

Digital Signal Converter (Terminal Module) Inputs

FA1-TH4X2SC20S1E, FA1-TH8X2SC20S1E,

FA1-TM1X100A, FA1-TM1X200A, FA1-TM1X24D,

FA1-TM1X48D, FA1-TM1X100D, FA1-TM1X24RA,

FA1-TM1ND4

User's Manual

Thank you for purchasing the products.

Before using the products, please read this manual and the relevant manuals carefully to handle the products correctly.

MITSUBISHI ELECTRIC ENGINEERING COMPANY LIMITED

SAFETY PRECAUTIONS

(Read these precautions before using the products.)

Before using the products, please read this manual and the relevant manuals carefully, and pay full attention to safety to handle the products correctly.

The precautions given in this manual are concerned with time and wire saving devices only.

For the safety precautions of the programmable controller system, refer to the user's manual for the programmable controller used.

In this manual, the safety precautions are classified into two levels: "⚠WARNING" and "⚠CAUTION".



WARNING

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



CAUTION

Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

[Design Precautions]



WARNING

- Configure safety circuits externally to ensure that the entire system operates safely even when a fault occurs in the external power supply, the programmable controller, or the products. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured externally.
 - (2) Outputs may remain on or off due to a failure of a component such as a relay, transistor, and triac used for digital signal converter outputs. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit for digital signal converter outputs, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.

[Design Precautions]



CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm (3.94 inches) or more between them. Failure to do so may result in malfunction or failure due to noise.
- When using a terminal block conversion module for a high-speed counter module, do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 150mm (5.91 inches) or more between them. Failure to do so may result in malfunction or failure due to noise.
- Keep a distance of 100mm (3.94 inches) or more between a thermocouple or RTD (Resistance Temperature Detector) and the main circuit line or AC control lines. Also, keep the thermocouple or RTD away from a circuit that includes harmonics, such as a high-voltage circuit and a load circuit of an inverter. If not, the thermocouple or RTD is more likely to be affected by noise, surges, and induction.
- At power-on or power-off, a voltage may occur or a current may flow between output terminals for a moment. To use an analog signal converter or analog terminal block conversion module, start the control after analog outputs become stable.
- Do not place an analog signal converter or analog terminal block conversion module near a device that generates magnetic noise.
- When a device such as a lamp, heater, or solenoid valve is controlled using a module for digital signal converter outputs, a large current (approximately 10 times greater than normal) may flow when the output is turned from off to on. Therefore, select a module for digital signal converter outputs that has a sufficient current rating.

[Installation Precautions]



WARNING

- Shut off the external power supply (all phases) used in the system before installation. Failure to do so may result in electric shock or damage to the products.

[Installation Precautions]



CAUTION

- Use products in an environment that meets the general specifications in this manual. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the products.
- Securely fix the products with a DIN rail or screws. Incorrect installation may cause malfunction, failure, or drop of the module. When using the products in an environment of frequent vibrations, fix the products with screws.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or products, resulting in drop, short circuit, or malfunction.
- Attach DIN rail stoppers on the right and left sides of the spring clamp conversion module (FA1-TESV**) and digital signal converter inputs (FA1-TH*X20S1E) to fix the module securely.
- Shut off the external power supply (all phases) used in the system before mounting or removing the products. Failure to do so may result in damage to, malfunction of, or failure of the products.
- Do not directly touch any conductive parts and electronic components of the products. Failure to do so may cause malfunction or failure of the products.
- Install the products in the correct orientation if it is specified. Failure to do so may result in damage to or deterioration of the products.
- When drilling screw holes, be careful not to drop chips into the inside of the products or conductive parts. Such foreign matter can cause a fire, failure, or malfunction.
- When using modules for replacing digital signal converters or signal conversion modules, use them in the correct combination. Incorrect combination may cause failure.
- Shut off the power supply before installing/removing a module for replacing digital signal converters. Failure to do so may cause failure or malfunction.
- Securely mount a module for replacing digital signal converters and signal conversion module on a digital signal converter and installation base. Failure to do so may cause damage to or drop of the products, or malfunction due to poor contact. Follow the correct procedure to install/remove them. Failure to do so may cause damage to or drop of the products, or malfunction due to poor contact.
- When a module for digital signal converters or signal conversion module is mounted on a digital signal converter or installation base, hold the digital signal converter or installation base to transport them or install them to a panel. Holding the module for digital signal converters or signal conversion module may cause drop or failure of the digital signal converter or installation base.

