

This manual contains safety information, associated manual listings, specifications and terminal layouts and wiring for Japanese specification FX_{1N} PLC main units.

For complete operation, mounting and programming instructions please refer to the FX_{1N} HANDY MANUAL (JY992D87501 JAPANESE ONLY) and PROGRAMMING MANUAL.

These manuals should be read and understood before attempting to install or use the unit.

Guidelines for the Safety of the User and Protection of the FX_{1N} PLC

This 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. 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. These engineers should also be trained in the use and maintenance of the complete product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices
- c) All operators of the completed equipment should be trained to use that product in a safe and co-ordinated manner in compliance to established safety practices. The operators should also be familiar with documentation which is connected to 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 of information which are intended to ensure the users personal safety and protect the integrity of equipment.

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

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

- 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.

Further Information Manual Lists

The following manuals are recommended as essential reference material for the correct operation of an FX_{1N} series Programmable Controller

Manual name	Manual No.	Description
FX _{1N} HANDY MANUAL	JY992D87501 (JAPANESE ONLY)	Describes contents related to hardware of world specification FX _{1N} series PLCs such as specifications, wiring and installation.
FX _{1S} , FX _{1N} , FX _{2N} , FX _{2NC} PROGRAMMING MANUAL	JY992D62001 (JAPANESE ONLY)	Programming manual for FX _{1S} , FX _{1N} , FX _{2N} and FX _{2NC} series Programmable Logic Controllers

1. Introduction

This manual covers basic hardware details for the FX₁N Series Programmable Logic Controller.

MODEL	INPUT		OUTPUT		POWER SUPPLY	DIMENSIONS mm (inches)			WEIGHT kg (lbs)
	QTY	TYPE	QTY	TYPE					
FX ₁ N-24MR	14	24V DC SINK	10	Relay	100-240 VAC +10% -15% 50/60Hz	90	90 (3.5)	75 (3.0)	0.45 (0.99)
FX ₁ N-24MT	(16)		16	Transistor		130			
FX ₁ N-40MR	24		24	Relay		175			
FX ₁ N-40MT				16					
FX ₁ N-60MR	36		24	Relay		175			
FX ₁ N-60MT	(40)			16					
FX ₁ N-24MR-D	14	24V DC SINK	10	Relay	12V DC -15% to 24V DC +20%	90	90 (3.5)	75 (3.0)	0.45 (0.99)
FX ₁ N-24MT-D	(16)		16	Transistor		130			
FX ₁ N-40MR-D	24		24	Relay		175			
FX ₁ N-40MT-D				16					
FX ₁ N-60MR-D	36		24	Relay		175			
FX ₁ N-60MT-D	(40)			16					

1.1 World Specification

Input - Sink/Source	World Spec models: SINK/SOURCE. Japanese models: ALWAYS SINK
Output - Transistor	World Spec models: ALWAYS SOURCE. Japanese models: ALWAYS SINK

2. Specifications

The installation of FX₁N 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.

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 IEC 68-2-6; 10 - 57 Hz: 0.75 mm Half Amplitude 57 - 150 Hz: 9.8 m/s ² Acceleration Sweep Count for X, Y, Z: 10 times (80 min in each direction)

Item	Description
Vibration Resistance - DIN rail Mounting	Conforms to IEC 68-2-6; 10 - 57 Hz: 0.035 mm Half Amplitude 57 - 150 Hz: 4.9 m/s ² Acceleration Sweep Count for X, Y, Z: 10 times (80 min in each direction)
Shock Resistance	Conforms to IEC 68-2-27: 147m/s ² Acceleration, Action Time: 11ms 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	AC unit = 1500 V AC > 1 min, tested between all points, terminals and ground DC unit = 500 V AC > 1 min, tested between all points, terminals and ground.
Insulation Resistance	5 MΩ > at 500 V DC, tested between all points, terminals and ground
Grounding	Grounding resistance 100 Ω or less Use a cable of at least 0.2mm ² (AWG24) to ground equipment. Note that ground cable must not be connected to the same ground as power circuits. Grounding is recommended but if a proper ground cannot be provided, the PLC will operate correctly without.



