

**FX<sub>3GC</sub> SERIES PROGRAMMABLE CONTROLLERS**

**USER'S MANUAL**

**Hardware Edition**

**Main Unit**

FX<sub>3GC</sub>-32MT/D

FX<sub>3GC</sub>-32MT/DSS

**Input/Output Extension Block**

FX<sub>2NC</sub>-16E□-□

FX<sub>2NC</sub>-32E□-□

FX<sub>2N</sub>-8E□-□

FX<sub>2N</sub>-16E□-□



**FX<sub>3GC</sub>**





# 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.

This manual classifies the safety precautions into two categories:  **DANGER** and  **CAUTION**.


|  |   |
|--|---|
|  <b>DANGER</b>  | Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.                              |
|  <b>CAUTION</b> | 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



|  <b>DANGER</b>   | Reference   |
|---|---|
| <ul style="list-style-type: none"> <li>• 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.                             <ol style="list-style-type: none"> <li>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).</li> <li>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.</li> <li>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.</li> </ol> </li> </ul> | <ul style="list-style-type: none"> <li></li> <li>70</li> <li>89</li> <li>95</li> <li>124</li> <li>143</li> <li>160</li> </ul> |

|  <b>CAUTION</b>   | Reference   |
|--|---|
| <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul> | <ul style="list-style-type: none"> <li>70</li> <li>89</li> <li>95</li> <li>124</li> <li>143</li> <li>160</li> </ul> |


# Safety Precautions

(Read these precautions before use.)

## 2. INSTALLATION PRECAUTIONS


|  <b>DANGER</b>   | Reference   |               |  |                             |           |
|---|---|---------------|--|-----------------------------|-----------|
| <ul style="list-style-type: none"> <li>• 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.</li> </ul>  | 70<br>160   |               |  |                             |           |
|  <b>CAUTION</b>  | Reference   |               |  |                             |           |
| <ul style="list-style-type: none"> <li>• 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, Cl<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub> or NO<sub>2</sub>), 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.</li> <li>• Do not touch the conductive parts of the product directly. Doing so may cause device failures or malfunctions.</li> <li>• Install the product securely using a DIN rail or mounting screws. <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="padding: 2px;">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</td> <td style="padding: 2px; text-align: center;">DIN rail only</td> </tr> <tr> <td style="padding: 2px;">FX2N Series I/O extension blocks, FX2N/FX3U Series special function blocks</td> <td style="padding: 2px; text-align: center;">DIN rail or direct mounting</td> </tr> </table> </li> <li>• 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.</li> <li>• 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.</li> <li>• 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.</li> <li>• Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors. Loose connections may cause malfunctions.</li> <li>• Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions. <ul style="list-style-type: none"> <li>- Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery</li> </ul> </li> </ul> | 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 | 70<br>160 |
| 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   |               |  |                             |           |

## 3. WIRING PRECAUTIONS


|  <b>DANGER</b>   | Reference                                       |
|---|---|
| <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul> | 71<br>85<br>87<br>89<br>95<br>124<br>143<br>161 |


# Safety Precautions

(Read these precautions before use.)

|  CAUTION  | Reference  |
|--|--|
| <ul style="list-style-type: none"> <li>• 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.</li> <li>• Do not wire vacant terminals externally. Doing so may damage the product.</li> <li>• 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.</li> <li>• 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.</li> <li>• 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.               <ul style="list-style-type: none"> <li>- The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>- Tightening torque should follow the specifications in the manual.</li> </ul> </li> <li>• 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.               <ul style="list-style-type: none"> <li>- The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>- Tightening torque should follow the specifications in the manual.</li> <li>- Twist the end of strand wire and make sure that there are no loose wires.</li> <li>- Do not solder-plate the electric wire ends.</li> <li>- Do not connect more than the specified number of wires or electric wires of unspecified size.</li> <li>- Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.</li> </ul> </li> <li>• 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.               <ul style="list-style-type: none"> <li>- The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>- Tightening torque should follow the specifications in the manual.</li> </ul> </li> </ul> | 71<br>85<br>87<br>90<br>96<br>104<br>105<br>106<br>108<br>110<br>125<br>133<br>134<br>139<br>142<br>144<br>161<br>170<br>171<br>173<br>174 |

## 4. STARTUP AND MAINTENANCE PRECAUTIONS


|  DANGER   | Reference  |
|--|------------|
| <ul style="list-style-type: none"> <li>• Do not touch any terminal while the PLC's power is on. Doing so may cause electric shock or malfunctions.</li> <li>• Before cleaning or retightening terminals, cut off all phases of the power supply externally. Failure to do so may cause electric shock.</li> <li>• Use the battery for memory backup correctly in conformance to this manual.               <ul style="list-style-type: none"> <li>- Use the battery only for the specified purpose.</li> <li>- Connect the battery correctly.</li> <li>- 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.</li> <li>- Do not store or use the battery at high temperatures or expose to direct sunlight.</li> <li>- Do not expose to water, bring near fire or touch liquid leakage or other contents directly.</li> <li>- 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.</li> </ul> </li> <li>• 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.</li> <li>• 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.</li> </ul> | 196<br>201 |

|  CAUTION   | Reference  |
|---|------------|
| <ul style="list-style-type: none"> <li>• Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions. For repair, contact your local Mitsubishi Electric representative.</li> <li>• Turn off the power to the PLC before connecting or disconnecting any extension cable. Failure to do so may cause equipment failures or malfunctions.</li> <li>• Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions.               <ul style="list-style-type: none"> <li>- Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery</li> </ul> </li> </ul> | 196<br>201 |


# Safety Precautions

(Read these precautions before use.)

## 5. DISPOSAL PRECAUTIONS

|  <b>CAUTION</b>  | Reference  |
|---|------------|
| <ul style="list-style-type: none"><li>• Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.<br/>When disposing of batteries, separate them from other waste according to local regulations.<br/>(For details of the Battery Directive in EU countries, refer to Appendix F.)</li></ul> | 196<br>201 |

## 6. TRANSPORTATION AND STORAGE PRECAUTIONS

|  <b>CAUTION</b>   | Reference  |
|--|------------|
| <ul style="list-style-type: none"><li>• 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.</li><li>• 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.</li><li>• When transporting lithium batteries, follow required transportation regulations.<br/>(For details of the regulated products, refer to Appendix E.)</li></ul> | 196<br>201 |

# FX3GC Series Programmable Controllers

## User's Manual [Hardware Edition]

|                 |             |
|-----------------|-------------|
| Manual number   | JY997D45401 |
| Manual revision | A           |
| Date            | 2/2012      |

### Foreword

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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.

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

## Outline Precautions

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- 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

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- The company name and the product name to be described in this manual are the registered trademarks or trademarks of each company.



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## 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-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 note does not guarantee that an entire mechanical module produced in accordance with the contents of this note will comply with the following standards.

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

### Requirement for Compliance with EMC directive

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

**Attention**

- This product is designed for use in industrial applications.

**Note**

- Manufactured by:  
Mitsubishi Electric Corporation  
2-7-3 Marunouchi, Chiyoda-ku, Tokyo, 100-8310 Japan
- Manufactured at:  
Mitsubishi Electric Corporation Himeji Works  
840 Chiyoda-machi, Himeji, Hyogo, 670-8677 Japan
- Authorized Representative in the European Community:  
Mitsubishi Electric Europe B.V.  
Gothaer Str. 8, 40880 Ratingen, Germany

**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   |                 |                  |

| Standard  | Remark   |
|---|--|
| EN61131-2:2007 Programmable controllers<br>- Equipment requirements and tests | Compliance with all relevant aspects of the standard.<br>EMI <ul style="list-style-type: none"> <li>• Radiated Emission</li> <li>• Conducted Emission</li> </ul> EMS <ul style="list-style-type: none"> <li>• Radiated electromagnetic field</li> <li>• Fast transient burst</li> <li>• Electrostatic discharge</li> <li>• High-energy surge</li> <li>• Voltage drops and interruptions</li> <li>• Conducted RF</li> <li>• Power frequency magnetic field</li> </ul> |

**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           | FX2NC-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<br>Industrial environment | Compliance with all relevant aspects of the standard. <ul style="list-style-type: none"> <li>• Emission-Enclosure port</li> <li>• Emission-Low voltage AC mains port</li> <li>• Emission-Telecommunications/network port</li> </ul>   |
| EN50081-2:1993 Electromagnetic compatibility                           |   |
| EN61000-6-2:2005 - Generic immunity standard<br>Industrial environment | Compliance with all relevant aspects of the standard. <ul style="list-style-type: none"> <li>• RF Immunity</li> <li>• Fast Transients</li> <li>• ESD</li> <li>• Conducted</li> <li>• Surge</li> <li>• Power magnetic fields</li> <li>• Voltage drops and Voltage interruptions</li> </ul> |



**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<br>Industrial environment                                | EN50081-2:1993 Electromagnetic compatibility | Compliance with all relevant aspects of the standard. <ul style="list-style-type: none"> <li>Emission-Enclosure port</li> <li>Emission-Low voltage AC mains port</li> <li>Emission-Telecommunications/network port</li> </ul>   |
| EN50082-2:1995 Electromagnetic compatibility<br>- Generic immunity standard<br>Industrial environment |  | Compliance with all relevant aspects of the standard. <ul style="list-style-type: none"> <li>RF immunity</li> <li>Fast Transients</li> <li>ESD</li> <li>Conducted</li> <li>Power magnetic fields</li> </ul>   |
| EN61131-2:1994 Programmable controllers<br>/A11:1996 - Equipment requirements and tests<br>/A12:2000  |  | Compliance with all relevant aspects of the standard. <ul style="list-style-type: none"> <li>Radiated electromagnetic field</li> <li>Fast transient burst</li> <li>Electrostatic discharge</li> <li>Damped oscillatory wave</li> </ul>  |
| EN61131-2:2007 Programmable controllers<br>- Equipment requirements and tests                         |  | Compliance with all relevant aspects of the standard. <p>EMI</p> <ul style="list-style-type: none"> <li>Radiated Emission</li> <li>Conducted Emission</li> </ul> <p>EMS</p> <ul style="list-style-type: none"> <li>Radiated electromagnetic field</li> <li>Fast transient burst</li> <li>Electrostatic discharge</li> <li>High-energy surge</li> <li>Voltage drops and interruptions</li> <li>Conducted RF</li> <li>Power frequency magnetic field</li> </ul> |

## Requirement for Compliance with LVD directive

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

**Type :** Programmable Controller (Open Type Equipment)

**Models :** MELSEC FX2Nc series manufactured

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

from October 1st, 2007 FX2NC-16EYR-T

| Standard                   |   | Remark   |
|----------------------------|---|--|
| IEC1010-1:1990<br>/A1:1992 | Safety requirements for electrical equipment for measurement, control, and laboratory use<br>- General requirements | The equipment has been assessed as a component for fitting in a suitable enclosure which meets the requirements of IEC 1010-1:1990+A1:1992 |
| BSEN61010-1:1993 *1        |   |  |

\*1. 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  
after May 1st, 2006 are compliant with EN61131-2:2007

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

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## Caution for compliance with EC Directive

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### 1. Installation in Enclosure

Programmable logic controllers are open-type devices that must be installed and used within conductive control boxes. Please use the FX3GC Series programmable logic controllers while installed in conductive shielded control boxes. Please secure the control box lid to the control box (for conduction). Installation within a control box greatly affects the safety of the system and aids in shielding noise from the programmable logic controller.

### 2. 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.

## 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 |
|--|-----------------------|---|---------------|---|------------|
| <b>Manuals for PLC main unit</b>         |                       |   |               |   |            |
| <b>■FX3GC PLC main unit</b>              |                       |   |               |   |            |
| △  | 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     |
| <b>■Programming</b>                      |                       |   |               |   |            |
| ⊙  | Separate volume       | FX3G/FX3U/FX3GC/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     |
| <b>■FX Series terminal block</b>         |                       |   |               |   |            |
| ✓  | Supplied with product | FX INPUT AND OUTPUT TERMINAL BLOCKS USER'S GUIDE                                      | JY992D50401   | Details on handling FX Series terminal blocks.  | -          |
| <b>Manuals for communication control</b> |                       |   |               |   |            |
| <b>■Common</b>                           |                       |   |               |   |            |
| ✓  | 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       | FX3G/FX3U/FX3GC/FX3UC Series User's Manual - MODBUS Serial Communication Edition      | JY997D26201   | Details on MODBUS serial communication in FX3G/FX3U/FX3GC/FX3UC PLCs.   | -          |

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

|  | Manual Name           | Manual Number   | Contents  | Model Code  |        |
|--|-----------------------|---|---|---|--------|
| <b>■RS-232C/RS-422/RS-485 communication</b>  |                       |   |   |   |        |
| 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-232ADP-MB Installation Manual  | JY997D26401   | Details on handling the RS-232C communication special adapter.<br>For details on MODBUS serial communication, refer to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - MODBUS Serial Communication Edition.<br>For details on other supported serial communication, refer to the FX Series User's Manual - Data Communication Edition. | -      |
| △  | Supplied with product | FX3U-232ADP Installation Manual   | JY997D13701   | Details on handling the RS-232C communication special adapter.<br>When using, refer also to the FX Series User's Manual - Data Communication Edition.   | -      |
| △  | Supplied with product | FX3U-485ADP-MB Installation Manual  | JY997D26301   | Details on handling the RS-485 communication special adapter.<br>For details on MODBUS serial communication, refer to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - MODBUS Serial Communication Edition.<br>For details on other supported serial communication, refer to the FX Series User's Manual - Data Communication Edition.  | -      |
| △  | Supplied with product | FX3U-485ADP Installation Manual   | JY997D13801   | Details on handling the RS-485 communication special adapter.<br>When using, refer also to the FX Series User's Manual - Data Communication Edition.  | -      |
| <b>■CC-Link and CC-Link/LT system</b>  |                       |   |   |   |        |
| 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-16CCCL-M Installation Manual   | JY992D43401   | Details on handling the CC-Link master special function block.<br>When using, refer also to the FX3U-16CCCL-M User's Manual.  | -      |
| ✓  | Separate volume       | FX3U-16CCCL-M User's Manual   | JY992D43601   | Details on the CC-Link master special function block  | 09R724 |
| △  | Supplied with product | FX2N-16CCCL-M Hardware Manual   | JY992D93201   | Details on handling the CC-Link master special function block.<br>When using, refer also to the FX2N-16CCCL-M User's Manual.  | -      |
| ✓  | Separate volume       | FX2N-16CCCL-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.<br>When using, refer also to the FX3U-64CCL User's Manual.   | -      |
| ✓  | Separate volume       | FX3U-64CCL User's Manual  | JY997D30401   | Details on handling the CC-Link intelligent device station special function block.  | 09R718 |
| ✓  | Supplied with product | FX2N-32CCL User's Manual  | JY992D71801   | Details on handling 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.<br>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. |   | -      |

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

|  | Manual Name           | Manual Number   | Contents    | Model Code  |
|--|-----------------------|---|-------------|---|
| <b>Manuals for analog/temperature control</b>  |                       |   |             |   |
| <b>■ Common</b>  |                       |   |             |   |
| ✓  | Separate volume       | FX3G/FX3U/FX3GC/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).<br>09R619   |
| <b>■ Analog input, temperature input and temperature control</b>   |                       |   |             |   |
| 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.<br>-  |
| △  | Supplied with product | FX3U-4AD Installation Manual  | JY997D20701 | Details on handling the 4-ch analog input special function block.<br>When using, refer also to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Analog Control Edition.<br>-                    |
| △  | Supplied with product | FX3U-4AD-ADP User's Manual  | JY997D13901 | Details on handling the 4-ch analog input special adapter.<br>When using, refer also to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Analog Control Edition.<br>-                           |
| △  | Supplied with product | FX3UC-4AD Installation Manual                                       | JY997D14901 | Details on handling the 4-ch analog input special function block.<br>When using, refer also to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Analog Control Edition.<br>-                    |
| ✓  | Supplied with product | FX2N-4AD User's Guide   | JY992D65201 | Details on handling the 4-ch analog input special function block.<br>-  |
| ✓  | Supplied with product | FX2NC-4AD User's Manual   | JY997D07801 | Details on handling the 4-ch analog input special function block.<br>-  |
| ✓  | 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).<br>09R608  |
| △  | Supplied with product | FX3U-4AD-PT-ADP User's Manual                                       | JY997D14701 | Details on handling the 4-ch Pt100 temperature sensor input special adapter.<br>When using, refer also to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Analog Control Edition.<br>-         |
| △  | Supplied with product | FX3U-4AD-PTW-ADP User's Manual                                      | JY997D29101 | Details on handling the 4-ch Pt100 temperature sensor input special adapter.<br>When using, refer also to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Analog Control Edition.<br>-         |
| △  | Supplied with product | FX3U-4AD-PNK-ADP User's Manual                                      | JY997D29201 | Details on handling the 4-ch Pt1000/Ni1000 temperature sensor input special adapter.<br>When using, refer also to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Analog Control Edition.<br>- |
| ✓  | Supplied with product | FX2N-4AD-PT User's Guide  | JY992D65601 | Details on handling the 4-ch Pt100 temperature sensor input special function block.<br>-  |
| △  | Supplied with product | FX3U-4AD-TC-ADP User's Manual                                       | JY997D14801 | Details on handling the 4-ch thermocouple input special adapter.<br>When using, refer also to the FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Analog Control Edition.<br>-                     |
| ✓  | Supplied with product | FX2N-4AD-TC User's Guide  | JY992D65501 | Details on handling the 4-ch thermocouple input special function block.<br>-  |
| △  | Supplied with product | FX3U-4LC Installation Manual  | JY997D38901 | Details on handling the 4-ch temperature control special function block.<br>When using, refer also to the FX3U-4LC User's Manual.<br>-  |

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

|   |                       | Manual Name            | Manual Number | Contents   | Model Code |
|---|-----------------------|------------------------|---------------|--|------------|
| ✓ | 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     |

**■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 FX3G/FX3U/FX3GC/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 FX3G/FX3U/FX3GC/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 FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Analog Control Edition. | -      |

**Manuals for positioning control**

**■Common**

|   |                 |  |             |  |        |
|---|-----------------|--|-------------|--|--------|
| ✓ | Separate volume | FX3G/FX3U/FX3GC/FX3UC Series User's Manual - Positioning Control Edition | JY997D16801 | Details on the positioning functions of FX3G/FX3U/FX3GC/FX3UC Series | 09R620 |
|---|-----------------|--|-------------|--|--------|

**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   |
|--|---|
| <b>PLCs</b>                                |   |
| 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<br>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<br>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<br>FX3U-232ADP(-MB), FX3U-485ADP(-MB)   |
| Analog special adapters                    | Generic name for the following models<br>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<br>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<br>FX3U-16CCL-M, FX3U-64CCL, FX3U-4AD, FX3U-4LC, FX3U-4DA   |
| FX2NC Series special function blocks       | Generic name for the following models<br>FX2NC-4AD, FX2NC-4DA   |
| FX3UC Series special function blocks       | Generic name for the following models<br>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<br>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<br>FX0N-30EC, FX0N-65EC   |
| Input/output cables                        | Generic name for the following models<br>FX-16E-500CAB-S, FX-16E-□□□CAB, FX-16E-□□□CAB-R, FX-A32E-□□□CAB<br>150, 300 or 500 is entered in □□□.  |
| Connectors for input/output                | Generic name for the following models<br>FX2C-I/O-CON, FX2C-I/O-CON-S, FX2C-I/O-CON-SA  |
| Power cable                                | Generic name for the following models<br>FX2NC-100MPCB, FX2NC-100BPCB, FX2NC-10BPCB1  |
| CC-Link master                             | Generic name for the following models<br>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  |



| Generic Name and Abbreviation | Description  |
|-------------------------------|--|
| Remote I/O stations           | Remote stations that handle information in bit units only  |
| Peripheral devices            | Generic name for programming software, handy programming panel (HPP) and indicator                       |
| Programming software          | Generic name for the following models<br>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<br>FX-30P, FX-20P, FX-20P-E  |
| <b>Indicators</b>             |  |
| GOT1000 Series                | Generic name for GT15, GT11 and GT10   |
| GOT-F900 Series               | Generic name for GOT-F900 Series   |
| <b>Manuals</b>                |  |
| FX3GC Hardware Edition        | Abbreviation of FX3GC Series User's Manual<br>- Hardware Edition   |
| Programming manual            | Abbreviation of FX3G/FX3U/FX3GC/FX3UC Series Programming Manual<br>- Basic & Applied Instruction Edition |
| Data Communication Edition    | Abbreviation of FX Series User's Manual<br>- Data Communication Edition                                  |
| Analog Control Edition        | Abbreviation of FX3G/FX3U/FX3GC/FX3UC Series User's Manual<br>- Analog Control Edition                   |
| Positioning Control Edition   | Abbreviation of FX3G/FX3U/FX3GC/FX3UC Series User's Manual<br>- 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 can be extended to 256 points.

#### [Program memory]

The PLC has a 32 K-step EEPROM memory.

#### [Operation instructions]

Various instructions, such as floating-point and character string processing instructions and scaling instructions, are provided.

#### [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 x 4 points + 10 kHz x 2 points
  - 2-phase 30 kHz x 2 points + 5 kHz x 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 (open collector outputs) 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 through RS-232C, RS-422 and USB  
→ **Refer to the Data Communication Edition.**
- N:N Network  
→ **Refer to the Data Communication Edition.**
- Parallel link  
→ **Refer to the Data Communication Edition.**
- Computer link  
→ **Refer to the Data Communication Edition.**
- Non-protocol communication through RS-232C/RS-485  
→ **Refer to the Data Communication Edition.**
- Inverter communication  
→ **Refer to the Data Communication Edition.**
- 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.**

### 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

Outline

2

External Dimensions

3

Generic Specifications

4

Power Supply Specifications

5

Input Specifications

6

Output Specifications

7

Examples of Wiring for Various Uses

8

Terminal Block

9

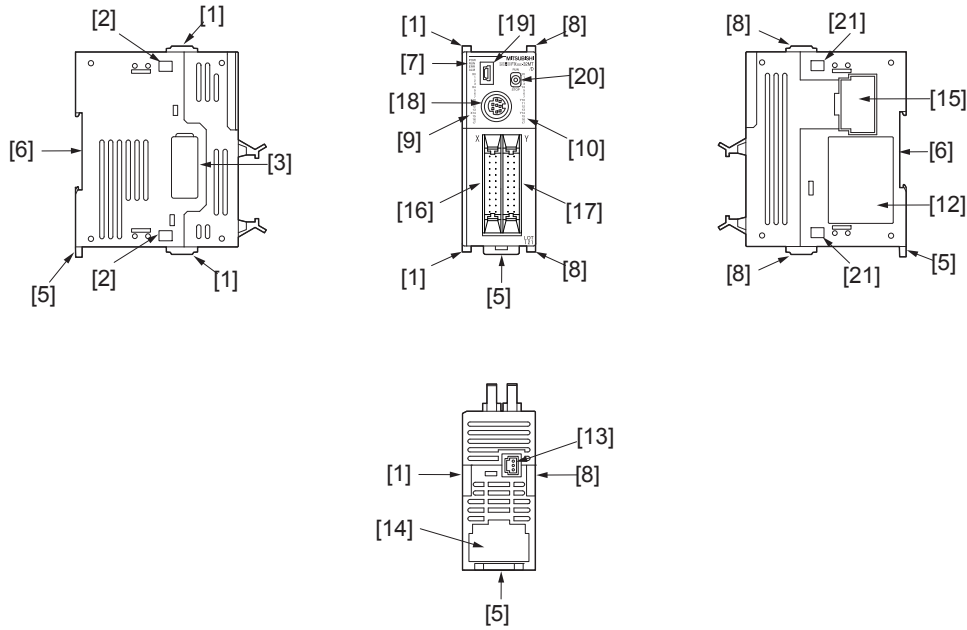
Battery

10

Test Run, Maintenance, Troubleshooting

## 1.2 Part Names

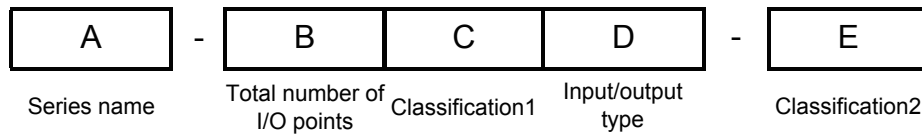
### 1.2.1 FX3GC-32MT/D(SS)



| No.     | Description   |         |                               |         |                          |         |  |         |   |
|---------|---|---------|-------------------------------|---------|--------------------------|---------|--|---------|---|
| [1]     | Special adapter connecting hooks  |         |                               |         |                          |         |  |         |   |
| [2]     | Special adapter connecting holes  |         |                               |         |                          |         |  |         |   |
| [3]     | Special adapter connector cover<br>When special adapter connector cover is removed  |         |                               |         |                          |         |  |         |   |
| [4]     | Special adapter connector   |         |                               |         |                          |         |  |         |   |
| [5]     | DIN rail mounting hooks   |         |                               |         |                          |         |  |         |   |
| [6]     | DIN rail mounting groove<br>[DIN rail: DIN46277(35 mm(1.38") wide)]   |         |                               |         |                          |         |  |         |   |
| [7]     | Display LEDs  |         |                               |         |                          |         |  |         |   |
|         |   |         |                               |         |                          |         |  |         |   |
|         | <table border="1"> <tr> <td>POW LED</td> <td>On while the PLC power is ON.</td> </tr> <tr> <td>RUN LED</td> <td>On while the PLC is RUN.</td> </tr> <tr> <td>ERR LED</td> <td>Flashing when a program error occurs.<br/>Turns ON when a CPU error occurs.</td> </tr> <tr> <td>ALM LED</td> <td>Turns ON when the battery voltage drops.<br/>(When the optional battery is used)</td> </tr> </table> | 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.<br>Turns ON when a CPU error occurs. | ALM LED | Turns ON when the battery voltage drops.<br>(When the optional battery is used) |
| 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.<br>Turns ON when a CPU error occurs.  |         |                               |         |                          |         |  |         |   |
| ALM LED | Turns ON when the battery voltage drops.<br>(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<br>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)

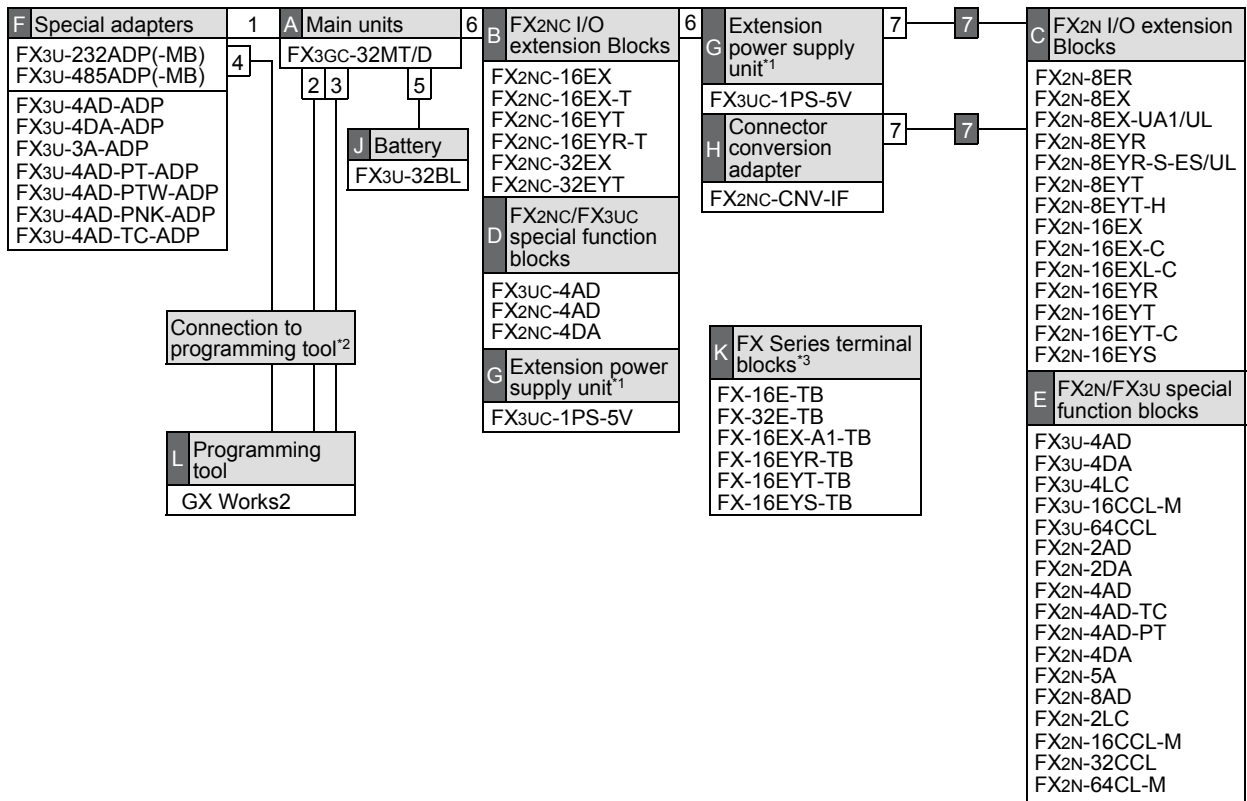


|   | Classification             | Symbol     | Description   |
|---|----------------------------|------------|---|
| A | Series name                | FX3GC      | FX3GC Series  |
|   |                            | FX2NC      | FX2NC Series  |
|   |                            | FX2N       | FX2N Series   |
| 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<br>Input : 24 V DC (Sink)<br>Output : Relay  |
|   |                            | T<br>T/D   | Input/output mixed<br>Input : 24 V DC (Sink)<br>Output : Transistor (Sink)  |
|   |                            | T/DSS      | Input/output mixed<br>Input : 24 V DC (Sink / Source)<br>Output : Transistor (Source)                             |
|   |                            | X          | Input dedicated<br>Classification 2 "None" : 24 V DC Input<br>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<br>YS   | Dedicated transistor output<br>Dedicated triac output   |
| E | Classification 2           | Non symbol | I/O connecting type<br>• FX3GC Series : Connector<br>• FX2NC Series : Connector<br>• FX2N Series : Terminal block |
|   |                            | UA1/UL     | Dedicated 100 V AC input  |
|   |                            | C          | I/O connecting type : Connector   |
|   |                            | T          | I/O connecting type : Terminal block  |

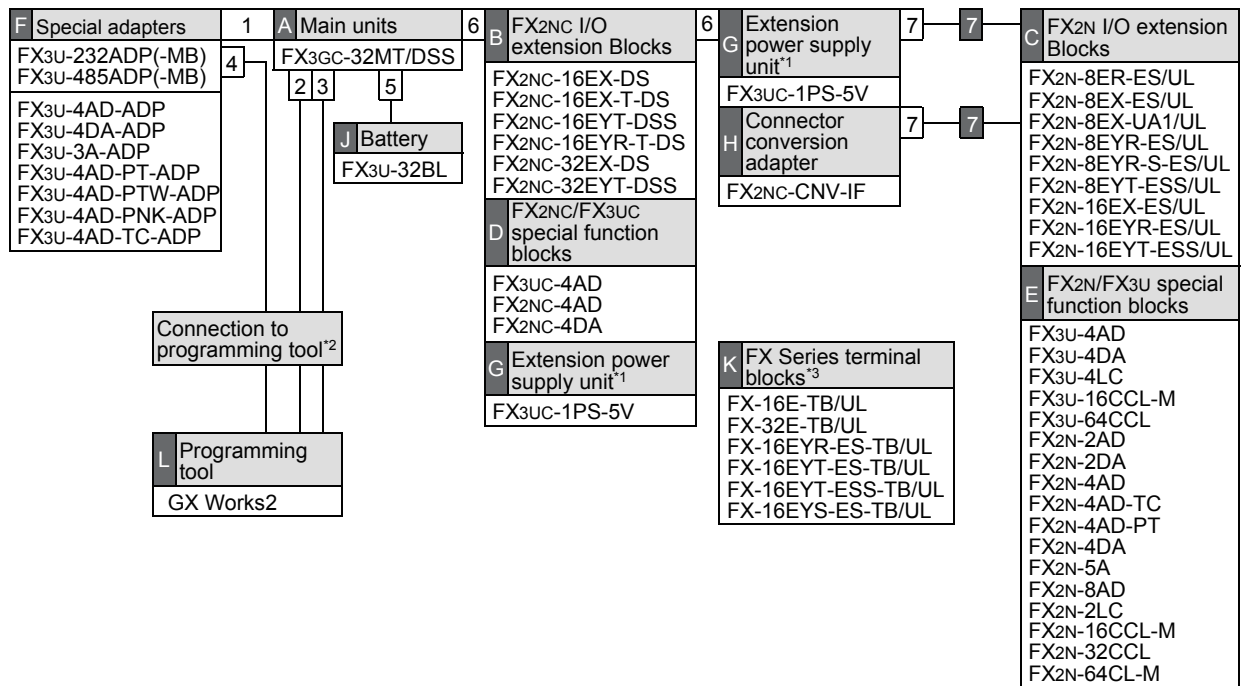
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## 1.4 List of Products

### 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   | No. | Cable or connection connector     |
|-----|---|-----|-----------------------------------|
| 1   | Special adapter connector   | 5   | Battery connector                 |
| 2   | Peripheral device connector [USB]<br>USB MINI B connector female [USB2.0] | 6   | Extension connector (FX2NC/FX3UC) |
| 3   | Peripheral device connector [RS-422]<br>MINI DIN 8Pin                     | 7   | Extension connector (FX2N/FX3U)   |
| 4   | FX3U-232ADP(-MB) D-SUB 9Pin [RS-232C]                                     | 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

| 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

| 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<br>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*1 | Master for CC-Link (Compatible With CC-Link Ver. 2.00 and Ver. 1.10)<br>Connectable stations: Remote I/O station, Remote device station, Intelligent device station | *3                            | -                               |
| FX3U-64CCL*2   | Intelligent device station for CC-Link<br>[1 to 4 stations occupied]  | 8                             | -                               |
| FX2N-16CCL-M*4 | Master for CC-Link (Compatible With CC-Link Ver. 1.10)<br>Connectable stations: Remote I/O station, Remote device station   | *3                            | -                               |
| FX2N-32CCL     | Remote device station for CC-Link<br>[1 to 4 stations occupied]   | 8                             | 130                             |
| FX2N-64CL-M    | Master for CC-Link/LT   | *5                            | 190                             |

- \*1. 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.
- \*2. Only one FX3U-64CCL unit can be connected to a single PLC main unit.
- \*3. 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
- \*4. Two or more FX2N-16CCL-M unit can be connected in one system, but remote I/O stations cannot be connected to the second and later master stations.  
This master cannot be used together with FX3U-16CCL-M.
- \*5. 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

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## 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<br>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                              |

## 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 <b>H</b> | 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 <b>J</b>          | FX3U-32BL  | This battery backs up the following data.<br><ul style="list-style-type: none"> <li>General devices (Parameter setting is required.) <ul style="list-style-type: none"> <li>M1536 to M7679</li> <li>S1000 to S4095</li> <li>D1100 to D7999</li> <li>R0 to R23999</li> </ul> </li> <li>Time on clock</li> </ul> |
| Extension cables <b>7</b> | FX0N-65EC  | These cables are used to mount input/output extension blocks for FX2N and special function blocks*2 for FX2N/FX3U away from the main unit.   |
|                           | FX0N-30EC  |  |

\*2. 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<br>16 output points                            |               | To be directly connected to the PLC<br>input/output connector | *1                 |
| FX-32E-TB                        | 32 input points,<br>32 output points or<br>16 input/output points |               |   |                    |
| FX-16EX-A1-TB <sup>*2</sup>      | 16  | -             | 100 V AC input type   | *4                 |
| FX-16EYR-TB <sup>*3</sup>        | -   | 16            | Relay output type   | 24 V DC 80 mA      |
| FX-16EYT-TB <sup>*3</sup>        | -   | 16            | Transistor output type (Sink output)                          | 24 V DC 112 mA     |
| FX-16EYS-TB <sup>*3</sup>        | -   | 16            | Triac output type   | 24 V DC 112 mA     |
| FX-16E-TB/UL                     | 16 input points or<br>16 output points                            |               | To be directly connected to the PLC<br>input/output connector | *1                 |
| FX-32E-TB/UL                     | 32 input points,<br>32 output points or<br>16 input/output points |               |   |                    |
| FX-16EYR-ES-TB/UL <sup>*3</sup>  | -   | 16            | Relay output type   | 24 V DC 80 mA      |
| FX-16EYT-ES-TB/UL <sup>*3</sup>  | -   | 16            | Transistor output type (Sink output)                          | 24 V DC 112 mA     |
| FX-16EYT-ESS-TB/UL <sup>*3</sup> | -   | 16            | Transistor output type (Source output)                        | 24 V DC 112 mA     |
| FX-16EYS-ES-TB/UL <sup>*3</sup>  | -   | 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 |
|---|--|---------------------|
| <b>Input connector</b>  |  |                     |
| FX3GC-32MT/D, FX2NC-□□EX  | Not required   |                     |
| FX3GC-32MT/DSS, FX2NC-□□EX-DS, FX2N-16EX-C                                  | 24 V DC  | 112 mA / 16 points  |
| <b>Output connector</b>   |  |                     |
| FX3GC-32MT/D, FX3GC-32MT/DSS,<br>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")     | <ul style="list-style-type: none"> <li>Single wire (Wire color: red)</li> <li>PLC side: A 20-pin connector</li> </ul> |  |
|                     | FX-16E-150CAB          | 1.5 m (4'11")   | <ul style="list-style-type: none"> <li>Flat cables (with tube)</li> <li>A 20-pin connector at both ends</li> </ul>    |  |
|                     | FX-16E-300CAB          | 3 m (9'10")     |   |  |
|                     | FX-16E-500CAB          | 5 m (16'4")     |   |  |
|                     | Input/output connector | FX-16E-150CAB-R | 1.5 m (4'11")   | <ul style="list-style-type: none"> <li>Round multicore cables</li> <li>A 20-pin connector at both ends</li> </ul>  |
|                     |                        | FX-16E-300CAB-R | 3 m (9'10")   |  |
|                     |                        | FX-16E-500CAB-R | 5 m (16'4")   |  |
|                     | Input/output connector | FX-A32E-150CAB  | 1.5 m (4'11")   | <ul style="list-style-type: none"> <li>Flat cables (with tube)</li> <li>PLC side: Two 20-pin connectors in 16-point units.</li> <li>Terminal block side: A dedicated connector</li> <li>One common terminal covers 32 input/output terminals.</li> </ul> |
|                     |                        | FX-A32E-300CAB  | 3 m (9'10")   |  |
| FX-A32E-500CAB      |                        | 5 m (16'4")     |   |  |
| Power cable         | 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 <sup>2</sup> [AWG22]  |  |
|                     | FX2C-I/O-CON-SA        | 5-piece set     | Input/output connector for bulk wire for 0.5 mm <sup>2</sup> [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         |

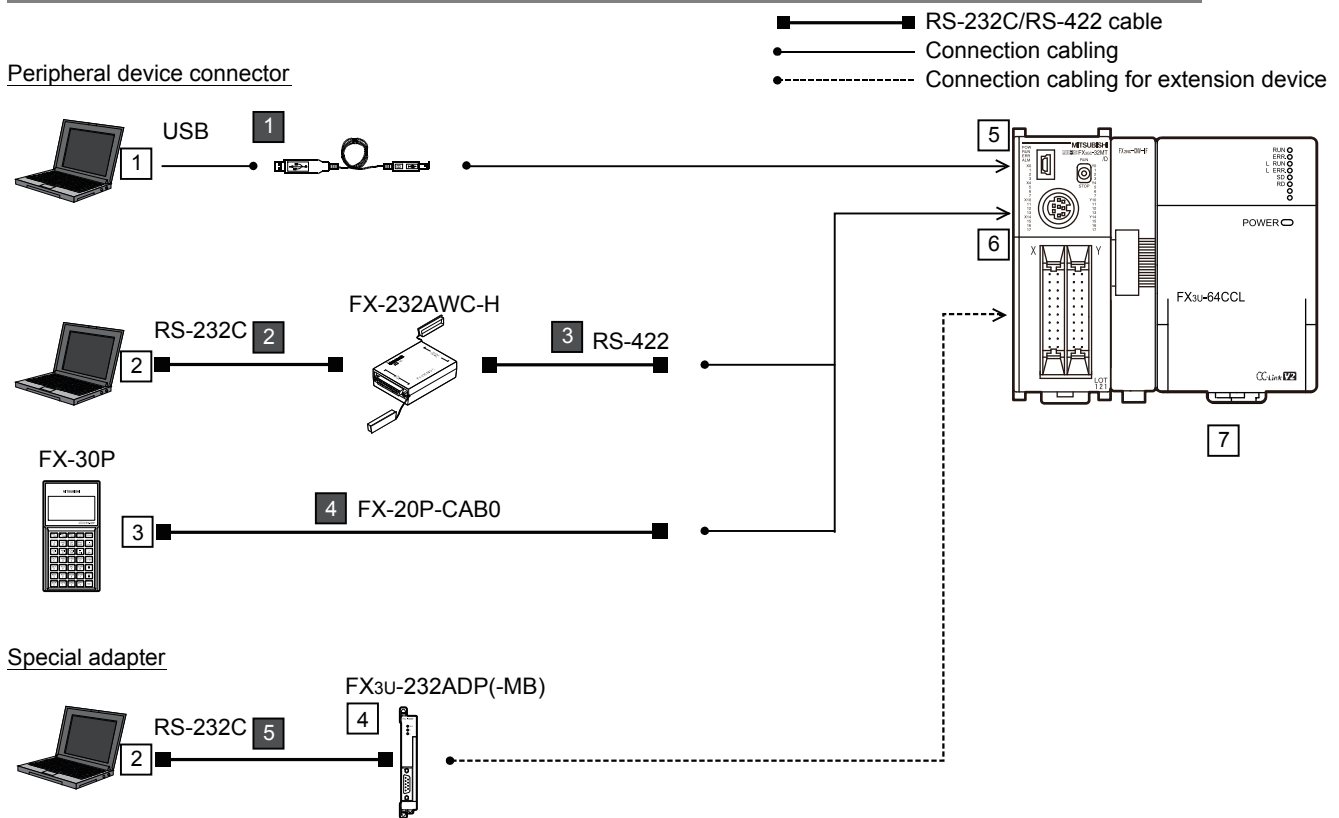
### 1.4.11 Programming tool

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



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

## 1.5 Connection to Programming Tool



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

| No. | Shape of connector or combination with cable  |
|-----|---|
| 3   | FX-30P MINI DIN 8Pin [RS-422]<br>4 FX-20P-CAB0  |
| 4   | FX3U-232ADP(-MB) D-SUB 9Pin [RS-232C]   |
| 5   | Peripheral device connector [USB]<br>MINI B connector female [USB2.0]   |
| 6   | Peripheral device connector [RS-422]<br>MINI DIN 8Pin   |
| 7   | FX3U-64CCL CC-Link connection terminal block<br>The access function description for the FX3GC main unit via another station QCPU (Q mode) is used.<br>→ <b>Subsection 1.5.1</b> |

\*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.

|    |  |
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| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 1.5.1 The accessing path to the FX3GC from CC-Link Network

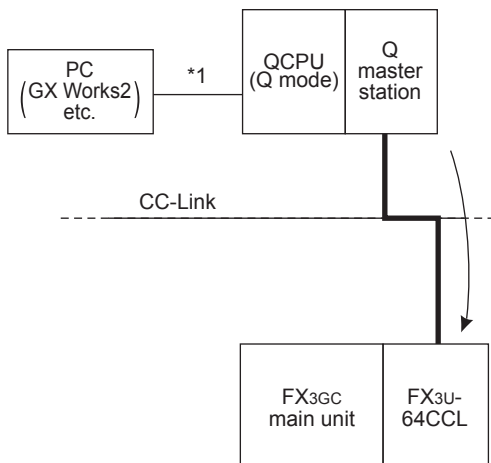
The FX3GC which is connected to the FX3U-64CCL can be accessed via CC-Link from QCPU (Q mode) master/local station when GX Works2 is used.

Accessing permits write and read, verify, carry out device batch monitoring and complete device test.

From the master station/local station of the QCPU (Q mode), the FX3GC Series main unit can be accessed.

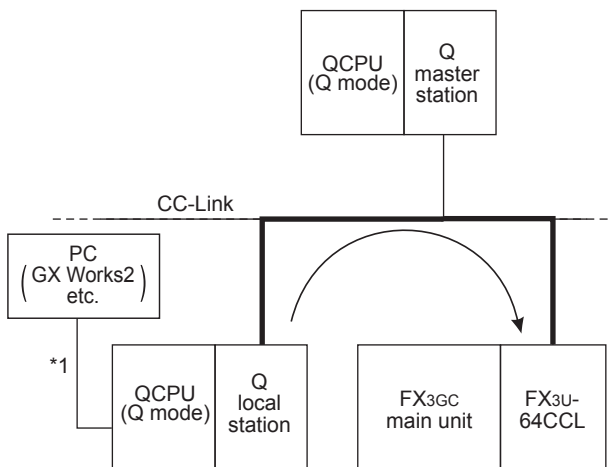
The communication path of CC-Link is illustrated as follows.

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



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

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

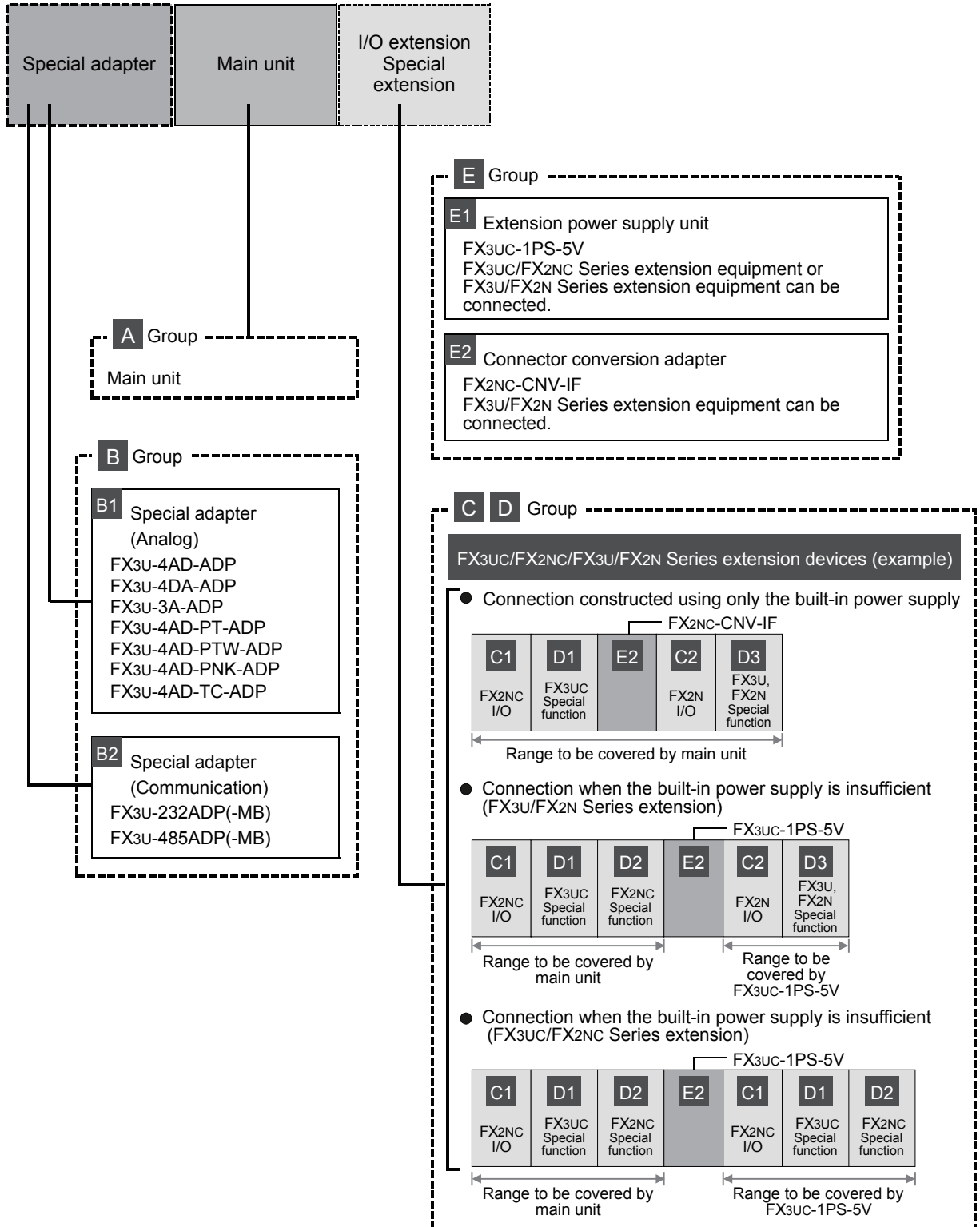


- \*1. Direct connection or connection using the GOT transparent mode.

## 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 Outline

2 External Dimensions

3 Generic Specifications

4 Power Supply Specifications

5 Input Specifications

6 Output Specifications

7 Examples of Wiring for Various Uses

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9 Battery

10 Test Run, Maintenance, Troubleshooting

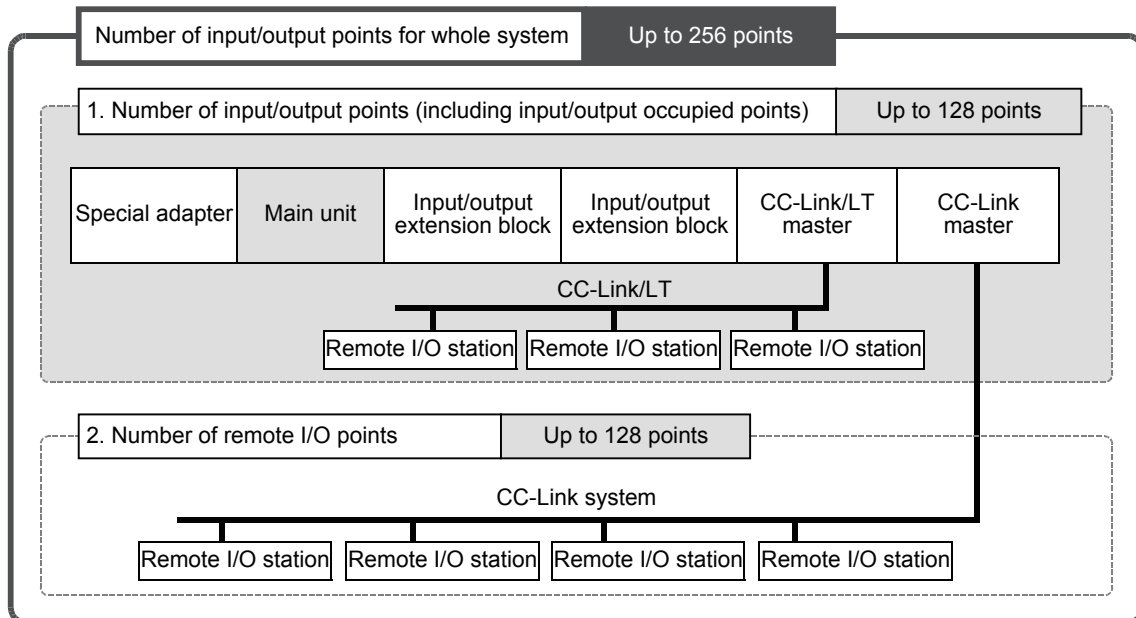
## 1.7 Rules of System Configuration

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.

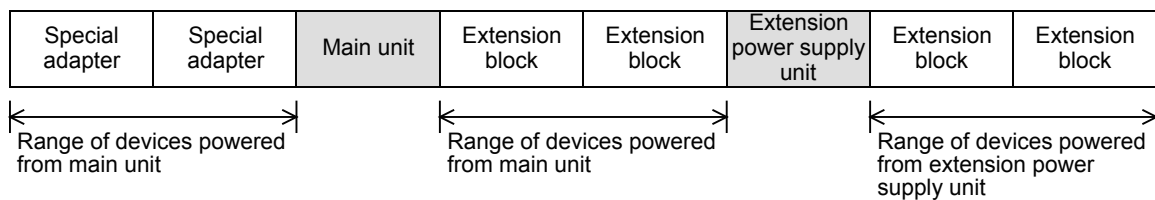
→ For details, refer to "1.8 Number of I/O Points and Maximum Number of I/O Points".



### 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.

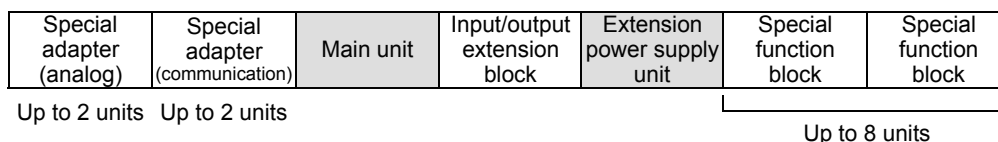


→ For details, refer to "1.9 Calculation of 5 V DC power supply capacity (current consumption)".

### 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 system is not used | 128                           | 128                                   | Subsection 1.8.1                     |
| When CC-Link system is used     | 128                           | 256                                   | Subsection 1.8.1<br>Subsection 1.8.2 |

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.

#### 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.

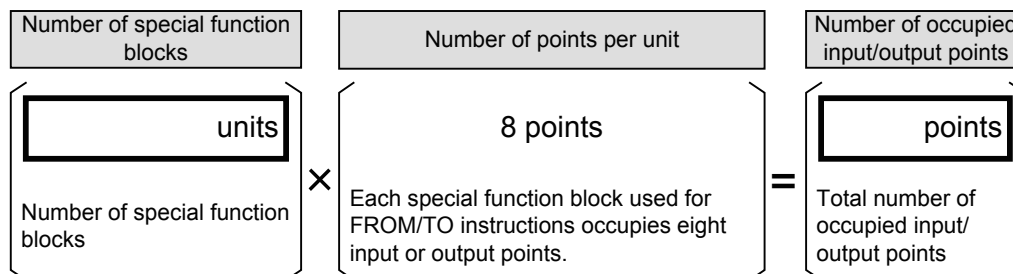
→ For the method of calculating the number of remote I/O points, refer to the FX2N-64CL-M manual.

#### 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.

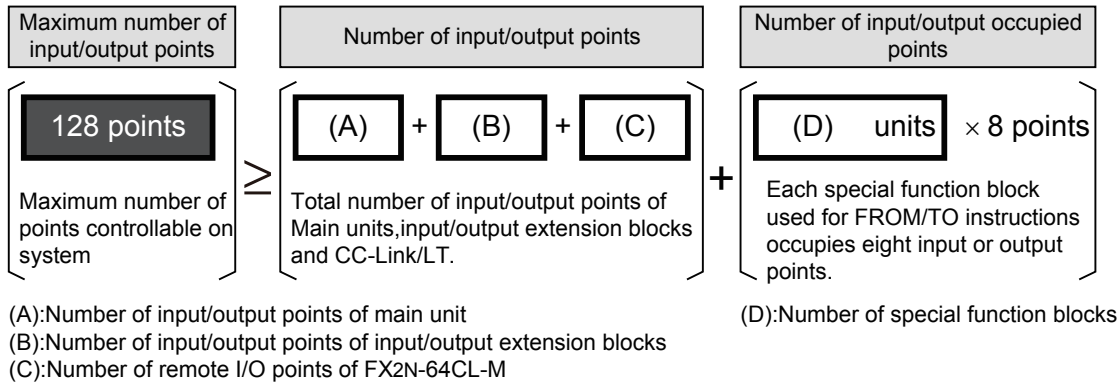


Observe the following instructions when using the following products.

- 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.
- 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.

**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).

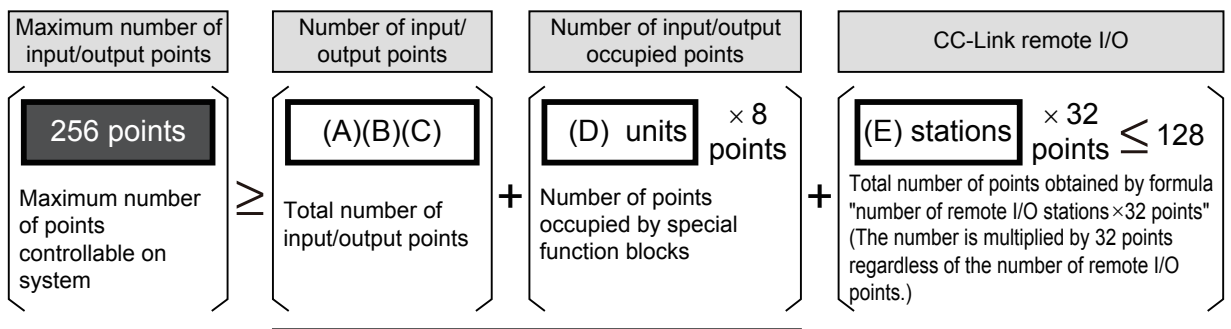


**1.8.2 Maximum number of input/output points when CC-Link master is used**

**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.



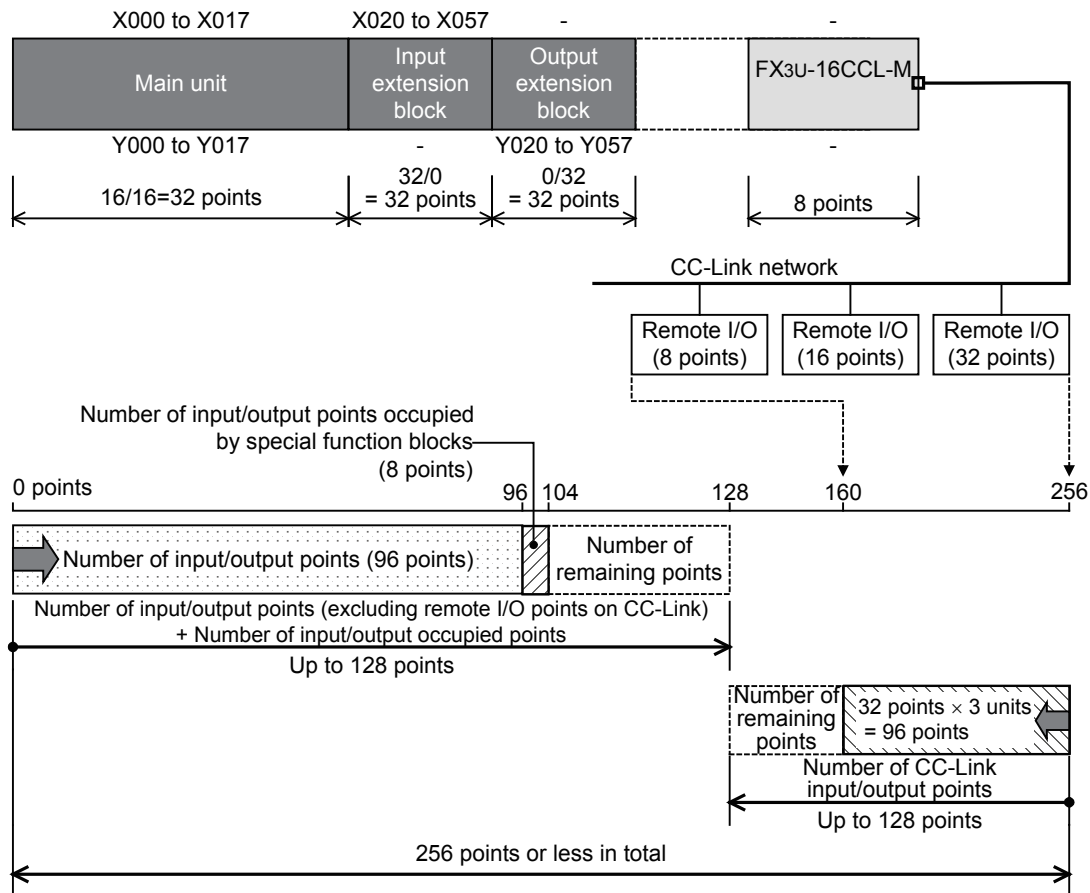
- (A): Number of input/output points of main unit
- (B): Number of input/output points of input/output extension blocks
- (C): Number of remote I/O points of FX2N-64CL-M.
- (D): Number of input/output points occupied by special function blocks
- (E): Number of remote I/O stations (units) connected to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

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.

