STARTUP AND MAINTENANCE PRECAUTIONS

- 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 the programming tool and a GOT)
- Do not 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, burning, ignition, liquid leakage or deformation, and lead to injury, fire or failures and malfunctions of facilities and other equipment.
- When replacing the battery, make sure to use our specified product (FX3U-32BL).
- When a battery error occurs ("BAT" LED is lit in red), follow the description in FX3U Series User’s Manual - Hardware Edition.
- Turn off the power to the PLC before attaching or detaching the following devices.
  - Peripheral devices, expansion units/blocks, converter, extension adapter, extension power supply units, special adapters, and FX Series terminal blocks.
  - Battery and memory cassettes
  - Do not use the chemicals for cleaning.
  - If there is a possibility of touching the PLC inside a control panel in maintenance, make sure to discharge to avoid the influence of static electricity.
- Turn off the power to the PLC before disconnecting or connecting any extension cable. Failure to do so may cause equipment failures or malfunctions.
- Turn off the power to the PLC before attaching or disconnecting the following devices.
  - When replacing the battery, make sure to use our specified product (FX3U-32BL).
- The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in Section 2.1 by using dedicated packaging boxes and shock-absorbing pallets. Failure to do so may cause damage or malfunction of the PLC program.
- Use the battery for memory backup correctly in FX3UC Series. If the memory cassette is attached or detached while the PLC’s power is on, the data in the memory may be destroyed, or the memory cassette may be damaged.
- Do not disassemble or modify the PLC.
- Do so may cause fire, equipment failures, or malfunctions.
  - For repair, contact your local Mitsubishi Electric representative.
- When replacing lithium batteries, follow required transportation regulations.
- 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.

Certificate of UL, cUL standards

FX3UC series main units, FX3U series special adapter, extension power supply unit and FX3N/FX2N series input/output expansion blocksUL, cUL standards are as follows:

UL, cUL file number: ES9239

Models: MELSEC FX3UC series manufactured

FX3UC- + MT/DB
FX3UC- + MT/DBS
FX3UC-18MRD-T
FX3UC-16MRD-T
FX3UC-232ADP (MB)
FX3UC-485ADP (MB)
FX3UC-3AD-ADP
FX3UC-4AD-ADP
FX3UC-AD-ADP
FX3UC-4AD-TP-ADP
FX3UC-4AD-PT-ADP
FX3UC-3AD-PT-ADP
FX3UC-3AD-TP-ADP
FX3UC-1PS-5V

Models: MELSEC FX2N series manufactured

FX2N-16SC-T/DB
FX2N-16SC-T/DBS
FX2N-16SC-T/DBS
FX2N-16SC-T/DBS
FX2N-16SC-T/DBS

Models: MELSEC FX3 series manufactured

FX3U-16ES (DB)
FX3U-32ES (DB)
FX3U-16ET (DB)
FX3U-16ET (DB)
FX3U-16ET (DB)

Models: MELSEC FX2N series manufactured

FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL
FX2N-8ES/UL

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 staff.

Caution for Compliance with EC directive

- Please use the FX3UC (D, DS, DSS) 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 grounding wires to the control panel (grounding). Installation within a control panel 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 protectioniveness and shielding property to an installation environment.
- 24 V DC of the power supply must be supplied from the circuit double/reinforced insulated from the main power supply (Main INS).

Caution for compliance with the LVD directive

(EN61010-2-201:2013) (1)

To an extension block other than those connected to AC power system 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 or lower external power supply and 30 V DC or lower external power supply and 30 V DC or lower external power supply as a touchable part, (When handling 30 V DC or lower external power supply as a touchable part, add a basic insulation.)
For crimp terminals to be used for the wiring applied with 30 V AC or higher, use the products with insulating sleeves.

Cutoff device such as a breaker or a circuit protector should be installed in accordance with the following precautions:

- Use EN60947-1 or EN60947-3 standards.
- Place the cutoff device so that it can be operated easily.
- Specify that the cutoff device is for this equipment.


