory capacity/type**	32000-step/EEPROM memory Max. allowable write: 20,000 times		
	Writing function during running	Provided (Program can be modified while the PLC is running.) For the writing function during running, refer to Appendix A-2-5.		
	Keyword function	With keyword/Customer keyword function		
Real-time clock	**Clock function**[*1]	Built-in 1980 to 2079 (with correction for leap year) 2- or 4-digit year, accuracy within ±45 seconds/month at 25 °C		
Kinds of instructions	**Basic instructions**	Sequence instructions: 29 Step-ladder instructions: 2		
	Applied instructions	123 kinds		
Processing speed	**Basic instructions**	Standard mode[*3] : 0.21 μs/instruction Extension mode[*3] : 0.42 μs/instruction		
	Applied instructions	Standard mode[*3] : 0.5 μs to several hundred μs/instruction Extension mode[*3] : 1.2 μs to several hundred μs/instruction		
Number of input/output points	**(1)Extension-combined number of input points**	128 points or less	**(3)Total points**	(1) + (2) ≤ (3) total number of points is 128 or less.
	(2)Extension-combined number of output points	128 points or less		
	(4)Remote I/O number of points (CC-Link, AnyWireASLINK)	128 points or less	The total number of remote I/O points in CC-Link and AnyWireASLINK must be 128 points or less.	
	(3) + (4) total number of points	256 points or less		
Input/output relay	**Input relay**	X000 to X177	The device numbers are octal.	
	Output relay	Y000 to Y177		
Auxiliary relay	**For general**	M0 to M383	384 points	
	EEPROM keep	M384 to M1535	1152 points	
	For general[*2]	M1536 to M7679	6144 points	
	For special	M8000 to M8511	512 points	
State	**For initial state (EEPROM keep)**	S0 to S9	10 points	
	EEPROM keep	S10 to S999	990 points	
	For general[*2]	S1000 to S4095	3096 points	
Timer (on-delay timer)	**100 ms**	T0 to T191	192 points	0.1 to 3,276.7 sec
	100 ms [for subroutine/ interruption subroutine]	T192 T199	8 points	0.1 to 3,276.7 sec
	10 ms	T200 to T245	46 points	0.01 to 327.67 sec
	1ms accumulating type (EEPROM keep)	T246 to T249	4 points	0.001 to 32.767 sec
	100 ms accumulating type (EEPROM keep)	T250 to T255	6 points	0.1 to 3,276.7 sec
	1 ms	T256 to T319	64 points	0.01 to 327.67 sec
Counter	**16 bits up (For general)**	C0 to C15	16 points	Counting from 0 to 32,767
	16 bits up (EEPROM keep)	C16 to C199	184 points	

Item		Performance		
Counter	**32 bits up/down (For general)**	C200 to C219	20 points	Counting from -2,147,483,648 to +2,147,483,647
	32 bits up/down (EEPROM keep)	C220 to C234	15 points	
High-speed counter	**1-phase 1-count input in both directions (32 bits up/down) (EEPROM keep)**	C235 to C245	Counting from -2,147,483,648 to +2,147,483,647	
	1-phase 2-count input in both directions (32 bits up/down) (EEPROM keep)	C246 to C250		
	2-phase 2-count input in both directions (32 bits up/down) (EEPROM keep)	C251 to C255		
Data register (32 bits when paired)	**For general (16 bits)**	D0 to D127	128 points	
	For EEPROM keep (16 bits)	D128 to D1099	972 points	
	For general*2 (16 bits)	D1100 to D7999	6900 points	
	File register (EEPROM keep)	D1000 to D7999	Maximum 7000 points	Can be set as file registers in units of 500 points from D1000 in the program area (EEPROM) using parameters.
	For special (16 bits)	D8000 to D8511	512 points	
	For index (16 bits)	V0 to V7 Z0 to Z7	16 points	
Extension register	**For general*2 (16 bits)**	R0 to R23999	24000 points	
Extension file register	**For EEPROM keep (16 bits)**	ER0 to ER23999	24000 points	Stored in the EEPROM built-in the main unit.
Pointer	**For branching of JUMP and CALL**	P0 to P2047	2048 points	For CJ instructions and CALL instructions
	Input interruption	I0□□ to I5□□	6 points	
	Timer interruption	I6□□ to I8□□	3 points	
Nesting	**For master control**	N0 to N7	8 points	For MC instructions
Constant	**Decimal number (K)**	16bits	-32,768 to +32,767	
		32bits	-2,147,483,648 to +2,147,483,647	
	Hexadecimal number (H)	16bits	0 to FFFF	
		32bits	0 to FFFFFFFF	
	Real number (E)	32bits	-1.0×2^{128} to -1.0×2^{-126}, 0 , 1.0×2^{-126} to 1.0×2^{128} Decimal-point and exponential notations are possible.	

*1. The current time of the clock is backed up by the capacitor built-in the PLC. Supply the power to the PLC for 30 minutes or more to completely charge this large-capacity capacitor.
(The capacitor works for 10 days (atmosphere: 25 °C)
The current time can be backed up by the battery when the optional battery is incorporated.
→ **For details on the battery, refer to Chapter 9.**

*2. These devices can be changed to the keep (battery backup) type using a parameter when the optional battery is used.
→ **For the parameter setting method, refer to Chapter 9.**

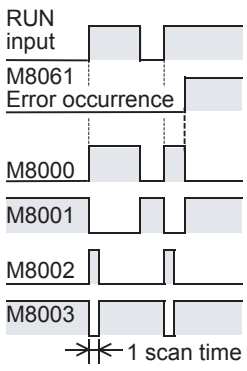
*3. The standard mode is selected when the program capacity is set to 16000 steps or less using a parameter.
The extension mode is selected when the program capacity is set to 16001 steps or more using a parameter.
→ **For parameter settings, refer to the Programming Manual.**

Appendix C: Operation of Special Devices

The device numbers and functions of the special auxiliary relays (indicated as "special M" in tables) and special data registers (indicated as "special D" in tables) are shown below.
Note that functions of certain devices vary depending on the series of the PLC.
Do not use the undefined / blank special auxiliary relays and special data registers in the sequence program since they are occupied by the CPU.
In addition, do not activate or write to the devices with brackets on the first letter such as [M]8000 or [D]8001 in the program.

→ **For detailed explanation, refer to the Programming Manual.**

Appendix C-1 Special Auxiliary Relay (M8000 to M8511)

Number and name	Operation and function	Corresponding special device
PLC Status		
[M]8000 RUN monitor NO contact		-
[M]8001 RUN monitor NC contact		-
[M]8002 Initial pulse NO contact		-
[M]8003 Initial pulse NC contact		-
[M]8004 Error occurrence	ON when either M8060, M8061, M8064, M8065, M8066, or M8067 is ON.	D8004
[M]8005 Battery voltage low	ON when battery voltage is below the value set in D8006.	D8005
[M]8006 Battery error latch	It is set when battery voltage low is detected.	D8006
[M]8007	Not used	-
[M]8008		-
[M]8009 24 V DC down	ON when 24 V DC power fails in special function block.	-

Number and name	Operation and function	Corresponding special device
Clock		
[M]8010	Not used	-
[M]8011 10 ms clock pulse	ON and OFF in 10 ms cycle (ON: 5 ms, OFF: 5 ms)	-
[M]8012 100 ms clock pulse	ON and OFF in 100 ms cycle (ON: 50 ms, OFF: 50 ms)	-
[M]8013 1sec clock pulse	ON and OFF in 1sec cycle (ON: 500 ms, OFF: 500 ms)	-
[M]8014 1min clock pulse	ON and OFF in 1min cycle (ON: 30 sec, OFF: 30sec)	-
M 8015	Clock stop and preset For real time clock	-
M 8016	Time read display is stopped For real time clock	-
M 8017	±30 seconds correction For real time clock	-
[M]8018	Installation detection (Always ON) For real time clock	-
M 8019	Real time clock (RTC) error For real time clock	-
Flag		
[M]8020 Zero	ON when the result of addition/ subtraction is 0.	-
[M]8021 Borrow	ON when the result of subtraction is less than the min. negative number.	-
M 8022 Carry	ON when 'carry' occurs as a result of addition or when an overflow occurs as a result of shift operation.	-
[M]8023	Not used	-
M 8024*1	BMOV direction specification (FNC 15)	-
M 8025 to M 8027	Not used	-
M 8028	Interrupt permission during FROM/ TO (FNC 78 and 79) instruction execution.	-
[M]8029 Instruction execution complete	ON when operation such as DSW (FNC 72) is completed.	-

*1. Cleared when PLC switches from RUN to STOP.