**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.



|    |  |
|----|--|
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## 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.

|   |                          |                                |                                   |                                     |
|---|--------------------------|--------------------------------|-----------------------------------|-------------------------------------|
| <b>A</b> Main unit                                    | <b>B</b> Special adapter | <b>C</b> I/O extension devices | <b>D</b> Special function devices |                                     |
| 400mA   | mA                       | mA                             | mA                                | Proceed to "2) FX3UC-1PS-5V" below. |
| $400\text{mA} \geq \text{mA} + \text{mA} + \text{mA}$ |                          |                                |                                   |                                     |

When the capacity of the main unit built-in power supply is insufficient, connect an extension power supply unit (FX3UC-1PS-5V) **E1**.  
 Select **C1**, **D1** or **D2** as **C** and **D** and proceed to 2).

|                                  |                        |                                      |
|----------------------------------|------------------------|--------------------------------------|
| <b>C1</b> FX2NC I/O              | <b>E1</b> FX3UC-1PS-5V | <b>C2</b> FX2N I/O                   |
| <b>D1</b> FX3UC special function |                        | <b>D3</b> FX3U/FX2N special function |
| <b>D2</b> FX2NC special function |                        |                                      |

- 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:

Proceed to 1) above. -----

|                        |                                |                                   |  |
|------------------------|--------------------------------|-----------------------------------|--|
| <b>E1</b> FX3UC-1PS-5V | <b>C</b> I/O extension devices | <b>D</b> Special function devices |  |
| 1A(1000mA)             | mA                             | mA                                | $1\text{A} \geq \text{mA} + \text{mA}$ |

|                                  |
|----------------------------------|
| <b>C1</b> FX2NC I/O              |
| <b>D1</b> FX3UC special function |
| <b>D2</b> FX2NC special function |

- 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:

Proceed to 1) above. -----

|                        |                                |                                   |  |
|------------------------|--------------------------------|-----------------------------------|--|
| <b>E1</b> FX3UC-1PS-5V | <b>C</b> I/O extension devices | <b>D</b> Special function devices |  |
| 1A(1000mA)             | mA                             | mA                                | $1\text{A} \geq \text{mA} + \text{mA}$ |

When there are FX3UC or FX2NC Series extension equipment **D1**, **C1** or **D2**, connect them first, and then connect the FX2NC-CNV-IF **E2**.

|                                  |                        |                                      |
|----------------------------------|------------------------|--------------------------------------|
| <b>C1</b> FX2NC I/O              | <b>E2</b> FX2NC-CNV-IF | <b>C2</b> FX2N I/O                   |
| <b>D1</b> FX3UC special function |                        | <b>D3</b> FX3U/FX2N special function |
| <b>D2</b> FX2NC special function |                        |                                      |

## 1.10 Restriction in number of units in each group

Confirm the number of units using the following procedures.

| Division                  |                         | Contents of restrictions  |                           |            |           |              |           |          |           |          |
|---------------------------|-------------------------|---|---------------------------|------------|-----------|--------------|-----------|----------|-----------|----------|
| Special adapter           | <b>B1</b> Analog        | Up to two units can be connected.   |                           |            |           |              |           |          |           |          |
|                           | <b>B2</b> Communication | Up to two units can be connected.   |                           |            |           |              |           |          |           |          |
|                           |                         | <ul style="list-style-type: none"> <li>When the FX3UC-1PS-5V is used                             <ul style="list-style-type: none"> <li>Up to 8 special function blocks in total can be connected in each system.</li> <li>Up to 2 special function blocks can be connected in the range where the power is supplied from the main unit.</li> <li>After the FX2NC-CNV-IF, up to 4 I/O extension blocks and special function blocks in total can be connected.</li> <li>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).</li> </ul> </li> <li>When the FX3UC-1PS-5V is not used                             <ul style="list-style-type: none"> <li>Up to 2 special function blocks in total can be connected in each system.</li> <li>After the FX2NC-CNV-IF, up to 4 I/O extension blocks and special function blocks in total can be connected.</li> <li>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).</li> </ul> </li> </ul> <p><b>&lt;Example&gt;</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">FX3GC-32MT/D<br/>Main unit</td> <td style="text-align: center;">FX2NC-32EX</td> <td style="text-align: center;">FX3UC-4AD</td> <td style="text-align: center;">FX2NC-CNV-IF</td> <td style="text-align: center;">FX2N-8EYR</td> <td style="text-align: center;">FX2N-8EX</td> <td style="text-align: center;">FX2N-8EYT</td> <td style="text-align: center;">FX3U-4DA</td> </tr> </table> <p style="margin-left: 200px;"> <span style="display: inline-block; width: 150px; border-bottom: 1px solid black; margin-bottom: 5px;"></span> <span style="display: inline-block; width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></span> </p> <p style="margin-left: 200px;"> <span style="display: inline-block; width: 150px; border-bottom: 1px solid black; margin-bottom: 5px;"></span> <span style="display: inline-block; width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></span> </p> <p style="margin-left: 200px;"> <span style="display: inline-block; width: 150px; border-bottom: 1px solid black; margin-bottom: 5px;"></span> <span style="display: inline-block; width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></span> </p> | FX3GC-32MT/D<br>Main unit | FX2NC-32EX | FX3UC-4AD | FX2NC-CNV-IF | FX2N-8EYR | FX2N-8EX | FX2N-8EYT | FX3U-4DA |
| FX3GC-32MT/D<br>Main unit | FX2NC-32EX              | FX3UC-4AD   | FX2NC-CNV-IF              | FX2N-8EYR  | FX2N-8EX  | FX2N-8EYT    | FX3U-4DA  |          |           |          |

**C** I/O extension devices

**D** Special function devices

|           |  |
|-----------|--|
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| <b>10</b> | Test Run, Maintenance, Troubleshooting |

| Division  | Contents of restrictions  |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
|---|---|---|---|--|---------------------------|---|---------------|--|--|----------|-----------|-------------------|-----------|-------------|------------|------------------------|------------------------|------------|---|--|-----------------------------|---|------------------|--|--|----------------|-----------------|-------------------|------------------|------------------|------------------------|------------------------|------------|--------------|--------------|---|------------|--|--------------|--|
|   | <p>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.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Model name</th> <th colspan="2" style="text-align: center;">Connection target and number of connectable units</th> </tr> <tr> <th style="text-align: center;">Main unit<br/>FX3GC-32MT/D</th> <th style="text-align: center;">Extension power supply unit<br/>FX3UC-1PS-5V</th> </tr> </thead> <tbody> <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.<br/>                     When the FX2NC-16EYR-T is used, refer to the note*<sup>1</sup> 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*<sup>2</sup></td></tr> <tr><td>FX2N-2DA*<sup>2</sup></td></tr> </tbody> </table><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Model name</th> <th colspan="2" style="text-align: center;">Connection target and number of connectable units</th> </tr> <tr> <th style="text-align: center;">Main unit<br/>FX3GC-32MT/DSS</th> <th style="text-align: center;">Extension power supply unit<br/>FX3UC-1PS-5V</th> </tr> </thead> <tbody> <tr> <td>FX2NC-16EYR-T-DS</td> <td rowspan="8">                     When the FX2NC-16EYR-T-DS is not used, up to 4 units in total can be connected.<br/>                     When the FX2NC-16EYR-T-DS is used, refer to the note*<sup>1</sup> below.                 </td> <td rowspan="8">                     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*<sup>2</sup></td></tr> <tr><td>FX2N-2DA*<sup>2</sup></td></tr> </tbody> </table> <p>*1. When the FX2N-2AD or FX2N-2DA is used, up to 4 units in total can be connected.<br/>                     When the FX2N-2AD or FX2N-2DA is not used, up to 5 units in total can be connected.<br/>                     *2. Consider the restriction for the number of special function equipment.</p> <p>Note that the number of connectable units is restricted for the following special function blocks.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Model name</th> <th style="text-align: center;">Restrictions</th> </tr> </thead> <tbody> <tr> <td>FX3U-16CCL-M</td> <td> <ul style="list-style-type: none"> <li>• It cannot be used together with the FX2N-16CCL-M.</li> <li>• Only one FX3U-16CCL-M unit can be connected to a single PLC main unit.</li> </ul> </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> <ul style="list-style-type: none"> <li>• It cannot be used together with the FX3U-16CCL-M.</li> <li>• When multiple units are used, a remote I/O station cannot be connected to the second master station or later.</li> </ul> </td> </tr> </tbody> </table> | Model name                                  | Connection target and number of connectable units |  | Main unit<br>FX3GC-32MT/D | Extension power supply unit<br>FX3UC-1PS-5V | FX2NC-16EYR-T | When the FX2NC-16EYR-T is not used, up to 4 units in total can be connected.<br>When the FX2NC-16EYR-T is used, refer to the note* <sup>1</sup> below. | Up to 5 units in total can be connected. | FX2N-8ER | FX2N-8EYR | FX2N-8EYR-S-ES/UL | FX2N-8EYT | FX2N-8EYT-H | FX2N-16EYR | FX2N-2AD* <sup>2</sup> | FX2N-2DA* <sup>2</sup> | Model name | Connection target and number of connectable units |  | Main unit<br>FX3GC-32MT/DSS | Extension power supply unit<br>FX3UC-1PS-5V | FX2NC-16EYR-T-DS | When the FX2NC-16EYR-T-DS is not used, up to 4 units in total can be connected.<br>When the FX2NC-16EYR-T-DS is used, refer to the note* <sup>1</sup> below. | Up to 5 units in total can be connected. | FX2N-8ER-ES/UL | FX2N-8EYR-ES/UL | FX2N-8EYR-S-ES/UL | FX2N-8EYT-ESS/UL | FX2N-16EYR-ES/UL | FX2N-2AD* <sup>2</sup> | FX2N-2DA* <sup>2</sup> | Model name | Restrictions | FX3U-16CCL-M | <ul style="list-style-type: none"> <li>• It cannot be used together with the FX2N-16CCL-M.</li> <li>• Only one FX3U-16CCL-M unit can be connected to a single PLC main unit.</li> </ul> | FX3U-64CCL | Only one FX3U-64CCL unit can be connected to a single PLC main unit. | FX2N-16CCL-M | <ul style="list-style-type: none"> <li>• It cannot be used together with the FX3U-16CCL-M.</li> <li>• When multiple units are used, a remote I/O station cannot be connected to the second master station or later.</li> </ul> |
| Model name  | Connection target and number of connectable units   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
|   | Main unit<br>FX3GC-32MT/D   | Extension power supply unit<br>FX3UC-1PS-5V |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2NC-16EYR-T   | When the FX2NC-16EYR-T is not used, up to 4 units in total can be connected.<br>When the FX2NC-16EYR-T is used, refer to the note* <sup>1</sup> below.  | Up to 5 units in total can be connected.    |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8ER  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8EYR   |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8EYR-S-ES/UL   |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8EYT   |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8EYT-H   |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-16EYR  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-2AD* <sup>2</sup>  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-2DA* <sup>2</sup>  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| Model name  | Connection target and number of connectable units   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
|   | Main unit<br>FX3GC-32MT/DSS   | Extension power supply unit<br>FX3UC-1PS-5V |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2NC-16EYR-T-DS  | When the FX2NC-16EYR-T-DS is not used, up to 4 units in total can be connected.<br>When the FX2NC-16EYR-T-DS is used, refer to the note* <sup>1</sup> below.  | Up to 5 units in total can be connected.    |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8ER-ES/UL  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8EYR-ES/UL   |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8EYR-S-ES/UL   |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-8EYT-ESS/UL  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-16EYR-ES/UL  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-2AD* <sup>2</sup>  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-2DA* <sup>2</sup>  |   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| Model name  | Restrictions  |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX3U-16CCL-M  | <ul style="list-style-type: none"> <li>• It cannot be used together with the FX2N-16CCL-M.</li> <li>• Only one FX3U-16CCL-M unit can be connected to a single PLC main unit.</li> </ul>   |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX3U-64CCL  | Only one FX3U-64CCL unit can be connected to a single PLC main unit.  |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| FX2N-16CCL-M  | <ul style="list-style-type: none"> <li>• It cannot be used together with the FX3U-16CCL-M.</li> <li>• When multiple units are used, a remote I/O station cannot be connected to the second master station or later.</li> </ul>  |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |
| <p><b>E1</b> Extension power supply unit<br/>FX3UC-1PS-5V</p> | <p>Only one extension power supply unit (FX3UC-1PS-5V) can be used for the whole system.</p>  |   |   |  |                           |   |               |  |  |          |           |                   |           |             |            |                        |                        |            |   |  |                             |   |                  |  |  |                |                 |                   |                  |                  |                        |                        |            |              |              |   |            |  |              |  |

**C** I/O extension devices  
**D** Special function devices

## 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) |
|-----------|------------------|-------------------------------|---------------------------------|
| <b>B1</b> | 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                              |
| <b>B2</b> | FX3U-232ADP(-MB) | 0                             | 30                              |
|           | FX3U-485ADP(-MB) | 0                             | 20                              |

### 3. I/O extension devices

**C**

| Division          | Model name       | Number of input/output points | 5 V DC current consumption (mA) |
|-------------------|------------------|-------------------------------|---------------------------------|
| <b>C1</b>         | 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                             |
|                   | <b>C2</b>        | FX2N-8ER                      | 16                              |
| 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                              |
| FX2N-16EYR-ES/UL  |                  | 16                            | 40                              |

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| Division | Model name        | Number of input/output points | 5 V DC current consumption (mA) |
|----------|-------------------|-------------------------------|---------------------------------|
| C2       | 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                             |

\*1. For the number of input/output occupied points in the FX3U-16CCL-M, FX2N-16CCL-M and FX2N-64CL-M, refer to the table below.

| Model name                   | Number of input/output occupied points<br>(Use the following formula.) |
|------------------------------|--|
| FX3U-16CCL-M<br>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  |

#### 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)   |
| FX2NC-16EX   | 16 points | 16 + 16 + 16 + 16 = 64  |
| FX2NC-16EYR-T  | 16 points |   |
| FX2N-16EX  | 16 points |   |
| FX2N-16EYR   | 16 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)   |
| FX3U-232ADP(-MB)   | 0 points  | 0 + 0 = 0   |
| FX3U-485ADP(-MB)   | 0 points  |   |
| e) Special function blocks (Number of input / output occupied points)      |           | Total of e)   |
| FX3UC-4AD  | 8 points  | 8 + 8 = 16  |
| FX3U-4DA   | 8 points  |   |
| Total number of I/O points   |           | a) + b) + c) + d) + e) =<br>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  |
| FX3U-232ADP(-MB)                                     | 30mA  |
| FX2NC-16EX   | 30mA  |
| FX2NC-16EYR-T  | 50mA  |
| FX3UC-4AD  | 100mA |
| FX2NC-CNV-IF   | 0mA   |
| FX3U-4DA   | 120mA |
| FX2N-16EX  | 45mA  |
| FX2N-16EYR   | 40mA  |

"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  |
| FX3U-232ADP (-MB)   | 30mA  |
| FX2NC-16EX  | 30mA  |
| FX2NC-16EYR-T   | 50mA  |
| 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       |
| 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

|    |  |
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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.

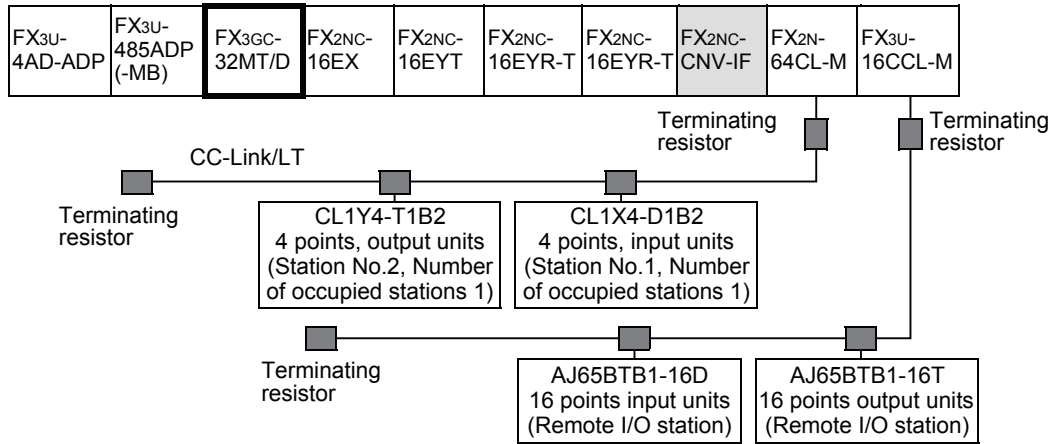
OK

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

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

OK

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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)<br>64 [Input/output occupied points in remote I/O<br>(32 points × 2 units)] = 64 |
| AJ65BTB1-16D  | 32 points | 64 points  |
| AJ65BTB1-16T  | 32 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  |  |
| FX3U-4AD-ADP   | 15mA  |  |
| FX2NC-16EX   | 45mA  |  |
| FX2NC-16EYT  | 50mA  |  |
| FX2NC-16EYR-T  | 50mA  |  |
| FX2NC-16EYR-T  | 50mA  |  |
| FX2NC-CNV-IF   | 0mA   |  |
| FX2N-64CL-M  | 190mA |  |
| 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).

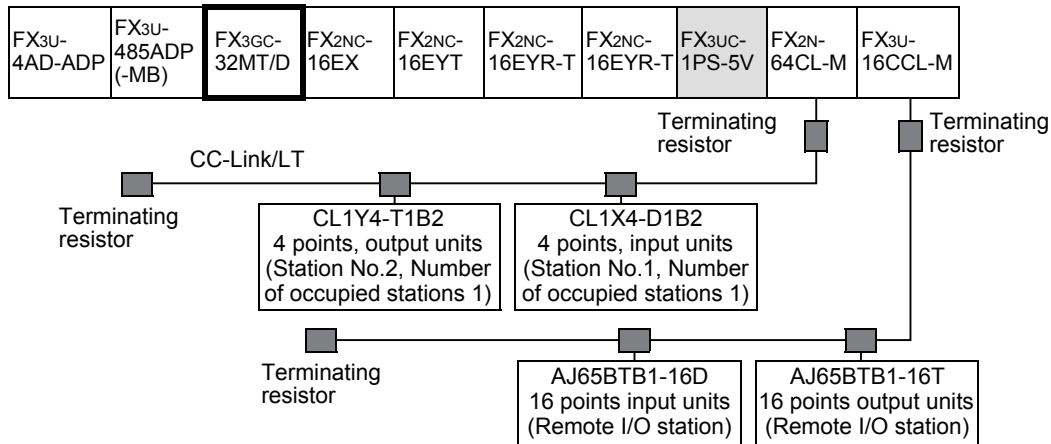
OK

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

OK

OK

- 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  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX3U-4AD-ADP  | 15mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX2NC-16EX  | 45mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX2NC-16EYT   | 50mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX2NC-16EYR-T   | 50mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX2NC-16EYR-T   | 50mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <table border="1" style="border-collapse: collapse;"> <tr><td>FX3U-485ADP(-MB)</td><td>20mA</td></tr> <tr><td>FX3U-4AD-ADP</td><td>15mA</td></tr> <tr><td>FX2NC-16EX</td><td>45mA</td></tr> <tr><td>FX2NC-16EYT</td><td>50mA</td></tr> <tr><td>FX2NC-16EYR-T</td><td>50mA</td></tr> <tr><td>FX2NC-16EYR-T</td><td>50mA</td></tr> </table> </div> <div style="margin-right: 10px;"> <table border="1" style="border-collapse: collapse;"> <tr><td>35mA</td></tr> <tr><td>80mA</td></tr> <tr><td>130mA</td></tr> <tr><td>180mA</td></tr> <tr><td>230mA</td></tr> </table> </div> </div> |       | FX3U-485ADP(-MB) | 20mA | FX3U-4AD-ADP | 15mA | FX2NC-16EX | 45mA | FX2NC-16EYT | 50mA | FX2NC-16EYR-T | 50mA | FX2NC-16EYR-T | 50mA | 35mA | 80mA | 130mA | 180mA | 230mA |
| FX3U-485ADP(-MB)  | 20mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX3U-4AD-ADP  | 15mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX2NC-16EX  | 45mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX2NC-16EYT   | 50mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX2NC-16EYR-T   | 50mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| FX2NC-16EYR-T   | 50mA  |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| 35mA  |       |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| 80mA  |       |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| 130mA   |       |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| 180mA   |       |                  |      |              |      |            |      |             |      |               |      |               |      |      |      |       |       |       |
| 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

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- 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.

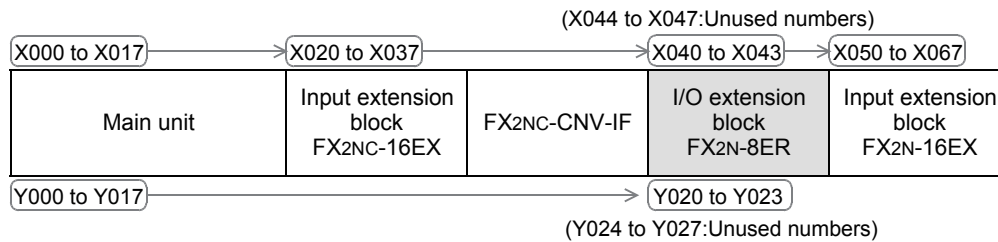
Octal numbers are assigned as input/output numbers (X/Y) as shown below.

- 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.)



|    |  |
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## 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.

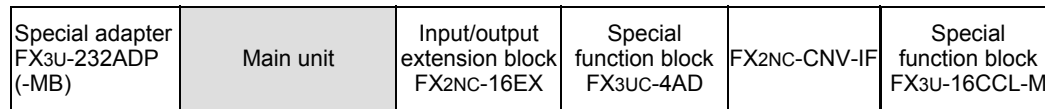
#### 2. Products to which unit numbers are not assigned

- 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.

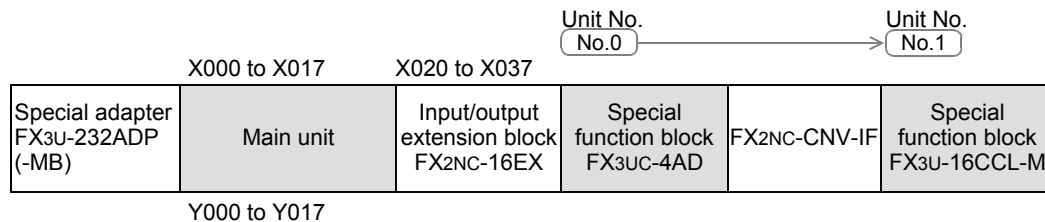
### 1.15.2 Example of assigning

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

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



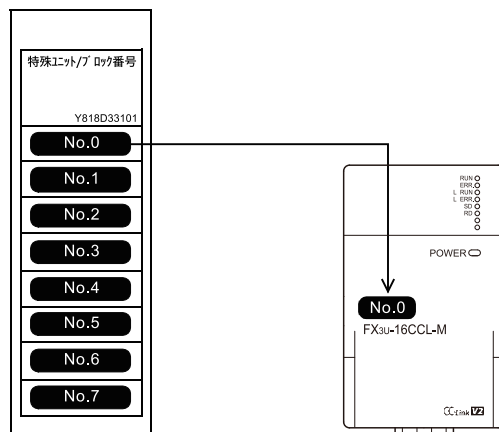
Unit numbers are assigned to the special function blocks in the above configuration as shown below.



### 1.15.3 Application of unit number labels

The special function blocks come with unit number labels.

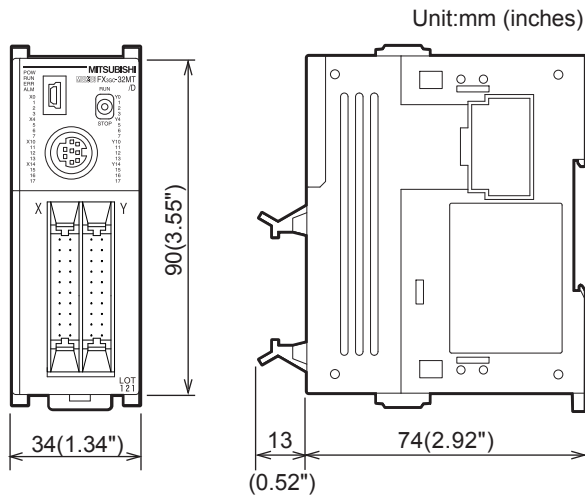
Apply the unit number labels to spaces on the enclosure (see the following figure) so that the unit numbers can be identified.



## 2. External Dimensions and Terminal Arrangement

### 2.1 External Dimensions (MASS/Installation/Accessories)

#### 2.1.1 Main units

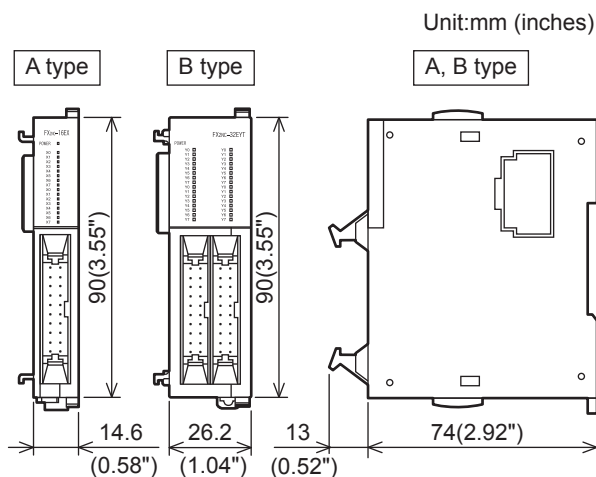


| Model name     | MASS(Weight):<br>kg (lbs) |
|----------------|---------------------------|
| FX3GC-32MT/D   | 0.2<br>(0.44lbs)          |
| FX3GC-32MT/DSS | 0.2<br>(0.44lbs)          |

- 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

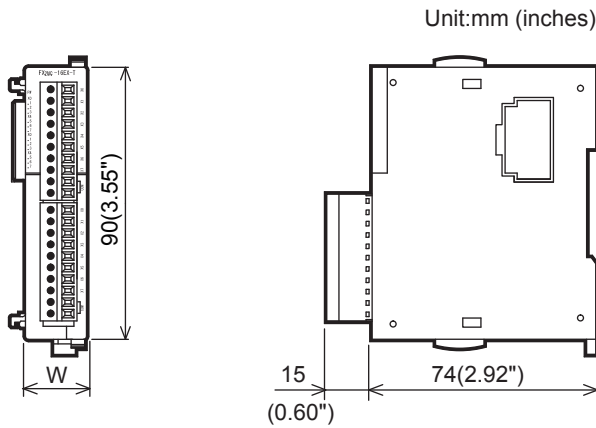
##### 1. Connector type



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

- 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

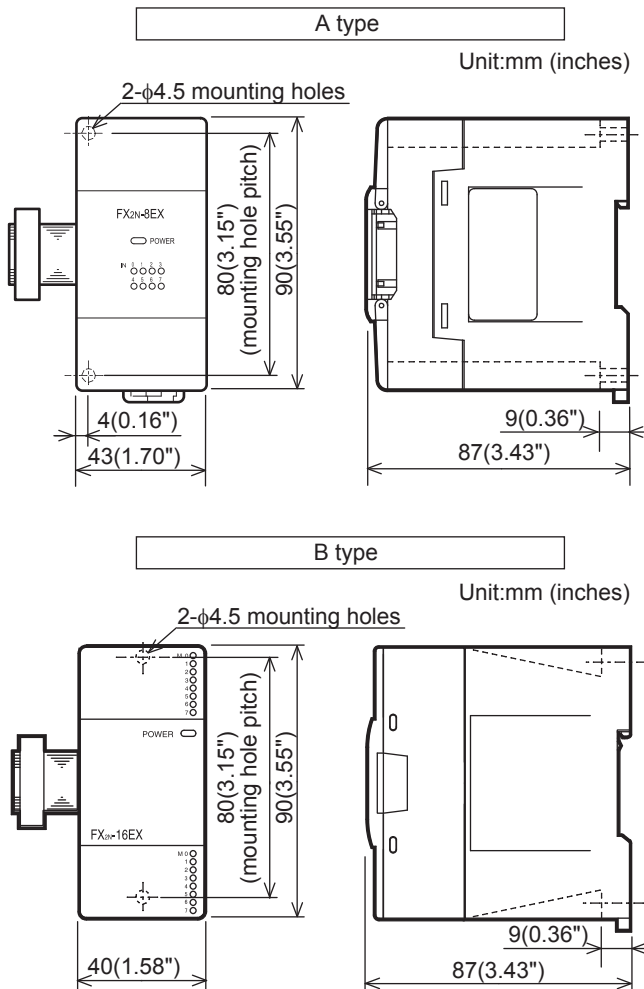


| Model name       | W:mm (inches) | MASS(Weight): kg (lbs) |
|------------------|---------------|------------------------|
| FX2NC-16EX-T     | 20.2          | 0.15                   |
| FX2NC-16EX-T-DS  | (0.80")       | (0.33lbs)              |
| FX2NC-16EYR-T    | 24.2          | 0.2            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



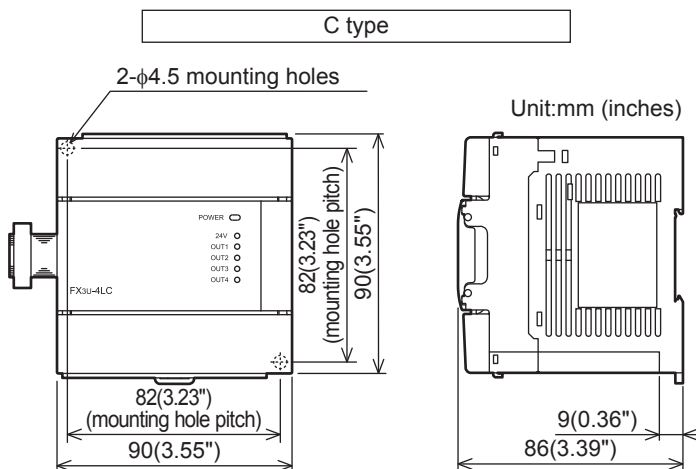
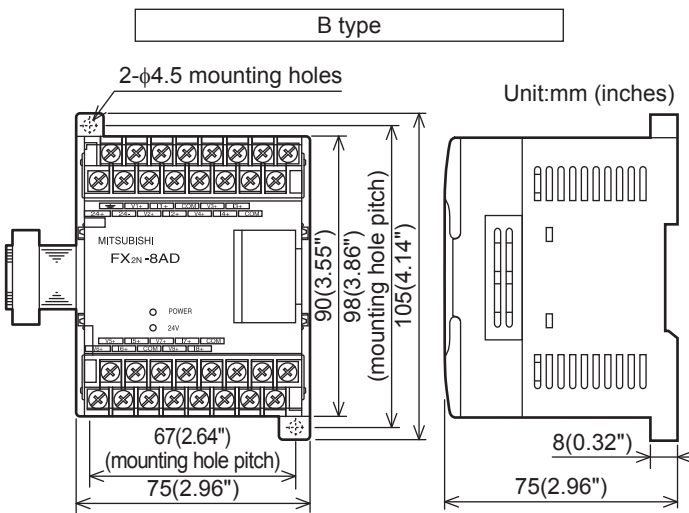
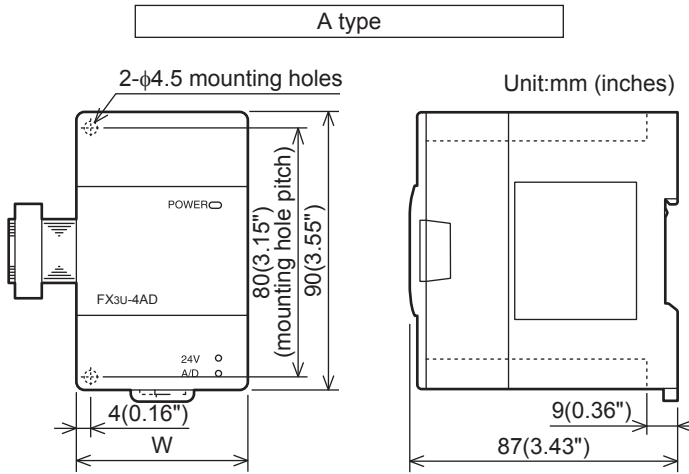
| Type              | Model name        | MASS(Weight): kg (lbs) |
|-------------------|-------------------|------------------------|
| A                 | FX2N-8ER          | 0.2<br>(0.44lbs)       |
|                   | FX2N-8EX          |                        |
|                   | FX2N-8EX-UA1/UL   |                        |
|                   | FX2N-8EYR         |                        |
|                   | FX2N-8EYT         |                        |
|                   | FX2N-8EYT-H       |                        |
|                   | FX2N-8ER-ES/UL    |                        |
|                   | FX2N-8EX-ES/UL    |                        |
|                   | FX2N-8EYR-ES/UL   |                        |
| B                 | FX2N-16EX         | 0.3<br>(0.66lbs)       |
|                   | 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 |                   |                        |

- 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    | 55            | 0.2                    |
|      | FX3U-4DA    | (2.17")       | (0.44lbs)              |
|      | FX2N-2AD    | 43            | 0.2                    |
|      | FX2N-2DA    | (1.70")       | (0.44lbs)              |
|      | FX2N-4AD    | 55            | 0.3                    |
|      | FX2N-4DA    | (2.17")       | (0.66lbs)              |
| B    | FX2N-4AD-PT | 75            | 0.4                    |
|      | FX2N-4AD-TC | (2.96")       | (0.88lbs)              |
| C    | FX2N-5A     | 90            | 0.4                    |
|      | FX2N-2LC    | (3.55")       | (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

1 Outline

2 External Dimensions

3 Generic Specifications

4 Power Supply Specifications

5 Input Specifications

6 Output Specifications

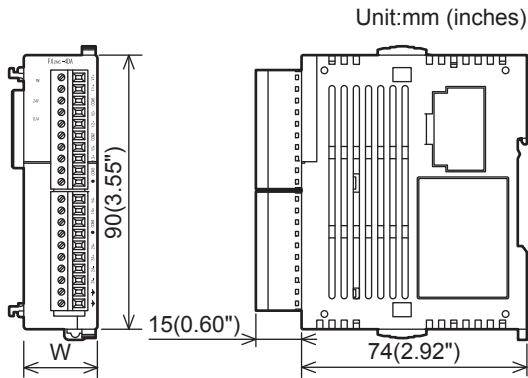
7 Examples of Wiring for Various Uses

8 Terminal Block

9 Battery

10 Test Run, Maintenance, Troubleshooting

**FX2NC/FX3UC Series**

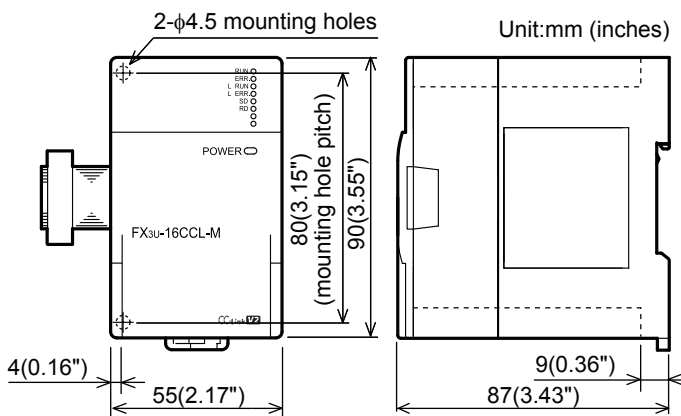


| Model name | W:mm (inches) | MASS(Weight): kg (lbs) |
|------------|---------------|------------------------|
| FX3UC-4AD  | 20.2 (0.80")  | 0.13 (0.29lbs)         |
| FX2NC-4AD  | 20.2 (0.80")  | 0.13 (0.29lbs)         |
| FX2NC-4DA  | 24.2 (0.96")  | 0.13 (0.29lbs)         |

- 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**

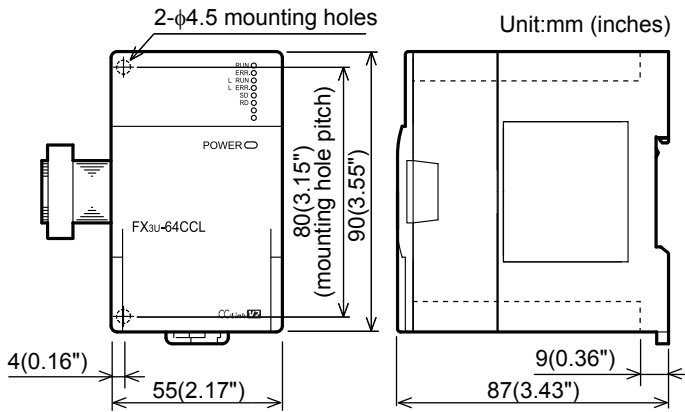
**FX3U-16CCL-M**



| Model name   | MASS(Weight): kg (lbs) |
|--------------|------------------------|
| FX3U-16CCL-M | 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

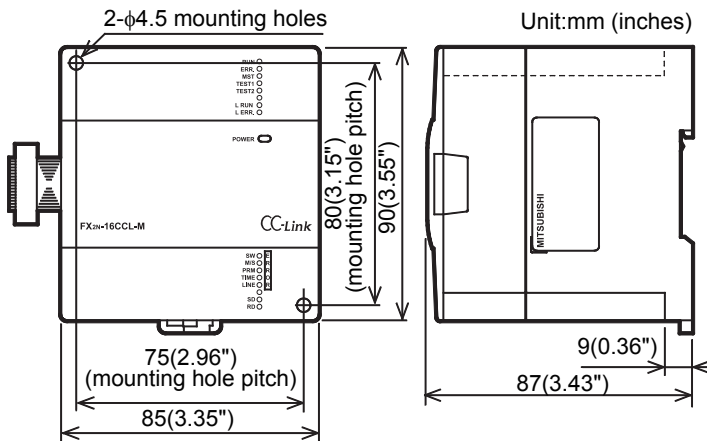
**FX3U-64CCL**



| Model name | MASS(Weight):<br>kg (lbs) |
|------------|---------------------------|
| FX3U-64CCL | 0.3<br>(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**

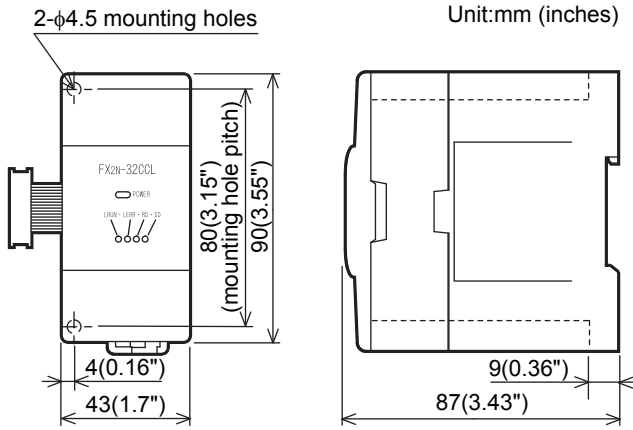


| Model name   | MASS(Weight):<br>kg (lbs) |
|--------------|---------------------------|
| FX2N-16CCL-M | 0.4<br>(0.88lbs)          |

- 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

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**FX2N-32CCL/FX2N-64CL-M**

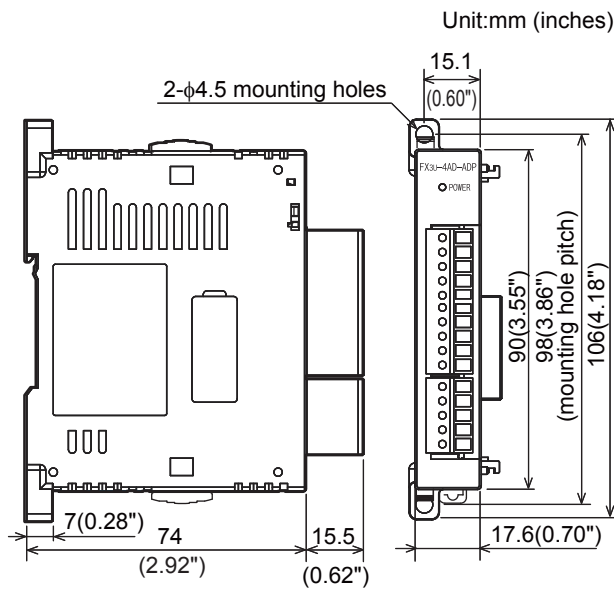


| Model name  | MASS(Weight):<br>kg (lbs) |
|-------------|---------------------------|
| FX2N-32CCL  | 0.2<br>(0.44lbs)          |
| FX2N-64CL-M | 0.15<br>(0.33lbs)         |

- 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

**2.1.5 Special adapters**

**1. Analog special adapters**



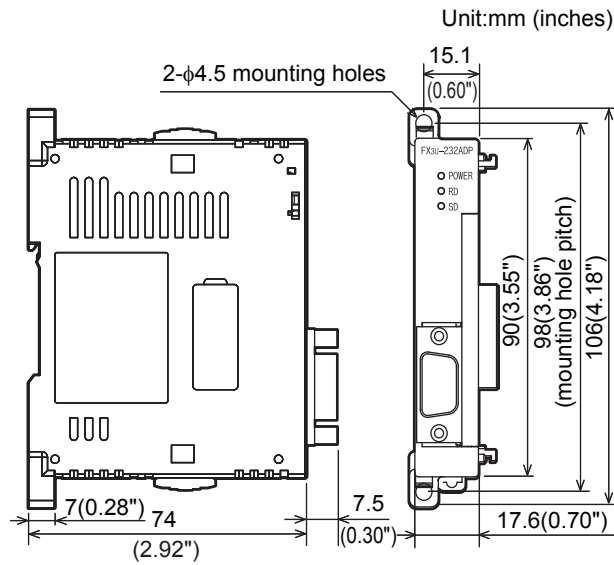
| Model name       | MASS(Weight):<br>kg (lbs) |
|------------------|---------------------------|
| FX3U-4AD-ADP     | 0.1<br>(0.22lbs)          |
| FX3U-4DA-ADP     |                           |
| FX3U-3A-ADP      |                           |
| FX3U-4AD-PT-ADP  |                           |
| FX3U-4AD-PTW-ADP |                           |
| FX3U-4AD-PNK-ADP |                           |
| FX3U-4AD-TC-ADP  |                           |

- Installation: DIN rail of 35 mm (1.38") in width or screws\*<sup>1</sup>
  - 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

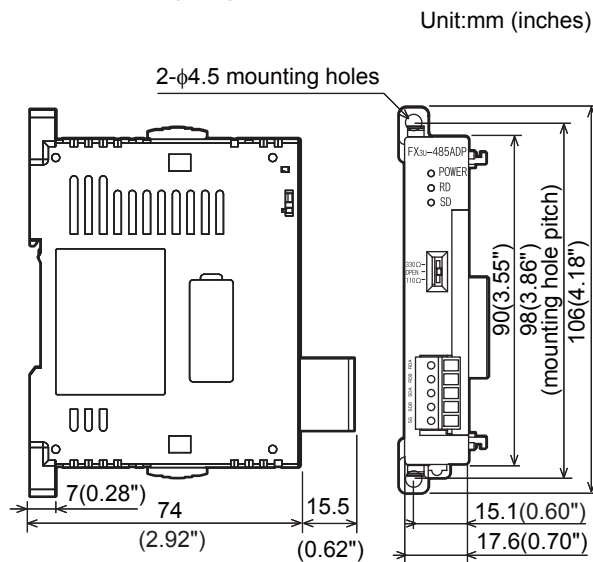
### FX3U-232ADP(-MB)



| Model name       | MASS(Weight):<br>g (lbs) |
|------------------|--------------------------|
| FX3U-232ADP(-MB) | 80<br>(0.18lbs)          |

- Installation: DIN rail of 35 mm (1.38") in width or screws\*<sup>1</sup>
  - 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)

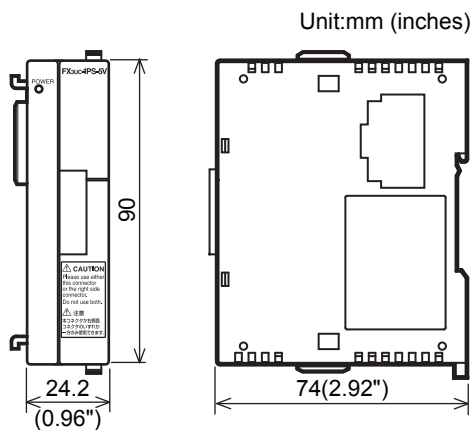


| Model name       | MASS(Weight):<br>g (lbs) |
|------------------|--------------------------|
| FX3U-485ADP(-MB) | 80<br>(0.18lbs)          |

- Installation: DIN rail of 35 mm (1.38") in width or screws\*<sup>2</sup>
  - 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.

## 2.1.6 Power supply unit

### 1. Extension Power Supply Unit



| Model name   | MASS(Weight):<br>kg (lbs) |
|--------------|---------------------------|
| FX3UC-1PS-5V | 0.15<br>(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

1 Outline

2 External Dimensions

3 Generic Specifications

4 Power Supply Specifications

5 Input Specifications

6 Output Specifications

7 Examples of Wiring for Various Uses

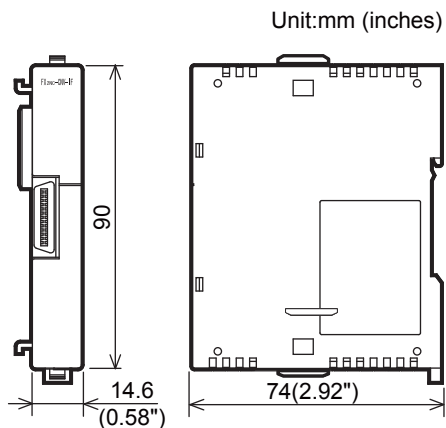
8 Terminal Block

9 Battery

10 Test Run, Maintenance, Troubleshooting

### 2.1.7 Connector conversion adapter

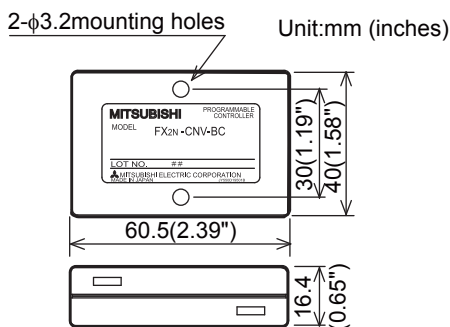
#### 1. FX2NC-CNV-IF



| Model name   | MASS(Weight):<br>g (lbs) |
|--------------|--------------------------|
| FX2NC-CNV-IF | 60<br>(0.14lbs)          |

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

#### 2. FX2N-CNV-BC



| Model name  | MASS(Weight):<br>g (lbs) |
|-------------|--------------------------|
| FX2N-CNV-BC | 40<br>(0.09lbs)          |

- Installation: Direct mounting only

## 2.2 Terminal Layout

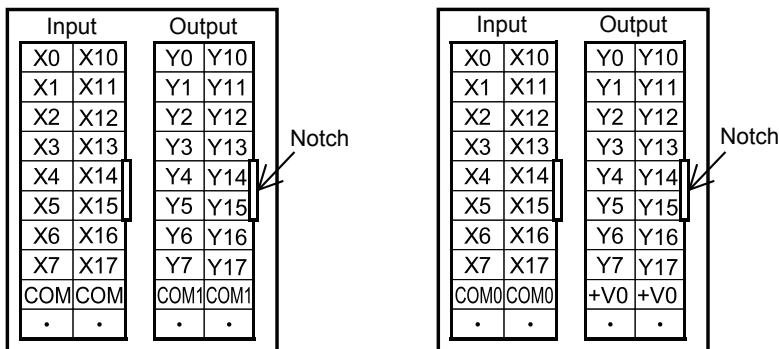
Refer to the respective special function blocks manual.

### 2.2.1 Main units

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

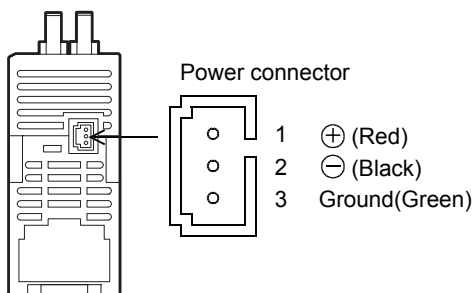
- FX3GC-32MT/D

- FX3GC-32MT/DSS



" . " represents vacant terminals.

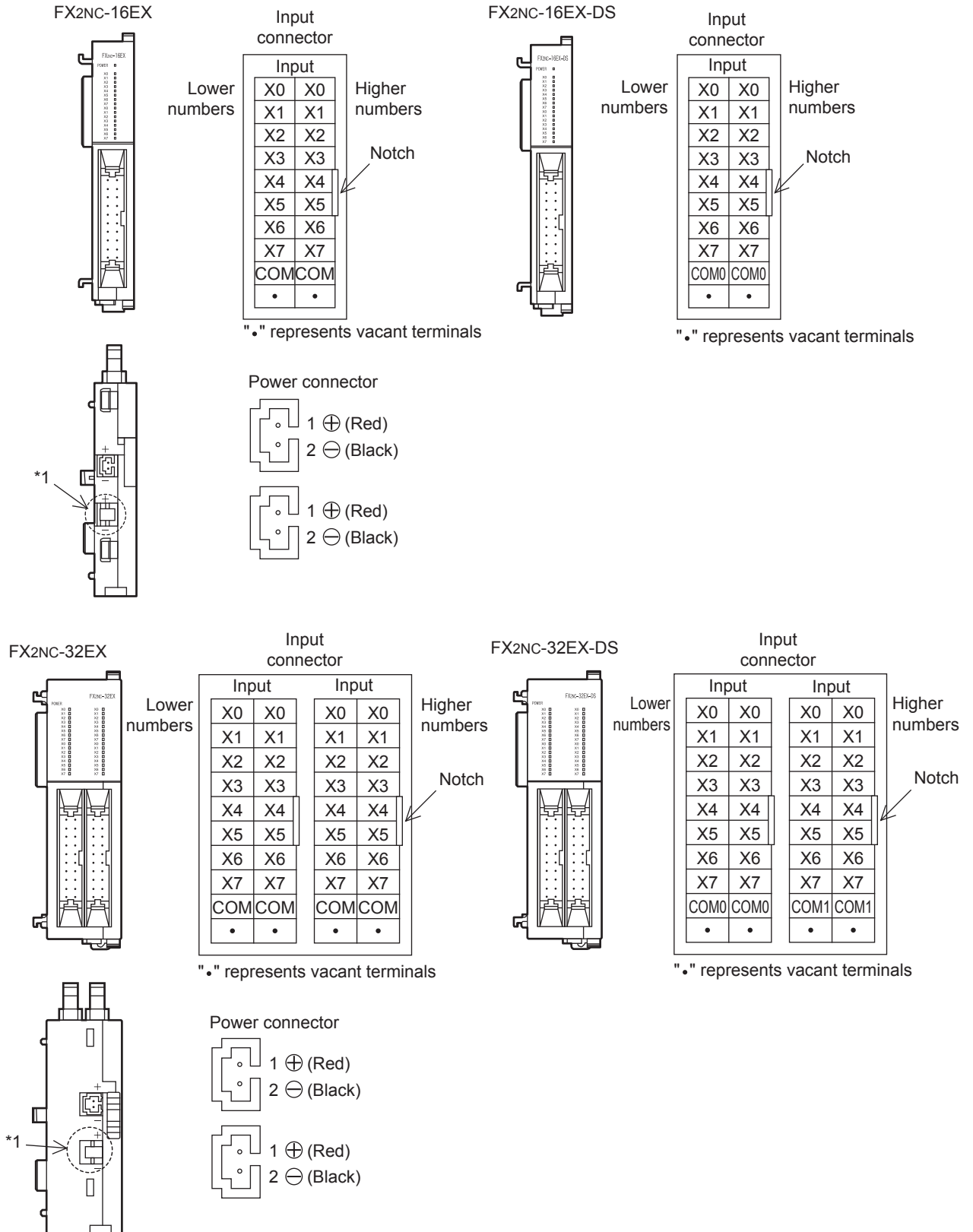
#### 2. FX3GC-32MT/D(SS) power connector



|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 2.2.2 FX2NC Series input/output extension block

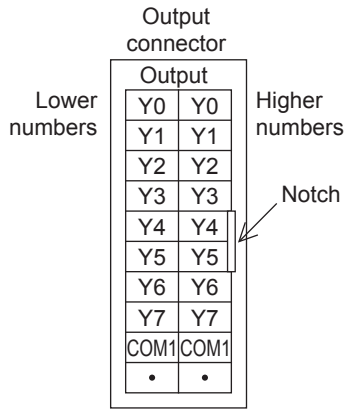
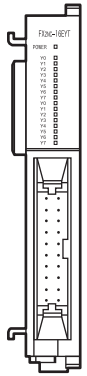
#### 1. Connector type



**Caution**

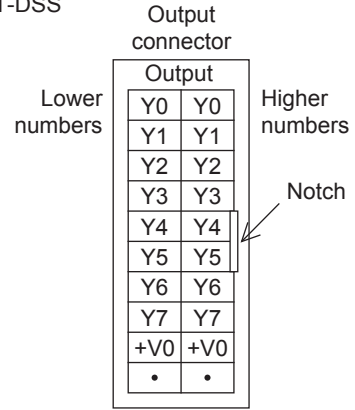
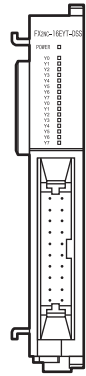
A power connector is not included in the FX2NC-16EX-DS and FX2NC-32EX-DS.

FX2NC-16EYT



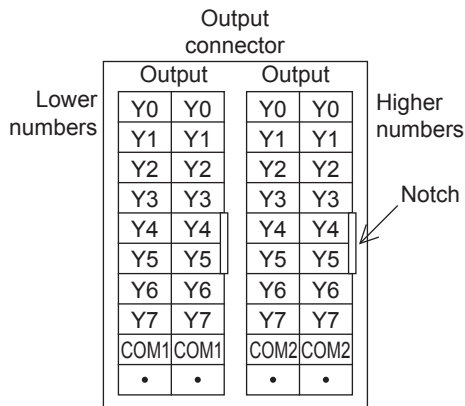
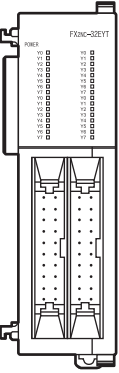
"•" represents vacant terminals

FX2NC-16EYT-DSS



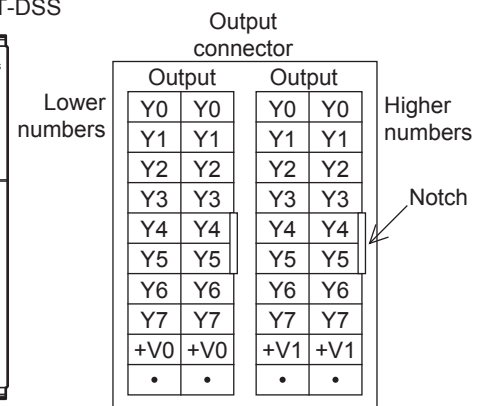
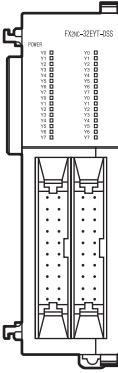
"•" represents vacant terminals

FX2NC-32EYT



"•" represents vacant terminals

FX2NC-32EYT-DSS

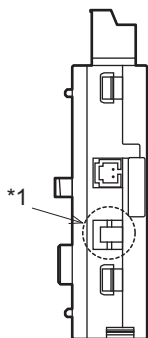
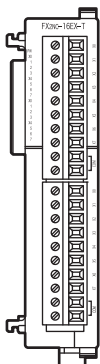


"•" represents vacant terminals

|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

## 2. Terminal type

FX2NC-16EX-T



Input terminal

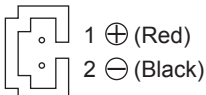
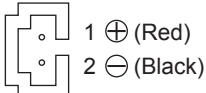
X0  
X1  
X2  
X3  
X4  
X5  
X6  
X7  
COM  
COM

Lower numbers

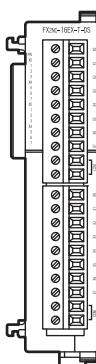
X0  
X1  
X2  
X3  
X4  
X5  
X6  
X7  
COM  
COM

Higher numbers

Power connector



FX2NC-16EX-T-DS



Input terminal

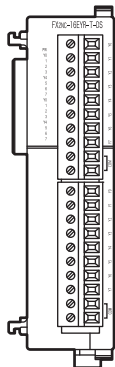
X0  
X1  
X2  
X3  
X4  
X5  
X6  
X7  
COM  
COM

Lower numbers

X0  
X1  
X2  
X3  
X4  
X5  
X6  
X7  
COM  
COM

Higher numbers

FX2NC-16EYR-T(-DS)



Output terminal

Y0  
Y1  
Y2  
Y3  
Y4  
Y5  
Y6  
Y7  
COM1  
COM1

Lower numbers

Y0  
Y1  
Y2  
Y3  
Y4  
Y5  
Y6  
Y7  
COM2  
COM2

Higher numbers

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

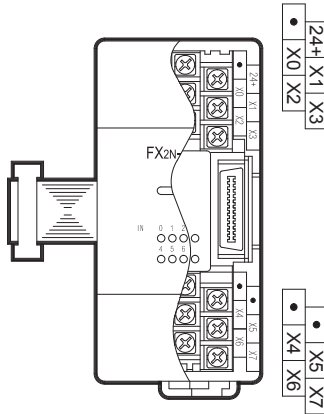
### Caution

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

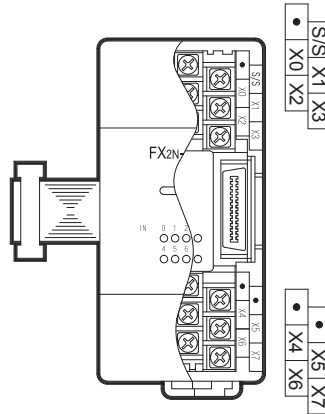
### 2.2.3 FX2N Series input/output extension block

#### 1. Terminal type

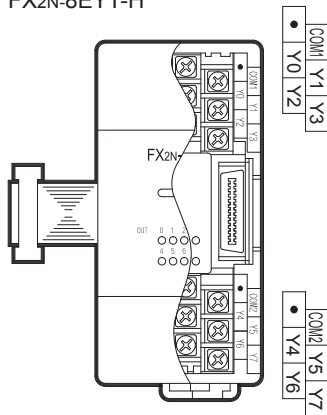
FX2N-8EX



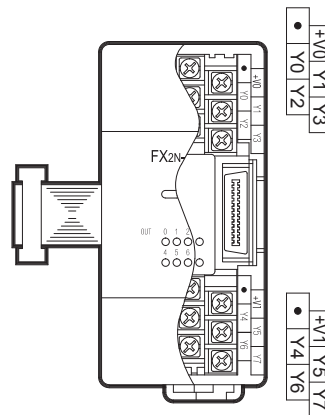
FX2N-8EX-ES/UL



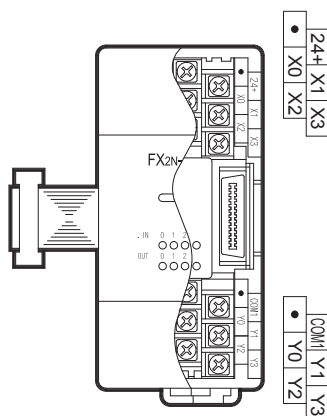
FX2N-8EYR(-ES/UL)  
FX2N-8EYT  
FX2N-8EYT-H



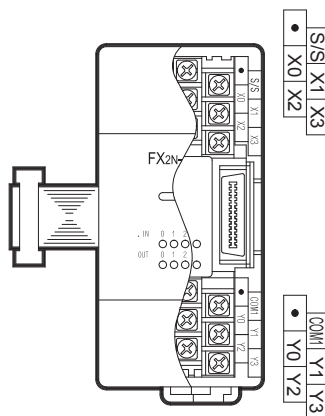
FX2N-8EYT-ESS/UL



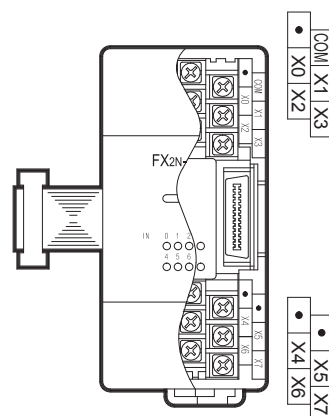
FX2N-8ER



FX2N-8ER-ES/UL



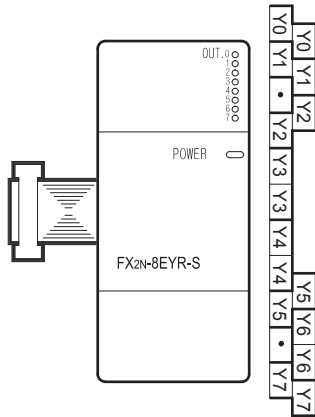
FX2N-8EX-UA1/UL



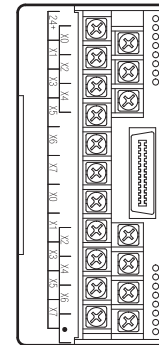
" . " represents vacant terminals.

|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

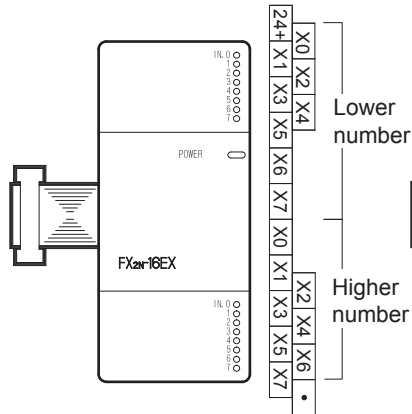
FX2N-8EYR-S-ES/UL



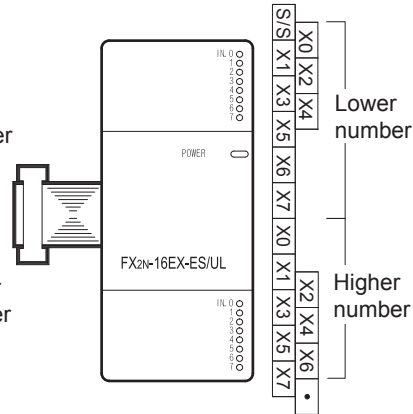
Vertical terminal block  
 (Example: FX2N-16EX)



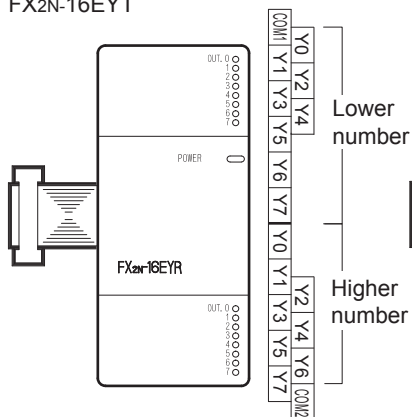
FX2N-16EX



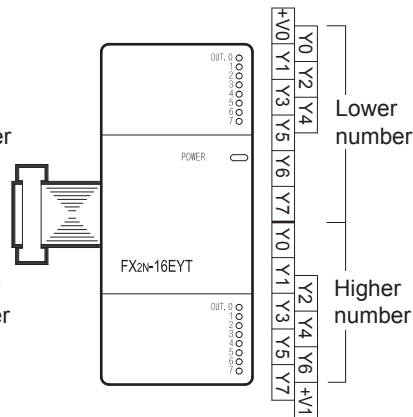
FX2N-16EX-ES/UL



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



FX2N-16EYT-ESS/UL

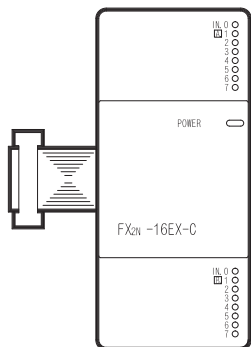


" • " represents vacant terminals.