**WARNING**

Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.

**INSTALLATION PRECAUTIONS**

- Do not touch the conductive parts of the product directly.
- Do not touch the conductive parts of the product directly.
- When reading analog values, EMC induced errors can be smoothed out by averaging the readings. This can be achieved either through functions on the analog special adapter/block or through the user’s program in the FX.
2.2 Installation Location

Install the PLC in an environment conforming to the generic specifications (section 2.1), installation precautions and notes.


Installation location in enclosure

Space in enclosure

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

2.3 Procedures for installing to and detaching from DIN rail

The main unit can be installed on a DIN46277 rail [35 mm (1.38”) wide].

For detail, refer to the following manual.


2.4 Connection of power supply connector

Use the dedicated built-in power connector to supply power to the main unit.

The power should be supplied to the main unit, FX2NC Series I/O extension blocks and FX2NC/FX3UC Series special extension blocks. Some (FX2NC-CNV-IF(T)-DS) require power line cables B and C shown on the right, while others (FX2NC-CNV-IF(T)-DS) do not require them. For details, refer to FX3UC Series User’s Manual - Hardware Edition.

When connecting two or more extension blocks which require power cables “B” and “C” shown on the right, perform crossover wiring between the extension blocks using two (upper and lower) power connectors.

Some (FX2NC-EX(-T)) of FX2NC Series I/O extension blocks do not require them. For details, refer to FX3UC Series User’s Manual - Hardware Edition.
### 2.5 Connection to input/output connector

The input/output connectors of the Main units (Connector type) conform to MIL-C-83503. Refer to Chapter 4 for the I/O connector pin arrangement.

#### 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. For terminal block connection, refer to FX2NC/FX3UC series special function blocks.

<table>
<thead>
<tr>
<th>Model names</th>
<th>Length</th>
<th>Description</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>FX-16E-500CAB-S</td>
<td>5 m (16'4&quot;)</td>
<td>General-purpose input/output cable</td>
<td>Single wire (Wire color: red) / PLC side: A 20-pin connector</td>
</tr>
<tr>
<td>FX-16E-300CAB</td>
<td>3 m (9'10&quot;)</td>
<td>Cables for connecting the FX Series terminal block with input/output connectors</td>
<td>Flat cables (with tube) / A 20-pin connector at both ends</td>
</tr>
<tr>
<td>FX-16E-150CAB</td>
<td>1.5 m (4'11&quot;)</td>
<td>Flat cables for terminal block connection, refer to FX3UC series User's Manual - Hardware Edition.</td>
<td>Flat cables (with tube) / A 20-pin connector at both ends</td>
</tr>
<tr>
<td>FX-16E-150CAB-R</td>
<td>1.5 m (4'11&quot;)</td>
<td>Flat cables for terminal block connection in 16-pin units.</td>
<td>Flat cables (with tube) / PLC side: Two 20-pin connectors in 16-pin units. / Terminal block side: A dedicated connector / One common terminal covers 32 input/output terminals.</td>
</tr>
</tbody>
</table>

#### 3) Connectors for user-made input/output cables (available from Mitsubishi)

Users should provide electric wires and a pressure bonding tool.

<table>
<thead>
<tr>
<th>Model name</th>
<th>Details of part (made by DDK Ltd.)</th>
<th>Electric wire size</th>
<th>Pressure bonding tool (made by DDK Ltd.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FX2C-I/O-CON for flat cable</td>
<td>Solderless connector FXC2-A020-30S</td>
<td>AWG28 (0.1 mm²) / 1.27 pitch, 20-core</td>
<td>357J-4674D: Main body / 357J-4664AT: Attachment</td>
</tr>
<tr>
<td>FX2C-I/O-CON-S for bulk wire</td>
<td>Housing Hu-2052S-001 Solderless contact Hu-411S</td>
<td>AWG22 (0.3 mm²)</td>
<td>357J-5538</td>
</tr>
<tr>
<td>FX2C-I/O-CON-SA for bulk wire</td>
<td>Housing Hu-2052S-001 Solderless contact Hu-411SA</td>
<td>AWG20 (0.5 mm²)</td>
<td>357J-13963</td>
</tr>
</tbody>
</table>

#### 4) Certified connectors (commercially available connectors)

Connectors made by DDK Ltd. shown in Item 3.

