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PROGRAMMABLE CONTROLLERS

MELSEC-F

DSS/DS

## HARDWARE MANUAL

FX2NC (DSS/DS) SERIES PROGRAMMABLE CONTROLLERS

# FX2NC

**Foreword**

This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the FX2NC and should be read and understood before attempting to install or use the unit.

If in doubt at any stage during the installation of the FX 2NC 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 of the FX2NC please consult the nearest Mitsubishi Electric distributor.

This manual is subject to change without notice.

ISO 9001

NATIONAL ACCREDITATION OF CERTIFICATION BODIES

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# FX2NC (DSS/DS) Series Programmable Controllers

**Hardware Manual**

Manual number : JY992D76401

Manual revision : D

Date : DEC. 2000

## Guidelines for the safety of the user and protection of the FX2NC.

This manual provides information for the installation and use of the FX2NC. 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 product should be trained to use that product in a safe and co-ordinated 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.

## Note's on the symbols used in this manual

At various times through out this manual certain symbols will be used to highlight points which are intended to ensure the users personal safety and protect the integrity of the equipment. Whenever any of the following symbols are encountered, its associated note must be read and understood. Each of the symbols used will now be listed with a brief description of its meaning.

### Hardware warnings

1) Indicates that the identified danger **WILL** cause physical and property damage.

2) Indicates that the identified danger could **POSSIBLY** cause physical and property damage.

3) Indicates a point of further interest or further explanation.

### Software warning

4) Indicates special care must be taken when using this element of software.

5) Indicates a special point which the user of the associate software element should be aware of.

6) Indicates a point of interest or further explanation.

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| 1 | **INTRODUCTION** |
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# 1.    Introduction

This manual covers the hardware installation instructions for the following programmable controller (PLC) product ranges;

- FX2NC main units.

- FX2NC extension blocks and special function blocks

### *Table 1.1  :  Main units*

| MODEL | INPUT | | OUTPUT | | POWER SUPPLY | DIMENSIONS mm (inches) | | | MASS kg (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| | QTY | TYPE | QTY | TYPE | | | | | |
| FX2NC-16MT-DSS | 8 | | 8 | | 24V DC +20% -15% | 35 (1.4) | | 87 (3.4) | 0.2 (0.44) |
| FX2NC-32MT-DSS | 16 | | 16 | | | | | | |
| FX2NC-64MT-DSS | 32 | 24V DC Sink / Source | 32 | Transistor (Source) | | 60 (2.4) | 90 (3.5) | | 0.35 (0.77) |
| FX2NC-96MT-DSS | 48 | | 48 | | Ripple Voltage (p-p) 5% or less | 86 (3.4) | | | 0.45 (0.99) |
| FX2NC-16MR–T DS | 8 | | 8 | Relay | | 35 (1.4) | | 89 (3.5) | |

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### Figure 1.1  :Main unit dimensions

UNITS: mm (inches)
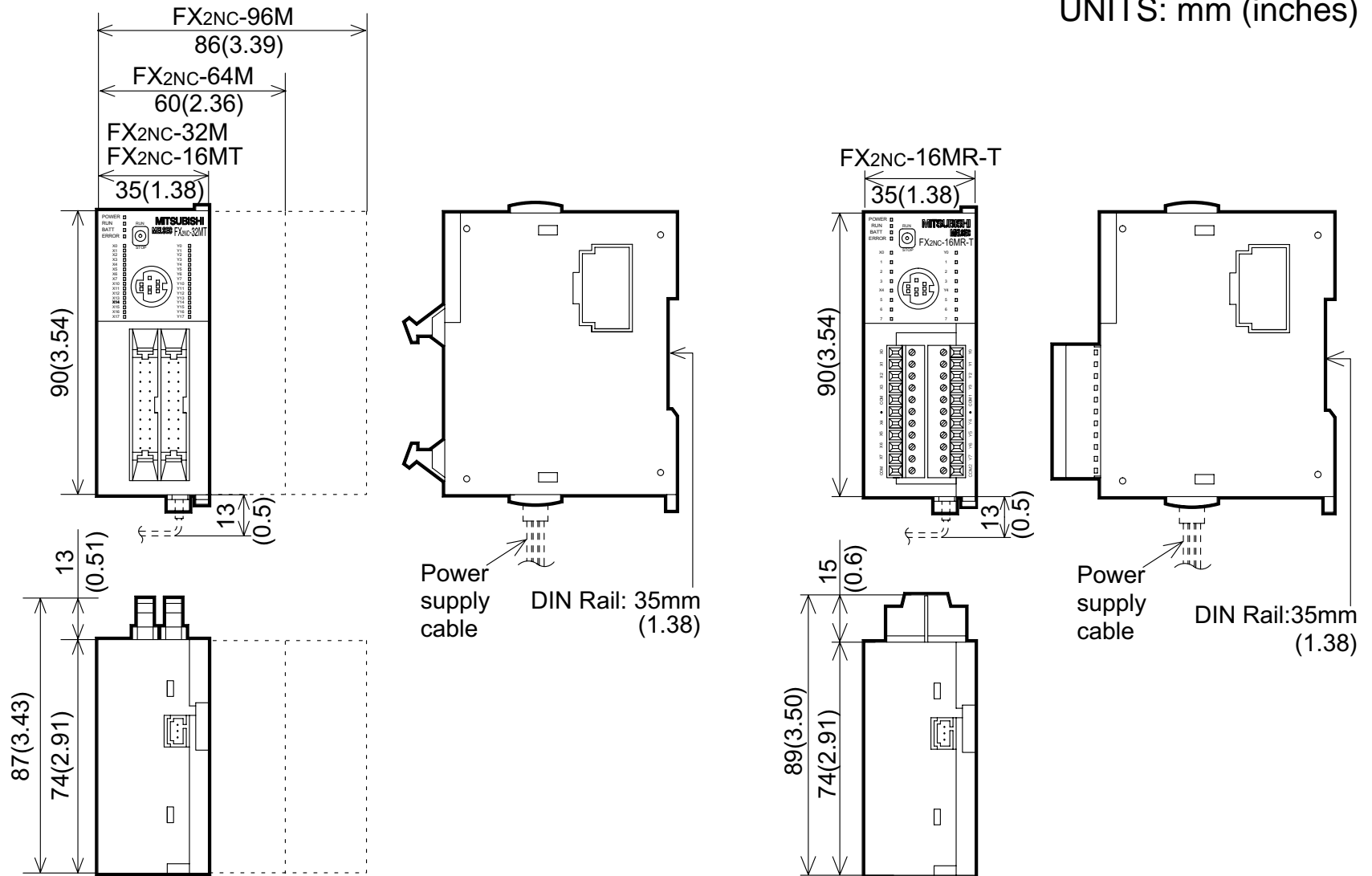


Power supply cable

DIN Rail: 35mm (1.38)

Power supply cable

DIN Rail:35mm (1.38)

### Table 1.2 : Extension blocks

| MODEL | INPUT | | OUTPUT | | | DIMENSIONS mm (inches) | | | MASS kg (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| | QTY | TYPE | QTY | DEVICE | TYPE | | | | |
| FX2NC-16EX-DS | 16 | 24V DC Sink/ Source | - | - | - | 14.6 (0.6) | 90 (3.5) | 87 (3.4) | 0.15 (0.33) |
| FX2NC-16EYT-DSS | - | - | 16 | Transistor | Source | | | | |
| FX2NC-32EX-DS | 32 | 24V DC Sink/ Source | - | - | - | 26.2 (1.0) | | | 0.2 (0.44) |
| FX2NC-32EYT-DSS | - | - | 32 | Transistor | Source | | | | |
| FX2NC-16EX-T-DS | 16 | 24V DC Sink/ Source | - | - | - | 20.2 (0.8) | | 89 (3.5) | |
| FX2NC-16EYR-T-DS | - | - | 16 | Relay | - | 24.2 (0.95) | | | 0.2 (0.44) |

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### Table 1.2 : Extension blocks

| MODEL | INPUT | | OUTPUT | | | DIMENSIONS mm (inches) | | | MASS kg (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| | QTY | TYPE | QTY | DEVICE | TYPE | | | | |
| FX0N-8EX-UA1/UL | 8 | 110V AC inputs | - | - | - | 43 (1.7) | | | 0.2 (0.44) |
| FX0N-8EX-ES/UL | 8 | 24V DC Sink/ Source | - | - | - | | | | |
| FX0N-8ER-ES/UL | 4 | | 4 | Relay | - | | 90 (3.5) | 87 (3.4) | |
| FX0N-8EYR-ES/UL | - | - | 8 | | - | | | | |
| FX0N-8EYT-ESS/UL | - | - | 8 | Transistor Source | | | | | |
| FX0N-16EX-ES/UL | 16 | 24V DC Sink/ Source | - | - | - | 70 (2.8) | | | 0.3 (0.66) |
| FX0N-16EYR-ES/UL | - | - | 16 | Relay | - | | | | |
| FX0N-16EYT-ESS/UL | - | - | 16 | Transistor Source | | | | | |
| FX2N-16EX-ES/UL | 16 | 24V DC Sink/ Source | - | - | - | 40 (1.6) | 90 (3.5) | 87 (3.4) | 0.3 (0.66) |
| FX2N-16EYR-ES/UL | - | - | 16 | Relay | - | | | | |
| FX2N-16EYT-ESS/UL | - | - | 16 | Transistor Source | | | | | |

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**Table 1.3 : Connector conversion adapter**

| MODEL | DESCRIPTION | DIMENSIONS mm (inches) | | | MASS kg (lbs) |
|---|---|---|---|---|---|
| FX2NC-CNV-IF | Extension blocks and special functions blocks of FX2N and FX0N are connected by this adapter | 14.6 (0.6) | 90 (3.5) | 74 (2.9) | 0.15 (0.33) |

### Figure 1.2 :Extension block dimensions

UNITS: mm (inches)



FX2NC-32E
26.2(1.03)
FX2NC-16E
14.6(0.57)

90(3.54)

13 (0.51)

87(3.43)
74(2.91)

DIN Rail: 35mm (1.38)

FX2NC-16EYR-T
24.2(0.95)
FX2NC-16EX-T
20.2(0.80)

90(3.54)

15 (0.6)

89(3.50)
74(2.91)

DIN Rail: 35mm (1.38)
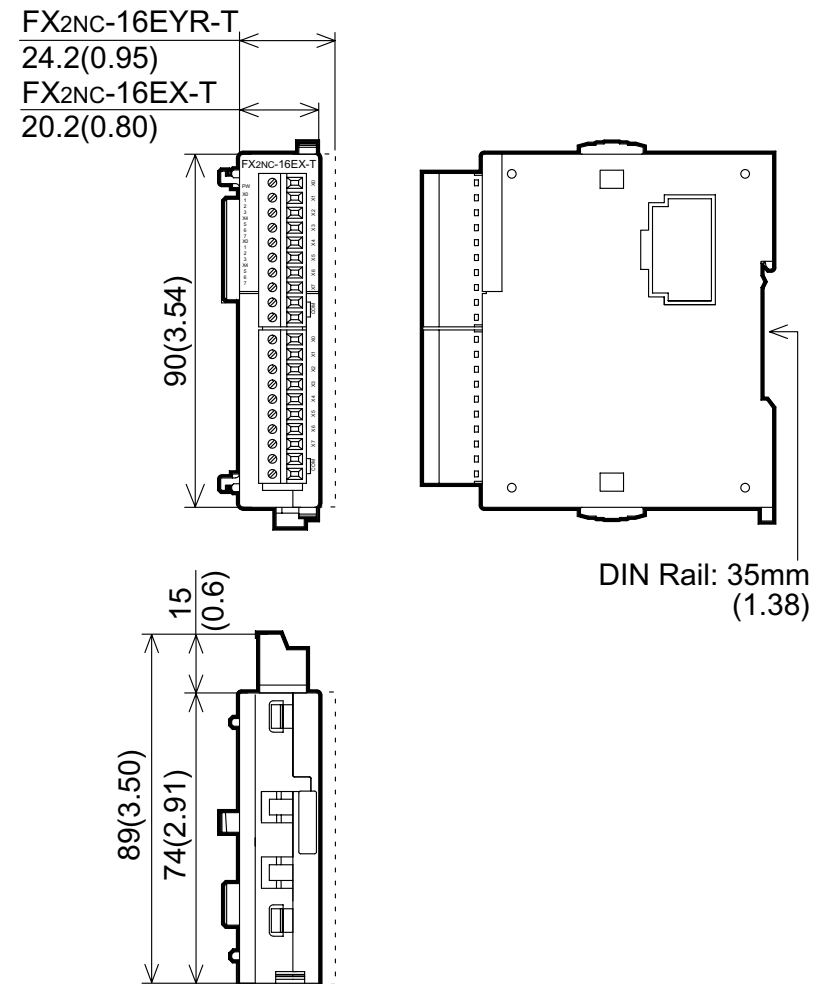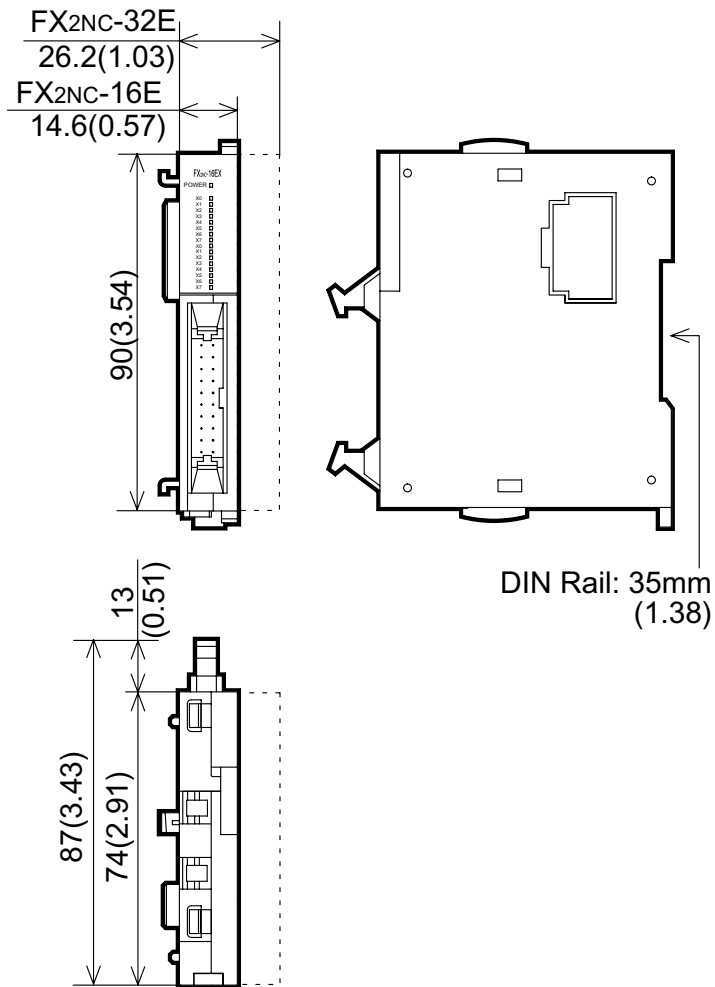
FX0N, FX2N Extension block dimensions →(See sec. 3.7)

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### Figure 1.3 :Connector conversion adapter

UNITS: mm (inches)
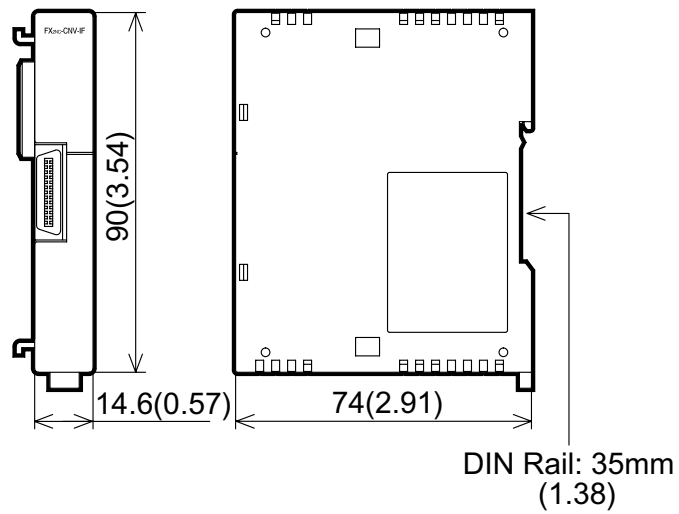


14.6(0.57)    74(2.91)

90(3.54)

DIN Rail: 35mm
(1.38)

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### Table 1.4 :Special function blocks

| MODEL | DESCRIPTION | NUMBER OF I/O | | POWER SUPPLY | | DIMENSIONS mm (inches) | | | MASS kg (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| | | I | O | Internal 5V DC | External 24V DC | | | | |
| FX2N-2DA | Digital to analog converter- | 8 | - | 30mA | 85mA[1] | 43 (1.7) | | 87 (3.4) | 0.2(0.44) |
| FX2N-2AD | Analog to digital converter - | 8 | - | 20mA | 50mA[1] | | | | |
| FX2N-2LC | Temperature control  - | 8 | - | 70mA | 55mA | 55 (2.1) | | | 0.3(0.66) |
| FX2N-4DA | Digital to analog converter- | 8 | - | 30mA | 200mA | | | | |
| FX2N-4AD | Analog to digital converter - | 8 | - | 30mA | 55mA | | | | |
| FX2N-8AD | Analog to digital converter - | 8 | - | 50mA | 80mA | 75 (3.0) | | 75 (3.0) | 0.4(0.88) |
| FX2N-4AD-PT | PT 100 probe interface  - | 8 | - | 30mA | 50mA | 55 (2.1) | 90 (3.5) | | 0.3(0.66) |
| FX2N-4AD-TC | Thermo-couple interface - | 8 | - | 30mA | 50mA | | | | |
| FX2N-1HC | High speed counter  - | 8 | - | 90mA | - | | | 87 (3.4) | |
| FX2N-1PG | Pulse output, Position control | - | 8 | 55mA | 40mA | 43 (1.7) | | | 0.2(0.44) |
| FX2N-232IF | RS232 Interface block  - | 8 | - | 40mA | 80mA | 55 (2.1) | | | 0.3(0.66) |
| FX2N-32CCL | CC-Link Interface block  - | 8 | - | 130mA | 50mA | | | | 0.2(0.44) |
| FX2N-16LNK-M | MELSEC-I/O LINK Remote I/O system master block | *2 | 8 | 200mA | 90mA | 43 (1.7) | | | 0.5(1.1) |

### Table 1.4 :Special function blocks

| MODEL | DESCRIPTION | NUMBER OF I/O | | POWER SUPPLY | | DIMENSIONS mm (inches) | | | MASS kg (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| | | I | O | Internal 5V DC | External 24V DC | | | | |
| FX0N-3A | Analog / Digital converter - | 8 | - | 30mA | 90mA[*1] | 43 (1.7) | 90 (3.5) | 87 (3.4) | 0.2(0.44) |
| FX0N-16NT | Net-mini interface | 8 | 8 | 20mA | 60mA | | | | 0.3(0.66) |
| FX0N-32NT-DP | Profibus DP Interface - | 8 | - | 170mA | 20mA | | | | |
| FX2N-10GM | Positioning controller | - | 8 | - | 5W | 60 (2.4) | | | 0.3(0.66) |
| FX2N-20GM | | - | 8 | - | 10W | 86 (3.4) | | | 0.4(0.88) |
| FX2N-1RM-E SET | Programmable cam switch | - | 8 | - | 210mA | 55 (2.1) | 111 (4.4) | 97 (3.8) | 0.5(1.1) |

*1 : Internal 24V DC

*2 : The value depends on the switch setting.