## 2. Connector type

FX2N-16EX-C

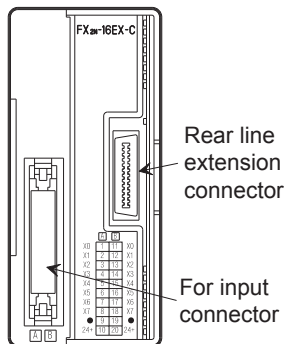


Connector pin arrangement

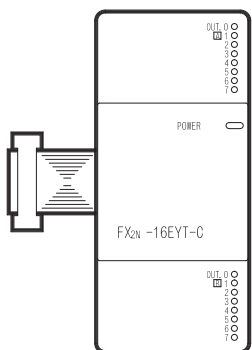
| Side A | No. | No. | Side B |
|--------|-----|-----|--------|
| X0     | 1   | 11  | X0     |
| X1     | 2   | 12  | X1     |
| X2     | 3   | 13  | X2     |
| X3     | 4   | 14  | X3     |
| X4     | 5   | 15  | X4     |
| X5     | 6   | 13  | X5     |
| X6     | 7   | 17  | X6     |
| X7     | 8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

Lower number Higher number

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



FX2N-16EYT-C

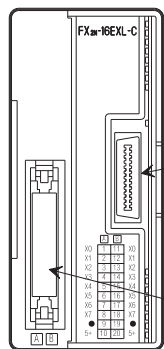
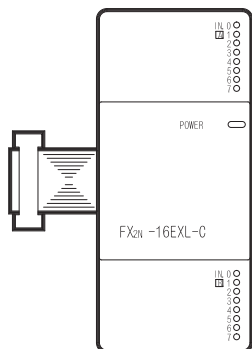


Connector pin arrangement

| 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 number Higher number

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+     |

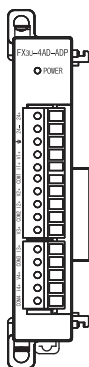
Lower number Higher number

" • " represents vacant terminals.

## 2.2.4 Special adapters

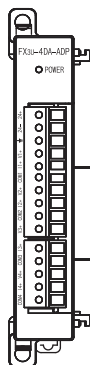
### 1. Analog special adapter

FX3U-4AD-ADP



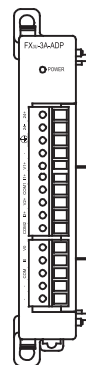
|      |
|------|
| 24+  |
| 24-  |
| ⏏    |
| V1+  |
| I1+  |
| COM1 |
| V2+  |
| I2+  |
| COM2 |
| V3+  |
| I3+  |
| COM3 |
| V4+  |
| I4+  |
| COM4 |

FX3U-4DA-ADP



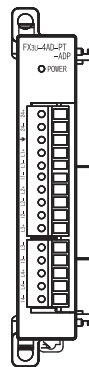
|      |
|------|
| 24+  |
| 24-  |
| ⏏    |
| V1+  |
| I1+  |
| COM1 |
| V2+  |
| I2+  |
| COM2 |
| V3+  |
| I3+  |
| COM3 |
| V4+  |
| I4+  |
| COM4 |

FX3U-3A-ADP



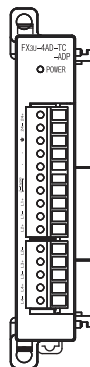
|      |
|------|
| 24+  |
| 24-  |
| ⏏    |
| .    |
| V1+  |
| I1+  |
| COM1 |
| V2+  |
| I2+  |
| COM2 |
| V0   |
| COM  |
| .    |
| .    |

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

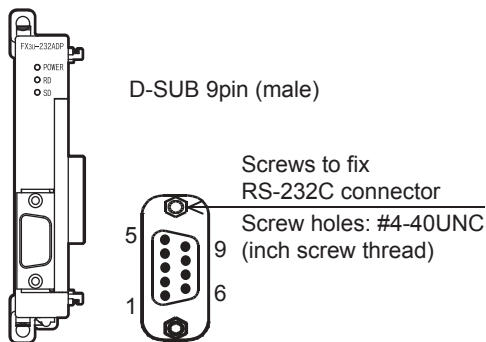


|        |
|--------|
| 24+    |
| 24-    |
| ⏏      |
| .      |
| .      |
| J-type |
| J-type |
| L1+    |
| L1-    |
| L2+    |
| L2-    |
| L3+    |
| L3-    |
| L4+    |
| L4-    |

" . " represents vacant terminals.

## 2. Communication special adapter

FX3U-232ADP(-MB)

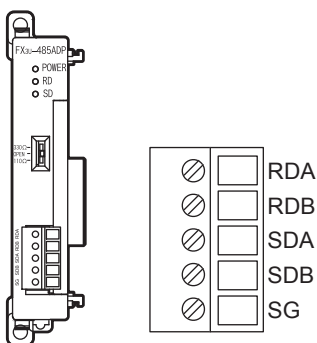


| Pin No. | Signal   | Name                              |
|---------|----------|-----------------------------------|
| 1       | CD(DCD)  | Receive carrier detection         |
| 2       | RD(RXD)  | Receive data                      |
| 3       | SD(TXD)  | Send data                         |
| 4  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

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

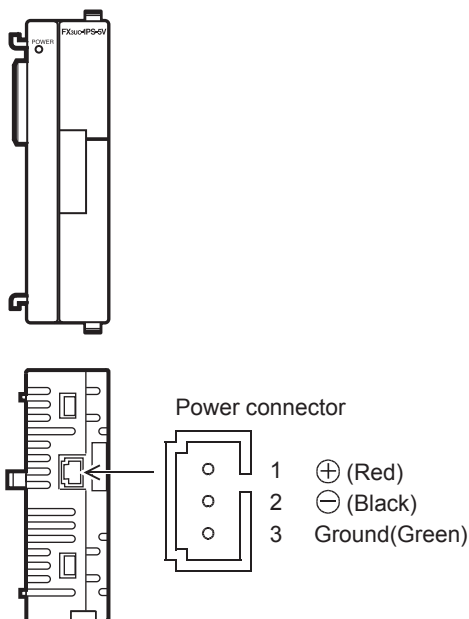
\*2. Data set ready uses it as a possible to send by the handling of the control line.

FX3U-485ADP(-MB)



### 2.2.5 Power supply unit

FX3UC-1PS-5V



|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 3. Generic Specifications/Installation Work

|  |               |
|--|---------------|
| <b>DESIGN PRECAUTIONS</b>  | <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>                     Otherwise, malfunctions may cause serious accidents.                     <ol style="list-style-type: none"> <li>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).</li> <li>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.<br/>                             External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.</li> <li>3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.<br/>                             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.</li> </ol> </li> </ul> |               |


|  |                |
|--|----------------|
| <b>DESIGN PRECAUTIONS</b>  | <b>CAUTION</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>                     Noise may cause malfunctions.</li> <li>• Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.<br/>                     Failure to do so may result in wire damage/breakage or PLC failure.</li> </ul> |                |

|   |               |
|---|---------------|
| <b>INSTALLATION PRECAUTIONS</b>   | <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.<br/>                     Failure to do so may cause electric shock.</li> </ul> |               |

|  |                             |   |               |  |                             |
|--|-----------------------------|---|---------------|--|-----------------------------|
| <b>INSTALLATION PRECAUTIONS</b>  | <b>CAUTION</b>              |   |               |  |                             |
| <ul style="list-style-type: none"> <li>• Use the product within the generic environment specifications described in Section 3.1 of this manual.<br/>                     Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub> or NO<sub>2</sub>), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind.<br/>                     If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.</li> <li>• Do not touch the conductive parts of the product directly.<br/>                     Doing so may cause device failures or malfunctions.</li> <li>• Install the product securely using a DIN rail or mounting screws.</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <tr> <td style="padding: 2px;">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</td> <td style="padding: 2px; text-align: center;">DIN rail only</td> </tr> <tr> <td style="padding: 2px;">FX2N Series I/O extension blocks, FX2N/FX3U Series special function blocks</td> <td style="padding: 2px; text-align: center;">DIN rail or direct mounting</td> </tr> </table> <ul style="list-style-type: none"> <li>• Install the product on a flat surface.<br/>                     If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformities.</li> <li>• When drilling screw holes or wiring, make sure cutting or write debris does not enter the ventilation slits.<br/>                     Failure to do so may cause fire, equipment failures or malfunctions.</li> <li>• Be sure to remove the dust proof sheet from the PLC's ventilation port when installation work is completed.<br/>                     Failure to do so may cause fire, equipment failures or malfunctions.</li> <li>• Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors.<br/>                     Loose connections may cause malfunctions.</li> <li>• Turn off the power to the PLC before attaching or detaching the following devices.<br/>                     Failure to do so may cause equipment failures or malfunctions.                     <ul style="list-style-type: none"> <li>- Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery</li> </ul> </li> </ul> |                             | 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 |
| 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 |   |               |  |                             |

| Note  |
|---|
| <ul style="list-style-type: none"> <li>When a dust proof sheet is supplied with an extension block, keep the sheet applied to the ventilation slits during installation and wiring work.</li> </ul> |

| WIRING PRECAUTIONS  |  <b>DANGER</b> |
|---|---|
| <ul style="list-style-type: none"> <li>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.</li> <li>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.</li> </ul> |   |

| WIRING PRECAUTIONS   |  <b>CAUTION</b> |
|--|--|
| <ul style="list-style-type: none"> <li>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.</li> <li>Do not wire vacant terminals externally. Doing so may damage the product.</li> <li>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.</li> <li>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.</li> <li>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.               <ul style="list-style-type: none"> <li>The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>Tightening torque should follow the specifications in the manual.</li> </ul> </li> <li>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.               <ul style="list-style-type: none"> <li>The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>Tightening torque should follow the specifications in the manual.</li> <li>Twist the end of strand wire and make sure that there are no loose wires.</li> <li>Do not solder-plate the electric wire ends.</li> <li>Do not connect more than the specified number of wires or electric wires of unspecified size.</li> <li>Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.</li> </ul> </li> <li>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.               <ul style="list-style-type: none"> <li>The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>Tightening torque should follow the specifications in the manual.</li> </ul> </li> </ul> |  |

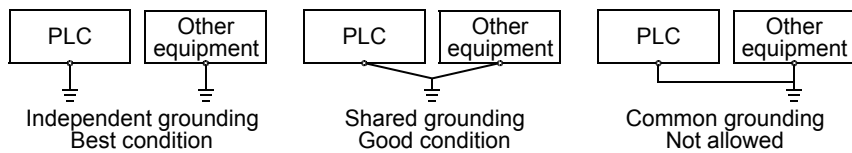
|           |  |
|-----------|--|
| <b>1</b>  | Outline                                |
| <b>2</b>  | External Dimensions                    |
| <b>3</b>  | Generic Specifications                 |
| <b>4</b>  | Power Supply Specifications            |
| <b>5</b>  | Input Specifications                   |
| <b>6</b>  | Output Specifications                  |
| <b>7</b>  | Examples of Wiring for Various Uses    |
| <b>8</b>  | Terminal Block                         |
| <b>9</b>  | Battery                                |
| <b>10</b> | Test Run, Maintenance, Troubleshooting |

### 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 <sup>2</sup> )                   | 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 <sup>2</sup> 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 more by 500 V DC megger  |                |  |                     |   |
| Grounding                    | Class D grounding (grounding resistance: 100 Ω or less)<br><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 <sup>3</sup>  |                |  |                     |   |

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

\*2.

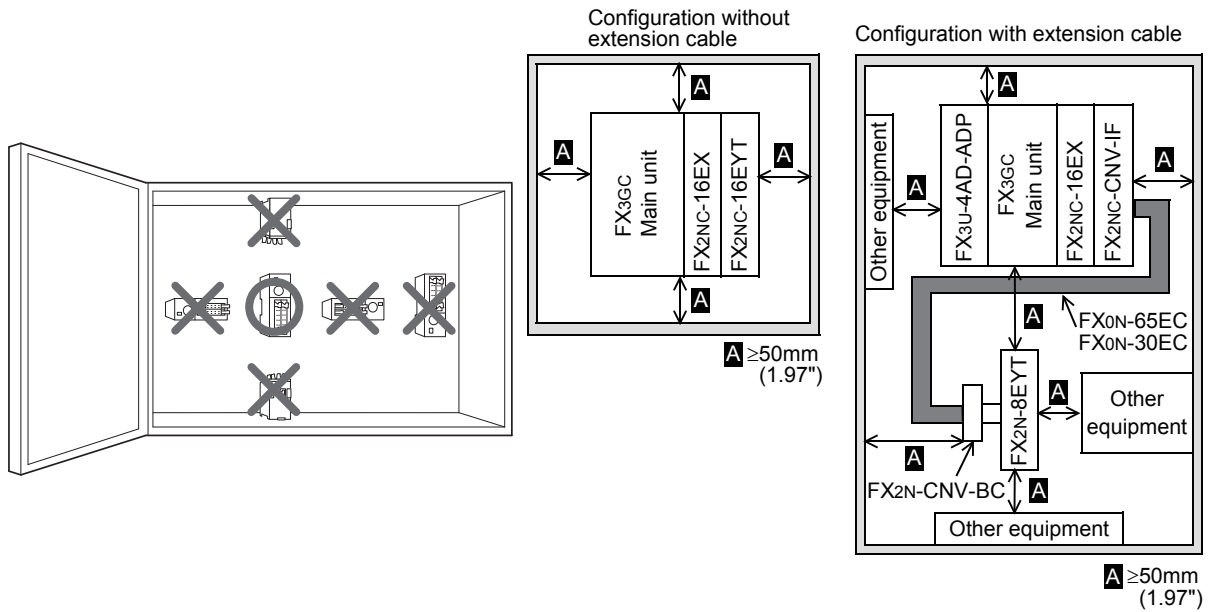


\*3. The PLC cannot be used at a pressure higher than the atmospheric pressure to avoid damage.

### 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. |
| •     | Do not install the PLC on a floor, a ceiling or a vertical surface. Install it horizontally on a wall as shown below.   |



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| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 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.

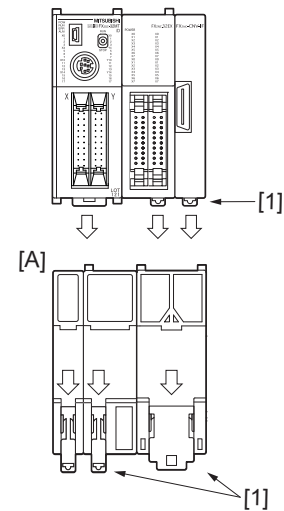
#### 3.3.1 Procedures for installing to and removing from DIN rail

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

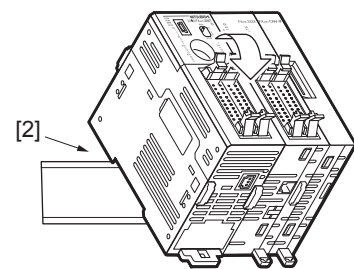
1) Connect all of the main unit, FX2NC Series I/O extension blocks, FX2NC/FX3UC Series special function blocks, extension power supply unit and FX2NC-CNV-IF.

→ For connecting method, refer to Subsection 3.4.3.

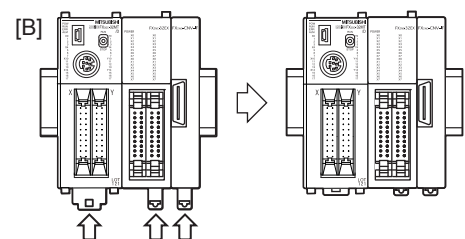
2) Push the DIN rail mounting hooks [1] of all connected units/blocks as shown in the figure on the right [A].



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



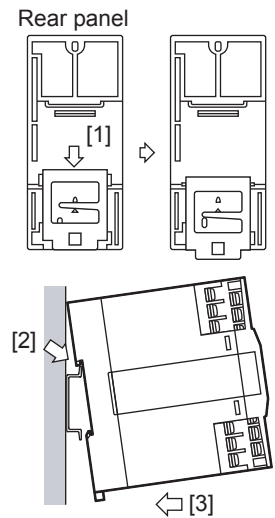
4) While pressing the main unit onto the DIN rail, lock the DIN rail mounting hooks as shown in the figure below [B].





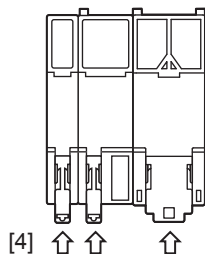
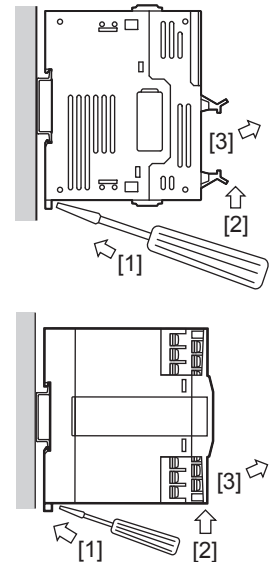
**2. FX2N Series I/O extension block, FX2N/FX3U Series special function block**

- 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.



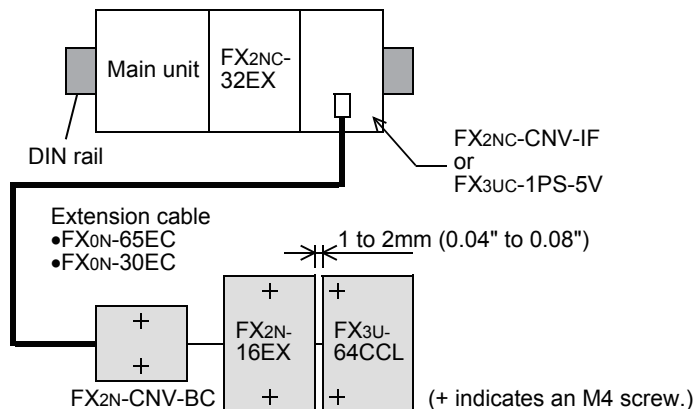
**3.3.2 Procedures for removal from DIN rail**

- 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.



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| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

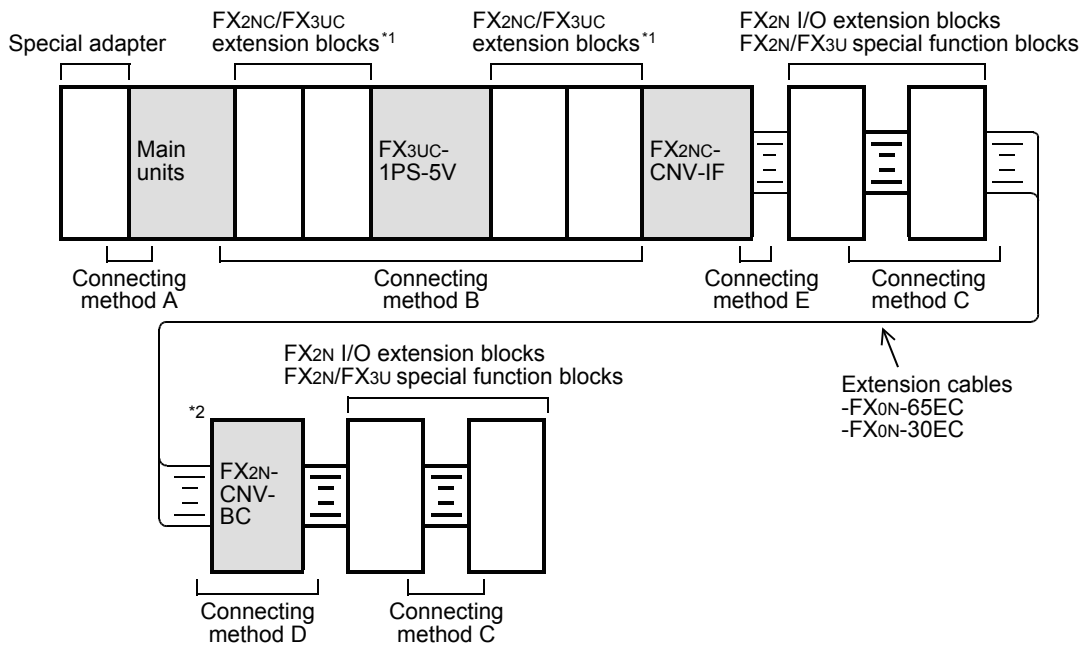
### 3.4 Connection between main unit and extension equipment

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.

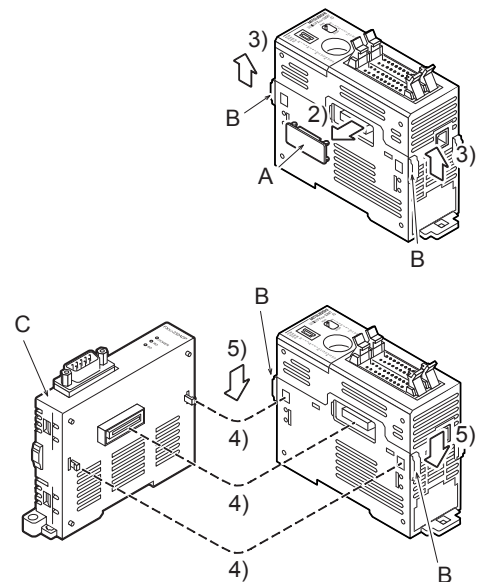


\*1. FX2NC Series I/O extension blocks and FX2NC/FX3UC Series special function blocks  
 \*2. Do not connect the FX3U-4LC or FX2N-8AD on the right side of the FX2N-CNV-BC. The FX2N-CNV-BC cannot be secured in this case.

#### 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).

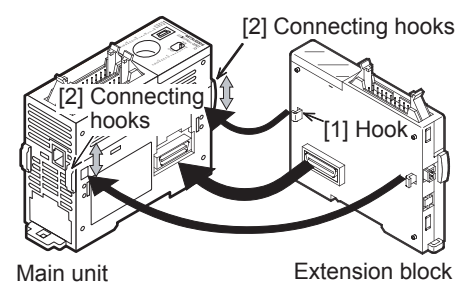
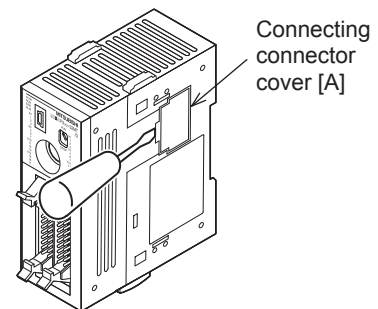


### 3.4.3 Connecting method B (Main units and Extension units/blocks connecting)

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.

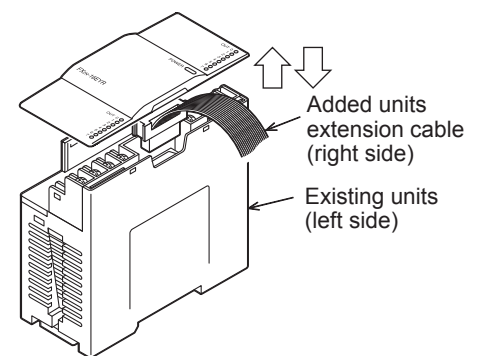


### 3.4.4 Connecting method C (Connection of FX2N/FX3U extension blocks)

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.



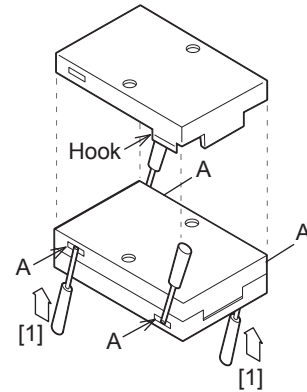
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### 3.4.5 Connecting method D (Extension cable • FX2N-CNV-BC connecting)

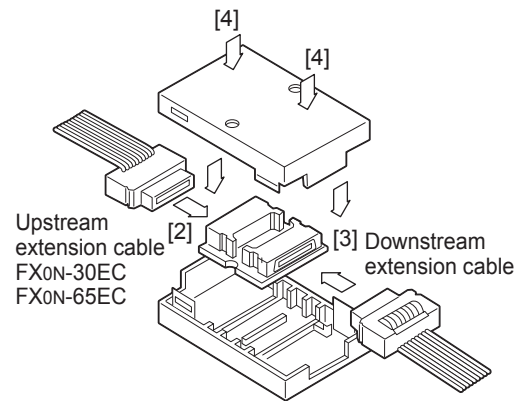
This subsection explains the procedures for connecting an extension cable and FX2N-CNV-BC to the extension cable of the extension block.

#### 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.

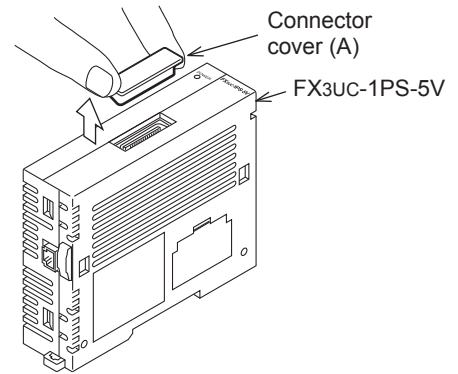


### 3.4.6 Connecting method E (Connection of FX3UC-1PS-5V/FX2NC-CNV-IF to right side)

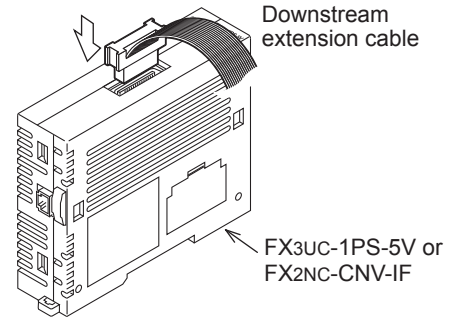
This subsection explains the procedures for connecting the extension cable to the extension power supply unit FX3UC-1PS-5V or the connector conversion interface FX2NC-CNV-IF.

#### 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.

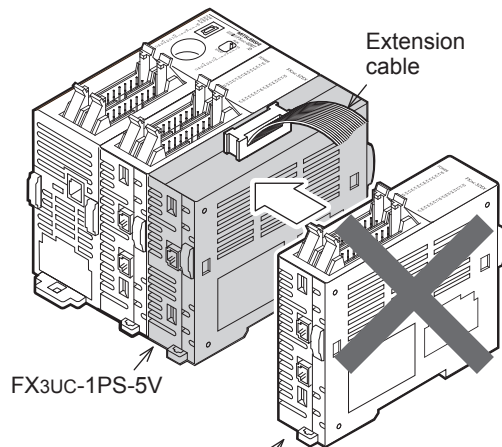
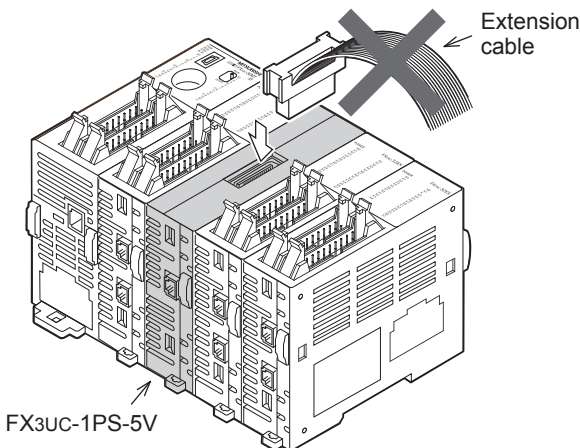


#### 2. Caution on the FX3UC-1PS-5V

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 FX2N/FX3U extension block connector (on the top) 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.

FX2NC/FX3UC extension block (FX2NC/FX3UC special function block, FX2NC-CNV-IF, FX3UC-1PS-5V)

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.

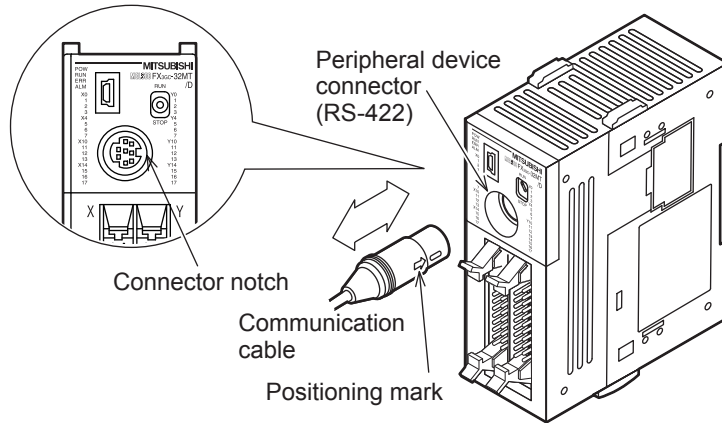
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|----|--|
| 1  | Outline                                |
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### 3.5 Connection to peripheral device connecting connector

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

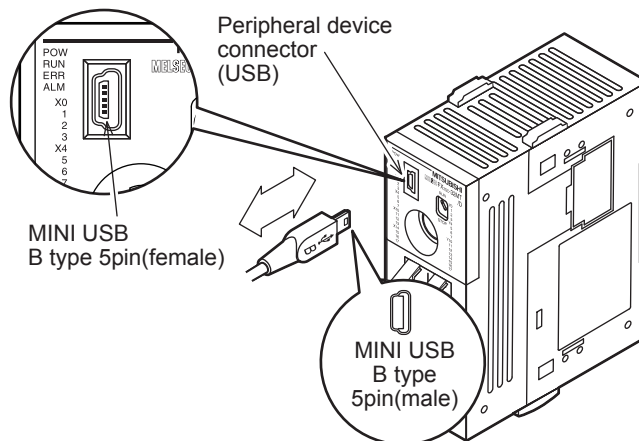
#### 1. RS-422

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

Power Cable types "A" and "B" are supplied with the main unit, while type "C" is supplied with the FX2NC-□□EX, FX2NC-16EX-T, and FX2NC/FX3UC Series special function blocks.

| Type | Application  | Model         | Length        | Cable supplied with  |
|------|--|---------------|---------------|--|
| "A"  | Power cable for main unit  | FX2NC-100MPCB | 1 m (3' 3")   | FX3GC-32MT/D, FX3GC-32MT/DSS   |
| "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/FX3UC Series special function blocks |

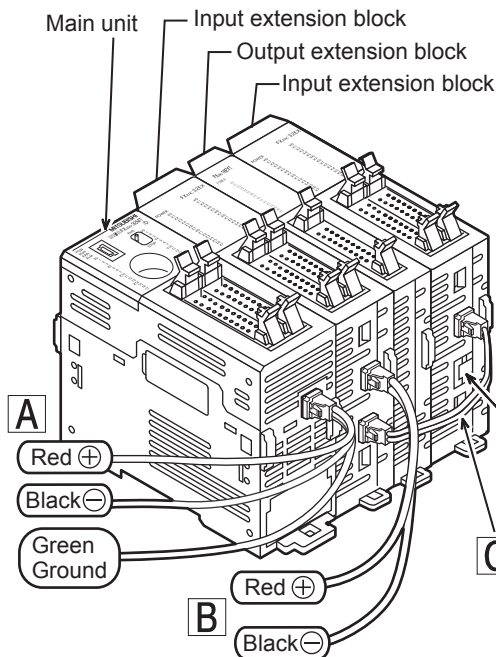
The crossover cable (type "C") can skip up to 4 16-point output blocks to connect units. If more blocks should be skipped to supply power to an input block, use cable type "B".

### 3.6.2 Connection of power cable to main unit and extension block

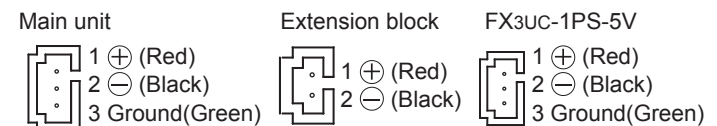
The PLC receives and supplies power through the built-in dedicated power connector. Power should be supplied to the main unit, FX2NC Series input extension blocks and FX2NC/FX3UC Series special function blocks.

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.

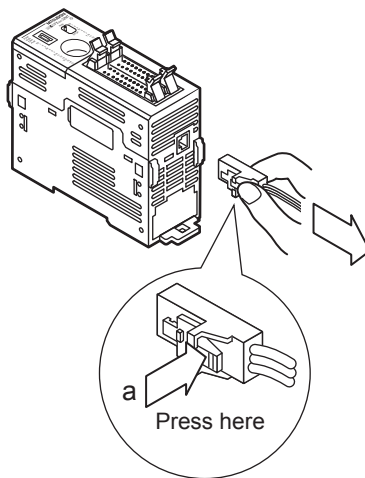
- Wiring from the FX2NC-□□EX, FX2NC-16EX-T or FX2NC/FX3UC Series special function block to another block.

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



### 3.6.4 Self-made power cable

To use self-made power cables, use the following wire and connector suggestions:

|                      |                           | Specifications / Model name                        |
|----------------------|---------------------------|--|
| Wire size            |                           | AWG24 (0.2 mm <sup>2</sup> )                       |
| Crimp-style terminal |                           | 1602-0069 (manufactured by Molex Japan Co., Ltd.)  |
| Housing              | For main unit             | 51030-0330 (manufactured by Molex Japan Co., Ltd.) |
|                      | For input extension block | 51030-0230 (manufactured by Molex Japan Co., Ltd.) |



## 3.7 Connection to Input/Output Connector

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

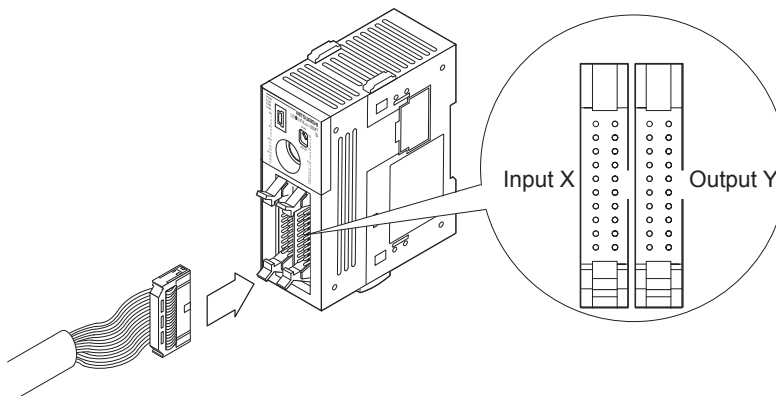
#### 1. Connection to input/output connector

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<br>(16'4")   | General-purpose input/output cable   | <ul style="list-style-type: none"> <li>• Single wire (Wire color: red)</li> <li>• PLC side: A 20-pin connector</li> </ul>  |
| FX-16E-150CAB   | 1.5 m<br>(4'11") | Cables for connecting the FX Series terminal block with input/output connectors.<br>For the connection with FX Series terminal block, refer to "Chapter 8. Terminal Block Specifications and External Wiring". | <ul style="list-style-type: none"> <li>• Flat cables (with tube)</li> <li>• A 20-pin connector at both ends</li> </ul>   |
| FX-16E-300CAB   | 3 m<br>(9'10")   |  |  |
| FX-16E-500CAB   | 5 m<br>(16'4")   |  |  |
| FX-16E-150CAB-R | 1.5 m<br>(4'11") |  |  |
| FX-16E-300CAB-R | 3 m<br>(9'10")   |  |  |
| FX-16E-500CAB-R | 5 m<br>(16'4")   |  |  |
| FX-A32E-150CAB  | 1.5 m<br>(4'11") | Cables for connecting the A Series Model A6TBXY36 connector/terminal block conversion unit and input/output connector type   | <ul style="list-style-type: none"> <li>• Flat cables (with tube)</li> <li>• PLC side: Two 20-pin connectors in 16-point units.</li> <li>• Terminal block side: A dedicated connector</li> <li>• One common terminal covers 32 input/output terminals.</li> </ul> |
| FX-A32E-300CAB  | 3 m<br>(9'10")   |  |  |
| FX-A32E-500CAB  | 5 m<br>(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<br>(UL-1061 are recommended) and tool |   |   |
|--|--------------|--|---|---|
| Our model name                                       |              | Details of part<br>(made by DDK Ltd.)                          | Electric wire size                                  | Pressure bonding tool<br>(made by DDK Ltd.)   |
| FX2C-I/O-CON for flatcable                           | 10-piece set | Solderless connector<br>FRC2-A020-30S                          | AWG28 (0.1 mm <sup>2</sup> )<br>1.27 pitch, 20-core | 357J-4674D Main body<br>357J-4664N Attachment |
| FX2C-I/O-CON-S for bulk wire                         | 5-piece set  | Housing<br>HU-200S2-001<br>Solderless contact<br>HU-411S       | AWG22 (0.3 mm <sup>2</sup> )                        | 357J-5538                                     |
| FX2C-I/O-CON-SA for bulk wire                        | 5-piece set  | Housing<br>HU-200S2-001<br>Solderless contact<br>HU-411SA      | AWG20 (0.5 mm <sup>2</sup> )                        | 357J-13963                                    |

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

### 3.7.2 Input/Output terminal block (European type) [FX2NC/FX3UC extension block]

|   |               |
|---|---------------|
| <b>WIRING PRECAUTIONS</b>   | <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul> |               |

|   |                |
|---|----------------|
| <b>WIRING PRECAUTIONS</b>   | <b>CAUTION</b> |
| <ul style="list-style-type: none"> <li>• 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.             <ul style="list-style-type: none"> <li>- The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>- Tightening torque should follow the specifications in the manual.</li> <li>- Twist the end of strand wire and make sure that there are no loose wires.</li> <li>- Do not solder-plate the electric wire ends.</li> <li>- Do not connect more than the specified number of wires or electric wires of unspecified size.</li> <li>- Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.</li> </ul> </li> </ul> |                |

#### 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<br>(stranded wire/solid wire)   | Tightening torque | End treatment   |
|-------------------------------------|--|-------------------|---|
| One electric wire                   | 0.3 to 0.5 mm <sup>2</sup><br>(AWG22 to 20)  | 0.22 to 0.25N•m   | <ul style="list-style-type: none"> <li>• Remove the coating of the stranded wire, twist the core wires, and connect the wires directly.</li> <li>• Remove the coating from the solid wire, and connect the wire directly.</li> </ul>  |
| Two electric wires                  | 0.3 mm <sup>2</sup> (AWG22) ×2   |                   |   |
| Bar terminal with insulating sleeve | 0.3 to 0.5 mm <sup>2</sup><br>(AWG22 to 20)<br>(Refer to the following outline drawing of bar terminal.) |                   | <ul style="list-style-type: none"> <li>• Bar terminal with insulating sleeve (recommended product)</li> <li>Al 0.5-8WH : Phoenix Contact</li> <li>Caulking tool</li> <li>CRIMPFOX 6*<sup>1</sup> : Phoenix Contact</li> <li>(CRIMPFOX 6T-F*<sup>2</sup> : Phoenix Contact)</li> </ul> |

- \*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 exceeding the specified torque. Failure to do so may cause equipment failures or malfunctions.

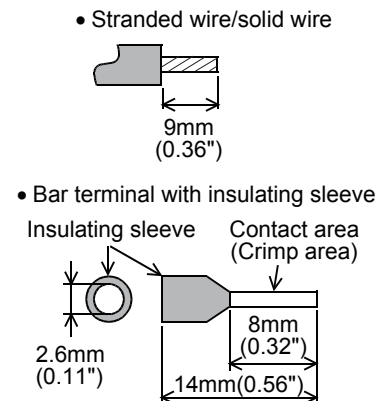
- Treatment of stranded wires and solid wires without coating
  - Twist the ends of stranded wires tightly so that loose wires will not stick out.
  - Do not solder-plate the electric wire ends.
- Treatment using bar terminal with insulating sleeve
 

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 | Al 0.5-8WH  | CRIMPFOX 6* <sup>3</sup><br>(CRIMPFOX 6T-F* <sup>4</sup> ) |

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



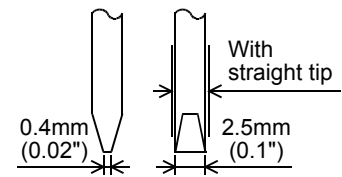
|           |  |
|-----------|--|
| <b>1</b>  | Outline                                |
| <b>2</b>  | External Dimensions                    |
| <b>3</b>  | Generic Specifications                 |
| <b>4</b>  | Power Supply Specifications            |
| <b>5</b>  | Input Specifications                   |
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| <b>7</b>  | Examples of Wiring for Various Uses    |
| <b>8</b>  | Terminal Block                         |
| <b>9</b>  | Battery                                |
| <b>10</b> | Test Run, Maintenance, Troubleshooting |

#### 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 | SZS 0.4 x 2.5 |

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

|   |               |
|---|---------------|
| <b>WIRING PRECAUTIONS</b>   | <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul> |               |

|  |                |
|--|----------------|
| <b>WIRING PRECAUTIONS</b>  | <b>CAUTION</b> |
| <ul style="list-style-type: none"> <li>• 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.             <ul style="list-style-type: none"> <li>- The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>- Tightening torque should follow the specifications in the manual.</li> </ul> </li> <li>• 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.             <ul style="list-style-type: none"> <li>- The disposal size of the cable end should follow the dimensions described in the manual.</li> <li>- Tightening torque should follow the specifications in the manual.</li> </ul> </li> </ul> |                |

#### 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-8AD, FX2N-16CCL-M signal terminal              | M3.5                                  |                   |
| FX3U extension blocks   | Refer to the manual for each product. |                   |

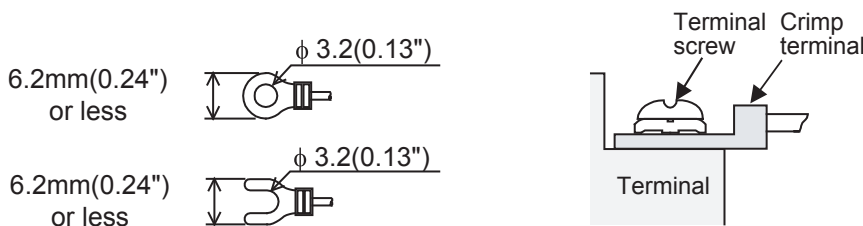
#### 2. Wire end treatment

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 exceeding the specified torque.  
Failure to do so may cause equipment failures of malfunctions.

#### In case of M3 terminal screw

- When one wire is connected to one terminal

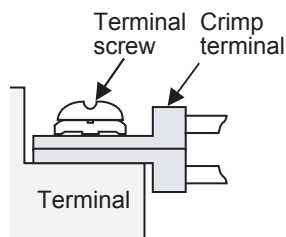
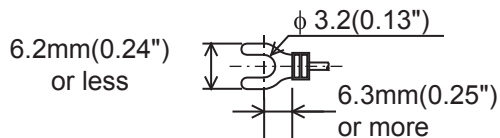
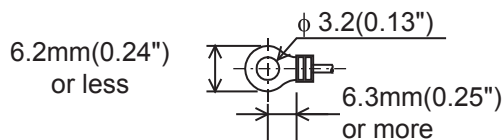


#### <Reference>

| Terminal Manufacturer                      | Type No.   | Certification | Pressure Bonding Tool |
|--|------------|---------------|-----------------------|
| JAPAN SOLDERLESS TERMINAL MFG CO LTD (JST) | FV1.25-B3A | UL Listed     | YA-1(JST)             |
|  | FV2-MS3    |               |                       |

|           |  |
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| <b>10</b> | Test Run, Maintenance, Troubleshooting |

- When two wires are connected to one terminal

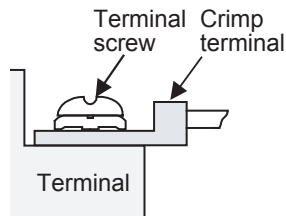
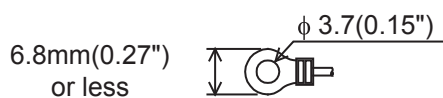


<Reference>

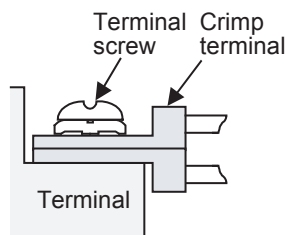
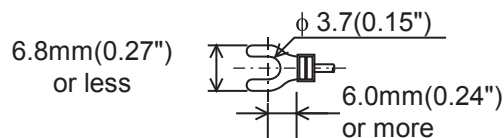
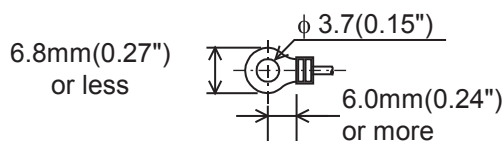
| Terminal Manufacturer                      | Type No.   | Certification | Pressure Bonding Tool |
|--|------------|---------------|-----------------------|
| JAPAN SOLDERLESS TERMINAL MFG CO LTD (JST) | FV1.25-B3A | UL Listed     | YA-1(JST)             |

In case of M3.5 terminal screw


- When one wire is connected to one terminal





- When two wires are connected to one terminal



## 4. Power Supply Specifications and External Wiring

|   |   |
|---|---|
| <b>DESIGN PRECAUTIONS</b>   |  <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>Otherwise, malfunctions may cause serious accidents.                             <ol style="list-style-type: none"> <li>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).</li> <li>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.<br/>External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.</li> <li>3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.<br/>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.</li> </ol> </li> </ul> |   |

|  |  |
|--|--|
| <b>DESIGN PRECAUTIONS</b>  |  <b>CAUTION</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>Noise may cause malfunctions.</li> <li>• Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.<br/>Failure to do so may result in wire damage/breakage or PLC failure.</li> </ul> |  |

|   |   |
|---|---|
| <b>WIRING PRECAUTIONS</b>   |  <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.<br/>Failure to do so may cause electric shock or damage to the product.</li> <li>• Make sure to attach the terminal cover, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.<br/>Failure to do so may cause electric shock.</li> </ul> |   |

|           |  |
|-----------|--|
| <b>1</b>  | Outline                                |
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| <b>8</b>  | Terminal Block                         |
| <b>9</b>  | Battery                                |
| <b>10</b> | Test Run, Maintenance, Troubleshooting |

**WIRING PRECAUTIONS**



- 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  $\Omega$  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.
- 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.



## 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*1                           | 24 V DC +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<br>(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 ±10 %"
- 2) When Group B is connected  
Please use the external power supply of "24 V DC +10 % -15 %"
- 3) When either group is not used  
The external power supply of "24 V DC +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 | Model name        | Power consumption  | Model name        | Power consumption  |
|------------------|-------------------|-------------------|--------------------|-------------------|--------------------|
| FX2NC-16EX       | 2.2W              | FX2N-8ER          | 1.2W               | FX2N-16EX         | 2.2W               |
| FX2NC-16EX-DS    | 2.2W              | FX2N-8ER-ES/UL    | 1.2W               | FX2N-16EX-ES/UL   | 2.2W               |
| FX2NC-16EX-T     | 2.2W              | FX2N-8EX          | 1.2W               | FX2N-16EX-C       | 2.2W               |
| FX2NC-16EX-T-DS  | 2.2W              | FX2N-8EX-ES/UL    | 1.2W               | FX2N-16EXL-C      | 0.3W <sup>*1</sup> |
| FX2NC-16EYT      | 0.35W             | FX2N-8EX-UA1/UL   | 0.2W <sup>*2</sup> | FX2N-16EYR        | 2.2W               |
| FX2NC-16EYT-DSS  | 0.35W             | FX2N-8EYR         | 1.2W               | FX2N-16EYR-ES/UL  | 2.2W               |
| FX2NC-16EYR-T    | 2.2W              | FX2N-8EYR-ES/UL   | 1.2W               | FX2N-16EYT        | 1.2W               |
| FX2NC-16EYR-T-DS | 2.2W              | FX2N-8EYR-S-ES/UL | 1.2W               | FX2N-16EYT-ESS/UL | 1.2W               |
| FX2NC-32EX       | 4.2W              | FX2N-8EYT         | 2.0W               | FX2N-16EYT-C      | 2.2W               |
| FX2NC-32EX-DS    | 4.2W              | FX2N-8EYT-ESS/UL  | 2.0W               | FX2N-16EYS        | 1.0W               |
| FX2NC-32EYT      | 0.7W              | FX2N-8EYT-H       | 2.1W               | FX2N-2AD          | 2.3W               |
| FX2NC-32EYT-DSS  | 0.7W              |                   |                    | FX2N-2DA          | 1.4W               |

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

\*2. AC input current is not included.

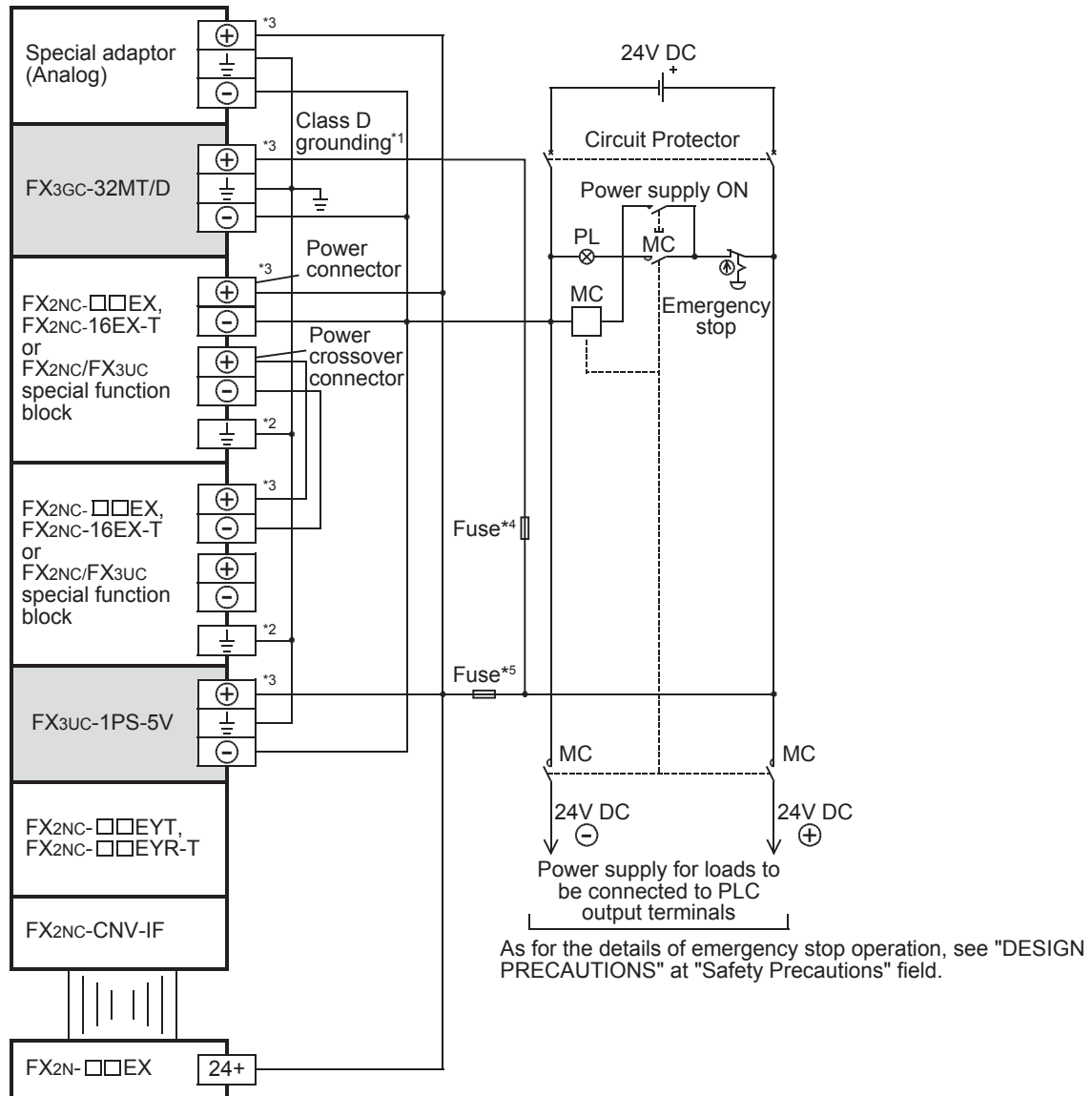
## 4.2 Example External Wiring


### 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.

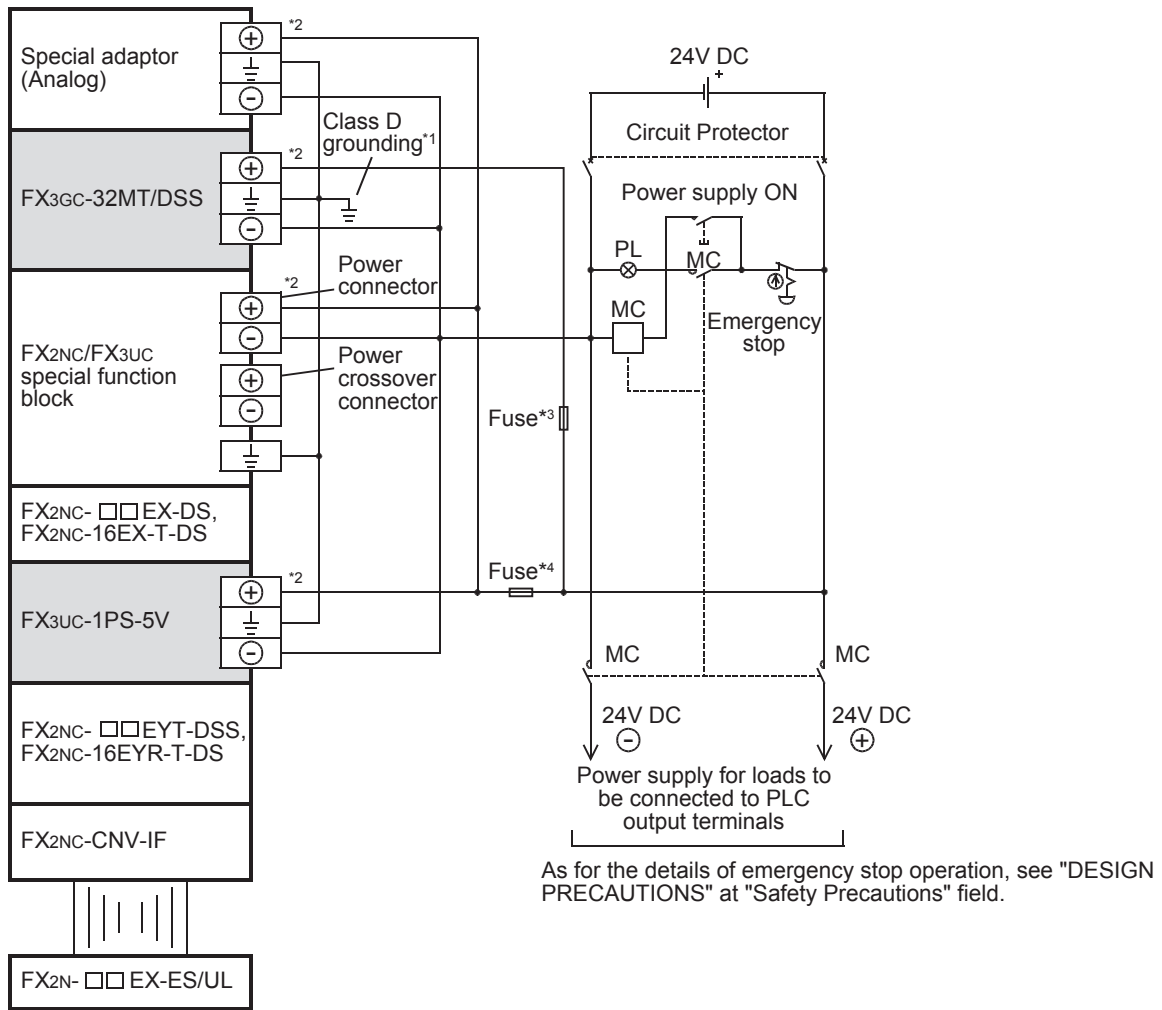
→ For wiring, refer to Section 3.6.

- 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.

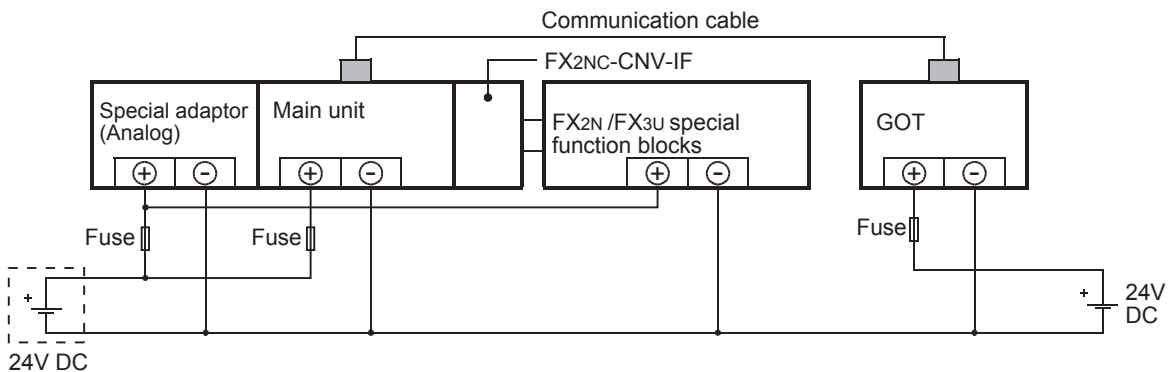
• Example of the FX3GC-32MT/DSS




- \*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

|  |   |
|--|---|
| <b>DESIGN PRECAUTIONS</b>  |  <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>                     Otherwise, malfunctions may cause serious accidents.                     <ol style="list-style-type: none"> <li>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).</li> <li>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.<br/>                             External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.</li> <li>3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.<br/>                             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.</li> </ol> </li> </ul> |   |

|   |  |
|---|--|
| <b>DESIGN PRECAUTIONS</b>   |  <b>CAUTION</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>                     Noise may cause malfunctions.</li> <li>• Install the product so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.<br/>                     Failure to do so may result in wire damage/breakage or PLC failure.</li> </ul> |  |

|   |   |
|---|---|
| <b>WIRING PRECAUTIONS</b>   |  <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.<br/>                     Failure to do so may cause electric shock or damage to the product.</li> <li>• Make sure to attach the terminal cover, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.<br/>                     Failure to do so may cause electric shock.</li> </ul> |   |

|           |  |
|-----------|--|
| <b>1</b>  | Outline                                |
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| <b>8</b>  | Terminal Block                         |
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**WIRING PRECAUTIONS**



- 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  $\Omega$  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.
- 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.

## 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.

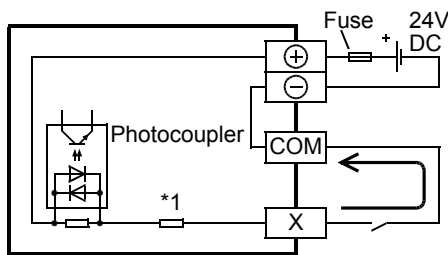
Inputs in FX2N/FX2NC Series input/output extension blocks are either sink input type only or sink/source common input type depending on the product.

### 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.

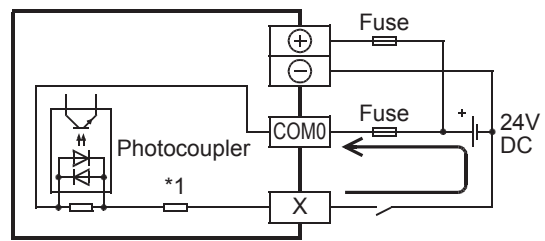
NPN open collector transistor outputs are available when transistor output type sensor outputs are connected.

- Examples of the FX3GC-32MT/D



\*1. Input impedance

- Examples of the FX3GC-32MT/DSS

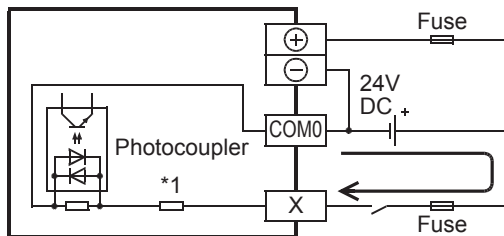


### 2. Source input [+common]

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

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<br>FX2NC-16EX(-T): 16 points<br>FX2NC-32EX: 32 points |                | FX2N-8ER: 4 points<br>FX2N-8EX: 8 points<br>FX2N-16EX(-C): 16 points |                |
| Input connecting type       | Except for the FX2NC-16EX-T: Connector<br>FX2NC-16EX-T: Terminal block        |                | Except for the FX2N-16EX-C: Terminal block<br>FX2N-16EX-C: Connector |                |
| Input form                  | Sink input  |                |  |                |
| Input signal voltage        | 24 V DC +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 |
|                             |   |                | X010 to X017   | 3.5 mA or more |
|                             | OFF   | 1.5 mA or less | 3.5 mA or more   |                |
| Input response time         | Approx. 10 ms   |                |  |                |
| Input signal 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



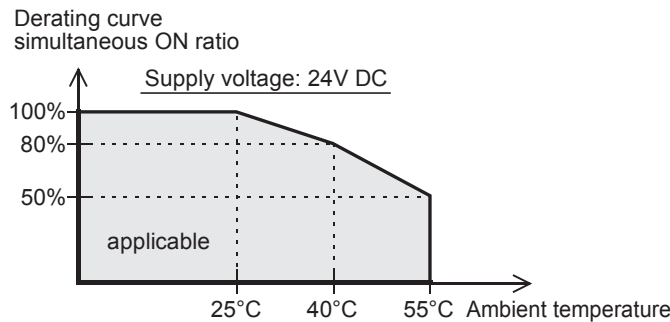
## 2. Sink/Source input

| 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<br>FX2NC-16EX(-T)-DS: 16 points<br>FX2NC-32EX-DS: 32 points  |                | FX2N-8ER-ES/UL: 4 points<br>FX2N-8EX-ES/UL: 8 points<br>FX2N-16EX-ES/UL: 16 points |                |
| Input connecting type       | Except for the FX2NC-16EX-T-DS: Connector<br>FX2NC-16EX-T-D: Terminal block  |                | Terminal block   |                |
| Input form                  | Sink/Source input  |                |  |                |
| Input signal voltage        | 24 V DC +20% -15%  |                |  |                |
| Input impedance             | Main unit  | X000 to X007   | 3.3 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   |                |
|                             |  | 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 |
|                             |  |                | 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           | Sink input: No-voltage contact input/NPN open collector transistor<br>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 | Sink input wiring  |                | Sink input wiring  |                |
|                             |  |                |  |                |
|                             | Source input wiring  |                | Source input wiring  |                |
|                             |  |                |  |                |

\*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

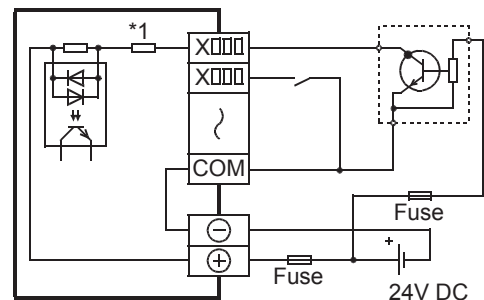
#### 1. Input terminals

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.