Number and name	Operation and function	Corresponding special device
PLC Mode		
M 8030*1 Battery LED OFF	When M8030 set to ON, LED on PLC is not lit even if low battery voltage is detected.	-
M 8031*1 Non-latch memory all clear	If this special auxiliary relay is activated, the ON/OFF image memory of Y, M, S, T, and C, and present values of T, C, D, special data registers and R are cleared to zero. However, file registers (D) in program memory, and extension file registers (ER) are not cleared.	-
M 8032*1 Latch memory all clear		-
M 8033 Memory hold STOP	When PLC is switched from RUN to STOP, image memory and data memory are retained.	-
M 8034*1 All outputs disable	All external output contacts of PLC are turned OFF.	-
M 8035 Forced RUN mode	Refer to Programming Manual for details.	-
M 8036 Forced RUN signal		-
M 8037 Forced STOP signal		-
[M]8038 Parameter setting	Communication parameter setting flag (for N:N network setting)	D8176 to D8180
M 8039 Constant scan mode	When M8039 is ON, PLC waits until scan time specified in D8039 and then executes cyclic operation.	D8039

*1. Executed at END instruction

Step Ladder and Annunciator		
M 8040 Transfer disable	While M8040 is turned ON, transfer between states is disabled.	-
[M]8041*2 Transfer start	Transfer from initial state is enabled in automatic operation mode.	-
[M]8042 Start pulse	Pulse output is given in response to a start input.	-
M 8043*2 Zero return complete	Set this in the last state of zero return mode.	-
M 8044*2 Zero point condition	Set this when machine zero return is detected.	-
M 8045 All output reset disable	Disables the 'all output reset' function when the operation mode is changed.	-
[M]8046*3 STL state ON	ON when M8047 is ON and either of S0 to S899 or S1000 to S4095 is active.	M8047
M 8047*3 STL monitoring enable	D8040 to D8047 are enabled when M8047 is ON.	D8040 to D8047
[M]8048*3 Annunciator operate	ON when M8049 is ON and either of S900 to S999 is ON.	-
M 8049*2 Annunciator enable	D8049 is enabled when M8049 is ON.	D8049 M8048

*2. Cleared when PLC switches from RUN to STOP.

*3. Executed at END instruction.

Number and name	Operation and function	Corresponding special device
Interrupt Disable		
M 8050 (Input interrupt) I00□ disable*4	• If an input interrupt or timer interrupt occurs while a special auxiliary relay for that interrupt (M8050 - M8058) is ON, the interrupt will not operate. For example, turning M8050 ON disables the I00□ interrupt; hence, the interrupt routine is not processed even in an allowable program area. • If an input interrupt or timer interrupt occurs while a special auxiliary relay for that interrupt (M8050 - M8058) is OFF. a) The interrupt will be accepted. b) The interrupt routine will be processed promptly if it is permitted by the EI (FNC 04) instruction. However, if the DI (FNC 05) instruction disables interrupts, the interrupt program will not be processed until EI (FNC 04) permits the interrupts.	-
M 8051 (Input interrupt) I10□ disable*4		-
M 8052 (Input interrupt) I20□ disable*4		-
M 8053 (Input interrupt) I30□ disable*4		-
M 8054 (Input interrupt) I40□ disable*4		-
M 8055 (Input interrupt) I50□ disable*4		-
M 8056 (Timer interrupt) I6□□ disable*4		-
M 8057 (Timer interrupt) I7□□ disable*4		-
M 8058 (Timer interrupt) I8□□ disable*4		-
M 8059	Not used	-

*4. Cleared when PLC switches from RUN to STOP.

Error Detection		
[M]8060	I/O configuration error	D8060
[M]8061	PLC hardware error	D8061
[M]8062*5	Serial communication error [ch0]	D8062
[M]8063*5*6	Serial communication error 1 [ch1]	D8063
[M]8064	Parameter error	D8064
[M]8065	Syntax error	D8065 D8069 D8314 D8315
[M]8066	Ladder error	D8066 D8069 D8314 D8315
[M]8067*7	Operation error	D8067 D8069 D8314 D8315
M 8068	Operation error latch	D8068 D8312 D8313
M 8069*8	I/O bus check	-

*5. Cleared when PLC power supply from OFF to ON.

*6. Serial communication error 2 [ch2] PLC is detected by M8438.

*7. Cleared when PLC switches from STOP to RUN.

*8. When M8069 is ON, I/O bus check is executed.

Number and name	Operation and function	Corresponding special device
Parallel Link		
M 8070*1	Parallel link Set M8070 when using master station.	-
M 8071*1	Parallel link Set M8071 when using slave station.	-
[M]8072	Parallel link ON when operating	-
[M]8073	Parallel link ON when M8070 or M8071 setting is incorrect	-

*1. Cleared when PLC switches from STOP to RUN.

Pulse width/Pulse period measurement function		
[M]8075	Pulse width/Pulse period measurement setting flag	-
[M]8076	[X000] Pulse width/Pulse period measurement flag	D8074 to D8079
[M]8077	[X001] Pulse width/Pulse period measurement flag	D8080 to D8085
[M]8078	[X003] Pulse width/Pulse period measurement flag	D8086 to D8091
[M]8079	[X004] Pulse width/Pulse period measurement flag	D8092 to D8097
M 8080	[X000] Pulse period measurement mode	D8074 to D8079
M 8081	[X001] Pulse period measurement mode	D8080 to D8085
M 8082	[X003] Pulse period measurement mode	D8086 to D8091
M 8083	[X004] Pulse period measurement mode	D8092 to D8097
Flag		
[M]8090 to [M]8100	Not used	-
Memory Information		
[M]8101	Not used	-
[M]8102		-
[M]8103		-
[M]8104		-
[M]8105	ON during writing in RUN mode	-
[M]8106	Not used	-
[M]8107		-
[M]8108		-
Output Refresh Error		
[M]8109	Output refresh error	D8109
[M]8110 to [M]8119	Not used	-

Number and name	Operation and function	Corresponding special device
RS (FNC 80) and Computer Link [ch1]		
[M]8120	Not used	-
[M]8121*2	RS (FNC 80) instruction: Send wait flag	-
M 8122*2	RS (FNC 80) instruction: Send request	D8122
M 8123*2	RS (FNC 80) instruction: Receive complete flag	D8123
[M]8124	RS (FNC 80) instruction: Carrier detection flag	-
[M]8125	Not used	-
[M]8126	Computer link [ch1]: Global ON	D8127 D8128 D8129
[M]8127	Computer link [ch1]: On-demand send processing	
M 8128	Computer link [ch1]: On-demand error flag	
M 8129	Computer link [ch1]: On-demand Word/Byte changeover RS (FNC 80) instruction: Time-out check flag	

*2. Cleared when PLC switches from RUN to STOP or RS instruction is OFF.

Positioning [PLSY, PLSR instruction]		
M 8145	[Y000] Pulse output stop command	-
M 8146	[Y001] Pulse output stop command	-
[M]8147	[Y000] Pulse output monitor (BUSY/READY)	-
[M]8148	[Y001] Pulse output monitor (BUSY/READY)	-
Inverter Communication Function		
[M]8150	Not used	-
[M]8151	Inverter communication in execution [ch1]	D8151
[M]8152*3	Inverter communication error [ch1]	D8152
[M]8153*3	Inverter communication error latch [ch1]	D8153
[M]8154	Not used	-
[M]8155		-
[M]8156	Inverter communication in execution [ch2]	D8156
[M]8157*3	Inverter communication error [ch2]	D8157
[M]8158*3	Inverter communication error latch [ch2]	D8158
[M]8159	Not used	-

*3. Cleared when PLC switches from STOP to RUN.

Number and name	Operation and function	Corresponding special device
Advanced Function		
M 8160	Not used	-
M 8161*1*2	8-bit process mode	-
M 8162	High speed parallel link mode	-
[M]8163	Not used	-
M 8164		-
M 8165		-
[M]8166		-
M 8167		-
M 8168*1	SMOV (FNC 13) instruction: HEX data handling function	-
[M]8169	Not used	-

*1. Cleared when PLC switches from STOP to RUN.
*2. Applicable to RS (FNC 80), ASCI (FNC 82), HEX (FNC 83), and CCD (FNC 84) instructions.

Pulse Catch		
M 8170*3	Input X000 pulse catch	-
M 8171*3	Input X001 pulse catch	-
M 8172*3	Input X002 pulse catch	-
M 8173*3	Input X003 pulse catch	-
M 8174*3	Input X004 pulse catch	-
M 8175*3	Input X005 pulse catch	-
M 8176	Not used	-
M 8177		-

*3. Cleared when PLC switches from STOP to RUN.