### 2.6 Connection to input/output terminal block

#### 2.6.1 Cable

1. **Applicable cable**

   - Single wire 0.3 mm² or 0.5 mm² (AWG22 to 20)
   - Double wire 0.3 mm² (AWG22X2)

2. **Termination**

   - Strip the coating of strand wire and twist the cable core before connecting it.
   - Strip the coating of single wire before connecting it. An alternative connection is to use a ferrule with insulating sleeve.

   - **Manufacturer**
     - Phoenix Contact GmbH & Co. KG
     - CRIMPFOX 6 (⁺) or CRIMPFOX 6T-F (⁺²)

   - **Cautions**
     - Ensure safe machinery operation in such a case.

#### 2.6.2 Tightening Torque

Tighten the terminals to a torque of 0.22 to 0.25 Nm.

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

Failure to do so may cause equipment failures or malfunctions.

<table>
<thead>
<tr>
<th>Tool</th>
<th>To tighten terminals, use a purchased small-sized screwdriver whose head is straight and is not widened as shown in the right figure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Reference&gt;</td>
<td>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 above, use the following screwdriver or an appropriate replacement (grasp diameter approximately 25 mm (0.98’)).</td>
</tr>
</tbody>
</table>

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

#### DESIGN PRECAUTIONS

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

  _Otherwise, malfunctions may cause serious accidents._

  1. _Most importantly, have the following:_ an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).

  2. _Note that when the PLC CPU detects an error, such as a watchdog timer error, during self-diagnosis, all outputs are turned off. Also, when an error that cannot be detected by the PLC CPU occurs in an input/output control block, output control may be disabled._

  _External circuits and mechanisms should be designed to ensure safe machinery operation in such a case._

  3. _Note that when an error occurs in a relay, transistor or relay output device, the output can be held either on or off. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case._

#### DESIGN PRECAUTIONS

- **CAUTION**
  - Do not bundle the control line together with or lay it close to the main circuit or power line. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit or power line.

  - Noise may cause malfunctions.

  - Install module so that excessive force will not be applied to peripheral device connectors, power connectors or input/output connectors.

  - Failure to do so may result in wire damage/breakage or PLC failure.
3.1 Power supply specifications and example of external wiring


3.1.1 Power supply specifications

The specifications for the power supply of the main unit are shown in the following table.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Voltage fluctuation range</td>
<td>+20% -15%</td>
</tr>
<tr>
<td>Ripple Voltage (p-p)</td>
<td>5% or less</td>
</tr>
<tr>
<td>Allowable instantaneous power failure time</td>
<td>Operation can be continued upon occurrence of an instantaneous power failure for 5 ms or less.</td>
</tr>
<tr>
<td>Power fuse</td>
<td>125 V ± 15 A</td>
</tr>
<tr>
<td>Rush current</td>
<td>30 A max 0.5 ma/24 V DC</td>
</tr>
</tbody>
</table>

5 V DC built-in power supply

→ For the power consumed by the special function units/blocks, refer to the Subsection 3.3.3.


3.1.2 Example of external wiring (power type)

Supply 24 V DC power to the main unit and FXNC-□□EX(-T) using the dedicated connector.

→ For the details of wiring work, refer to Section 2.4.
→ For the power supply wiring of the FX2nC input extension blocks, refer to the Subsection 3.3.3.

For DC power supply, use the products with 24 V DC, a voltage fluctuation range of -15% to +20%, and whose ripple (p-p) is within 5%. The allowable range of the 24 V DC power supply may be narrower when special function units/blocks are connected.


