This manual describes the part names, dimensions, mounting, cabling, and specifications for the product. This manual is extracted from FX3U SERIES User's Manual - Hardware Edition. Refer to FX3U SERIES User’s Manual - Hardware Edition for details. Before use, read this manual and manuals of relevant products fully to acquire proficiency in the handling and operating the product. Make sure to learn all the product information, safety information, and precautions. 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.

Registration

The company name and the product name to be described in this manual is "Mitsubishi Electric" and "FX3U Series Programmable Controllers".

Effective March 2018
Specifications are subject to change without notice.

WARNING

It is important to follow all precautions for personal safety.

STARTUP AND MAINTENANCE PRECAUTIONS

• Before cleaning or repairing terminals, cut off all phases of the power supply externally.
• Failure to do so may cause electric shock.
• Do not open the equipment while the PLC is powered on.
• Do not touch any terminal while the PLC’s power is on.
• Do not change the program in the PLC from two or more PLCs or personal computers at the same time.

MAINTENANCE

• Turn off the power to the PLC before connecting or disconnecting any extension cable.
• Failure to do so may cause equipment failures or malfunctions.

CAUTION

• Turning on the power of the PLC before connecting or attaching the memory cassette. If the memory cassette is attached or detached while the PLC’s power is on, the data in the memory cassette may be damaged. Do not disassemble or modify the PLC.
• Do not disconnect or modify the PLC while the power is on.
• Do not touch terminals while the PLC is powered on.
• Do not turn the power on or off while the LED is illuminated.

STARTUP AND MAINTENANCE PRECAUTIONS

• 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 excess 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.

CAUTION

• Do not change the memory cassette while the PLC is powered on.
• If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

 Associated manuals

How to obtain manuals
For the necessary product manuals or documents, consult with your local Mitsubishi Electric representative.

Associated manuals

FX3U SERIES PLC (main unit) comes with this document (hardware manual).

For a detailed explanation of the FX3U SERIES hardware and information on instructions for PLC programming and special extension unit/block, refer to the relevant documents.

Manual name | Manual No. | Description
--- | --- | ---
MELSIC-Q/LF Structured Programming Manual (Fundamentals) | SH-087782 MODEL CODE: 13JW06 | Programming methods, specifications, functions, etc. required to create structured programs.

WARNING

It is important to follow all precautions for personal safety.

Marine standard

Please consult with Mitsubishi Electric for the information on marine standard practices and the corresponding types of equipment.

Certification of UL, cUL standards
FX3U series main units, FX3U series special adapters and FX3U series input/output extension units/extensions supporting UL, cUL standards are as follows:

UL, cUL file numbers

<table>
<thead>
<tr>
<th>MODEL CODE:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JY997D34801</td>
<td>Explains the specifications for positioning control of FX3U/FX3G/FX3Gc/FX3U/UX series PLCs.</td>
</tr>
<tr>
<td>JY997D34901</td>
<td>Explains N I/O link, parallel link, control link, no protocol communication by RS instructions/FX2N-232F.</td>
</tr>
<tr>
<td>JY997D35001</td>
<td>Explains specifications for analog control and programming methods for FX3U/FX3G/FX3Gc/FX3U/UX series PLCs.</td>
</tr>
</tbody>
</table>

FX3U SERIES Programmable Controllers

PROGRAMMABLE CONTROLLERS

MELSEC-F

FX3U SERIES Programmable Controllers

HARDWARE MANUAL

Manual number: JY97TD50301
Revision: E
Date: March 2018

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Safety Precaution
(Read these precautions before use.)

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

This manual classifies the safety precautions into two categories:

1. Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

2. Indicates that incorrect handling may cause hazardous conditions, resulting in minor or slight personal injury or physical damage.

WARNING

Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

CAUTION

Indicates that incorrect handling may cause hazardous conditions, resulting in minor or slight personal injury or physical damage.

Depending on the circumstances, procedures indicated by CAUTION may also cause severe injury.
Compliance with EC directive (CE Marking)

This product complies with EC directive, however, this document does not guarantee that a mechanical system including this product will comply with EC directive. Compliance to EMC directive and LVD directive of the entire mechanical system should be checked by the user/manufacturer. For more details please contact the local Mitsubishi Electric sales site.