Communication Port Channel Setting		
M 8178	Parallel link channel switch (OFF: ch1/ON: ch2)	-
M 8179	N:N network channel switch*4	-

*4. The channel is specified by either creating or not creating M8179 in setting program.
- ch1: not creating M8179 in setting program
- ch2: creating M8179 in setting program

Number and name	Operation and function	Corresponding special device
N:N Network		
[M]8180	Not used	-
[M]8181		-
[M]8182		-
[M]8183	Data communication error (Master station)	D8201 to D8218
[M]8184	Data communication error (Slave station No.1)	
[M]8185	Data communication error (Slave station No.2)	
[M]8186	Data communication error (Slave station No.3)	
[M]8187	Data communication error (Slave station No.4)	
[M]8188	Data communication error (Slave station No.5)	
[M]8189	Data communication error (Slave station No.6)	
[M]8190	Data communication error (Slave station No.7)	
[M]8191	Data communication in execution	
[M]8192	Not used	-
[M]8193		-
[M]8194		-
[M]8195		-
[M]8196		-
[M]8197		-
M 8198		-
M 8199		-

Number and name		Operation and function	Corresponding special device
Counter Up/down Counter Counting Direction			
M 8200	C200	When M8□□□is ON, the corresponding C□□□ is changed to down mode. • ON: Down count operation • OFF: Up count operation	-
M 8201	C201		-
M 8202	C202		-
M 8203	C203		-
M 8204	C204		-
M 8205	C205		-
M 8206	C206		-
M 8207	C207		-
M 8208	C208		-
M 8209	C209		-
M 8210	C210		-
M 8211	C211		-
M 8212	C212		-
M 8213	C213		-
M 8214	C214		-
M 8215	C215		-
M 8216	C216		-
M 8217	C217		-
M 8218	C218		-
M 8219	C219		-
M 8220	C220		-
M 8221	C221		-
M 8222	C222		-
M 8223	C223		-
M 8224	C224		-
M 8225	C225		-
M 8226	C226		-
M 8227	C227		-
M 8228	C228		-
M 8229	C229		-
M 8230	C230		-
M 8231	C231		-
M 8232	C232		-
M 8233	C233		-
M 8234	C234		-
High Speed Counter Up/down Counter Counting Direction			
M 8235	C235	When M8□□□ is ON, the corresponding C□□□ is changed to down mode. • ON: Down count operation • OFF: Up count operation	-
M 8236	C236		-
M 8237	C237		-
M 8238	C238		-
M 8239	C239		-
M 8240	C240		-
M 8241	C241		-
M 8242	C242		-
M 8243	C243		-
M 8244	C244		-
M 8245	C245		-

Number and name		Operation and function	Corresponding special device
High Speed Counter Up/down Counter Monitoring			
[M]8246	C246	When C□□□ of 1-phase 2-input or 2-phase 2-input counter is in down mode, the corresponding M8□□□ turns ON. • OFF: Down count operation • ON: Up count operation	-
[M]8247	C247		-
[M]8248	C248		-
[M]8249	C249		-
[M]8250	C250		-
[M]8251	C251		-
[M]8252	C252		-
[M]8253	C253		-
[M]8254	C254		-
[M]8255	C255		-
[M]8256 to [M]8279	Not used		-
Analog Special Adapter (Refer to Appendix C-3 for details)			
M 8280 to M 8289	1st special adapter*1		-
M 8290 to M 8299	2nd special adapter*1		-

*1. Connected analog special adapters are counted from the main unit side.

Flag		
[M]8300 to [M]8303	Not used	-
[M]8304 Zero	ON when the multiplication and division calculated result is 0	-
[M]8305	Not used	-
[M]8306 Carry	ON when the division calculated result overflows	-
[M]8307 to [M]8311	Not used	-
[M]8312*2	Real time clock data lost error	-
[M]8313 to [M]8328	Not used	-
[M]8329	Instruction execution abnormal end	-

*2. Backed up against power interruption, and automatically cleared when M8312 itself is cleared or when the clock data is set again.

Number and name	Operation and function	Corresponding special device
Positioning		
[M]8330 to [M]8337	Not used	-
M 8338*1	PLSV (FNC157) instruction: Acceleration/deceleration operation	-
[M]8339	Not used	-
[M]8340	[Y000] Pulse output monitor (ON: BUSY/ OFF: READY)	-
M 8341*1	[Y000] Clear signal output function enable	-
M 8342*1	[Y000] Zero return direction specification	-
M 8343	[Y000] Forward limit	-
M 8344	[Y000] Reverse limit	-
M 8345*1	[Y000] DOG signal logic reverse	-
M 8346*1	[Y000] Zero point signal logic reverse	-
M 8347	Not used	-
[M]8348	[Y000] Positioning instruction activation	-
M 8349*1	[Y000] Pulse output stop command	-
[M]8350	[Y001] Pulse output monitor (ON: BUSY/ OFF: READY)	-
M 8351*1	[Y001] Clear signal output function enable	-
M 8352*1	[Y001] Zero return direction specification	-
M 8353	[Y001] Forward limit	-
M 8354	[Y001] Reverse limit	-
M 8355*1	[Y001] DOG signal logic reverse	-
M 8356*1	[Y001] Zero point signal logic reverse	-
M 8357	Not used	-
[M]8358	[Y001] Positioning instruction activation	-
M 8359*1	[Y001] Pulse output stop command	-
[M]8360 to [M]8369	Not used	-

*1. Cleared when PLC switches from RUN to STOP.

Number and name	Operation and function	Corresponding special device
RS2 (FNC 87) [ch0]		
[M]8370	Not used	-
M 8371*2	RS2 (FNC 87) [ch0] Send wait flag	-
M 8372*2	RS2 (FNC 87) [ch0] Send request	D8372
M 8373*2	RS2 (FNC 87) [ch0] Receive complete flag	D8373
[M]8374 to [M]8378	Not used	-
M 8379	RS2 (FNC 87) [ch0] Time-out check flag	-
High Speed Counter Function		
[M]8380 to [M]8387	Not used	-
[M]8388	Contact for high speed counter function change	-
M 8389 to M 8391	Not used	-
M 8392	Function changeover device for C248 and C253	-
[M]8393	Not used	-
[M]8394	Not used	-
[M]8395	Function changeover device for C254	-
[M]8396	Not used	-
[M]8397		-
Ring Counter		
M 8398	Ring counter operation (in units of 1ms, 32 bits)*3	D8398 D8399
[M]8399	Not used	-

*2. Cleared when PLC switches from RUN to STOP or when RS2 instruction [ch0] is OFF.

*3. 1ms ring counter (D8399, D8398) will operate after M8398 turns ON.

RS2 (FNC 87) [ch1]		
[M]8400	Not used	-
[M]8401*4	RS2 (FNC 87) [ch1] Send wait flag	-
M 8402*4	RS2 (FNC 87) [ch1] Send request	D8402
M 8403*4	RS2 (FNC 87) [ch1] Receive complete flag	D8403
[M]8404	RS2 (FNC 87) [ch1] Carrier detection flag	-
[M]8405	RS2 (FNC 87) [ch1] Data set ready (DSR) flag	-
[M]8406	Not used	-
[M]8407		-
[M]8408		-
M 8409	RS2 (FNC 87) [ch1] Time-out check flag	-

*4. Cleared when PLC switches from RUN to STOP or when RS2 instruction [ch1] is OFF.

Number and name	Operation and function	Corresponding special device
RS2 (FNC 87) [ch2] and Computer Link [ch2]		
[M]8410 to [M]8420	Not used	-
[M]8421*1	RS2 (FNC 87) [ch2] Send wait flag	-
M 8422*1	RS2 (FNC 87) [ch2] Send request	D8422
M 8423*1	RS2 (FNC 87) [ch2] Receive complete flag	D8423
[M]8424	RS2 (FNC 87) [ch2] Carrier detection flag	-
[M]8425	RS2 (FNC 87) [ch2] Data set ready (DSR) flag	-
[M]8426	Computer link [ch2] Global ON	D8427 D8428 D8429
[M]8427	Computer link [ch2] On-demand send processing	
M 8428	Computer link [ch2] On-demand error flag	
M 8429	Computer link [ch2] On-demand Word/Byte changeover RS2 (FNC 87) [ch2] Time-out check flag	

*1. Cleared when PLC switches from RUN to STOP or when RS2 instruction [ch2] is OFF.

MODBUS communication [ch1]		
[M]8401	MODBUS request in process	-
[M]8402	MODBUS communication error	D8402
[M]8403	MODBUS communication error (latched)	D8403
[M]8404 to [M]8407	Not used	-
[M]8408	Retry	-
[M]8409	Timeout	-
[M]8410	Not used	-
MODBUS communication [ch2]		
[M]8421	MODBUS request in process	-
[M]8422	MODBUS communication error	D8422
[M]8423	MODBUS communication error (latched)	D8423
[M]8424 to [M]8427	Not used	-
[M]8428	Retry	-
[M]8429	Timeout	-
[M]8430	Not used	-
MODBUS communication [ch1, ch2]		
M 8411	MODBUS configuration request flag	-

Number and name	Operation and function	Corresponding special device
FX3U-ENET-ADP [ch1]		
[M]8404*2	FX3U-ENET-ADP unit ready	-
[M]8405	Not used	-
[M]8406*2*3	Time setting execution	-
[M]8407 to [M]8410	Not used	-
M 8411*2*3	Execute time setting	-
[M]8063*2	Error occurrence	D8063
FX3U-ENET-ADP [ch2]		
[M]8424*2	FX3U-ENET-ADP unit ready	-
[M]8425	Not used	-
[M]8426*2*3	Time setting execution	-
[M]8427 to [M]8430	Not used	-
M 8431*2*3	Execute time setting	-
[M]8438*2	Error occurrence	D8438

*2. Supported in Ver. 2.00 or later.
*3. Used when the SNTP function setting is set to "Use" in the time setting parameters.