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## 1.1      Unit accessories

MPU-Main unit : FX2NC-100MPCB power supply cables.
Extension block : I / O label kit.

## 1.2      World Spec.

***Table 1.5  :  World / Japanese Spec.***

| Input Sink / Source | World spec models : SINK / SOURCE. Japanese models : ALWAYS SINK. |
|---|---|
| Outputs Transistor | World spec models : ALWAYS SOURCE. Japanese models : ALWAYS SINK. |

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## 1.3    Model name

FX2NC -16MT-☐-DSS / ☐

A) ——
B) ——
C) ——
D) ——
E) ——
F) ——
G) ——
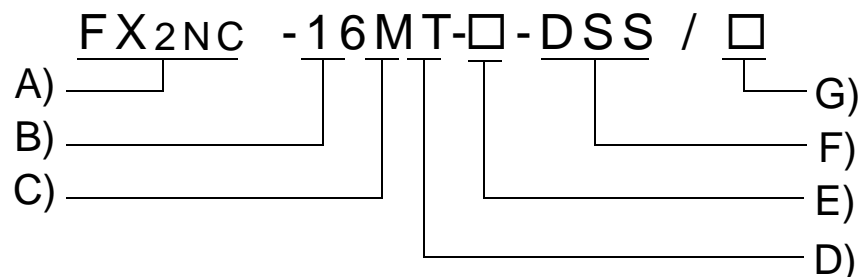
### *Table 1.6  :  Model table*

| A) | | PLC type : FX2NC, FX2N, FX0N |
| --- | --- | --- |
| B) | | Total number of I / O channels |
| | **Unit type** | |
| | M | MPU - main unit |
| C) | E | Powered extension unit |
| | EX | Extension block, input |
| | EY | Extension block, output |
| | **Output type** | |
| D) | R | Relay |
| | S | Triac (SSR) |
| | T | Transistor |

| E) | T | Terminal style I/O. ,Only FX2NC. |
| --- | --- | --- |
| | **Features** | |
| | Omit | AC, Japanese spec. |
| | D | 24V DC Japanese spec. |
| | DS | 24V DC World spec. |
| F) | DSS | 24V DC World spec., DC source transistor |
| | ES | AC Power Supply World spec.,DC sink transistor |
| | ESS | AC Power Supply World spec., DC source transistor |
| | UA1 | AC Power Supply, AC inputs |
| G) | UL | CE,UL registered product |

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## 1.4 Serial numbers

SERIAL NO.: 9 X 3267

1)

3)

e.g.

2)

9=1999
0=2000

1 - 9 = Jan - Sept
X     = Oct
Y     = Nov
Z     = Dec
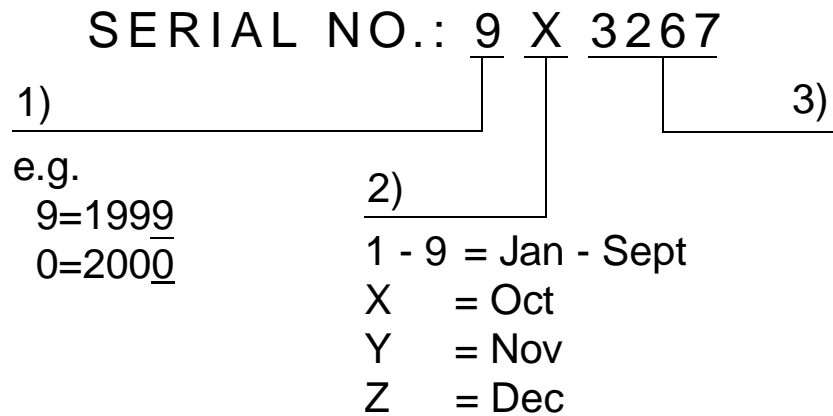
### Table 1.7 : Notes on serial numbers

| | |
|---|---|
| **1)** | Production year |
| **2)** | Production month |
| **3)** | Production serial number |

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## 1.5     Configuration

### *Figure 1.4 :Schematic system*



FX0N-232ADP
FX0N-485ADP
F

FX2NC-EEPROM-16
FX2NC-RTC
FX2NC-EEPROM-4C
FX2NC-EEPROM16C
G

FX2NC-16MT-DSS
FX2NC-32MT-DSS
FX2NC-64MT-DSS
FX2NC-96MT-DSS

FX2NC-16MR-T-DS
A

FX2NC-16EX-DS
FX2NC-16EYT-DSS
FX2NC-32EX-DS
FX2NC-32EYT-DSS

FX2NC-16EX-T-DS
FX2NC-16EYR-T-DS
B

FX2N-16EX-ES/UL
FX2N-16EYR-ES/UL
FX2N-16EYT-ESS/UL
FX0N-8EX-ES/UL
FX0N-8EX-UA1/UL
FX0N-8ER-ES/UL
FX0N-8EYR-ES/UL
FX0N-8EYT-ESS/UL
FX0N-16EX-ES/UL
FX0N-16EYR-ES/UL
FX0N-16EYT-ESS/UL
D

FX2NC-CNV-IF
C

RS 422/RS 232 CONVERTER
FX-232AW(C)
J

FX-16E-TB/UL
FX-32E-TB/UL
FX-16EYR-ES-TB/UL
FX-16EYS-ES-TB/UL
FX-16EYT-ESS-TB/UL
FX-16EYT-ES-TB/UL
L

FX2N-2DA  FX2N-4DA
FX2N-2AD  FX2N-4AD
FX2N-4AD-PT
FX2N-4AD-TC
FX2N-2LC  FX2N-8AD
FX2N-1HC  FX2N-1PG
FX2N-232IF
FX2N-32CCL
FX2N-16LNK-M
FX0N-3A
FX0N-16NT
FX0N-32NT-DP
FX2N-1RM-E-SET
FX2N-10GM
FX2N-20GM
E

MELSEC MEDOC
FX-PCS/AT-EE

MELSEC MEDOC PLUS
FX-PCS/WIN-E
K

FX-10P-E     FX-20P-E
A6 GPP/PHP + FX-A6GPP-E-KIT
I

FX-10DU-E     FX-40DU-ES
FX-20DU-E     FX-40DU-TK -ES
FX-25DU-E     FX-50DU-TKS-E
FX-30DU-E     F930GOT
              F940GOT
H

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### Table 1.8 : Configuration notes

| | |
|---|---|
| **A** | MPU-Main unit (Main Processing Unit) |
| **B** | Extension block |
| **C** | Connector conversion adapter |
| **D** | Extension block |
| **E** | Special function block |
| **F** | Function adapters |
| **G** | Memory board (Real time clock) |
| **H** | Data access units |
| **I** | Dedicated programming |
| **J** | Computer interface |
| **K** | Computer software |
| **L** | Terminal block |

| | |
|---|---|
| ① | Left hand side port |
| ② | Memory port |
| ③ | Programming port |
| ④ | I/O port |
| ⑤ | MPU bus port |
| ⑥ | Unit bus port |

### 1.5.1    Summary

#### Connection of FX2NC series extension blocks only

The FX2NC series input extension blocks and FX2NC series output extension blocks can be directly connected to the FX2NC series main unit. These input/output extension blocks can be connected in the desired order. After connection, octal numbers will be assign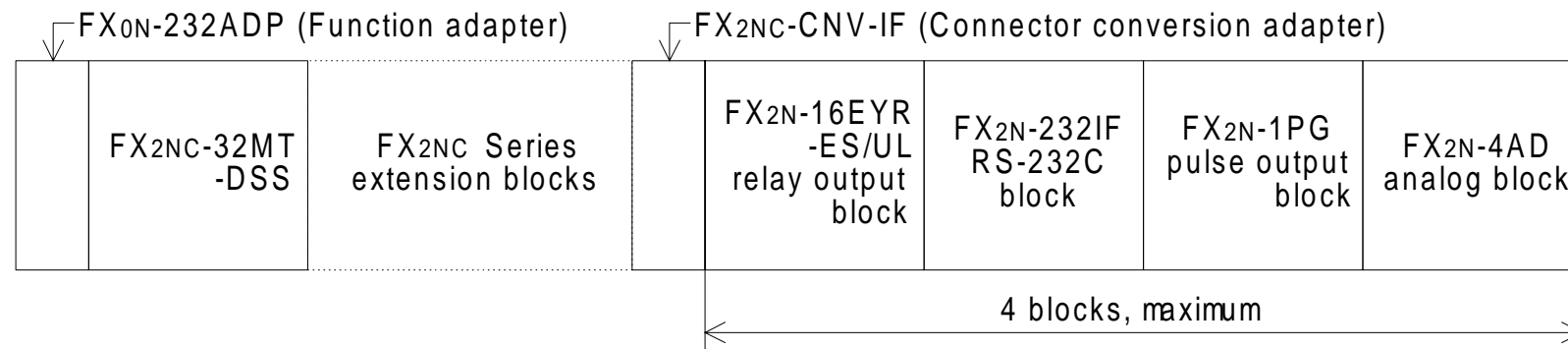ed to the input/output points of the extension blocks. These octal numbers are regarded as the input/output numbers. The smallest number will be assigned to the input/output point next to the main unit, and then sequentially increased for the subsequent input/output points.
Before connection, calculate the number of connectable input/output points by referring to Sec. 1.5.3, or quickly obtain this number using the table shown in Sec. 1.5.5.

```
              X020        X040              X060                          X100
               |           |                 |                             |
 X000-X017    X037        X057              X077                          X117
┌──────────────┬──────────┬──────────┬──────────┬──────────┬──────────┬──────────┬──────────┐
│FX2NC-32MT-DSS│          │          │          │          │          │          │          │
│              │ 16EX     │ 16EX     │ 16EYT    │ 16EX     │ 16EYT    │ 16EYT    │ 16EX     │ 16EYT
│ X: 16 points │16 points │16 points │16 points │16 points │16 points │16 points │16 points │16 points
│ Y: 16 points │          │          │          │          │          │          │          │
│              │          │          │          │          │          │          │          │
└──────────────┴──────────┴──────────┴──────────┴──────────┴──────────┴──────────┴──────────┘
   Y000-Y017                          Y020                 Y040      Y060                 Y100
                                       |                    |         |                    |
                                      Y037                 Y057      Y077                 Y117
```

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## Connection of FX0N and FX2N series extension blocks and function adapter

To connect an FX2NC series main unit to FX0N or FX2N series extension blocks, be sure to connect an FX2NC-CNV-IF connector conversion adapter first. Following the adapter, up to 4 blocks can be connected. In addition, one special adapter can be connected to the left side of the base unit. Before connection, calculate the number of connectable input/output points by referring to Sec. 1.5.3.

┌FX0N-232ADP (Function adapter)          ┌FX2NC-CNV-IF (Connector conversion adapter)

| FX2NC-32MT -DSS | FX2NC Series extension blocks | FX2N-16EYR -ES/UL relay output block | FX2N-232IF RS-232C block | FX2N-1PG pulse output block | FX2N-4AD analog block |
|---|---|---|---|---|---|

4 blocks, maximum

### 1.5.2 Current consumption and input/output points

The following tables show current consumption and input/output points of various types of FX2NC series main units, extension blocks, and special function blocks.
While referring to Sec. 1.5.3, calculate the total current consumption and input/output values using the following main unit values (values ❶ through ❹), extension block values, and special function block values.

*Table 1.9 : Base units*

| MODEL | ❶ CURRENT CAPACITY 5V DC | ❷ INPUT X | ❸ OUTPUT Y | ❹ TOTAL |
|---|---|---|---|---|
| FX2NC-16MT-DSS FX2NC-16MR-T-DS | 600mA | 8 | 8 | 16 |
| FX2NC-32MT-DSS | 560mA | 16 | 16 | 32 |
| FX2NC-64MT-DSS | 480mA | 32 | 32 | 64 |
| FX2NC-96MT-DSS | 400mA | 48 | 48 | 96 |

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### Table 1.10: Extension blocks

| MODEL | CURRENT CONSUMPTION 5V DC | INPUT X | OUTPUT Y | TOTAL |
|---|---|---|---|---|
| FX2NC-16EX-DS | 30mA | 16 | - | 16 |
| FX2NC-16EX-T-DS | 30mA | 16 | - | 16 |
| FX2NC-16EYT-DSS | 50mA | - | 16 | 16 |
| FX2NC-16EYR-T-DS | 50mA | - | 16 | 16 |
| FX2NC-32EX-DS | 60mA | 32 | - | 32 |
| FX2NC-32EYT-DSS | 100mA | - | 32 | 32 |
| FX0N-8ER-ES/UL | 25mA | 4(8) | 4(8) | 16[*1] |
| FX0N-8EX-ES/UL | 25mA | 8 | - | 8 |
| FX0N-8EX-UA1/UL | 25mA | 8 | - | 8 |
| FX0N-8EYR-ES/UL | 30mA | - | 8 | 8 |
| FX0N-8EYT-ESS/UL | 30mA | - | 8 | 8 |
| FX0N-16EX-ES/UL | 40mA | 16 | - | 16 |
| FX0N-16EYT-ESS/UL | 40mA | - | 16 | 16 |
| FX0N-16EYR-ES/UL | 40mA | - | 16 | 16 |
| FX2N-16EX-ES/UL | 45mA | 16 | - | 16 |
| FX2N-16EYR-ES/UL | 40mA | - | 16 | 16 |
| FX2N-16EYT-ESS/UL | 180mA | - | 16 | 16 |

*1:8 points are used for actual input/output, however, this block should occupy 16 input/output points.

### Table 1.11: Special function block    Function adapters

| MODEL | CURRENT CONSUMPTION 5V DC | INPUT X | X/Y | OUTPUT Y | TOTAL |
|-------|---------------------------|---------|-----|----------|-------|
| FX0N-3A | 30mA | - | 8 | - | 8 |
| FX0N-16NT | 20mA | 8 | - | 8 | 16 |
| FX0N-32NT-DP | 170mA | - | 8 | - | 8 |
| FX2N-2AD | 20mA | - | 8 | - | 8 |
| FX2N-4AD | 30mA | - | 8 | - | 8 |
| FX2N-8AD | 50mA | - | 8 | - | 8 |
| FX2N-4AD-PT | 30mA | - | 8 | - | 8 |
| FX2N-4AD-TC | 30mA | - | 8 | - | 8 |
| FX2N-2DA | 30mA | - | 8 | - | 8 |
| FX2N-4DA | 30mA | - | 8 | - | 8 |
| FX2N-2LC | 70mA | - | 8 | - | 8 |
| FX2N-1HC | 90mA | - | 8 | - | 8 |
| FX2N-1PG | 55mA | - | 8 | - | 8 |
| FX2N-232IF | 40mA | - | 8 | - | 8 |
| FX2N-32CCL | 130mA | - | 8 | - | 8 |

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| MODEL | CURRENT CONSUMPTION 5V DC | INPUT X | X/Y | OUTPUT Y | TOTAL |
|---|---|---|---|---|---|
| FX2N-16LNK-M | 200mA | *2 | 8 | *2 | *2 |
| FX2N-10GM | - | - | 8 | - | 8 |
| FX2N-20GM | - | - | 8 | - | 8 |
| FX2N-1RM-E SET *3 | - | - | 8 | - | 8 |
| FX0N-232ADP | 200mA | - | - | - | - |
| FX0N-485ADP | 30mA | - | - | - | - |
| FX-2PIF | 290mA | - | - | - | - |

*2: Value depends on the switch setting.

*3: Maximum of 1 unit can be connected.

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### 1.5.3    Rules

1) Add the input/output points of the extension blocks and special functions blocks to the input/ output points of the main unit. The total number of input and output points should be no more than 256 points. However, the total number of input points should be 184 points or less, and the total number of output points should also be 184 points or less.

2) The FX 2NC series main unit supplies control power (5V DC) to the extension blocks and special function blocks. For this reason, the total current consumption of all the blocks connected to the main unit should not exceed the current capacity of the main unit.

3) Next to the FX 2NC-CNV-IF, up to 4 blocks can be connected. To connect a special function unit, such as the FX-10GM or FX2N-1RM-E-SET, refer to the instruction manual of the corresponding special function block.

**Calculation form for system configuration**

Enter current consumption values and input/output points of the extension blocks and special function blocks while referring to Sec. 1.5.2, and then calculate the total current value ❺ and total input and output points ❻ through❾. From the obtained values, judge whether the blocks can be connected.