3.2 Grounding

Ground the PLC as stated below:

1. Perform class D grounding. (Grounding resistance: 100 Ω or less)
2. Ground the PLC independently if possible. If it cannot be grounded independently, ground it jointly as shown below.
   • Position the grounding point as close to the PLC as possible to decrease the length of the ground wire.

3.3 Input specifications and external wiring


3.3.1 Input specifications

Supply 24 V DC to the main unit and FXNC-□□EX(-T) using the dedicated connector.

→ For the details of wiring work, refer to Section 2.4.
→ For the power supply wiring of the FX2nC input extension blocks, refer to the Subsection 3.3.3.

WIRING PRECAUTIONS

WARNING

Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.

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

CAUTION

Connect the DC power supply wiring to the dedicated terminals described in this manual. If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the PLC will burn out.

Do not use common grounding with heavy electrical systems (refer to section 3.2).

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 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 strain 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 pressed.

Notes

• Simultaneously turn on and off the power supplies of the main unit and extension devices.
• Even if the power supply causes an instantaneous power failure for 5 ms, the PLC can continue to operate.
• If a long-time power failure or an abnormal voltage drop occurs, the PLC will stop, and output is turned off. When the power supply is restored, it will automatically restart (when the RUN input is on).

SIMULTANEOUS POWER SUPPLIES

Input specification (24 V DC)

Power consumption

Input specification (24 V DC)

Supply 24 V DC power to the main unit and FX2nC-□□EX(-T) using the dedicated connector.

→ For the details of wiring work, refer to Section 2.4.
→ For the power supply wiring of the FX2nC input extension blocks, refer to the Subsection 3.3.3.

For DC power supply, use the products with 24 V DC, a voltage fluctuation range of -15% to +20%, and whose ripple (p-p) is within 5%. The allowable range of the 24 V DC power supply may be narrower when special function units/blocks are connected.


3.2.1 Power supply specifications

The specifications for the power supply of the main unit are shown in the following table.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Voltage fluctuation range</td>
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</tr>
<tr>
<td>Ripple Voltage (p-p)</td>
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</tr>
<tr>
<td>Allowable instantaneous power failure time</td>
<td>Operation can be continued upon occurrence of an instantaneous power failure for 5 ms or less.</td>
</tr>
<tr>
<td>Power fuse</td>
<td>125 V ± 15 A</td>
</tr>
<tr>
<td>Rush current</td>
<td>30 A max 0.5 ma/24 V DC</td>
</tr>
</tbody>
</table>

5 V DC built-in power supply

→ For the power consumed by the special function units/blocks, refer to the Subsection 3.3.3.


3.2.2 Example of external wiring (power type)

Supply 24 V DC power to the main unit and FX2nC-□□EX(-T) using the dedicated connector.

→ For the details of wiring work, refer to Section 2.4.
→ For the power supply wiring of the FX2nC input extension blocks, refer to the Subsection 3.3.3.

For DC power supply, use the products with 24 V DC, a voltage fluctuation range of -15% to +20%, and whose ripple (p-p) is within 5%. The allowable range of the 24 V DC power supply may be narrower when special function units/blocks are connected.


3.3.1 Input specifications

Supply 24 V DC to the main unit and FX2nC-□□EX(-T) using the dedicated connector.

→ For the details of wiring work, refer to Section 2.4.
→ For the power supply wiring of the FX2nC input extension blocks, refer to the Subsection 3.3.3.

For DC power supply, use the products with 24 V DC, a voltage fluctuation range of -15% to +20%, and whose ripple (p-p) is within 5%. The allowable range of the 24 V DC power supply may be narrower when special function units/blocks are connected.


3.3.2 Example of external wiring (power type)

Supply 24 V DC power to the main unit and FXNC-□□EX(-T) using the dedicated connector.