2.1 Power Specifications

AC Powered Units	FX1N-24M	FX1N-40M	FX1N-60M
Power Supply	100-240V AC +10% -15%, 50-60 Hz		
Max. allowable momentary power failure	10ms; If less than 10ms, PLC continues operation		
Fuse (size) rating	250V 1A	250V 3.15A (3A)	
In-rush current	100V AC - Max. 30A for 5ms 200V AC - Max. 50A for 5ms		
Power Consumption *1	30W	32W	35W

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

DC Powered Units	FX1N-24M	FX1N-40M	FX1N-60M
Power Supply	24V DC + 20% - 12V DC -15% (28.8 ~ 10.2 V DC)		
Max. allowable momentary power failure	5ms; If less than 5ms, PLC continues operation		
Fuse (size) rating	125V 3.15A (3A)		
In-rush current	24V DC - Max. 25A for 1ms 12V DC - Max. 22A for 0.3ms		
Power Consumption	15W	18W	20W

2.2 Input Specifications

	FX1N Main unit		FX0N, FX2N Extension block
	X0 → X7	X10 → ∞	
Input voltage	24V DC ±10%		
Input current	24V DC, 7mA	24V DC, 5mA	24V DC, 5mA
Input switching current	OFF → ON	>4.5mA	>3.5mA
	ON → OFF	<1.5mA	
Response time	10ms		
Variable response time	0-15ms	---	
Circuit isolation	Photocoupler		
Operation indication	LED is lit		

2.3 Output Specifications

Description	Relay Output	Transistor Output
Switched voltages (resistive load)	≤ 240V AC, ≤ 30V DC	5-30V DC
Rated current / N points (resistive load)	2A/1 point, 8A/COM	0.5A/1 point, 0.8A/COM
Max. Inductive load	80VA, 120/240V AC	12W/24V DC
Max. lamp load (tungsten load)	100W (1.17A/85V AC, 0.4A/250V AC)	1.5W/24V DC
Minimum load	When supply voltage < 5V DC allow at least 2mA flow	-----
Response time (approx.)	OFF → ON	10ms
	ON → OFF	10ms
Circuit isolation	By Relay	PhotoCoupler
Open circuit current leakage	-----	0.1mA/30V DC
Operation indication	LED is lit when coil is energized	

3. Installation Notes

The installation of FX1N 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.

FX1N Main PLC units can be either directly or DIN rail mounted. For details of either method, and installation guidelines please refer to the FX1N HANDY MANUAL JY992D87501 (JAPANESE ONLY).

Mounting Cautions



- Units should not 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.

4. Terminal Layouts

The following selection of terminal layouts are taken from the FX^{1N} product range.

Note: All layouts are diagrammatic and are only intended to aid the creation of wiring diagrams.

4.1 AC Powered Main Units

	$\frac{\perp}{\perp}$	COM	X1	X3	X5	X7	X11	X13	X15				
L	N	X0	X2	X4	X6	X10	X12	X14					
FX _{1N} -24MR / 24MT													
		COM	Y0	Y1	Y2	Y3	Y5	Y6	Y10	•			
24+	COM0	COM1	COM2	COM3	Y4	COM4	Y7	Y11					

	$\frac{\perp}{\perp}$	COM	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27		
L	N	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26			
FX _{1N} -40MR / 40MT																
		COM	Y0	Y1	Y2	•	Y4	Y6	•	Y10	Y12	•	Y14	Y16	•	
24+	COM0	COM1	COM2	Y3	COM3	Y5	Y7	COM4	Y11	Y13	COM5	Y15	Y17			

	$\frac{\perp}{\perp}$	COM	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27	X31	X33	X35	X37	X41	X43	
L	N	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26	X30	X32	X34	X36	X40	X42		
FX _{1N} -60MR / 60MT																					
		COM	Y0	Y1	Y2	•	Y4	Y6	•	Y10	Y12	•	Y14	Y16	•	Y20	Y22	•	Y24	Y26	•
24+	COM0	COM1	COM2	Y3	COM3	Y5	Y7	COM4	Y11	Y13	COM5	Y15	Y17	COM6	Y21	Y23	COM7	Y25	Y27		