### Table 1.12 : Calculation form

| Block | Model | Current consu-mption | Number of blocks connected | Current consumption ×number of blocks | INPUT X | X/Y | OUTPUT Y |
|-------|-------|------|------|------|------|------|------|
| FX2NC series input extension block | FX2NC-16EX-DS FX2NC-16EX-T-DS | 30 mA | blocks | mA | points | | points |
| | FX2NC-32EX-DS | 60 mA | blocks | mA | points | | points |
| FX2NC series output extension block | FX2NC-16EYT-DSS FX2NC-16EYR-T-DS | 50 mA | blocks | mA | points | | points |
| | FX2NC-32EYT-DSS | 100 mA | blocks | mA | points | | points |
| FX0N/FX2N series extension block (4 blocks, maximum) | | mA | blocks | mA | points | points | points |
| | | mA | blocks | mA | points | points | points |
| | | mA | blocks | mA | points | points | points |
| | | mA | blocks | mA | points | points | points |
| Function adapter | | mA | blocks | mA | - | | |
| 2-port interface | FX-2PIF | mA | blocks | mA | - | | |

❺ Total current consumption:    mA

❻ Total input points:    points
❼ Total output points:    points
❽ Total input/output common points:    points

❾ Total points:    points

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### Judgment form

#### a) 5V DC control current capacity check

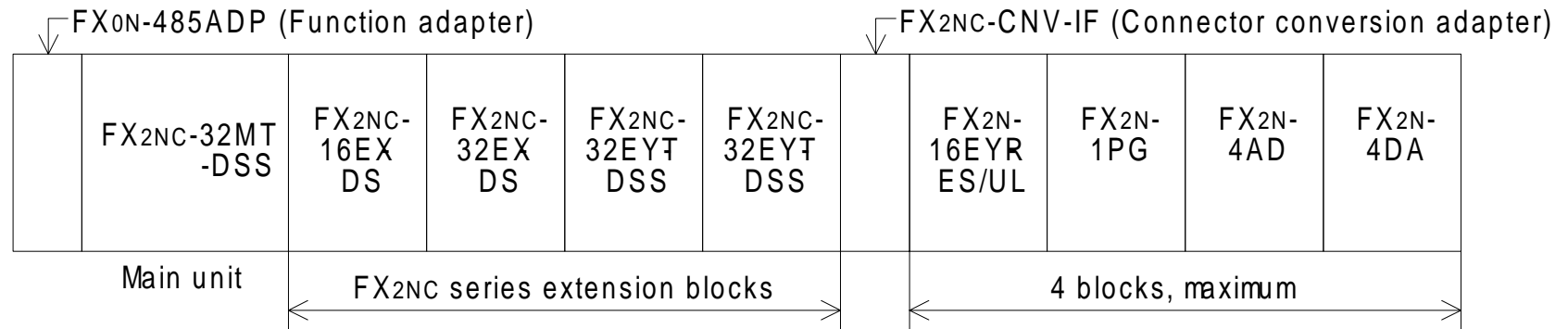| 5V DC current capacity of main unit (value ❶ shown in Sec. 1.5.2): ☐ mA | ≥ | Total current consumption of all connected blocks (value ❺ written in calculation form): ☐ mA |
|---|---|---|

#### b) Input/output point connection upper limit check

| Input point connection upper limit : 184 points | ≥ | ( Input points of main unit (value ❷ shown in Sec. 1.5.2): ☐ points | + | Total input points of all connected blocks (value ❻ written in calculation form): ☐ points | = ☐ points ) |
|---|---|---|---|---|---|
| Output point connection upper limit 184 points | ≥ | ( Output points of main unit (value ❸ shown in Sec. 1.5.2): ☐ points | + | Total output points of all connected blocks (value ❼ written in calculation form): ☐ points | = ☐ points ) |
| Input/output point connection upper limit 256 points | ≥ | ( Input/output points of main unit (value ❹ shown in Sec. 1.5.2): ☐ points | + | Total input/output points of all connected blocks (value ❾ written in calculation form): ☐ points | = ☐ points ) |

If all the above conditions are met, the extension and special function blocks can be connected to the base block.

If one of the above conditions is not met, reduce the number of input/output points or number of blocks, or change the types of blocks to be connected.

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## 1.5.4    System configuration example

FX0N-485ADP (Function adapter)                                    FX2NC-CNV-IF (Connector conversion adapter)

| FX2NC-32MT -DSS | FX2NC- 16EX DS | FX2NC- 32EX DS | FX2NC- 32EYT DSS | FX2NC- 32EYT DSS | | FX2N- 16EYR ES/UL | FX2N- 1PG | FX2N- 4AD | FX2N- 4DA |
|---|---|---|---|---|---|---|---|---|---|

Main unit    ←  FX2NC series extension blocks  →        ←         4 blocks, maximum         →

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### Table 1.13 : Calculation (Example)

| Block | Model | Current consumption | Number of blocks connected | Current consumption × number of blocks | INPUT X | X/Y | OUTPUT Y |
|---|---|---|---|---|---|---|---|
| FX2NC series input extension block | FX2NC-16EX-DS FX2NC-16EX-T-DS | 30 mA | **1** blocks | **30** mA | **16** points | | points |
| | FX2NC-32EX-DS | 60 mA | **1** blocks | **60** mA | **32** points | | points |
| FX2NC series output extension block | FX2NC-16EYT-DSS FX2NC-16EYR-T-DS | 50 mA | **0** blocks | **0** mA | points | | points |
| | FX2NC-32EYT-DSS | 100 mA | **2** blocks | **200** mA | points | | **64** points |
| FX0N/FX2N series extension block (4 blocks, maximum) | **FX2N-16EYR-ES/UL** | **40** mA | **1** blocks | **40** mA | points | points | **16** points |
| | **FX2N-1PG** | **55** mA | **1** blocks | **55** mA | points | **8** points | points |
| | **FX2N-4AD** | **30** mA | **1** blocks | **30** mA | points | **8** points | points |
| | **FX2N-4DA** | **30** mA | **1** blocks | **30** mA | points | **8** points | points |
| Function adapter | **FX0N-485ADP** | **30** mA | **1** blocks | **30** mA | - | | |
| 2-port interface | FX-2PIF | mA | **0** blocks | **0** mA | - | | |

❺ Total current consumption: **475** mA

❻ Total input points: **48** points
❼ Total output points : **80** points
❽ Total input/output common points: **24** points
❾ Total points: **152** points

### Judgment (Example)

#### a) 5V DC control current capacity check

| 5V DC current capacity of main unit<br>(value ❶ shown in Sec. 1.5.2): 560 mA | $\geq$ | Total current consumption of all connected blocks<br>(value ❺ written in calculation form): 475 m A | OK |

#### b) Input/output point connection upper limit check

| Input point connection upper limit : 184 points | $\geq$ | ( Input points of main unit<br>(value ❷ shown in Sec. 1.5.2): 16 points | + | Total input points of all connected blocks (value ❻ written in calculation form) 48 points | = | 64 points ) | OK |

| Output point connection upper limit 184 points | $\geq$ | ( Output points of main unit<br>(value ❸ shown in Sec. 1.5.2): 16 points | + | Total output points of all connected blocks (value ❼ written in calculation form) 80 points | = | 96 points ) | OK |

| Input/output point connection upper limit 256 points | $\geq$ | ( Input/output points of main unit<br>(value ❹ shown in Sec. 1.5.2): 32 points | + | Total input/output points of all connected blocks (value ❾ written in calculation form) 152 points | = | 184 points ) | OK |

Calculation result:

The 5V DC power total current consumption value and total input/output points are in the specified ranges, therefore the above system configuration is possible.

### 1.5.5 Quick judgment

To connect FX2NC series extension blocks only, use the following tables to quickly obtain the connectable input/output points.

**Example of quick judgment:**

If 96 input points are connected to an FX 2NC-32MT-DSS main unit, up to 112 output points can be connected.

If the number of output points are determined first, select the same number or a slightly larger number from the output points (Y) area (marked with *1). In this case, note that you cannot increase the corresponding number of input points shown above even if the determined number of output points is slightly smaller than the number shown in the table. However, if the same number of output points are listed twice, you can select the larger number of input points.

*Table 1.14:  FX2NC-16M main unit (input: 8 points / output: 8 points)*

| Input points of FX2NC series input extension block (X) | 0 | 16 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | 144 | 160 | 176 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Output points of FX2NC series output extension block (Y) | 176 | 176 | 160 | 160 | 144 | 144 | 128 | 112 | 112 | 96 | 80 | 64 | ←*1 |
| Total points including those of main unit | 192 | 208 | 208 | 224 | 224 | 240 | 240 | 240 | 256 | 256 | 256 | 256 | |

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### Table 1.15: FX2NC-32M main unit (input: 16 points / output: 16 points)

| Input points of FX2NC series input extension block (X) | 0 | 16 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | 144 | 160 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Output points of FX2NC series output extension block (Y) | 168 | 160 | 160 | 144 | 128 | 128 | 112 | 112 | 96 | 80 | 64 | ←*1 |
| Total points including those of main unit | 200 | 208 | 224 | 224 | 224 | 240 | 240 | 256 | 256 | 256 | 256 | |

Example of quick judgment

### Table 1.16: FX2NC-64M main unit (input: 32 points / output: 32 points)

| Input points of FX2NC series input extension block (X) | 0 | 16 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | 144 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Output points of FX2NC series output extension block (Y) | 144 | 144 | 128 | 112 | 112 | 96 | 96 | 80 | 64 | 48 | ←*1 |
| Total points including those of main unit | 208 | 224 | 224 | 224 | 240 | 240 | 256 | 256 | 256 | 256 | |

### Table 1.17: FX2NC-96M main unit (input: 48 points / output: 48 points)

| Input points of FX2NC series input extension block (X) | 0 | 16 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Output points of FX2NC series output extension block (Y) | 128 | 112 | 96 | 96 | 80 | 80 | 64 | 48 | 32 | ←*1 |
| Total points including those of main unit | 224 | 224 | 224 | 240 | 240 | 256 | 256 | 256 | 256 | |

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# 2.    Terminal layouts

The following selection of terminal layouts are taken from the FX2NC product range.
Note: All layouts are diagrammatic and are only intended to aid the creation of wiring diagrams.

## 2.1    Main units

### FX2NC-16MT-DSS

| IN | | OUT | |
|------|------|------|------|
| X0 | • | Y0 | • |
| X1 | • | Y1 | • |
| X2 | • | Y2 | • |
| X3 | • | Y3 | • |
| X4 | • | Y4 | • |
| X5 | • | Y5 | • |
| X6 | • | Y6 | • |
| X7 | • | Y7 | • |
| COM0 | COM0 | +V0 | +V0 |
| • | • | • | • |

### FX2NC-16MR-T-DS

| IN | OUT |
|------|------|
| X0 | Y0 |
| X1 | Y1 |
| X2 | Y2 |
| X3 | Y3 |
| COM | COM1 |
| • | • |
| X4 | Y4 |
| X5 | Y5 |
| X6 | Y6 |
| X7 | Y7 |
| COM | COM2 |

## FX2NC-32MT-DSS

| IN | | OUT | |
|---|---|---|---|
| X0 | X10 | Y0 | Y10 |
| X1 | X11 | Y1 | Y11 |
| X2 | X12 | Y2 | Y12 |
| X3 | X13 | Y3 | Y13 |
| X4 | X14 | Y4 | Y14 |
| X5 | X15 | Y5 | Y15 |
| X6 | X16 | Y6 | Y16 |
| X7 | X17 | Y7 | Y17 |
| COM0 | COM0 | +V0 | +V0 |
| • | • | • | • |

## FX2NC-64MT-DSS

| IN | | OUT | | IN | | OUT | |
|---|---|---|---|---|---|---|---|
| X0 | X10 | Y0 | Y10 | X20 | X30 | Y20 | Y30 |
| X1 | X11 | Y1 | Y11 | X21 | X31 | Y21 | Y31 |
| X2 | X12 | Y2 | Y12 | X22 | X32 | Y22 | Y32 |
| X3 | X13 | Y3 | Y13 | X23 | X33 | Y23 | Y33 |
| X4 | X14 | Y4 | Y14 | X24 | X34 | Y24 | Y34 |
| X5 | X15 | Y5 | Y15 | X25 | X35 | Y25 | Y35 |
| X6 | X16 | Y6 | Y16 | X26 | X36 | Y26 | Y36 |
| X7 | X17 | Y7 | Y17 | X27 | X37 | Y27 | Y37 |
| COM0 | COM0 | +V0 | +V0 | COM1 | COM1 | +V1 | +V1 |
| • | • | • | • | • | • | • | • |

## FX2NC-96MT-DSS

| IN | | OUT | | IN | | OUT | | IN | | OUT | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X0 | X10 | Y0 | Y10 | X20 | X30 | Y20 | Y30 | X40 | X50 | Y40 | Y50 |
| X1 | X11 | Y1 | Y11 | X21 | X31 | Y21 | Y31 | X41 | X51 | Y41 | Y51 |
| X2 | X12 | Y2 | Y12 | X22 | X32 | Y22 | Y32 | X42 | X52 | Y42 | Y52 |
| X3 | X13 | Y3 | Y13 | X23 | X33 | Y23 | Y33 | X43 | X53 | Y43 | Y53 |
| X4 | X14 | Y4 | Y14 | X24 | X34 | Y24 | Y34 | X44 | X54 | Y44 | Y54 |
| X5 | X15 | Y5 | Y15 | X25 | X35 | Y25 | Y35 | X45 | X55 | Y45 | Y55 |
| X6 | X16 | Y6 | Y16 | X26 | X36 | Y26 | Y36 | X46 | X56 | Y46 | Y56 |
| X7 | X17 | Y7 | Y17 | X27 | X37 | Y27 | Y37 | X47 | X57 | Y47 | Y57 |
| COM0 | COM0 | +V0 | +V0 | COM1 | COM1 | +V1 | +V1 | COM2 | COM2 | +V2 | +V2 |
| • | • | • | • | • | • | • | • | • | • | • | • |

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## 2.2 FX2NC Extension blocks

### FX2NC-16EX-DS

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

Lower / Upper

### FX2NC-32EX-DS

| IN | | IN | |
|---|---|---|---|
| X0 | X0 | X0 | X0 |
| X1 | X1 | X1 | X1 |
| X2 | X2 | X2 | X2 |
| X3 | X3 | X3 | X3 |
| X4 | X4 | X4 | X4 |
| X5 | X5 | X5 | X5 |
| X6 | X6 | X6 | X6 |
| X7 | X7 | X7 | X7 |
| COM0 | COM0 | COM1 | COM1 |
| • | • | • | • |

Lower / Upper

### FX2NC-16EX-T-DS    FX2NC-16EYR-T-DS

| IN |
|---|
| X0 |
| X1 |
| X2 |
| X3 |
| X4 |
| X5 |
| X6 |
| X7 |
| COM |
| COM |

Lower

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

Upper

| OUT |
|---|
| Y0 |
| Y1 |
| Y2 |
| Y3 |
| Y4 |
| Y5 |
| Y6 |
| Y7 |
| COM1 |
| COM1 |

Lower

| |
|---|
| Y0 |
| Y1 |
| Y2 |
| Y3 |
| Y4 |
| Y5 |
| Y6 |
| Y7 |
| COM2 |
| COM2 |

Upper

### FX2NC-16EYT-DSS

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

Lower / Upper

### FX2NC-32EYT-DSS

| OUT | | OUT | |
|---|---|---|---|
| Y0 | Y0 | Y0 | Y0 |
| Y1 | Y1 | Y1 | Y1 |
| Y2 | Y2 | Y2 | Y2 |
| Y3 | Y3 | Y3 | Y3 |
| Y4 | Y4 | Y4 | Y4 |
| Y5 | Y5 | Y5 | Y5 |
| Y6 | Y6 | Y6 | Y6 |
| Y7 | Y7 | Y7 | Y7 |
| +V0 | +V0 | +V1 | +V1 |
| • | • | • | • |

Lower / Upper

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## 2.3 FX2N and FX0N Extension blocks

FX0N-8EX-ES/UL

FX0N-8EYR-ES/UL

FX0N-8EYT-ESS/UL

FX0N-8ER-ES/UL

FX0N-8EX-UA1/UL

FX2N-16EX-ES/UL

FX2N-16EYR-ES/UL

FX2N-16EYT-ESS/UL

| S/S | X1 | X3 | X5 | X7 | • |
|-----|----|----|----|----|---|
| X0 | X2 | X4 | X6 | • | |

**FX0N-16EX-ES/UL**

| X0 | X2 | X4 | X6 | • | |
|----|----|----|----|----|---|
| S/S | X1 | X3 | X5 | X7 | • |

| COM1 | Y1 | Y3 | COM2 | Y5 | Y7 |
|------|----|----|------|----|----|
| | Y0 | Y2 | • | Y4 | Y6 |

**FX0N-16EYR-ES/UL**

| | Y0 | Y2 | • | Y4 | Y6 |
|---|----|----|---|----|----|
| COM3 | Y1 | Y3 | COM4 | Y5 | Y7 |

| +V0 | Y1 | Y3 | +V1 | Y5 | Y7 |
|-----|----|----|-----|----|----|
| | Y0 | Y2 | • | Y4 | Y6 |

**FX0N-16EYT-ESS/UL**

| | Y0 | Y2 | • | Y4 | Y6 |
|---|----|----|---|----|----|
| +V2 | Y1 | Y3 | +V3 | Y5 | Y7 |

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# 3.    Installation notes

The installation of FX2NC products has been designed to be safe and easy. When the products associated with this manual are used as a system or individually, they must be installed in a suitable enclosure. The enclosure should be selected and installed in accordance to the local and national standards.