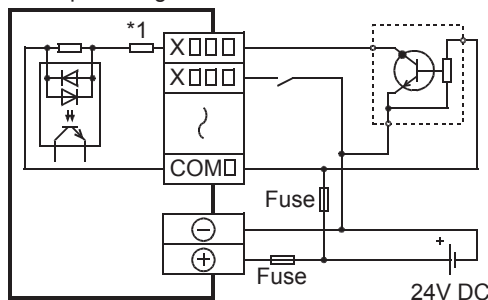
One of the input terminals X000 to X017 of the main unit can be used as a RUN input terminal by a parameter setting.

- 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.

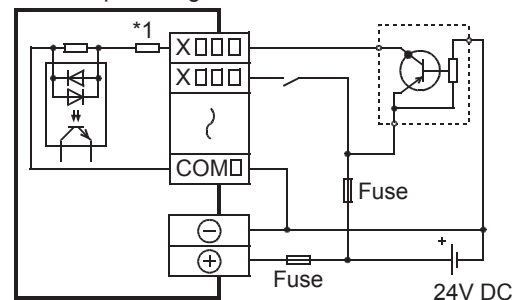


- Common to both sink and source input types  
 For sink input in the sink/source common input type, connect the 24 V DC+ terminal and COM□ terminal<sup>\*2</sup>, and electrically connect an input terminal and 24 V DC with a no-voltage contact or NPN open collector transistor to turn ON the input. For source input, connect the 24 V DC- terminal and COM□ terminal<sup>\*2</sup>, 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 $\mu$ s                             |
| X002, X005, X006, X007 | 50 $\mu$ s                             |

## 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 +20% -15% |                |
| Input signal current      | 7 mA              | 5 mA           |
| Input sensitivity current | ON                | 3.5 mA or more |
|                           | OFF               | 1.5 mA or less |

1

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Output Specifications

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Test Run, Maintenance, Troubleshooting

### 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**

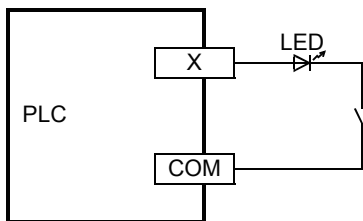
| Type             | Model name           |
|------------------|----------------------|
| Microswitch      | Models Z, V and D2RV |
| Proximity switch | Model TL             |

| Type                 | Model name |
|----------------------|------------|
| Operation switch     | Model A3P  |
| Photoelectric switch | Model E3S  |

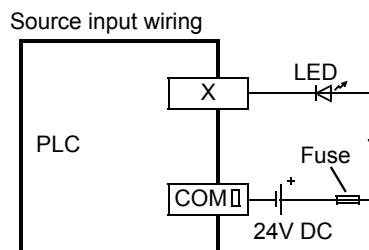
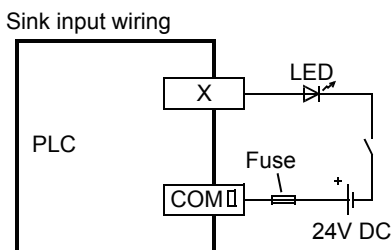
**1. In the case of input device with built-in series diode**

The voltage drop of the series diode should be approx. 4 V or less.  
 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)



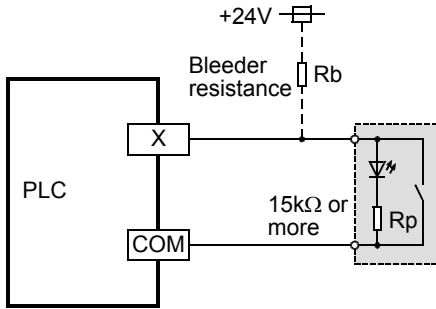
**2. In the case of input device with built-in parallel resistance**

Use a device having a parallel resistance,  $R_p$ , of 15 k $\Omega$  or more.

If the resistance is less than 15 k $\Omega$ , connect a bleeder resistance,  $R_b$ (k $\Omega$ ), obtained by the following formula as shown in the following figure.

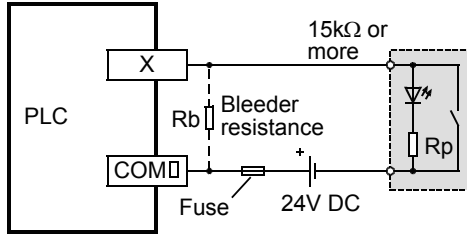
$$R_b(k\Omega) \leq \frac{4R_p}{15-R_p}$$

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

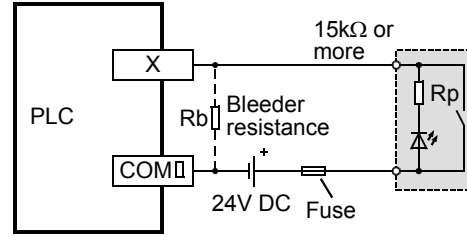


- Examples of wiring (Common to both sink and source input types)

Sink input wiring



Source input wiring



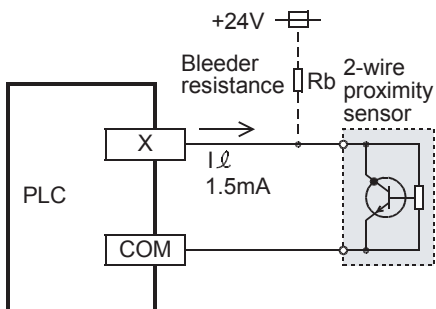
**3. In the case of 2-wire proximity switch**

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

When the current is 1.5 mA or more, connect a bleeder resistance,  $R_b$ (k $\Omega$ ), determined by the following formula as shown in the following figure.

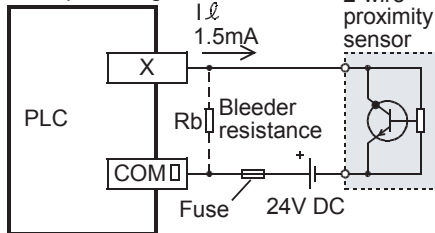
$$R_b(k\Omega) \leq \frac{6}{I_l - 1.5}$$

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

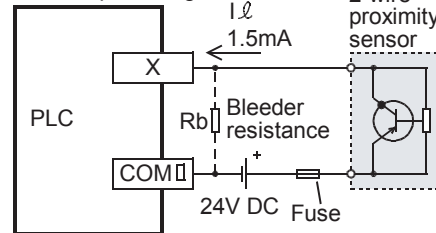


- Examples of wiring (Common to both sink and source input types)

Sink input wiring



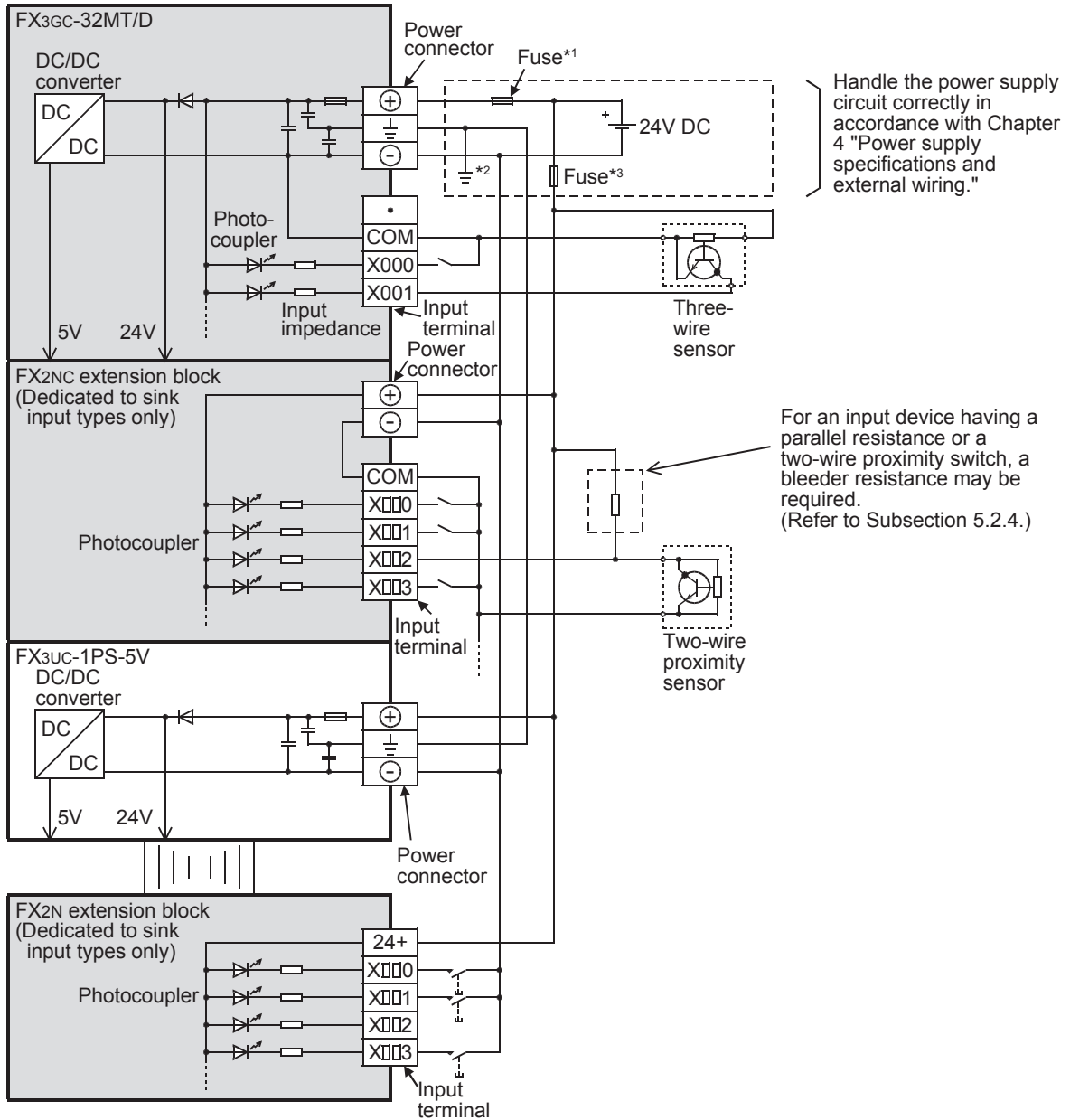
Source input wiring



|    |  |
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| 10 | Test Run, Maintenance, Troubleshooting |

### 5.2.5 Examples of external wiring

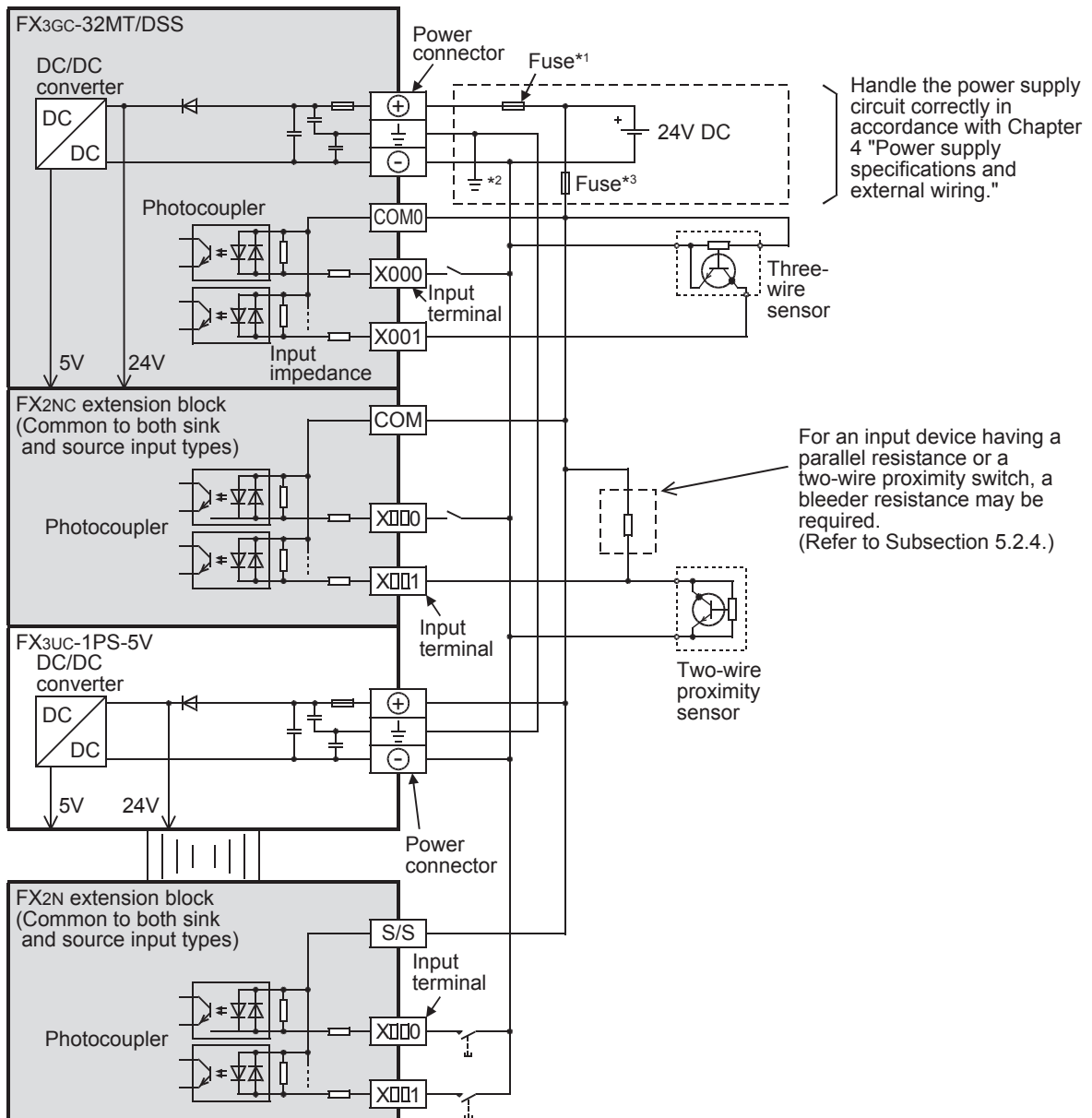
#### 1. Examples of wiring (Dedicated to sink input types only)



- \*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.

|   |                |
|---|----------------|
| <b>WIRING PRECAUTIONS</b>   | <b>CAUTION</b> |
| <ul style="list-style-type: none"> <li>• Do not wire vacant terminals externally. Doing so may damage the product.</li> </ul> |                |

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**



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

1 Outline

2 External Dimensions

3 Generic Specifications

4 Power Supply Specifications

5 Input Specifications

6 Output Specifications

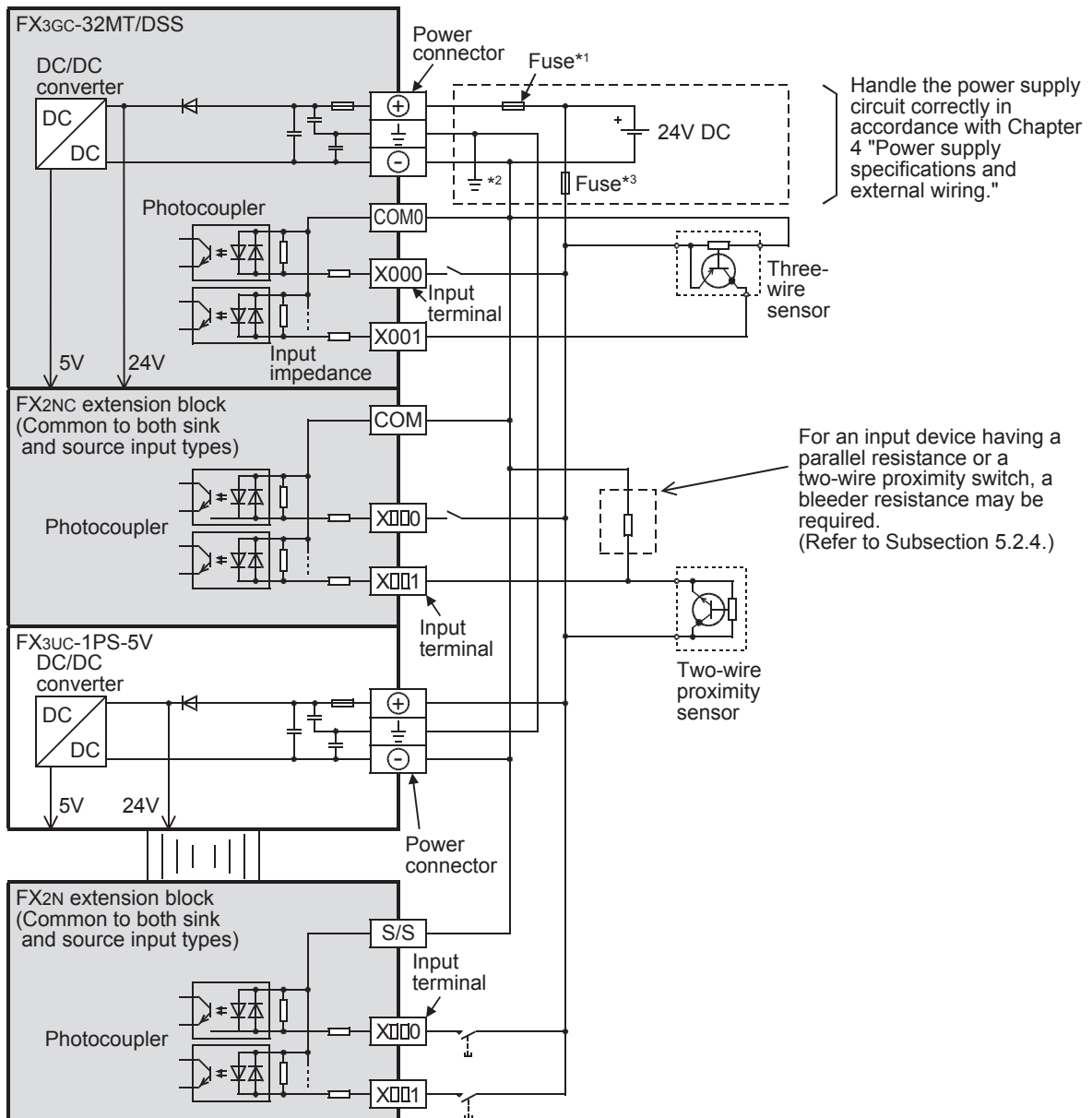
7 Examples of Wiring for Various Uses

8 Terminal Block

9 Battery

10 Test Run, Maintenance, Troubleshooting

**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**



- 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 $\pm$ 5%   |
| Input impedance           |   | 2.2 k $\Omega$  |
| 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 $\rightarrow$ ON (High $\rightarrow$ Low) | 1 ms +1 ms, -0.5 ms                                     |
|                           | ON $\rightarrow$ OFF (Low $\rightarrow$ 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.

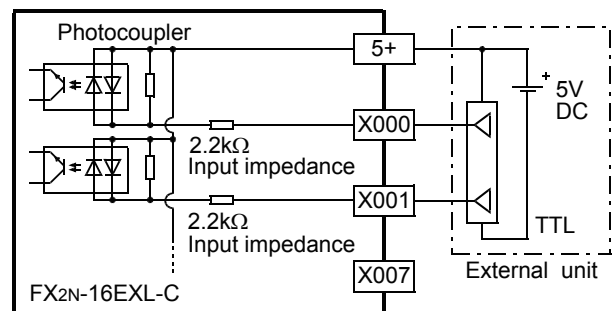
#### 2. Input circuit

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  $\rightarrow$  OFF" or "OFF  $\rightarrow$  ON").

#### 3. Input sensitivity

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

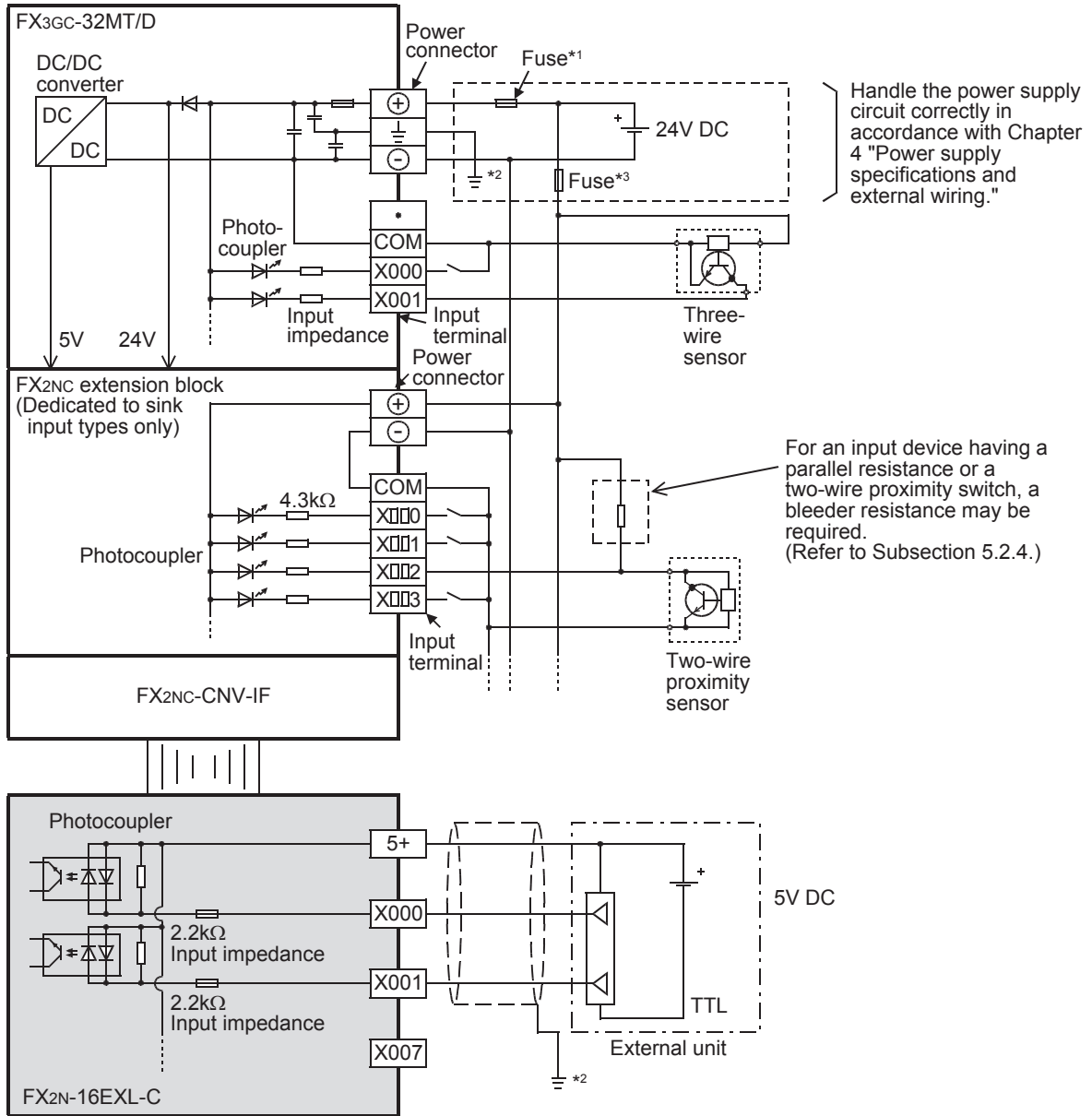
| Item                      |            | Specifications   |
|---------------------------|------------|------------------|
| Input signal voltage      |            | 5 V DC $\pm$ 5%  |
| Input signal current      |            | Max.40 mA 5 V DC |
| Input sensitivity current | ON (Low)   | 1 mA or more     |
|                           | 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 |



|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 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



- 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<br>Approx. 18 kΩ/60 Hz              |                        |
| Input signal current     | 6.2 mA/110 V 60 Hz<br>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      | Approx. 25 to 30 ms                                     |                        |
| 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

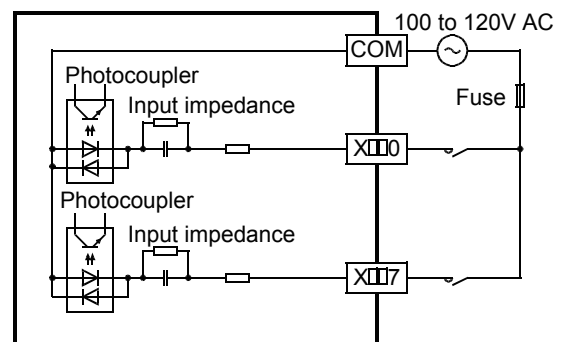
The primary input circuit and the secondary input circuit are insulated with a photocopier.

Response delay of approximately 25 ms to 30 ms 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.

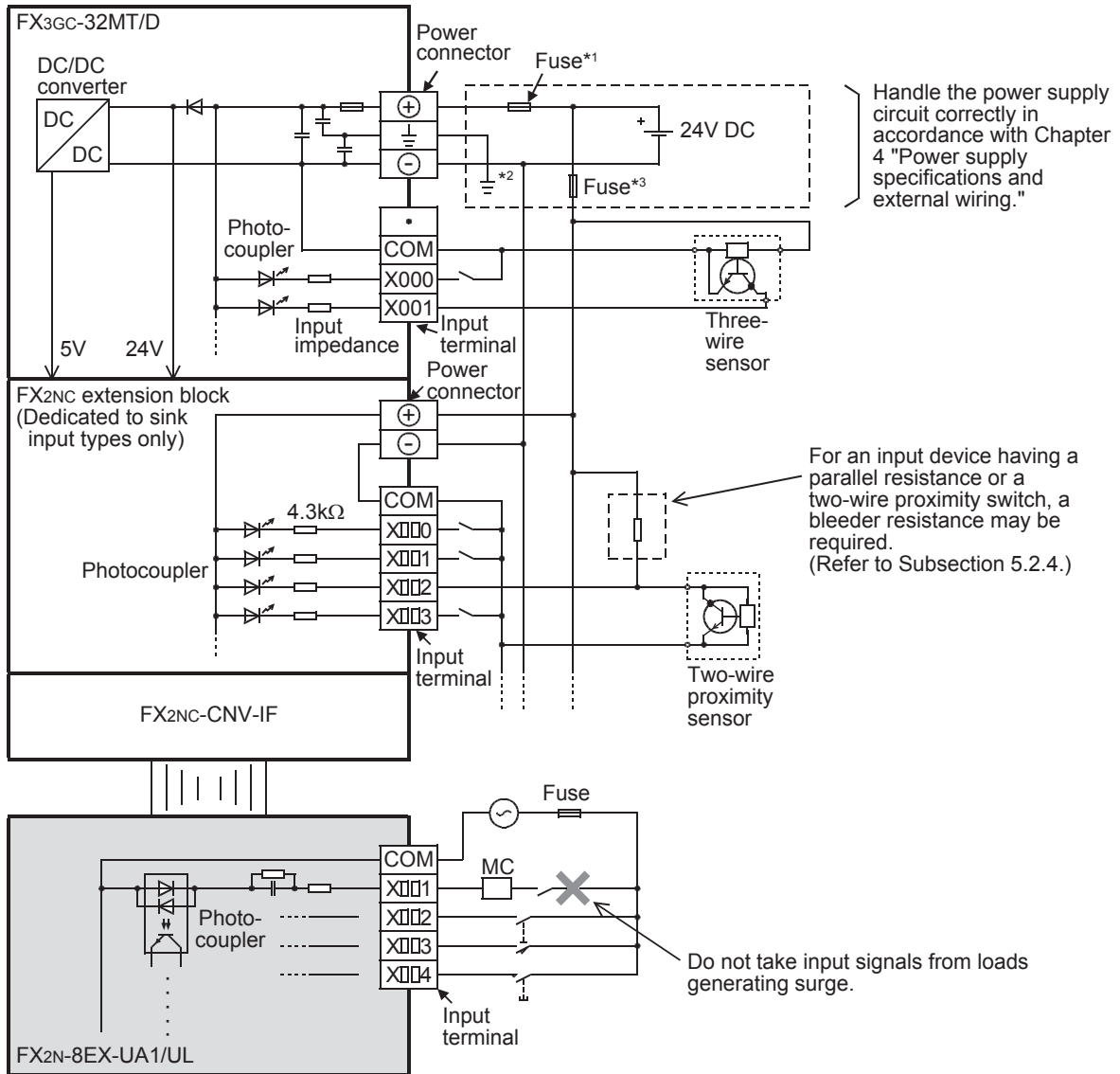
| Item                 | Specifications                           |                |
|----------------------|--|----------------|
| Input signal voltage | 100 to 110 V AC +10% -15% 50/60 Hz       |                |
| Input signal current | 6.2 mA/110 V 60 Hz<br>4.7 mA/100 V 50 Hz |                |
|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



|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
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| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 5.4.3 Example of external wiring

Do not bind or lay wires near the AC input wiring and/or 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



- 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 | UP/DOWN  | Down-count or up-count is specified by turning on or off M8235 to M8245.<br>ON: Down-counting<br>OFF: Up-counting  |
| 1-phase 2-count input | UP<br>DOWN   | Up-count or down-count<br>The counting direction can be checked with M8246 to M8250.<br>ON: Down-counting<br>OFF: Up-counting  |
| 2-phase 2-count input | Phase A<br>Phase B<br>Up-counting<br>Down-counting | Automatic up-count or down-count according to change in input status of phase A/B<br>The counting direction can be checked with M8251 to M8255.<br>ON: Down-counting<br>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<br>bi-directional counter | None                          | None                          |
|                       | C236                 |                            |                                  |                               |                               |
|                       | C237                 | 10                         |                                  |                               |                               |
|                       | C238                 | 60                         |                                  |                               |                               |
|                       | C239                 |                            |                                  |                               |                               |
|                       | C240                 | 10                         |                                  |                               |                               |
|                       | C241                 | 60                         |                                  |                               |                               |
|                       | C242                 | 10                         |                                  | Provided                      | None                          |
|                       | C243                 |                            |                                  |                               |                               |
|                       | C244                 |                            |                                  |                               |                               |
| C245                  | Provided             |                            | Provided                         |                               |                               |
| 1-phase 2-count input | C246<br>C248(OP)     | 60                         | 32-bit<br>bi-directional counter | None                          | None                          |
|                       | C247<br>C248         | 10                         |                                  | Provided                      | None                          |
|                       | C249<br>C250         |                            |                                  | Provided                      | Provided                      |
|                       |                      |                            |                                  |                               |                               |
| 2-phase 2-count input | C251<br>C253(OP)     | 30                         | 32-bit<br>bi-directional counter | None                          | None                          |
|                       | C254(OP)             | 5                          |                                  | Provided                      | None                          |
|                       | C252<br>C253         |                            |                                  | Provided                      | Provided                      |
|                       | C254<br>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  $\mu$ s, X002, X005, X006 and X007: 50  $\mu$ s).

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    |      |
| 1-phase 2-count input | C245        |                  |      | U/D  | R    |      |      |      | S    |
|                       | C246        | U                | D    |      |      |      |      |      |      |
|                       | C247        | U                | D    | R    |      |      |      |      |      |
|                       | C248        |                  |      |      | U    | D    | R    |      |      |
|                       | C248(OP)*1  |                  |      |      | U    | D    |      |      |      |
|                       | C249        | U                | D    | R    |      |      |      | S    |      |
| 2-phase 2-count input | C250        |                  |      |      | U    | D    | R    |      | S    |
|                       | 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.

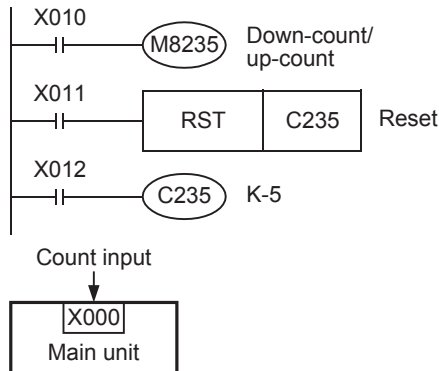
For example, when C251 is used, X000 and X001 are occupied. Therefore, it is impossible to use C235, C236, C241, C244, C246, C247, C249, C252 and C254, input interruption pointers I000 and I101, pulse catch contacts M8170 and M8171 and SPD, ZRN and DSZR instructions at the same time.

### 5.5.3 Handling of High-speed Counters

#### 1. 1-phase 1-count input

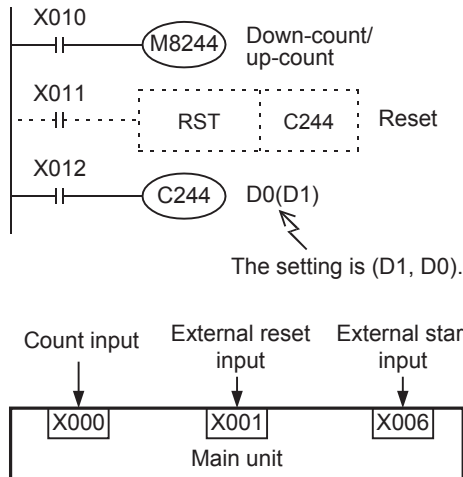
##### Examples of program

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.

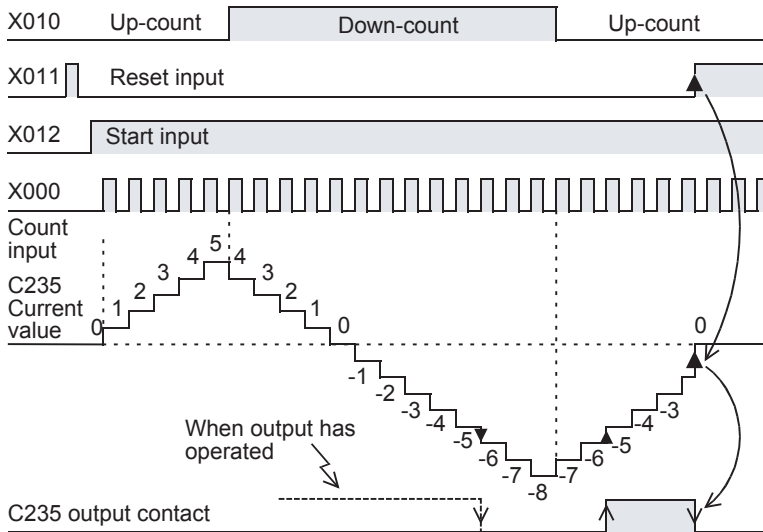
2) For C244



- 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.

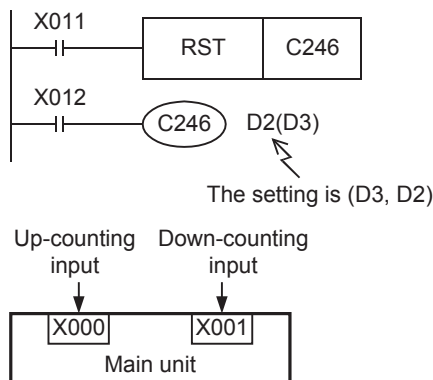
## 2. 1-phase 2-count input

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

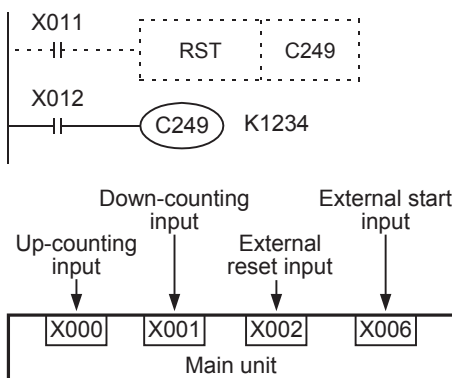
1) For C246



- 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.

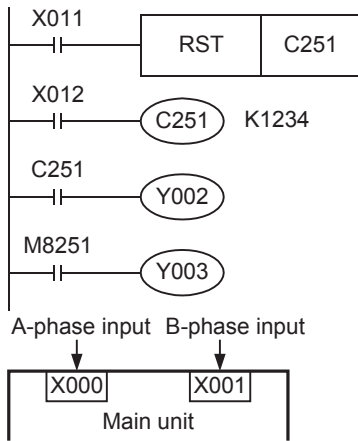
ON : Down-counting  
OFF: Up-counting

### 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.

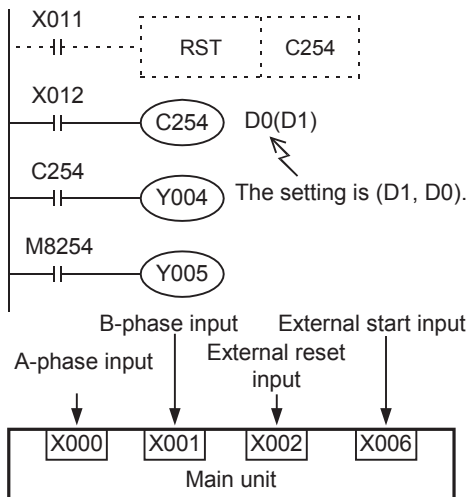
#### Examples of program

1) For C251



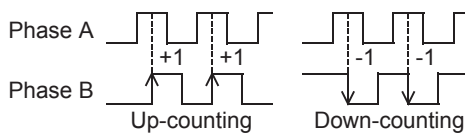
- While X012 is on, C251 counts the operation of the input terminals X000 (A-phase) and X001 (B-phase) through interruption.
- While X011 is turned on, the counter is reset when RST instruction is executed.
- When the current value exceeds the setting, Y002 turns on, and when the current value becomes 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<br>1-count<br>input | C235, C236, C238,<br>C239, C241       | 60 kHz             | 200 kHz<br>- (Number of positioned axes*1<br>+ Number of pulse width/cycle<br>measurement inputs) x 40 kHz | 60 kHz<br>- (Number of positioned axes*1<br>x 5 kHz) - (Number of pulse width/cycle<br>measurement inputs x 20 kHz) |
|                             | C237, C240, C242,<br>C243, C244, C245 | 10 kHz             |  |   |
| 1-phase<br>2-count<br>input | C246, C248(OP)                        | 60 kHz             |  |   |
|                             | C247, C248, C249,<br>C250             | 10 kHz             |  |   |
| 2-phase<br>2-count<br>input | C251, C253(OP)                        | 30 kHz             |  |   |
|                             | C252, C253, C254,<br>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  $\geq$  [(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 $\leq$ 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 $\leq$ 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             | Up-counting | Down-counting |
|                       | 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 |

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### 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)    | <p>The diagram shows a ladder logic circuit. The top rail is connected to M8388. A normally open contact is connected to M8392. A normally closed contact is connected to C248. The output is K0000.</p> | <ul style="list-style-type: none"> <li>Reset input is not given.</li> </ul>  |
| C253(OP)    | <p>The diagram shows a ladder logic circuit. The top rail is connected to M8388. A normally open contact is connected to M8392. A normally closed contact is connected to C253. The output is K0000.</p> | <ul style="list-style-type: none"> <li>Reset input is not given.</li> </ul>  |
| C254(OP)    | <p>The diagram shows a ladder logic circuit. The top rail is connected to M8388. A normally open contact is connected to M8395. A normally closed contact is connected to C254. The output is K0000.</p> | <ul style="list-style-type: none"> <li>The input count (2-phase 2-count) changes as follows<br/>Phase A : Changes from X000 to X006.<br/>Phase B : Changes from X001 to X007.</li> <li>Reset input is not given.</li> <li>Start input is not given.</li> </ul> |

### 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.  
For example, when C251 is used, X000 and X001 are occupied. As a result, "C235, C236, C241, C244, C246, C247, C249, C252, C254", "input interrupt pointers I00\* and I10\*", "pulse catch contacts M8170 and M8171", "SPD instruction using X000 and/or X001" and "pulse width/pulse period measurement contacts M8076 and M8077" cannot be used.
- 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.

#### Example:

When the input interrupt pointer "I001" is used, X000 is occupied. Therefore, it is impossible to use C235, C241, C244, C246, C247, C249, C252 and C254, input interruption pointer I000, pulse catch contact M8170 and SPD, ZRN and DSZR instructions at the same time.

#### 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.

**Example:**

When the C235, C241, C244, C246, C247, C249, C252 and C254 is used, X000 is occupied. Therefore, it is impossible to use pulse catch input contact M8170.

#### 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  $\mu$ s.

→ 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/<br>Pulse period<br>measurement flag | Pulse period<br>measurement<br>mode | Ring counter value for<br>rising edge <sup>*1</sup><br>[in units of 1/6 $\mu$ s] | Ring counter value for<br>falling edge <sup>*1</sup><br>[in units of 1/6 $\mu$ s] | Pulse width/<br>Pulse period <sup>*1*2</sup><br>(in units of 10 $\mu$ s) |
|--------------|--|-------------------------------------|--|---|--|
| 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  $\mu$ s and a maximum of 100s.  
The pulse period which can be measured is a minimum of 20  $\mu$ 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.

#### Example:

When the pulse width/period measurement flag M8076 is used, X000 is occupied. Therefore, it is impossible to use C235, C241, C244, C246, C247, C249, C252 and C254, pulse catch contact M8170, SPD, ZRN and DSZR instructions at the same time.

#### 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



- 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



- 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.

### WIRING PRECAUTIONS



- 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**



- 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.
- 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.

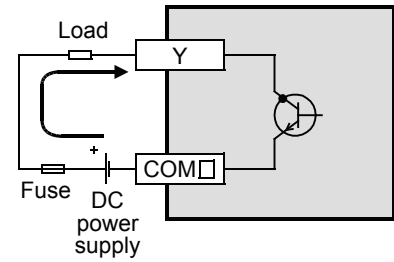
## 6.1 Transistor Output

### 6.1.1 Sink and Source Output (Transistor)

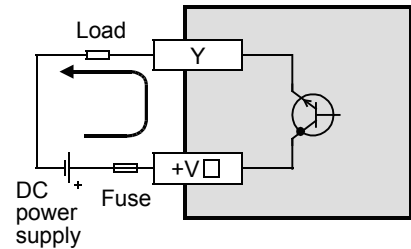
Transistor outputs in the main unit and FX2N/FX2NC Series I/O extension blocks are classified into sink output type or source output type.

#### 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<br>FX2NC-16EYT, FX2NC-32EYT<br>FX2N-16EYT-C | Connector                               |                          |                          |   |   |
|                              | FX2N-8EYT(-H), FX2N-16EYT                                | Terminal block                          |                          |                          |   |   |
| Output type/form             |  | Transistor/Sink output                  |                          |                          |   |   |
| External power supply        |  | 5 to 30 V DC                            |                          |                          |   |   |
| Max. load                    | Resistance load  | Main unit                               | Y000, Y001               | 0.3 A/1 points           | Make sure that the total load current of 8 resistance load points is 0.8 A* <sup>1</sup> or less. |   |
|                              |  |   | Y002 to Y017             | 0.1 A/1 points           |   |   |
|                              |  | FX2NC-16EYT<br>FX2NC-32EYT              | 0.1 A/1 points           |                          |   | 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 points           |                          |   | Make sure that the total load current of 16 resistance load points is 1.6 A or less.  |
|                              |  | FX2N-8EYT<br>FX2N-16EYT                 | 0.5 A/1 points           |                          |   | The total load current of resistance loads per common terminal should be the following value.<br>4points/common: 0.8 A<br>8points/common: 1.6 A |
|                              |  | FX2N-8EYT-H                             | 1 A/1 points             |                          |   | 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 points (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 points (24 V DC) |   |   |
|                              |  | FX2NC-16EYT, FX2NC-32EYT                | 2.4 W/1 points (24 V DC) |                          |   |   |
|                              |  | FX2N-16EYT-C                            | 7.2 W/1 points (24 V DC) |                          |   |   |
|                              |  | FX2N-8EYT, FX2N-16EYT                   | 12 W/1 points (24 V DC)  |                          |   |   |
|                              |  | FX2N-8EYT-H                             | 24 W/1 points (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 to 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 to 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.

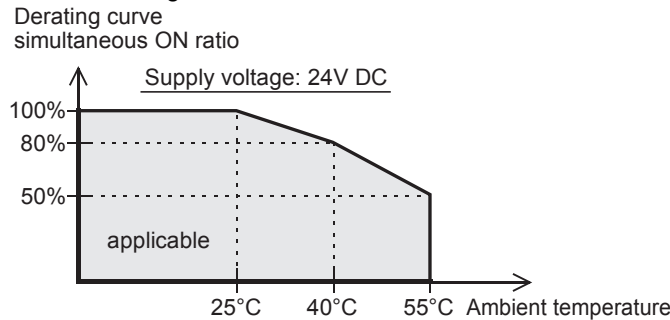
| Item                         |  | Transistor output (source) specifications        |                       |   |  |   |
|------------------------------|--|--|-----------------------|---|--|---|
| Number of output points      | FX3GC-32MT/DSS                                     |  | 16 points             |   |  |   |
|                              | FX2N-8EYT-ESS/UL                                   |  | 8 points              |   |  |   |
|                              | FX2N-16EYT-ESS/UL<br>FX2NC-16EYT-DSS               |  | 16 points             |   |  |   |
|                              | FX2NC-32EYT-DSS                                    |  | 32 points             |   |  |   |
| Connecting type              | FX3GC-32MT/DSS<br>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 to 30 V DC                                     |                       |   |  |   |
| Max. load                    | Resistance load                                    | Main unit  | Y000, Y001            | 0.3 A/1 points                            | Make sure that the total load current of 8 resistance load points is 0.8A* <sup>1</sup> or less. |   |
|                              |  |  | Y002 to Y017          | 0.1 A/1 points                            |  |   |
|                              |  | FX2NC-16EYT-DSS<br>FX2NC-32EYT-DSS               |                       | 0.1 A/1 points                            |  | Make sure that the total load current of 8 resistance load points is 0.8A or less.  |
|                              |  | FX2N-8EYT-ESS/UL<br>FX2N-16EYT-ESS/UL            |                       | 0.5 A/1 points                            |  | The total load current of resistance loads per common terminal should be the following value.<br>4points/common: 0.8 A<br>8points/common: 1.6 A |
|                              | Inductive load                                     | Main unit  | Y000, Y001            | 7.2 W/1 points (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 points (24 V DC)                  |  |   |
|                              |  | FX2NC-16EYT-DSS, FX2NC-32EYT-DSS                 |                       | 2.4 W/1 points (24 V DC)                  |  |   |
|                              |  | FX2N-8EYT-ESS/UL, FX2N-16EYT-ESS/UL              |                       | 12 W/1 points (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 to 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 to 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.

|    |  |
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### 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.



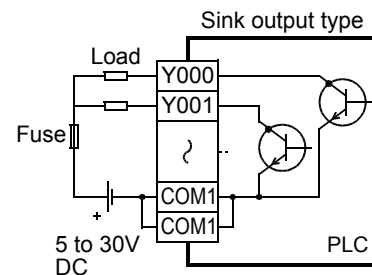
### 6.1.5 Handling of transistor output

#### 1. Output terminals

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

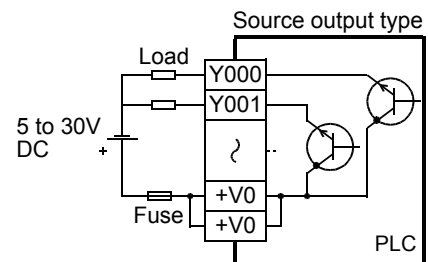
##### Sink output

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 to 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.



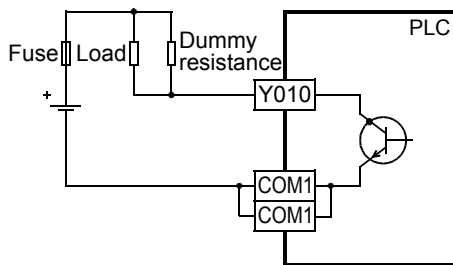
### 5. Response time

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.

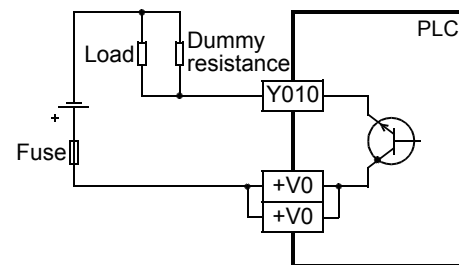
| Classification   |                  | Response time  | Load current                  |   |
|------------------|------------------|----------------|-------------------------------|---|
| Main units       | Y000, Y001       | 5 μs or less   | 5 to 24 V DC<br>10 mA or more | When using an instruction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

\*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 points <sup>*1</sup> | Make sure that the total load current of 8 resistance load points is 0.8 A <sup>*2</sup> or less so that temperature rise is restrained.        |
|                  | Y002 to Y017                              | 0.1 A/1 points               |   |
| Extension blocks | FX2NC-16EYT(-DSS)<br>FX2NC-32EYT(-DSS)    | 0.1 A/1 points               | 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 points               | Make sure that the total load current of 16 resistance load points is 1.6 A or less.  |
|                  | FX2N-8EYT(-ESS/UL)<br>FX2N-16EYT(-ESS/UL) | 0.5 A/1 points               | The total load current of resistance loads per common terminal should be the following value.<br>4points/common: 0.8 A<br>8points/common: 1.6 A |
|                  | FX2N-8EYT-H                               | 1 A/1 points                 | 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 to 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

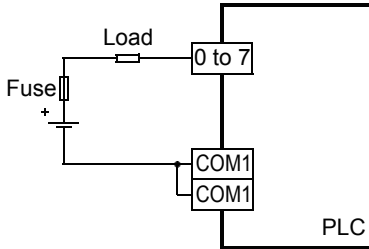
0.1 mA or less

### 6.1.6 External wiring precautions

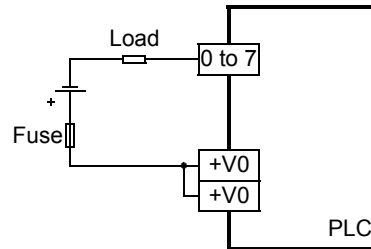
#### 1. Protection circuit for load short-circuits

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

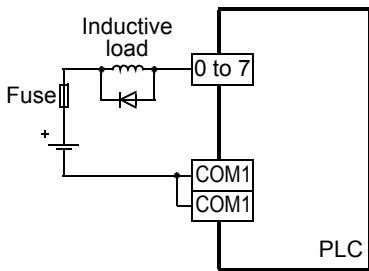


#### 2. Contact protection circuit for inductive loads

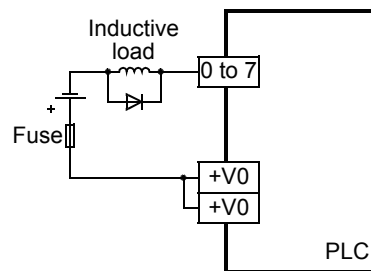
When an inductive load is connected, connect a diode (for commutation) in parallel with the load as necessary. The diode (for commutation) must comply with the following specifications.

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

• External Wiring of Sink Output Type



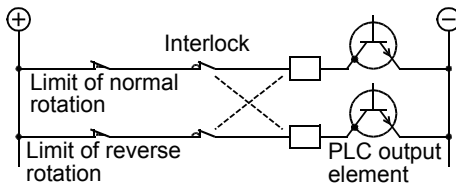
• External Wiring of Source Output Type



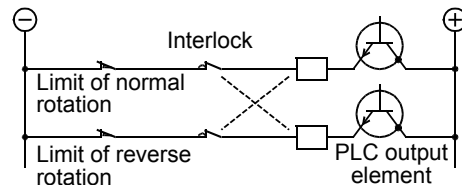
#### 3. Interlock

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

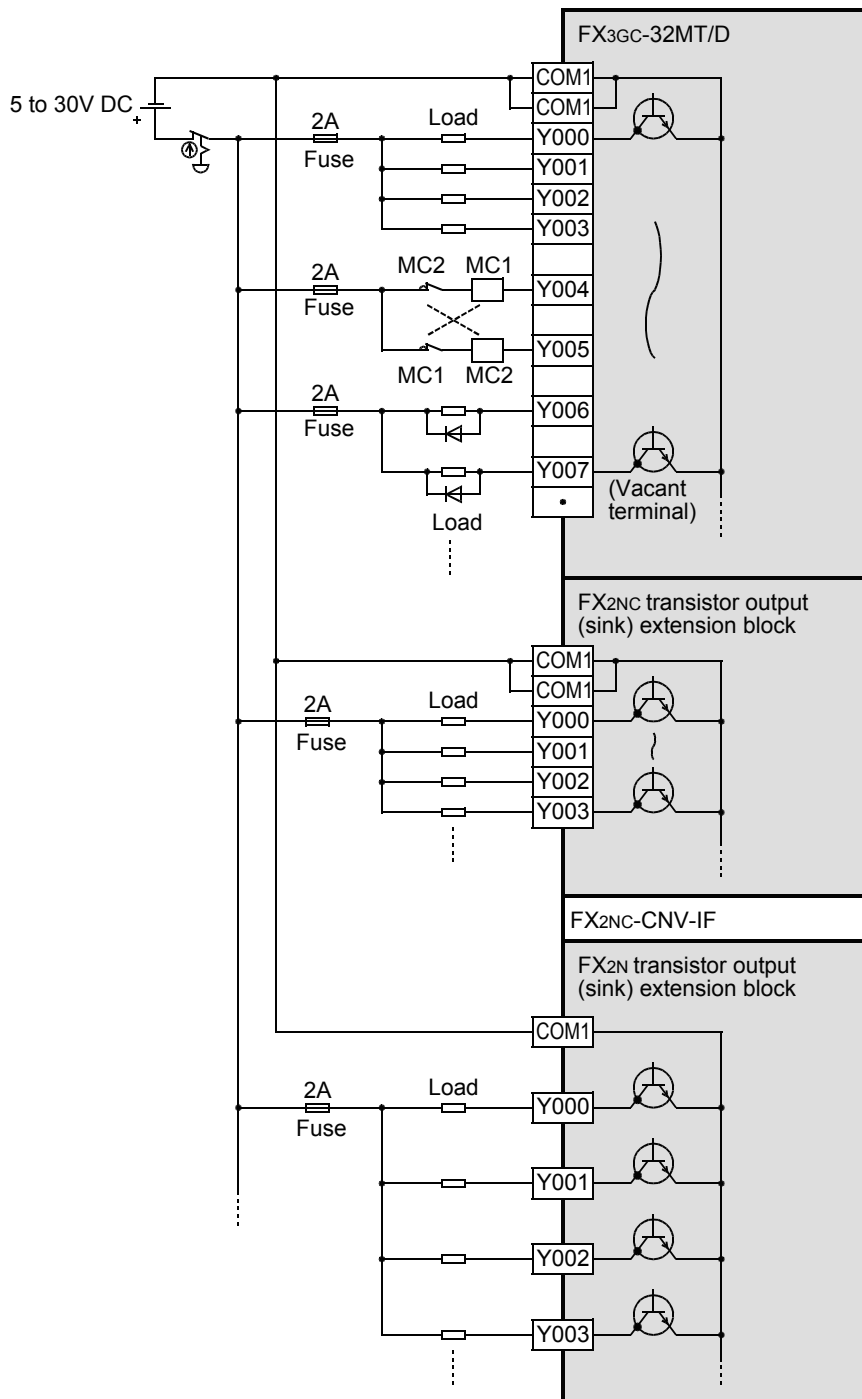


• External Wiring of Source Output Type



### 6.1.7 Example of external wiring

#### 1. Transistor output (Sink)



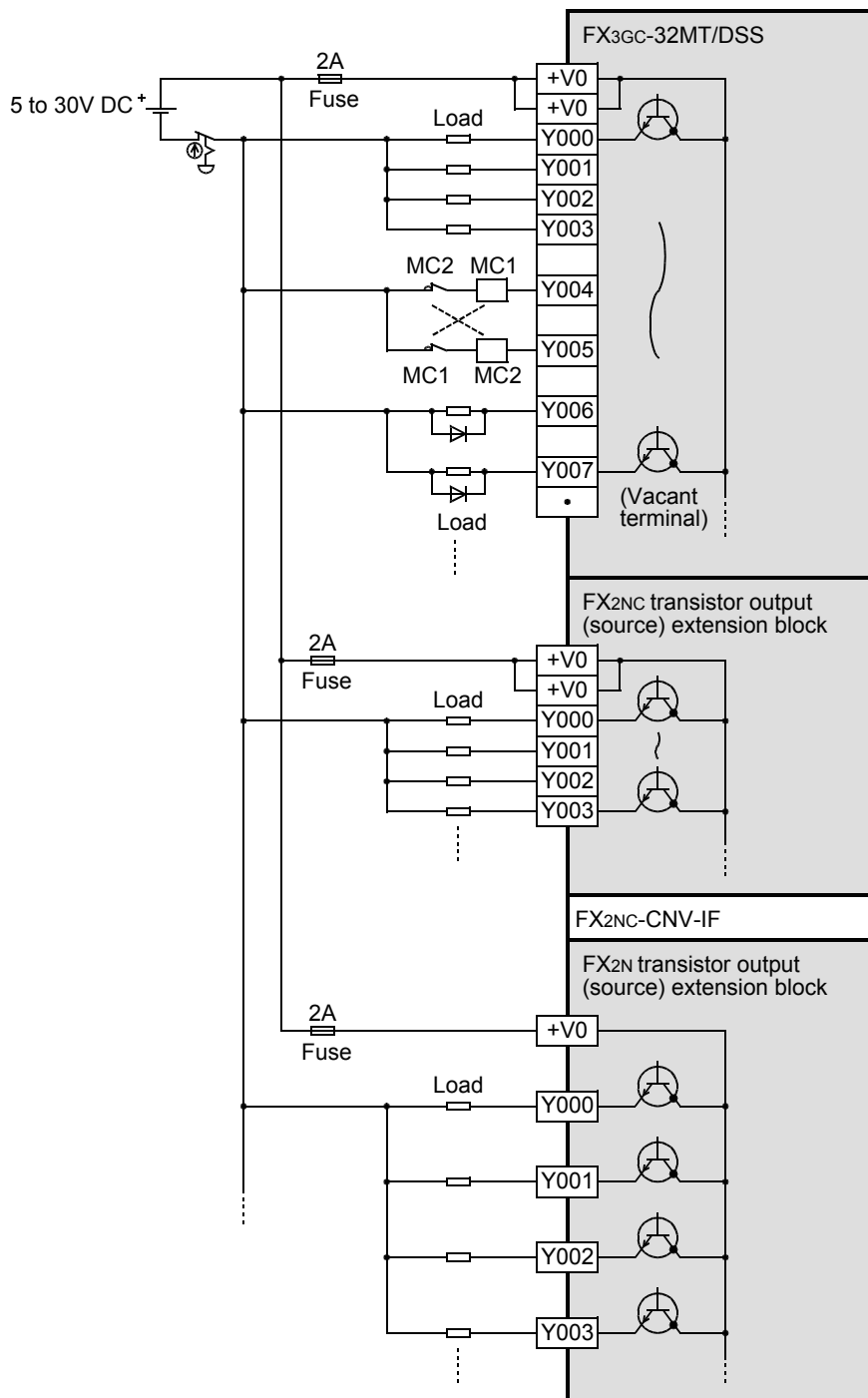
#### WIRING PRECAUTIONS



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

|    |  |
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2. Transistor output (Source)



**WIRING PRECAUTIONS**



- 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)<br>FX2N-8EYR-S-ES/UL   | 8 points   |  |
|                              | FX2N-16EYR(-ES/UL)   | 16 points  |  |
| Connecting type              | FX2NC-16EYR-T(-DS)<br>FX2N-8ER(-ES/UL)<br>FX2N-8EYR(-ES/UL)<br>FX2N-8EYR-S-ES/UL<br>FX2N-16EYR(-ES/UL) | Terminal block   |  |
| Output type                  |  | Relay output   |  |
| External power supply        |  | 30 V DC or less or 240 V AC or less<br>(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<br>When using one COM□ terminal, make sure that the total load current of 8 resistance load points is 4 A or less.<br>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)<br>FX2N-8EYR(-ES/UL)<br>FX2N-8EYR-S-ES/UL<br>FX2N-16EYR(-ES/UL)                                     | 2 A/1 point<br>The total resistance load current per common should be as follows:<br>4 output points/common: 8A or less<br>8 output points/common: 8A or less  |
|                              | Inductive load   | FX2NC-16EYR-T(-DS)<br>FX2N-8ER(-ES/UL)<br>FX2N-8EYR(-ES/UL)<br>FX2N-8EYR-S-ES/UL<br>FX2N-16EYR(-ES/UL)               | 80 VA<br>For the product life, refer to Subsection 6.2.2.<br>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

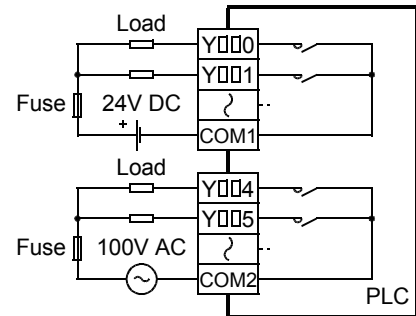
Capacitive loads can generate rush current 20 to 40 times the stationary current. Make sure that the rush current does not exceed the current corresponding to the maximum specified resistance load. Capacitive loads such as capacitors may be present in electronic circuit loads including inverters.

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

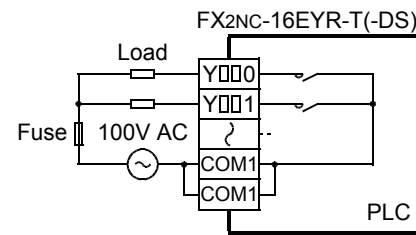
### 6.2.3 Handling of relay output

#### 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          |

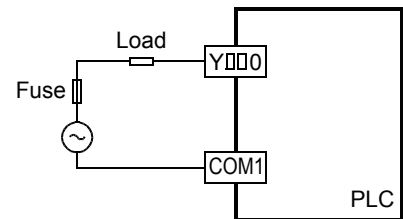
#### 7. Open circuit leakage current

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

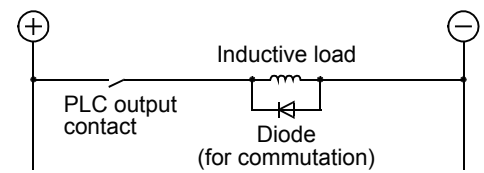
An internal protection circuit for the relays is not provided for the relay output circuit. It is recommended to use inductive loads with built-in protection circuits. When using loads without built-in protection circuits, insert an external contact protection circuit, etc. to reduce noise and extend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

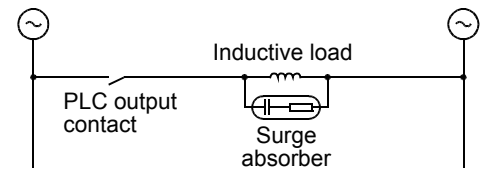


##### 2) AC circuit

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 $\mu$ F         |
| Resistance value       | Approx. 100 to 200 $\Omega$ |



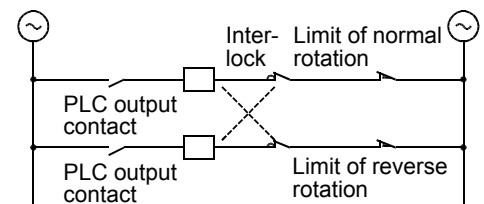
#### Reference

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

| Manufacturer        | Model name           |
|---------------------|----------------------|
| Rubycon Corporation | 250MCRA104100M B0325 |

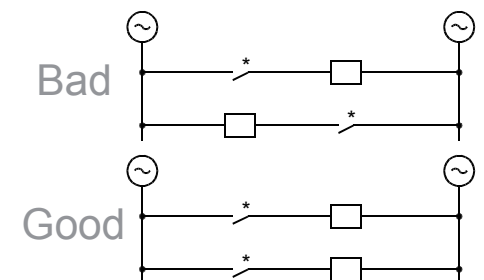
#### 3. Interlock

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.