Error Detection		
[M]8430 to [M]8437	Not used	-
M 8438*4	Serial communication error 2 [ch2]	D8438
[M]8439 to [M]8448	Not used	-
[M]8449	Special block error flag	D8449
[M]8450 to [M]8459	Not used	-
Positioning		
M 8460 to M 8463	Not used	-
M 8464	DSZR (FNC150), ZRN (FNC156) instructions [Y000] Clear signal device specification function enabled	D8464
M 8465	DSZR (FNC150), ZRN (FNC156) instructions [Y001] Clear signal device specification function enabled	D8465
[M]8466 to [M]8467	Not used	-

*4. Cleared when PLC power supply from OFF to ON.

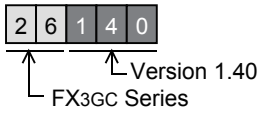
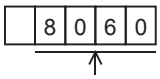
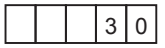
Error Detection		
[M]8468 to [M]8488	Not used	-
[M]8489*5	Special parameter error	D8489
[M]8490 to [M]8511	Not used	-

*5. Supported in Ver. 2.00 or later.

FX3U-ENET-ADP [ch1, ch2]		
[M]8490 to [M]8491	Not used	-
M 8492*6	IP address storage area write request	-
[M]8493*6	IP address storage area write completion	-
[M]8494*6	IP address storage area write error	-
M 8495*6	IP address storage area clear request	-
[M]8496*6	IP address storage area clear completion	-
[M]8497*6	IP address storage area clear error	-
[M]8498*6	IP address change function enable flag	-

*6. Supported in Ver. 2.10 or later.

Appendix C-2 Special Data Register (D8000 to D8511)

Number and name	Content of register	Corresponding special device
PLC Status		
D 8000 Watchdog timer	Default value is 200 ms (in 1ms steps) (Writes from system ROM at power ON) Value overwritten by program is valid after END or WDT instruction execution.	-
[D]8001 PLC type and system version		D8101
[D]8002 Memory capacity	• 2...2K steps • 4...4K steps • 8...8K steps • If 16K steps or more "K8" is written to D8002 and "16" or "32" is written to D8102.	M8002 D8102
[D]8003 Memory type	Stores the memory type. 10H: Built-in memory in PLC	-
[D]8004 Error number M	 8060 to 8068 (when M8004 is ON)	M8004
[D]8005 Battery voltage	 (in units of 0.1V) Battery voltage present value (Example: 3.0V)	M8005
[D]8006 Low battery voltage detection level	Default: 2.7 V (in units of 0.1 V) (Writes from system ROM at power ON)	M8006
[D]8007 D 8008 [D]8009	Not used	-

Number and name	Content of register	Corresponding special device
Clock		
[D]8010 Present scan time*1	Accumulated instruction-execution time from 0 step (in units of 0.1ms)	-
[D]8011 Minimum scan time*1	Minimum value of scan time (in units of 0.1ms)	-
[D]8012 Maximum scan time*1	Maximum value of scan time (in units of 0.1ms)	-
D 8013 Second data	0 to 59 seconds (for real time clock)	-
D 8014 Minute data	0 to 59 minutes (for real time clock)	-
D 8015 Hour data	0 to 23 hours (for real time clock)	-
D 8016 Day data	1 to 31 days (for real time clock)	-
D 8017 Month data	1 to 12 months (for real time clock)	-
D 8018 Year data	2 digits of year data (0 to 99) (for real time clock)	-
D 8019 Day-of-the-week data	0 (Sunday) to 6 (Saturday) (for real time clock)	-

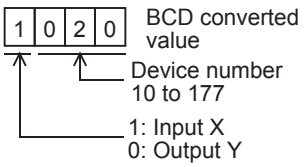
*1. Indicated value includes waiting time of constant scan operation (when M8039 is activated).

Input Filter		
D 8020 Input filter adjustment	Input filter value of X000 to X007 (Default: 10 ms)	-
[D]8021	Not used	-
[D]8022		-
[D]8023		-
[D]8024		-
[D]8025		-
[D]8026		-
[D]8027		-
Index Register Z0 and V0		
[D]8028	Value of Z0 (Z) register*2	-
[D]8029	Value of V0 (V) register*2	-
Constant Scan		
[D]8030 to [D]8038	Not used	-
D 8039 Constant scan duration	Default: 0 ms (in 1 ms steps) (Writes from system ROM at power ON) Can be overwritten by program	M8039

*2. The values of Z1 to Z7 and V1 to V7 are stored in D8182 to D8195.

Number and name	Content of register	Corresponding special device
Stepladder and Annunciator		
[D]8040*1 ON state number 1	The smallest number out of active state ranging from S0 to S899 and S1000 to S4095 is stored in D8040 and the second-smallest state number is stored in D8041. Active state numbers are then sequentially stored in registers up to D8047 (Max. 8 points).	M8047
[D]8041*1 ON state number 2		
[D]8042*1 ON state number 3		
[D]8043*1 ON state number 4		
[D]8044*1 ON state number 5		
[D]8045*1 ON state number 6		
[D]8046*1 ON state number 7		
[D]8047*1 ON state number 8		
[D]8048	Not used	-
[D]8049*1 On state minimum number	When M8049 is ON, the smallest number out of active annunciator relay ranging from S900 to S999 is stored in D8049.	M8049
[D]8050 to [D]8059	Not used	-

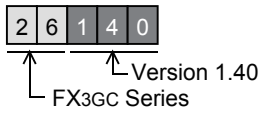
*1. Executed at END instruction

Error Detection (Refer to Subsection 10.6.3 for details)		
[D]8060	If the unit or block corresponding to a programmed I/O number is not actually loaded, M8060 is set to ON and the first device number of the erroneous block is written to D8060. Example: If X020 is unconnected. 	M8060
[D]8061	Error code for PLC hardware error	M8061
[D]8062*2	Error code for PC/PP communication error or serial communication error 0 [ch0]	M8062
[D]8063*2	Error code for serial communication error 1 [ch1]	M8063
[D]8064	Error code for parameter error	M8064
[D]8065	Error code for syntax error	M8065
[D]8066	Error code for ladder error	M8066
[D]8067*3	Error code for operation error	M8067
D 8068	Operation error step number latched	M8068
[D]8069*3	Error step number of M8065 to M8067	M8065 to M8067

*2. Cleared when PLC power supply from OFF to ON.
*3. Cleared when PLC switches from STOP to RUN.

Number and name		Content of register	Corresponding special device
Parallel Link			
[D]8070		Parallel link error time-out check time: 500 ms	-
[D]8071 to [D]8073		Not used	-
Pulse width/Pulse period measurement function			
D 8074*4	Lower	[X000] Ring counter value for rising edge (1/6 μs unit)	M8076 M8080
D 8075*4	Upper		
D 8076*4	Lower	[X000] Ring counter value for falling edge (1/6 μs unit)	
D 8077*4	Upper		
D 8078*4	Lower	[X000] Pulse width/Pulse period (10 μs unit)	
D 8079*4	Upper		
D 8080*4	Lower	[X001] Ring counter value for rising edge (1/6 μs unit)	M8077 M8081
D 8081*4	Upper		
D 8082*4	Lower	[X001] Ring counter value for falling edge (1/6 μs unit)	
D 8083*4	Upper		
D 8084*4	Lower	[X001] Pulse width/Pulse period (10 μs unit)	
D 8085*4	Upper		
D 8086*4	Lower	[X003] Ring counter value for rising edge (1/6 μs unit)	M8078 M8082
D 8087*4	Upper		
D 8088*4	Lower	[X003] Ring counter value for falling edge (1/6 μs unit)	
D 8089*4	Upper		
D 8090*4	Lower	[X003] Pulse width/Pulse period (10 μs unit)	
D 8091*4	Upper		
D 8092*4	Lower	[X004] Ring counter value for rising edge (1/6 μs unit)	M8079 M8083
D 8093*4	Upper		
D 8094*4	Lower	[X004] Ring counter value for falling edge (1/6 μs unit)	
D 8095*4	Upper		
D 8096*4	Lower	[X004] Pulse width/Pulse period (10 μs unit)	
D 8097*4	Upper		

*4. Cleared when PLC switches from STOP to RUN.

Memory Information		
[D]8101 PLC type and system version		-
[D]8102	2.....2K steps 4.....4K steps 8.....8K steps 16....16K steps 32....32K steps	-
[D]8103 to [D]8107	Not used	-
[D]8108	Number of special function blocks connected	-

Number and name	Content of register	Corresponding special device
Output Refresh Error		
[D]8109	Y number where output refresh error occurs	M8109
[D]8110 to [D]8119	Not used	-
RS (FNC 80) and Computer Link [ch1]		
D 8120*1	RS (FNC 80) instruction and computer link [ch1] Communication format setting	-
D 8121*1	Computer link [ch1] Station number setting	-
[D]8122*2	RS (FNC 80) instruction: Remaining points of transmit data	M8122
[D]8123*2	RS (FNC 80) instruction: Monitoring receive data points	M8123
D 8124	RS (FNC 80) instruction: Header <Default: STX>	-
D 8125	RS (FNC 80) instruction: Terminator <Default: ETX>	-
[D]8126	Not used	-
D 8127	Computer link [ch1] Specification of on-demand head device register	M8126 to M8129
D 8128	Computer link [ch1] Specification of on-demand data length register	
D 8129*1	RS (FNC 80) instruction, computer link [ch1] Time-out time setting	

*1. Latch device
*2. Cleared when PLC switches from RUN to STOP.