[Wiring Precautions]



WARNING

- Shut off the external power supply (all phases) used in the system before wiring. Failure to do so may result in electric shock or damage to the products.
- After wiring, attach the included terminal cover to the products before turning them on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]



CAUTION

- Use applicable solderless terminals and tighten them within the specified torque range. Failure to do so may cause failure, damage, or malfunction.
- Check the rated voltage and terminal layout before wiring to the products, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause a fire or failure.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- When using a terminal block conversion module for a high-speed counter module, do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 150mm (5.91 inches) or more between them. Failure to do so may result in malfunction or failure due to noise.
- Keep a distance of 100mm (3.94 inches) or more between a thermocouple or RTD (Resistance Temperature Detector) and the main circuit line or AC control lines. Also, keep the thermocouple or RTD away from a circuit that includes harmonics, such as a high-voltage circuit and a load circuit of an inverter. If not, the thermocouple or RTD is more likely to be affected by noise, surges, and induction.
- Do not place an analog signal converter or analog terminal block conversion module near a device that generates magnetic noise.
- Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the products or cables or malfunction due to poor contact.
- Tighten the terminal screws within the specified torque range. Undertightening can cause short circuit, fire, or malfunction. Overtightening can damage the screw and/or products, resulting in drop, short circuit, or malfunction.
- Tighten the connector screws within the specified torque range. Undertightening can cause short circuit, fire, or malfunction. Overtightening can damage the screw and/or products, resulting in drop, short circuit, fire, or malfunction.
- Securely connect connectors to the products. Failure to do so may cause malfunction.
- When disconnecting a cable from the products, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the products may result in malfunction or damage to the products or cable.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the products and external device.
- Prevent foreign matter such as dust or wire chips from entering the products. Such foreign matter can cause a fire, failure, or malfunction.
- The products must be installed in control panels. Connect the main power supply to the products in the control panel through a relay terminal block. Wiring and replacement of the products must be performed by qualified maintenance personnel with knowledge of protection against electric shock.
- When connecting the products with a programmable controller, check that the product configuration is correct. An incorrect configuration may cause failure or malfunction.
- Use the products with no force applied to their connectors. Applied force may cause failure or disconnection.
- Attach protective covers or signal conversion modules to unused connectors or empty slots of the products. Failure to do so may cause a fire, failure, or malfunction due to foreign matter.
- When using modules for replacing digital signal converters or signal conversion modules, use them in the correct combination. Incorrect combination may cause failure of a programmable controller, digital signal converter, installation base, or external device.
- Individually ground the FG terminal of the products with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.

[Startup and Maintenance Precautions]



WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Shut off the external power supply (all phases) used in the system before cleaning the products or retightening the terminal screws, connector screws, or products fixing screws. Failure to do so may result in electric shock or cause failure or malfunction of the products. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or products, resulting in drop, short circuit, or malfunction.

[Startup and Maintenance Precautions]



CAUTION

- Do not disassemble or modify the products. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller and products. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the products. Failure to do so may cause failure or malfunction of or damage to the products.
- After the first use of the products, do not connect/remove the products and cables more than 50 times. Exceeding the limit may cause malfunction.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the products, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause failure or malfunction of the products.

[Disposal Precautions]



CAUTION

- When disposing of the products, treat them as industrial waste.

[Transportation Precautions]



CAUTION

- Do not apply shock that exceeds the shock resistance described in the general specifications during transportation since the products are precision devices. Doing so may cause failure of the module.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the products. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

EMC and Low Voltage Directives

Compliance with the EMC Directive, which is one of the EU directives, has been mandatory for products sold within EU member states since 1996 as well as compliance with the Low Voltage Directive since 1997.