4.2 DC Powered Main Units

	$\frac{\perp}{\perp}$	COM	X1	X3	X5	X7	X11	X13	X15				
⊕	⊖	X0	X2	X4	X6	X10	X12	X14					
FX _{1N} -24MR-D / 24MT-D													
		COM	Y0	Y1	Y2	Y3	Y5	Y6	Y10	•			
24+	COM0	COM1	COM2	COM3	Y4	COM4	Y7	Y11					

	$\frac{\perp}{\perp}$	COM	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27		
⊕	⊖	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26			
FX _{1N} -40MR-D / MT-D																
		COM	Y0	Y1	Y2	•	Y4	Y6	•	Y10	Y12	•	Y14	Y16	•	
24+	COM0	COM1	COM2	Y3	COM3	Y5	Y7	COM4	Y11	Y13	COM5	Y15	Y17			

	$\frac{\perp}{\perp}$	COM	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27	X31	X33	X35	X37	X41	X43	
⊕	⊖	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26	X30	X32	X34	X36	X40	X42		
FX _{1N} -60MR-D / MT-D																					
		COM	Y0	Y1	Y2	•	Y4	Y6	•	Y10	Y12	•	Y14	Y16	•	Y20	Y22	•	Y24	Y26	•
24+	COM0	COM1	COM2	Y3	COM3	Y5	Y7	COM4	Y11	Y13	COM5	Y15	Y17	COM6	Y21	Y23	COM7	Y25	Y27		

5. Example Wiring

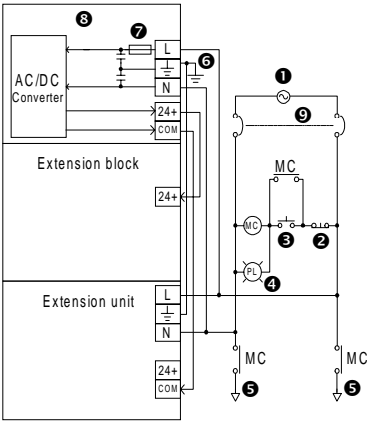
If during the wiring of these products or associated products concern is felt, please contact a professional electrician who is trained in the local and national standards applicable to the installation site.

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

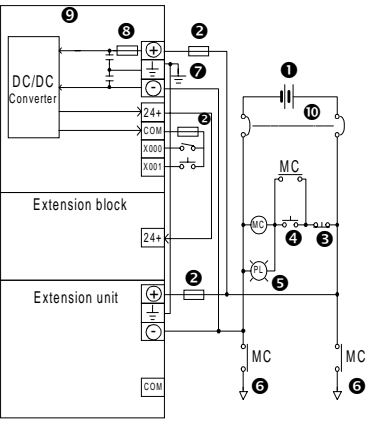
Both Japanese and World Specification Extension blocks/units and special function blocks can be used with these main units.

5.1 AC Power Supply



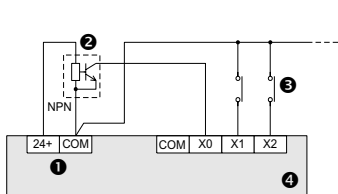
1	Power supply 100-240V AC +10% -15% 50-60Hz
2	Emergency stop
3	Power supply switch
4	Power ON pilot indicator
5	Power supply for loads
6	Ground
7	Fuse
8	Main unit
9	Breaker

5.2 DC Power Supply



1	Power supply 12-24V DC +20% -15% 20.4-28.8V DC when using extension unit.
2	Circuit protector or fuse
3	Emergency stop
4	Power supply switch
5	Power ON pilot indicator
6	Power supply for loads
7	Ground
8	Fuse
9	Main unit
10	Breaker