Caution for compliance with EC Directive

- Please use the FX3U Series programmable controllers while installed in conductive shielded control panels under a general industrial environment.
- Programmable controllers are open-type devices that must be installed and used within conductive control panels. Please secure the control box lid to the control box (for conduction).
- Installation within a control box greatly affects the safety of the system and aids in shielding noise from the programmable controller.
- For the control panel, use the product having sufficient strength, fire protection and shielding property to an installation environment.
- 24 V DC of the power supply must be supplied from the circuit double/reinforced isolated from the main power supply (MAINS).

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

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

Caution for Analog Products in use

The analog special adapters 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 device 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 should be used. If no other EMC protection is provided, then users may experience temporary induced errors not exceeding +10 %/-10 % in very heavy industrial areas.

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

- Sensitive analog cable should not be laid in the same trunking or cable conduit as high voltage cabling. Where possible users should run analog cables separately.
- Good cable shielding should be used. When terminating the shield at Earth - ensure that no earth loops are accidentally created.
- When reading analog values, EMC induced errors can be smoothed out by averaging the readings. This can be achieved through functions on the analog special adapter/block or through a users program in the FX3U Series PLC main unit.

Check if the following product and items are included in the package:

Incorporated Items

Check if the following product and items are included in the package:

- **Main units**
  - FX3U-64MR to FX3U-128MR
  - Dust proof protection sheet
  - Manuals [Japanese (*1)/English] 1 manual
- **Input/output extension unit**
  - FX3U-32MR
  - Extension cable
  - Input/output number label
  - Operation status display LEDs
- **Input/output extension blocks**
  - FX3U-48ME
  - Input/output number label

Incorporated Items

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>W: (mm)</th>
<th>MASS: (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top cover</td>
<td>103</td>
<td>0.6</td>
</tr>
<tr>
<td>2</td>
<td>Battery cover</td>
<td>123</td>
<td>0.65</td>
</tr>
<tr>
<td>3</td>
<td>Special adapter connecting hooks</td>
<td>155</td>
<td>0.85</td>
</tr>
<tr>
<td>4</td>
<td>Expansion board dummy cover</td>
<td>193</td>
<td>1.00</td>
</tr>
<tr>
<td>5</td>
<td>RUN/STOP switch</td>
<td>258</td>
<td>1.20</td>
</tr>
<tr>
<td>6</td>
<td>Peripheral device connecting connector</td>
<td>323</td>
<td>1.80</td>
</tr>
<tr>
<td>7</td>
<td>DIN rail mounting hooks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Model number (abbreviation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Input display LEDs (Red)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Terminal block cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Extension device connecting connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Operation status display LEDs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Output display LEDs (Red)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


[1] 2-4.5-diam mounting holes: FX3U-16ME, FX3U-32ME (except FX3U-30MRUA1)

FX3U-16ME and FX3U-32ME (except FX3U-30MRUA1) do not have the (*) marked mounting holes.

Model name W: (mm) Direct mounting hole pitches MASS (Weight): kg (lbs)

<table>
<thead>
<tr>
<th>Model name</th>
<th>W1: (mm)</th>
<th>Direct mounting hole pitches</th>
<th>MASS (Weight): kg (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FX3U-16ME</td>
<td>130</td>
<td>103 (4.06&quot;)</td>
<td>0.6 (1.32lbs)</td>
</tr>
<tr>
<td>FX3U-32ME</td>
<td>150</td>
<td>123 (4.85&quot;)</td>
<td>0.65 (1.43lbs)</td>
</tr>
<tr>
<td>FX3U-48ME</td>
<td>162</td>
<td>155 (6.11&quot;)</td>
<td>0.85 (1.87lbs)</td>
</tr>
<tr>
<td>FX3U-64ME</td>
<td>220</td>
<td>193 (7.6&quot;)</td>
<td>1.00 (2.2lbs)</td>
</tr>
<tr>
<td>FX3U-80ME</td>
<td>285</td>
<td>258 (10.16&quot;)</td>
<td>1.20 (2.64lbs)</td>
</tr>
<tr>
<td>FX3U-128ME</td>
<td>350</td>
<td>323 (12.72&quot;)</td>
<td>1.80 (3.96lbs)</td>
</tr>
</tbody>
</table>

(*) FX3U-32MRUA1 is equivalent to FX3U-48ME.