## 3.1    Product outline

### *Figure 3.1:Features of the FX2NC PLC*
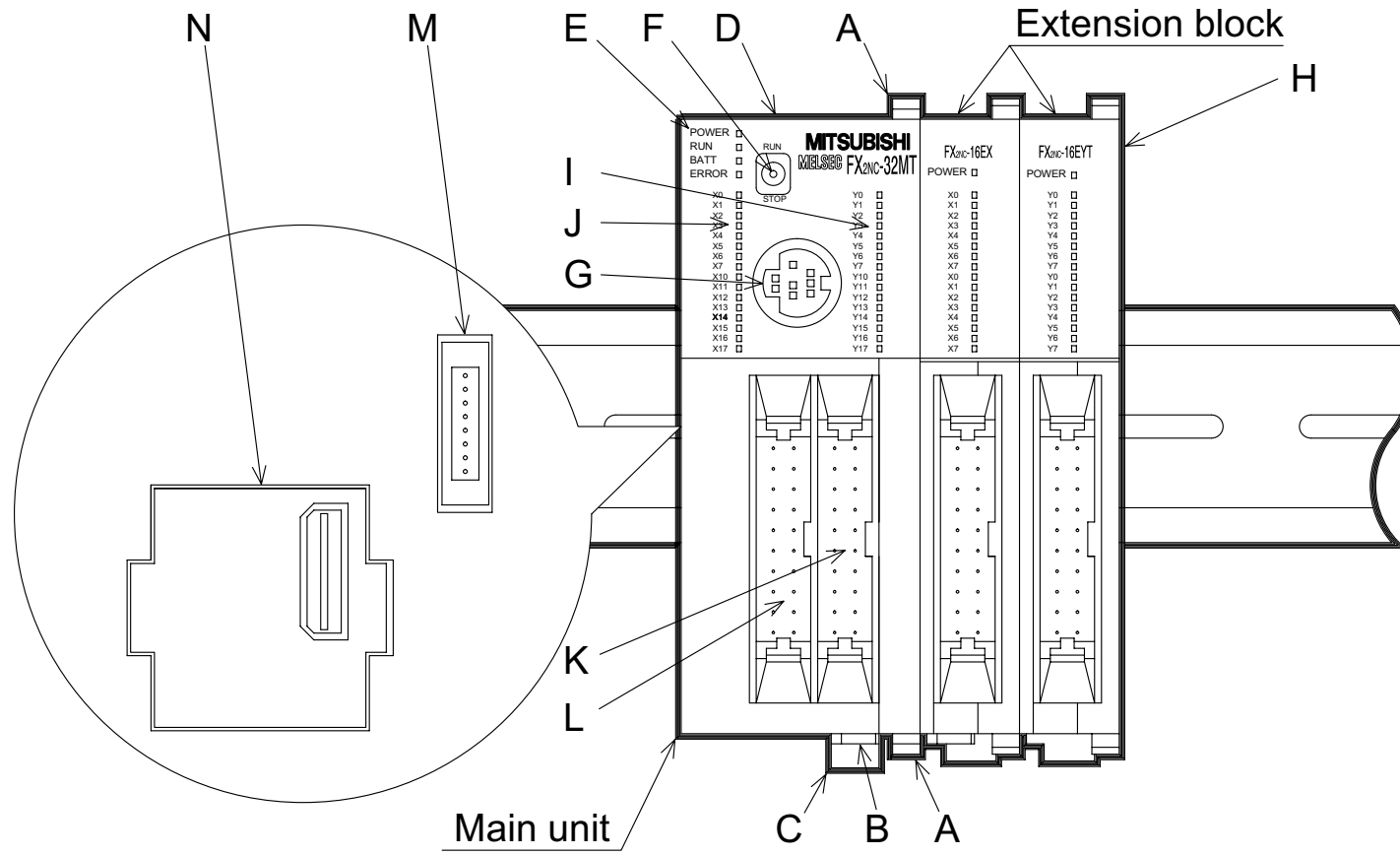
### Table 3.1  : Feature table

| | |
|---|---|
| **A** | Slide lock for extension I/O block |
| **B** | Power supply connector (Uses the 24V DC) |
| **C** | Din rail clip |
| **D** | Backup battery |
| **E** | Status indicators (POWER, RUN, BATT, ERROR) |
| **F** | Run / Stop switch |
| **G** | Programming port |
| **H** | Extension port |
| **I** | Output indicators |
| **J** | Input indicators |
| **K** | Output connector or Output terminal |
| **L** | Input connector or Input terminal |
| **M** | Function adapter port |
| **N** | Memory board / Real time clock board, port |

## 3.2      **FX2NC RUN/STOP Control**

RUN or STOP of the FX2NC can be controlled by:

❶The RUN/STOP switch mounted next to the programming port.

❷A standard input (X0 to X17; X0 to x7 for FX2NC-16M★ units) defined by the system parameters.

❸Remotely from a personal computer or other programming peripheral.

**Note**: The FX2NC RUN/STOP switch ❶ works in parallel with the RUN-input terminal ❷. Please refer to table 3.2.
During remote operation the FX2NC RUN/STOP status is determined by the most recently operated control.
E.g. If the RUN/STOP switch is in RUN and a remote STOP is made from a personal computer the RUN/STOP switch must be switched to STOP then back to RUN to switch the MPU back to RUN mode.

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**Table 3.2 : RUN/STOP selection**

| ❶ RUN/STOP SWITCH | ❷ RUN INPUT TERMINAL | FX2NC MPU STATUS |
|:---:|:---:|:---:|
| ✓ | ✓ | RUN |
| ✓ | ✗ | RUN |
| ✗ | ✗ | STOP |
| ✗ | ✓ | RUN |

**Figure 3.2:**



Parameter setting

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## 3.3    General specifications

### *Table 3.3: General Specifications*

| Item | Description |
|------|-------------|
| Operating Temperature | 0 to 55 C (32 to 131 F) |
| Storage Temperature | -20 to 70 C (-4 to 158 F) |
| Operating Humidity | 35 to 85% Relative Humidity, No condensation |
| storage Humidity | 35 to 90% Relative Humidity, No condensation |
| Vibration Resistance - Direct Mounting | Conforms to JIS C0040; 10 - 57 Hz: 0.075 mm Half Amplitude<br>57 - 150 Hz: 9.8 m/s$^2$ Acceleration<br>Sweep Count for X, Y, Z: 10 times (80 min in each direction) |
| Vibration Resistance - DIN rail Mounting | Conforms to JIS C0040; 10 - 57 Hz: 0.035 mm Half Amplitude<br>57 - 150 Hz: 4.9 m/s$^2$ Acceleration<br>Sweep Count for X, Y, Z: 10 times (80 min in each direction) |
| Shock Resistance | Conforms to JIS C0041: 147m/s$^2$ Acceleration, Action Time: 11 ms<br>3 times in each direction X, Y, and Z |
| Noise Immunity | 1000 Vp-p, 1microsecond, 30 - 100 Hz, tested by noise simulator |
| Dielectric Withstand Voltage | 500 V AC > 1 min, tested between all points, terminals and ground |
| Insulation Resistance | 5 M $\Omega$ > at 500 V DC, tested between all points, terminals and ground |
| Ground | Class D (100 $\Omega$ or less) |

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## 3.4     PLC mounting arrangements

To prevent a rise in temperature, mount the units to walls. Never mount them to the floor or ceiling of an enclosure.

Figure 3.3   Single row arrangement

Figure 3.4   Double row arrangement using extension cable FX ₀ₙ-65EC
                      (650mm (25.59 inches); supplied separately).

**Figure 3.3 :**                                  **Figure 3.4 :**



■ > 50mm(1.97 inches)



■ > 50mm(1.97 inches)

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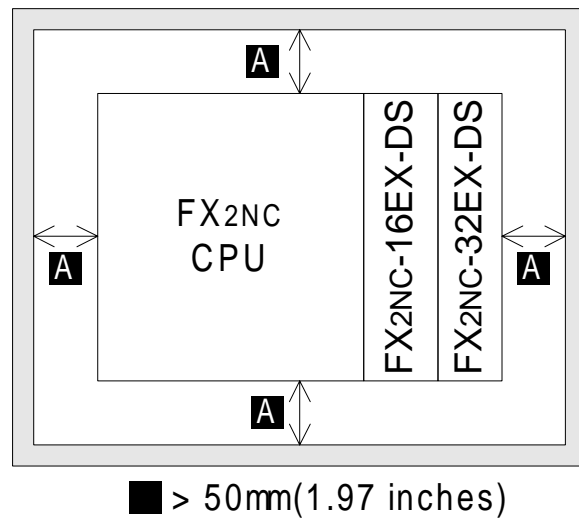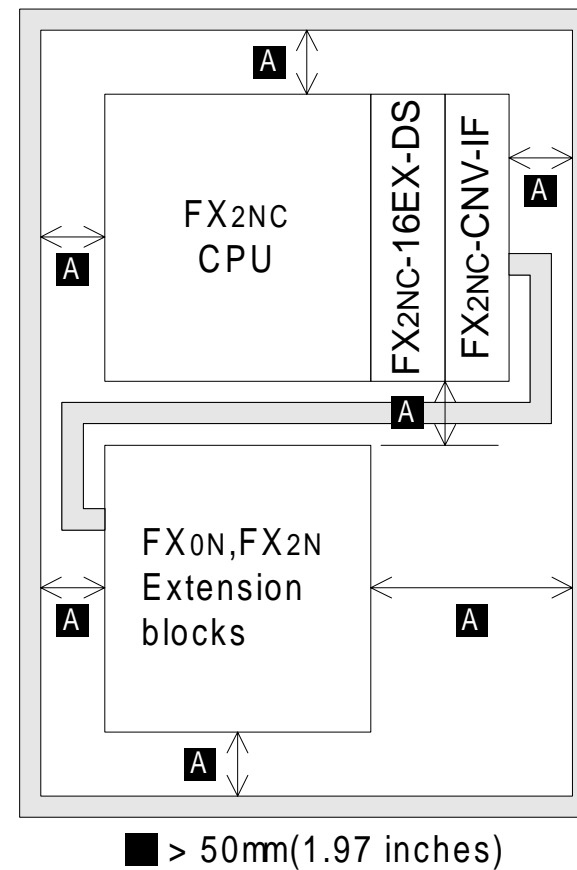
## ⚠ Caution

Units should mot be installed in areas subject to the following conditions: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

Take special care not to allow debris to fall inside the unit during installation e.g. cut wires, shavings etc. Once installation is complete remove the protective paper band: to prevent overheating.

## 3.5      Connection of extension blocks to main unit

1) Remove the port cover from the right side of the main unit.

2) Push up the slide lock of the main unit, and then connect an extension block.

3) Slide down the lock to secure the extension block.
   Connect other extension blocks in the same way.

***Figure 3.5 :***



Slide lock

Slide lock

Main unit                                        Extension block
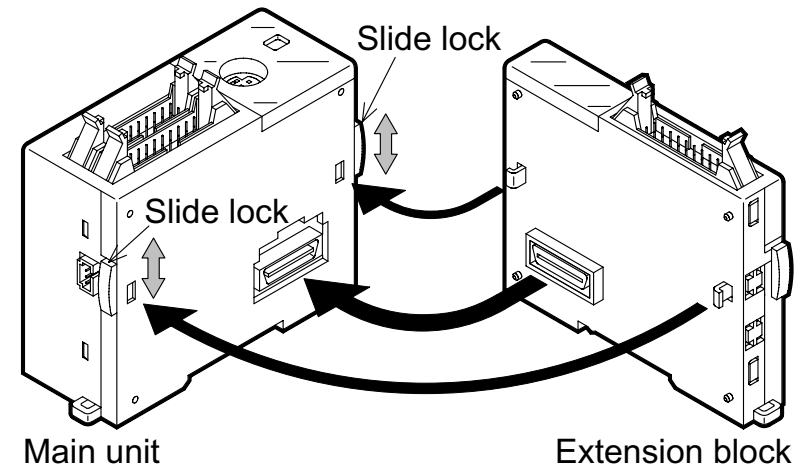
## 3.6      DIN rail mounting

DIN 46277 rail (35 mm, 1.4 inches) can be directly installed on the FX2NC series programmable controller. (Do not use any screws for this installation.) To remove the main body, slightly pull down the DIN rail mounting clip. Slide the clip further, and the rail will be locked with the clip left open.

To connect the FX2N series extension blocks, slide the DIN rail mounting clip in the arrow direction as shown to the right.

***Figure 3.6 :***



Remove                          Locks the clip.

When DIN rail is            When directly installed
installed                        (before shipment)

![Mitsubishi logo] **MITSUBISHI**
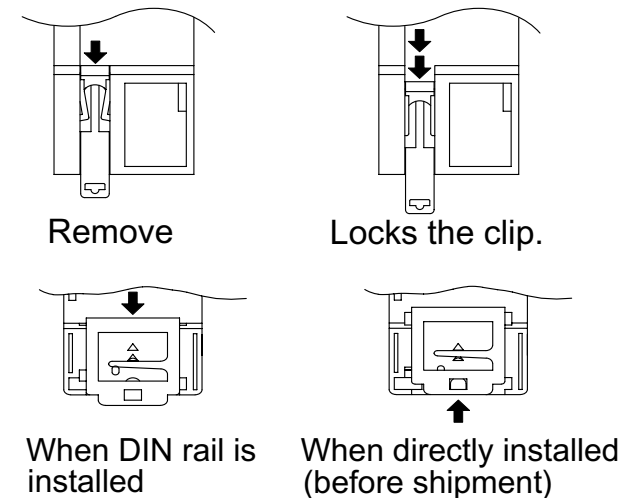
## 3.7      Direct mounting

### *Figure 3.7  :Group1*
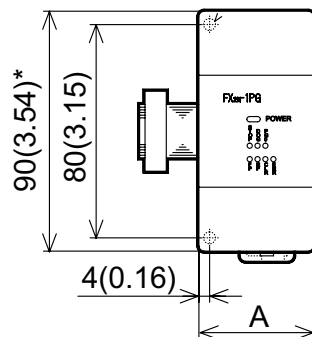


*: FX2N-1RM is 111(4.37)

∅ = 4.5mm (0.18)

UNITS: mm (inches)

### *Table 3.4  :*

| MODEL | A | MODEL | A | MODEL | A |
|-------|---|-------|---|-------|---|
| FX2N-4DA | | FX2N-2DA | | FX0N-32NT-DP | |
| FX2N-4AD | | FX 2N-2AD | | FX 0N-232ADP | 43 (1.69) |
| FX2N-4AD-PT | | FX 2N-32CCL | | FX 0N-485ADP | |
| FX2N-4AD-TC | 55 (2.16) | FX 2N-16LNK-M | 43 (1.69) | FX 0N-8E□ | |
| FX2N-1HC | | FX 0N-8E | | FX 2N-8AD | 75(2.95) |
| FX2N-232IF | | FX 0N-3A | | | |
| FX2N-1RM | | FX 0N-16NT | | | |
| FX2N-2LC | | FX 2N-1PG | | | |

### Figure 3.8:Group2

FX2N-16E□

80(3.15)
90(3.54)

20(0.79)

40(1.57)

FX0N-16E□

80(3.15)
90(3.54)

60(2.36)
70(2.76)

UNITS: mm (inches)

### Figure 3.9:Side view

87(3.42)*

\* :  FX2N-232IF is 85 (3.35)
     FX2N-1RM is 97(3.82)
     FX0N-232ADP is 68(2.68)
     FX2N-8AD is 75(2.95)

9(0.35)

UNITS: mm (inches)

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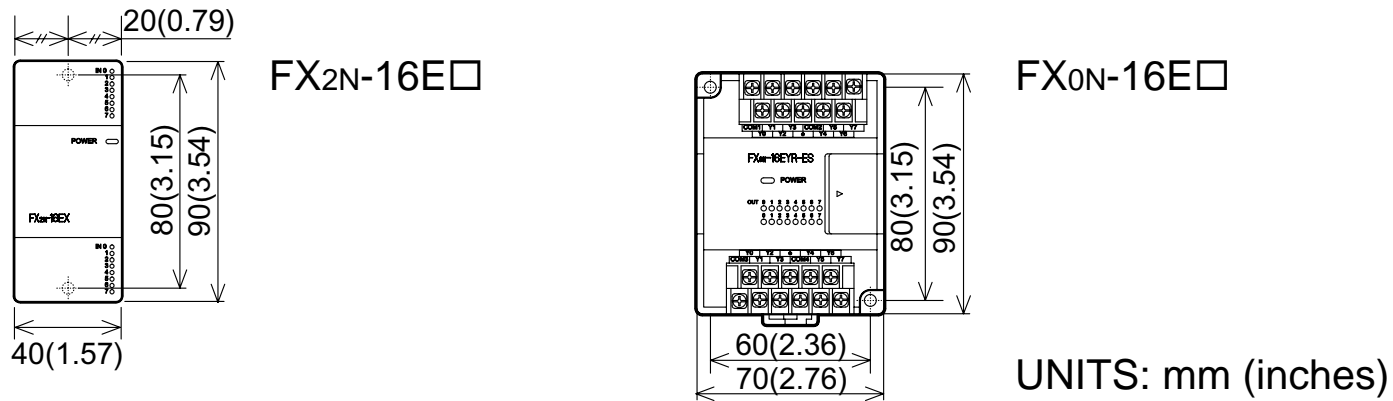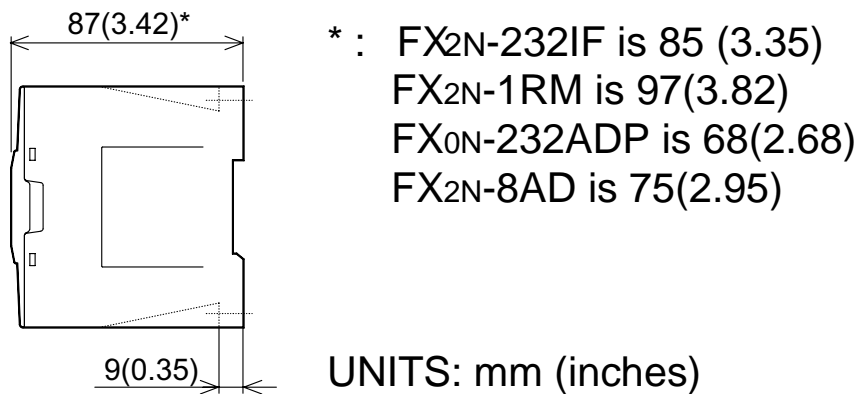
## 3.8     Extension cable installation

To connect extension blocks next to the FX2NC-CNV-IF block, use the FX0N-30EC or FX0N-65EC extension cable. Note that only one extension cable can be used for one system. In addition, to connect extension blocks, use the FX2N-CNV-BC connector conversion adapter as shown below.