For products compliant to the EMC and Low Voltage Directives, their manufacturers are required to declare compliance and affix the CE marking.

(1) Sales representative in EU member states

The sales representative in EU member states is:

Company: MITSUBISHI ELECTRIC EUROPE B.V.

Address: Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany

(2) Method of ensuring compliance

To ensure that products maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to "EMC and Low Voltage Directives Compliant Manual" (50D-FA9010-108).

REVISIONS

*The manual number is given on the bottom left of the last page.

Print Date	*Manual Number	Revision
November, 2020	50D-FG0466	First edition

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1. INTRODUCTION

This manual describes the specifications and handling of digital signal converters used in combination with Mitsubishi Electric Corporation programmable controller DC input modules.

2. GENERAL SPECIFICATIONS

Item			Specifications
Operating surrounding air temperature			-20 to 55°C ^{*4}
Storage ambient temperature			-25 to 75°C
Operating ambient humidity			5 to 95% RH, no condensation
Storage ambient humidity			5 to 95% RH, no condensation
Vibration resistance	Compliance with standards		JIS B 3502, IEC61131-2
	Under intermittent vibration	5 to 8.4Hz	Amplitude: 3.5mm
		8.4 to 150Hz	Acceleration: 9.8m/s ² (1G)
		Sweep count	10 times each in X, Y, and Z directions
	Under continuous vibration	5 to 8.4Hz	Amplitude: 1.75mm
		8.4 to 150Hz	Acceleration: 4.9m/s ² (0.5G)
		Sweep count	—
Shock resistance			Compliance with JIS B 3502 and IEC61131-2 (147m/s ² (15G), 3 times each in X, Y, and Z directions)
Operating atmosphere			No corrosive gas
Operating altitude ^{*1}			2,000m or lower
Installation location			Inside the control panel ^{*5} (Indoor use)
Overvoltage category ^{*2}			II or lower
Pollution level ^{*3}			2 or lower

^{*1}: Do not use or store the products under pressure higher than the atmospheric pressure of altitude 0m. Doing so may cause malfunction.

^{*2}: This category indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises.

^{*3}: This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used.

^{*4}: Use the digital signal converter within the specifications of the programmable controller being used.

^{*5}: The enclosure is suitably designed for those specific environmental conditions, as applicable, and enclosure rate meets IP20 and minimum type 1 of UL 50.

3. PERFORMANCE SPECIFICATIONS

3-1. Base Unit

3-1-1. FA1-TH4X2SC20S1E (4 points) , FA1-TH8X2SC20S1E (8 points)

Item			Model	Specifications	
				FA1-TH4X2SC20S1E	FA1-TH8X2SC20S1E
Standard mounted module				No	
Connected programmable controller				DC input module (Positive common type)	
Number of points				4 points	8 points
Wiring method for common				All points independent	
Maximum number of points simultaneously ON				100%(5-directional attachment)	
Electrical Specifications				Depends on modules connected.	
External power supply				24VDC±10%(ripple ratio: within 5%, SELV and LIM or CLASS 2)	
Current consumption				Approx. 10mA at 24VDC (not including current consumption of programmable controller and module)	
Withstand voltage, insulation resistance				2300Vrms AC / 1min (altitude: 0 to 2000m), 10MQ or higher	
Noise immunity				Simulator noise 500Vp-p, noise width 1μs (based on noise simulator with noise frequency of 25 to 60Hz)	
Operation indication				LED on with power supply ON	
Terminal block (spring clamp type)	Number of points			20 points (power supply: 4 points, input: 16 points)	36 points (power supply: 4 points, input: 32 points)
	Applicable wire *1 *2	When a ferrule is not used (stranded wire or solid wire)			0.2 to 1.5mm ² (AWG24-16) Copper wire with a temperature rating of 75°C or more
		When a ferrule is used (stranded wire)			0.08 to 0.75mm ² (AWG28-18) Copper wire with a temperature rating of 75°C or more
		Wire strip length			8mm
	Installation method *3	Screw			M4×0.7mm×27mm or more Tightening torque range: 78 to 118N·cm (8 to 12kgf·cm, 7 to 10lbf·in)
DIN rail			Applicable DIN rail: TH35-7.5Fe, TH35-7.5Al (compliant with IEC 60715)		
Socket				Yes (relay module replaceable)	
Module replacement count				50 times	
Module mixing				Possible	
Connectable modules				100VAC input (photocoupler isolation): 200VAC input (photocoupler isolation): 24VDC input (photocoupler isolation): 48VDC input (photocoupler isolation): 100VDC input (photocoupler isolation): 24VDC input (relay isolation): Dummy (protection from dust):	FA1-TM1X100A FA1-TM1X200A FA1-TM1X24D FA1-TM1X48D FA1-TM1X100D FA1-TM1X24RA FA1-TM1ND4
Weight				Approx. 160g	Approx. 210g