5.3 Input

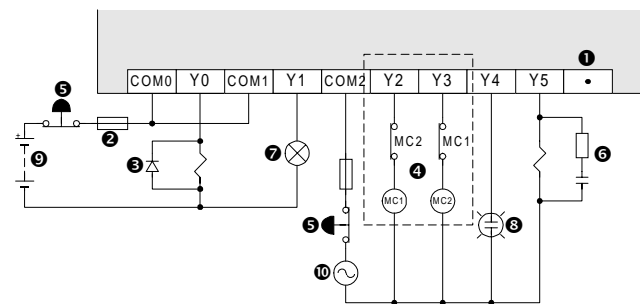


1	AC Model - Service supply DC Model - Input circuit power supply
2	NPN Sensor
3	Input Device Contact
4	Main unit

Note

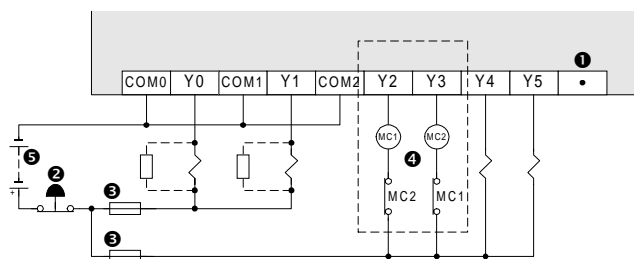
- When using a DC powered unit, the input circuit power supply should be used. If an external 24V DC supply is used, the FX1N will not operate correctly.
- Japanese specification models are ALWAYS SINK input

5.4 Output



Typical Relay

❶	Do not use this terminal
❷	Fuse
❸	Surge absorbing Diode
❹	External Mechanical Interlock
❺	Emergency Stop
❻	Noise Suppressor 0.1μF capacitor + 100-200Ω resistor Contactor
❼	Valve
❽	Incandescent Lamp
❾	DC Power Supply
❿	AC Power Supply



Japanese model Transistor

❶	Do not use this terminal
❷	Emergency Stop
❸	Fuse
❹	External Mechanical Interlock
❺	DC Power Supply

Additional information

Additional information regarding:

- Product Outline
- World Specification Extension Units / Blocks and Special Function Blocks
- Configuration Schematics
- Current Consumption and Rules of Expansion
- Back up Data procedure and details
- Diagnostic information, Instruction and Device lists

Can be found in the FX1N HANDY MANUAL (JY992D87501 JAPANESE ONLY). It is strongly recommended that this manual is read and understood before the use or configuration of this product.

Manual number : JY997D07901

Manual revision : A

Date : November 2002

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : MITSUBISHI DENKI BLDG MARUNOUTI TOKYO 100-8310 TELEX : J24532 CABLE MELCO TOKYO
HIMEJI WORKS : 840, CHIYODA CHO, HIMEJI, JAPAN

FX1N JAPANESE SPECIFICATION UNITS

HARDWARE MANUAL

JY997D07901A

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1. Introduction

This manual covers basic hardware details for the FX1N Series Programmable Logic Controller.

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	QTY	TYPE	QTY	TYPE						
FX1N-24MR	14	24V DC SINK	10	Relay	100-240 VAC +10% -15%	90	90	75	0.45	
FX1N-24MT	(16)		10	Transistor		(3.6)			0.99	
FX1N-40MR	24		16	Relay		130			0.65	
FX1N-40MT			16	Transistor	(5.2)	(3.5)	(3.0)	(1.44)		
FX1N-60MR	36		24V DC SINK	24	Relay	50/60Hz	175			0.80
FX1N-60MT	(40)			24	Transistor		(7.0)			(1.77)
FX1N-24MR-D	14	24V DC SINK	10	Relay	12V DC -15% to 24V DC		90			90
FX1N-24MT-D	(16)		10	Transistor		(3.6)	0.99			
FX1N-40MR-D	24		16	Relay		130	0.65			
FX1N-40MT-D			16	Transistor	(5.2)	(3.5)	(3.0)	(1.44)		
FX1N-60MR-D	36		24V DC SINK	24	Relay	+20%	175			0.80
FX1N-60MT-D	(40)			24	Transistor		(7.0)			(1.77)

1.1 World Specification

Input - Sink/Source	World Spec models: SINK/SOURCE. Japanese models: ALWAYS SINK
Output - Transistor	World Spec models: ALWAYS SOURCE. Japanese models: ALWAYS SINK

2. Specifications

The installation of FX1N 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.