### *Figure 3.10:*

Connection example 1



FX0N-30EC/FX0N-65EC

| FX2NC series main unit or FX2NC series extension block | | FX0N/FX2N series extension block |

FX2NC-CNV-IF       FX2N-CNV-BC
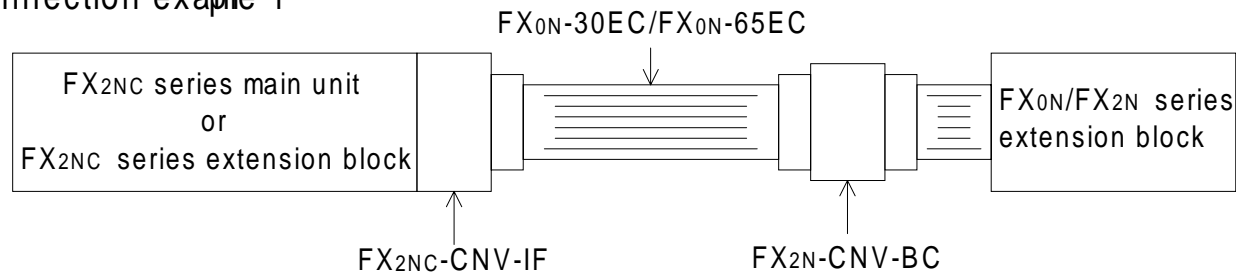
### *Figure 3.11:*

Connection example 2



FX0N-30EC/FX0N-65EC

| FX2NC series main unit or FX2NC series extension block | FX0N/FX2N series extension block | FX0N/FX2N series extension block |

FX2NC-CNV-IF       FX2N-CNV-BC

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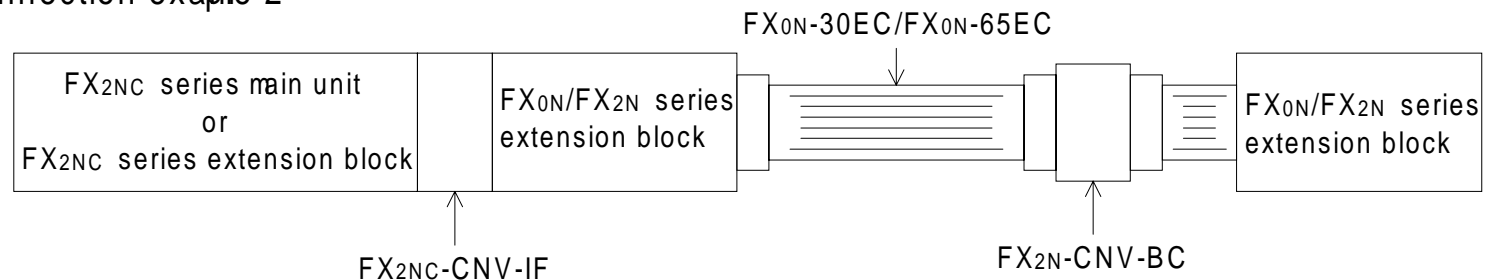
## 3.9 General notes

⚠ Always ensure that mounted units and blocks are kept as far as possible from high-voltage cables, high-voltage equipment and power equipment.

## 3.10    Memory Board installation

### *Figure 3.12:Installation*

1) Turn off the power to the programmable controller.
2) Remove the cover from the memory board installation section.
3) Connect the memory board while carefully inserting the pins.
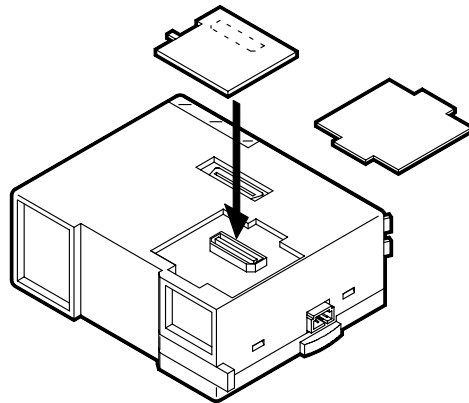
### *Figure 3.13:Removal*

1) Turn off the power to the programmable controller.
2) Remove the cover from the memory board installation section.
3) Slowly pull up the lower section of the memory board, and completely remove the board.
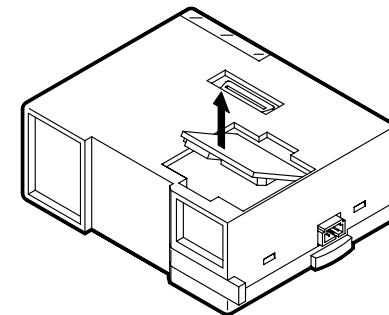
Before removing or installing the memory board, be sure to turn off the power.

If the memory board is removed or installed with the power on, it may be damaged.

During memory board removal or installation, be careful not to directly touch any electronic parts.

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## 3.11    Wiring techniques

The wiring of FX2NC products has been designed to be safe and easy. If during the installation of these products or associated products concern is felt, please contact a professional electrician who is trained to the local and national standards applicable to the installation site.

### Wiring cautions

Do not run input signals in the same multicore cable as output signals or allow them to share the same wire.

Do not lay I/O signal cables next to power cables or allow them to share the same trunking duct. Low voltage cables should be reliably separated or insulated with regard to high voltage cabling.

Where I/O signal lines are used over an extended distance consideration for voltage drop and noise interference should be made.

## 3.12    Termination of connector style I/O

I/O connectors should be 20-pin type and conform to MIL C 83503 of Military Standard.
This type of connector is also used for FX2C series programmable controllers.

The output connectors of the main unit and the connector-type 16-point output extension blocks are 16-point common type (8-point common type for the FX2NC-16MT).
These output connectors have two +V0 to +V2 pins that are connected to each other inside the programmable controller. To connect the line to an external unit, shortcircuit these two pins at the external circuit so that the load of each pin can be reduced.

## 3.13    Termination of Terminal style I/O

Observe the following cautions, and properly wire the I/O cables of the terminal style FX2NC PLC.
If you do not observe the following cautions, electrical shock, shortcircuit, disconnection and damages in the unit may be caused.

Make sure that the end of each cable is treated into the size shown in Fig. 3.14.

Twist the end of each stranded cable so that barbed wires are not present.

Never solder the end of any cables.

Never connect cables whose size is not allowed. Make sure that the number of connected cables is not more than a specified number.

Fix cables so that the stress is not directly applied on the terminal block and the cable connection area.

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⚠️ The output connectors of FX2NC-16MR-T-DS are 4-point common type.
The output connectors of FX2NC -16EYR-T-DS are 8-point common type.
The output terminal block in the FX2NC-16EYR-T-DS has two COM1 or COM2 pins that are connected to each other inside the main unit.
To connect the line to an external unit, shortcircuit these two pins at the external circuit so that the load applied on each pin can be reduced.

### *Table 3.5  :Applicable cables*

| Model | Cable size (stranded/single) | Tightening torque | Terminal |
|---|---|---|---|
| One cable | 0.3 to 0.5 mm$^2$ (AWG 22 to 20) | 0.22 to 0.25 N·m | Stranded cable: Rip off sheath, twist core wires, then connect cable as it is. Single cable: Rip off sheath, then connect cable as it is. |
| Two cables | 0.3 mm$^2$(AWG 22) $\times$ 2 cables | | |
| Ferrules, with plastic insulating sleeve | 0.3 to 0.5 mm$^2$ (AWG 22 to 20) (Refer to outline drawing of ferrule shown later.) | | Ferrule with insulating sleeve (recommended) AI 0, 5-8WH (manufactured by PHOENIX CONTACT) Caulking tool CRIMPFOX UD6(manufactured by PHOENIX CONTACT) |

### *Figure 3.14:Cable end treatment size*

Stranded cable/single cable

Approx. 9 mm (0.35in)
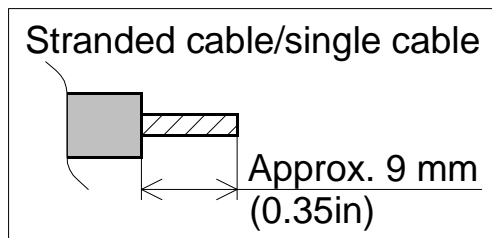
Treat the end of a cable in accordance with the hardware warning shown in the previous page.

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### Figure 3.15:Specifications of terminal block tightening screwdriver
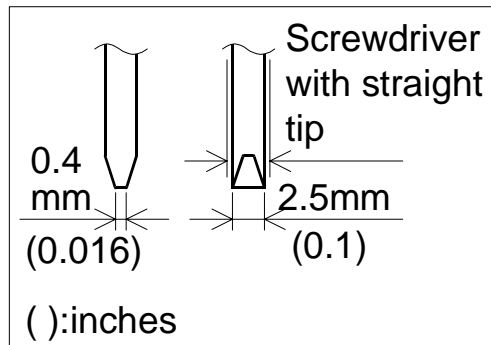
Use a small commercial screwdriver of the size shown on the left. Make sure that the tip is straight, and is not broadened.

Recommended dedicated screwdriver:
Model SZS 0, 4 × 2, 5 (manufactured by PHOENIX CONTACT)

Screwdriver with straight tip

0.4 mm (0.016)

2.5mm (0.1)

( ):inches

### Figure 3.16  :Outline drawing of ferrule with insulating sleeve (manufactured by PHOENIX CONTACT)
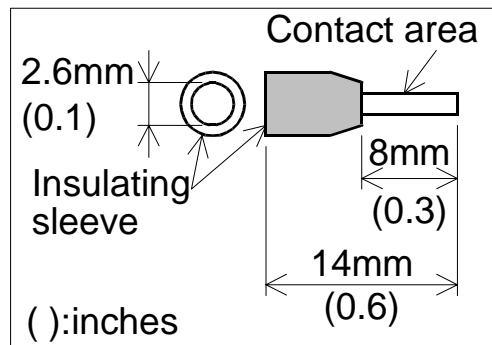
Recommended ferrule: Model AI 0, 5-8WH

Caulking tool: CRIMPFOX UD6

A cable may not be smoothly inserted into the insulating sleeve if the sheath of the cable is thick.  Select a proper cable while referring to the outline drawing.

Contact area

2.6mm (0.1)

Insulating sleeve

8mm (0.3)

14mm (0.6)

( ):inches

**Point of contact of PHOENIX CONTACT:**
 Web page    http://www.phoenixcontact.com/

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## 3.14    Termination of screw terminals

Cables terminating at a screw terminal of an FX2N or FX0N product should be fitted with insulated crimp terminals, see example shown. Terminal screws should be tightened to between 0.5 to 0.8 N·m. Screw terminals must be secured to prevent a loose connection from causing a malfunction.

*Figure 3.17:*



Max. 6.2mm 0.24 in

To suit M3 (0.12in) screw terminals

Max. 6.2mm 0.24 in
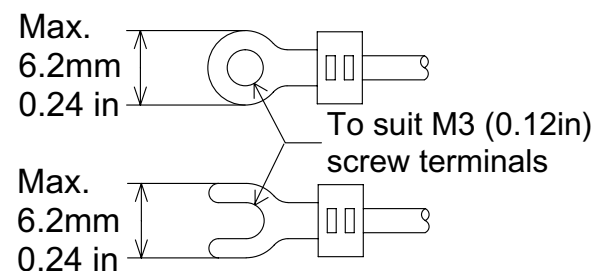
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## 3.15    Termination of connector style I/O cables

Standard, pre-terminated cables are available from Mitsubishi in 1.5, 3 and 5 meter (4.9, 9.8 and 16.4 ft) lengths. However, users are encouraged to make their own cables to the lengths they require. The following table identifies connectors and cable requirements;

***Figure 3.18:***
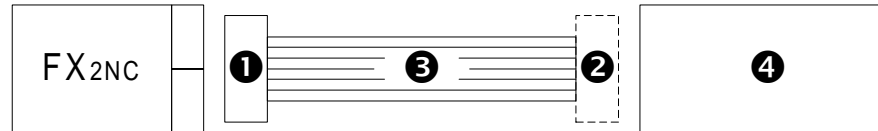
***Table 3.6 :***                                    ( ): ft

| MODEL | LENGTH | ❶ | ❷ | ❸ | ❹ |
|---|---|---|---|---|---|
| FX-16E-500CAB-S | 5m (16.4) | 20 Pin connector | No connector | Single wire | Input switch or Loads |
| FX-16E-150CAB | 1.5m (4.9) | 20 Pin connector | 20 Pin connector | Flat cables | **TERMINAL BLOCK**<br>·FX-16E-TB/UL<br>·FX-32E-TB/UL<br>·FX-16EYR-ES-TB/UL<br>·FX-16EYT-ESS-TB/UL<br>·FX-16EYT-ES-TB/UL<br>·FX-16EYS-TB/UL |
| FX-16E-300CAB | 3m (9.8) | | | | |
| FX-16E-500CAB | 5m (16.4) | | | | |
| FX-16E-150CAB-R | 1.5m (4.9) | 20 Pin connector | 20 Pin connector | Round cables | |
| FX-16E-300CAB-R | 3m (9.8) | | | | |
| FX-16E-500CAB-R | 5m (16.4) | | | | |

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# 4.        Power supply

### Table 4.1  : Power requirements

|  | FX2NC-16MR-T-DS | FX2NC-16MT-DSS | FX2NC-32MT-DSS | FX2NC-64MT-DSS | FX2NC-96MT-DSS |
|---|---|---|---|---|---|
| Power supply | 24V DC  +20%, -15% Ripple Voltage (p-p) 5% or less | | | | |
| Max. allowable momentary power failure period | 5ms (5ms > PLC = RUN, 5ms < PLC = STOP) | | | | |
| Fuse (size) rating | 125V 2.5A 250V  3.15A (3A)  5      $\phi\times$20mm (0.2$\times$0.79 inches) | | | | |
| In-rush current | 30A or less   0.5ms/24V DC | | | | |
| Power consumption *1 | 6W | 6W | 8W | 11W | 14W |

*1 Includes input current (7 or 5 mA per point).

### Table 4.2  :Power consumption of FX2NC extension blocks

When connecting extension blocks, add the values shown below to the power consumption value of the main unit.

| Type | Model | Power consumption |
|---|---|---|
| Input extension | FX2NC-16EX-DS, FX2NC-16EX-T-DS | 2.2W [2] |
| | FX2NC-32EX-DS | 4.2W [2] |
| Output extension | FX2NC-16EYT-DSS | 0.35W |
| | FX2NC-16EYR-T-DS | 2.2W |
| | FX2NC-32EYT-DSS | 0.7W |
| Special extension | See sec. Table 1.4 | |

*2 Includes input current (5 mA per point).

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For the 24V DC power source of FX or FX2N series programmable controllers, the correction value should be written in data register D8008; a special data register that sets the power failure detection period. However, for FX2NC series programmable controllers, it is not necessary to write the correction value.
The data stored in D8008 register will be automatically corrected by the system program. Do not modify D8008.

### *Figure 4.1 :  Connection of power supply cables*
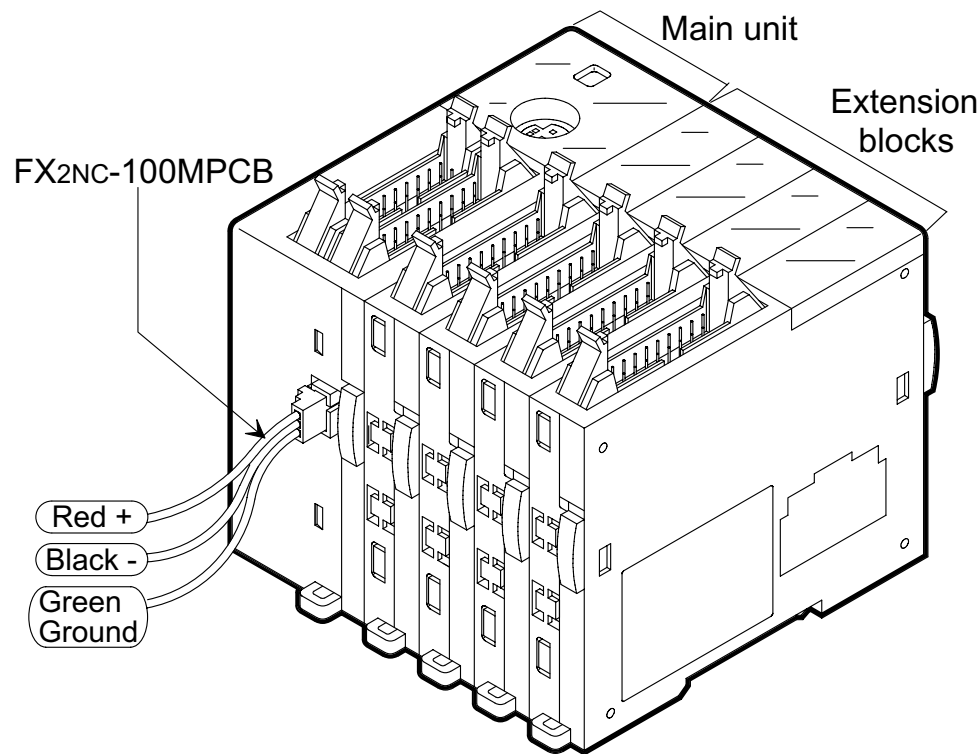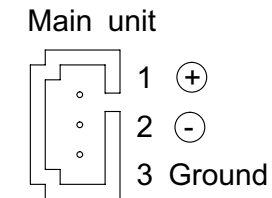
### Figure 4.2 : EX.wiring
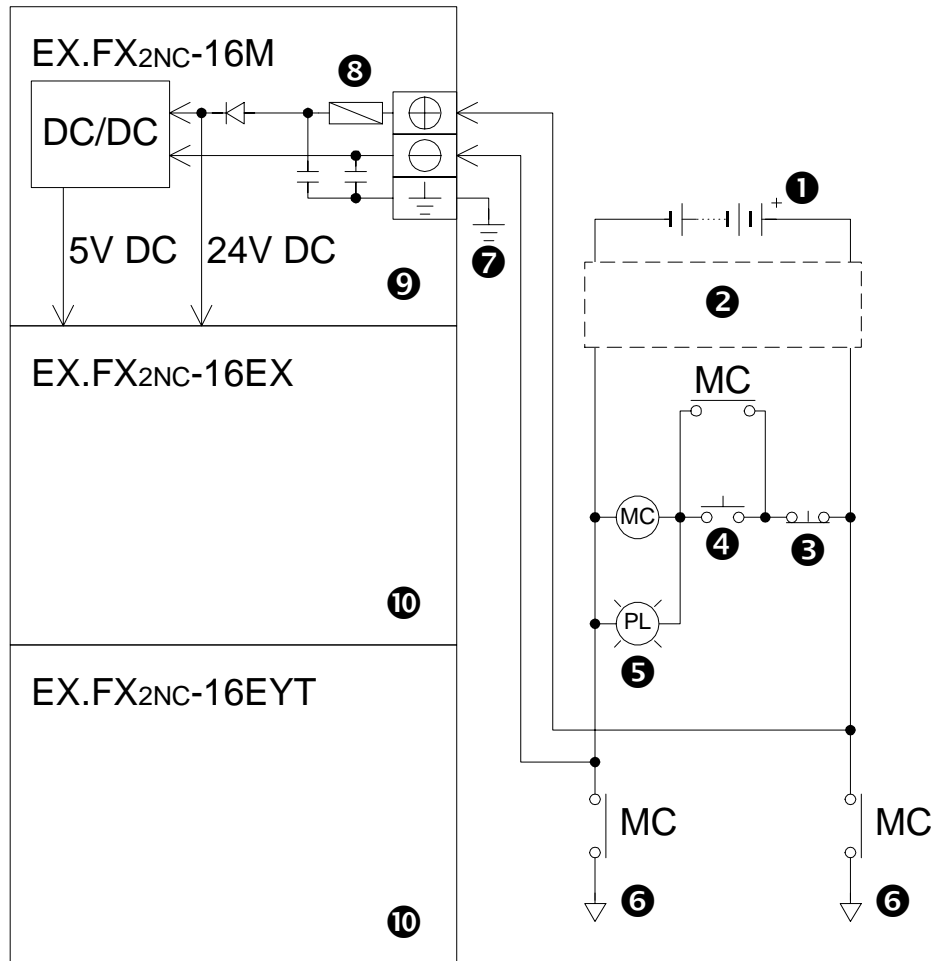


| | |
|---|---|
| ❶ | Power supply 24V DC +20% -15% Ripple voltage (p-p) 5% or less |
| ❷ | Circuit protector or Fuse |
| ❸ | Emergency stop |
| ❹ | Power supply switch |
| ❺ | Power ON pilot indicator |
| ❻ | Power supply for loads |
| ❼ | Grounding resistor 100Ω or less (class D) |
| ❽ | Fuse |
| ❾ | Main unit |
| ❿ | Extension blocks |