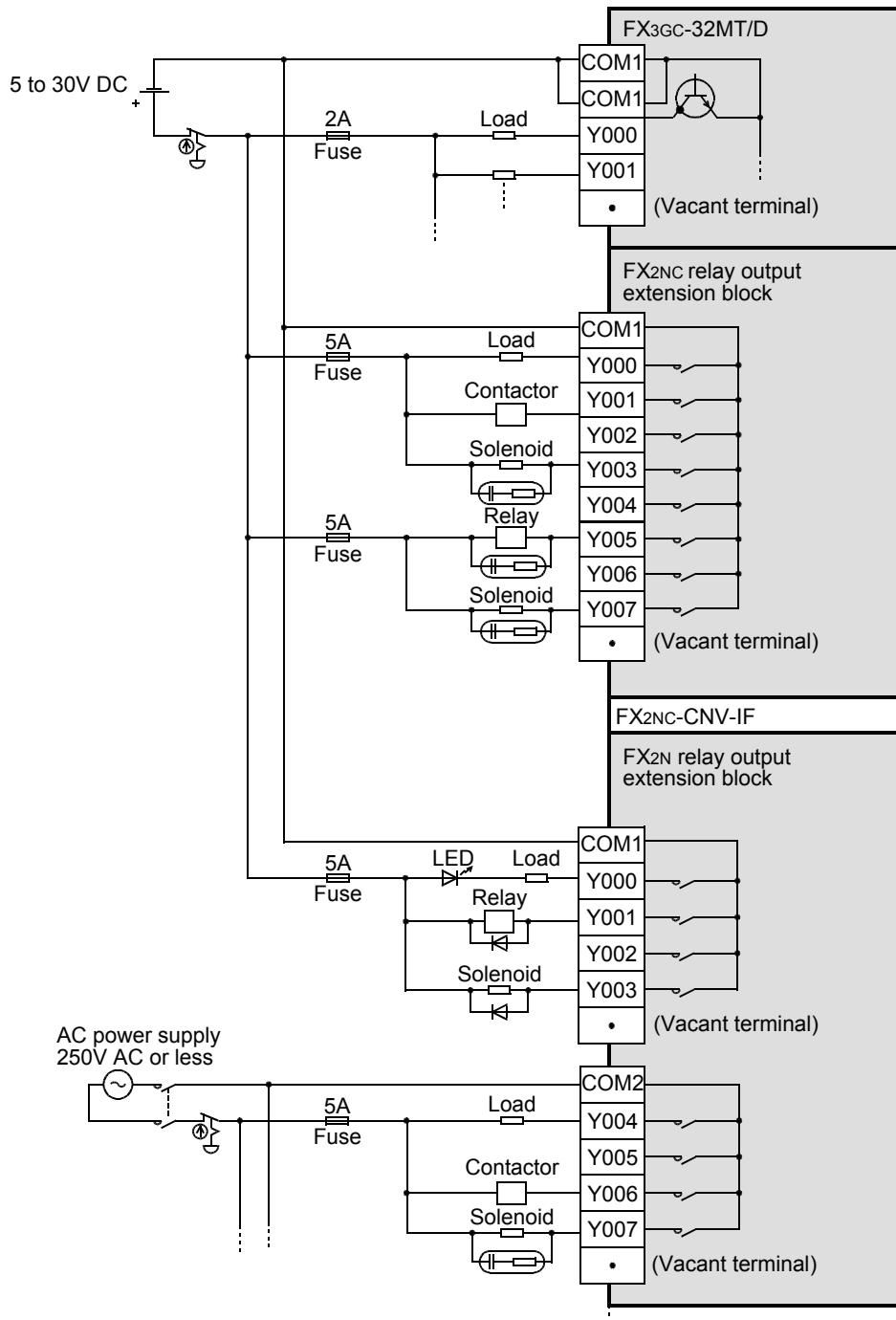
#### 4. In-phase

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





### 6.2.5 Example of external wiring



#### WIRING PRECAUTIONS



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

|    |  |
|----|--|
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| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

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

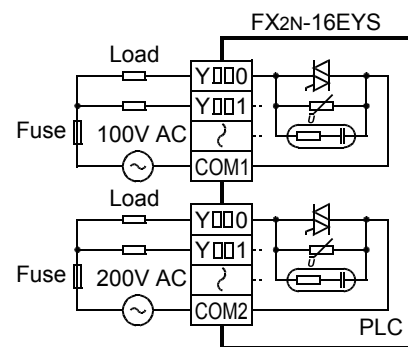
### 6.3.1 Specifications

| 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:<br>8 output points/common: 0.8 A or less |
|                              | Inductive load  | 15 VA/100 V AC<br>36 VA/200 V AC                    |  |
| Minimum load                 |                 | 0.4 VA/100 V AC<br>1.6 VA/200 V AC                  |  |
| Open circuit leakage current |                 | 1 mA/100 V AC<br>2 mA/200 V AC                      |  |
| Response time                | 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

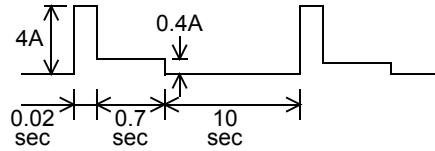
The time from when the photo-thyristor is driven or shut down until the output triac is turned on and until it is turned off is 1ms or less and 10 ms or less, respectively.

### 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.

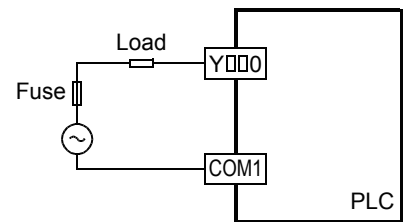
Since the triac output type devices leak current when the circuits are open, small-size relays and micro current loads having low rated operating current may keep operating even when the triac output is turned off. Therefore, use a load of 0.4 VA or more at 100 V AC or 1.6 VA or more at 200 V AC. If 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

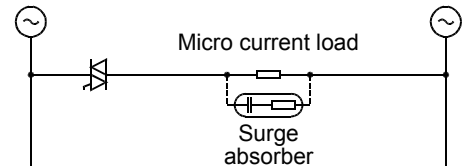
### 1. Protection circuit for load short-circuits

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 |

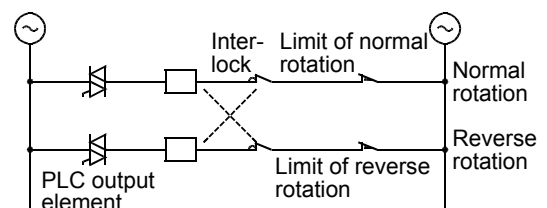
#### Reference

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

| Manufacturer        | Model name           |
|---------------------|----------------------|
| Rubycon Corporation | 250MCRA104100M B0325 |

### 3. Interlock

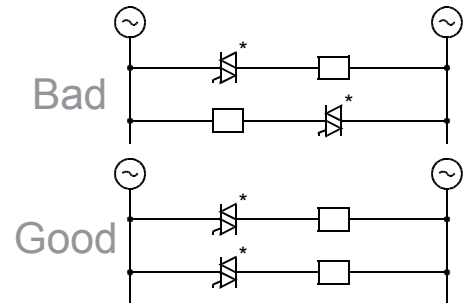
For loads such as forward/reverse contactors, etc., where a hazardous condition could result if switched ON simultaneously, an external interlock should be provided for interlocking the PLC's internal programs as shown to the right.



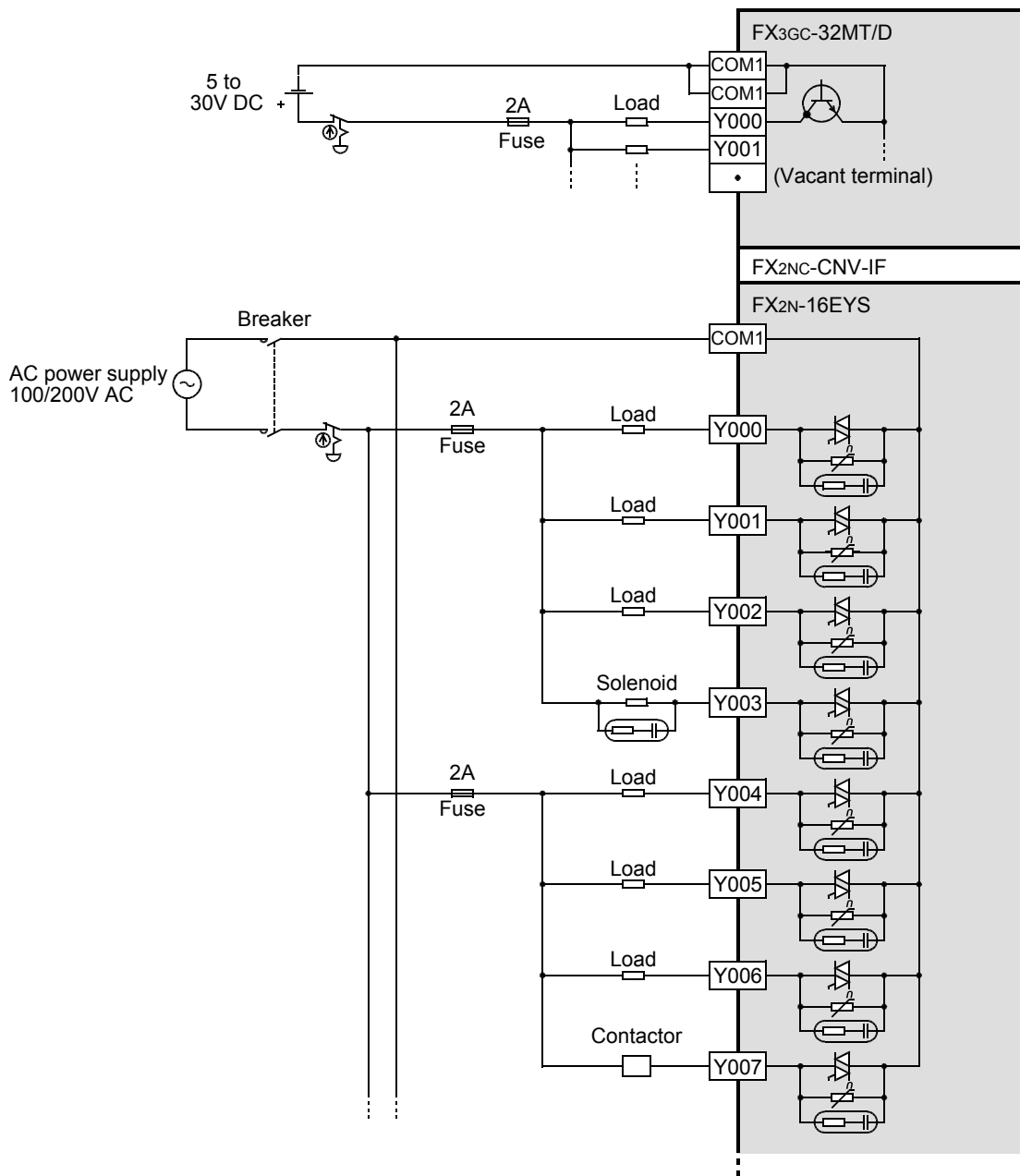
|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
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| 7  | Examples of Wiring for Various Uses    |
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| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

**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

|  |   |
|--|---|
| <b>DESIGN PRECAUTIONS</b>  |  <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>                     Otherwise, malfunctions may cause serious accidents.                     <ol style="list-style-type: none"> <li>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).</li> <li>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.<br/>                             External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.</li> <li>3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.<br/>                             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.</li> </ol> </li> </ul> |   |

|   |  |
|---|--|
| <b>DESIGN PRECAUTIONS</b>   |  <b>CAUTION</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>                     Noise may cause malfunctions.</li> <li>• Install the product so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.<br/>                     Failure to do so may result in wire damage/breakage or PLC failure.</li> </ul> |  |

|   |   |
|---|---|
| <b>WIRING PRECAUTIONS</b>   |  <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.<br/>                     Failure to do so may cause electric shock or damage to the product.</li> <li>• Make sure to attach the terminal cover, offered as an accessory, before turning on the power or initiating operation after installation or wiring work.<br/>                     Failure to do so may cause electric shock.</li> </ul> |   |

|           |  |
|-----------|--|
| <b>1</b>  | Outline                                |
| <b>2</b>  | External Dimensions                    |
| <b>3</b>  | Generic Specifications                 |
| <b>4</b>  | Power Supply Specifications            |
| <b>5</b>  | Input Specifications                   |
| <b>6</b>  | Output Specifications                  |
| <b>7</b>  | Examples of Wiring for Various Uses    |
| <b>8</b>  | Terminal Block                         |
| <b>9</b>  | Battery                                |
| <b>10</b> | Test Run, Maintenance, Troubleshooting |

## WIRING PRECAUTIONS



- 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  $\Omega$  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.
- 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.

## 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.

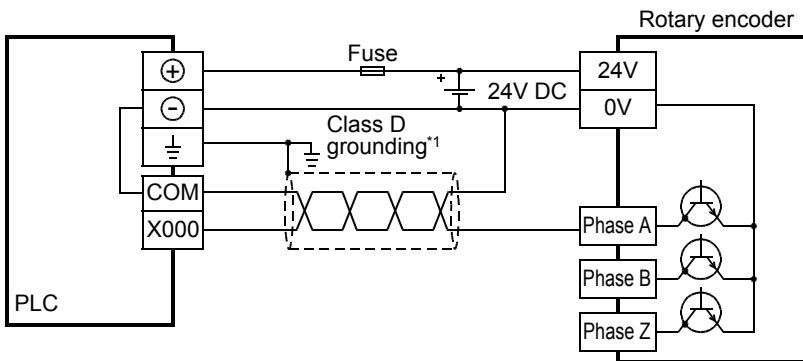
→ For input allocation in high-speed counters, refer to Subsection 5.5.2.

#### Caution

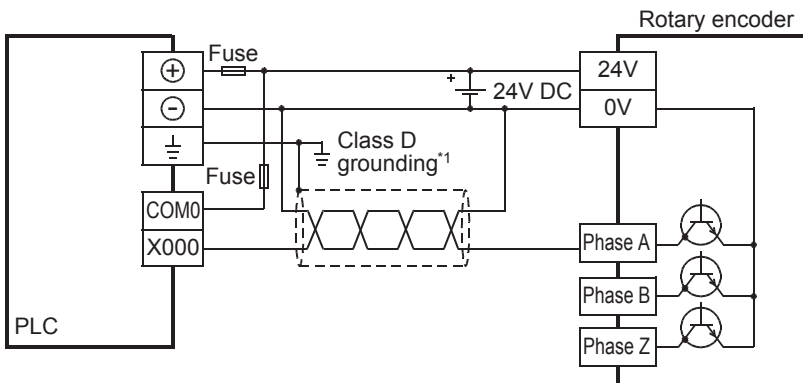
As connecting cables, use shielded twisted-pair cables. Ground the shield of each shielded cable only on the PLC side.

#### 1. NPN open collector transistor output rotary encoder

1) FX3GC-32MT/D

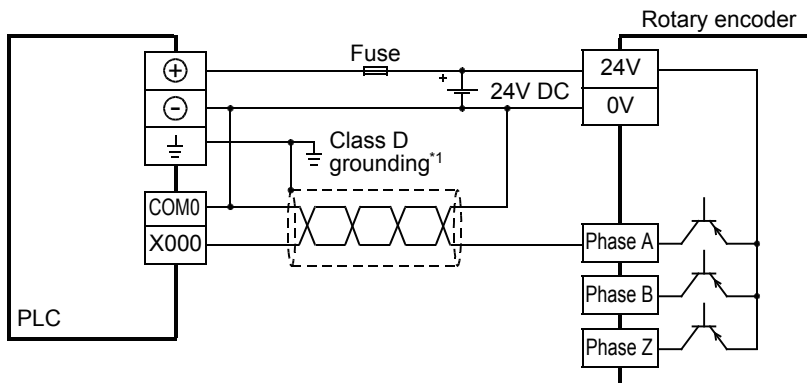


2) FX3GC-32MT/DSS [Sink input wiring]



#### 2. PNP open collector transistor output rotary encoder

FX3GC-32MT/DSS [Source input wiring]



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

|    |  |
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## 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.

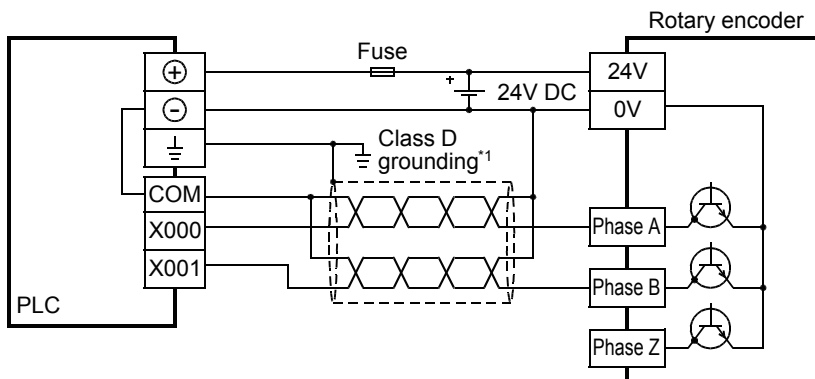
→ For input allocation in high-speed counters, refer to Subsection 5.5.2.

### Caution

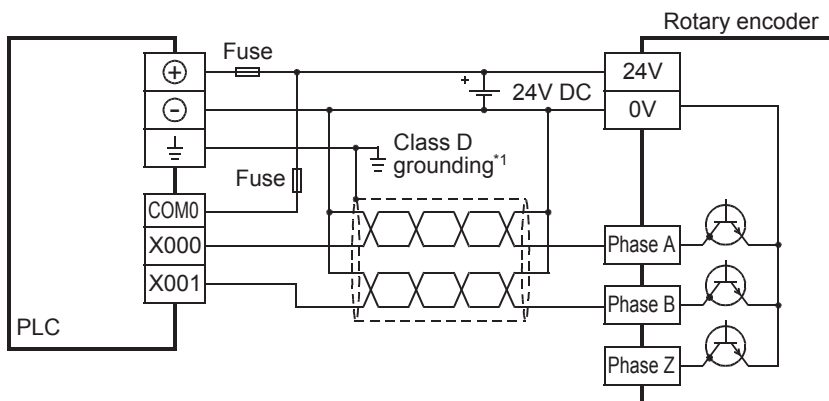
As connecting cables, use shielded twisted-pair cables. Ground the shield of each shielded cable only on the PLC side.

### 1. NPN open collector transistor output rotary encoder

1) FX3GC-32MT/D

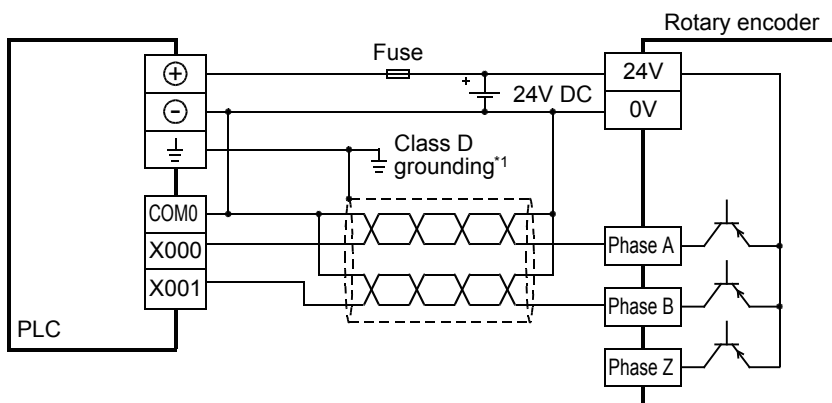


2) FX3GC-32MT/DSS [Sink input wiring]



### 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.

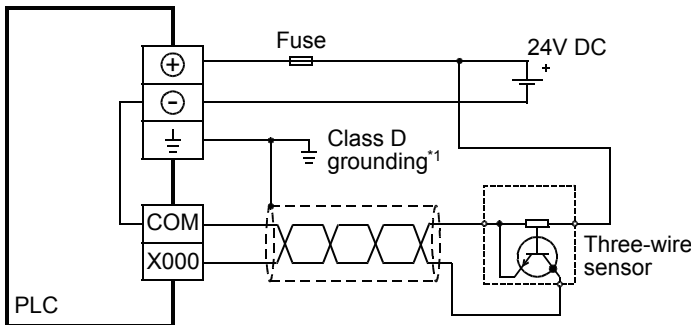
→ For input allocation in pulse width/pulse period measurement function, refer to Section 5.8.

### Caution

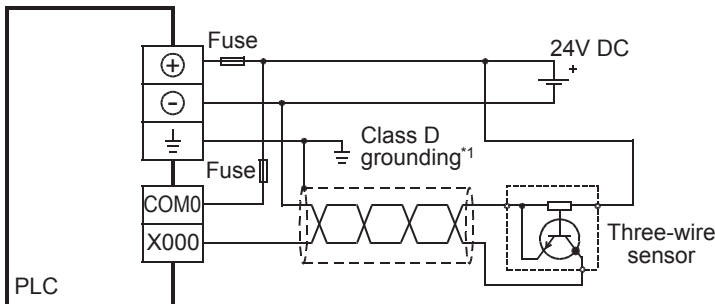
Use shielded twisted-pair cables for connecting cables. Ground the shield of each shielded cable only on the PLC side.

### 1. NPN open collector transistor output three-wire sensor

1) FX3GC-32MT/D

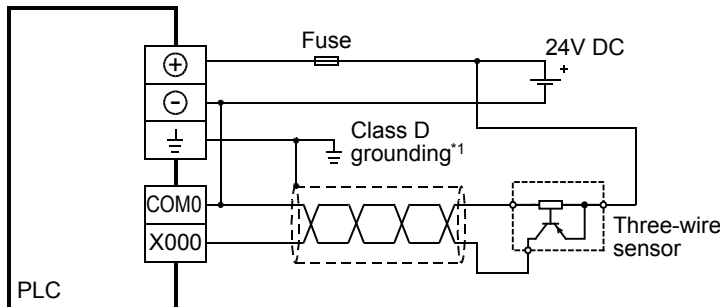


2) FX3GC-32MT/DSS [Sink input wiring]



### 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.

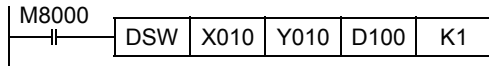
## 7.4 Digital Switch [DSW (FNC 72)/BIN (FNC 19)]

### 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.

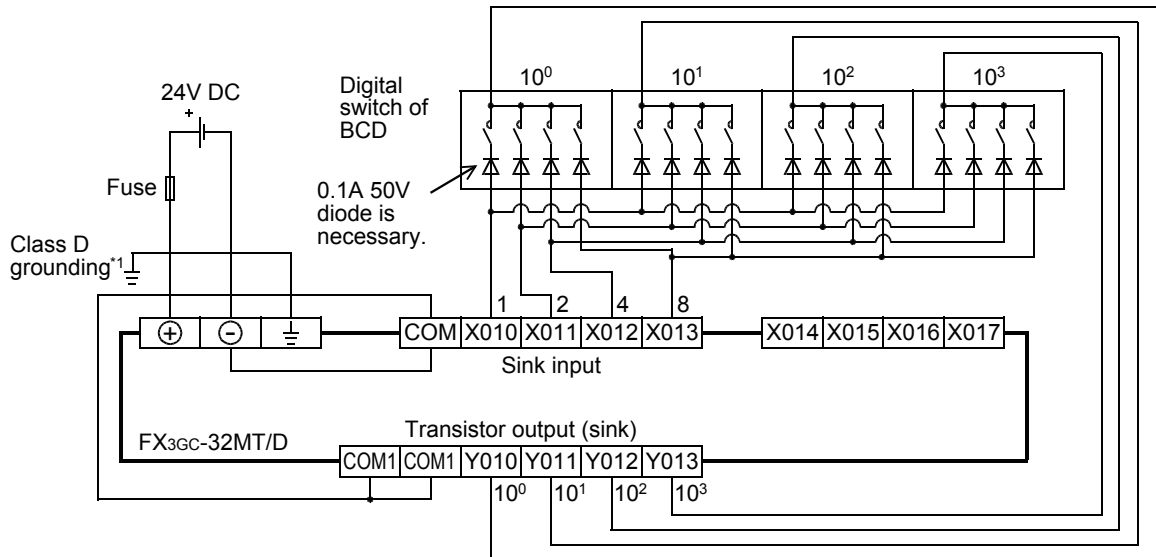
#### 1. Main unit

##### Example of program

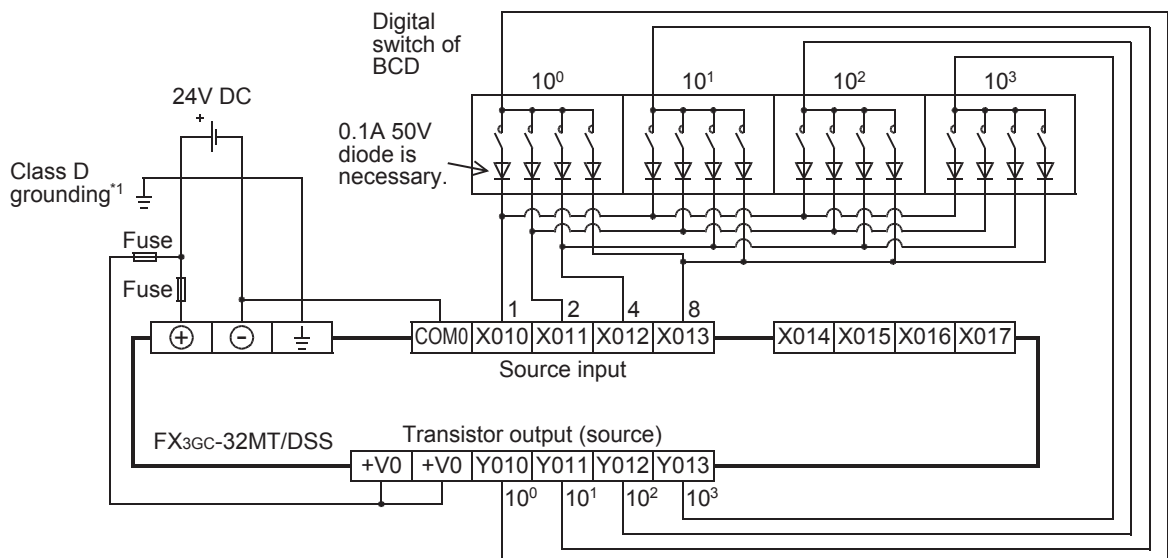


##### Example of wiring

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



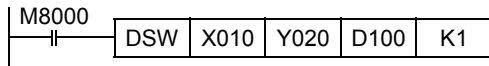
- 2) Source wiring  
 Use the sink/source common input, source only output (transistor output) type main unit.  
 The wiring example is the FX3GC-32MT/DSS.



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

2. Main unit + Output extension block

Example of program

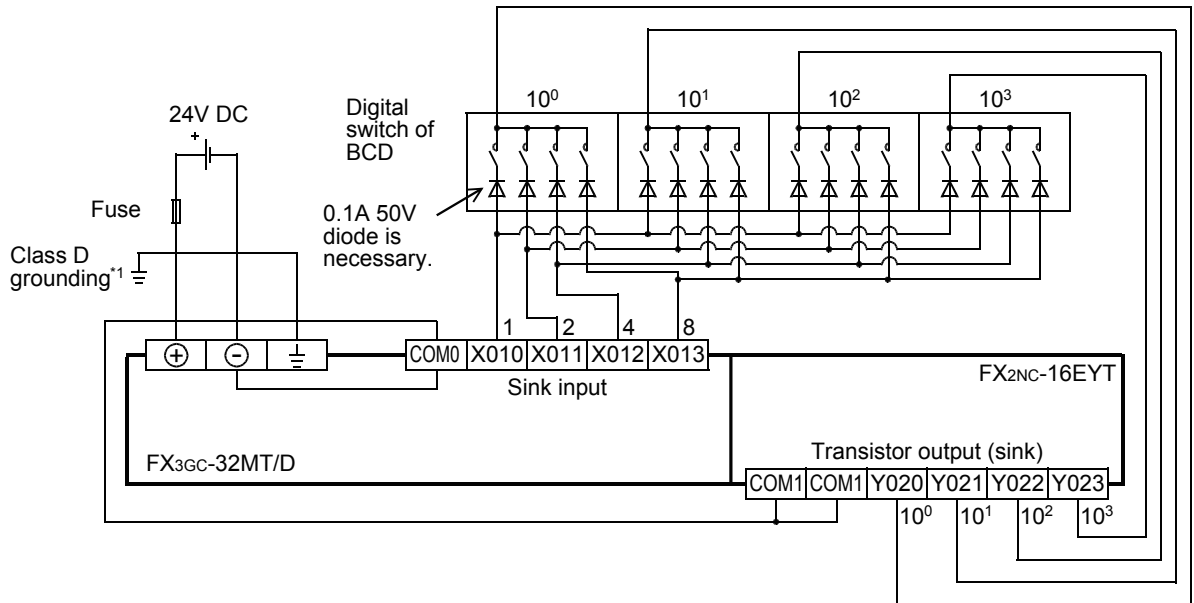


Example of wiring

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.

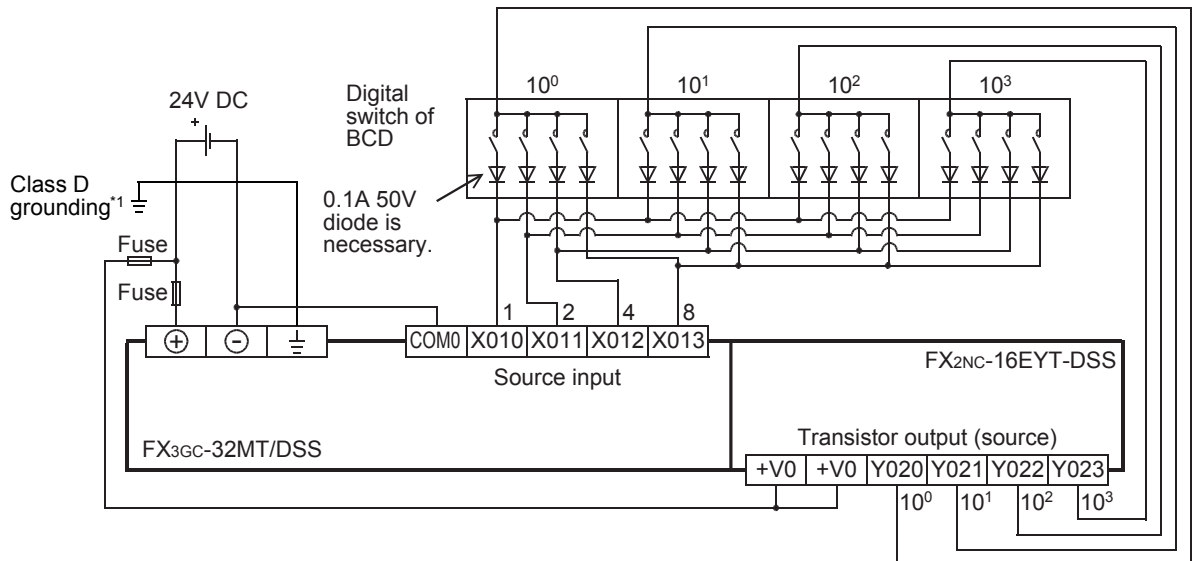
The wiring example is the [FX3GC-32MT/D] + output extension block [FX2NC-16EYT].



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].

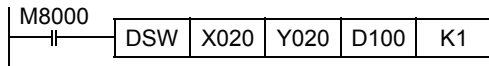


\*1. The grounding resistance should be 100 Ω or less.

1 Outline  
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### 3. Input extension block + Output extension block

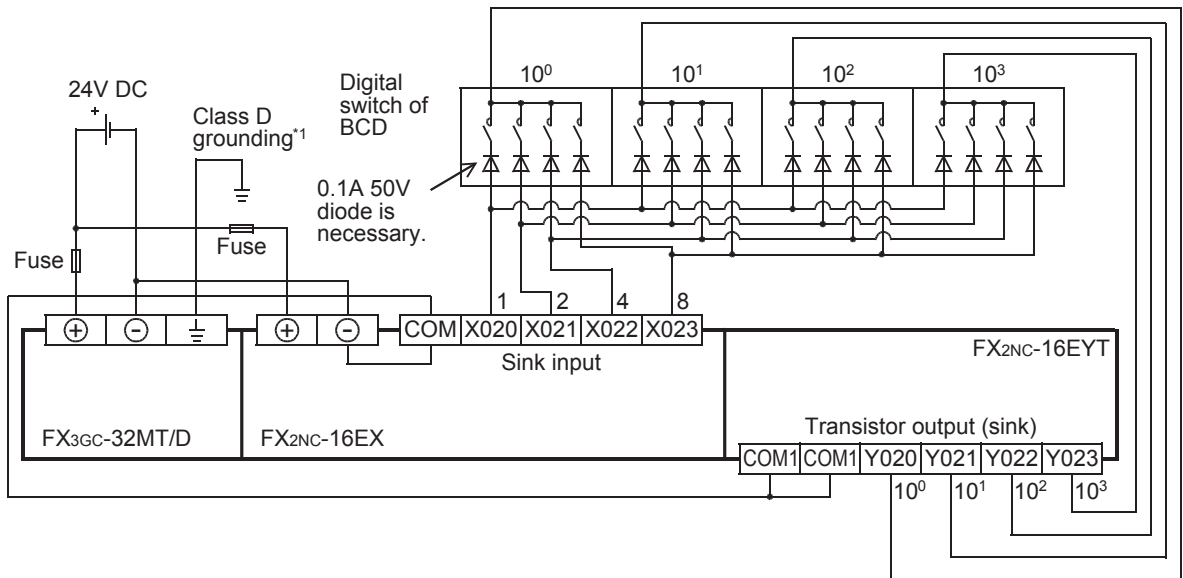
#### Example of program



#### Example of wiring

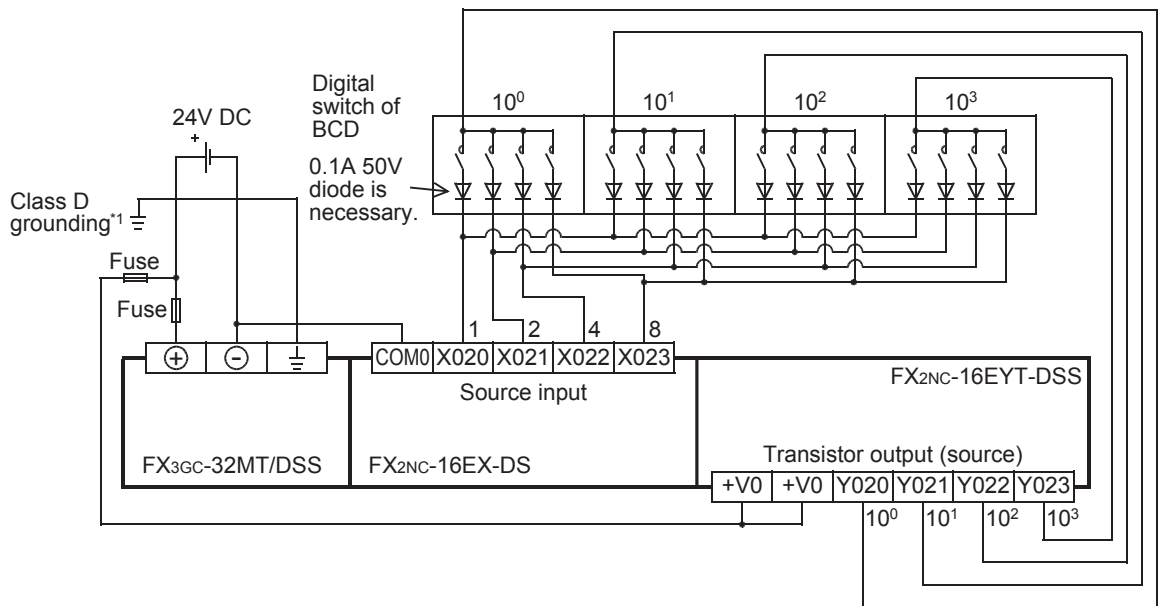
##### 1) Sink wiring

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].



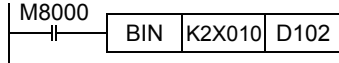
\*1. The grounding resistance should be 100 Ω or less.

## 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

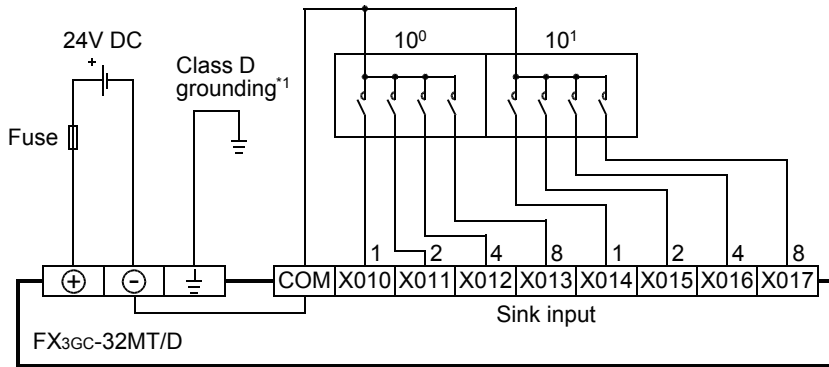


#### Example of wiring

##### 1) Sink wiring

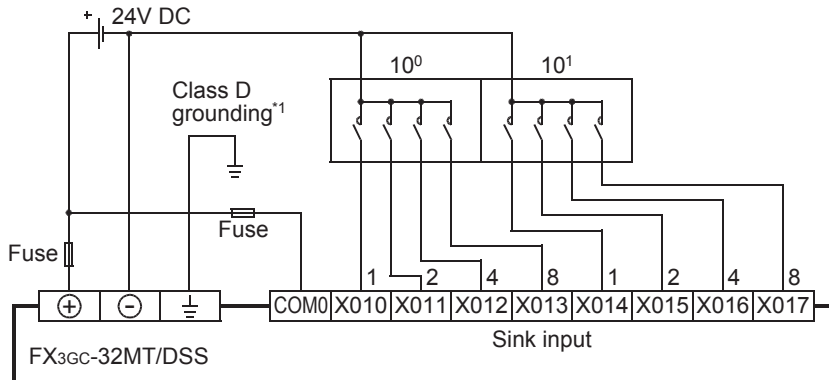
###### a) Sink only input type main unit

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



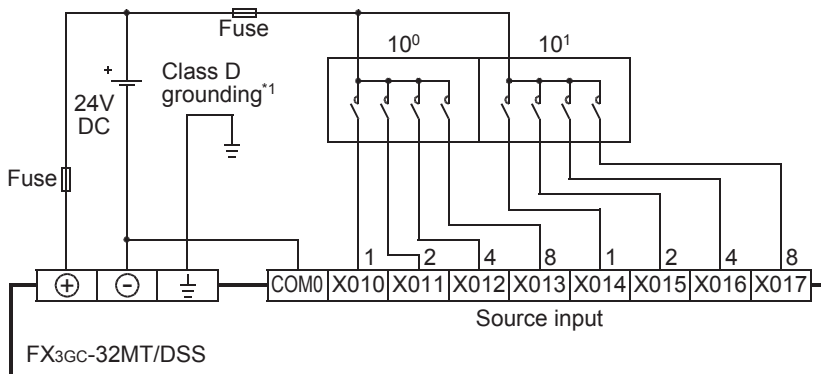
###### b) Sink/source common input type main unit

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.

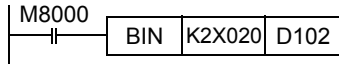


\*1. The grounding resistance should be 100 Ω or less.

|    |  |
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| 10 | Test Run, Maintenance, Troubleshooting |

2. Input extension block

Example of program

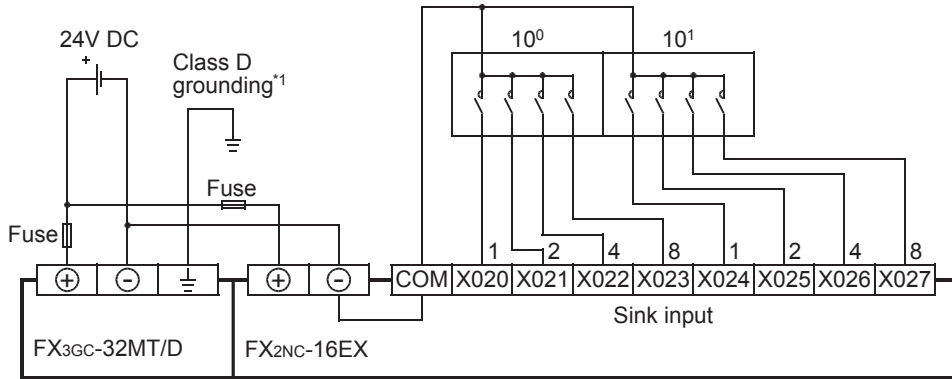


Example of wiring

1) Sink wiring

a) Sink only input type extension block

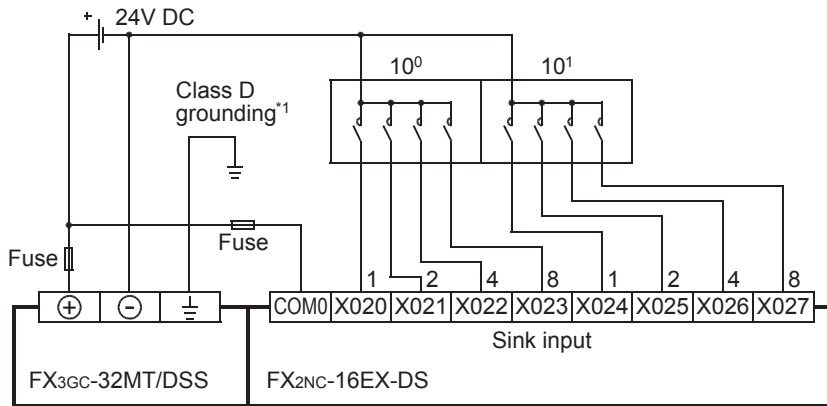
Use the sink only input, sink only output type main unit, and a sink only input type input extension block. The wiring example is the [FX3GC-32MT/D] + input extension block [FX2NC-16EX].



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].

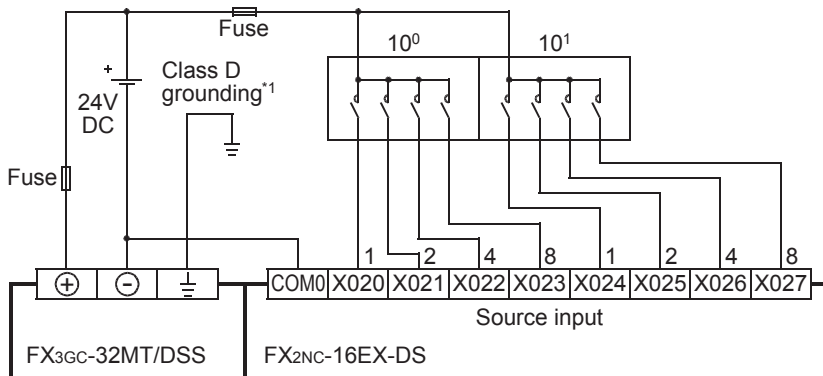
The wiring example is the [FX3GC-32MT/DSS] + input extension block [FX2NC-16EX-DS].



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].

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



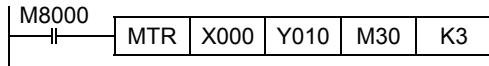
\*1. The grounding resistance should be 100 Ω or less.

## 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

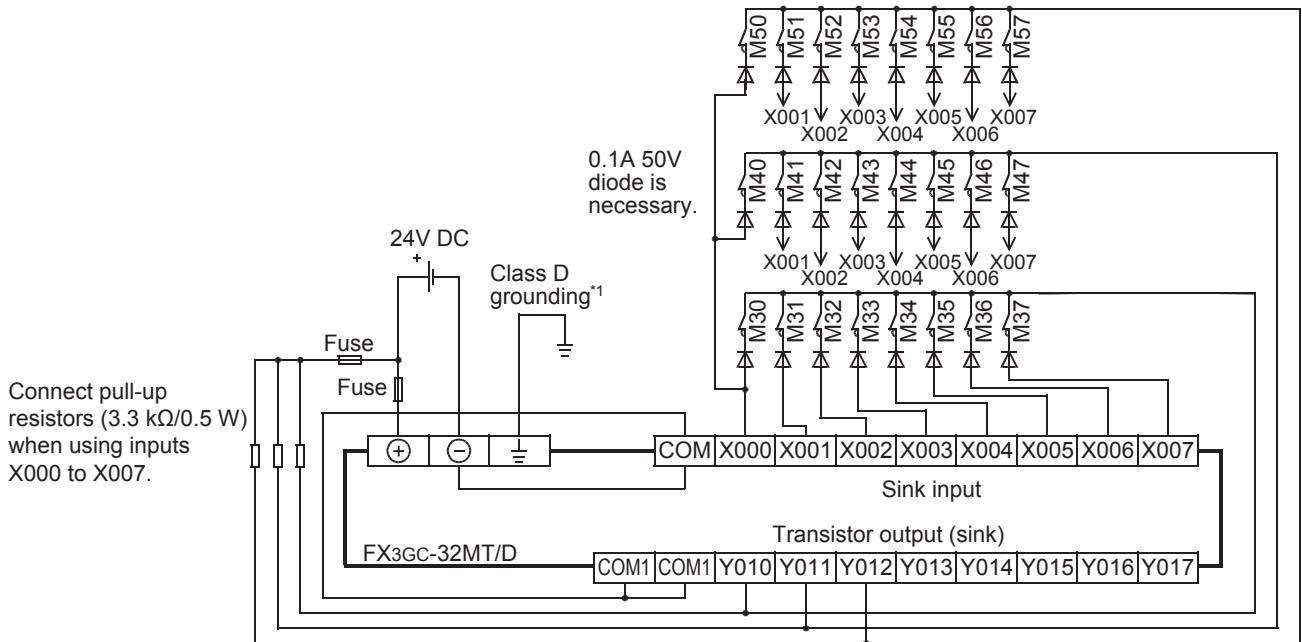
#### Example of program



#### Example of wiring

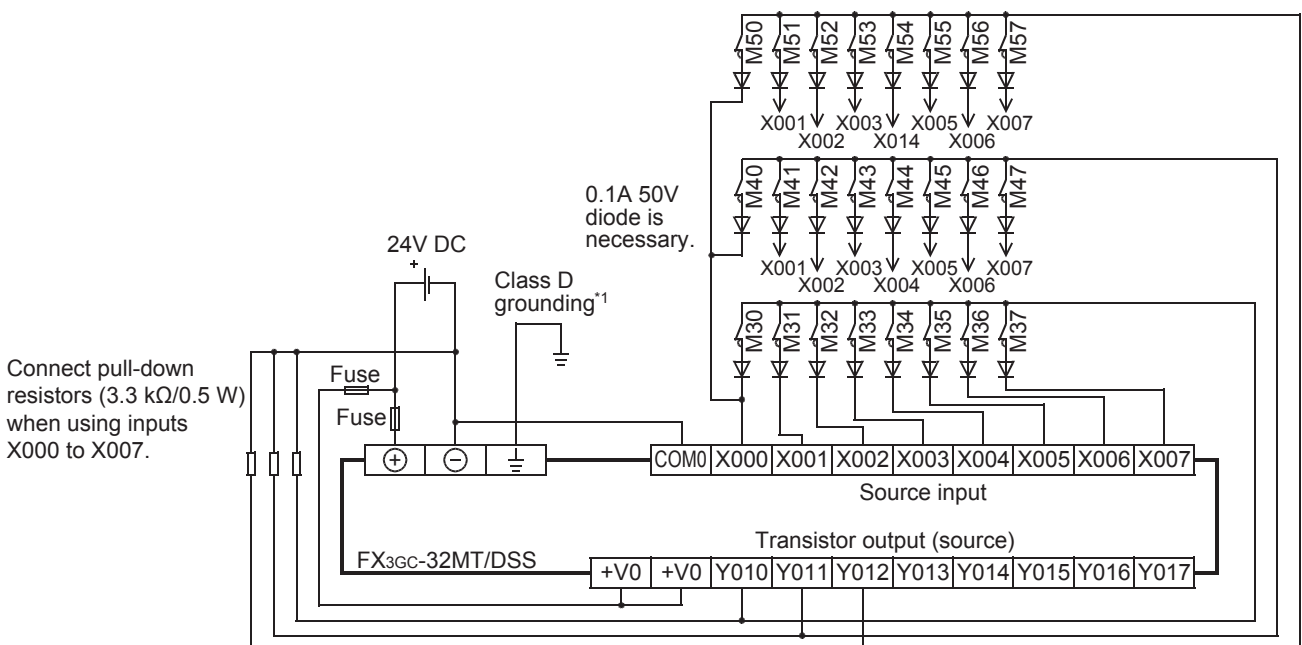
##### 1) Sink wiring

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.

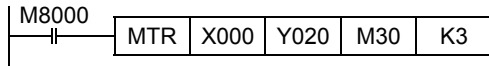


\*1. The grounding resistance should be 100 Ω or less.

|    |  |
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**2. Main unit + Output extension block**

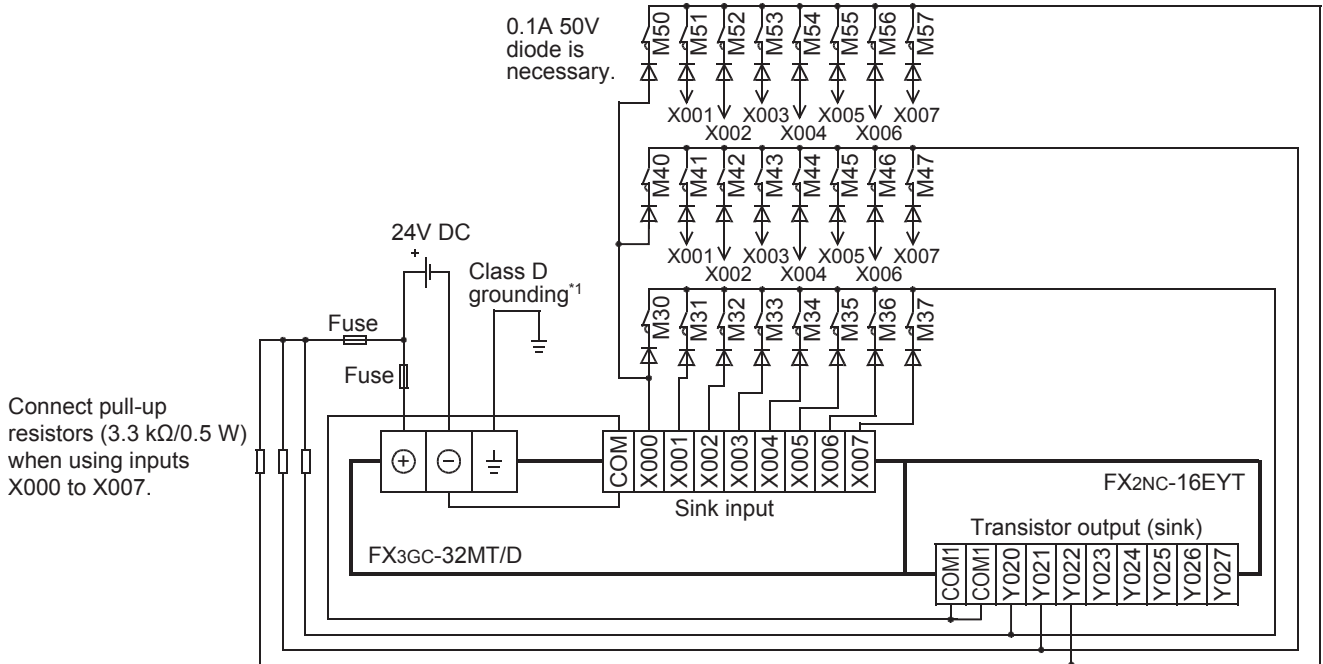
**Example of program**



**Example of wiring**

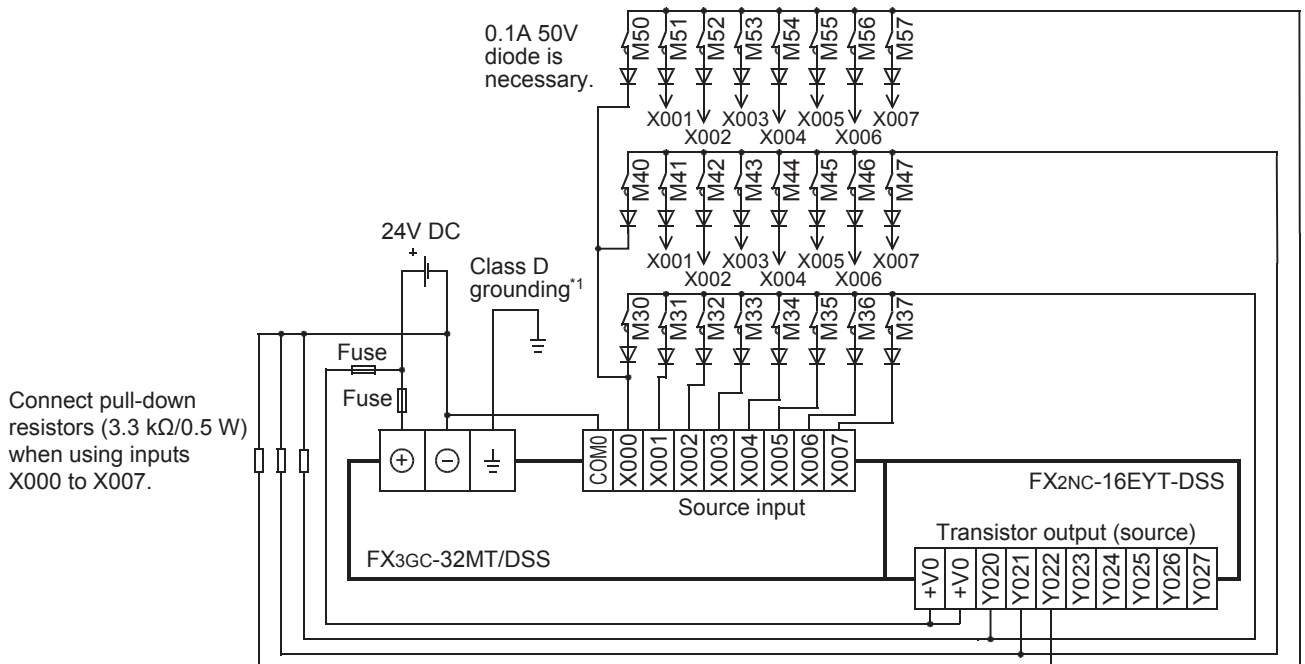
1) Sink wiring

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].

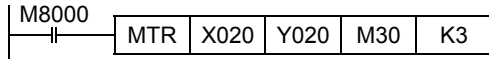


\*1. The grounding resistance should be 100 Ω or less.



### 3. Input extension block + Output extension block

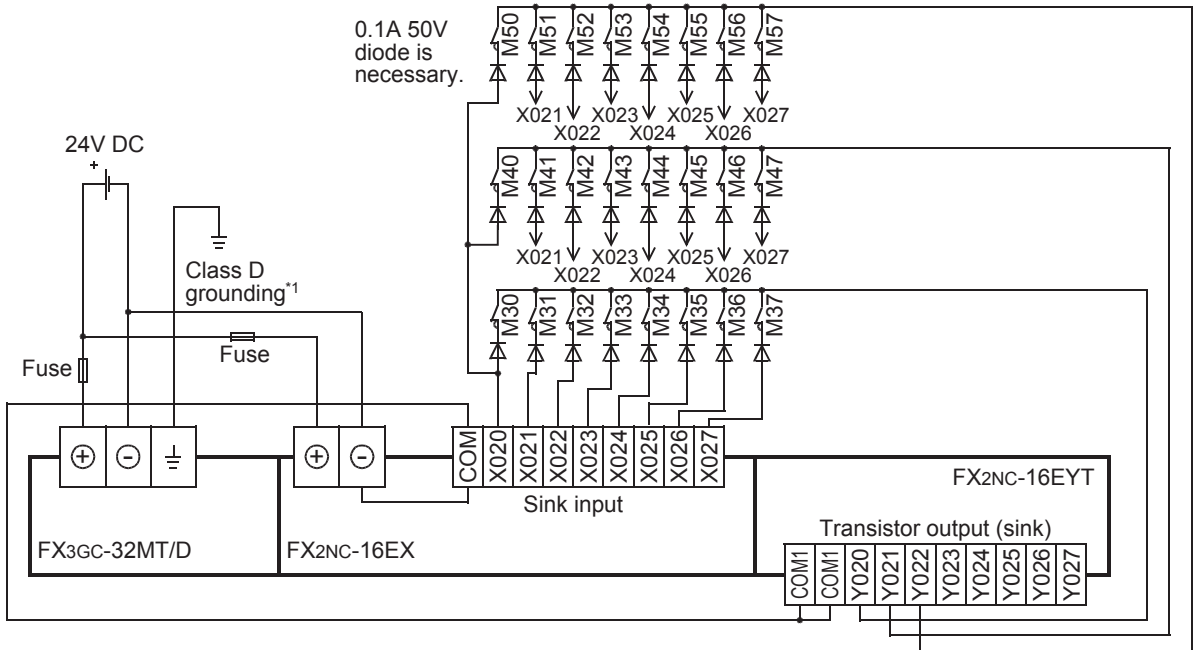
#### Example of program



#### Example of wiring

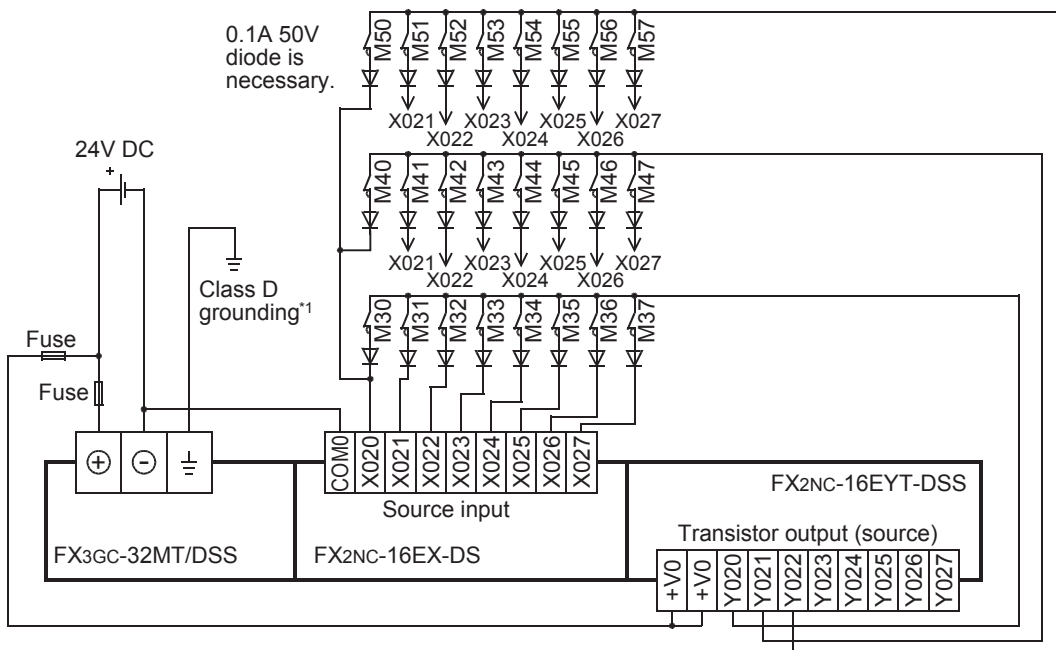
##### 1) Sink wiring

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.

|    |  |
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| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

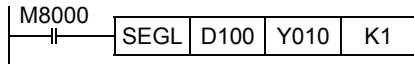
## 7.6 Seven Segment with Latch [SEGL (FNC 74)/BCD (FNC 18)]

### 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.

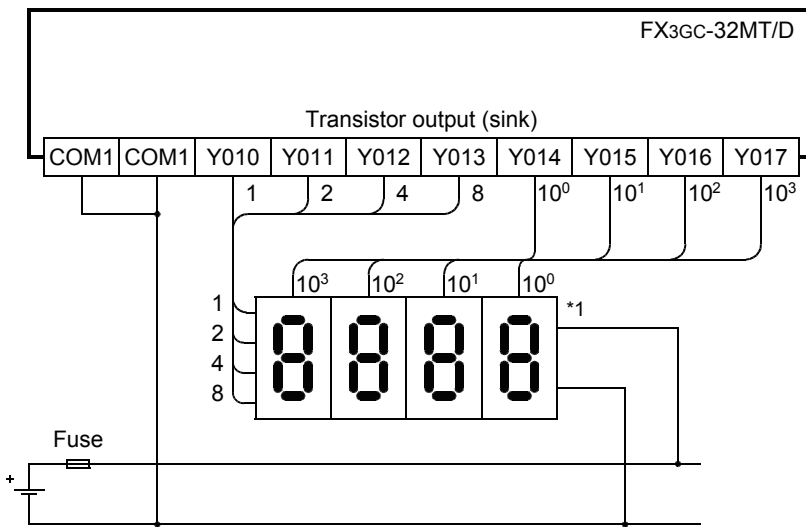
#### 1. Main unit

##### Example of program

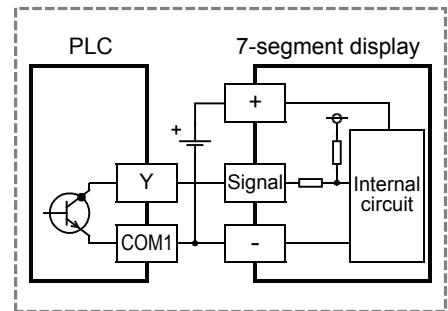


##### Example of wiring

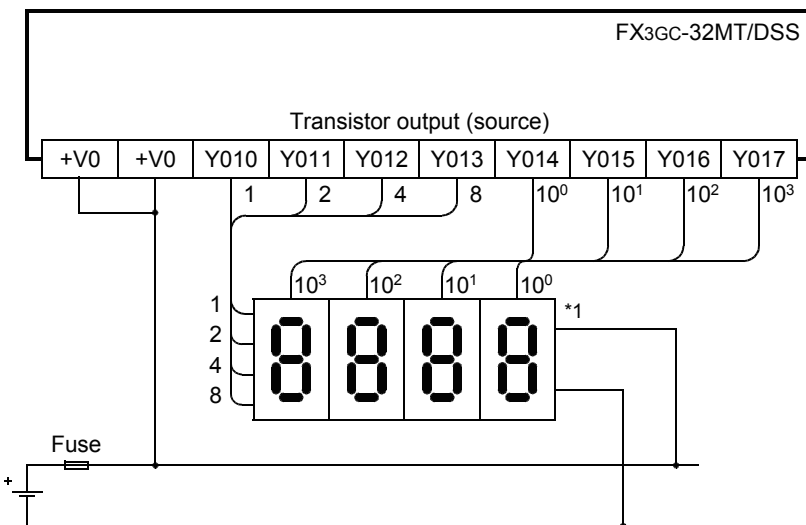
- 1) Sink wiring  
 Use the sink only input, sink only output type main unit.  
 The wiring example is the FX3GC-32MT/D.