Installation

- 35-mm-wide DIN rail or Direct (screw) mounting (M4)
2. Installation (general specifications)


**INSTALLATION PRECAUTIONS**

- Use the product within the generic environment specifications described in section 2.1 of this manual.
- Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, C2H2, SO2 or NO2), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind.
- If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.
- Do not touch the conductive parts of the product directly. Doing so may cause device failure or malfunctions.
- Install the product securely using a DIN rail or mounting screws.
- 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.

**INSTALLATION PRECAUTIONS**

- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
- Failure to do so may cause fire, equipment failures or malfunctions.
- Be sure to remove the dust proof sheet from the PLC's main unit when beginning the installation and wiring work.
- Loose connections may cause malfunctions.
- Failure to do so may cause fire, equipment failures or malfunctions.
- Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors.
- Loose connections may cause malfunctions.
- Turn off the power to the PLC before attaching or detaching the product or electric shock.

**INSTALLATION PRECAUTIONS**

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

### 2.1 Generic specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>0 to 56 °C (32 to 131 °F) when operating and -25 to 75 °C (-13 to 167 °F) when stored</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>5 to 95 %RH (no condensation) when operating</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vibration resistance</th>
<th>Frequency (Hz)</th>
<th>Acceleration (m/s²)</th>
<th>Half amplitude (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>When installed on DIN rail</td>
<td>10 to 57</td>
<td>57 to 150</td>
<td>0.035</td>
</tr>
<tr>
<td>When installed directly</td>
<td>10 to 57</td>
<td>57 to 150</td>
<td>-</td>
</tr>
</tbody>
</table>

| Shock resistance | 447 m/s² Acceleration, Action time: 11 ms, 3 times by half-sine pulse in each direction X, Y, and Z |

<table>
<thead>
<tr>
<th>Diielectric withstand voltage</th>
<th>500 V AC for one minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between each terminals and ground terminal</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insulation resistance</th>
<th>5 MΩ or higher by 500 V DC insulation resistance tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class D grounding (grounding resistance: 100 Ω or less)</td>
<td>Each manual</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Working atmosphere</th>
<th>Free from corrosive or flammable gas and excessive conductive dusts</th>
</tr>
</thead>
</table>

| Working altitude | <2000 m (7400 ft) |

| Installation location | Inside a control panel (15°) |

<table>
<thead>
<tr>
<th>Over voltage category</th>
<th>111 or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollution degree</td>
<td>2 or less</td>
</tr>
</tbody>
</table>

### 2.2 Installation location

Install the PLC in an environment conforming to the generic specifications (section 2.1), installation precautions and notes. For more details, refer to FX3U Series User’s Manual - Hardware Edition.

**Installation location in enclosure**

Extension devices can be connected on the left and right sides of the main unit of the PLC. If you intend to add extension devices in the future, keep necessary spaces on the left and right sides.

**Configuration without extension cable**

Configuration in 2 stages with extension cable

**Configuration in 2 stages with extension cable**

**2.2.1 Affixing the dust proof sheet**

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

- For the affixing procedure, refer to the instructions on the dust proof sheet.
- Be sure to remove the dust proof sheet when the installation and wiring work is completed.
2.3 Procedures for installing to and detaching from DIN rail

The products can be installed on a DIN46277 rail (35 mm (1.38") wide). This section explains the installations of the main units.

For the input/output extension units/blocks and special adapters, refer to the following manual.

2.3.1 Installation

1) Connect the expansion boards and special adapters to the main unit.

2) Push out all DIN rail mounting hooks (below fig.A)

3) Fit the upper edge of the DIN rail mounting groove (right fig.B) onto the DIN rail.