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## 4.1      Power supply cautions

As shown in the following figure, supply 24V DC to the main unit, special function blocks, and data access unit from the same power source.
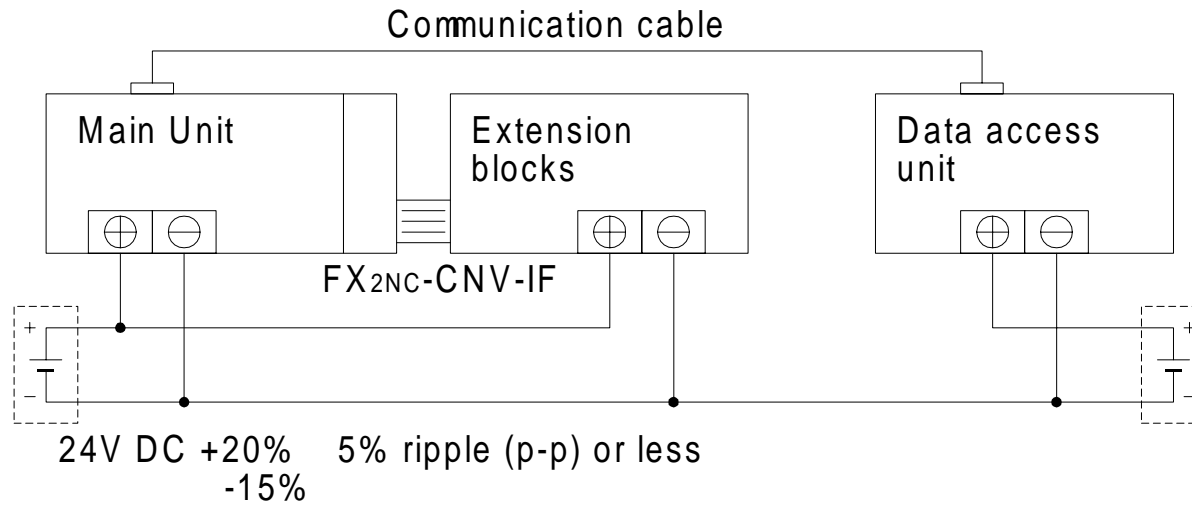
### *Figure 4.3 :  Use of same power source*



FX2NC-CNV-IF

24V DC +20%    5% ripple (p-p) or less
       -15%

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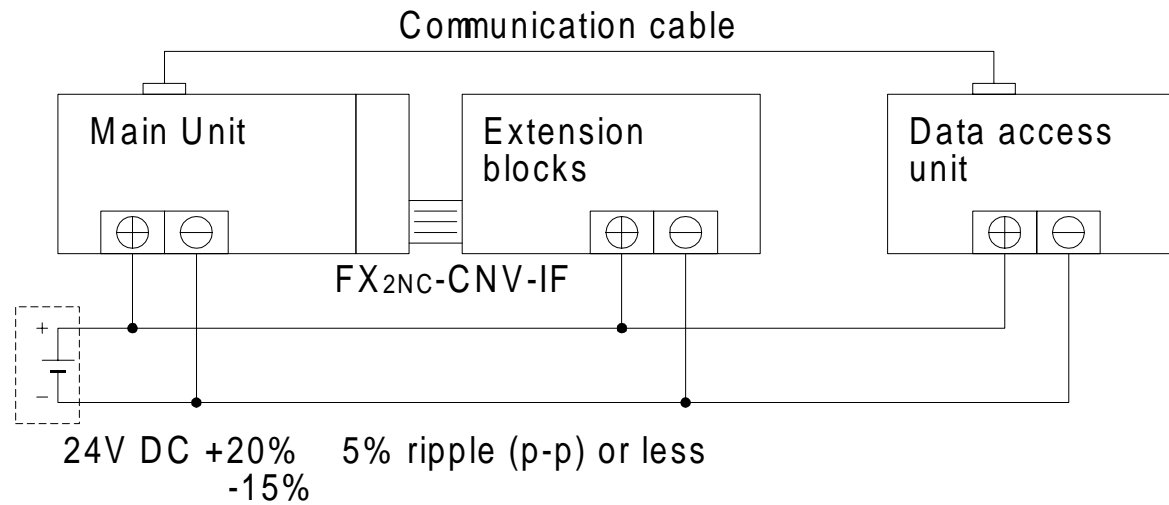
If the power has to be supplied from two power sources due to low capacity of the DC power supply unit, etc., be sure to connect the minus lines of the two power supply units.

### Figure 4.4: Connection of minus lines

Communication cable

Main Unit

Extension blocks

Data access unit

FX2NC-CNV-IF

24V DC +20% 5% ripple (p-p) or less
-15%

## 4.2 Earthing / Grounding

Use a cable at least 0.2mm$^2$ (AWG24) to ground equipment. Ground resistance must be less than 100$\Omega$ (class D). Note that the ground cable must not be connected to the same ground as the power circuits. Grounding is recommended but if a proper ground cannot be provided the PLC will still operate correctly.

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# 5. Inputs

## 5.1 24V DC input specifications

### *Table 5.1 :FX2NC input specifications*

| | | FX2NC main unit, extension block | | FX0N, FX2N Extension block |
|---|---|---|---|---|
| | | **X0 → X7** | **X10 → ∞∞** | |
| Input voltage | | 24V DC +20%, -15% | | |
| Input current | | 24V DC, 7mA | 24V DC, 5mA | 24V DC, 5mA |
| Input switching current | OFF → ON | >4.5mA | >3.5mA | >3.5mA |
| | ON → OFF | <1.5mA | | |
| Response time | | 10ms | | |
| Variable response time | | X000-X017  0-60ms (FX2NC-16M★ : X000-X007) | | --- |
| Circuit isolation | | Photocoupler | | |
| Operation indication | | LED is lit | | |

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## 5.1.1 Typical wiring

### *Figure 5.1: source*
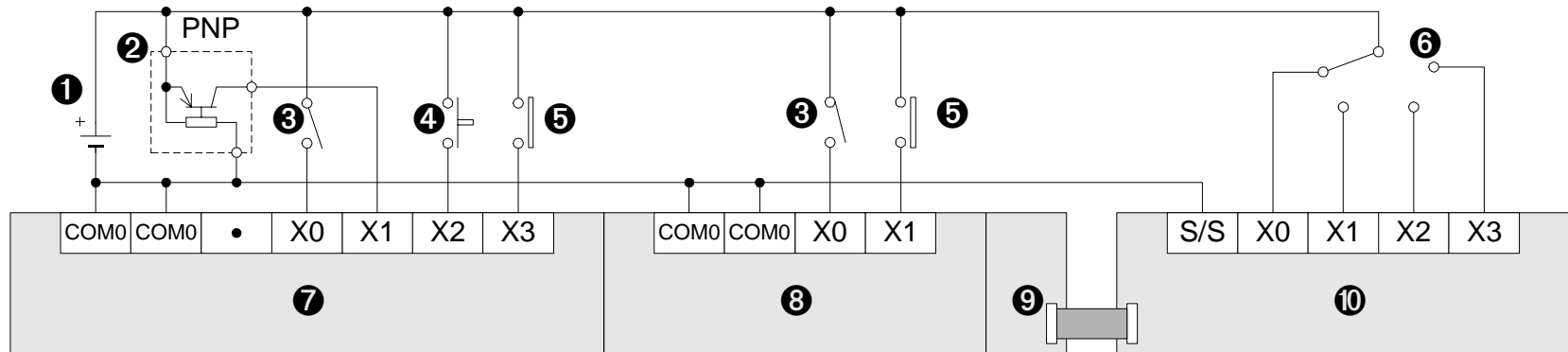


### *Figure 5.2: sink*
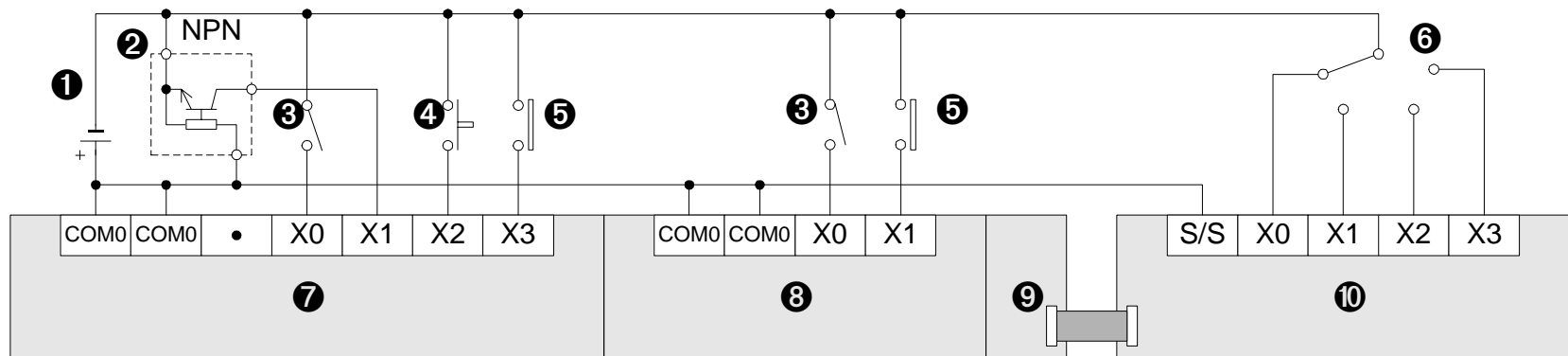
### Table 5.2 : Item check

| | | |
|---|---|---|
| ❶ | | External power supply 24V DC +20% -15% |
| ❷ | | PNP (NPN) proximity sensor |
| ❸ | | Switch |
| ❹ | | Push button |
| ❺ | | Contact |
| ❻ | | Rotary switch |
| ❼ | | MPU main processing unit (main unit) |
| ❽ | | FX2NC Extension block |
| ❾ | | FX2NC-CNV-IF  Connector conversion adapter |
| ❿ | | FX0N, FX2N Extension block |

## 5.1.2    Input circuit connection

### *Figure 5.3: FX2NC Main unit and FX2NC Extension block*



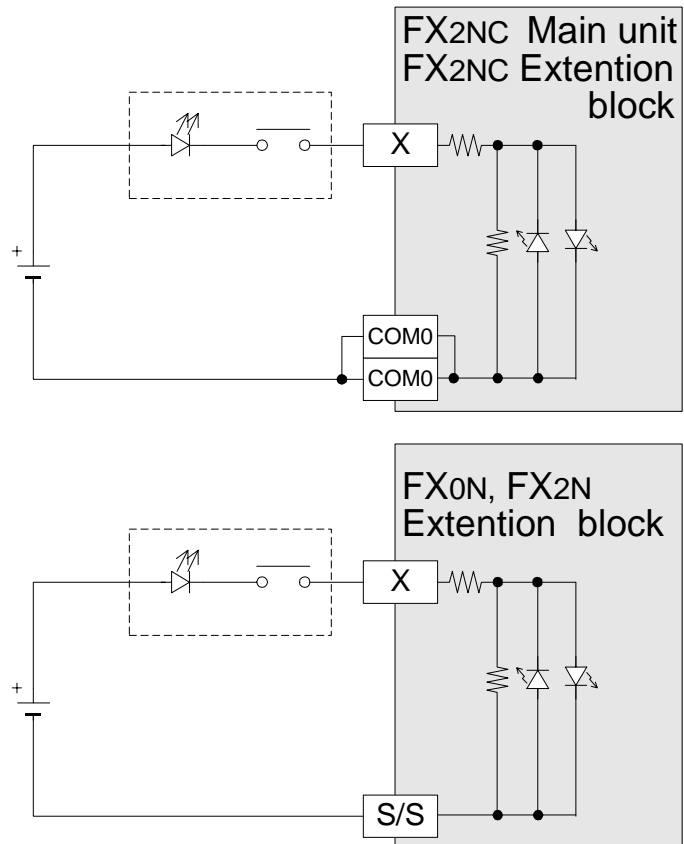### *Figure 5.4: FX2N and FX0N Extension block*

## 5.1.3    Diodes and inputs connected in series;

Vdrop across the diode Max. 4V
No more than 2 LEDs should be connected in series.

### Figure 5.5: Series diodes

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### 5.1.4    Resistors and inputs connected in parallel;

Parallel resistance Rp: FX2NC = 15kΩ. If resistance Rp is less than the stated value, then add Rb. See equation 1 for Rb calculation.
Alternatively; Current leakage: FX2NC = 1.5mA. If the current leakage is greater than the stated value, then add Rb. See equation 2 for Rb calculation.

### *Figure 5.6: Parallel LED*

$$\text{Eqn 1}: \quad Rb \leq \frac{4Rp}{15 - Rp}$$

$$\text{Eqn 2}: \quad Rb \leq \frac{6}{I - 1.5}$$

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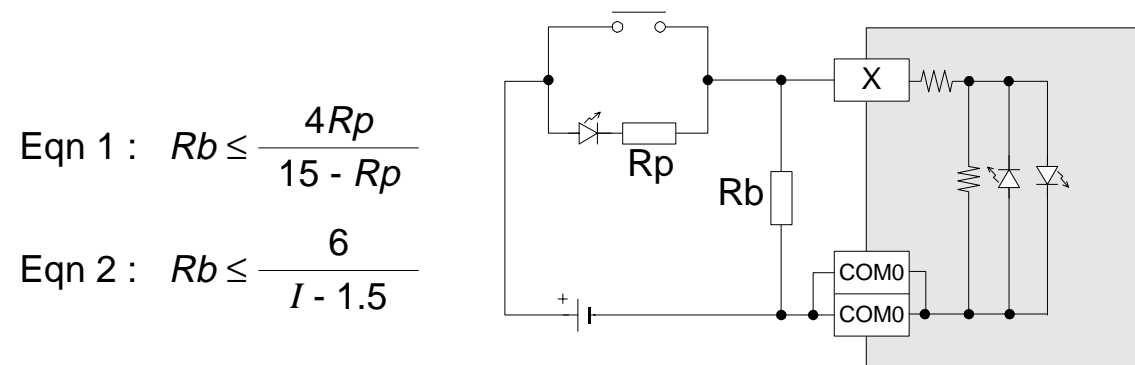
## 5.2      AC110V input Extension block

### Table 5.3  : FX0N-8EX-UA1/UL  input specification

| | |
|---|---|
| **Input voltage** | 85-132V AC   50/60Hz |
| **Input impedance** | 21kΩ/50HZ   18kΩ/60Hz |
| **Input current** | 4.7mA 100V AC/50Hz   6.2mA 110V AC/60Hz |
| **OFF → ON/ON → OFF; input switching current** | 80V   3.8mA/30V   1.7mA |
| **Response time** | 25ms |
| **Circuit isolation / Operation indication** | Photocoupler/LED is lit |

### 5.2.1     Input circuit connection

### Figure 5.7: FX0N-8EX-UA1/UL
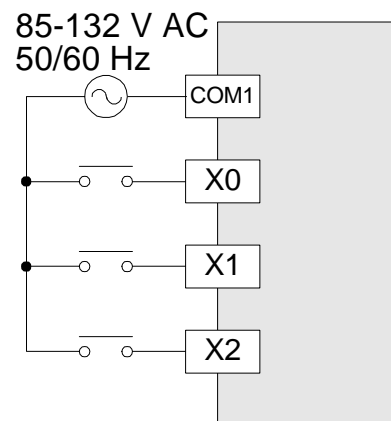
### 5.2.2    Programming caution

When using 110V AC units, high speed counter and interrupt routines are not suitable for use due to the long 'ON/OFF' times. The following instructions are also not suitable.