*1: Select wires depending on the current value used.

*2: For UL certification, suitable for field wiring when a ferrule is not used.

*3: Evaluation for UL certification is conducted a DIN rail installation.

3-2. Module

3-2-1. FA1-TM1X100A (100VAC input)

Model		Specifications
Item		FA1-TM1X100A
Insulation method		Photocoupler
Marker strip color		Orange
Input side	Rated input voltage/current	Voltage: 100 to 110VAC (50/60Hz), Current: Approx. 8mA (100VAC 60Hz), Approx. 7mA (100VAC 50Hz)
	Used voltage range	85 to 132 VAC (50/60Hz $\pm 3\text{Hz}$ (distortion factor within 5%))
	ON voltage/ON current	80VAC or higher / 5mA or higher (50Hz, 60Hz)
	OFF voltage/OFF current	30VAC or lower / 1.7mA or lower (50Hz, 60Hz)
	Inrush current	Max. 200mA within 1ms (132VAC)
Response time	Input impedance	Approx. 12k Ω (60Hz), Approx. 15k Ω (50Hz)
	OFF→ON	15ms or less (100VAC 60Hz) (excluding programmable controller response time)
	ON→OFF	35ms or less (100VAC 60Hz) (excluding programmable controller response time)
Current consumption		Approx. 2mA
Withstand voltage, insulation resistance		1400Vrms AC / 1min (altitude: 0 to 2000m), 10M Ω or higher
Noise immunity		Simulator noise 1500Vp-p, noise width 1 μs (based on noise simulator with noise frequency of 25 to 60Hz)
Operation indication		LED on and input ON
Weight		Approx. 30g

3-2-2. FA1-TM1X200A (200VAC input)

Model		Specifications
Item		FA1-TM1X200A
Insulation method		Photocoupler
Marker strip color		Red
Input side	Rated input voltage/current	Voltage: 200 to 220 VAC (50/60Hz), Current: Approx. 7.5mA (200VAC 60Hz), Approx. 6mA (200VAC 50Hz)
	Used voltage range	170 to 264VAC (50/60Hz $\pm 3\text{Hz}$ (distortion factor within 5%))
	ON voltage/ON current	160VAC or higher / 4.8mA or higher (50Hz, 60Hz)
	OFF voltage/OFF current	60VAC or lower / 2.3mA or lower (50Hz, 60Hz)
	Inrush current	Max. 500mA within 1ms (264VAC)
Response time	Input impedance	Approx. 27k Ω (60Hz), Approx. 15k Ω (50Hz)
	OFF→ON	15ms or less (100VAC 60Hz) (excluding programmable controller response time)
	ON→OFF	35ms or less (100VAC 60Hz) (excluding programmable controller response time)
Current consumption		Approx. 2mA
Withstand voltage, insulation resistance		2300Vrms AC / 1min (altitude: 0 to 2000m), 10M Ω or higher
Noise immunity		Simulator noise 1500Vp-p, noise width 1 μs (based on noise simulator with noise frequency of 25 to 60Hz)
Operation indication		LED on and input ON
Weight		Approx. 30g