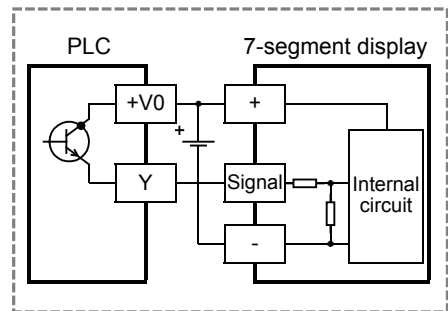
7-segment display to be used for sink wiring (in the case of transistor output)



- 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.



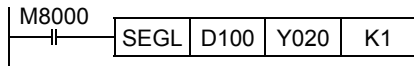
7-segment display to be used for source wiring (in the case of transistor output)



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

## 2. Output extension block

### Example of program

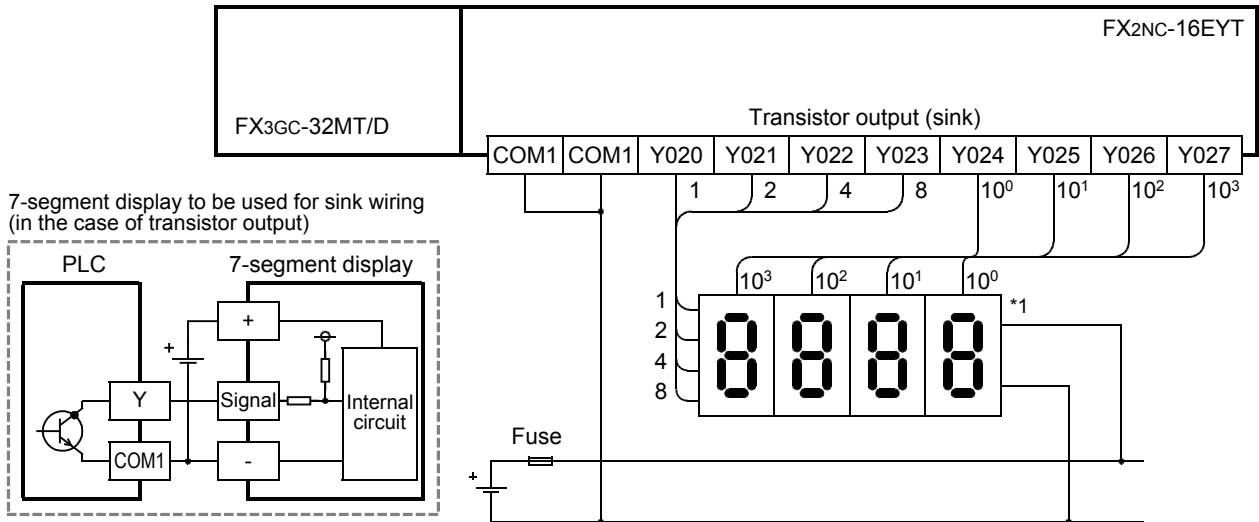


### Example of wiring

#### 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.

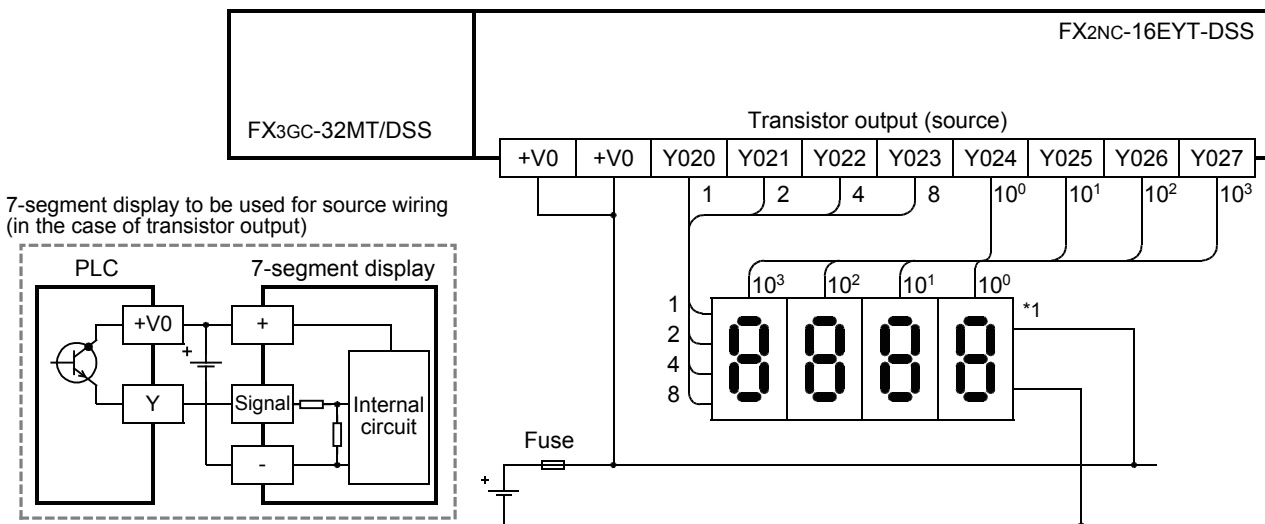
The wiring example is the [FX3GC-32MT/D] + output extension block [FX2NC-16EYT].



#### 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.

1 Outline

2 External Dimensions

3 Generic Specifications

4 Power Supply Specifications

5 Input Specifications

6 Output Specifications

7 Examples of Wiring for Various Uses

8 Terminal Block

9 Battery

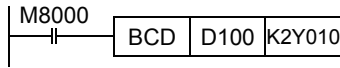
10 Test Run, Maintenance, Troubleshooting

### 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.

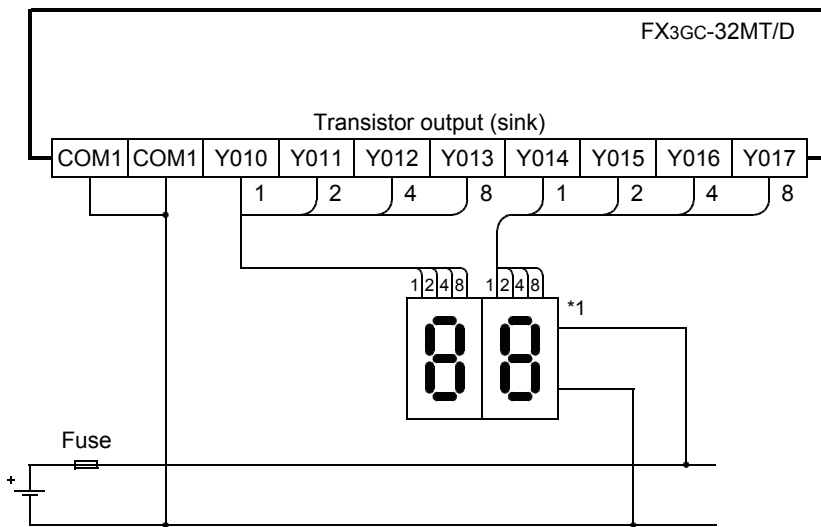
#### 1. Main unit

##### Example of program

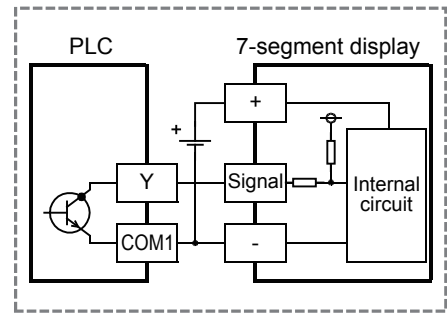


##### Example of wiring

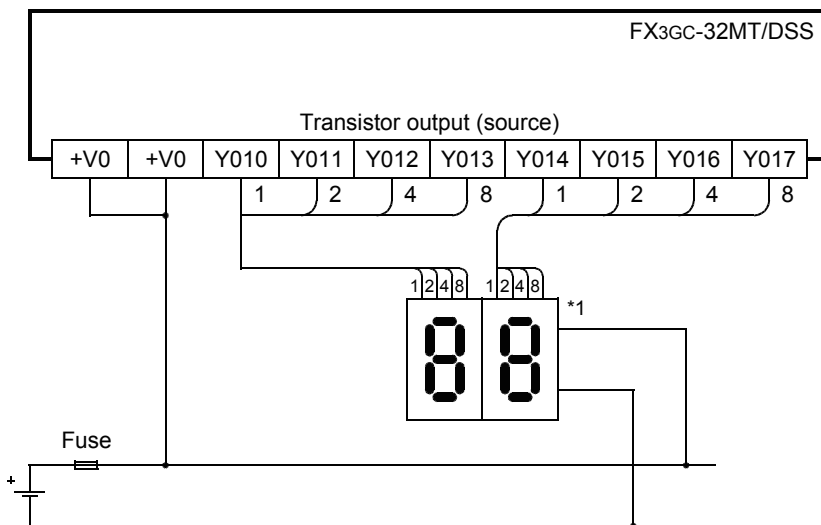
- 1) Sink wiring  
 Use the sink only input, sink only output type main unit.  
 The wiring example is the FX3GC-32MT/D.



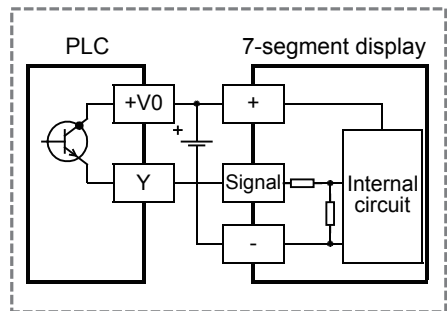
7-segment display to be used for sink wiring (in the case of transistor output)



- 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.



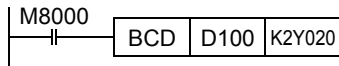
7-segment display to be used for source wiring (in the case of transistor output)



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

## 2. Output extension block

### Example of program

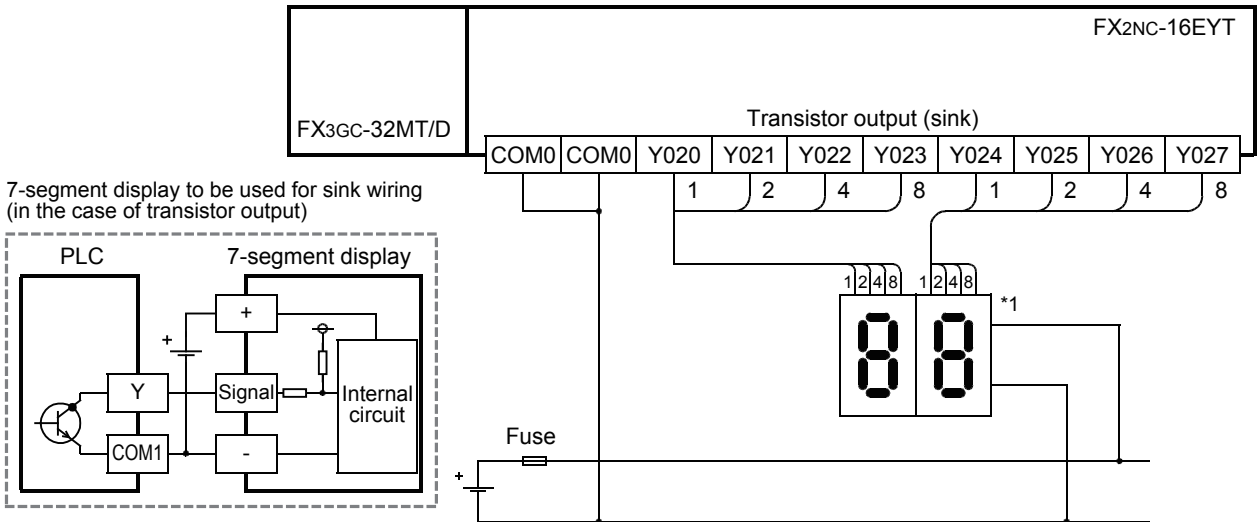


### Example of wiring

#### 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.

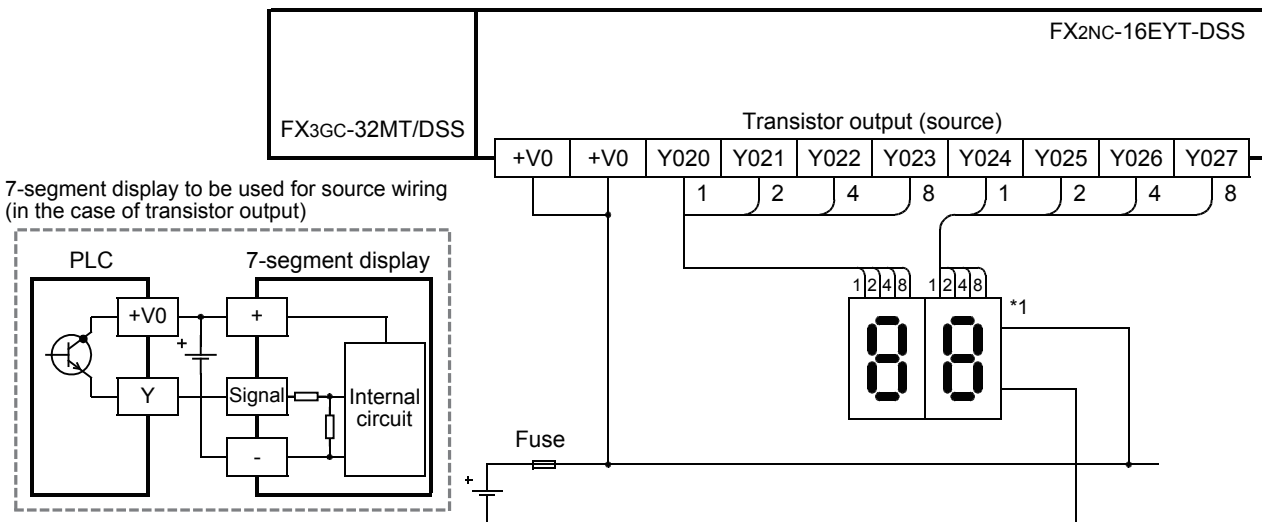
The wiring example is the [FX3GC-32MT/D] + output extension block [FX2NC-16EYT-DSS].



#### 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.

|    |  |
|----|--|
| 1  | Outline                                |
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| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
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| 6  | Output Specifications                  |
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| 8  | Terminal Block                         |
| 9  | Battery                                |
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## 8. Terminal Block Specifications and External Wiring

|  |               |
|--|---------------|
| <b>DESIGN PRECAUTIONS</b>  | <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>                     Otherwise, malfunctions may cause serious accidents.                     <ol style="list-style-type: none"> <li>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).</li> <li>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.<br/>                         External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.</li> <li>3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off.<br/>                         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.</li> </ol> </li> </ul> |               |

|  |                |
|--|----------------|
| <b>DESIGN PRECAUTIONS</b>  | <b>CAUTION</b> |
| <ul style="list-style-type: none"> <li>• 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.<br/>                     Noise may cause malfunctions.</li> <li>• Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.<br/>                     Failure to do so may result in wire damage/breakage or PLC failure.</li> </ul> |                |

|   |               |
|---|---------------|
| <b>INSTALLATION PRECAUTIONS</b>   | <b>DANGER</b> |
| <ul style="list-style-type: none"> <li>• Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.<br/>                     Failure to do so may cause electric shock.</li> </ul> |               |

|  |                             |   |               |  |                             |
|--|-----------------------------|---|---------------|--|-----------------------------|
| <b>INSTALLATION PRECAUTIONS</b>  | <b>CAUTION</b>              |   |               |  |                             |
| <ul style="list-style-type: none"> <li>• Use the product within the generic environment specifications described in Section 3.1 of this manual.<br/>                     Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub> or NO<sub>2</sub>), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind.<br/>                     If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.</li> <li>• Do not touch the conductive parts of the product directly.<br/>                     Doing so may cause device failures or malfunctions.</li> <li>• Install the product securely using a DIN rail or mounting screws.</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <tr> <td style="padding: 2px;">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</td> <td style="padding: 2px; text-align: center;">DIN rail only</td> </tr> <tr> <td style="padding: 2px;">FX2N Series I/O extension blocks, FX2N/FX3U Series special function blocks</td> <td style="padding: 2px; text-align: center;">DIN rail or direct mounting</td> </tr> </table> <ul style="list-style-type: none"> <li>• Install the product on a flat surface.<br/>                     If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformities.</li> <li>• When drilling screw holes or wiring, make sure cutting or write debris does not enter the ventilation slits.<br/>                     Failure to do so may cause fire, equipment failures or malfunctions.</li> <li>• Be sure to remove the dust proof sheet from the PLC's ventilation port when installation work is completed.<br/>                     Failure to do so may cause fire, equipment failures or malfunctions.</li> <li>• Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors.<br/>                     Loose connections may cause malfunctions.</li> <li>• Turn off the power to the PLC before attaching or detaching the following devices.<br/>                     Failure to do so may cause equipment failures or malfunctions.                     <ul style="list-style-type: none"> <li>- Peripheral devices, extension blocks, special adapters, FX Series terminal blocks, extension power supply unit, connector conversion adapter and Battery</li> </ul> </li> </ul> |                             | 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 |
| 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 |   |               |  |                             |

**WIRING PRECAUTIONS**



- 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**



- 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.
- 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.

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**4**  
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Specifications

**5**  
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**6**  
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Specifications

**7**  
Examples of  
Wiring for  
Various Uses

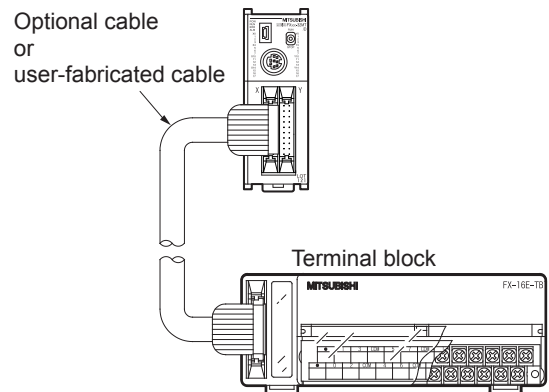
**8**  
Terminal Block

**9**  
Battery

**10**  
Test Run,  
Maintenance,  
Troubleshooting

## 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 |
|---|---|--|---------------------------------|--|--------------------|
| <b>Connected to sink only input or sink only output (transistor output) type main unit or I/O extension block</b>                 |   |  |                                 |  |                    |
| 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 <sup>*2</sup>   | 16  | -  | 100 V AC input type             | FX3GC-32MT/D, FX2NC-□□EX, FX2N-16EX-C                            | *4                 |
| FX-16EYR-TB <sup>*3</sup>   | -   | 16   | Relay output type               | FX3GC-32MT/D, FX2NC-□□EYT, FX2N-16EYT-C                          | 24 V DC 80 mA      |
| FX-16EYT-TB <sup>*3</sup>   | -   | 16   | Transistor output (sink) type   |  | 24 V DC 112 mA     |
| FX-16EYS-TB <sup>*3</sup>   | -   | 16   | Triac output type               |  |                    |
| <b>Connected to sink/source common input type or source only output (transistor output) type main unit or I/O extension block</b> |   |  |                                 |  |                    |
| 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 <sup>*3</sup>   | -   | 16   | Relay output type               | FX3GC-32MT/DSS, FX2NC-□□EYT-DSS                                  | 24 V DC 80 mA      |
| FX-16EYT-ES-TB/UL <sup>*3</sup>   | -   | 16   | Transistor output (sink) type   |  | 24 V DC 112 mA     |
| FX-16EYT-ESS-TB/UL <sup>*3</sup>  | -   | 16   | Transistor output (source) type |  |                    |
| FX-16EYS-ES-TB <sup>*3</sup>  | -   | 16   | Triac output type               |  |                    |

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

| Connection destination   | Power Supply Voltage                                 | Current Consumption |
|--|--|---------------------|
| <b>Input connector</b>   |  |                     |
| FX3GC-32MT/D, FX2NC-□□EX   | Not required   |                     |
| FX3GC-32MT/DSS, FX2NC-□□EX-DS, FX2N-16EX-C                               | 24 V DC  | 112 mA/ 16 points   |
| <b>Output connector</b>  |  |                     |
| 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              |

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7 Examples of Wiring for Various Uses

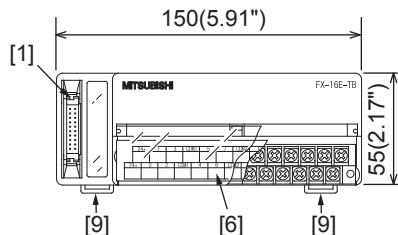
8 Terminal Block

9 Battery

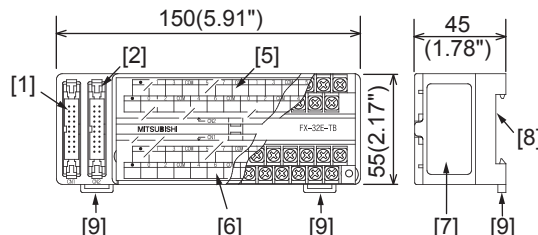
10 Test Run, Maintenance, Troubleshooting

## 8.2 External Dimensions & Component Names

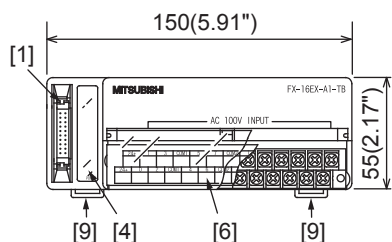
FX-16E-TB, FX-16E-TB/UL



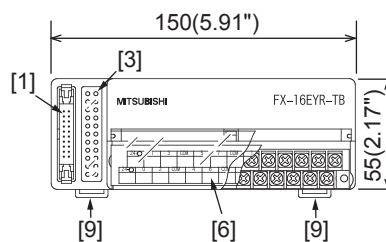
FX-32E-TB, FX-32E-TB/UL



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



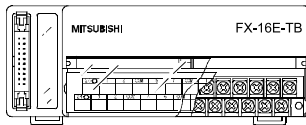
Units: mm (inches)  
Accessories: Input/output No. labels,  
terminal block arrangement cards

| 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,<br>FX-16EYT-TB, FX-16EYT-ES-TB/UL, FX-16EYT-ESS-TB/UL,<br>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<br>(DIN rail width: 35 mm(1.38")) | -   |
| [9] | DIN rail mounting hook                                     | -   |

## 8.3 Terminal Arrangement

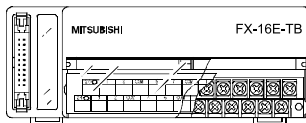
### 1. FX-16E-TB, FX-16E-TB/UL

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

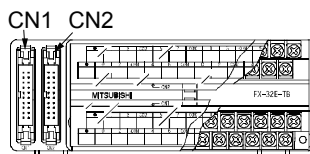


| Lower numbers |   |   |   |   |   |   | Higher numbers |   |   |   |   |   |  |
|---------------|---|---|---|---|---|---|----------------|---|---|---|---|---|--|
| 24+           | 1 | 3 | • | 5 | 7 | • | 1              | 3 | • | 5 | 7 | • |  |
| 24+           | 0 | 2 | • | 4 | 6 | • | 0              | 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

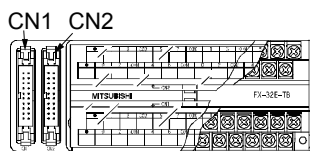
| Lower numbers |   |   |   |     |   |   | Higher numbers |   |   |     |   |   |     |
|---------------|---|---|---|-----|---|---|----------------|---|---|-----|---|---|-----|
| CN2           | • | 1 | 3 | COM | 5 | 7 | COM            | 1 | 3 | COM | 5 | 7 | COM |
|               | • | 0 | 2 | COM | 4 | 6 | COM            | 0 | 2 | COM | 4 | 6 | COM |



| 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

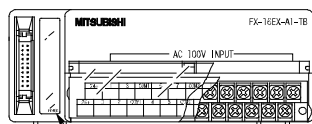
| Lower numbers |     |   |   |   |   |   | Higher numbers |   |   |   |   |   |   |
|---------------|-----|---|---|---|---|---|----------------|---|---|---|---|---|---|
| CN2           | 24+ | 1 | 3 | • | 5 | 7 | •              | 1 | 3 | • | 5 | 7 | • |
|               | 24+ | 0 | 2 | • | 4 | 6 | •              | 0 | 2 | • | 4 | 6 | • |



| Lower numbers |     |   |   |   |   |   | Higher numbers |   |   |   |   |   |   |
|---------------|-----|---|---|---|---|---|----------------|---|---|---|---|---|---|
| CN1           | 24+ | 1 | 3 | • | 5 | 7 | •              | 1 | 3 | • | 5 | 7 | • |
|               | 24+ | 0 | 2 | • | 4 | 6 | •              | 0 | 2 | • | 4 | 6 | • |

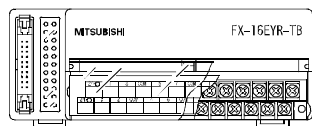
|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

**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 |

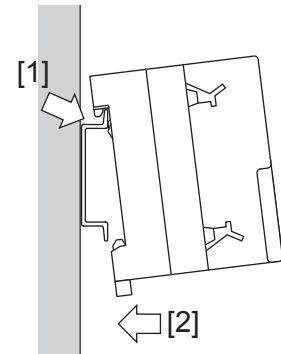
## 8.4 Installation Work

→ Refer to "3.2 Installation location".

### 8.4.1 Mounting/Removal

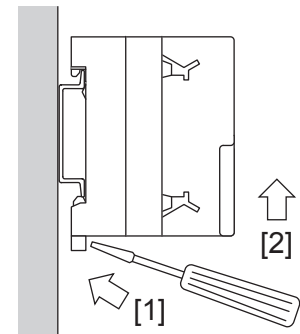
#### 1. Mounting method

- 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

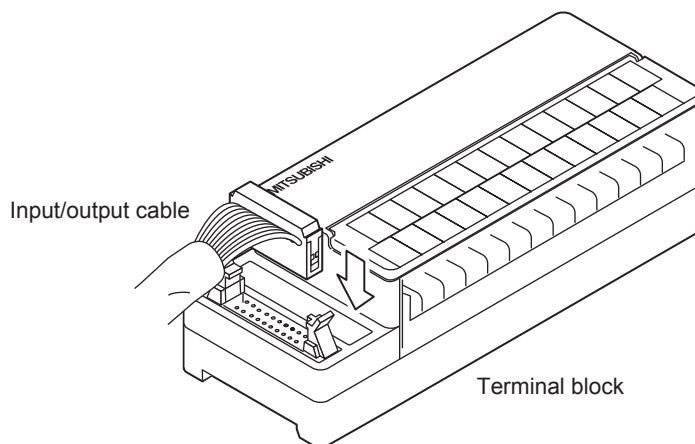
- 1) Turn the power supply OFF.
- 2) Disconnect the wiring and input/output cables.
- 3) Place a flathead screwdriver against the DIN rail mounting hook in the posture shown (refer to [1] at right).
- 4) Move the flathead screwdriver in direction shown at right (refer to [2] at right) to detach the DIN 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,<br>FX-16EYR-TB, FX-16EYR-ES-TB/UL, FX-16EYT-TB, FX-16EYT-ES-TB/UL,<br>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.**

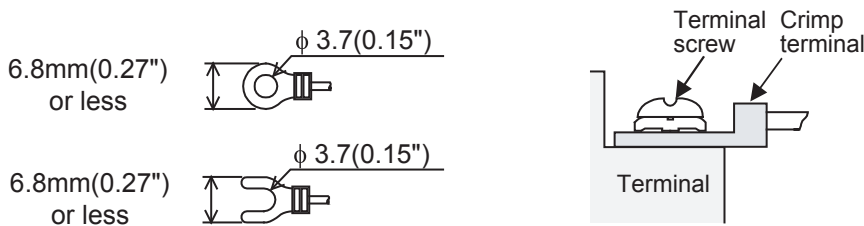
Use the sizes shown below.

Tighten the terminals to a torque of 0.5 to 0.8 N•m.

Do not tighten terminal screws exceeding the specified torque. Failure to do so may cause equipment failures or malfunctions.

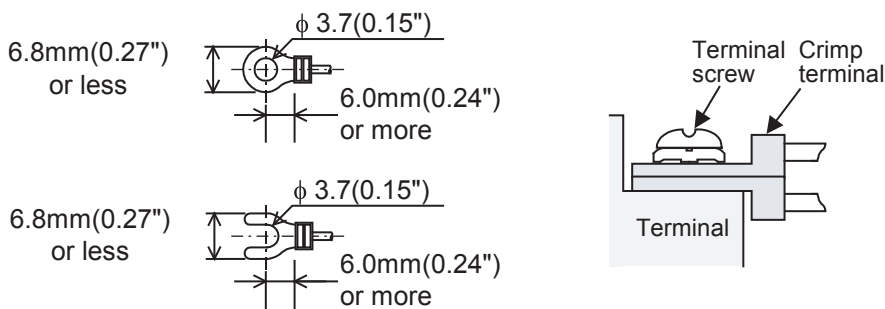
- When 1 wire is connected to 1 terminal:

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.

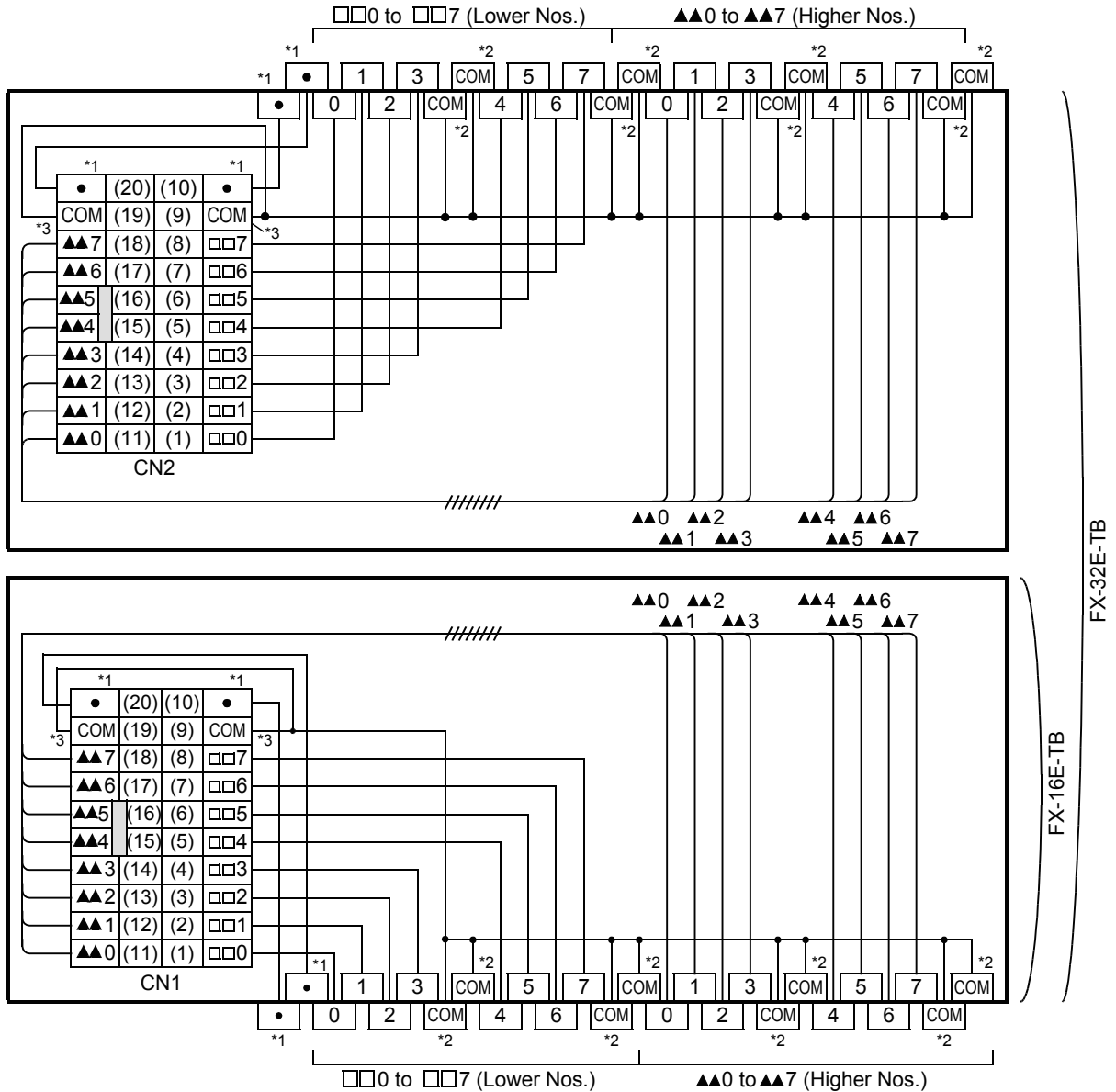


## 8.5 FX-16E-TB/FX-32E-TB

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.

|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

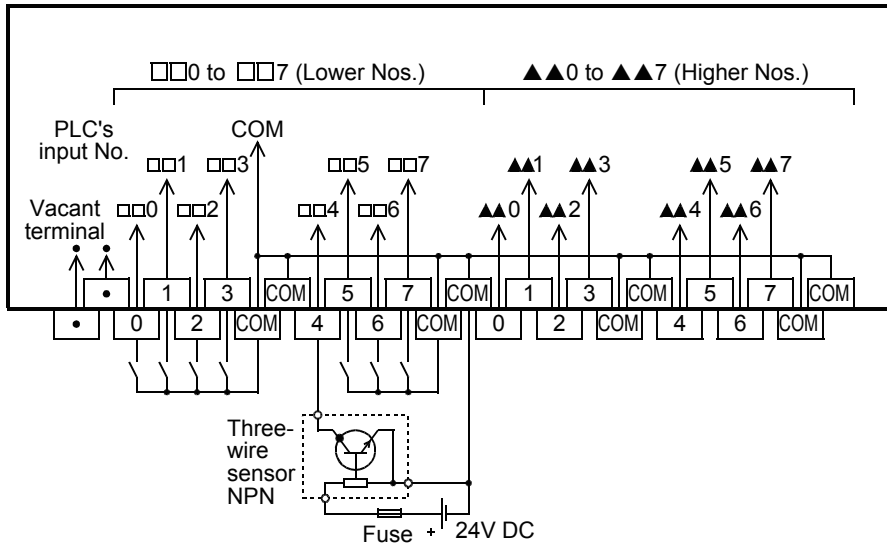
### 8.5.2 Example of input external wiring [sink wiring]

#### WIRING PRECAUTIONS

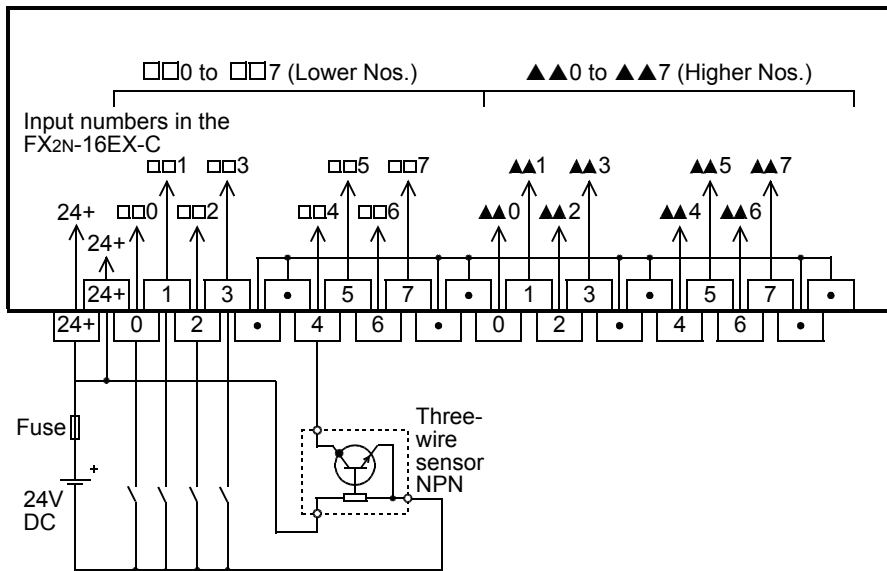


- Before cleaning or retightening terminals cut off all phases of the power supply externally. Failure to do so may cause electric shock.

#### 1. When connected to the FX3GC-32MT/D and FX2NC-□□EX input connector.



#### 2. When connected to an FX2N-16EX-C input connector.





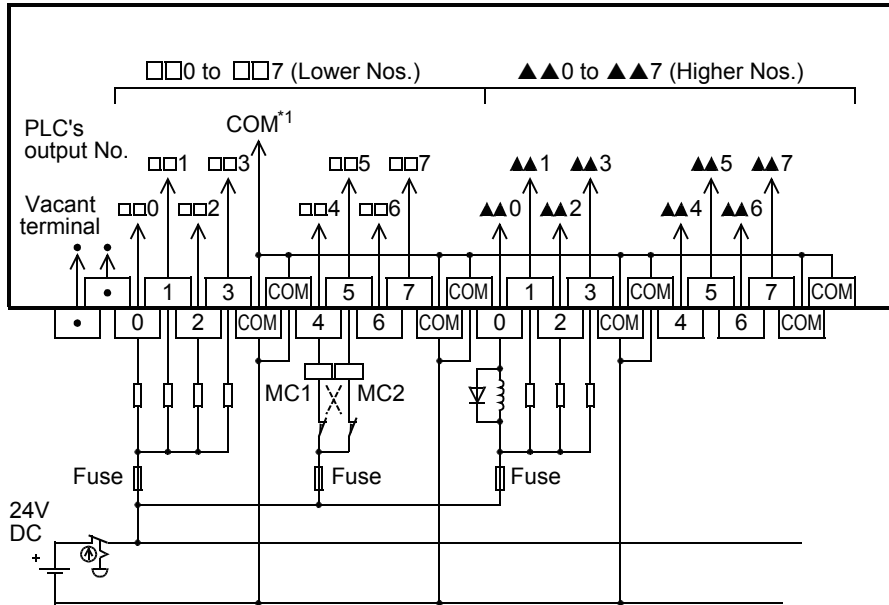
### 8.5.3 Example of output external wiring [sink wiring]

#### WIRING PRECAUTIONS



- Before cleaning or retightening terminals cut off all phases of the power supply externally. Failure to do so may cause electric shock.

#### 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.

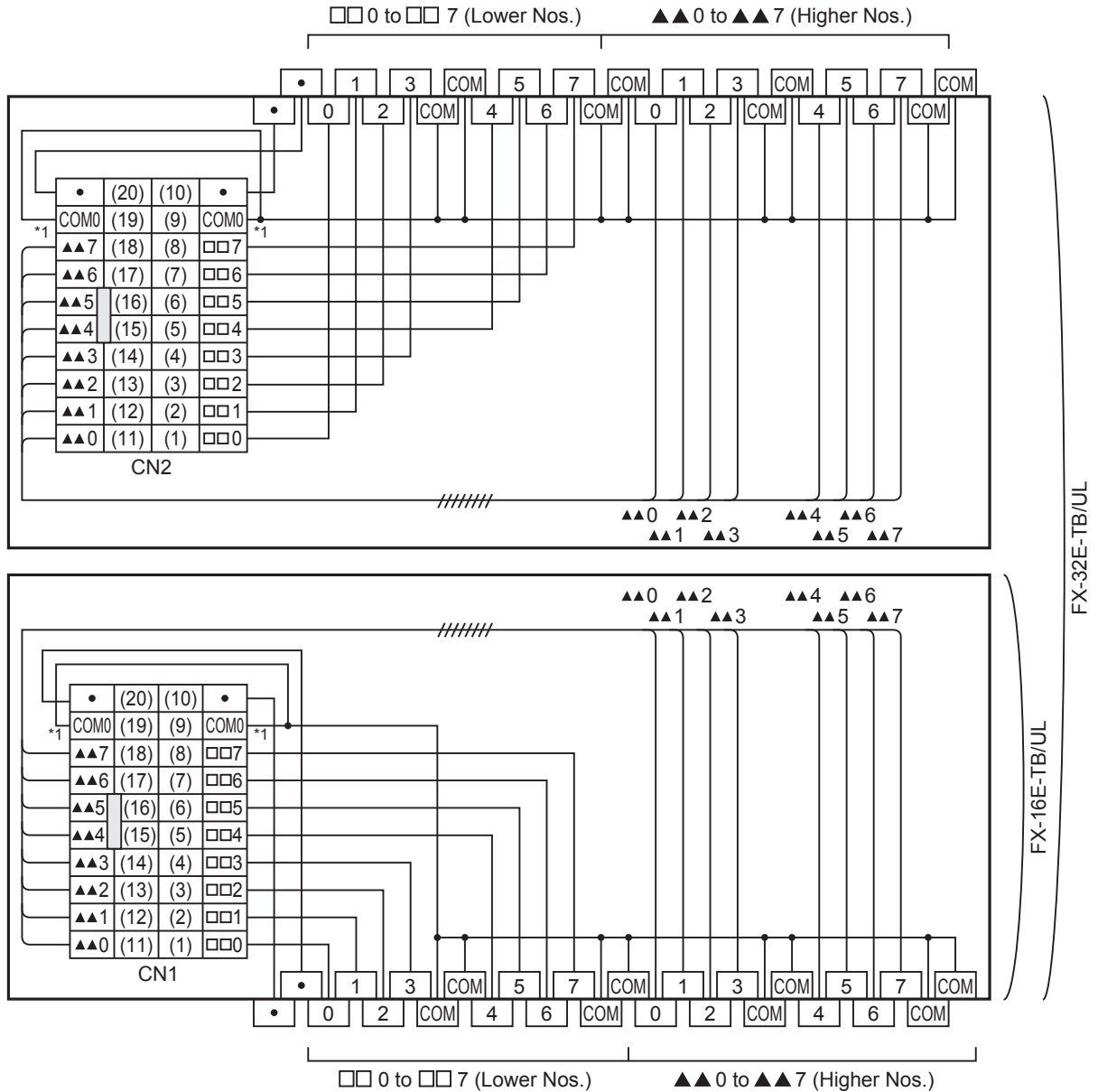
|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

## 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"

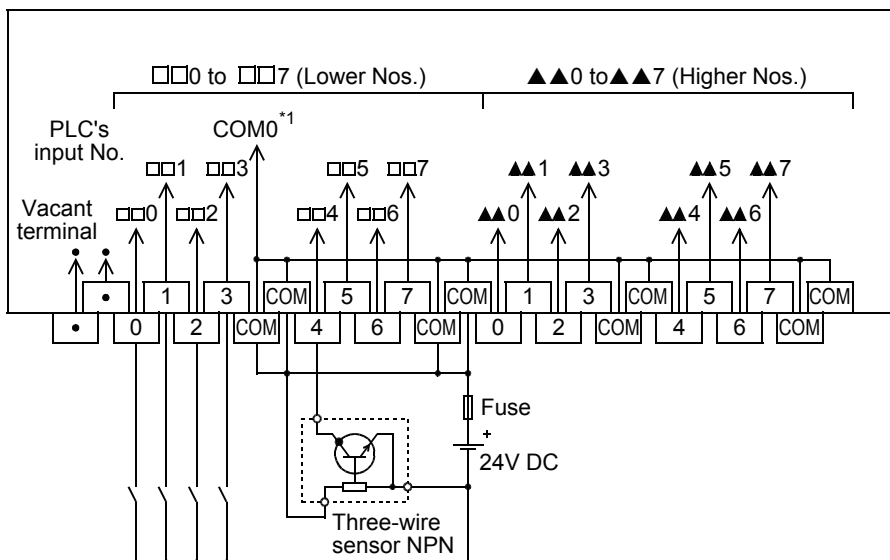
### 8.6.2 Example of input external wiring [Sink/Source wiring]

#### WIRING PRECAUTIONS

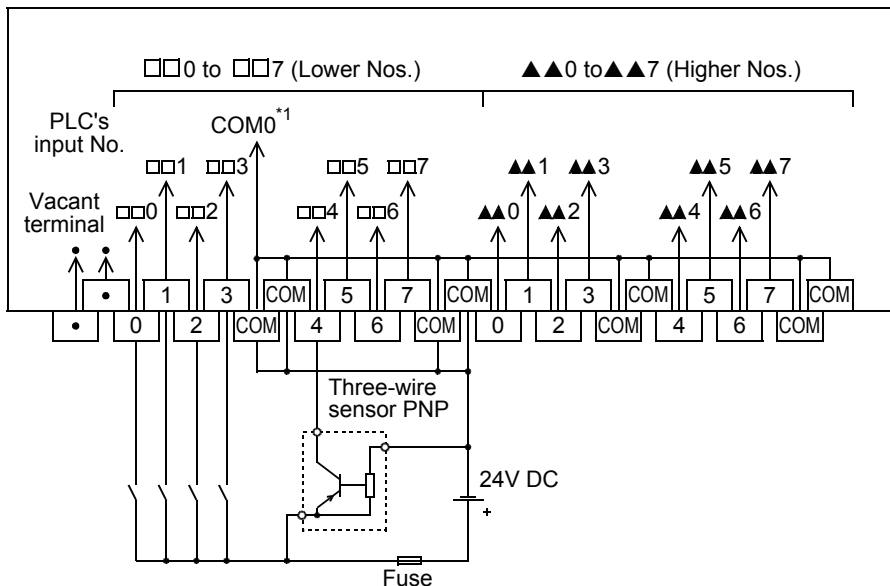


- Before cleaning or retightening terminals cut off all phases of the power supply externally.  
Failure to do so may cause electric shock.

#### 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

|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

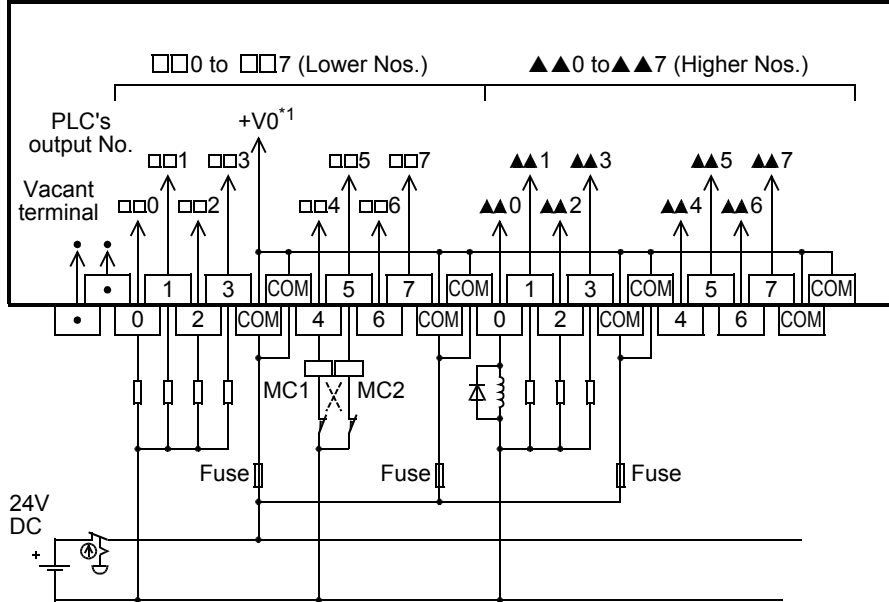
8.6.3 Example of output external wiring [Source wiring]

**WIRING PRECAUTIONS**



- Before cleaning or retightening terminals cut off all phases of the power supply externally. Failure to do so may cause electric shock.

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   |

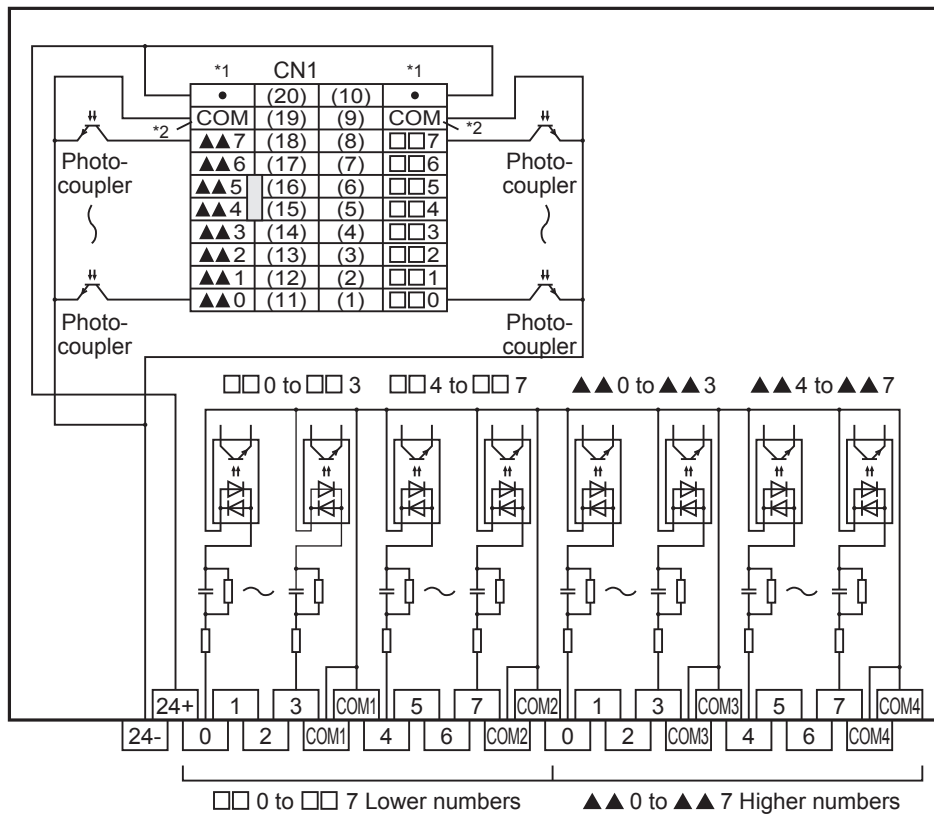
### 8.7.1 Specifications

| Item                        | FX-16EX-A1-TB   |
|-----------------------------|---|
| Connection form             | Terminal block (M3.5 screw)<br>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<br>6.2 mA/110 V AC 60 Hz  |
| Input impedance             | Approx. 21 k $\Omega$ /50 Hz<br>Approx. 18 k $\Omega$ /60 Hz  |
| Input sensitivity           | ON  |
|                             | OFF   |
| Response time <sup>*1</sup> | 25 to 30 ms   |
| 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) <sup>*2</sup>   |
| Input/output circuitry      | <p>The diagram illustrates the internal circuitry of the terminal block. On the left, the 'CN1 Connector side' is shown with a photocoupler. The photocoupler's output is connected to a terminal block labeled '0 to 7'. A common terminal 'COMn' is also shown. The external wiring section includes a 100V AC source connected through a fuse to the terminal block.</p> |

\*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.

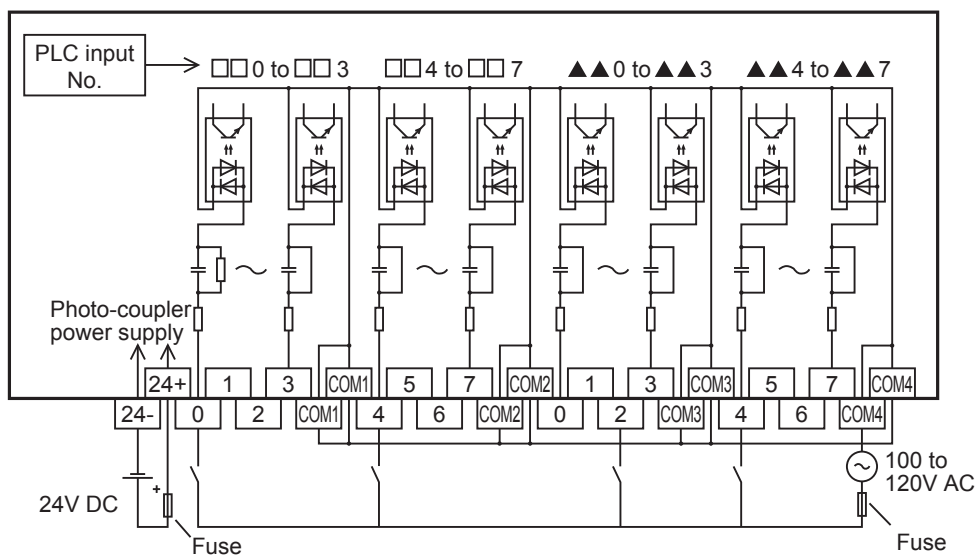
### 8.7.2 Internal circuit



\*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  |

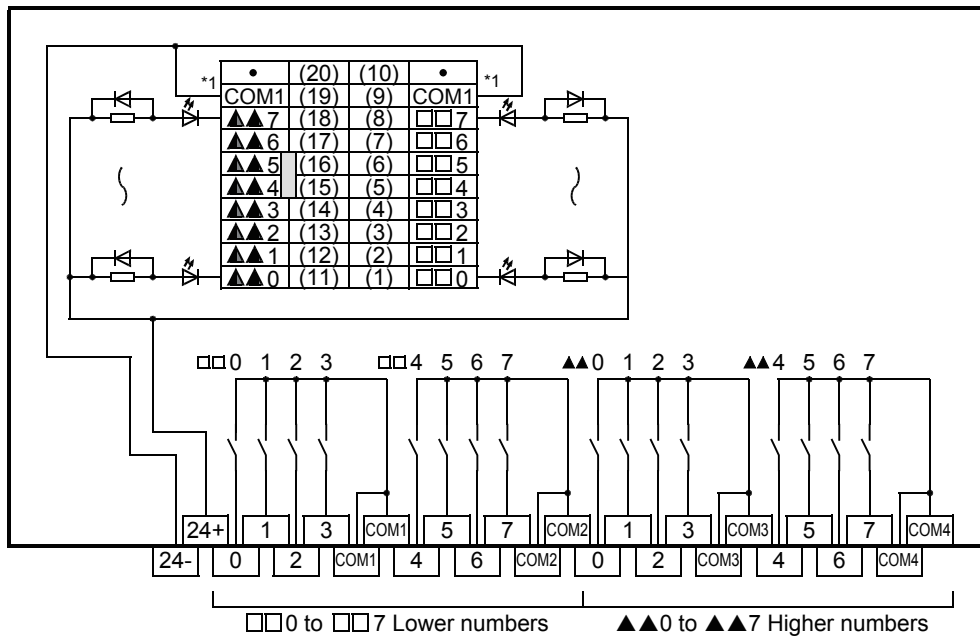
### 8.8.1 Specifications

| Item                         | FX-16EYR-TB  |
|------------------------------|--|
| Connection form              | Terminal block (M3.5 screw)<br>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 points   Make sure that the total load current of 4 resistance load points is 2 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.

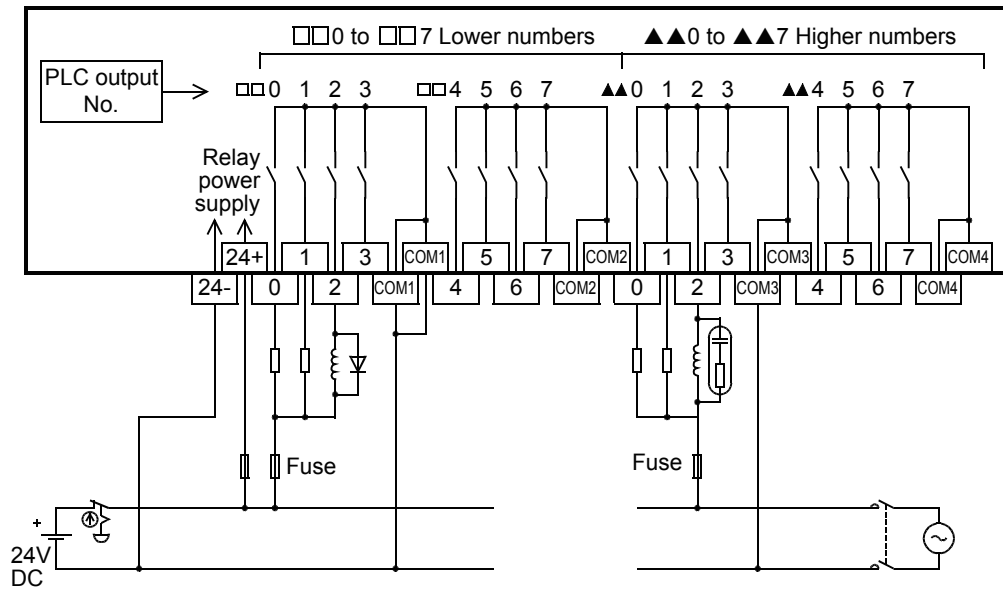
|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 8.8.2 Internal circuit



\*1. "COM2" or "COM3" in accordance with connected connector

### 8.8.3 Example of output external wiring

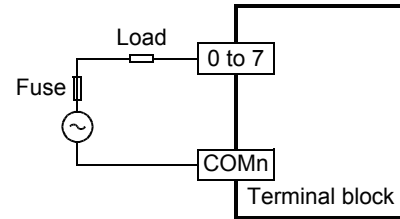




### 8.8.4 External wiring precautions

#### 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

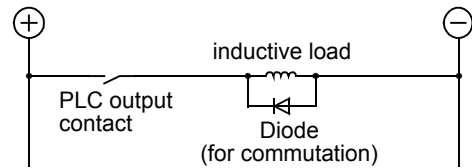
An internal protection circuit for the relays is not provided for the relay output circuit in the terminal block. It is recommended to use inductive loads with built-in protection circuits. When using loads without built-in protection circuits, insert an external contact protection circuit, etc. to reduce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

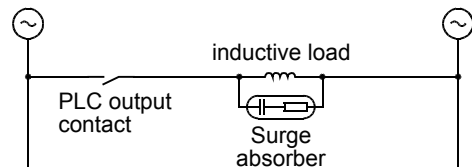


##### 2) AC circuit

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 $\mu$ F         |
| Forward current             | Approx. 100 to 200 $\Omega$ |



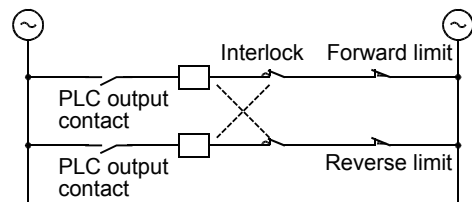
#### Reference

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

| Manufacturer        | Model name           |
|---------------------|----------------------|
| Rubycon Corporation | 250MCRA104100M B0325 |

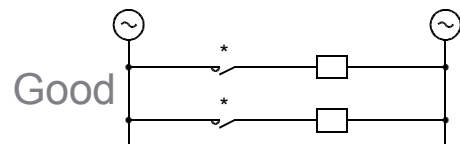
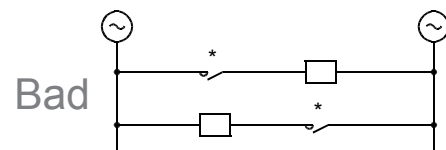
#### 3. Interlock

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.



|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

## 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  |

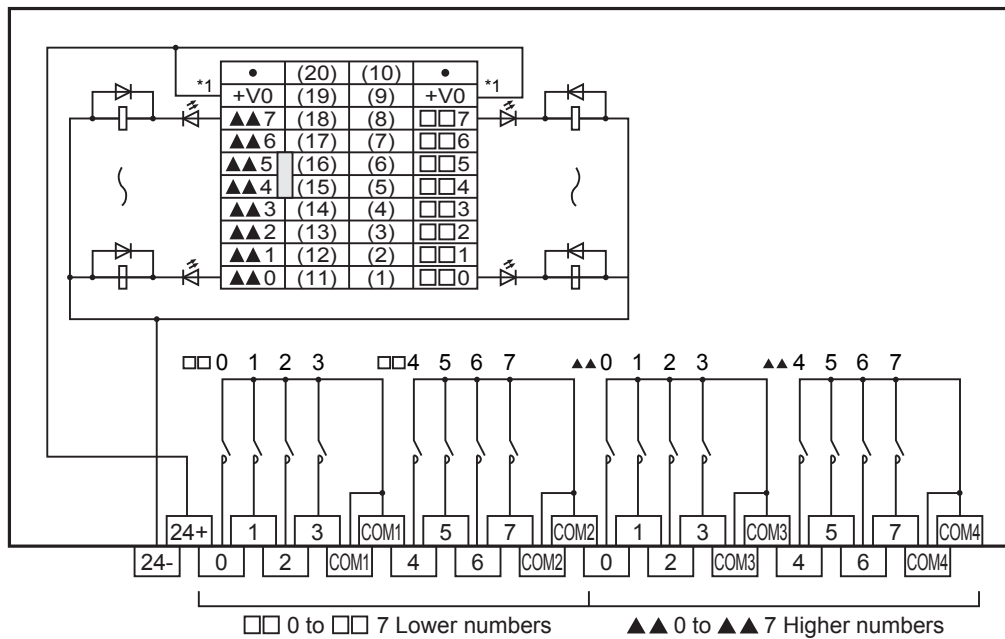
### 8.9.1 Specifications

| Item                         | FX-16EYR-ES-TB/UL  |  |
|------------------------------|--|--|
| Connection form              | Terminal block (M3.5 screw)<br>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 points   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.

|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 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.