→ For the details of wiring work, refer to Section 2.4.
→ For the power supply wiring of the FX2nC input extension blocks, refer to the Subsection 3.3.3.

For DC power supply, use the products with 24 V DC, a voltage fluctuation range of -15% to +20%, and whose ripple (p-p) is within 5%. The allowable range of the 24 V DC power supply may be narrower when special function units/blocks are connected.


3.3.3 Input specifications

Supply 24 V DC power to the main unit and FXNC-□□EX(-T) using the dedicated connector.

→ For the details of wiring work, refer to Section 2.4.
→ For the power supply wiring of the FX2nC input extension blocks, refer to the Subsection 3.3.3.

For DC power supply, use the products with 24 V DC, a voltage fluctuation range of -15% to +20%, and whose ripple (p-p) is within 5%. The allowable range of the 24 V DC power supply may be narrower when special function units/blocks are connected.


3.3.4 Example of external wiring (power type)

Supply 24 V DC power to the main unit and FXNC-□□EX(-T) using the dedicated connector.

→ For the details of wiring work, refer to Section 2.4.
→ For the power supply wiring of the FX2nC input extension blocks, refer to the Subsection 3.3.3.

For DC power supply, use the products with 24 V DC, a voltage fluctuation range of -15% to +20%, and whose ripple (p-p) is within 5%. The allowable range of the 24 V DC power supply may be narrower when special function units/blocks are connected.
3.3.2 Handling of input terminal

1) FX3UC-D/MTID, FX3UC-16MR/D-T, FX2NC-C/DEX(T)
   Inputs turn ON when the input terminal and COM terminal are electrically connected with a no-voltage contact or NPN open collector transistor.

2) FX3UC-C/DMT/DSS, FX3UC-16MR/D-S/T, FX2NC-C/DEX(T)-DS
   • sink input
     Inputs turn ON when the 24 V DC terminal and COM terminal or COM terminal and COM terminal are connected, and the input terminal and 24 V DC terminal are electrically connected with a no-voltage contact or NPN open collector transistor.
   • source input
     Inputs turn ON when the 24 V DC terminal and COM terminal or COM terminal and COM terminal are connected, and the input terminal and 24 V DC terminal are electrically connected with a no-voltage contact or PNP open collector transistor.

   Where △ indicates 0 to 2

3.3.3 Example of input wiring

1. Examples of input wiring (FX3UC-D/MTID, FX3UC-16MR/D-T)
   Breaker, Circuit protector, Fuse, etc.
   24 V DC
   • sink input
     Inputs turn ON when the input terminal and COM terminal are electrically connected with a no-voltage contact or NPN open collector transistor.
   • source input
     Inputs turn ON when the input terminal and COM terminal are electrically connected with a no-voltage contact or PNP open collector transistor.
   (2) The grounding resistance should be 100 Ω or less.

2. Examples of sink input wiring (FX3UC-D/DMT/DSS, FX3UC-16MR/D-S/T)
   Breaker, Circuit protector, Fuse, etc.
   24 V DC
   • sink input
     Inputs turn ON when the input terminal and COM terminal are electrically connected with a no-voltage contact or NPN open collector transistor.
   • source input
     Inputs turn ON when the input terminal and COM terminal are electrically connected with a no-voltage contact or PNP open collector transistor.
   (2) The grounding resistance should be 100 Ω or less.

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

3.4 Output specifications and example of external wiring

3.4.1 Transistor output specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Output specification (Transistor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of output points</td>
<td>FX3UC-16MT/DS(DSS) 8 points</td>
</tr>
<tr>
<td>FX3UC-32MT/DS(DSS) 16 points</td>
<td></td>
</tr>
<tr>
<td>FX3UC-64MT/DS(DSS) 32 points</td>
<td></td>
</tr>
<tr>
<td>FX3UC-96MT/DS(DSS) 48 points</td>
<td></td>
</tr>
<tr>
<td>FX3UC-X6MT/DS(DSS) 32 points</td>
<td></td>
</tr>
</tbody>
</table>

Output connecting type

- Link
- Source

Output form

- FX3UC-C/DMT/DSS
- FX3UC-C/DEY/DSS
- FX3UC-C/DMT/DSS (-DSS)
- FX3UC-C/DEY/DSS (-DSS)

External power supply

5-30V DC

Max. load

- Resistance load
  - Main units: Y000 to Y002 0.3 A/point
  - Y004 or more 0.1 A/point
  - Make sure that the total load current of 8 resistance load points is 0.8 A (*1) or less.