3-2-3. FA1-TM1X24D (24VDC input)

Model		Specifications
Item		FA1-TM1X24D
Insulation method		Photocoupler
Marker strip color		Black
Input side	Rated input voltage /current	Voltage: 24 VDC (SELV and LIM or Class 2), Current: Approx. 10mA (24 VDC)
	Used voltage range	21.6 to 26.4 VDC (24 VDC \pm 10% (ripple factor within 5%), SELV and LIM or Class 2)
	ON voltage /ON current	DC19V or higher /7.9mA or higher
	OFF voltage /OFF current	DC8V or lower /3.3mA or lower
	Input impedance	Approx. 2.2k Ω
	Maximum switching frequency	—
	Mechanical life	—
	Electrical life	—
Response time	OFF \rightarrow ON	10ms or less(excluding programmable controller response time)
	ON \rightarrow OFF	10ms or less(excluding programmable controller response time)
Current consumption		Approx. 2mA
Withstand voltage, insulation resistance		510Vrms AC / 1min (altitude: 0 to 2000m), 10M Ω or higher
Noise immunity		Simulator noise 500Vp-p, noise width 1 μ s (based on noise simulator with noise frequency of 25 to 60Hz)
Operation indication		LED on and input ON
Weight		Approx. 30g

3-2-4. FA1-TM1X48D (48VDC input)

Model		Specifications
Item		FA1-TM1X48D
Insulation method		Photocoupler
Marker strip color		Sky blue
Input side	Rated input voltage/current	Voltage: 48VDC(SELV and LIM or Class 2), Current: Approx. 5mA (48VDC)
	Used voltage range	43.2 to 52.8VDC (48VDC \pm 10% (ripple ratio: within 5%))
	ON voltage/ON current	DC34V or higher /4.0mA or higher
	OFF voltage/OFF current	DC10V or lower /1.0mA or lower
	Input impedance	Approx. 8.5k Ω
	Maximum switching frequency	—
	Mechanical life	—
	Electrical life	—
Response time	OFF \rightarrow ON	10ms or less(excluding programmable controller response time)
	ON \rightarrow OFF	10ms or less(excluding programmable controller response time)
Current consumption		Approx. 2mA
Withstand voltage, insulation resistance		510Vrms AC / 1min (altitude: 0 to 2000m), 10M Ω or higher
Noise immunity		Simulator noise 500Vp-p, noise width 1 μ s (based on noise simulator with noise frequency of 25 to 60Hz)
Operation indication		LED on and input ON
Weight		Approx. 30g

3-2-5. FA1-TM1X100D (100VDC input)

Model		Specifications
Item		FA1-TM1X100D
Insulation method		Photocoupler
Marker strip color		Purple
Input side	Rated input voltage/current	Voltage: 100/110VDC, Current: Approx. 2.5mA (100VDC)
	Used voltage range	90 to 121VDC (100/110VDC \pm 10% (ripple ratio: within 5%))
	ON voltage/ON current	DC80V or higher /2.2mA or higher
	OFF voltage/OFF current	DC20V or lower /0.5mA or lower
	Input impedance	Approx. 37k Ω
	Maximum switching frequency	—
	Mechanical life	—
	Electrical life	—
Response time	OFF \rightarrow ON	10ms or less(excluding programmable controller response time)
	ON \rightarrow OFF	10ms or less(excluding programmable controller response time)
Current consumption		Approx. 2mA
Withstand voltage, insulation resistance		1400Vrms AC / 1min (altitude: 0 to 2000m), 10M Ω or higher
Noise immunity		Simulator noise 500Vp-p, noise width 1 μ s (based on noise simulator with noise frequency of 25 to 60Hz)
Operation indication		LED on and input ON
Weight		Approx. 30g

3-2-6. FA1-TM1X24RA (24VDC relay input)