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 IEC 68-2-6; 10 - 57 Hz: 0.75 mm Half Amplitude 57 - 150 Hz: 9.8 m/s ² Acceleration Sweep Count for X, Y, Z: 10 times (80 min in each direction)

Item	Description
Vibration Resistance - DIN rail Mounting	Conforms to IEC 68-2-6; 10 - 57 Hz: 0.035 mm Half Amplitude 57 - 150 Hz: 4.9 m/s ² Acceleration Sweep Count for X, Y, Z: 10 times (80 min in each direction)
Shock Resistance	Conforms to IEC 68-2-27: 147m/s ² Acceleration, Action Time: 11ms 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	AC unit = 1500 V AC > 1 min, tested between all points, terminals and ground DC unit = 500 V AC > 1 min, tested between all points, terminals and ground.
Insulation Resistance	5 MΩ > at 500 V DC, tested between all points, terminals and ground
Grounding	Grounding resistance 100 Ω or less Use a cable of at least 0.2mm ² (AWG24) to ground equipment. Note that ground cable must not be connected to the same ground as power circuits. Grounding is recommended but if a proper ground cannot be provided, the PLC will operate correctly without.

2.1 Power Specifications

AC Powered Units	FX1N-24M	FX1N-40M	FX1N-60M
Power Supply	100-240V AC +10% -15%, 50-60 Hz		
Max. allowable momentary power failure	10ms; If less than 10ms, PLC continues operation		
Fuse (size) rating	250V 1A	250V 3.15A (3A)	
In-rush current	100V AC - Max. 30A for 5ms 200V AC - Max. 50A for 5ms		
Power Consumption *1	30W	32W	35W

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

DC Powered Units	FX1N-24M	FX1N-40M	FX1N-60M
Power Supply	24V DC + 20% - 12V DC -15% (28.8 ~ 10.2 V DC)		
Max. allowable momentary power failure	5ms; If less than 5ms, PLC continues operation		
Fuse (size) rating	125V 3.15A (3A)		
In-rush current	24V DC - Max. 25A for 1ms 12V DC - Max. 22A for 0.3ms		
Power Consumption	15W	18W	20W

2.2 Input Specifications

	FX1N Main unit		FX0N, FX2N Extension block
	X0 → X7	X10 → ∞	
Input voltage	24V DC ±10%		
Input current	24V DC, 7mA	24V DC, 5mA	24V DC, 5mA
Input switching current	OFF → ON	>4.5mA	>3.5mA
	ON → OFF	<1.5mA	
Response time	10ms		
Variable response time	0-15ms	---	
Circuit isolation	Photocoupler		
Operation indication	LED is lit		

2.3 Output Specifications

Description	Relay Output	Transistor Output	
Switched voltages (resistive load)	≤ 240V AC, ≤ 30V DC	5-30V DC	
Rated current / N points (resistive load)	2A/1 point, 8A/COM	0.5A/1 point, 0.8A/COM	
Max. Inductive load	80VA, 120/240V AC	12W/24V DC	
Max. lamp load (tungsten load)	100W (1.17A/85V AC, 0.4A/250V AC)	1.5W/24V DC	
Minimum load	When supply voltage < 5V DC allow at least 2mA flow -----		
Response time (approx.)	OFF → ON	10ms	< 0.2ms; < 5μs (Y0, Y1 only)
	ON → OFF	10ms	< 0.2ms (I > 0.2A); < 5μs (Y0, Y1 only)
Circuit isolation	By Relay	PhotoCoupler	
Open circuit current leakage	-----	0.1mA/30V DC	
Operation indication	LED is lit when coil is energized		

3. Installation Notes

The installation of FX1N 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.