Positioning			
[D]8130 to [D]8135	Not used		-
D 8136	Lower	PLSY (FNC 57), PLSR (FNC 59) instructions: Accumulated total number of pulses output to Y000 and Y001	-
D 8137	Upper		-
[D]8138	Not used		-
[D]8139			-
D 8140	Lower	Accumulated number of pulses output to Y000 for PLSY (FNC 57) and PLSR (FNC 59) instructions	-
D 8141	Upper		-
D 8142	Lower	Accumulated number of pulses output to Y001 for PLSY (FNC 57) and PLSR (FNC 59) instructions	-
D 8143	Upper		
[D]8144	Not used		-
D 8145			-
D 8146			-
D 8147			-
D 8148			-
[D]8149			-

Number and name	Content of register	Corresponding special device
Inverter Communication Function		
D 8150*3	Response wait time of inverter communication [ch1]	-
[D]8151	Step number of instruction during inverter communication [ch1] Default: -1	M8151
[D]8152*4	Error code for inverter communication [ch1]	M8152
[D]8153*3	Inverter communication error step number latched [ch1] Default: -1	M8153
[D]8154	Not used	-
D 8155*3	Response wait time of inverter communication [ch2]	-
[D]8156	Step number of instruction during inverter communication [ch2] Default: -1	M8156
[D]8157*4	Error code for inverter communication [ch2]	M8157
[D]8158*4	Inverter communication error step number latched [ch2] Default: -1	M8158
[D]8159	Not used	-

*3. Cleared when PLC power supply from OFF to ON.
*4. Cleared when PLC switches from STOP to RUN.

Advanced Function		
[D]8160	Not used	-
[D]8161		-
[D]8162		-
[D]8163		-
D 8164		-
[D]8165		-
[D]8166		-
[D]8167		-
[D]8168		-
[D]8169	Access restriction status*5	-

*5. Access restriction status

Present value	Access restriction status	Program		Monitoring	Present value change
		Read	Write		
H**00*8	2nd keyword is not set	✓*6	✓*6	✓*6	✓*6
H**10*8	Write protection	✓	-	✓	✓
H**11*8	Read / write protection	-	-	✓	✓
H**12*7	All online operation protection	-	-	-	-
H**20*7	Keyword cancel	✓	✓	✓	✓

*6. Accesses are restricted by the keyword setting status.
*7. "**" indicates areas used by the system.

Number and name	Content of register	Corresponding special device
N:N Network (setting)		
[D]8170	Not used	-
[D]8171		-
[D]8172		-
[D]8173	Station number	-
[D]8174	Total number of slave stations	-
[D]8175	Refresh range	-
D 8176	Station number setting	M8038
D 8177	Total slave station number setting	
D 8178	Refresh range setting	
D 8179	Retry count setting	
D 8180	Comms time-out setting	
[D]8181	Not used	-
Index Register Z1 to Z7 and V1 to V7		
[D]8182	Value of Z1 register	-
[D]8183	Value of V1 register	-
[D]8184	Value of Z2 register	-
[D]8185	Value of V2 register	-
[D]8186	Value of Z3 register	-
[D]8187	Value of V3 register	-
[D]8188	Value of Z4 register	-
[D]8189	Value of V4 register	-
[D]8190	Value of Z5 register	-
[D]8191	Value of V5 register	-
[D]8192	Value of Z6 register	-
[D]8193	Value of V6 register	-
[D]8194	Value of Z7 register	-
[D]8195	Value of V7 register	-
[D]8196	Not used	-
[D]8197		-
[D]8198		-
[D]8199		-
N:N Network (monitoring)		
[D]8200	Not used	-
[D]8201	Current link scan time	-
[D]8202	Maximum link scan time	-
[D]8203	Number of communication error at master station	M8183 to M8191
[D]8204	Number of communication error at slave station No.1	
[D]8205	Number of communication error at slave station No.2	
[D]8206	Number of communication error at slave station No.3	
[D]8207	Number of communication error at slave station No.4	
[D]8208	Number of communication error at slave station No.5	
[D]8209	Number of communication error at slave station No.6	
[D]8210	Number of communication error at slave station No.7	
[D]8211	Code of communication error at master station	
[D]8212	Code of communication error at slave station No.1	
[D]8213	Code of communication error at slave station No.2	
[D]8214	Code of communication error at slave station No.3	
[D]8215	Code of communication error at slave station No.4	
[D]8216	Code of communication error at slave station No.5	
[D]8217	Code of communication error at slave station No.6	
[D]8218	Code of communication error at slave station No.7	
[D]8219 to [D]8279	Not used	
Analog Special Adapter (Refer to Appendix C-3 for details)		
D 8280 to D 8289	1st special adapter*1	-
D 8290 to D 8299	2nd special adapter*1	-
D 8300 to D 8328	Not used	-

*1. Connected analog special adapters are counted from the main unit side.

Positioning			
[D]8329 to [D]8339	Not used		-
D 8340	Lower	[Y000] Current value register Default: 0	-
D 8341	Upper		
D 8342	[Y000] Bias speed Default: 0		-
D 8343	Lower	[Y000] Maximum speed Default: 100000	-
D 8344	Upper		
D 8345	[Y000] Creep speed Default: 1000		-
D 8346	Lower	[Y000] Zero return speed Default: 50000	-
D 8347	Upper		
D 8348	[Y000] Acceleration time Default: 100		-
D 8349	[Y000] Deceleration time Default: 100		-
D 8350	Lower	[Y001] Current value register Default: 0	-
D 8351	Upper		
D 8352	[Y001] Bias speed Default: 0		-
D 8353	Lower	[Y001] Maximum speed Default: 100000	-
D 8354	Upper		
D 8355	[Y001] Creep speed Default: 1000		-
D 8356	Lower	[Y001] Zero return speed Default: 50000	-
D 8357	Upper		
D 8358	[Y001] Acceleration time Default: 100		-
D 8359	[Y001] Deceleration time Default: 100		-
[D]8360 to [D]8369	Not used		-

Number and name	Content of register	Corresponding special device
RS2 (FNC 87) [ch0]		
D 8370	RS2 (FNC 87) [ch0] Communication format setting	-
[D]8371	Not used	-
[D]8372*1	RS2 (FNC 87) [ch0] Remaining points of transmit data	M8372
[D]8373*1	RS2 (FNC 87) [ch0] Monitoring receive data points	M8373
[D]8374	Not used	-
[D]8375		-
[D]8376		-
[D]8377		-
[D]8378		-
[D]8379	RS2 (FNC 87) [ch0] Time-out time setting	-
D 8380	RS2 (FNC 87) [ch0] Header 1 and 2 <Default: STX>	-
D 8381	RS2 (FNC 87) [ch0] Header 3 and 4	-
D 8382	RS2 (FNC 87) [ch0] Terminator 1 and 2 <Default: ETX>	-
D 8383	RS2 (FNC 87) [ch0] Terminator 3 and 4	-
[D]8384	RS2 (FNC 87) [ch0] Receive sum (received data)	-
[D]8385	RS2 (FNC 87) [ch0] Receive sum (calculated result)	-
[D]8386	RS2 (FNC 87) [ch0] Receive sum (calculated result)	-
[D]8387	Not used	-
[D]8388		-
[D]8389	Operation mode display [ch0]	-

Number and name		Content of register	Corresponding special device
Ring Counter			
D 8398	Lower	Up-operation ring counter of 0 to 2,147,483,647 (in units of 1ms, 32-bit)*2	M8398
D 8399	Upper		
RS2 (FNC 87) [ch1]			
D 8400		RS2 (FNC 87) [ch1] Communication format setting	-
[D]8401		Not used	-
[D]8402*1		RS2 (FNC 87) [ch1] Remaining points of transmit data	M8402
[D]8403*1		RS2 (FNC 87) [ch1] Monitoring receive data points	M8403
[D]8404		Not used	-
[D]8405		Communication parameter display [ch1]	-
[D]8406		Not used	-
[D]8407			-
[D]8408			-
D 8409		RS2 (FNC 87) [ch1] Time-out time setting	-
D 8410		RS2 (FNC 87) [ch1] Header 1 and 2 <Default: STX>	-
D 8411		RS2 (FNC 87) [ch1] Header 3 and 4	-
D 8412		RS2 (FNC 87) [ch1] Terminator 1 and 2 <Default: ETX>	-
D 8413		RS2 (FNC 87) [ch1] Terminator 3 and 4	-
[D]8414		RS2 (FNC 87) [ch1] Receive sum (received data)	-
[D]8415		RS2 (FNC 87) [ch1] Receive sum (calculated result)	-
[D]8416		RS2 (FNC 87) [ch1] Send sum	-
[D]8417		Not used	-
[D]8418			-
[D]8419		Operation mode display [ch1]	-

*1. Cleared when PLC switches from RUN to STOP.
*2. 1ms ring counter (D8399, D8398) will operate after M8398 turns ON.