FNC 51 REFF   FNC 70 TKY

FNC 52 MTR    FNC71 HKY

FNC 56 SPD    FNC 72 DSW

FNC 68 ROTC   FNC 75 ARWS

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# 6. Outputs

## 6.1 Transistor output specification

### *Table 6.1 :*

| Switched voltage (resistive load) | | 5-30V DC |
|---|---|---|
| **Rated current / N points (resistive load)** | | FX2NC Main unit, Extension block: 0.1A/1point, 0.8A/8point, 0.3A/1point (Y0-Y3) FX0N, FX2N Extension block: 0.5A/1point, 0.8A/4point, 1.6A/8point |
| **Max. Inductive load** | | FX2NC Main unit, Extension block: 2.4W/24V DC, 7.2W/24V DC (Y0-Y3) FX0N, FX2N Extension block: 12W/24V DC |
| **Max. lamp load (tungsten load)** | | FX2NC Main unit, Extension block: 0.3W/24V DC, 0.9W/24V DC (Y0-Y3) FX0N, FX2N Extension block: 1.5W/24V DC |
| **Response time (approx.)** | OFF → ON | <0.2ms (100mA/24V DC), <15 µs (100mA/5V DC) (Y0,Y1) |
| | ON → OFF | <0.2ms (100mA/24V DC), <30 µs (100mA/5V DC) (Y0,Y1) |
| **Open circuit current leakage** | | 0.1mA/30V DC |
| **Circuit isolation** | | Photocoupler |
| **Operation indication** | | LED is lit when photocoupler is driven |

### 6.1.1 Response times

OFF times increase as the load current decreases.
For improved response times use a 'dummy' resistor, see Figure 6.1. If a response time of 0.5 ms or better is required when using 'light loads' use a 'dummy' resistor and ensure the signal line has a current greater than 60mA/24V DC.
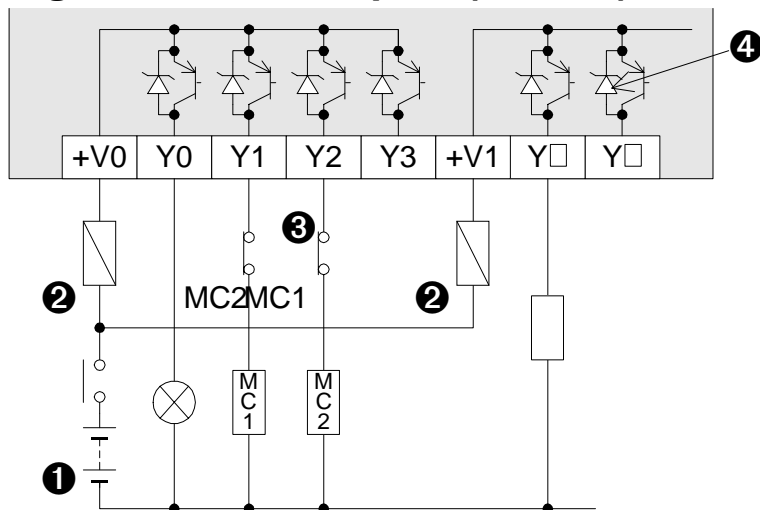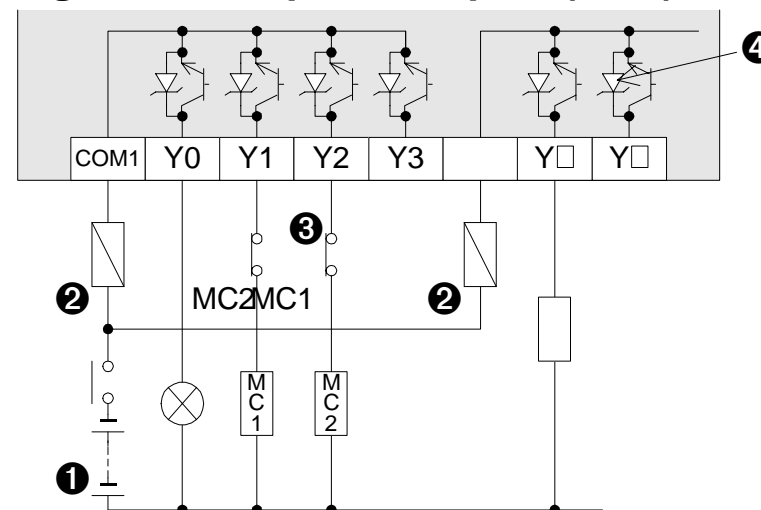
### *Figure 6.1 :Dummy load*

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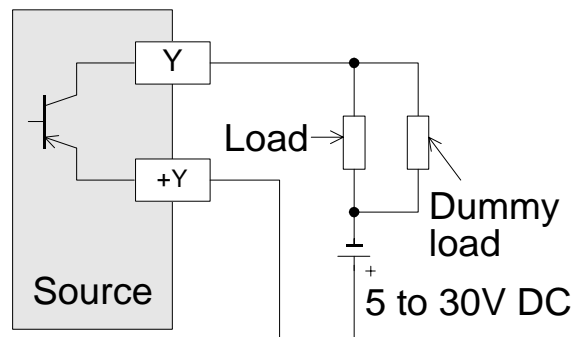
### 6.1.2 Transistor output example

**Typical wiring to 4-point common type.**

*Figure 6.2:World Spec. (Source)*

*Figure 6.3 :Japanese Spec. (Sink)*



## Common points (See sec, 2.1, 2.2, 2.3)

FX 2NC-16MT-DSS : 8 points (+V0 See sec, 3.12)

FX 2NC-32/64/96MT-DSS, FX2NC-16/32EYT-DSS :

16 points (+V0 to +V2 See sec, 3.12)

FX 2N Extension blocks : 8 points (+V0, +V1)

FX 0N Extension blocks : 4 points (+V0 to +V3)

### *Table 6.2  : Item check*

| ❶ | DC power supply | ❸ | External, mechanical inter-lock |
|---|---|---|---|
| ❷ | Fuse | ❹ | Internal noise suppressor |

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## Typical wiring to 8 and 16-point common type.

### Figure 6.4 :World Spec. (Source)
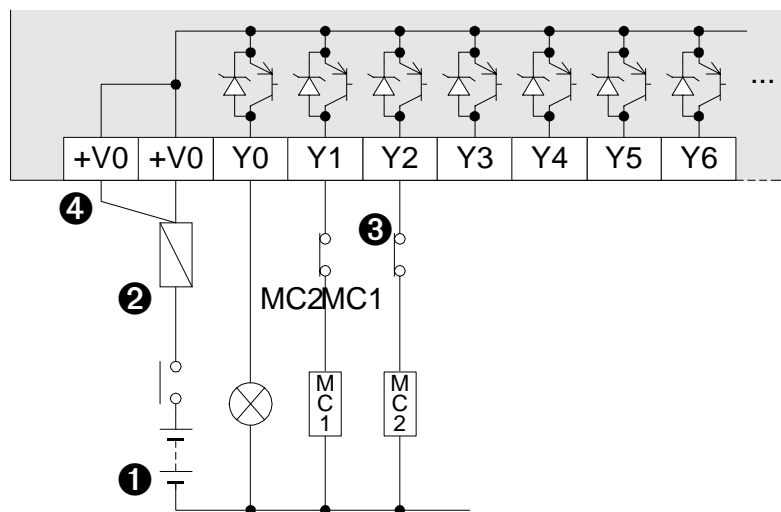


### Figure 6.5 :Japanese Spec. (Sink)



### Table 6.3:Item check

| ❶ | DC power supply |
|---|---|
| ❷ | Fuse |
| ❸ | External, mechanical inter-lock |
| ❹ | The output connectors of the main unit and the connector-type 16-point output extension blocks are the 16-point common type (8-point common type for the FX2NC-16MT). These output connectors have two +V0 to +V2 pins that are connected to each other inside the programmable controller. To connect the line to an external unit, shortcircuit these two pins at the external circuit so that the load of each pin can be reduced. |

## 6.2 Relay output specification

### Table 6.4 :

| Switched voltages (resistive load) | | $\leq$ 240V AC, $\leq$ 30V DC |
|---|---|---|
| **Rated current / N points (resistive load)** | | FX 2NC:Main units and Extension blocks<br>2A/1point, 4A/1COM(8A/2COM)<br>(See sec, 3.13, 6.2.2) |
| | | FX 2N ,FX0N:Extension blocks<br>2A/1point, 8A/COM |
| **Max. Inductive load** | | 80VA See table 6.5 |
| **Max. lamp load (tungsten load)** | | 100W (1.17A/85V AC, 0.4A/250V AC) |
| **Minimum load** | | When supply voltage < 24V DC allow at least 5mA flow |
| **Response time (approx.)** | **OFF → ON** | 10ms |
| | **ON → OFF** | 10ms |
| **Circuit isolation** | | by relay |
| **Operation indication** | | LED is lit when coil is energized |

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6-5

### 6.2.1    Reliability tests

 The test results in table 6.4 were gathered from a 1 sec ON/OFF test cycle. Please note that the over current induced by in-rush greatly reduces the relay contacts service life. The rated life for an inductive AC load such as a contactor or solenoid valve is 500,000 operations at 20VA.

*Table 6.5  :*

|  | **20VA** | **35VA** | **80VA** |
|---|---|---|---|
| Load capacity | 0.2A/100VAC<br>0.1A/200VAC | 0.35A/100V AC<br>0.17A/240V AC | 0.8A/100V AC<br>0.4A/240V AC |
| Life of contact (cycles) | 3,000,000 | 1,000,000 | 200,000 |
| Example load (Mitsubishi contactor) | S-K10 to S-K95 | S-K100 to S-K150 | S-K180,S-K400 |

### 6.2.2 Relay output example

**Figure 6.6:Typical wiring to the 4-point common type**



**Table 6.6 : Item check**

| | |
|---|---|
| ❶ | AC power supply |
| ❷ | Fuse |
| ❸ | Solenoid valve |
| ❹ | Incandescent lamp |
| ❺ | Neon lamp |
| ❻ | Contactor |
| ❼ | Noise suppressor 0.1μF capacitor + 100-120Ω resistor |
| ❽ | DC power supply |
| ❾ | LED |
| ❿ | Surge absorbing diode |

**STOP**

Common points (See sec, 2.1, 2.2, 2.3)

FX 2NC-16MR-T-DS : 4points (COM1, COM2)

FX 2NC-16EYR-T-DS : 8points (Tow COM1, Tow COM2  See sec, 3.13)

FX 2N Extension blocks : 8points (COM1, COM2)

FX 0N Extension blocks : 4points (COM1 to COM4)

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### Figure 6.7 :Typical wiring to the 8-point common type



### Table 6.7 :Item check

| | |
|---|---|
| ❶ | AC power supply |
| ❷ | Fuse |
| ❸ ⚠ | The output terminal block in the FX2NC-16EYR-T-DS has two COM1 or COM2 pins that are connected to each other inside the main unit. To connect the line to an external unit, shortcircuit these two pins at the external circuit so that the load applied on each pin can be reduced. |
| ❹ | Incandescent lamp |

## 6.3 Triac (SSR) output specifications

### *Table 6.8 :*

| | | |
|---|---|---|
| **Switched voltages (resistive load)** | | 85-242V AC |
| **Rated current / N points (resistive load)** | | 0.3A/1point, 0.8A/COM |
| **Max. Inductive load** | | 15VA/100V AC, 36VA/240V AC |
| **Max. lamp load (tungsten load)** | | 30W (0.35A/85V AC, 0.12A/242V AC) |
| **Minimum load** | | 0.4VA/100V AC, 2.3VA/240V AC |
| **Open circuit current leakage** | | 1mA/100V AC, 2.4mA/240V AC |
| **Response time (approx.)** | **OFF→ON** | <1ms |
| | **ON→OFF** | <10ms |
| **Circuit isolation** | | by photocoupler |
| **Operation indication** | | LED is lit when photocoupler is driven |

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### 6.3.1 In-rush currents

These currents should be kept as low possible. The root mean square ($I_{rms}$) <0.2A. Reference Eqn 1 for ($I_{rms}$)

$I_r$ -In-rush current (A)       $T_r$ -In-rush time (sec)
$I_s$ -Switch current (A)         $T_s$ -Switch time (sec)
                                         $T_f$ -Operation time (sec)

Eqn 1

$$I_{rms} = \sqrt{\frac{I_r^2 \times T_r + I_s^2 \times T_s}{T_r + T_s + T_f}}$$

Ex.

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

**Figure 6.9 :Current graph**



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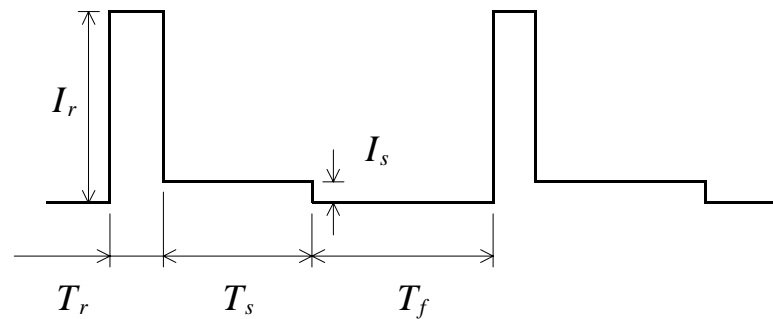
### 6.3.2    Triac output example

*Figure 6.10:Typical wiring*
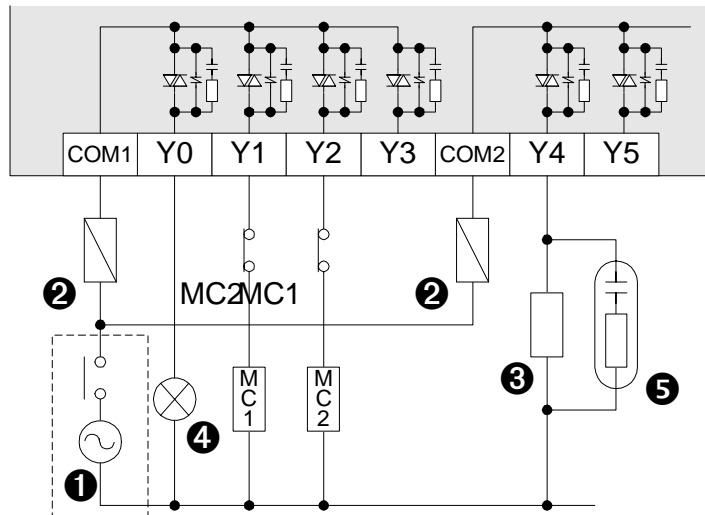


*Table 6.9:  Item check*

| | |
|---|---|
| ❶ | AC power supply |
| ❷ | Fuse |
| ❸ | Solenoid valve |
| ❹ | Incandescent lamp |
| ❺ | Noise suppressor 0.1μF capacitor+100-120Ω resistor |

## 6.4    Applying safe loads

Ensure all loads are applied to the same side of each PLC output, see previous figures. Loads which should NEVER simultaneously operate (e.g. direction control of a motor), because of a safety critical situation, should not rely on the PLC's sequencing alone. Mechanical interlocks MUST be fitted to all safety critical circuits. (See preceding figure.)

MEMO

| 1 | **INTRODUCTION** |
|---|---|

| 2 | **TERMINAL LAYOUTS** |
|---|---|

| 3 | **INSTALLATION NOTES** |
|---|---|

| 4 | **POWER SUPPLY** |
|---|---|

| 5 | **INPUTS** |
|---|---|

| 6 | **OUTPUTS** |
|---|---|

| 7 | **DIAGNOSTICS** |
|---|---|

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# 7. Diagnostics

## 7.1 Preliminary checks

| POWER ☐<br>RUN ☐<br>BATT ☐<br>ERROR ☐ | Check power supply, ground and I/O cables are wired correctly. |
|---|---|
| POWER ■<br>RUN ☐<br>BATT ☐<br>ERROR ☐ | Turn the power supply on. Check the power LED is lit. Down load a small test program into the PLC using a handheld programmer or MEDOC. Verify the program to ensure it has been written to the PLC correctly. Using the programming device force ON/OFF each output. Check the output LEDs for operation. |
| POWER ■<br>RUN ■<br>BATT ☐<br>ERROR ☐ | Put the PLC into RUN. Check the RUN LED is lit. Check the previously down loaded program works correctly. Once all check are complete take the PLC out of run and turn OFF the power supply. |
| ⚠ | During this testing stage take extrem care not to touch any live or hazardous parts. |

## 7.2     Basic diagnostics

The following diagnostic functions will help identify, common faults.

### 7.2.1     BATT LED ON

| POWER ■ <br> RUN ■ <br> BATT ■ <br> ERROR ☐ | **Fault** <br> BATT LED ON | **Remedy** <br> Monitor M8006 with a programming tool. | **Possible results** | M8006:ON | If the current program and/or date is stored only in the PLCs RAM, copy and store this immediately. Proceed to replace the PLCs battery. |
|---|---|---|---|---|---|
| | | | | M8006:OFF | Monitor D8005. This is the current battery voltage (in 0.1V units). Contact a Mitsubishi service center for further consideration of the problem. |

### 7.2.2     ERROR LED flashes (PROGRAM ERROR)

| POWER ■ <br> RUN ☐ <br> BATT ☐ <br> ERROR ◪ | **Fault** <br> ERROR LED flashes | **Remedy** <br> Check BATT LED. | **Possible results** | LED OFF | Is the BATT OK? <br> Work through BATT diagnostic. If the BATT LED is cured yet the ERROR LED still flashes check for a programming problem. |
|---|---|---|---|---|---|
| | | | | LED is lit | Check for programming problem. |

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## 7.2.3 ERROR LED ON (CPU ERROR)

| | **Fault**<br>ERROR<br>LED ON | **Remedy**<br>Reset PLC.<br>Power<br>OFF,ON<br>and trigger<br>RUN input. | **Possible results** | LED OFF | Has the memory cassette been installed or removed while the units has still been powered? |
|---|---|---|---|---|---|
| POWER ■<br>RUN □<br>BATT □<br>ERROR ■ | | | | LED is lit | ( A ) |

| | **Remedy**<br>Power OFF<br><br>Disconnect earth/ ground terminal<br><br>Power ON | **Possible results** | LED is lit | ( B ) |
|---|---|---|---|---|
| ( A ) | | | LED is flashing | Check for programming error. Ensure the earth/ ground cable is correctly rewired.<br><br>PLC  M/C   PLC  M/C   PLC  M/C<br> ✓     ✓      ✗ |

| | **Remedy**<br>Possible program/scan time error.<br>Check D8012 for program scan time, (units 0.2 msec must be less than 0.2 sec, i.e data value <2000). | Possible results<br>D8012 > D8000 |
|---|---|---|
| ( B ) | | |

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## 7.3 Common errors

- Corroded contact points at some point in an I/O line.