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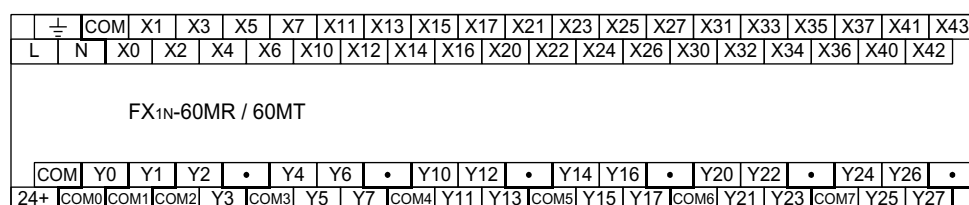
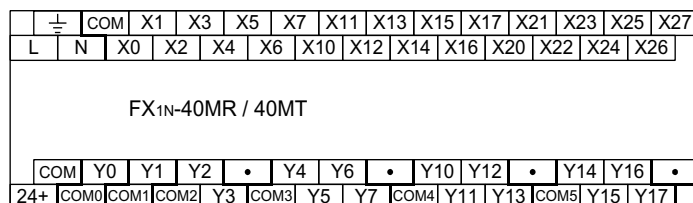
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- Take special care not to allow debris to fall inside the unit during installation e.g. cut wires, shavings etc. Once installation is complete remove the protective paper band, to prevent overheating.

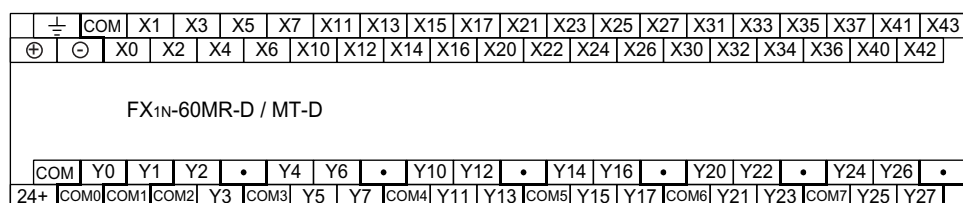
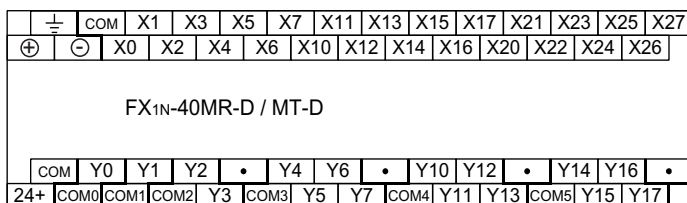
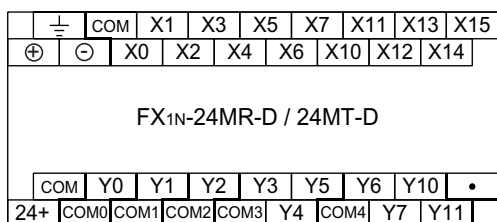
4. Terminal Layouts

The following selection of terminal layouts are taken from the FX1N product range.
Note: All layouts are diagrammatic and are only intended to aid the creation of wiring diagrams.

4.1 AC Powered Main Units



4.2 DC Powered Main Units



5. Example Wiring

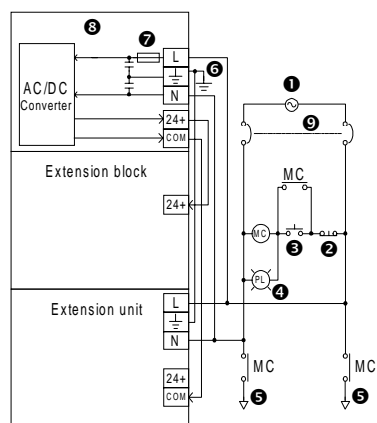
If during the wiring of these products or associated products concern is felt, please contact a professional electrician who is trained in the local and national standards applicable to the installation site.