Number and name	Content of register	Corresponding special device
RS2 (FNC 87) [ch2] and Computer Link [ch2]		
D 8420	RS2 (FNC 87) [ch2] Communication format setting	-
D 8421	Computer link [ch2] Station number setting	-
[D]8422*1	RS2 (FNC 87) [ch2] Remaining points of transmit data	M8422
[D]8423*1	RS2 (FNC 87) [ch2] Monitoring receive data points	M8423
[D]8424	Not used	-
[D]8425	Communication parameter display [ch2]	-
[D]8426	Not used	-
D 8427	Computer link [ch2] Specification of on-demand head device register	M8426 to M8429
D 8428	Computer link [ch2] Specification of on-demand data length register	
D 8429	RS2 (FNC 87) [ch2], computer link [ch2] Time-out time setting	
D 8430	RS2 (FNC 87) [ch2] Header 1 and 2 <Default: STX>	-
D 8431	RS2 (FNC 87) [ch2] Header 3 and 4	-
D 8432	RS2 (FNC 87) [ch2] Terminator 1 and 2 <Default: ETX>	-
D 8433	RS2 (FNC 87) [ch2] Terminator 3 and 4	-
[D]8434	RS2 (FNC 87) [ch2] Receive sum (received data)	-
[D]8435	RS2 (FNC 87) [ch2] Receive sum (calculated result)	-
[D]8436	RS2 (FNC 87) [ch2] Send sum	-
[D]8437	Not used	-

*1. Cleared when PLC switches from RUN to STOP

MODBUS communication [ch1]		
D 8400	Communication format	-
D 8401	Protocol	-
D 8402	Communication error code	M8402
D 8403	Error details	M8403
D 8404	Error step number	-
[D]8405	Communication format display	-
[D]8406	Not used	-
[D]8407	Step number being executed	-
[D]8408	Current retry value	-
D 8409	Slave response timeout	-
D 8410	Turn around delay	-
D 8411	Message to message delay	-
D 8412	Number of retries	-
[D]8413	Not used	-
D 8414	Slave node address	-
[D]8415 to [D]8418	Not used	-
[D]8419	Communication mode	-

MODBUS communication [ch2]		
D 8420	Communication format	-
D 8421	Protocol	-
D 8422	Communication error code	M8422
D 8423	Error details	M8423
D 8424	Error step number	-
[D]8425	Communication format display	-
[D]8426	Not used	-
[D]8427	Step number being executed	-
[D]8428	Current retry value	-
D 8429	Slave response timeout	-
D 8430	Turn around delay	-
D 8431	Message to message delay	-
D 8432	Number of retries	-
[D]8433	Not used	-
D 8434	Slave node address	-
[D]8435 to [D]8438	Not used	-
[D]8439	Communication mode	-
FX3U-ENET-ADP [ch1]		
[D]8400*2	IP Address (Low-order)	-
[D]8401*2	IP Address (High-order)	-
[D]8402*2	Subnet mask (Low-order)	-
[D]8403*2	Subnet mask (High-order)	-
[D]8404*2	Default router IP Address (Low-order)	-
[D]8405*2	Default router IP Address (High-order)	-
[D]8406*2	Status information	-
[D]8407*2	Connection condition of the Ethernet port	-
[D]8408*2	FX3U-ENET-ADP version	-
D 8409*2	Communication timeout time	-
D 8410*2	Connection forcible nullification	-
[D]8411*2	Time setting functional operation result	-
[D]8412 to [D]8414*2	Host MAC address	-
[D]8415	Not used	-
[D]8416*2	Model code	-
[D]8417*2	Error code of the Ethernet adapter	-
[D]8418	Not used	-
[D]8063*2	Error code	M8063
[D]8419*2	Operation mode display	-

*2. Supported in Ver. 2.00 or later.

Number and name	Content of register	Corresponding special device
FX3U-ENET-ADP [ch2]		
[D]8420*1	IP Address (Low-order)	-
[D]8421*1	IP Address (High-order)	-
[D]8422*1	Subnet mask (Low-order)	-
[D]8423*1	Subnet mask (High-order)	-
[D]8424*1	Default router IP Address (Low-order)	-
[D]8425*1	Default router IP Address (High-order)	-
[D]8426*1	Status information	-
[D]8427*1	Connection condition of the Ethernet port	-
[D]8428*1	FX3U-ENET-ADP version	-
D 8429*1	Communication timeout time	-
D 8430*1	Connection forcible nullification	-
[D]8431*1	Time setting functional operation result	-
[D]8432 to [D]8434*1	Host MAC address	-
[D]8435	Not used	-
[D]8436*1	Model code	-
[D]8437*1	Error code of the Ethernet adapter	-
[D]8438*1	Error code	M8438
[D]8439*1	Operation mode display	-

*1. Supported in Ver. 2.00 or later.

Error Detection		
[D]8438*2	Error code for serial communication error 2 [ch2]	M8438
RS2 (FNC 87) [ch2] and Computer Link [ch2]		
[D]8439	Operation mode display [ch2]	-
Error Detection		
[D]8440 to [D]8448	Not used	-
[D]8449	Special block error code	M8449
[D]8450 to [D]8459	Not used	-
Positioning		
[D]8460 to [D]8463	Not used	-
D 8464	DSZR (FNC150) and ZRN (FNC156) instructions: [Y000] Clear signal device specification	M8464
D 8465	DSZR (FNC150) and ZRN (FNC156) instructions: [Y001] Clear signal device specification	M8465
D 8466 to [D]8467	Not used	-

*2. Cleared when PLC power supply from OFF to ON.

Number and name	Content of register	Corresponding special device
Error Detection		
[D]8468 to [D]8488	Not used	-
[D]8489*3	Error code for special parameter error	M8489
[D]8490 to [D]8511	Not used	-

*3. Supported in Ver. 2.00 or later.

FX3U-ENET-ADP [ch1, ch2]		
D 8492*4	IP address setting (Low-order)	-
D 8493*4	IP address setting (High-order)	-
D 8494*4	Subnet mask setting (Low-order)	-
D 8495*4	Subnet mask setting (High-order)	-
D 8496*4	Default router IP address setting (Low-order)	-
D 8497*4	Default router IP address setting (High-order)	-
[D]8498*4	Error code for IP address storage area write	-
[D]8499*4	Error code for IP address storage area clear	-

*4. Supported in Ver. 2.10 or later.

Appendix C-3 Analog special adapters special devices

When analog special adapters are connected, operations and functions are assigned to the devices shown in the tables below in accordance with the number of connected analog special adapters.
Devices which cannot be written are shaded in "Operation and function" column.

→ **For details, refer to Analog Control Edition.**

Appendix C-3-1 Special auxiliary relays (M8280 to M8299)

Number	Operation and function		
	FX3U-4AD-ADP	**FX3U-4DA-ADP**	**FX3U-3A-ADP**
Compatible Versions	From first product	From first product	From first product
1st analog special adapter			
M 8280	Input mode switching Ch1	Output mode switching Ch1	Input mode switching Ch1
M 8281	Input mode switching Ch2	Output mode switching Ch2	Input mode switching Ch2
M 8282	Input mode switching Ch3	Output mode switching Ch3	Output mode switching
M 8283	Input mode switching Ch4	Output mode switching Ch4	Not used
M 8284	Not used	Output hold mode cancel Ch1	Not used
M 8285	Not used	Output hold mode cancel Ch2	Not used
M 8286	Not used	Output hold mode cancel Ch3	Output hold mode cancel
M 8287	Not used	Output hold mode cancel Ch4	Sets whether or not input channel 1 is used.
M 8288	Not used	Not used	Sets whether or not input channel 2 is used.
M 8289	Not used	Not used	Sets whether or not output channel is used.
2nd analog special adapter			
M 8290	Input mode switching Ch1	Output mode switching Ch1	Input mode switching Ch1
M 8291	Input mode switching Ch2	Output mode switching Ch2	Input mode switching Ch2
M 8292	Input mode switching Ch3	Output mode switching Ch3	Output mode switching
M 8293	Input mode switching Ch4	Output mode switching Ch4	Not used
M 8294	Not used	Output hold mode cancel Ch1	Not used
M 8295	Not used	Output hold mode cancel Ch2	Not used
M 8296	Not used	Output hold mode cancel Ch3	Output hold mode cancel
M 8297	Not used	Output hold mode cancel Ch4	Sets whether or not input channel 1 is used.
M 8298	Not used	Not used	Sets whether or not input channel 2 is used.
M 8299	Not used	Not used	Sets whether or not output channel is used.