4) Lock the DIN rail mounting hooks (below fig.C) while pressing the PLC against the DIN rail.

2.4 Procedures for installing directly (with M4 screws)

The product can be installed directly on the panel (with screws).

This section explains the installation of the main units.

As for the details of the installation/detaching for input extension units/blocks and special adapters, refer to the following manual.


2.4.1 Mounting hole pitches

Refer to the External Dimensions (section 1.2) for the product's mounting hole pitch information.

As for the details of the mounting hole pitches for extension units/block and special adapters, refer to the following manual.


2.4.2 Installation

1) Make mounting holes in the mounting surface referring to the external dimensions diagram.

2) Fit the main unit (A in the right figure) based on the holes, and secure it with M4 screws (B in the right figure).

The mounting hole pitches and number of screws depend on the product. Refer to the external dimensions diagram.

3. Power supply/input/output specifications and examples of external wiring

As for the details of the power supply wiring and input/output wiring, refer to FX3U Series User’s Manual - Hardware Edition.

DESIGN PRECAUTIONS

• Make sure to have the following safety circuits outside of the PLC to ensure safe operation even during external power supply problems or PLC failure.

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 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 the output current of the 24 V DC service power supply varies depending on the model and the absence/presence of extension blocks. If an overload occurs, the voltage automatically drops, inputs in the PLC are turned off (input is on).

4) Do not use common grounding with heavy electrical systems. Doing so may damage the product.

When two wires are connected to one terminal(*1)

WARNING

• Make sure to cut off all phases of the power supply externally before installation or wiring work.

Failure to do so may cause electric shock or damage to the product.

The temperature rating of the cable should be 80°C or more.

WIRING PRECAUTIONS

• Connect the AC power supply to the dedicated terminals described in this manual.

Failure to do so may cause fire, equipment failures or malfunctions.

• Connect the AC power supply to the dedicated terminals described in this manual.

Failure to do so may cause electric shock, equipment failures, or malfunctions.

• Make sure to properly wire to the terminal in accordance with the following precautions.

Failure to do so may cause fire, equipment failures, or malfunctions.

• Do not use common grounding with heavy electrical systems. Doing so may damage the product.

WIRING PRECAUTIONS

• Connect the AC power supply to the dedicated terminals described in this manual.

Failure to do so may cause fire, equipment failures, or malfunctions.

• Make sure to properly wire to the terminal in accordance with the following precautions.

Failure to do so may cause fire, equipment failures, or malfunctions.

• Connect the AC power supply to the dedicated terminals described in this manual.

Failure to do so may cause fire, equipment failures, or malfunctions.

<Reference>

Terminal manufacturer Type No. Applicable cable Certification Pressure bonding tool

J.S.T. Mfg. Co., Ltd. FV2-25-B3A AWG12 to 16 UL Listed YA-1 (J.S.T. Mfg. Co., Ltd.)

6.2 mm (0.24") or less 63.2 (0.13") Solderless terminal

6.3 mm (0.25") or more 63.2 (0.13") Solderless terminal

6.3 mm (0.25") or more 63.2 (0.13") Solderless terminal

3.1 Wiring

3.1.1 Cable end treatment and tightening torque

For the terminals of FX3U series PLC, M3 screws are used.

The electric wire ends should be treated as shown below.

Tighten the screws to a torque of 0.5 to 0.8 Nm.

Do not tighten terminal screws with a torque outside the above-mentioned range.

Failure to do so may cause equipment failures or malfunctions.

When one wire is connected to one terminal

<Reference>

Terminal manufacturer Type No. Applicable cable Certification Pressure bonding tool

J.S.T. Mfg. Co., Ltd. FV2-25-B3A AWG12 to 16 UL Listed YA-1 (J.S.T. Mfg. Co., Ltd.)

6.2 mm (0.24") or less 63.2 (0.13") Solderless terminal

6.3 mm (0.25") or more 63.2 (0.13") Solderless terminal

6.3 mm (0.25") or more 63.2 (0.13") Solderless terminal

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


3.1.2 Removal and installation of quick-release terminal block

Removal Unscrew the terminal block mounting screw (both right and left screws) evenly, and remove the terminal block.