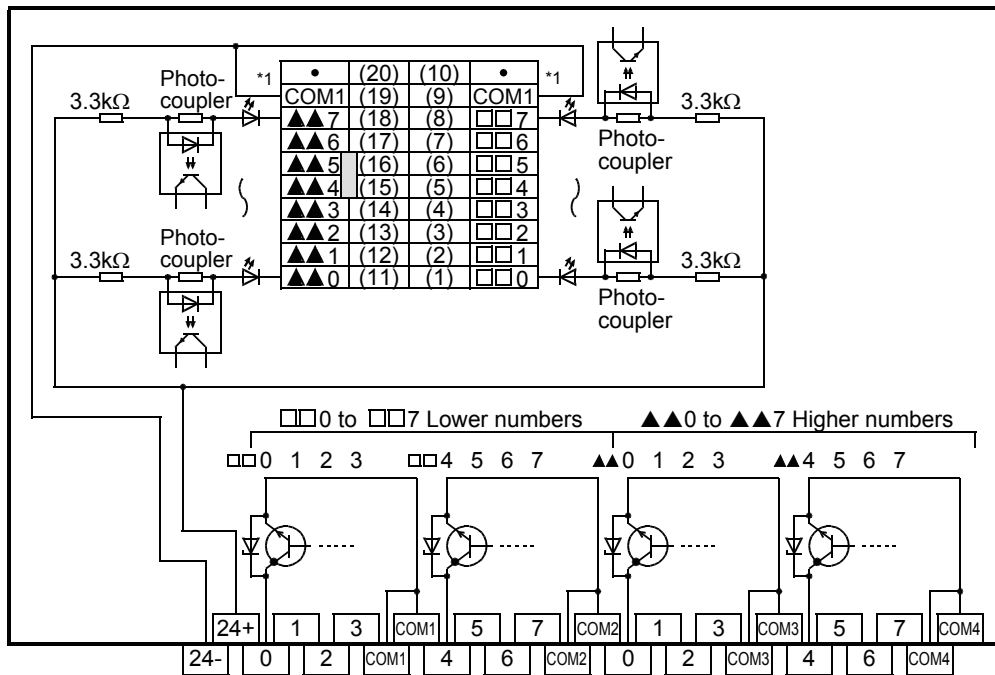
|                      | Unsupported Applications   |
|----------------------|--|
| Pulse output         | Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning 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)<br>The connection with the PLC is the connector. |   |
| input type/form              | Transistor/sink output   |   |
| External power supply        | 5 to 30 V DC   |   |
| Max.load                     | Resistance load  | 0.5 A/1points   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       |  |   |

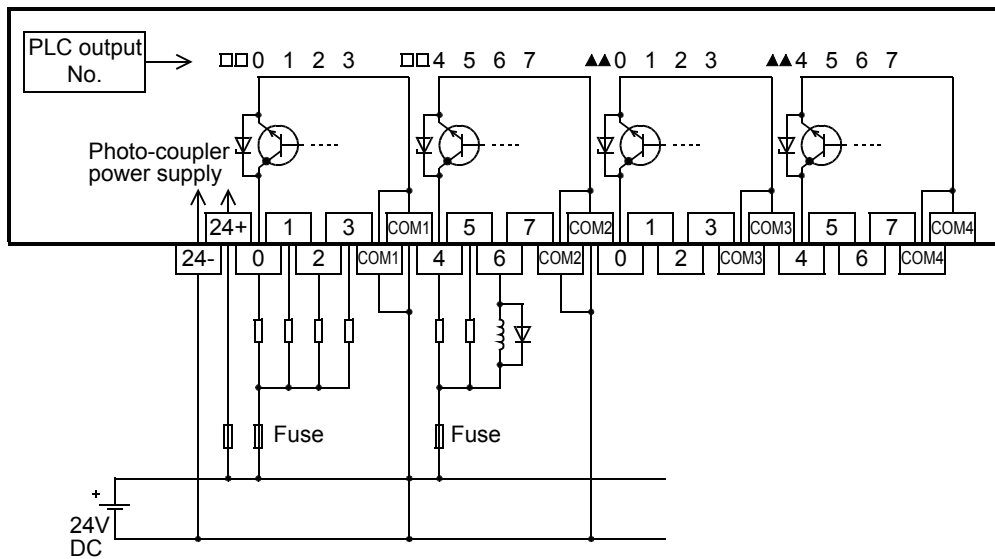
\*1. This response time does not include the response delay at the PLC.

### 8.10.2 Internal circuit



\*1. "COM2" or "COM3" in accordance with connected connector

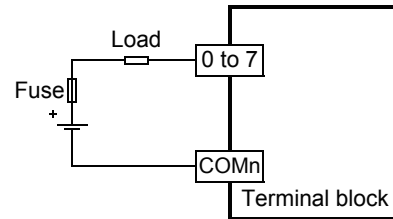
### 8.10.3 Example of output external wiring



### 8.10.4 External wiring precautions

#### 1. Protection circuit for load short-circuits

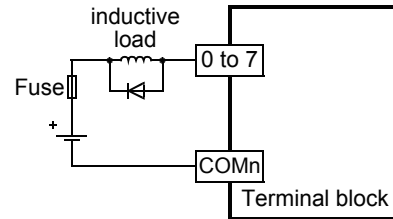
A short-circuit at a load connected to an output terminal could cause burnout at the output element or the PCB. To prevent this, a protection fuse should be inserted at the output. Use a load power supply capacity that is at least 2 times larger than the total rated fuse capacity.



#### 2. Transistor protection circuit for inductive loads

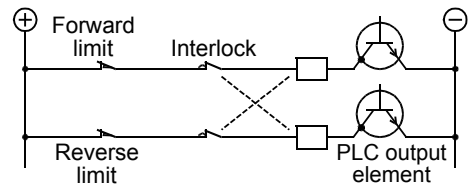
The transistor output circuit in the terminal block is equipped with a Zener diode (50 V) for protection. When an inductive load is connected, however, a diode should be connected parallel to the load when required. The diode must comply with the specifications shown below.

|                        |                                   |
|------------------------|-----------------------------------|
| <b>Counter voltage</b> | 5 to 10 times of the load voltage |
| <b>Forward current</b> | 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.



- 1** Outline
- 2** External Dimensions
- 3** Generic Specifications
- 4** Power Supply Specifications
- 5** Input Specifications
- 6** Output Specifications
- 7** Examples of Wiring for Various Uses
- 8** Terminal Block
- 9** Battery
- 10** Test Run, Maintenance, Troubleshooting

## 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  |

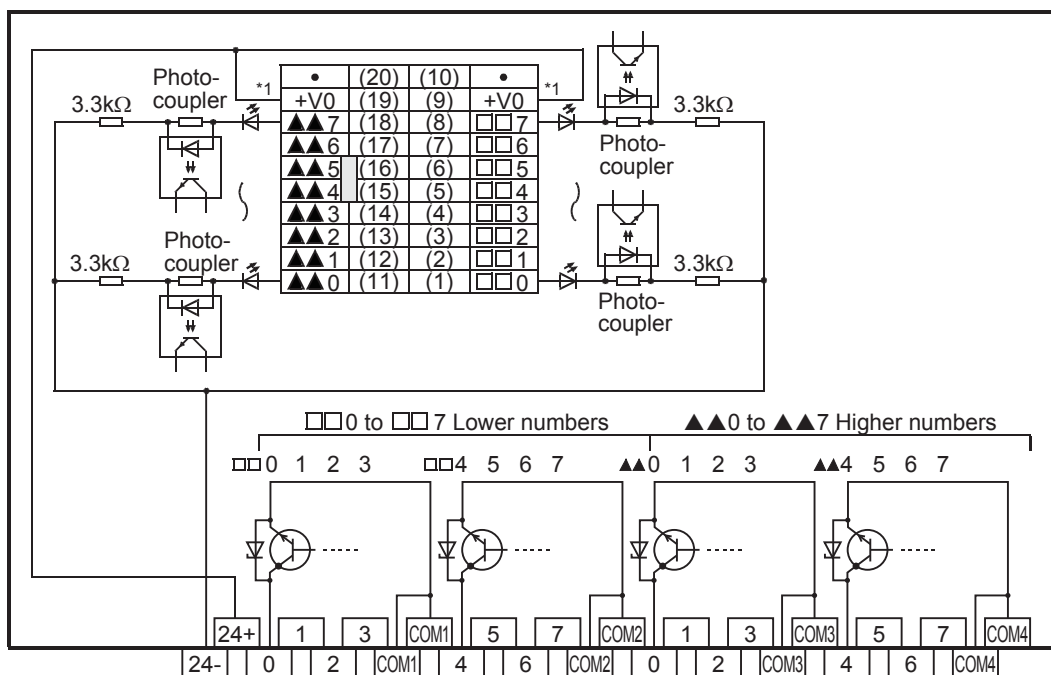
### 8.11.1 Specifications

| Item                         | FX-16EYT-ES-TB/UL  |                        |
|------------------------------|--|------------------------|
| Connection form              | Terminal block (M3.5 screw)<br>The connection with the PLC is the connector. |                        |
| Output type                  | Transistor/sink output   |                        |
| External power supply        | 5 to 30 V DC   |                        |
| Max. load                    | Resistance load  | 0.5 A/1points          |
|                              | 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.

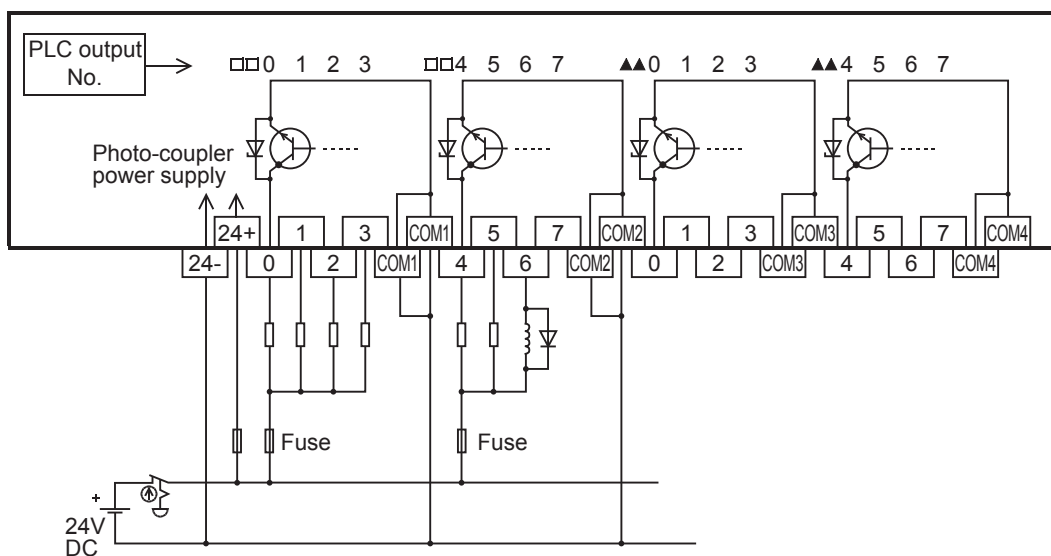


### 8.11.2 Internal circuit



\*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.

|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

## 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.

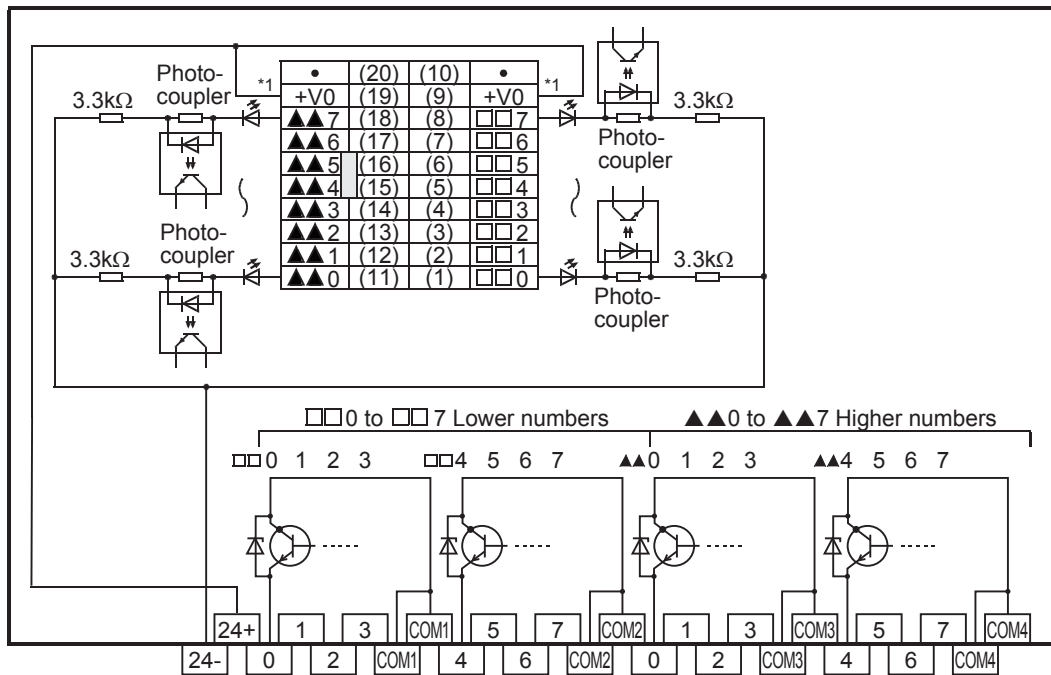
|                      | Unsupported Applications   |
|----------------------|--|
| Pulse output         | Pulse Y output (PLSY) instruction, acceleration/deceleration setup (PLSR) instruction, pulse width modulation (PWM) instruction, DOG search zero return (DSZR) instruction, batch data positioning 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)<br>The connection with the PLC is the connector. |   |
| Output type/form             | Transistor/source output   |   |
| External power supply        | 5 to 30 V DC   |   |
| Max. load                    | Resistance load  | 0.5 A/1points   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       |  |   |

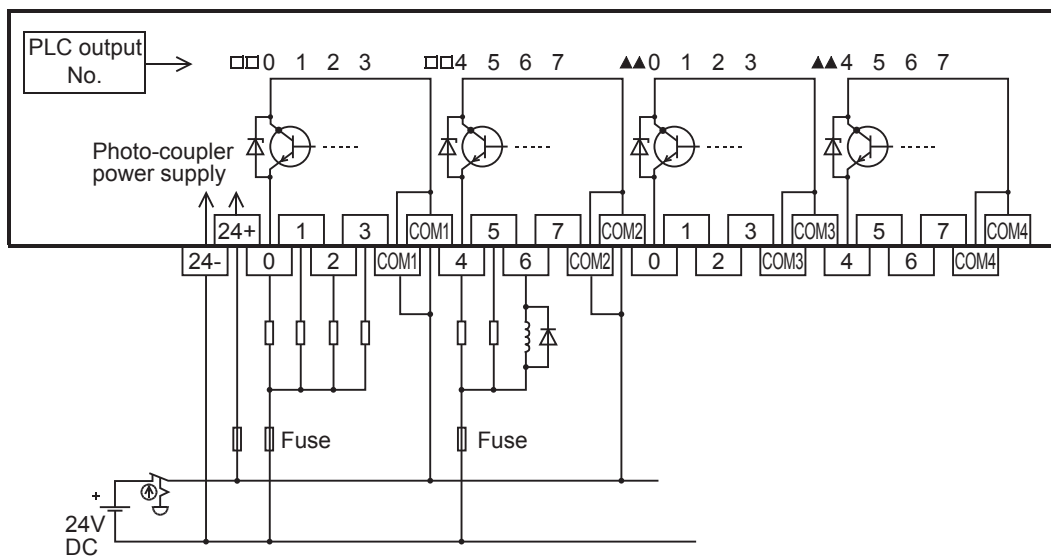
\*1. This response time does not include the response delay at the PLC.

### 8.12.2 Internal circuit



\*1. "+V1" or "+V2" in accordance with connected connector

### 8.12.3 Example of output external wiring

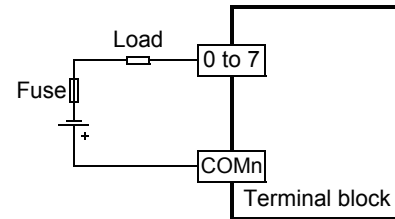


|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

### 8.12.4 External wiring precautions

#### 1. Protection circuit for load short-circuits

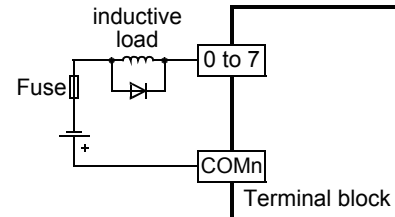
A short-circuit at a load connected to an output terminal could cause burnout at the output element or the PCB. To prevent this, a protection fuse should be inserted at the output. Use a load power supply capacity that is at least 2 times larger than the total rated fuse capacity.



#### 2. Transistor protection circuit for inductive loads

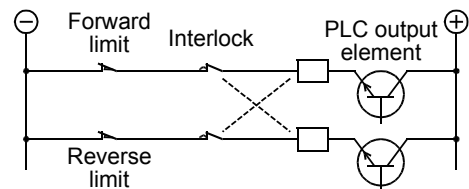
The transistor output circuit in the terminal block is equipped with a Zener diode (50 V) for protection. When an inductive load is connected, however, a diode should be connected parallel to the load when required. The diode must comply with the specifications shown below.

|                        |                                   |
|------------------------|-----------------------------------|
| <b>Counter voltage</b> | 5 to 10 times of the load voltage |
| <b>Forward current</b> | 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  |

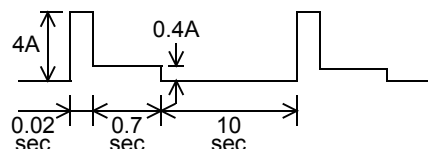
#### 8.13.1 Specifications

| Item                         | FX-16EYS-TB   |
|------------------------------|---|
| Connection form              | Terminal block (M3.5 screw)<br>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<br>36 VA/200 V AC   |
| Min. load                    | 0.4 VA/100 V AC<br>1.6 VA/200 V AC  |
| Open-circuit leakage current | 1 mA/100 V AC<br>2 mA/200 V AC  |
| Response time*2              | 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.

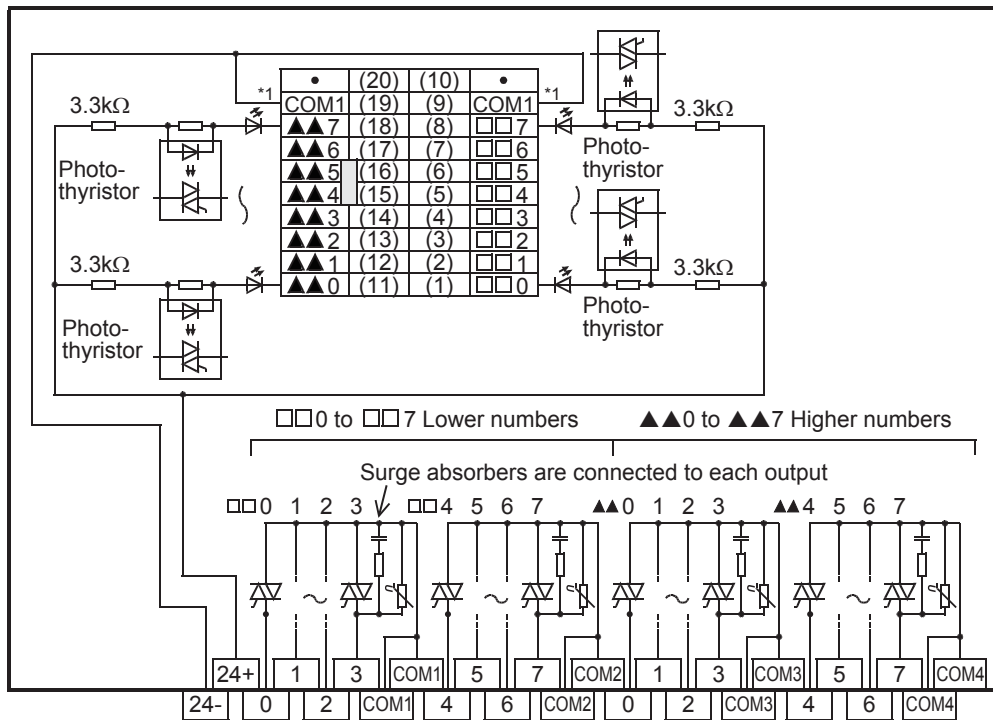
<Example>

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



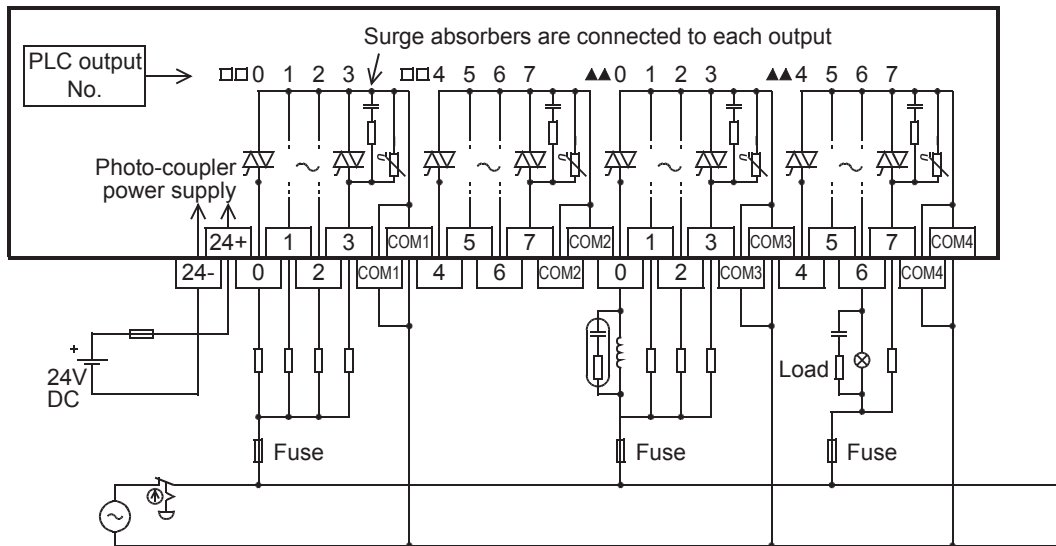
\*2. This response time does not include the response delay at the PLC.

8.13.2 Internal circuit



\*1. "COM2" or "COM3" in accordance with connected connector

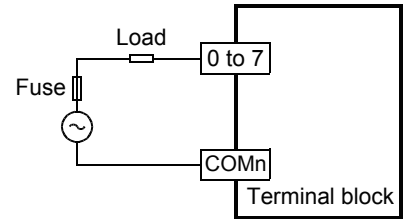
8.13.3 Example of output external wiring



### 8.13.4 External wiring precautions

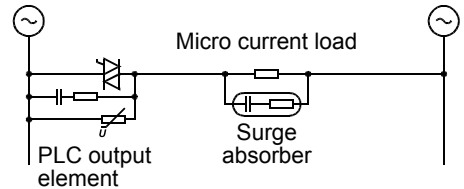
#### 1. Protection circuit for load short-circuits

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 $\mu$ F         |
| Resistance value            | Approx. 100 to 200 $\Omega$ |

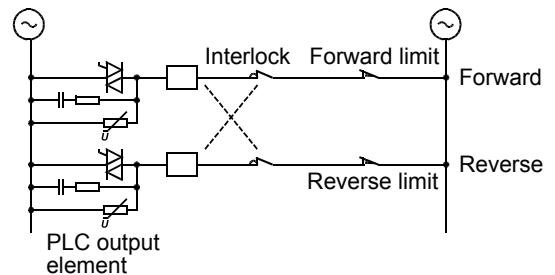
#### Reference

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

| Manufacturer        | Model name           |
|---------------------|----------------------|
| Rubycon Corporation | 250MCRA104100M B0325 |

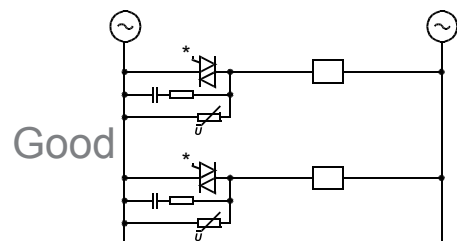
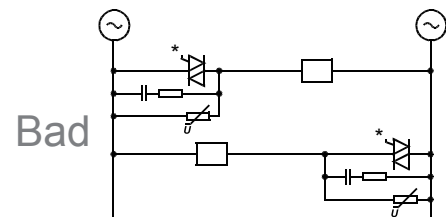
#### 3. Interlock

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.



|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

## 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  |

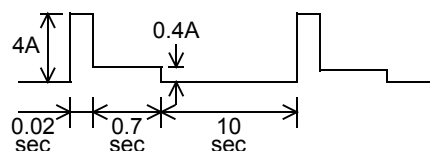
### 8.14.1 Specifications

| Item                         | FX-16EYS-ES-TB/UL   |
|------------------------------|---|
| Connection form              | Terminal block (M3.5 screw)<br>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<br>36 VA/200 V AC   |
| Min. load                    | 0.4 VA/100 V AC<br>1.6 VA/200 V AC  |
| Open-circuit leakage current | 1 mA/100 V AC<br>2 mA/200 V AC  |
| Response time*2              | 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>

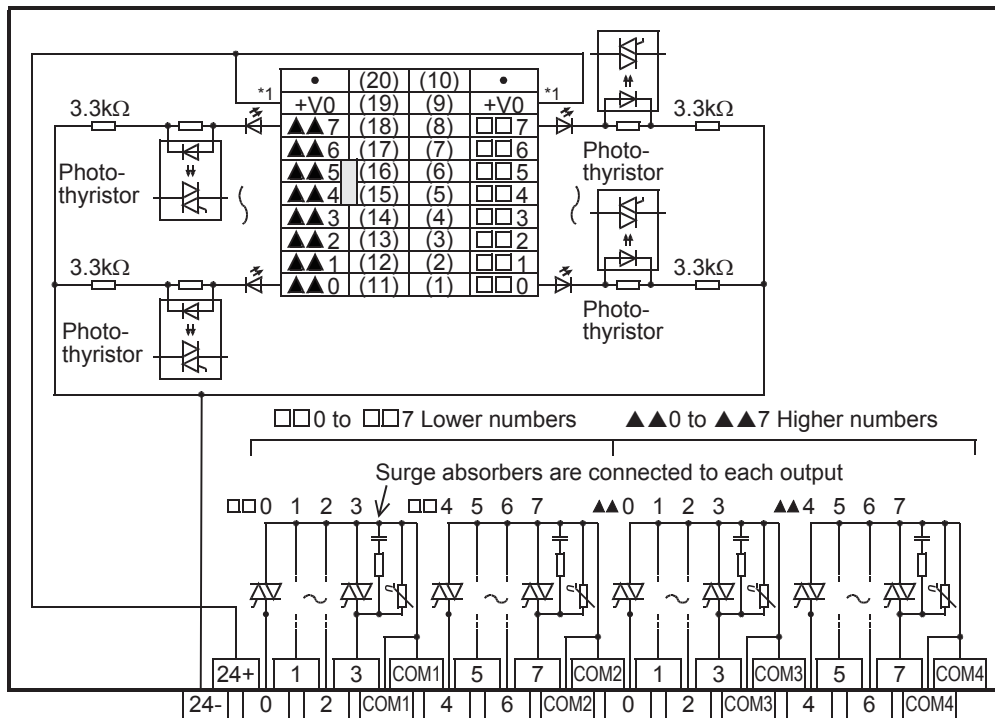
$$\sqrt{\frac{4^2 \times 0.02 + 0.4^2 \times 0.7}{0.02 + 0.7 + 10}} = 0.2\text{A}$$



\*2. This response time does not include the response delay at the PLC.

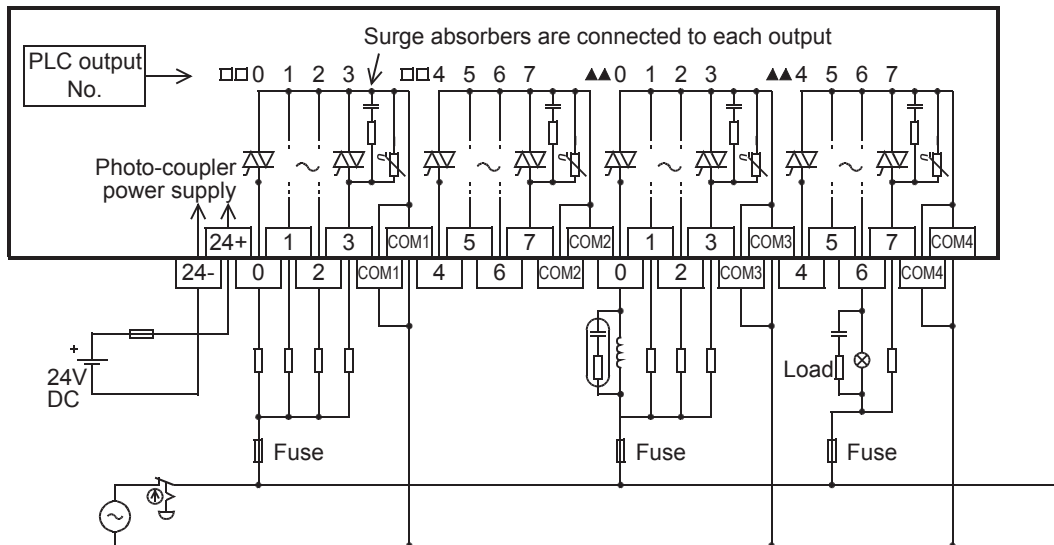


### 8.14.2 Internal circuit



\*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.

|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

## 9. Battery

### STARTUP AND MAINTENANCE PRECAUTIONS



## DANGER

- 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.

### 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 F.)

### 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 E.)

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.

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

Step 4 of the replacement procedure (below), must be performed within 20 seconds after step 3, or the memory content could be lost.

**1 Turn the power OFF.**

**2 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.

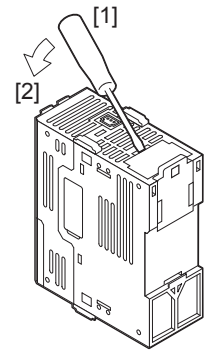
→ For the removal method, refer to Section 3.3.

### 3 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.



### 4 Remove the old battery (if it is connected).

Extract the old battery from the battery holder, and disconnect the battery connector.

### 5 Install the new battery.

Connect the battery connector to the new battery, and insert the battery into the battery holder.

### 6 Attach the battery cover.

#### Caution

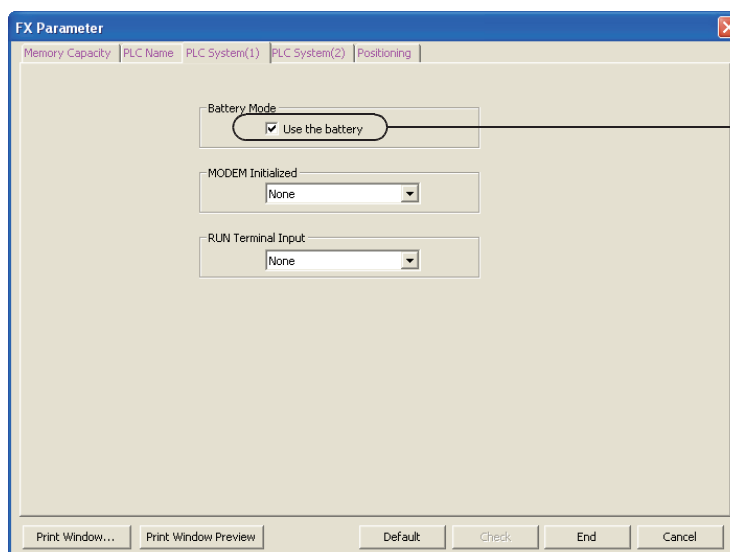
- 1) Battery replacement requires users to verify data integrity such as the PLC program, latched (battery backed) device values and RTC values. Before switching the PLC to RUN, ensure the safety of the operation.
- 2) If the battery backed data becomes unstable, clear the latched (battery backed) devices, 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.

## 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.)

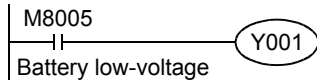


Put a check mark to the check box "Use the battery"

## 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



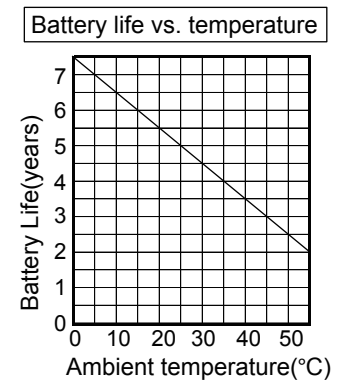
Y001 is output when a battery low-voltage condition occurs.

- M8006  
Battery low-voltage is latched.
- D8005  
Battery voltage can be monitored.

## 9.5 Battery life & replacement guidelines

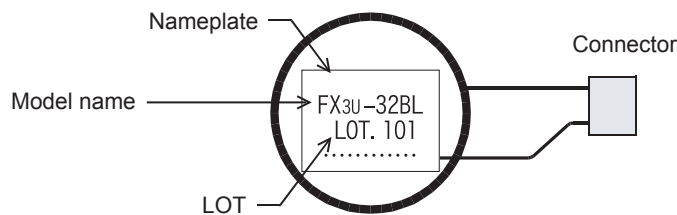
**FX3U-32BL battery life: Approx. 5 years (ambient temperature: 25 °C(77 °F))**

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.

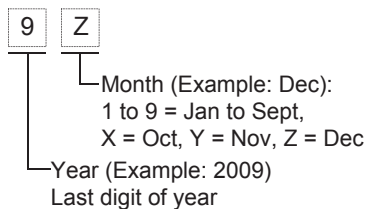


## 9.6 Reading the date of manufacture

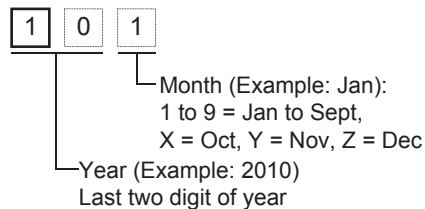
Reading the optional battery's lot No. (reference)



<Product during December, 2009 or earlier>



<Product from January, 2010>



1 Outline

2 External Dimensions

3 Generic Specifications

4 Power Supply Specifications

5 Input Specifications

6 Output Specifications

7 Examples of Wiring for Various Uses

8 Terminal Block

9 Battery

10 Test Run, Maintenance, Troubleshooting

## 9.7 Battery Related Precautions

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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



- 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.
- 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



- 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

### DISPOSAL PRECAUTIONS



- 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 F.)

### TRANSPORTATION AND STORAGE PRECAUTIONS



- 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 E.)

## 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.<br>1) Remove all input/output wires and power supply wires from the PLC.<br>2) Connect all terminals except the grounding terminal with a crossover wire in the PLC single unit.<br>3) Measure the voltage between the crossover wire and the grounding terminal.<br>Dielectric withstand voltage: 500 V AC for 1min<br>Insulation resistance: 500 V DC/5 MΩ or more |

### 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]

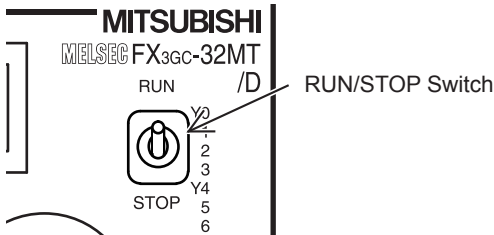
### 10.2.1 Methods of running and stopping

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.



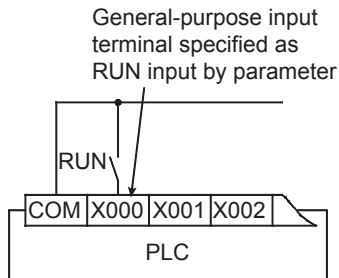
#### 2. Running and stopping with general-purpose input (RUN terminal)

##### Operation with one switch (RUN)

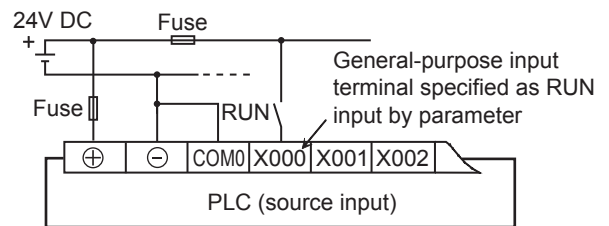
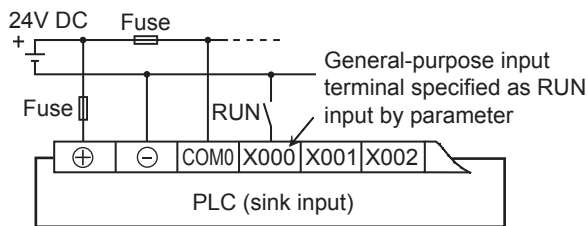
One of the input terminals X000 to X017 of the main unit can be used as a RUN input terminal by a parameter setting (refer to the figure below).

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.

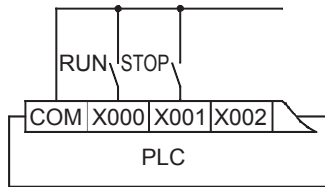
|    |  |
|----|--|
| 1  | Outline                                |
| 2  | External Dimensions                    |
| 3  | Generic Specifications                 |
| 4  | Power Supply Specifications            |
| 5  | Input Specifications                   |
| 6  | Output Specifications                  |
| 7  | Examples of Wiring for Various Uses    |
| 8  | Terminal Block                         |
| 9  | Battery                                |
| 10 | Test Run, Maintenance, Troubleshooting |

**Operation with two switches (RUN and STOP)**

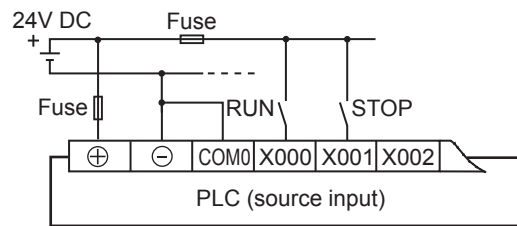
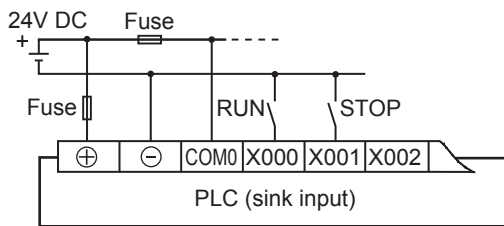
The PLC can be started and stopped with individual RUN and STOP push button switches. For this operation, a sequence program using M8035 to M8037 is necessary.

→ 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. <ul style="list-style-type: none"> <li>Power of the specified voltage and current is not being supplied to the power supply terminal.</li> <li>External wiring is incorrect.</li> <li>Internal error of PLC</li> </ul>                            | <ul style="list-style-type: none"> <li>Check the supply voltage.</li> <li>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.</li> </ul>  |
| Off          | One of the following problems may have occurred. <ul style="list-style-type: none"> <li>The power supply is off.</li> <li>External wiring is incorrect.</li> <li>Power of the specified voltage is not being supplied to the power supply terminal.</li> <li>The power cable is broken.</li> </ul> | <ul style="list-style-type: none"> <li>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.</li> <li>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.</li> </ul> |

### 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.   | <ol style="list-style-type: none"> <li>1) Stop the PLC, and re-apply power.<br/>If ERR LED goes off, a watchdog timer error may have occurred. Take any of the following measures.                             <ul style="list-style-type: none"> <li>- Review the program.<br/>The maximum value (D8012) of the scan time should not exceed the setting (D8000) of the watchdog timer.</li> <li>- Check that the input used for input interruption or pulse catch is not being abnormally turned on and off in one scan.</li> <li>- Check that the frequency of the pulse (duty of 50%) input to the high-speed counter does not exceed the specified range.</li> <li>- Add the WDT instructions.<br/>Add some WDT instructions to the program, and reset the watchdog timer several times in one scan.</li> <li>- Change the setting of the watchdog timer.<br/>Change the watchdog timer setting (D8000) in the program so that the setting is larger than the maximum value of the scan time (D8012).</li> </ul> </li> <li>2) Remove the PLC and supply power to it from another power supply on a desk.<br/>If the ERR LED goes off, noise may have affected the PLC. Take the following measures.                             <ul style="list-style-type: none"> <li>- Check the ground wiring, and reexamine the wiring route and installation location.</li> <li>- Fit a noise filter onto the power supply line.</li> </ul> </li> <li>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.</li> </ol> |
| Flashing     | One of the following errors has occurred in the PLC. <ul style="list-style-type: none"> <li>• Parameter error</li> <li>• Syntax error</li> <li>• Ladder error</li> </ul> | 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.<br>An I/O error, Comms.error or Runtime error may have occurred.  |

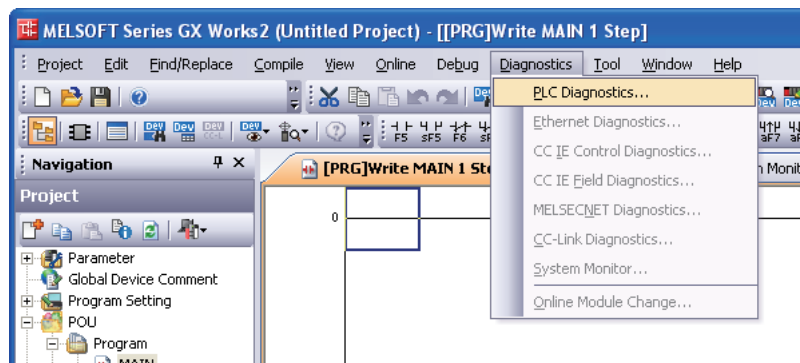
## 10.6 Judgment by Error Codes and Representation of Error Codes

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

The error in PLC is displayed.

The LED status of FX PLC is displayed.

Open the help window of GX Works2 to check the error details.

| Status | No.  | Error Step | Current Error   | Year/Month/Day | Time     |
|--------|------|------------|-----------------|----------------|----------|
| ▲      | 6401 |            | Parameter Error | 2011-11-29     | 11:48:14 |

LED Status:

- POWER
- RUN
- ERROR
- ALARM

PLC Information:

Memory Type: RAM  
CPU Version: 1.40



## 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                         |
|------------------------------------|-----------------------------------|
|                                    | SW□DNC-GXW2-E(Ver. 1.77F)         |
| 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               |

### 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  |   |   |   |  |
|---|-----------------------------------|---|---|---|---|---|--|
| <b>I/O configuration error [M8060(D8060)]</b>       |                                   |   |   |   |   |   |  |
| Ex-ample: 1020                                      | Continues operation               | <p>The head number of unconnected I/O device</p> <p>Example: When X020 is unconnected</p> <table border="1" style="margin-left: 20px;"> <tr> <td>1</td> <td>0</td> <td>2</td> <td>0</td> </tr> </table> <p style="margin-left: 20px;">BCD conversion value</p> <p style="margin-left: 20px;">Device number: 10 to 177</p> <p style="margin-left: 20px;">1: Input (X), 0: Output (Y)</p> <ul style="list-style-type: none"> <li>• 1st to 3rd digits: Device number</li> <li>• 4th digit: I/O type (1 = input (X), 0 = output (Y))</li> </ul> <p>Example: When 1020 is stored in D8060<br/>Inputs X020 and later are unconnected.</p> | 1   | 0 | 2 | 0 | <p>Unconnected I/O relay numbers are programmed.</p> <p>The PLC continues its operation. Modify the program, check wiring connection, or add the appropriate unit/block.</p> |
| 1   | 0                                 | 2   | 0   |   |   |   |  |
| <b>Serial communication error 2 [M8438 (D8438)]</b> |                                   |   |   |   |   |   |  |
| 0000  | —                                 | No error  |   |   |   |   |  |
| 3801  | Continues operation               | Parity, overrun or framing error  | <ul style="list-style-type: none"> <li>• Inverter communication, computer link and programming: Ensure the communication parameters are correctly set according to their applications.</li> <li>• N:N network, parallel link, etc.: Check programs according to the applications.</li> <li>• Remote maintenance: Ensure modem power is ON and check the settings of the AT commands.</li> <li>• Wiring: Check the communication cables for correct wiring.</li> </ul>   |   |   |   |  |
| 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   |   |   |   |   |  |
| 3812  |                                   | Parallel link character error   |   |   |   |   |  |
| 3813  |                                   | Parallel link sum error   |   |   |   |   |  |
| 3814  | Parallel link format error        |   |   |   |   |   |  |
| 3820  | Inverter communication error      |   |   |   |   |   |  |
| <b>PLC hardware error [M8061(D8061)]</b>            |                                   |   |   |   |   |   |  |
| 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   | <p>Isolate the PLC and supply power to it using a different power supply.</p> <p>If the ERR LED turns OFF, noise may be affecting the PLC. Take the following measures.</p> <ul style="list-style-type: none"> <li>- Check the ground wiring, and reexamine the wiring route and installation location.</li> <li>- Fit a noise filter onto the power supply line.</li> </ul> <p>If the ERR LED does not turn OFF even after the above actions are taken, consult your local Mitsubishi Electric representative.</p> |   |   |   |  |
| 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.<br>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   |
|---|-----------------------------------|---|--|
| <b>PLC/PP communication error (D8062)</b>           |                                   |   |  |
| 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   |  |
| <b>Serial communication error 1 [M8063 (D8063)]</b> |                                   |   |  |
| 0000  | —                                 | No error  |  |
| 6301  | Continues operation               | Parity, overrun or framing error  | <ul style="list-style-type: none"> <li>Inverter communication, computer link and programming: Ensure that the communication parameters are correctly set according to their applications.</li> <li>N:N network, parallel link, etc.: Check programs according to applications.</li> <li>Remote maintenance: Ensure modem power is ON and check the settings of the AT commands.</li> <li>Wiring: Check the communication cables for correct wiring.</li> </ul> |
| 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   |  |
| 6312  |                                   | Parallel link character error   |  |
| 6313  |                                   | Parallel link sum error   |  |
| 6314  |                                   | Parallel link format error  |  |
| 6320  | Inverter communication error      |   |  |
| <b>Parameter error [M8064(D8064)]</b>               |                                   |   |  |
| 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               |   |  |
| <b>Syntax error [M8065(D8065)]</b>                  |                                   |   |  |
| 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<br>Insufficient number of operands for an applied instruction                   |  |
| 6504  |                                   | Same label number is used more than once.<br>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   |  |

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| Error code                            | PLC operation at error occurrence   | Contents of error  | Action   |
|---------------------------------------|---|--|--|
| <b>Circuit error [M8066(D8066)]</b>   |   |  |  |
| 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:<br>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:<br>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:<br>MC, MCR, I (interrupt pointer), SRET or IRET.  |  |
| 6627                                  |   | No STL instruction   |  |
| 6628                                  | Invalid instruction is used in main program:<br>I (interrupt pointer), SRET or IRET |  |  |
| 6629                                  | No P or I (interrupt pointer)   |  |  |
| 6630                                  | No SRET or IRET instruction<br>STL-RET or MC-MCR instructions in subroutine         |  |  |
| 6631                                  | SRET programmed in invalid location   |  |  |
| 6632                                  | FEND programmed in invalid location   |  |  |
| <b>Operation error [M8067(D8067)]</b> |   |  |  |
| 0000                                  | —   | No error   |  |
| 6701                                  | Continues operation   | <ul style="list-style-type: none"> <li>No jump destination (pointer) for CJ or CALL instruction</li> <li>Label is undefined or out of P0 to P4095 due to indexing.</li> <li>Label P63 is executed in CALL instruction; cannot be used in CALL instruction as P63 is for jumping to END instruction.</li> </ul> | 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:<br>"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. <ul style="list-style-type: none"> <li>Review the program and check the contents of the operands used in applied instructions.</li> <li>Verify that the specified buffer memories exist in the counterpart equipment.</li> <li>Verify that extension cables are correctly connected.</li> </ul>   |

| Error code                            | PLC operation at error occurrence  | Contents of error  | Action   |
|---------------------------------------|--|--|--|
| <b>Operation error [M8067(D8067)]</b> |  |  |  |
| 6709                                  | Continues operation  | 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.<br>Even if the syntax or circuit design is correct, an operation error may still occur.<br>For example:<br>"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) ( $TS \leq 0$ )   | <PID instruction is stopped.><br>This error occurs in the parameter setting value or operation data executing PID instruction.<br>Check the contents of the parameters.  |
| 6732                                  |  | Incompatible input filter constant ( $\alpha$ ) ( $\alpha < 0$ or $100 \leq \alpha$ )  |  |
| 6733                                  |  | Incompatible proportional gain (KP) ( $KP < 0$ )   |  |
| 6734                                  |  | Incompatible integral time (TI) ( $TI < 0$ )   |  |
| 6735                                  |  | Incompatible derivative gain (KD) ( $KD < 0$ or $201 \leq KD$ )  |  |
| 6736                                  |  | Incompatible derivative time (TD) ( $TD < 0$ )   |  |
| 6740                                  |  | Sampling time (TS) $\leq$ Scan time  |  |
| 6742                                  |  | Variation of measured value exceeds limit.<br>( $\Delta PV < -32768$ or $+32767 < \Delta PV$ )   | <PID operation is continued.><br>The operation is continued with each parameter set to the maximum or minimum value.   |
| 6743                                  |  | Deviation exceeds limit.<br>( $EV < -32768$ or $+32767 < EV$ )   |  |
| 6744                                  |  | Integral result exceeds limit.<br>(Outside range from -32768 to +32767)  |  |
| 6745                                  |  | Derivative value exceeds limit due to derivative gain (KD).  |  |
| 6746                                  |  | Derivative result exceeds limit.<br>(Outside range from -32768 to +32767)  | <Transpose of output upper limit value and output lower limit value. → PID operation is continued.><br>Check whether the target setting contents are correct.  |
| 6747                                  |  | PID operation result exceeds limit.<br>(Outside range from -32768 to +32767)   |  |
| 6748                                  |  | PID output upper limit set value < PID output lower limit set value.   | <Alarm output is not given. → PID operation is continued.><br>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) | <Auto tuning is finished. → PID operation is started.><br>• The deviation at start of auto tuning is 150 or less.<br>• The deviation at end of auto tuning is 1/3 or more of the deviation at start of auto tuning.<br>Check the measured value and target value, and then execute auto tuning again.  |  |
| 6750                                  | <Step response method><br>Improper auto tuning result  | <Auto tuning is forcibly finished. → PID operation is not started.><br>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.<br>Correct the relationship among the target value, output value for auto tuning, and the measured value, and then execute auto tuning again. |  |
| 6751                                  | <Step response method><br>Auto tuning operation direction mismatch                               | <Auto tuning is finished. → PID operation is not started.><br>Because the set value was fluctuated during auto tuning, auto tuning was not executed correctly.<br>Set the sampling time to a value larger than the output change cycle, or set a larger value for the input filter constant.<br>After changing the setting, execute auto tuning again.   |  |
| 6752                                  | <Step response method><br>Improper auto tuning result  |  |  |

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| Error code                                 | PLC operation at error occurrence            | Contents of error   | Action   |
|--|--|---|--|
| <b>Operation error [M8067(D8067)]</b>      |  |   |  |
| 6753                                       | Continues operation                          | <Limit cycle method><br>Auto tuning operation direction mismatch  | <Auto tuning is forcibly finished. → PID operation is not started.>  |
| 6754                                       |  | <Limit cycle method><br>Abnormal PV threshold (hysteresis) set value for auto tuning (SHPV < 0)   | Check whether the target setting contents are correct.   |
| 6755                                       |  | <Limit cycle method><br>Abnormal auto tuning transfer status<br>(Data of device controlling transfer status is abnormally overwritten.)     | <Auto tuning is forcibly finished. → PID operation is not started.><br>Ensure that devices occupied by PID instruction are not overwritten in the program.   |
| 6756                                       |  | <Limit cycle method><br>Abnormal result due to excessive auto tuning measurement time ( $\tau_{on} > \tau$ , $\tau_{on} < 0$ , $\tau < 0$ ) | <Auto tuning is forcibly finished. → PID operation is not started.><br>The auto tuning time is longer than necessary.<br>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 ( $\alpha$ ), or set a smaller value to the PV threshold (SHPV) for auto tuning, and then check the result for improvement. |
| 6757                                       |  | <Limit cycle method><br>Auto tuning result exceeds proportional gain. (KP = outside range from 0 to 32767)                                  | <Auto tuning is finished (KP = 32767). → PID operation is started.><br>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.  |
| 6758                                       |  | <Limit cycle method><br>Auto tuning result exceeds integral time. (TI = outside range from 0 to 32767)                                      | <Auto tuning is finished (KP = 32767). → PID operation is started.><br>The auto tuning time is longer than necessary.  |
| 6759                                       |  | <Limit cycle method><br>Auto tuning result exceeds derivative time. (TD = outside range from 0 to 32767)                                    | 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 ( $\alpha$ ), or set a smaller value to the PV threshold (SHPV) for auto tuning, and then check the result for improvement.  |
| 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:<br>- Input interrupt<br>- High-speed counter C235 to C255<br>- Pulse catch M8170 to M8175<br>- 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                                       | EEPROM access error                          | Something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.                                      |  |
| <b>Special block error [M8449 (D8449)]</b> |  |   |  |
| □020*1                                     | Continues operation                          | General data sum error  | Verify that extension cables are correctly connected.  |
| □021*1                                     |  | General data message error  |  |
| □080*1                                     |  | FROM/TO error   | This error occurs in the execution of operation.<br>• Review the program and check the contents of the operands used in applied instructions.<br>• Verify that the specified buffer memories exist in the counterpart equipment.<br>• 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.<br>• Verify that extension cables are correctly connected.   |

\*1. The unit number 0 to 7 of the special function unit/block error is put in □.

## 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 $\Delta$  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.<br>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. <ul style="list-style-type: none"> <li>• 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 +20% -15%".</li> <li>• Check the external wiring, connected equipment configuration and extension cable connection.</li> </ul> In the FX3GC-32MT/DSS, confirm using the tester that the voltage between the COM $\Delta$ terminal and an input terminal is approximately 24 V DC. <ul style="list-style-type: none"> <li>• 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 +20% -15%".</li> <li>• Check the external wiring, connected equipment configuration and extension cable connection.</li> </ul> |

#### 2. Input does not turn off.

Check for leakage current from input devices.

If the leakage current is 1.5 mA or more, 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

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#### 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 Connectivity

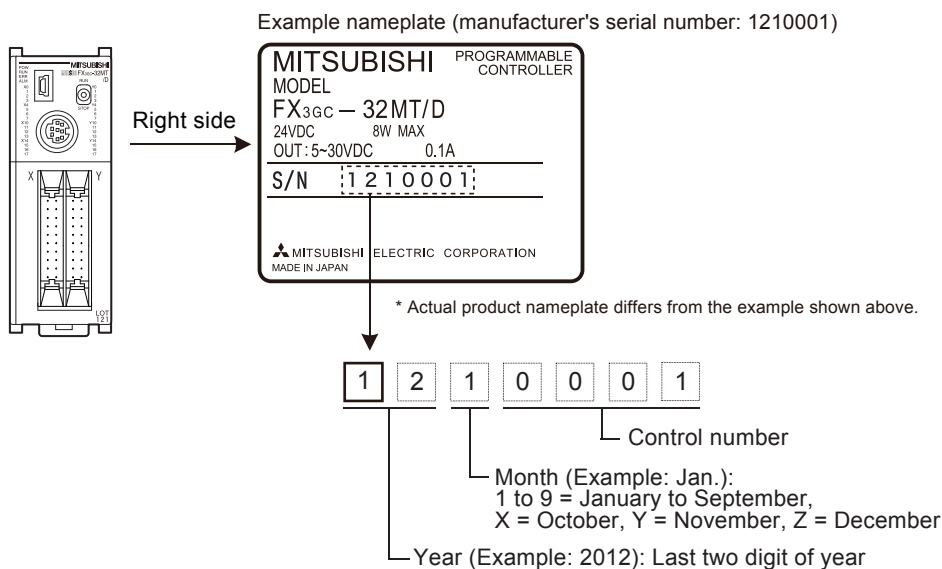
## Appendix A-1 Version Upgrade History

### 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.

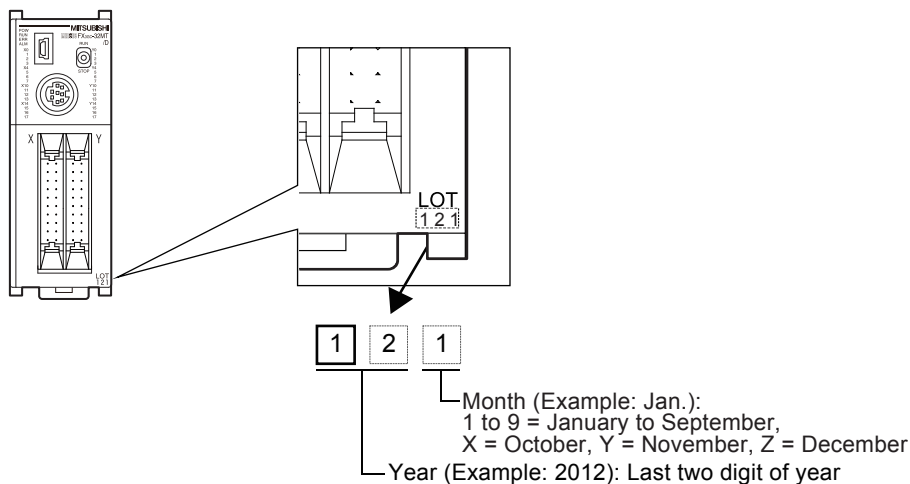
#### 1. Checking the name plate

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.



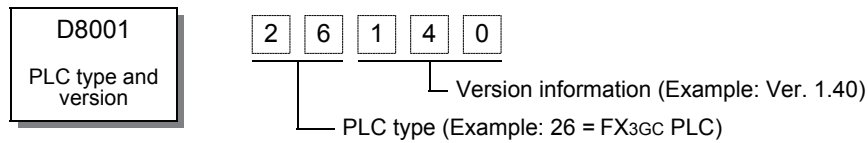
#### 2. Checking the front of the product

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

In FX3GC PLCs, users can obtain the PLC version information by monitoring special data register D8001 (decimal number).



## 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<br>(Corresponds to FX3G PLC Ver. 1.40.) |

## 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.

| FX3GC PLC version | Model name<br>(Media model name is shown below.) | Applicable GX Works2 version | Remarks |
|-------------------|--|------------------------------|---------|
| Ver. 1.40         | GX Works2<br>SW□DNC-GXW2-E                       | Ver. 1.77F or later          | -       |

### Appendix A-2-2 In the case of programming tool (version) not applicable

Inapplicable programming tools can program by setting alternative model.

#### 1. Alternative model setting

| Model to be programmed | Model to be set |   |      |   | Priority High → Low |   |                    |
|------------------------|-----------------|---|------|---|---------------------|---|--------------------|
| FX3GC PLC              | FX3GC           | → | FX3G | → | FX1N <sup>*1</sup>  | → | FX2N <sup>*1</sup> |

\*1. "FX2N" is selected when the FX-10P(-E) is used.

#### 2. Contents of restrictions

- Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in a PLC selected as the alternative model.
- 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.

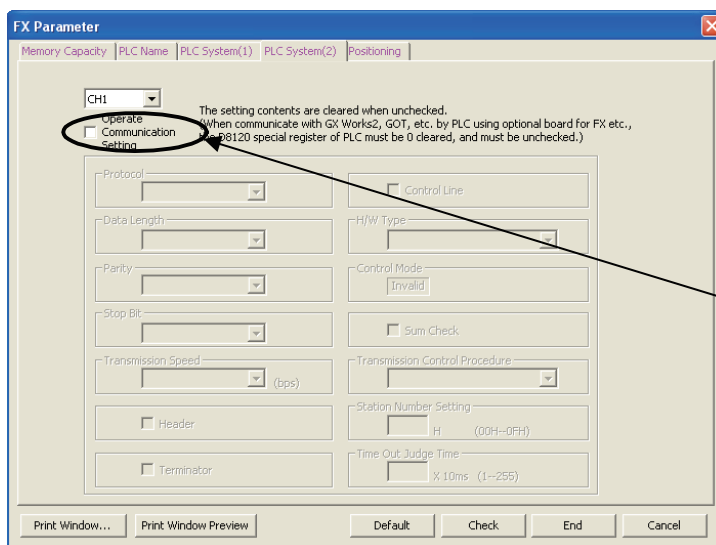
\*2. Select FX3G when using a programming tool that does not support the FX3GC PLC.

## 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).



Leave this unchecked.

## 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<br>(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<br>(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.              |

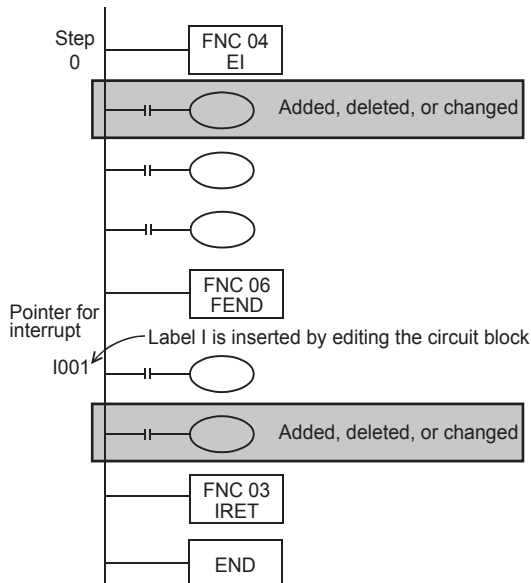
\*1. Write during RUN is not possible with a SFC program.