Number	Operation and function		
	FX3U-4AD-PT(W)-ADP	FX3U-4AD-TC-ADP	FX3U-4AD-PNK-ADP
Compatible Versions	From first product	From first product	From first product
1st analog special adapter			
M 8280	Temperature unit selection	Temperature unit selection	Temperature unit selection
M 8281	Not used	Type-K/-J switching	Input sensor selection
M 8282	Not used	Not used	Not used
M 8283	Not used	Not used	Not used
M 8284	Not used	Not used	Not used
M 8285	Not used	Not used	Not used
M 8286	Not used	Not used	Not used
M 8287	Not used	Not used	Not used
M 8288	Not used	Not used	Not used
M 8289	Not used	Not used	Not used
2nd analog special adapter			
M 8290	Temperature unit selection	Temperature unit selection	Temperature unit selection
M 8291	Not used	Type-K/-J switching	Input sensor selection
M 8292	Not used	Not used	Not used
M 8293	Not used	Not used	Not used
M 8294	Not used	Not used	Not used
M 8295	Not used	Not used	Not used
M 8296	Not used	Not used	Not used
M 8297	Not used	Not used	Not used
M 8298	Not used	Not used	Not used
M 8299	Not used	Not used	Not used

Appendix C-3-2 Special data registers (D8260 to D8299)

Number	Operation and function		
	FX3U-4AD-ADP	**FX3U-4DA-ADP**	**FX3U-3A-ADP**
Compatible Versions	From first product	From first product	From first product
1st analog special adapter			
D 8280	Input data Ch1	Output data Ch1	Input data Ch1
D 8281	Input data Ch2	Output data Ch2	Input data Ch2
D 8282	Input data Ch3	Output data Ch3	Output data
D 8283	Input data Ch4	Output data Ch4	Not used
D 8284	Number of averaging times for Ch1 (1 to 4095)	Not used	Number of averaging times for Ch1 (1 to 4095)
D 8285	Number of averaging times for Ch2 (1 to 4095)	Not used	Number of averaging times for Ch2 (1 to 4095)
D 8286	Number of averaging times for Ch3 (1 to 4095)	Not used	Not used
D 8287	Number of averaging times for Ch4 (1 to 4095)	Not used	Not used
D 8288	Error status	Error status	Error status
D 8289	Model code: K1	Model code: K2	Model code: K50
2nd analog special adapter			
D 8290	Input data Ch1	Output data Ch1	Input data Ch1
D 8291	Input data Ch2	Output data Ch2	Input data Ch2
D 8292	Input data Ch3	Output data Ch3	Output data
D 8293	Input data Ch4	Output data Ch4	Not used
D 8294	Number of averaging times for Ch1 (1 to 4095)	Not used	Number of averaging times for Ch1 (1 to 4095)
D 8295	Number of averaging times for Ch2 (1 to 4095)	Not used	Number of averaging times for Ch2 (1 to 4095)
D 8296	Number of averaging times for Ch3 (1 to 4095)	Not used	Not used
D 8297	Number of averaging times for Ch4 (1 to 4095)	Not used	Not used
D 8298	Error status	Error status	Error status
D 8299	Model code: K1	Model code: K2	Model code: K50

Number	Operation and function		
	FX3U-4AD-PT(W)-ADP	**FX3U-4AD-TC-ADP**	**FX3U-4AD-PNK-ADP**
Compatible Versions	From first product	From first product	From first product
1st analog special adapter			
D 8280	Measured temperature Ch1	Measured temperature Ch1	Measured temperature Ch1
D 8281	Measured temperature Ch2	Measured temperature Ch2	Measured temperature Ch2
D 8282	Measured temperature Ch3	Measured temperature Ch3	Measured temperature Ch3
D 8283	Measured temperature Ch4	Measured temperature Ch4	Measured temperature Ch4
D 8284	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)
D 8285	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)
D 8286	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)
D 8287	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)
D 8288	Error status	Error status	Error status
D 8289	Model code: K20 (PT), K21 (PTW)	Model code: K10	Model code: K11
2nd analog special adapter			
D 8290	Measured temperature Ch1	Measured temperature Ch1	Measured temperature Ch1
D 8291	Measured temperature Ch2	Measured temperature Ch2	Measured temperature Ch2
D 8292	Measured temperature Ch3	Measured temperature Ch3	Measured temperature Ch3
D 8293	Measured temperature Ch4	Measured temperature Ch4	Measured temperature Ch4
D 8294	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)
D 8295	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)
D 8296	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)
D 8297	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)
D 8298	Error status	Error status	Error status
D 8299	Model code: K20 (PT), K21 (PTW)	Model code: K10	Model code: K11

Appendix D: Instruction List

Appendix D-1 Basic Instructions

Mnemonic	Function
Contact Instruction	
LD	Initial logical operation contact type NO (normally open)
LDI	Initial logical operation contact type NC (normally closed)
LDP	Initial logical operation of Rising edge pulse
LDF	Initial logical operation of Falling/trailing edge pulse
AND	Serial connection of NO (normally open) contacts
ANI	Serial connection of NC (normally closed) contacts
ANDP	Serial connection of Rising edge pulse
ANDF	Serial connection of Falling/trailing edge pulse
OR	Parallel connection of NO (normally open) contacts
ORI	Parallel connection of NC (normally closed) contacts
ORP	Parallel connection of Rising edge pulse
ORF	Parallel connection of Falling/trailing edge pulse
Connection Instruction	
ANB	Serial connection of multiple parallel circuits
ORB	Parallel connection of multiple contact circuits
MPS	Stores the current result of the internal PLC operations
MRD	Reads the current result of the internal PLC operations
MPP	Pops (recalls and removes) the currently stored result
INV	Invert the current result of the internal PLC operations
MEP	Conversion of operation result to leading edge pulse
MEF	Conversion of operation result to trailing edge pulse

Mnemonic	Function
Out Instruction	
OUT	Final logical operation type coil drive
SET	SET Bit device latch ON
RST	RESET Bit device OFF
PLS	Rising edge pulse
PLF	Falling/trailing edge pulse
Master Control Instruction	
MC	Denotes the start of a master control block
MCR	Denotes the end of a master control block
Other Instruction	
NOP	No operation or null step
End Instruction	
END	Program END, I/O refresh and Return to Step 0

Appendix D-2 Step Ladder Instructions

Mnemonic	Function
STL	Starts step ladder
RET	Completes step ladder

Appendix D-3 Applied Instructions ... in Ascending Order of FNC Number

FNC No.	Mnemonic	Function
Program Flow		
00	CJ	Conditional Jump
01	CALL	Call Subroutine
02	SRET	Subroutine Return
03	IRET	Interrupt Return
04	EI	Enable Interrupt
05	DI	Disable Interrupt
06	FEND	Main Routine Program End
07	WDT	Watchdog Timer Refresh
08	FOR	Start a FOR/NEXT Loop
09	NEXT	End a FOR/NEXT Loop
Move and Compare		
10	CMP	Compare
11	ZCP	Zone Compare
12	MOV	Move
13	SMOV	Shift Move
14	CML	Complement
15	BMOV	Block Move
16	FMOV	Fill Move
17	-	
18	BCD	Conversion to Binary Coded Decimal
19	BIN	Conversion to Binary
Arithmetic and Logical Operation		
20	ADD	Addition
21	SUB	Subtraction
22	MUL	Multiplication
23	DIV	Division
24	INC	Increment
25	DEC	Decrement
26	WAND	Logical Word AND
27	WOR	Logical Word OR
28	WXOR	Logical Exclusive OR
29	-	
Rotation and Shift Operation		
30	ROR	Rotation Right
31	ROL	Rotation Left
32	-	
33	-	
34	SFTR	Bit Shift Right
35	SFTL	Bit Shift Left
36	WSFR	Word Shift Right
37	WSFL	Word Shift Left
38	SFWR	Shift Write [FIFO/FILO Control]
39	SFRD	Shift Read [FIFO Control]

FNC No.	Mnemonic	Function
Data Operation		
40	ZRST	Zone Reset
41	DECO	Decode
42	ENCO	Encode
43	SUM	Sum of Active Bits
44	BON	Check Specified Bit Status
45	MEAN	Mean
46	ANS	Timed Annunciator Set
47	ANR	Annunciator Reset
48	-	
49	FLT	Conversion to Floating Point
High Speed Processing		
50	REF	Refresh
51	-	
52	MTR	Input Matrix
53	HSCS	High Speed Counter Set
54	HSCR	High Speed Counter Reset
55	HSZ	High Speed Counter Zone Compare
56	SPD	Speed Detection
57	PLSY	Pulse Y Output
58	PWM	Pulse Width Modulation
59	PLSR	Acceleration/Deceleration Setup
Handy Instruction		
60	IST	Initial State
61	SER	Search a Data Stack
62	ABSD	Absolute Drum Sequencer
63	INCD	Incremental Drum Sequencer
64	-	
65	-	
66	ALT	Alternate State
67	RAMP	Ramp Variable Value
68	-	
69	-	
External FX I/O Device		
70	-	
71	-	
72	DSW	Digital Switch (Thumbwheel Input)
73	-	
74	SEGL	Seven Segment With Latch
75	-	
76	-	
77	-	
78	FROM	Read From A Special Function Block
79	TO	Write To A Special Function Block