Installation Place the terminal block in the specified position, and tighten the terminal block mounting screw evenly (both right and left screws).

Tightening torque 0.4 to 0.5 Nm

Do not tighten the terminal block mounting screws exceeding with a torque outside the above-mentioned range.

Failure to do so may cause equipment failures or malfunctions.

(*) Pay attention so that the center of the terminal block is not lifted.
3.2 Power supply specifications and example of external wiring

As for the details of the power supply specifications and example of external wiring, refer to the following manual.


3.2.1 Power supply specifications [Main unit, Input/output extension units]

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC power type</td>
<td>DC power type (*1)</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>Main unit: 100 to 240 V AC 24 V DC</td>
</tr>
<tr>
<td>Voltage fluctuation range</td>
<td>FX2N-32E: -15% to +10% FX2N-48E: -30% to +20%</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Allowable instantaneous power failure time</td>
<td>Operation can be continued upon occurrence of instantaneous power failure for 10 ms or less.</td>
</tr>
</tbody>
</table>

(*1) Does not include the power consumption of extension units/ special extension units, and of the extension blocks/special extension blocks connected to those units. For the power (current) consumed by the extension units/ blocks for input/output, refer to FX3U Series User’s Manual - Hardware Edition.

3.2.2 Example of external wiring (AC power type)

100 to 240 V AC power is supplied to the main unit and input/output extension units. For the details of wiring work, refer to section 3.1.

3.3 Grounding

Ground the PLC as stated below.

• Perform class D grounding. [Grounding resistance: 10 Ω or less]

• The PLC independently if possible. If it cannot be grounded independently, ground it jointly as shown below.

3.4 Input specifications and external wiring

As for the details of the input specifications and external wiring, refer to the following manual.


3.4.1 Input specifications (24 V DC input type)

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input connecting type</td>
<td>Refer to FX3U Series User’s Manual - Hardware Edition</td>
</tr>
<tr>
<td>Input signal form</td>
<td>AC power Type</td>
</tr>
<tr>
<td>Input signal voltage</td>
<td>DC power Type</td>
</tr>
<tr>
<td>Input/output unit/block</td>
<td>Main units</td>
</tr>
<tr>
<td>Input signal current</td>
<td>X010 or more</td>
</tr>
<tr>
<td>ON input sensitivity current</td>
<td>3.5 mA or more</td>
</tr>
<tr>
<td>OFF input sensitivity current</td>
<td>1.5 mA or less</td>
</tr>
<tr>
<td>Input response time</td>
<td>Approx. 10 ms</td>
</tr>
<tr>
<td>Input signal form (Input sensor form)</td>
<td>Sink input: No-voltage contact input NPN open collector transistor Source input: No-voltage contact input PNP open collector transistor</td>
</tr>
<tr>
<td>Input circuit insulation</td>
<td>Photocoupler insulation</td>
</tr>
<tr>
<td>Input operation display</td>
<td>LED on panel lights when photocoupler is driven</td>
</tr>
</tbody>
</table>

(*1) Each value inside ( ) indicates the number of occupied points.
3.4.2 Examples of 24 V DC input wiring [AC power type]

1. Sink input type
2. Source input type

(*) Class D grounding
See section 3.3 for details.

(*) Do not connect the (0V), (24V) terminals with others, since they are not available.

1) Main unite, input/output extension unit
(Common to both sink and source inputs)
2) Input/output extension block
(Common to both sink and source inputs)

3.4.3 Examples of 24 V DC input wiring [DC power type]

1. Sink input type
2. Source input type

(*) Class D grounding
See section 3.3 for details.

(*) Do not connect the (0V), (24V) terminals with others, since they are not available.

1) Main unite, input/output extension unit
(Common to both sink and source inputs)
2) Input/output extension block
(Common to both sink and source inputs)

3.4.4 Instructions for connecting input devices

1) In the case of no-voltage contact:
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.