- Inductive load
  - Main units: Y000 to Y002 2.4 W/point (24 V DC)
  - Make sure that the total load of 16 inductive load points is 38.4 W (24 V DC or less).

3.4.2 Handling of transistor output circuit

Output terminal:
The main unit and FX2NC input/output expansion block have 16 transistor output points per common. Two COM* or +V* terminals connected to each other inside the PLC are provided for outputs. Connect two COM* or +V* terminals outside the PLC so that the load applied to each COM* or +V* terminal is smaller.

Where * indicates: 1 to 3
Where △ indicates: 0 to 2

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.

3.4.3 Example of transistor output wiring

1. Examples of sink output wiring

2. Examples of source output wiring

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

(*3) 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 to increase the load current.

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

(*2) In FX3UC-64MT/DSS or FX3UC-96MT/DSS units, the COM0, COM1 and COM2 terminals are not connected internally. Wire the COM0, COM1 and COM2 terminals respectively.

(*3) 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 to increase the load current.

(*1) When the two COM* terminal are connected outside the PLC, resistance load is 1.6 A or less.
3.4.4 Relay output specifications


<table>
<thead>
<tr>
<th>Item</th>
<th>Output specification (Relay)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of output points</td>
<td>FX3UC-16MR/DS(S)-T 8 points</td>
</tr>
<tr>
<td></td>
<td>FX3UC-16EYR-T(DS)-T 16 points</td>
</tr>
</tbody>
</table>

3.5 Cautions in input and output wiring

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

<table>
<thead>
<tr>
<th>Derating curve</th>
<th>Supply voltage: 24 V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>simultaneous ON ratio</td>
<td>80 % - 20 %</td>
</tr>
<tr>
<td>When only the main unit is used (without extension units/blocks)</td>
<td></td>
</tr>
</tbody>
</table>

- When extending units/ blocks are connected, make sure that the total load current of 4 or 8 resistance load points is 4 A or less. When connecting two COMC terminals outside the PLC, make sure that the total load current of 4 resistance load points is 8 A or less.

3.5.1 Instructions for 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 switches for larger current are being used, contact failure may occur.


1) In the case of input devices with built-in series diodes: 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 OFF.

2) Contact protection circuit for inductive loads

- Use a two-wire proximity switch whose leakage current is 1.5 mA or less when the switch is off. When the current is larger than 1.5 mA, connect a bleeder resistor.

3) Interlock

- 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 the surge absorber suitable to the output used. Refer to the table below for other specifications.

4) Common mode

- Use output contacts of the PLC in the common mode.

3.5.2 Cautions on transistor output wiring


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 PC board. To prevent this, a protection fuse should be included at the output.

2) Protection circuit for 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.

- DC circuit

- Connect a diode in parallel with the load. Use a diode (for commutation) having the following specifications.

- Reverse voltage: 5 to 10 times of the load voltage

- Forward current: Load current or more

- 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 the surge absorber suitable to the output used. Refer to the table below for other specifications.

- ELECTRICAL CAPACITANCE 0.1 μF

- RESISTANCE VALUE 200 Ω

- 3) 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.

4) Common mode

- Use output contacts of the PLC in the common mode.
4.2 FX2nc input/output extension blocks

4.2.1 FX2nc-CC16EX(1)-DS

4.2.2 FX2nc-CC16EYT(1)-DS

4.3 FX2nc-16MR(1)-T

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