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

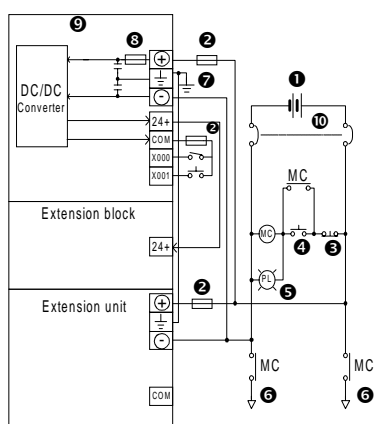
Both Japanese and World Specification Extension blocks/units and special function blocks can be used with these main units.

5.1 AC Power Supply



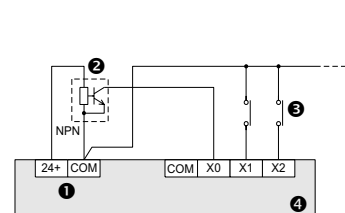
1	Power supply 100-240V AC +10% -15% 50-60Hz
2	Emergency stop
3	Power supply switch
4	Power ON pilot indicator
5	Power supply for loads
6	Ground
7	Fuse
8	Main unit
9	Breaker

5.2 DC Power Supply



1	Power supply 12-24V DC +20% -15% 20.4-28.8V DC when using extension unit.
2	Circuit protector or fuse
3	Emergency stop
4	Power supply switch
5	Power ON pilot indicator
6	Power supply for loads
7	Ground
8	Fuse
9	Main unit
10	Breaker

5.3 Input

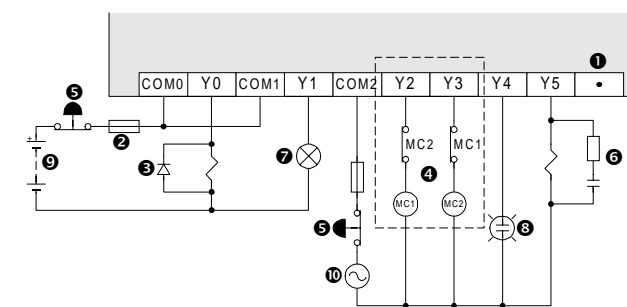


1	AC Model - Service supply DC Model - Input circuit power supply
2	NPN Sensor
3	Input Device Contact
4	Main unit

Note

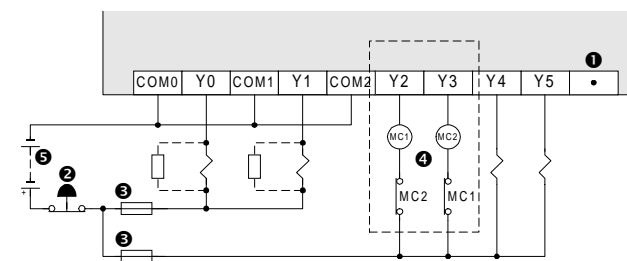
- When using a DC powered unit, the input circuit power supply should be used. If an external 24V DC supply is used, the FX1N will not operate correctly.
- Japanese specification models are ALWAYS SINK input

5.4 Output



Typical Relay

1	Do not use this terminal
2	Fuse
3	Surge absorbing Diode
4	External Mechanical Interlock
5	Emergency Stop
6	Noise Suppressor 0.1μF capacitor + 100-200Ω resistor Contactor
7	Valve
8	Incandescent Lamp
9	DC Power Supply
10	AC Power Supply



Japanese model Transistor

1	Do not use this terminal
2	Emergency Stop
3	Fuse
4	External Mechanical Interlock
5	DC Power Supply

Additional information

Additional information regarding:

- Product Outline
- World Specification Extension Units / Blocks and Special Function Blocks
- Configuration Schematics
- Current Consumption and Rules of Expansion
- Back up Data procedure and details
- Diagnostic information, Instruction and Device lists

Can be found in the FX1N HANDY MANUAL (JY992D87501 JAPANESE ONLY). It is strongly recommended that this manual is read and understood before the use or configuration of this product.

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Specifications are subject to
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