*Example* Products of OMRON

<table>
<thead>
<tr>
<th>Type</th>
<th>Model name</th>
<th>Type</th>
<th>Model name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microswitch</td>
<td>Models 2, V and D2RV</td>
<td>Operation switch</td>
<td>Model A3P</td>
</tr>
<tr>
<td>Proximity switch</td>
<td>Model TL</td>
<td>Photoelectric switch</td>
<td>Model E3S</td>
</tr>
</tbody>
</table>

2) In the case of 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.

3.4.5 Input specifications (100 V AC input type)

- **Sink input**
  - 24V
  - S/S
  - 0V

- **Source input**
  - 0V
  - S/S
  - 24V

- **Input impedance**
  - 100 to 240 V AC
  - +10 %, -15 % 50/60 Hz

- **Input signal current**
  - 4.7 mA/100 V AC 50 Hz
  - 6.2 mA/110 V AC 60 Hz

- **ON input sensitivity current**
  - 3.8 mA or more

- **OFF input sensitivity current**
  - 1.7 mA or less

- **Input response time**
  - Approx. 25 to 30 ms (A high-speed receiving is improper)

- **Input signal form**
  - Contact input

- **Input circuit insulation**
  - Photocoupler insulation

- **Input operation display**
  - LED on panel lights when photocoupler is driven.

3.4.6 Examples of 100V AC input wiring

1) Main unit, input/output extension unit
(100 V AC input type)
2) Input extension block
(100 V AC input type)

3.5 Relay output specifications and example of external wiring

As for the details of instructions for connecting input devices, refer to the following manual.
*→ Refer to FX3U Series User's Manual - Hardware Edition*

3.5.1 Relay output specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of output points</td>
<td>Refer to FX3U Series User's Manual - Hardware Edition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of output points</th>
<th>FX3N-4ER</th>
<th>FX3N-8ER</th>
<th>FX3N-16ER</th>
</tr>
</thead>
<tbody>
<tr>
<td>FX3U-32ER, FX3U-64ER</td>
<td>8 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FX3U-48ER, FX3U-96ER</td>
<td>16 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FX3U-128ER</td>
<td>32 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FX3U-256ER</td>
<td>64 points</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Output connecting type | Refer to FX3U Series User's Manual - Hardware Edition |

<table>
<thead>
<tr>
<th>Output form</th>
<th>Relay</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>External power supply</th>
<th>30 V DC or less</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Current Leakage</th>
<th>2 A or less</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Output circuit</th>
<th>Mechanical insulation</th>
</tr>
</thead>
</table>

| Input operation display | LED on panel lights when power is applied to relay coil. |
3.5.3 Example of relay output wiring

![Relay Output Wiring Diagram]

3.5.4 Cautions in external wiring

For cautions in external wiring, refer to the following manual.

Protection circuit for load short-circuiting

When a load connected to the output terminal short-circuits, the printed circuit board may be burnt out. Fit a protective fuse on the output circuit.

Protection circuit of contact when inductive load is used

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. Use a diode (for commutation) having the following specifications:
- Forward current: Load current or more
- Reverse voltage: 5 to 10 times the load voltage
- Forward current: Load current or more

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistor load</td>
<td>0.5 A/point (*)</td>
</tr>
<tr>
<td>Inductive load</td>
<td>0.3 A/point (*)</td>
</tr>
<tr>
<td>Interlock</td>
<td>12 W/24 V DC (*)</td>
</tr>
<tr>
<td>Common mode</td>
<td>7.2 W/24 V DC (*)</td>
</tr>
</tbody>
</table>

Interlock

Loads, such as contactors for normal and reverse rotations, that must not be turned on simultaneously should have an interlock in the PLC program and an external interlock.

Common mode

Use output contacts of the PLC in the common mode.

3.6.1 Transistor output specifications

As for the details of the transistor output specifications and external wiring, refer to the following manual.