FNC No.	Mnemonic	Function
External FX Device		
80	RS	Serial Communication
81	PRUN	Parallel Run (Octal Mode)
82	ASCI	Hexadecimal to ASCII Conversion
83	HEX	ASCII to Hexadecimal Conversion
84	CCD	Check Code
85	-	
86	-	
87	RS2	Serial Communication 2
88	PID	PID Control Loop
89	-	
Floating Point		
110	ECMP	Floating Point Compare
111	-	
112	EMOV	Floating Point Move
113 to 119	-	
120	EADD	Floating Point Addition
121	ESUB	Floating Point Subtraction
122	EMUL	Floating Point Multiplication
123	EDIV	Floating Point Division
124	-	
125	-	
126	-	
127	ESQR	Floating Point Square Root
128	-	
129	INT	Floating Point to Integer Conversion
Positioning Control		
150	DSZR	DOG Search Zero Return
151	-	
152	TBL	Batch Data Positioning Mode
153	-	
154	-	
155	ABS	Absolute Current Value Read
156	ZRN	Zero Return
157	PLSV	Variable Speed Pulse Output
158	DRVI	Drive to Increment
159	DRVA	Drive to Absolute
Real Time Clock Control		
160	TCMP	RTC Data Compare
161	TZCP	RTC Data Zone Compare
162	TADD	RTC Data Addition
163	TSUB	RTC Data Subtraction
164	-	
165	-	
166	TRD	Read RTC data
167	TWR	Set RTC data
168	-	
169	HOUR	Hour Meter

FNC No.	Mnemonic	Function
External Device		
170	GRY	Decimal to Gray Code Conversion
171	GBIN	Gray Code to Decimal Conversion
172 to 175	-	
176	RD3A	Read from Dedicated Analog Block
177	WR3A	Write to Dedicated Analog Block
178	-	
179	-	
Data Comparison		
220 to 223	-	
224	LD=	Load Compare (S1)=(S2)
225	LD>	Load Compare (S1)>(S2)
226	LD<	Load Compare (S1)<(S2)
227	-	
228	LD<>	Load Compare (S1)≠(S2)
229	LD<=	Load Compare (S1)≤(S2)
230	LD>=	Load Compare (S1)≥(S2)
231	-	
232	AND=	AND Compare (S1)=(S2)
233	AND>	AND Compare (S1)>(S2)
234	AND<	AND Compare (S1)<(S2)
235	-	
236	AND<>	AND Compare (S1)≠(S2)
237	AND<=	AND Compare (S1)≤(S2)
238	AND>=	AND Compare (S1)≥(S2)
239	-	
240	OR=	OR Compare (S1)=(S2)
241	OR>	OR Compare (S1)>(S2)
242	OR<	OR Compare (S1)<(S2)
243	-	
244	OR<>	OR Compare (S1)≠(S2)
245	OR<=	OR Compare (S1)≤(S2)
246	OR>=	OR Compare (S1)≥(S2)
247 to 249	-	
External Device Communication		
270	IVCK	Inverter Status Check
271	IVDR	Inverter Drive
272	IVRD	Inverter Parameter Read
273	IVWR	Inverter Parameter Write
274	-	
275	IVMC	Inverter Multi Command
276	ADPRW	MODBUS Read/Write
Extension File Register Control		
290	LOADR	Load From ER
291 to 293	-	
294	RWER	Rewrite to ER
295 to 299	-	

Appendix E: Discontinued models

The table below lists the discontinued MELSEC-F Series PLC models and programming tools described in this manual.

Discontinued model	Production stop date	Repair acceptance period
FX2N-2LC	March 31, 2018	Until March 31, 2025
FX-10DM(-SET0)	September 30, 2017	Until September 30, 2024
FX2N-20PSU	December 31, 2015	Until December 31, 2022
FX2N-4AD		
FX2N-4DA		
FX2NC-4AD		
FX2NC-4DA		
FX2N-4AD-PT		
FX2N-4AD-TC		
FX3U-232ADP	September 30, 2013	Until September 30, 2020
FX3U-485ADP		
FX-PCS/WIN(-E)	March 31, 2013	-
FX-20P(-E)	December, 31, 2012	Until December, 31, 2019
FX-10DU(-E)		
FX2N-16CCL-M	September 30, 2012	Until September 30, 2019
FX-10P	June 30, 2008	Until June 30, 2015
FX-232AW	September 30, 2004	Until September 30, 2011
FX-232AWC	June 30, 2004	Until June 30, 2011

MEMO

Appendix F: Precautions for Battery Transportation

When transporting lithium batteries, follow the transportation regulations.
The batteries for the FX3GC Series CPU unit are classified as shown in following table.

Appendix F-1 Regulated FX3GC Series products

1) Included modules and batteries
None. (FX3GC Series CPU units do not include batteries when shipped from the factory.)

2) Batteries to be built in modules (spare parts and optional parts)

Product name	Battery type	Product supply status	Lithium Content (gram/unit)	Mass*1 (gram/unit)
FX3U-32BL	Lithium metal battery	Cell	0.15	30

*1. The value indicates the mass with packaging.

Appendix F-2 Transport guidelines

Comply with IATA Dangerous Goods Regulations, IMDG code and the local transport regulations when transporting products listed above.
Also, consult with the shipping carrier.

MEMO

Appendix G: 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.

Appendix G-1 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 following figure is printed on the batteries and packaging of batteries and devices with built-in batteries used for Mitsubishi programmable controllers.

for battery
EU

*. This symbol to the left 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.

The symbol to the left indicates that batteries need to be disposed of separately from other wastes.

Appendix G-2 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

1) Labelling
To market or export batteries and/or devices with built-in batteries, which have no symbol, to EU member states on September 26, 2008 or later, print the symbol shown in the figure above on the batteries, devices, or their packaging.

2) Explaining the symbol in the manuals
To export devices incorporating Mitsubishi programmable controller to EU member states on September 26, 2008 or later, provide the latest manuals that include the explanation of the symbol.
If no Mitsubishi manuals or any old manuals without the explanation of the symbol 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).

Appendix G-3 Regulated FX3GC Series products

1) Included modules and batteries
None. (FX3GC Series CPU units do not include batteries when shipped from the factory.)

2) Batteries to be built in modules (spare parts and optional parts)

Product name	Battery type
FX3U-32BL	Lithium Manganese Dioxide Battery

MEMO

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.
   1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
   2. Failure caused by unapproved modifications, etc., to the product by the user.
   3. 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.
   4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
   5. Relay failure or output contact failure caused by usage beyond the specified life of contact (cycles).
   6. 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.
   7. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
   8. 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 to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) 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.

(3) Mitsubishi shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

Revised History

Date	Revision	Description
2/2012	A	First Edition
5/2012	B	• Ver. 2.00 is supported. - Supports parameter setting in the FX3U-16CCL-M. - Supports accessing the other station from CC-Link. - Special parameter error (M8489 and D8489) is added. Description of special auxiliary relays and special data registers is added. (Appendix C) - The error code for parameter error is added. (Subsection 10.6.3) - The error code for special block error is added. (Subsection 10.6.3)
11/2013	C	• The following product is added to Outline (Chapter 1), External Dimensions and Terminal Arrangement (Chapter 2), etc. - Special adapter FX3U-ENET-ADP - Special function block FX3U-128ASL-M • Ver. 2.00 is supported. - Description of special auxiliary relays and special data registers for FX3U-ENET-ADP is added. (Appendix C) • Ver. 2.10 is supported. - Supports the IP address change function in the FX3U-ENET-ADP. • Mention of MODBUS communication is added. - Description of special auxiliary relays and special data registers for MODBUS communication is added. (Appendix C) - One instruction is added. ADPRW(FNC276) (Appendix D-3). • "Maximum number of input/output points when AnyWireASLINK master is used" is added. (Subsection 1.8.3) • Errors are corrected.
8/2014	D	• "Self-made power cable" is deleted. (Subsection 3.6.4) • Errors are corrected.
4/2015	E	• A part of the cover design is changed.
2/2018	F	• The contents of standards are changed.
1/2020	G	• The following product is added to Outline (Chapter 1), External Dimensions and Terminal Arrangement (Chapter 2), etc. - Special function block FX3U-32DP • Errors are corrected.
6/2021	H	• SECURITY PRECAUTIONS on the Safety Precautions are added. • SECURITY PRECAUTIONS on the Chapter 3 to 8 are added. • Zener diodes are added on the figures in Output Specifications and External Wiring (Chapter 6). • Battery replacement procedures (Section 9.3.1) are modified. • Extension bus error is added. (Section 10.6.3) • Warranty is modified.
12/2021	J	• Compliance with UKCA marking is added.
8/2022	K	• The input response time is changed.

Japanese manual number: JY997D45301K

FX3GC SERIES PROGRAMMABLE CONTROLLERS

USER'S MANUAL

Hardware Edition

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

MODEL	FX3GC-HW-E
MODEL CODE	09R533

JY997D45401K
(MEE)

Effective August 2022