\*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<br>Circuit blocks in which 1-ms timers (T246 to T249 and T256 to T319) are added in edited circuits<br>Circuit blocks in which the following instructions are included in edited circuits <ul style="list-style-type: none"> <li>• Instruction to output high-speed counters C235 to C255 (OUT instruction)</li> <li>• TBL (FNC152) instruction</li> </ul> |

\*1. Circuit blocks cannot be edited to insert a label as shown below when written during RUN.



| Item  | Caution  |   |                                   |                                    |     |                     |                     |    |                 |                     |
|---|--|---|-----------------------------------|------------------------------------|-----|---------------------|---------------------|----|-----------------|---------------------|
| <p>Circuit blocks which require attention on operation after write during RUN</p> | <p>Avoid write during RUN to a circuit block including the following instructions during execution.<br/>If write during RUN is executed to such a circuit block, the PLC decelerates and stops pulse output.</p> <ul style="list-style-type: none"> <li>• DSZR (FNC150), ZRN (FNC156), PLSV (FNC157) instructions [with acceleration/deceleration operation], DRVI (FNC158) and/or DRVA (FNC159) instructions</li> </ul>   |   |                                   |                                    |     |                     |                     |    |                 |                     |
|   | <p>Avoid write during RUN to a circuit block including the following instruction during execution.<br/>If write during RUN is executed to such a circuit block, the PLC immediately stops pulse output.</p> <ul style="list-style-type: none"> <li>• PLSV (FNC157) instruction [without acceleration/deceleration operation]</li> </ul>  |   |                                   |                                    |     |                     |                     |    |                 |                     |
|   | <p>Avoid write during RUN to a circuit block including the following instructions during execution of communication.<br/>If write during RUN is executed to such a circuit block, the PLC may stop communication after that.<br/>If the PLC stops communication, set the PLC to the STOP mode once, and then set it to the RUN mode again.</p> <ul style="list-style-type: none"> <li>• IVCK (FNC270), IVDR (FNC271), IVRD (FNC272), IVWR (FNC273) and IVMC (FNC275) instructions</li> </ul>   |   |                                   |                                    |     |                     |                     |    |                 |                     |
|   | <ul style="list-style-type: none"> <li>• Instructions for falling edge pulse<br/>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.<br/>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.<br/>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.</li> <li>• Instructions for rising edge pulse<br/>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.<br/>Target instructions for rising edge pulse: LDP, ANDP, ORP, and pulse operation type applied instructions (such as MOV<sub>P</sub>)</li> </ul> <table border="1"> <thead> <tr> <th>Contact ON/OFF status<br/>(while write during RUN is executed)</th> <th>Instruction for rising edge pulse</th> <th>Instruction for falling edge pulse</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>*1 The PLS instruction is not executed.</p> | Contact ON/OFF status<br>(while write during RUN is executed) | Instruction for rising edge pulse | Instruction for falling edge pulse | OFF | Not executed        | Not executed        | ON | Executed*1      | Not executed        |
| Contact ON/OFF status<br>(while write during RUN is executed)                     | Instruction for rising edge pulse  | Instruction for falling edge pulse                            |                                   |                                    |     |                     |                     |    |                 |                     |
| OFF   | Not executed   | Not executed  |                                   |                                    |     |                     |                     |    |                 |                     |
| ON  | Executed*1   | Not executed  |                                   |                                    |     |                     |                     |    |                 |                     |
|   | <p>Writing in RUN mode to circuit blocks including the following instructions results in the following operation</p> <ul style="list-style-type: none"> <li>• MEP instruction (Conversion of operation result to leading edge pulse instruction)<br/>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.</li> <li>• MEF instruction (Conversion of operation result to trailing edge pulse instruction)<br/>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.<br/>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)</li> </ul> <table border="1"> <thead> <tr> <th>Operation result up to MEP/MEF instruction</th> <th>MEP instruction</th> <th>MEF instruction</th> </tr> </thead> <tbody> <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> </tbody> </table>  | Operation result up to MEP/MEF instruction                    | MEP instruction                   | MEF instruction                    | OFF | OFF (nonconducting) | OFF (nonconducting) | ON | ON (conducting) | OFF (nonconducting) |
| Operation result up to MEP/MEF instruction  | MEP instruction  | MEF instruction   |                                   |                                    |     |                     |                     |    |                 |                     |
| OFF   | OFF (nonconducting)  | OFF (nonconducting)   |                                   |                                    |     |                     |                     |    |                 |                     |
| ON  | ON (conducting)  | OFF (nonconducting)   |                                   |                                    |     |                     |                     |    |                 |                     |
| <p>Others</p>   | <ul style="list-style-type: none"> <li>• When writing during RUN with GX Works2 Ver. 1.08J or later, GX Developer Ver. 8.72A or later, the program is as follows.<br/>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.</li> </ul>  |   |                                   |                                    |     |                     |                     |    |                 |                     |

|          |   |
|----------|---|
| <b>A</b> | Version Information                       |
| <b>B</b> | Performance Specifications                |
| <b>C</b> | Special Devices (M8000-D8000-)            |
| <b>D</b> | Instruction List                          |
| <b>E</b> | Precautions for battery transportation    |
| <b>F</b> | Handling of batteries in EU member states |

## Appendix A-3 Precautions on 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

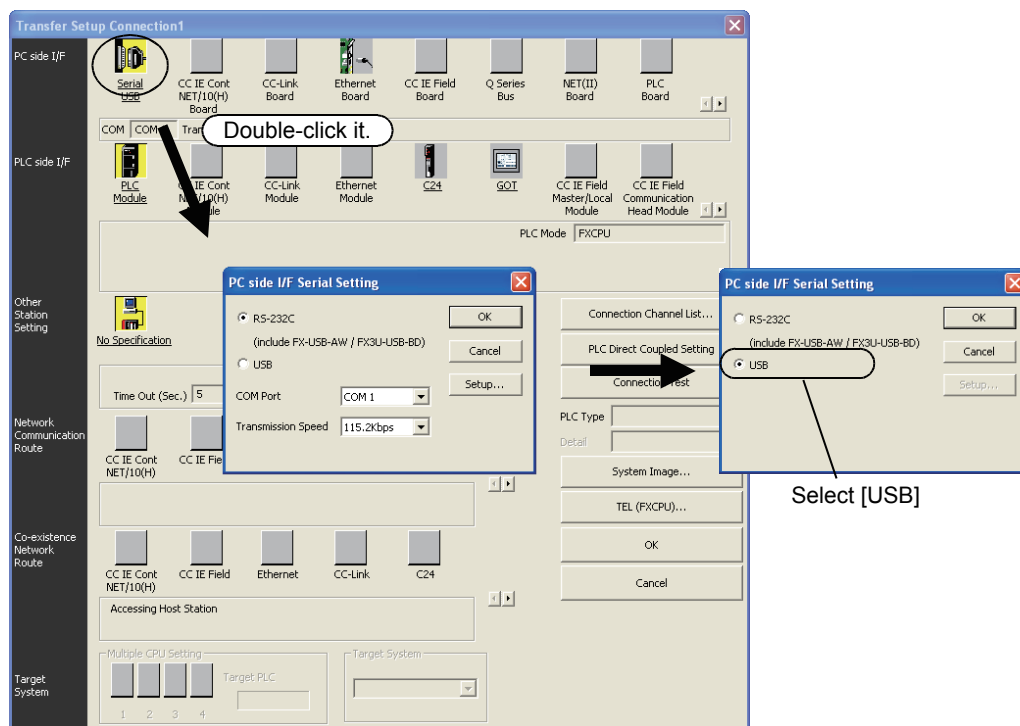
It is necessary to install the USB driver to execute USB communication using the (built-in USB) programming port.

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]**.

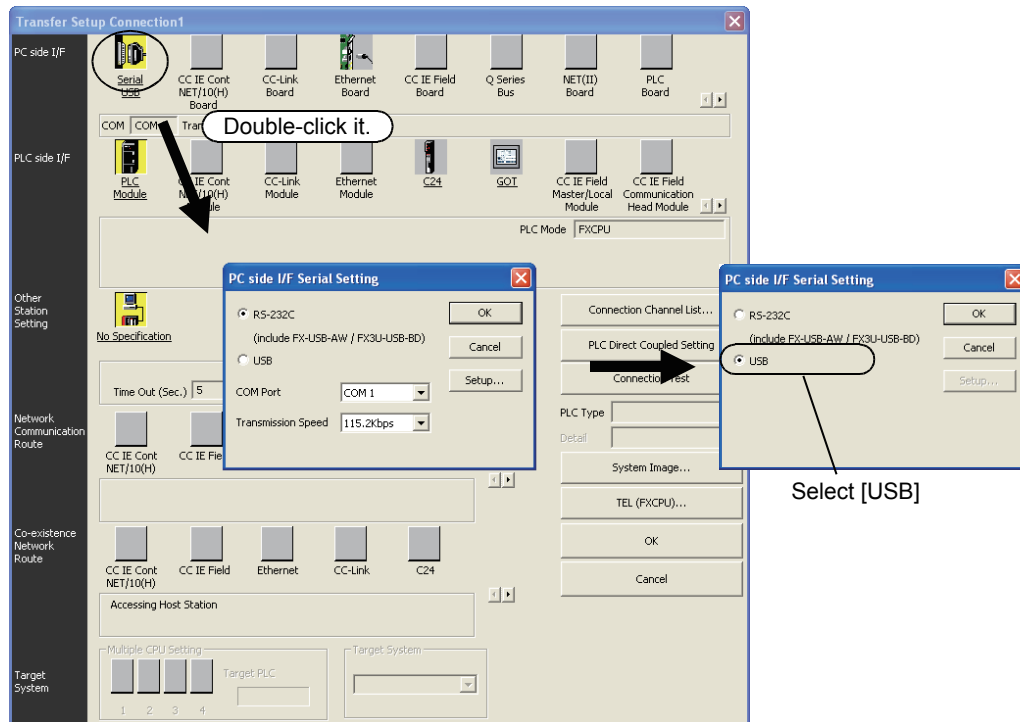


4. Click the **[OK]** button to finish the setting.

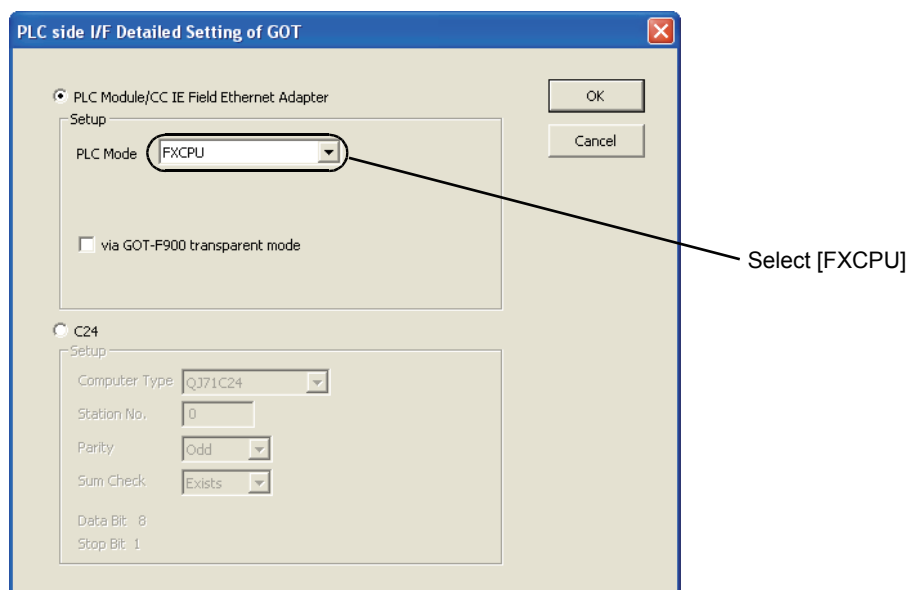
## Appendix A-4 Cautions on using FA transparent function in GOT1000 Series

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.

A

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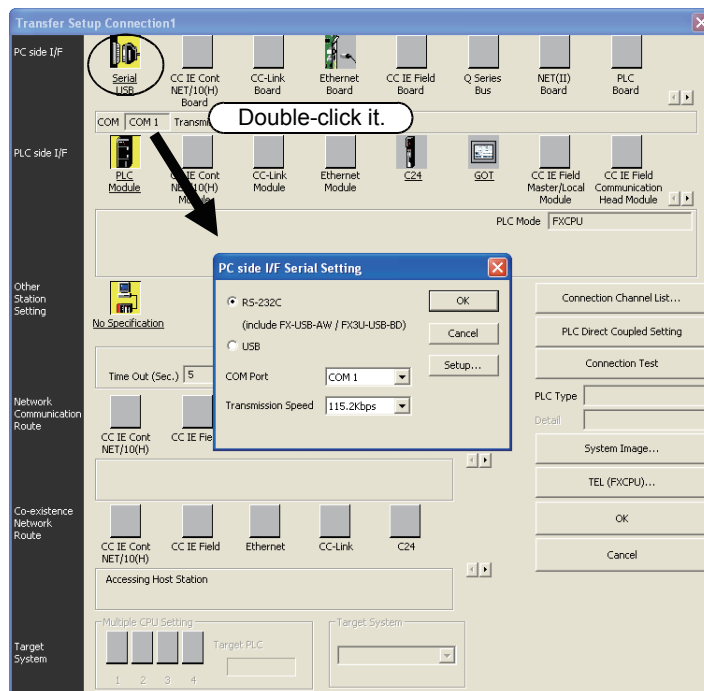
F

Handling of batteries in EU member states

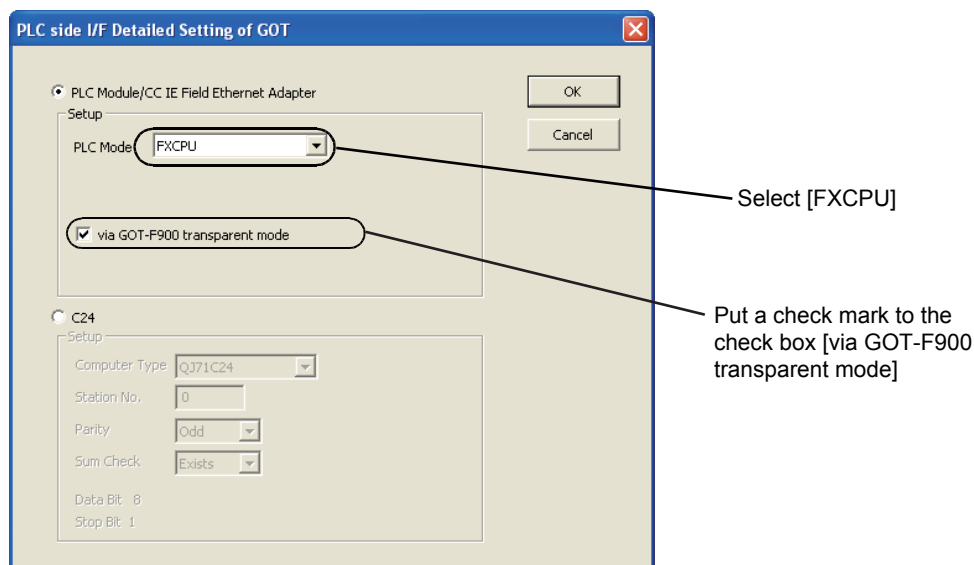
## Appendix A-5 Cautions on using transparent port (2-port) function of GOT-F900 Series

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    | <p>Standard monitor OS, communication driver and option OS which support the FX3GC PLC are required.<br/>For details, refer to the GOT manual.</p> <p>This series is subject to the following restrictions when connected using unsupported standard monitor OS, communication driver or option OS.</p> <p><b>Contents of restrictions</b></p> <ul style="list-style-type: none"> <li>• When connected using standard monitor OS, communication driver and option OS which support the FX3G PLC <ul style="list-style-type: none"> <li>- Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in the FX3G PLC.</li> </ul> </li> <li>• When connected using standard monitor OS, communication driver and option OS which do not support the FX3G PLC <ul style="list-style-type: none"> <li>- Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in the FX1N and FX1NC PLCs.</li> <li>- 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.</li> </ul> </li> </ul> <p>Check the applicability of other items in the GOT manual.</p> |
| F940WGOT               | Not available | The following restriction applies when connected.   |
| F940GOT F940 Handy GOT | Not available | <b>Contents of restrictions</b>   |
| F930GOT(-K)            | Not available | Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in the FX1N and FX1NC PLCs.  |
| F920GOT(-K)            | Not available | For applicable models, refer to the GOT manual.   |
| ET-940                 | Not available | For connection using the 2-port interface function, refer to Appendix A-5.  |
| FX-10DM(-SET0)         | Not available | <p>The following restriction applies when connected.</p> <p><b>Contents of restrictions</b></p> <p>Programming is enabled only in the function ranges such as instructions, device ranges and program sizes available in the FX1N and FX1NC PLCs.<br/>For supported models and device ranges, refer to the FX-10DM USER'S MANUAL (Manual No. JY992D86401).</p>  |
| FX-10DU                | Not available | <p>The following restriction applies when connected.</p> <p><b>Contents of restrictions</b></p> <p>It is limited to the device range and function range supported by the highest class model (FX1N or FX2N) applicable in the product version.<br/>For supported models and device ranges, refer to the FX-10DU-E/FX-20DU-E User's Manual (Manual No. JY992D54801).</p>   |

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## 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)<br>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<br>Max. allowable write: 20,000 times  |                               |  |
|                               | Writing function during running                 | Provided (Program can be modified while the PLC is running.)<br>For the writing function during running, refer to Appendix A-2-5.                 |                               |  |
|                               | Keyword function                                | With keyword/Customer keyword function  |                               |  |
| Real-time clock               | Clock function* <sup>1</sup>                    | Built-in<br>1980 to 2079 (with correction for leap year)<br>2- or 4-digit year, accuracy within ±45 seconds/month at 25 °C                        |                               |  |
| Kinds of instructions         | Basic instructions                              | Sequence instructions: 29<br>Step-ladder instructions: 2  |                               |  |
|                               | Applied instructions                            | 122 kinds   |                               |  |
| Processing speed              | Basic instructions                              | Standard mode* <sup>3</sup> : 0.21 μs/instruction<br>Extension mode* <sup>3</sup> : 0.42 μs/instruction   |                               |  |
|                               | Applied instructions                            | Standard mode* <sup>3</sup> : 0.5 μs to several hundred μs/instruction<br>Extension mode* <sup>3</sup> : 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)        | 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* <sup>2</sup>                       | 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* <sup>2</sup>                       | 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* <sup>2</sup> (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<br>Z0 to Z7  | 16 points                                      |   |
| Extension register                  | For general* <sup>2</sup> (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 x 2 <sup>128</sup> to -1.0 x 2 <sup>-126</sup> , 0, 1.0 x 2 <sup>-126</sup> to 1.0 x 2 <sup>128</sup><br>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.





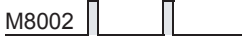
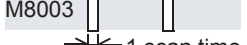
Note that functions of certain devices vary depending on the series of the PLC.

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 | Number and name                           | Operation and function  | Corresponding special device |
|--|---|------------------------------|---|---|------------------------------|
| <b>PLC Status</b>                      |   |                              | <b>Clock</b>                              |   |                              |
| [M]8000<br>RUN monitor<br>NO contact   | RUN input    | -                            | [M]8010                                   | Not used  | -                            |
| [M]8001<br>RUN monitor<br>NC contact   | M8061<br>Error occurrence    | -                            | [M]8011                                   | ON and OFF in 10 ms cycle<br>(ON: 5 ms, OFF: 5 ms)  | -                            |
| [M]8002<br>Initial pulse<br>NO contact | M8000 <br>M8001                     | -                            | [M]8012                                   | ON and OFF in 100 ms cycle<br>(ON: 50 ms, OFF: 50 ms)   | -                            |
| [M]8003<br>Initial pulse<br>NC contact | M8002 <br>M8003 <br>→ ← 1 scan time | -                            | [M]8013                                   | ON and OFF in 1sec cycle<br>(ON: 500 ms, OFF: 500 ms)   | -                            |
| [M]8004<br>Error occurrence            | ON when either M8060, M8061, M8064, M8065, M8066, or M8067 is ON.   | D8004                        | [M]8014                                   | ON and OFF in 1min cycle<br>(ON: 30 sec, OFF: 30sec)  | -                            |
| [M]8005<br>Battery voltage low         | ON when battery voltage is below the value set in D8006.  | D8005                        | M 8015                                    | Clock stop and preset<br>For real time clock  | -                            |
| [M]8006<br>Battery error latch         | It is set when battery voltage low is detected.   | D8006                        | M 8016                                    | Time read display is stopped<br>For real time clock   | -                            |
| [M]8007                                | Not used  | -                            | M 8017                                    | ±30 seconds correction<br>For real time clock   | -                            |
| [M]8008                                | Not used  | -                            | [M]8018                                   | Installation detection (Always ON)<br>For real time clock   | -                            |
| [M]8009<br>24 V DC down                | ON when 24 V DC power fails in special function block.  | -                            | M 8019                                    | Real time clock (RTC) error<br>For real time clock  | -                            |
|  |   |                              | <b>Flag</b>                               |   |                              |
|  |   |                              | [M]8020<br>Zero                           | ON when the result of addition/subtraction is 0.  | -                            |
|  |   |                              | [M]8021<br>Borrow                         | ON when the result of subtraction is less than the min. negative number.                                  | -                            |
|  |   |                              | M 8022<br>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<br>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 |
|--|--|------------------------------|
| <b>PLC Mode</b>                        |  |                              |
| M 8030*1<br>Battery LED OFF            | When M8030 set to ON, LED on PLC is not lit even if low battery voltage is detected.   | -                            |
| M 8031*1<br>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. | -                            |
| M 8032*1<br>Latch memory all clear     | However, file registers (D) in program memory, and extension file registers (ER) are not cleared.  | -                            |
| M 8033<br>Memory hold STOP             | When PLC is switched from RUN to STOP, image memory and data memory are retained.  | -                            |
| M 8034*1<br>All outputs disable        | All external output contacts of PLC are turned OFF.  | -                            |
| M 8035<br>Forced RUN mode              | Refer to Programming Manual for details.   | -                            |
| M 8036<br>Forced RUN signal            |  | -                            |
| M 8037<br>Forced STOP signal           |  | -                            |
| [M]8038<br>Parameter setting           | Communication parameter setting flag (for N:N network setting)   | D8176 to D8180               |
| M 8039<br>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

| <b>Step Ladder and Annunciator</b> |  |                |
|------------------------------------|--|----------------|
| M 8040<br>Transfer disable         | While M8040 is turned ON, transfer between states is disabled.               | -              |
| [M]8041*2<br>Transfer start        | Transfer from initial state is enabled in automatic operation mode.          | -              |
| [M]8042<br>Start pulse             | Pulse output is given in response to a start input.                          | -              |
| M 8043*2<br>Zero return complete   | Set this in the last state of zero return mode.                              | -              |
| M 8044*2<br>Zero point condition   | Set this when machine zero return is detected.                               | -              |
| M 8045<br>All output reset disable | Disables the 'all output reset' function when the operation mode is changed. | -              |
| [M]8046*3<br>STL state ON          | ON when M8047 is ON and either of S0 to S899 or S1000 to S4095 is active.    | M8047          |
| M 8047*3<br>STL monitoring enable  | D8040 to D8047 are enabled when M8047 is ON.                                 | D8040 to D8047 |
| [M]8048*3<br>Annunciator operate   | ON when M8049 is ON and either of S900 to S999 is ON.                        | -              |
| M 8049*2<br>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 |
|---|--|------------------------------|
| <b>Interrupt Disable</b>                      |  |                              |
| M 8050<br>(Input interrupt)<br>I00□ disable*4 | <ul style="list-style-type: none"> <li>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.</li> <li>If an input interrupt or timer interrupt occurs while a special auxiliary relay for that interrupt (M8050 - M8058) is OFF.                             <ol style="list-style-type: none"> <li>The interrupt will be accepted.</li> <li>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.</li> </ol> </li> </ul> | -                            |
| M 8051<br>(Input interrupt)<br>I10□ disable*4 |  | -                            |
| M 8052<br>(Input interrupt)<br>I20□ disable*4 |  | -                            |
| M 8053<br>(Input interrupt)<br>I30□ disable*4 |  | -                            |
| M 8054<br>(Input interrupt)<br>I40□ disable*4 |  | -                            |
| M 8055<br>(Input interrupt)<br>I50□ disable*4 |  | -                            |
| M 8056<br>(Timer interrupt)<br>I6□□ disable*4 |  | -                            |
| M 8057<br>(Timer interrupt)<br>I7□□ disable*4 |  | -                            |
| M 8058<br>(Timer interrupt)<br>I8□□ disable*4 |  | -                            |
| M 8059  |  | Not used                     |

\*4. Cleared when PLC switches from RUN to STOP.

| <b>Error Detection</b> |                                    |                                  |
|------------------------|------------------------------------|----------------------------------|
| [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<br>D8069<br>D8314<br>D8315 |
| [M]8066                | Ladder error                       | D8066<br>D8069<br>D8314<br>D8315 |
| [M]8067*7              | Operation error                    | D8067<br>D8069<br>D8314<br>D8315 |
| M 8068                 | Operation error latch              | D8068<br>D8312<br>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 |
|----------------------|--|------------------------------|
| <b>Parallel Link</b> |  |                              |
| M 8070*1             | Parallel link<br>Set M8070 when using master station.        | -                            |
| M 8071*1             | Parallel link<br>Set M8071 when using slave station.         | -                            |
| [M]8072              | Parallel link<br>ON when operating                           | -                            |
| [M]8073              | Parallel link<br>ON when M8070 or M8071 setting is incorrect | -                            |

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

| <b>Pulse width/Pulse period measurement function</b> |   |                |
|--|---|----------------|
| [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 |

| <b>Flag</b>        |          |   |
|--------------------|----------|---|
| [M]8090 to [M]8100 | Not used | - |

| <b>Memory Information</b> |                               |   |
|---------------------------|-------------------------------|---|
| [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                   |                               | - |

| <b>Output Refresh Error</b> |                      |       |
|-----------------------------|----------------------|-------|
| [M]8109                     | Output refresh error | D8109 |
| [M]8110 to [M]8119          | Not used             | -     |

| Number and name                            | Operation and function   | Corresponding special device |
|--|--|------------------------------|
| <b>RS (FNC 80) and Computer Link [ch1]</b> |  |                              |
| [M]8120                                    | Not used   | -                            |
| [M]8121*2                                  | RS (FNC 80) instruction:<br>Send wait flag   | -                            |
| M 8122*2                                   | RS (FNC 80) instruction:<br>Send request   | D8122                        |
| M 8123*2                                   | RS (FNC 80) instruction:<br>Receive complete flag  | D8123                        |
| [M]8124                                    | RS (FNC 80) instruction:<br>Carrier detection flag   | -                            |
| [M]8125                                    | Not used   | -                            |
| [M]8126                                    | Computer link [ch1]: Global ON   | D8127<br>D8128<br>D8129      |
| [M]8127                                    | Computer link [ch1]:<br>On-demand send processing  |                              |
| M 8128                                     | Computer link [ch1]:<br>On-demand error flag   |                              |
| M 8129                                     | Computer link [ch1]:<br>On-demand Word/Byte<br>changeover<br>RS (FNC 80) instruction:<br>Time-out check flag |                              |

\*2. Cleared when PLC switches from RUN to STOP or RS instruction is OFF.

| <b>Positioning [PLSY, PLSR instruction]</b> |   |   |
|---|---|---|
| M 8145                                      | [Y000] Pulse output stop command            | - |
| M 8146                                      | [Y001] Pulse output stop command            | - |
| [M]8147                                     | [Y000] Pulse output monitor<br>(BUSY/READY) | - |
| [M]8148                                     | [Y001] Pulse output monitor<br>(BUSY/READY) | - |

| <b>Inverter Communication Function</b> |  |       |
|--|--|-------|
| [M]8150                                | Not used                                     | -     |
| [M]8151                                | Inverter communication in<br>execution [ch1] | D8151 |
| [M]8152*3                              | Inverter communication error [ch1]           | D8152 |
| [M]8153*3                              | Inverter communication error latch<br>[ch1]  | D8153 |
| [M]8154                                | Not used                                     | -     |
| [M]8155                                |  | -     |
| [M]8156                                | Inverter communication in<br>execution [ch2] | D8156 |
| [M]8157*3                              | Inverter communication error [ch2]           | D8157 |
| [M]8158*3                              | Inverter communication error latch<br>[ch2]  | D8158 |
| [M]8159                                | Not used                                     | -     |

\*3. Cleared when PLC switches from STOP to RUN.

| Number and name          | Operation and function        | Corresponding special device                          |   |
|--------------------------|-------------------------------|---|---|
| <b>Advanced Function</b> |                               |   |   |
| M 8160                   | Not used                      | -   |   |
| M 8161 <sup>+1+2</sup>   | 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 <sup>*1</sup>     |                               | 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), ASCII (FNC 82), HEX (FNC 83), and CCD (FNC 84) instructions.

| <b>Pulse Catch</b>   |                        |   |
|----------------------|------------------------|---|
| M 8170 <sup>*3</sup> | Input X000 pulse catch | - |
| M 8171 <sup>*3</sup> | Input X001 pulse catch | - |
| M 8172 <sup>*3</sup> | Input X002 pulse catch | - |
| M 8173 <sup>*3</sup> | Input X003 pulse catch | - |
| M 8174 <sup>*3</sup> | Input X004 pulse catch | - |
| M 8175 <sup>*3</sup> | Input X005 pulse catch | - |
| M 8176               | Not used               | - |
| M 8177               |                        | - |

- \*3. Cleared when PLC switches from STOP to RUN.

| <b>Communication Port Channel Setting</b> |   |   |
|---|---|---|
| M 8178                                    | Parallel link channel switch (OFF: ch1/ON: ch2) | - |
| M 8179                                    | N:N network channel switch <sup>*4</sup>        | - |

- \*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 |   |
|--------------------|---|------------------------------|---|
| <b>N:N Network</b> |   |                              |   |
| [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             |   | -                            |   |

**A**

Version Information

**B**

Performance Specifications

**C**

Special Devices (M8000-D8000-)

**D**

Instruction List

**E**

Precautions for battery transportation

**F**

Handling of batteries in EU member states

| Number and name  | Operation and function | Corresponding special device |
|--|------------------------|------------------------------|
| <b>Counter Up/down Counter Counting Direction</b>            |                        |                              |
| M 8200   | C200                   | -                            |
| 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                   | -                            |
| <b>High Speed Counter Up/down Counter Counting Direction</b> |                        |                              |
| M 8235   | C235                   | -                            |
| 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                   | -                            |

When M8□□□ is ON, the corresponding C□□□ is changed to down mode.

- ON: Down count operation
- OFF: Up count operation

| Number and name   | Operation and function            | Corresponding special device |
|---|-----------------------------------|------------------------------|
| <b>High Speed Counter Up/down Counter Monitoring</b>              |                                   |                              |
| [M]8246   | C246                              | -                            |
| [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                          | -                            |
| <b>Analog Special Adapter (Refer to Appendix C-3 for details)</b> |                                   |                              |
| M 8280 to M 8289  | 1st special adapter <sup>*1</sup> | -                            |
| M 8290 to M 8299  | 2nd special adapter <sup>*1</sup> | -                            |

\*1. Connected analog special adapters are counted from the main unit side.

| <b>Flag</b>           |  |   |
|-----------------------|--|---|
| [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 <sup>*2</sup> | 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 |
|--------------------|--|------------------------------|
| <b>Positioning</b> |  |                              |
| [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 |
|--|---|------------------------------|
| <b>RS2 (FNC 87) [ch0]</b>  |   |                              |
| [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              | -                            |
| <b>High Speed Counter Function</b>   |   |                              |
| [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  | Not used  | -                            |
| <b>Ring Counter</b>  |   |                              |
| M 8398   | Ring counter operation (in units of 1ms, 32 bits)*3 | D8398<br>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.               |   |                              |
| <b>RS2 (FNC 87) [ch1]</b>  |   |                              |
| [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  | Not used  | -                            |
| [M]8408  | Not used  | -                            |
| 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.

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| Number and name                                   | Operation and function   | Corresponding special device |
|---|--|------------------------------|
| <b>RS2 (FNC 87) [ch2] and Computer Link [ch2]</b> |  |                              |
| [M]8410 to [M]8420                                | Not used   | -                            |
| [M]8421 <sup>*1</sup>                             | RS2 (FNC 87) [ch2] Send wait flag  | -                            |
| M 8422 <sup>*1</sup>                              | RS2 (FNC 87) [ch2] Send request  | D8422                        |
| M 8423 <sup>*1</sup>                              | RS2 (FNC 87) [ch2]<br>Receive complete flag  | D8423                        |
| [M]8424   | RS2 (FNC 87) [ch2]<br>Carrier detection flag   | -                            |
| [M]8425   | RS2 (FNC 87) [ch2]<br>Data set ready (DSR) flag  | -                            |
| [M]8426   | Computer link [ch2] Global ON  | D8427<br>D8428<br>D8429      |
| [M]8427   | Computer link [ch2]<br>On-demand send processing   |                              |
| M 8428  | Computer link [ch2]<br>On-demand error flag  |                              |
| M 8429  | Computer link [ch2]<br>On-demand Word/Byte changeover<br>RS2 (FNC 87) [ch2]<br>Time-out check flag |                              |

\*1. Cleared when PLC switches from RUN to STOP or when RS2 instruction [ch2] is OFF.

| <b>Error Detection</b> |   |       |
|------------------------|---|-------|
| [M]8430 to [M]8437     | Not used  | -     |
| M 8438 <sup>*2</sup>   | 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  | -     |
| <b>Positioning</b>     |   |       |
| M 8460 to M 8463       | Not used  | -     |
| M 8464                 | DSZR (FNC150), ZRN (FNC156)<br>instructions [Y000]<br>Clear signal device specification<br>function enabled | D8464 |
| M 8465                 | DSZR (FNC150), ZRN (FNC156)<br>instructions [Y001]<br>Clear signal device specification<br>function enabled | D8465 |
| [M]8466 to [M]8511     | Not used  | -     |

\*2. Cleared when PLC power supply from OFF to ON.

## Appendix C-2 Special Data Register (D8000 to D8511)

| Number and name                                | Content of register   | Corresponding special device | Number and name   | Content of register  | Corresponding special device |       |                       |                                       |  |   |
|--|---|------------------------------|---|--|------------------------------|-------|-----------------------|---------------------------------------|--|---|
| <b>PLC Status</b>                              |   |                              | <b>Clock</b>  |  |                              |       |                       |                                       |  |   |
| D 8000<br>Watchdog timer                       | Default value is 200 ms (in 1ms steps)<br>(Writes from system ROM at power ON)<br>Value overwritten by program is valid after END or WDT instruction execution.   | -                            | [D]8010<br>Present scan time*1  | Accumulated instruction-execution time from 0 step (in units of 0.1ms)                                 | -                            |       |                       |                                       |  |   |
| [D]8001<br>PLC type and system version         | <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>2</td> <td>6</td> <td>1</td> <td>4</td> <td>0</td> </tr> </table> BCD converted value<br>↑ Version 1.40<br>↑ FX3GC Series                    | 2                            | 6   | 1  | 4                            | 0     | D8101                 | [D]8011<br>Minimum scan time*1        | Minimum value of scan time (in units of 0.1ms) | - |
| 2  | 6   | 1                            | 4   | 0  |                              |       |                       |                                       |  |   |
| [D]8002<br>Memory capacity                     | <ul style="list-style-type: none"> <li>2...2K steps</li> <li>4...4K steps</li> <li>8...8K steps</li> <li>If 16K steps or more "K8" is written to D8002 and "16" or "32" is written to D8102.</li> </ul>                         | M8002<br>D8102               | [D]8012<br>Maximum scan time*1  | Maximum value of scan time (in units of 0.1ms)   | -                            |       |                       |                                       |  |   |
| [D]8003<br>Memory type                         | Stores the memory type.<br>10H: Built-in memory in PLC  | -                            | D 8013<br>Second data   | 0 to 59 seconds (for real time clock)  | -                            |       |                       |                                       |  |   |
| [D]8004<br>Error number M                      | <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>8</td> <td>0</td> <td>6</td> <td>0</td> </tr> </table> BCD converted value<br>↑<br>8060 to 8068 (when M8004 is ON)                           | 8                            | 0   | 6  | 0                            | M8004 | D 8014<br>Minute data | 0 to 59 minutes (for real time clock) | -  |   |
| 8  | 0   | 6                            | 0   |  |                              |       |                       |                                       |  |   |
| [D]8005<br>Battery voltage                     | <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td></td> <td></td> <td>3</td> <td>0</td> </tr> </table> BCD converted value (in units of 0.1V)<br>Battery voltage present value (Example: 3.0V) |                              |   | 3  | 0                            | M8005 | D 8015<br>Hour data   | 0 to 23 hours (for real time clock)   | -  |   |
|  |   | 3                            | 0   |  |                              |       |                       |                                       |  |   |
| [D]8006<br>Low battery voltage detection level | Default: 2.7 V (in units of 0.1 V)<br>(Writes from system ROM at power ON)  | M8006                        | D 8016<br>Day data  | 1 to 31 days (for real time clock)   | -                            |       |                       |                                       |  |   |
| [D]8007  |   |                              | D 8017<br>Month data  | 1 to 12 months (for real time clock)   | -                            |       |                       |                                       |  |   |
| D 8008   | Not used  | -                            | D 8018<br>Year data   | 2 digits of year data (0 to 99) (for real time clock)  | -                            |       |                       |                                       |  |   |
| [D]8009  |   |                              | D 8019<br>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). |  |                              |       |                       |                                       |  |   |
|  |   |                              | <b>Input Filter</b>   |  |                              |       |                       |                                       |  |   |
|  |   |                              | D 8020<br>Input filter adjustment   | Input filter value of X000 to X007 (Default: 10 ms)  | -                            |       |                       |                                       |  |   |
|  |   |                              | [D]8021   |  | -                            |       |                       |                                       |  |   |
|  |   |                              | [D]8022   |  | -                            |       |                       |                                       |  |   |
|  |   |                              | [D]8023   |  | -                            |       |                       |                                       |  |   |
|  |   |                              | [D]8024   | Not used   | -                            |       |                       |                                       |  |   |
|  |   |                              | [D]8025   |  | -                            |       |                       |                                       |  |   |
|  |   |                              | [D]8026   |  | -                            |       |                       |                                       |  |   |
|  |   |                              | [D]8027   |  | -                            |       |                       |                                       |  |   |
|  |   |                              | <b>Index Register Z0 and V0</b>   |  |                              |       |                       |                                       |  |   |
|  |   |                              | [D]8028   | Value of Z0 (Z) register*2   | -                            |       |                       |                                       |  |   |
|  |   |                              | [D]8029   | Value of V0 (V) register*2   | -                            |       |                       |                                       |  |   |
|  |   |                              | <b>Constant Scan</b>  |  |                              |       |                       |                                       |  |   |
|  |   |                              | [D]8030 to [D]8038  | Not used   | -                            |       |                       |                                       |  |   |
|  |   |                              | D 8039<br>Constant scan duration  | Default: 0 ms (in 1 ms steps)<br>(Writes from system ROM at power ON)<br>Can be overwritten by program | M8039                        |       |                       |                                       |  |   |

\*2. The values of Z1 to Z7 and V1 to V7 are stored in D8182 to D8195.

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|--|--|------------------------------|
| <b>Stepladder and Annunciator</b>                |  |                              |
| [D]8040 <sup>*1</sup><br>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 <sup>*1</sup><br>ON state number 2       |  |                              |
| [D]8042 <sup>*1</sup><br>ON state number 3       |  |                              |
| [D]8043 <sup>*1</sup><br>ON state number 4       |  |                              |
| [D]8044 <sup>*1</sup><br>ON state number 5       |  |                              |
| [D]8045 <sup>*1</sup><br>ON state number 6       |  |                              |
| [D]8046 <sup>*1</sup><br>ON state number 7       |  |                              |
| [D]8047 <sup>*1</sup><br>ON state number 8       |  |                              |
| [D]8048  | Not used   | -                            |
| [D]8049 <sup>*1</sup><br>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

| <b>Error Detection (Refer to Subsection 10.6.3 for details)</b> |  |                |   |   |   |       |
|---|--|----------------|---|---|---|-------|
| [D]8060   | <p>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.</p> <p>Example: If X020 is unconnected.</p> <div style="display: flex; align-items: center;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">0</td> <td style="padding: 2px 5px;">2</td> <td style="padding: 2px 5px;">0</td> </tr> </table> <div style="margin-left: 10px;"> <p>BCD converted value</p> <p>↑ Device number 10 to 177</p> <p>1: Input X<br/>0: Output Y</p> </div> </div> | 1              | 0 | 2 | 0 | M8060 |
| 1   | 0  | 2              | 0 |   |   |       |
| [D]8061   | Error code for PLC hardware error  | M8061          |   |   |   |       |
| [D]8062 <sup>*2</sup>   | Error code for PC/PP communication error or serial communication error 0 [ch0]   | M8062          |   |   |   |       |
| [D]8063 <sup>*2</sup>   | 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 <sup>*3</sup>   | Error code for operation error   | M8067          |   |   |   |       |
| D 8068  | Operation error step number latched  | M8068          |   |   |   |       |
| [D]8069 <sup>*3</sup>   | 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                             |                |                |
|--|---|--|----------------|----------------|
| <b>Parallel Link</b>                                 |   |  |                |                |
| [D]8070  | Parallel link error time-out check time: 500 ms | -  |                |                |
| [D]8071 to [D]8073                                   | Not used  | -  |                |                |
| <b>Pulse width/Pulse period measurement function</b> |   |  |                |                |
| D 8074 <sup>*4</sup>                                 | Lower   | [X000] Ring counter value for rising edge (1/6 μs unit)  | M8076<br>M8080 |                |
| D 8075 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8076 <sup>*4</sup>                                 | Lower   | [X000] Ring counter value for falling edge (1/6 μs unit) |                |                |
| D 8077 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8078 <sup>*4</sup>                                 | Lower   | [X000] Pulse width/Pulse period (10 μs unit)             |                |                |
| D 8079 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8080 <sup>*4</sup>                                 | Lower   | [X001] Ring counter value for rising edge (1/6 μs unit)  |                | M8077<br>M8081 |
| D 8081 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8082 <sup>*4</sup>                                 | Lower   | [X001] Ring counter value for falling edge (1/6 μs unit) |                |                |
| D 8083 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8084 <sup>*4</sup>                                 | Lower   | [X001] Pulse width/Pulse period (10 μs unit)             |                |                |
| D 8085 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8086 <sup>*4</sup>                                 | Lower   | [X003] Ring counter value for rising edge (1/6 μs unit)  | M8078<br>M8082 |                |
| D 8087 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8088 <sup>*4</sup>                                 | Lower   | [X003] Ring counter value for falling edge (1/6 μs unit) |                |                |
| D 8089 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8090 <sup>*4</sup>                                 | Lower   | [X003] Pulse width/Pulse period (10 μs unit)             |                |                |
| D 8091 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8092 <sup>*4</sup>                                 | Lower   | [X004] Ring counter value for rising edge (1/6 μs unit)  |                | M8079<br>M8083 |
| D 8093 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8094 <sup>*4</sup>                                 | Lower   | [X004] Ring counter value for falling edge (1/6 μs unit) |                |                |
| D 8095 <sup>*4</sup>                                 | Upper   |  |                |                |
| D 8096 <sup>*4</sup>                                 | Lower   | [X004] Pulse width/Pulse period (10 μs unit)             |                |                |
| D 8097 <sup>*4</sup>                                 | Upper   |  |                |                |

\*4. Cleared when PLC switches from STOP to RUN.

| <b>Memory Information</b>              |   |   |   |   |   |   |   |
|--|---|---|---|---|---|---|---|
| [D]8101<br>PLC type and system version | <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px 5px;">2</td> <td style="padding: 2px 5px;">6</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">0</td> </tr> </table> <p>BCD converted value</p> <p>↑ Version 1.40</p> <p>FX3GC Series</p> | 2 | 6 | 1 | 4 | 0 | - |
| 2                                      | 6   | 1 | 4 | 0 |   |   |   |
| [D]8102                                | <p>2.....2K steps</p> <p>4.....4K steps</p> <p>8.....8K steps</p> <p>16....16K steps</p> <p>32....32K steps</p>   | - |   |   |   |   |   |
| [D]8103 to [D]8107                     | Not used  | - |   |   |   |   |   |
| [D]8108                                | Number of special function blocks connected   | - |   |   |   |   |   |

| Number and name                            | Content of register   | Corresponding special device |
|--|---|------------------------------|
| <b>Output Refresh Error</b>                |   |                              |
| [D]8109                                    | Y number where output refresh error occurs                                      | M8109                        |
| [D]8110 to [D]8119                         | Not used  | -                            |
| <b>RS (FNC 80) and Computer Link [ch1]</b> |   |                              |
| D 8120 <sup>*1</sup>                       | RS (FNC 80) instruction and computer link [ch1]<br>Communication format setting | -                            |
| D 8121 <sup>*1</sup>                       | Computer link [ch1]<br>Station number setting                                   | -                            |
| [D]8122 <sup>*2</sup>                      | RS (FNC 80) instruction:<br>Remaining points of transmit data                   | M8122                        |
| [D]8123 <sup>*2</sup>                      | RS (FNC 80) instruction:<br>Monitoring receive data points                      | M8123                        |
| D 8124                                     | RS (FNC 80) instruction:<br>Header <Default: STX>                               | -                            |
| D 8125                                     | RS (FNC 80) instruction:<br>Terminator <Default: ETX>                           | -                            |
| [D]8126                                    | Not used  | -                            |
| D 8127                                     | Computer link [ch1]<br>Specification of on-demand head device register          | M8126 to M8129               |
| D 8128                                     | Computer link [ch1]<br>Specification of on-demand data length register          |                              |
| D 8129 <sup>*1</sup>                       | RS (FNC 80) instruction, computer link [ch1]<br>Time-out time setting           |                              |

\*1. Latch device

\*2. Cleared when PLC switches from RUN to STOP.

| <b>Positioning</b> |          |  |   |
|--------------------|----------|--|---|
| [D]8130 to [D]8135 | Not used |  | - |
| D 8136             | Lower    | PLSY (FNC 57), PLSR (FNC 59) instructions:<br>Accumulated total number of pulses output to Y000 and Y001 | - |
| D 8137             | Upper    |  | - |
| [D]8138            | Not used |  | - |
| [D]8139            | Not used |  | - |
| 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             | Not used |  | - |
| D 8146             | Not used |  | - |
| D 8147             | Not used |  | - |
| D 8148             | Not used |  | - |
| [D]8149            | Not used |  | - |

| Number and name                        | Content of register   | Corresponding special device |
|--|---|------------------------------|
| <b>Inverter Communication Function</b> |   |                              |
| D 8150 <sup>*3</sup>                   | Response wait time of inverter communication [ch1]                            | -                            |
| [D]8151                                | Step number of instruction during inverter communication [ch1]<br>Default: -1 | M8151                        |
| [D]8152 <sup>*4</sup>                  | Error code for inverter communication [ch1]                                   | M8152                        |
| [D]8153 <sup>*3</sup>                  | Inverter communication error step number latched [ch1]<br>Default: -1         | M8153                        |
| [D]8154                                | Not used  | -                            |
| D 8155 <sup>*3</sup>                   | Response wait time of inverter communication [ch2]                            | -                            |
| [D]8156                                | Step number of instruction during inverter communication [ch2]<br>Default: -1 | M8156                        |
| [D]8157 <sup>*4</sup>                  | Error code for inverter communication [ch2]                                   | M8157                        |
| [D]8158 <sup>*4</sup>                  | Inverter communication error step number latched [ch2]<br>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.

| <b>Advanced Function</b> |          |   |
|--------------------------|----------|---|
| [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 <sup>*5</sup> |

\*5. Access restriction status

| Present value       | Access restriction status       | Program         |                 | Monitor-ing     | Present value change |
|---------------------|---------------------------------|-----------------|-----------------|-----------------|----------------------|
|                     |                                 | Read            | Write           |                 |                      |
| H**00 <sup>*8</sup> | 2nd keyword is not set          | ✓ <sup>*6</sup> | ✓ <sup>*6</sup> | ✓ <sup>*6</sup> | ✓ <sup>*6</sup>      |
| H**10 <sup>*8</sup> | Write protection                | ✓               | -               | ✓               | ✓                    |
| H**11 <sup>*8</sup> | Read / write protection         | -               | -               | ✓               | ✓                    |
| H**12 <sup>*7</sup> | All online operation protection | -               | -               | -               | -                    |
| H**20 <sup>*7</sup> | Keyword cancel                  | ✓               | ✓               | ✓               | ✓                    |

\*6. Accesses are restricted by the keyword setting status.

\*7. "\*" indicates areas used by the system.

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|---|---|------------------------------|
| <b>N:N Network (setting)</b>                |   |                              |
| [D]8170                                     |   | -                            |
| [D]8171                                     | Not used  | -                            |
| [D]8172                                     |   | -                            |
| [D]8173                                     |   | -                            |
| [D]8174                                     | Station number                                      | -                            |
| [D]8175                                     | Total number of slave stations                      | -                            |
| [D]8176                                     | 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  | -                            |
| <b>Index Register Z1 to Z7 and V1 to V7</b> |   |                              |
| [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                                     |   | -                            |
| [D]8199                                     |   | -                            |
| <b>N:N Network (monitoring)</b>             |   |                              |
| [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 |                              |

| Number and name  | Content of register                               | Corresponding special device   |
|--|---|--------------------------------|
| [D]8211  | Code of communication error at master station     | M8183 to M8191                 |
| [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  |                                |
| [D]8219 to [D]8279   | Not used  |                                |
| <b>Analog Special Adapter (Refer to Appendix C-3 for details)</b>          |   |                                |
| 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. |   |                                |
| <b>Positioning</b>   |   |                                |
| [D]8329 to [D]8339   | Not used  | -                              |
| D 8340   | Lower   | [Y000] Current value register  |
| D 8341   | Upper   | Default: 0                     |
| D 8342   | [Y000]  | Bias speed Default: 0          |
| D 8343   | Lower   | [Y000] Maximum speed           |
| D 8344   | Upper   | Default: 100000                |
| D 8345   | [Y000]  | Creep speed Default: 1000      |
| D 8346   | Lower   | [Y000] Zero return speed       |
| D 8347   | Upper   | Default: 50000                 |
| D 8348   | [Y000]  | Acceleration time Default: 100 |
| D 8349   | [Y000]  | Deceleration time Default: 100 |
| D 8350   | Lower   | [Y001] Current value register  |
| D 8351   | Upper   | Default: 0                     |
| D 8352   | [Y001]  | Bias speed Default: 0          |
| D 8353   | Lower   | [Y001] Maximum speed           |
| D 8354   | Upper   | Default: 100000                |
| D 8355   | [Y001]  | Creep speed Default: 1000      |
| D 8356   | Lower   | [Y001] Zero return speed       |
| D 8357   | Upper   | Default: 50000                 |
| 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                |
|---------------------------|---|---|
| <b>RS2 (FNC 87) [ch0]</b> |   |   |
| D 8370                    | RS2 (FNC 87) [ch0]<br>Communication format setting      | -   |
| [D]8371                   | Not used  | -   |
| [D]8372*1                 | RS2 (FNC 87) [ch0]<br>Remaining points of transmit data | M8372                                       |
| [D]8373*1                 | RS2 (FNC 87) [ch0]<br>Monitoring receive data points    | M8373                                       |
| [D]8374                   | Not used  | -   |
| [D]8375                   |   | -   |
| [D]8376                   |   | -   |
| [D]8377                   |   | -   |
| [D]8378                   |   | -   |
| [D]8379                   |   | RS2 (FNC 87) [ch0]<br>Time-out time setting |
| D 8380                    | RS2 (FNC 87) [ch0]<br>Header 1 and 2 <Default: STX>     | -   |
| D 8381                    | RS2 (FNC 87) [ch0]<br>Header 3 and 4                    | -   |
| D 8382                    | RS2 (FNC 87) [ch0]<br>Terminator 1 and 2 <Default: ETX> | -   |
| D 8383                    | RS2 (FNC 87) [ch0]<br>Terminator 3 and 4                | -   |
| [D]8384                   | RS2 (FNC 87) [ch0]<br>Receive sum (received data)       | -   |
| [D]8385                   | RS2 (FNC 87) [ch0]<br>Receive sum (calculated result)   | -   |
| [D]8386                   | RS2 (FNC 87) [ch0]<br>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  |
|---------------------------|---|---|
| <b>Ring Counter</b>       |   |   |
| D 8398                    | Lower   | Up-operation ring counter of 0 to 2,147,483,647 (in units of 1ms, 32-bit)*2 |
| D 8399                    | Upper   |   |
| <b>RS2 (FNC 87) [ch1]</b> |   |   |
| D 8400                    | RS2 (FNC 87) [ch1]<br>Communication format setting      | -   |
| [D]8401                   | Not used  | -   |
| [D]8402*1                 | RS2 (FNC 87) [ch1]<br>Remaining points of transmit data | M8402   |
| [D]8403*1                 | RS2 (FNC 87) [ch1]<br>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]<br>Time-out time setting             | -   |
| D 8410                    | RS2 (FNC 87) [ch1]<br>Header 1 and 2 <Default: STX>     | -   |
| D 8411                    | RS2 (FNC 87) [ch1]<br>Header 3 and 4                    | -   |
| D 8412                    | RS2 (FNC 87) [ch1]<br>Terminator 1 and 2 <Default: ETX> | -   |
| D 8413                    | RS2 (FNC 87) [ch1]<br>Terminator 3 and 4                | -   |
| [D]8414                   | RS2 (FNC 87) [ch1]<br>Receive sum (received data)       | -   |
| [D]8415                   | RS2 (FNC 87) [ch1]<br>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.

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| Number and name                                   | Content of register  | Corresponding special device |
|---|--|------------------------------|
| <b>RS2 (FNC 87) [ch2] and Computer Link [ch2]</b> |  |                              |
| D 8420  | RS2 (FNC 87) [ch2]<br>Communication format setting                     | -                            |
| D 8421  | Computer link [ch2]<br>Station number setting                          | -                            |
| [D]8422*1   | RS2 (FNC 87) [ch2]<br>Remaining points of transmit data                | M8422                        |
| [D]8423*1   | RS2 (FNC 87) [ch2]<br>Monitoring receive data points                   | M8423                        |
| [D]8424   | Not used   | -                            |
| [D]8425   | Communication parameter display [ch2]                                  | -                            |
| [D]8426   | Not used   | -                            |
| D 8427  | Computer link [ch2]<br>Specification of on-demand head device register | M8426 to M8429               |
| D 8428  | Computer link [ch2]<br>Specification of on-demand data length register |                              |
| D 8429  | RS2 (FNC 87) [ch2], computer link [ch2]<br>Time-out time setting       |                              |
| D 8430  | RS2 (FNC 87) [ch2]<br>Header 1 and 2 <Default: STX>                    | -                            |
| D 8431  | RS2 (FNC 87) [ch2]<br>Header 3 and 4                                   | -                            |
| D 8432  | RS2 (FNC 87) [ch2]<br>Terminator 1 and 2 <Default: ETX>                | -                            |
| D 8433  | RS2 (FNC 87) [ch2]<br>Terminator 3 and 4                               | -                            |
| [D]8434   | RS2 (FNC 87) [ch2]<br>Receive sum (received data)                      | -                            |
| [D]8435   | RS2 (FNC 87) [ch2]<br>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

|   |  |       |
|---|--|-------|
| <b>Error Detection</b>                            |  |       |
| [D]8438*2   | Error code for serial communication error 2 [ch2]  | M8438 |
| <b>RS2 (FNC 87) [ch2] and Computer Link [ch2]</b> |  |       |
| [D]8439   | Operation mode display [ch2]   | -     |
| <b>Error Detection</b>                            |  |       |
| [D]8440 to [D]8448                                | Not used   | -     |
| [D]8449   | Special block error code   | M8449 |
| [D]8450 to [D]8459                                | Not used   | -     |
| <b>Positioning</b>                                |  |       |
| [D]8460 to [D]8463                                | Not used   | -     |
| D 8464  | DSZR (FNC150) and ZRN (FNC156) instructions:<br>[Y000] Clear signal device specification | M8464 |
| D 8465  | DSZR (FNC150) and ZRN (FNC156) instructions:<br>[Y001] Clear signal device specification | M8465 |
| D 8466 to [D]8511                                 | Not used   | -     |

\*2. Cleared when PLC power supply from OFF to ON.



## 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                           |
| <b>1st analog special adapter</b> |                          |                             |  |
| 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.  |
| <b>2nd analog special adapter</b> |                          |                             |  |
| 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.  |

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| 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         |
| <b>1st analog special adapter</b> |                            |                            |                            |
| 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                   |
| <b>2nd analog special adapter</b> |                            |                            |                            |
| 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                            |
| <b>1st analog special adapter</b> |   |                    |   |
| 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                               |
| <b>2nd analog special adapter</b> |   |                    |   |
| 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                               |

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| 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                            |
| <b>1st analog special adapter</b> |   |   |   |
| 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                               |
| <b>2nd analog special adapter</b> |   |   |   |
| 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  |
|-------------------------------|---|
| <b>Contact Instruction</b>    |   |
| 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          |
| <b>Connection Instruction</b> |   |
| 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                                      |
|-----------------------------------|---|
| <b>Out Instruction</b>            |   |
| 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                   |
| <b>Master Control Instruction</b> |   |
| MC                                | Denotes the start of a master control block   |
| MCR                               | Denotes the end of a master control block     |
| <b>Other Instruction</b>          |   |
| NOP                               | No operation or null step                     |
| <b>End Instruction</b>            |   |
| 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 |

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## Appendix D-3 Applied Instructions ... in Ascending Order of FNC Number

| FNC No.                                 | Mnemonic | Function                           |
|---|----------|------------------------------------|
| <b>Program Flow</b>                     |          |                                    |
| 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                |
| <b>Move and Compare</b>                 |          |                                    |
| 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               |
| <b>Arithmetic and Logical Operation</b> |          |                                    |
| 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                                      | -        |                                    |
| <b>Rotation and Shift Operation</b>     |          |                                    |
| 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                           |
|-------------------------------|----------|------------------------------------|
| <b>Data Operation</b>         |          |                                    |
| 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       |
| <b>High Speed Processing</b>  |          |                                    |
| 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    |
| <b>Handy Instruction</b>      |          |                                    |
| 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                            | -        |                                    |
| <b>External FX I/O Device</b> |          |                                    |
| 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                             |
|--------------------------------|----------|--------------------------------------|
| <b>External FX Device</b>      |          |                                      |
| 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                             | -        |                                      |
| <b>Floating Point</b>          |          |                                      |
| 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 |
| <b>Positioning Control</b>     |          |                                      |
| 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                    |
| <b>Real Time Clock Control</b> |          |                                      |
| 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                         |
|---|----------|----------------------------------|
| <b>External Device</b>  |          |                                  |
| 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   | -        |                                  |
| <b>Data Comparison</b>  |          |                                  |
| 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 $(S1) \neq (S2)$    |
| 229   | LD<=     | Load Compare $(S1) \leq (S2)$    |
| 230   | LD>=     | Load Compare $(S1) \geq (S2)$    |
| 231   | -        |                                  |
| 232   | AND=     | AND Compare $(S1) = (S2)$        |
| 233   | AND>     | AND Compare $(S1) > (S2)$        |
| 234   | AND<     | AND Compare $(S1) < (S2)$        |
| 235   | -        |                                  |
| 236   | AND<>    | AND Compare $(S1) \neq (S2)$     |
| 237   | AND<=    | AND Compare $(S1) \leq (S2)$     |
| 238   | AND>=    | AND Compare $(S1) \geq (S2)$     |
| 239   | -        |                                  |
| 240   | OR=      | OR Compare $(S1) = (S2)$         |
| 241   | OR>      | OR Compare $(S1) > (S2)$         |
| 242   | OR<      | OR Compare $(S1) < (S2)$         |
| 243   | -        |                                  |
| 244   | OR<>     | OR Compare $(S1) \neq (S2)$      |
| 245   | OR<=     | OR Compare $(S1) \leq (S2)$      |
| 246   | OR>=     | OR Compare $(S1) \geq (S2)$      |
| 247 to 249  | -        |                                  |
| <b>External Device Communication (Inverter Communication)</b> |          |                                  |
| 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           |
| <b>Extension File Register Control</b>                        |          |                                  |
| 290   | LOADR    | Load From ER                     |
| 291 to 293  | -        |                                  |
| 294   | RWER     | Rewrite to ER                    |
| 295 to 299  | -        |                                  |

**A**

Version Information

**B**

Performance Specifications

**C**

Special Devices (M8000-DS000-)

**D**

Instruction List

**E**

Precautions for battery transportation

**F**

Handling of batteries in EU member states

## MEMO



## Appendix E: 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 E-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 E-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 F: 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 F-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.



- \*. 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 F-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 F-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.
  - a) Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
  - b) Failure caused by unapproved modifications, etc., to the product by the user.
  - c) When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
  - d) Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
  - e) Relay failure or output contact failure caused by usage beyond the specified Life of contact (cycles).
  - f) Failure caused by external irresistible forces such as fires or abnormal voltages, and failure caused by force majeure such as earthquakes, lightning, wind and water damage.
  - g) Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
  - h) Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

### 2. **Onerous repair term after discontinuation of production**

- 1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
- 2) Product supply (including repair parts) is not available after production is discontinued.

### 3. **Overseas service**

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

### 4. **Exclusion of loss in opportunity and secondary loss from warranty liability**

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user or third person by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

### 5. **Changes in product specifications**

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

### 6. **Product application**

- 1) In using the Mitsubishi MELSEC programmable logic 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 logic 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 logic 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 logic 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 logic 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 users discretion.

## Revised History

| Date   | Revision | Description   |
|--------|----------|---------------|
| 2/2012 | A        | First Edition |
|        |          |               |



# **FX<sub>3</sub>Gc SERIES PROGRAMMABLE CONTROLLERS**

## **USER'S MANUAL**

### **Hardware Edition**



HEAD OFFICE: TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN  
HIMEJI WORKS: 840, CHIYODA CHO, HIMEJI, JAPAN

|            |            |
|------------|------------|
| MODEL      | FX3GC-HW-E |
| MODEL CODE | 09R533     |