3.6.2 Transistor output specifications and example of external wiring

As for the details of the transistor output specifications and external wiring, refer to the following manual.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input/output extension units/(blocks) (*7)</td>
<td>0.2 ms or less/200 mA or more (24 V DC)</td>
</tr>
<tr>
<td>Response time</td>
<td>0.2 ms or less/10 mA or more (5-24 V DC)</td>
</tr>
<tr>
<td>Output circuit insulation</td>
<td>Photocoupler insulation</td>
</tr>
<tr>
<td>Output operation display</td>
<td>LED on panel lights when photocoupler is driven.</td>
</tr>
</tbody>
</table>

(*1) The total load current of resistance loads per common terminal should be the following value:
- 1 output point/common terminal: 0.5 A or less
- 4 output points/common terminal: 0.8 A or less
- 8 output points/common terminal: 1.6 A or less
- As for the number of outputs per common terminal, refer to “Chapter 4 interpretation of partition” and the following manual.

(*2) The total load current of load points per common terminal should be the following value:
- 4 output points/common terminal: 2 A or less
- 8 output points/common terminal: 4 A or less
- As for the number of outputs per common terminal, refer to the following manual.

(*3) The total load current of resistance loads per common terminal should be the following value:
- 1 output point/common terminal: 0.5 A or less
- 8 output points/common terminal: 1.6 A or less
- As for the number of outputs per common terminal, refer to “Chapter 4 interpretation of partition” and the following manual.

(*4) The total load of inductive loads per common terminal should be the following value:
- 1 output point/common terminal: 12 W or less/24 V DC
- 4 output points/common terminal: 19.2 W or less/24 V DC
- 8 output points/common terminal: 38.4 W or less/24 V DC
- As for the number of outputs per common terminal, refer to “Chapter 4 interpretation of partition” and the following manual.

(*5) The total load of inductive loads per common terminal should be the following value:
- 4 output points/common terminal: 48 W or less/24 V DC
- As for the number of outputs per common terminal, refer to the following manual.

(*6) The total load of inductive loads per common terminal should be the following value:
- 16 output points/common terminal: 38.4 W or less
- As for the number of outputs per common terminal, refer to the following manual.

(*7) 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
3.6.2 External wiring of transistor output

1. External wiring of sink output type

For cautions in external wiring, refer to the following manual.


2. External wiring of source output type

For cautions in external wiring, refer to the following manual.


3.6.3 Cautions in external wiring

For cautions in external wiring, refer to the following manual.


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.

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of output points</td>
<td>FX3U-32MS/ES, FX3N-18ES, FX3N-32ES</td>
</tr>
<tr>
<td>External power supply</td>
<td>85 to 242 V AC</td>
</tr>
<tr>
<td>Resistance load</td>
<td>0.3 A/point (*1)</td>
</tr>
<tr>
<td>Inductive load</td>
<td>15 VA/100 V AC, 30 VA/200 V AC</td>
</tr>
<tr>
<td>Min. load</td>
<td>0.4 VA/100 V AC, 1.6 VA/200 V AC</td>
</tr>
<tr>
<td>Open circuit leakage current</td>
<td>1 mA/100 V AC, 2 mA/200 V AC</td>
</tr>
<tr>
<td>Response time</td>
<td>OFF→ON: 1 ms or less, ON→OFF: 10 ms or less</td>
</tr>
<tr>
<td>Output circuit insulation</td>
<td>Photo-thyristor insulation</td>
</tr>
<tr>
<td>Output operation display</td>
<td>LED on panel lights when photo-thyristor is driven</td>
</tr>
</tbody>
</table>

(*1) The total load current of resistance loads per common terminal should be the following value:

- 4 output points/common terminal: 0.8 A or less
- 8 output points/common terminal: 0.8 A or less

As for the number of outputs per common terminal, refer to “Chapter 4 interpretation of partition” and the following manual.


3.7 Triac output specifications and example of external wiring

For cautions in external wiring, refer to the following manual.


For details on the terminal block layout, refer to the following manual.


Interpretation of partition

The partition of the output terminals (see following figure) indicates the range of the output connected to the same common.

Example: FX3U-48MT/ES

4. Terminal block layouts

For details on the terminal block layout, refer to the following manual.


For safe use

- 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.