- An I/O device has been used outside its specified operating range.

- An input signal occurs in a shorter time period that taken by one program scan.

## 7.4 Replacing the battery

Turn OFF PLC's power supply. Remove sidecover from the PLC. Remove battery from holder-disconnect and replace (this should be carried out in 20 sec if the current data held in the PLC RAM is not to be lost).
Refit battery and cover.

*Figure 7.1: Battery (FX2NC-32BL)*
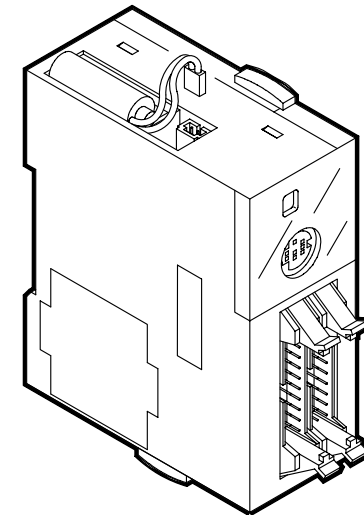


## 7.5 Maintenance

- Battery has a 3 year life.

- Check interior temperature of the panel.

- Check panel air filters if fitted.

- Check for loosening of terminals or mounting facilities (due to vibration).

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## 7.6      Error flags ON indicates error.

| | | | | |
|---|---|---|---|---|
| **M8004**<br>(ref. 8004) | Error occurance<br>(ON when M8060-7 are ON) | **M8060**<br>(ref. D8060) | I/O configuration error |
| **M8005** | Battery voltage abnormally low | **M8061**<br>(ref. D8061) | PLC hardware error |
| **M8006**<br>(ref. D8005/6) | Latched low battery voltage flag | **M8062**<br>(ref. D8062) | PLC/programming device communication error |
| **M8007**<br>(ref. D8007/8) | Momentary power failure | **M8063**<br>(ref. D8063) | Parallel link error |
| **M8008**<br>(ref. D8008) | Power failure<br>(see Figure 7.2) | **M8064**<br>(ref. D8064) | Parameter error |
| **M8009**<br>(ref. D8009) | 24V DC OFF | **M8065**<br>(ref. D8065, D8069) | Syntax error |
| **M8030** | Battery LED OFF - Battery voltage low | **M8066**<br>(ref. D8066, D8069) | Program (circuit) error |
| **M8035** | Forced RUN mode | **M8067**<br>(ref. D8067, D8069) | Program execution error |
| **M8036** | Forced RUN signal | **M8068**<br>(ref. D8068) | Execution error latch |
| **M8037** | Forced STOP signal | **M8069**<br>(ref. D8069) | I/O bus check |
| **M8039**<br>(ref. D8039) | Constant scan mode | | |

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### Figure 7.2: Power down and its associated flags
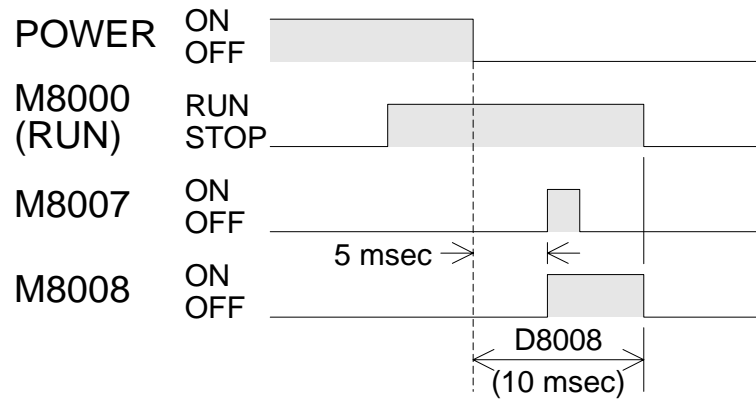
## 7.7    Error registers

| D8000 (default 200msec) | Watchdog timer |
|---|---|
| M8001 | PLC version<br><br>24201=FX2NC/FX2N V2.01<br>(24=FX2NC/FX2N, 201=V2.01) |
| M8002 | Memory capacity<br><br>02=2K steps, 04=4K steps,<br>08=8K(16K) steps |
| M8003 | Memory type<br><br>02H=EEPROM protect switch OFF<br>0AH=EEPROM protect switch ON<br>10H=MPU memory |
| M8004 | Error flag number<br>8060=M8060, (8060-8068) |
| M8005 | Battery voltage<br>36=3.6V (uniits 0.1V) |
| D8006 (default 3.0V) | Low battery detection level |
| D8007 | Number of momentry power failures - reset on full power OFF |

| D8008 | Power failure detection period (Automatically corrected) |
|---|---|
| D8009 | Lowest device affected by 24V DC power failure |

| | |
|---|---|
| **D8060** | Reports location of I/O configuration error (see Figure 7.3) |
| **D8061** | Error code for PLC hardware error |
| **D8062** | Error code number for programmer communications fault |
| **D8063** | Error code for parallel link fault |
| **D8064** | Parameter error code |
| **D8065** | Systax error code |
| **D8066** | Program (circuit) error code |
| **D8067** | Program execution error code |
| **D8068** | Latched step number of execution error |
| **D8069** | Step number of errors associated with error flags M8065-M8067 |

**Figure 7.3:**
**I/O configuration error, A) number, B) type.**

```
 1  0  7  0
```

A) No.10 to 370

B) 1=X
   2=Y
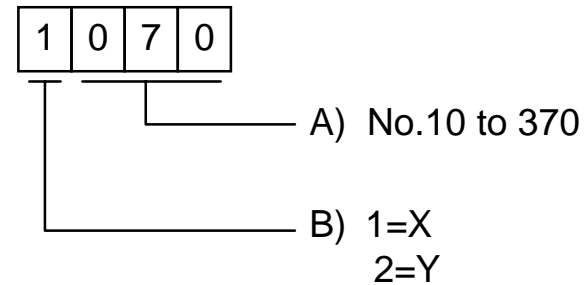
## 7.8 Error codes

| D8061 | | Check cable connections |
|---|---|---|
| | 0000 | No error |
| | 6101 | RAM error |
| | 6102 | Operation circuit error |
| | 6103 | I/O bus error (M8069 = ON) |
| D8062 | | Check the programmer / PLC connections |
| | 0000 | No error |
| | 6201 | Parity/overrun/framing error |
| | 6202 | Character error |
| | 6203 | Data sum check error |
| | 6204 | Data format error |
| | 6205 | Command error |

| D8063 | | Check both power and communications connections |
|---|---|---|
| | 0000 | No error |
| | 6301 | Parity/overrun/framing error |
| | 6302 | Character error |
| | 6303 | Data sum check error |
| | 6304 | Data format error |
| | 6305 | Command error |
| | 6306 | Watchdog timer error |

## 7.9 Instruction list

### *Table 7.1: Numerically sorted*

| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 000 | PROGRAM FLOW | CJ | CALL | SRET | IRET | EI | DI | FEND | WDT | FOR | NEXT |
| 010 | TRANSFERS, COMP | CMP | ZCP | MOV | SMOV | CML | BMOV | FMOV | XCH | BCD | BIN |
| 020 | +-×÷, LOGICS | ADD | SUB | MUL | DIV | INC | DEC | WAND | WOR | WXOR | NEG |
| 030 | ROTATION, SHIFT | ROR | ROL | RCR | RCL | SFTR | SFTL | WSFR | WSFL | SFWR | SFRD |
| 040 | DATA OPERATION 1 | ZRST | DECO | ENCO | SUM | BON | MEAN | ANS | ANR | SQR | FLT |
| 050 | HIGH-SPEED | REF | REFF | MTR | HSCS | HSCR | HSZ | SPD | PLSY | PWM | PLSR |
| 060 | HANDY INSTR. 1 | IST | SER | ABSD | INCD | TTMR | STMR | ALT | RAMP | ROTC | SORT |
| 070 | FX I/O DEVICES | TKY | HKY | DSW | SEGD | SEGL | ARWS | ASC | PR | FROM | TO |
| 080 | FX SER DEVICES | RS | PRUN | ASCI | HEX | CCD | VRRD | VRSC | - | PID | - |
| | | | | | | | | | | | |
| 110 | FLOATING POINT 1 | ECMP | EZCP | - | - | - | - | - | - | EBCD | EBIN |
| 120 | FLOATING POINT 2 | EADD | ESUB | EMUL | EDIV | - | - | - | ESQR | - | INT |
| 130 | FLOATING POINT 3 | SIN | COS | TAN | - | - | - | - | - | - | - |
| 140 | DATA OPERATION 2 | - | - | - | - | - | - | - | SWAP | - | - |
| | | | | | | | | | | | |
| 160 | REAL TIME CLOCK | TCMP | TZCP | TADD | TSUB | - | - | TRD | TWR | - | - |
| 170 | GREY CODES | GRY | GBIN | - | - | - | - | - | - | - | - |
| | | | | | | | | | | | |
| 220 | | - | - | - | - | LD= | LD> | LD< | - | LD≠ | LD≤ |
| 230 | IN-LINE COMPARE | LD≥ | - | AND= | AND> | AND< | - | AND≠ | AND≤ | AND≥ | - |
| 240 | | OR= | OR> | OR< | - | OR≠ | OR≤ | OR≥ | - | - | - |

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### Table: 7.2 Alphabetically sorted

| | Symbol | FNC No. | D | P |
|---|---|---|---|---|
| A | ABSD | 062 | ■ | |
| | ADD | 020 | ■ | ■ |
| | ALT | 066 | | ■ |
| | AND□ | 232-238 | ■ | |
| | ANR | 047 | | ■ |
| | ANS | 046 | | |
| | ARWS | 075 | | |
| | ASC | 076 | | |
| | ASCI | 082 | | ■ |
| B | BCD | 018 | ■ | ■ |
| | BIN | 019 | ■ | ■ |
| | BMOV | 015 | | ■ |
| | BON | 044 | ■ | |
| C | CALL | 001 | | ■ |
| | CCD | 084 | | ■ |
| | CJ | 000 | | ■ |
| | CML | 014 | ■ | ■ |
| | CMP | 010 | ■ | ■ |
| | COS | 131 | ■ | ■ |

| | Symbol | FNC No. | D | P |
|---|---|---|---|---|
| D | DEC | 025 | ■ | |
| | DECO | 041 | | ■ |
| | DI | 005 | | |
| | DIV | 023 | ■ | ■ |
| | DSW | 072 | | |
| E | EADD | 120 | ■ | ■ |
| | EBCD | 118 | ■ | |
| | EBIN | 119 | ■ | |
| | ECMP | 110 | ■ | ■ |
| | EDIV | 123 | ■ | ■ |
| | EI | 004 | | |
| | EMULL | 122 | ■ | |
| | ENCO | 042 | | ■ |
| | ESQR | 127 | ■ | ■ |
| | ESUB | 121 | ■ | ■ |
| | EZCP | 111 | ■ | ■ |
| F | FEND | 006 | | |
| | FLT | 049 | ■ | ■ |
| | FMOV | 016 | ■ | ■ |
| | FOR | 008 | | |
| | FROM | 078 | ■ | ■ |

| | Symbol | FNC No. | D | P |
|---|---|---|---|---|
| G | GBIN | 171 | ■ | ■ |
| | GRY | 170 | ■ | ■ |
| H | HEX | 083 | | ■ |
| | HKY | 071 | ■ | |
| | HSCR | 054 | ■ | |
| | HSCS | 053 | ■ | |
| | HSZ | 055 | ■ | |
| I | INC | 024 | ■ | ■ |
| | INCD | 063 | | |
| | INT | 129 | ■ | ■ |
| | IRET | 003 | | |
| | IST | 060 | | |
| L | LD□ | 224-230 | ■ | |
| M | MEAN | 045 | ■ | ■ |
| | MOV | 012 | ■ | ■ |
| | MTR | 052 | | |
| | MUL | 022 | ■ | ■ |
| N | NEG | 029 | ■ | ■ |
| | NEXT | 009 | | |
| O | OR□ | 240-246 | ■ | |

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| | Symbol | FNC No. | D | P |
|---|---|---|---|---|
| **P** | PID | 088 | | |
| | PLSR | 059 | ● | |
| | PLSY | 057 | ● | |
| | PR | 077 | | |
| | PRUN | 081 | ● | ● |
| | PWM | 058 | | |
| **R** | RAMP | 067 | | |
| | RCL | 033 | ● | ● |
| | RCR | 032 | ● | ● |
| | REF | 050 | | ● |
| | REFF | 051 | | ● |
| | ROL | 031 | ● | ● |
| | ROR | 030 | ● | ● |
| | ROTC | 068 | | |
| | RS | 080 | | |
| **S** | SEGD | 073 | | ● |
| | SEGL | 074 | | |
| | SER | 061 | ● | ● |
| | SFRD | 039 | | ● |
| | SFTL | 035 | | ● |
| | SFTR | 034 | | ● |

| | Symbol | FNC No. | D | P |
|---|---|---|---|---|
| **S** | SFWR | 038 | | ● |
| | SIN | 130 | | ● |
| | SMOV | 013 | | ● |
| | SORT | 069 | | |
| | SPD | 056 | | |
| | SQR | 048 | ● | ● |
| | SRET | 002 | | |
| | STMR | 065 | | |
| | SUB | 021 | ● | ● |
| | SUM | 043 | ● | ● |
| | SWAP | 147 | ● | ● |
| **T** | TADD | 162 | | ● |
| | TAN | 132 | | ● |
| | TCMP | 160 | | ● |
| | TKY | 070 | ● | |
| | TO | 079 | ● | ● |
| | TRD | 166 | | ● |
| | TSUB | 163 | | ● |
| | TTMR | 064 | | |
| | TWR | 167 | | ● |
| | TZCP | 161 | | ● |

| | Symbol | FNC No. | D | P |
|---|---|---|---|---|
| **V** | VRRD | 085 | | ● |
| | VRSC | 086 | | ● |
| **W** | WAND | 026 | ● | ● |
| | WDT | 007 | | ● |
| | WOR | 027 | ● | ● |
| | WSFL | 037 | | ● |
| | WSFR | 036 | | ● |
| | WXOR | 028 | ● | ● |
| **X** | XCH | 017 | ● | ● |
| **Z** | ZCP | 011 | ● | ● |
| | ZRST | 040 | | ● |

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| | | **FX2NC** | |
|---|---|---|---|
| Program capacity | | Built-in memory(RAM) = 8K steps<br>FX2NC-EEPROM-4C = 2K - 4K steps<br>FX2NC-EEPROM-16 = 2K - 16K steps<br>FX2NC-EEPROM16C = 2K - 16K steps | |
| Input (X) relay | | X0 - 267 (184 pnts) | (X + Y) $\leq$ 256 pnts Max. |
| Output (Y) relay | | Y0 - 267 (184 pnts) | |
| Auxiliary relay<br>(3072 pnts, + 256 pnts) | | M0-M499 (500 pnts) | Battery backup<br>by Parameters |
| | Battery backup | M500-M1023 (524 pnts) | |
| | Battery backup | M1024-M3071 (2048 pnts) | |
| | Special function | M8000-M8255 (256 pnts) | |
| State relay<br>(1000 pnts) | | S0-S499 (500 pnts) | Battery backup<br>by Parameters |
| | Battery backup | S500-S999 (500 pnts)<br>(S900-S999 ANS FNC46) | |
| Timer<br>(256 pnts) | 100 ms | T0-T199 (200 pnts) | |
| | 10 ms | T200-T245 (46 pnts) | |
| | 1 ms | Battery backup | T246-T249 (4 pnts) |
| | 100 ms | | T250-T255 (6 pnts) |

| | | | FX2NC | |
|---|---|---|---|---|
| Counter (256 pnts) | 16 bit | C0-C99 (100 pnts) | Battery backup by Parameters | |
| | 16 bit | C100-C199 (100 pnts) | | |
| | 32 bit | C200-C219 (20 pnts) | Battery backup by Parameters | |
| | 32 bit | C200-C234 (15 pnts) | | |
| | | C235-C245 | | |
| | | C246-C250 | | |
| | | C251-C255 | | |
| Data register (8000 pnts, + 256 pnts) | | D0-D199 (200 pnts) | Battery backup by Parameters | |
| | Battery backup | D200-D511 (312 pnts) | | |
| | Battery backup | D512-D7999 (7488 pnts) | D1000-D7999 File register by Parameters | |
| | Special function | D8000-D8255 (256 pnts) | | |
| | Index | V0-V7, Z0-Z7 (16 pnts) | | |
| Pointer | CALL (FNC 01) | P0-P127 (128 pnts) | | |
| | EI (FNC 04) | I00 □ - I50□, I6□□ - I8□□, I010 - I060 (6, 3, 6 pnts) | | |
| Nesting | MC /MCR | N0 - N7 (8 pnts) | | |
| Numbers | 16 bit | 32 bit | | |
| K | -32,768 to 32,767 | -2,147,483,648 to 2,147,483,647 | | |
| H | 0 to FFFFH | 0 to FFFFFFFFH | | |
| Float | - | $0, 1.175 \times 10^{-38}$ to $3.403 \times 10^{38}$ | | |

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Under no circumstances will MITSUBISHI ELECTRIC be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. MITSUBISHI ELECTRIC will accept no responsibility for actual use of the product based on these illustrative examples.

Owing to the very great variety in possible application of this equipment, you must satisfy yourself as to its suitability for your specific application.

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# HARDWARE MANUAL

FX2NC (DSS/DS) SERIES PROGRAMMABLE CONTROLLERS

## MITSUBISHI ELECTRIC CORPORATION

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(MEE0012)

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