Model		Specifications
Item		FA1-TM1X24RA
Insulation method		Relay
Marker strip color		Navy blue
Input side	Rated input voltage/current	Voltage: 24 VDC (SELV and LIM or Class 2), Current: Approx. 10mA (24 VDC)
	Used voltage range	21.6 to 26.4 VDC (24 VDC \pm 10% (ripple factor within 5%), SELV and LIM or Class 2)
	ON voltage/ON current	19.2 VDC or higher / 8.1mA or higher
	OFF voltage/OFF current	DC1.2VDC or lower / 0.5mA or lower
	Input impedance	Approx. 2.2k Ω
	Maximum switching frequency	1800 times/hr (ON for 1 second or longer, OFF for 1 second or longer)
	Mechanical life	20000000 times or more
	Electrical life	100,000 times or more (at contact side) at 24 VDC, 10mA ^{*1}
Response time	OFF→ON	10ms or less (excluding programmable controller response time)
	ON→OFF	12ms or less (excluding programmable controller response time)
Current consumption		Approx. 3mA
Withstand voltage, insulation resistance		510Vrms AC / 1min (altitude: 0 to 2000m), 10M Ω or higher
Noise immunity		Simulator noise 500Vp-p, noise width 1 μ s (based on noise simulator with noise frequency of 25 to 60Hz)
Operation indication		LED on and input ON
Weight		Approx. 30g

*1: Evaluation for UL certification is conducted 6000 times.

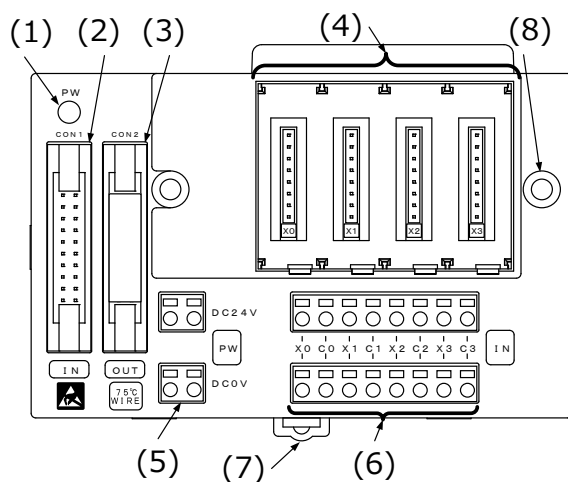
3-2-7. FA1-TM1ND4 (Dummy module)

Model		Specifications
Item		FA1-TM1ND4
Number of modules		4
Marker strip color		Green
Weight		Approx. 20g

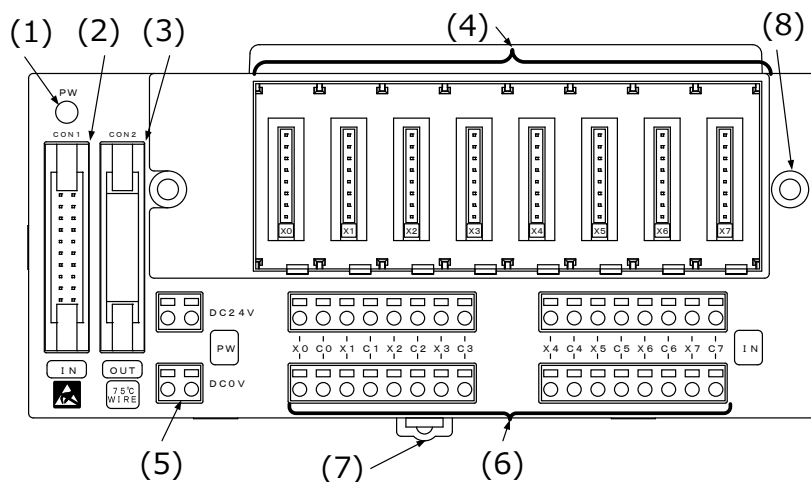
4. PART NAMES

4-1. Base Unit (FA1-TH4X2SC20S1E, FA1-TH8X2SC20S1E)

Base unit (4 points)

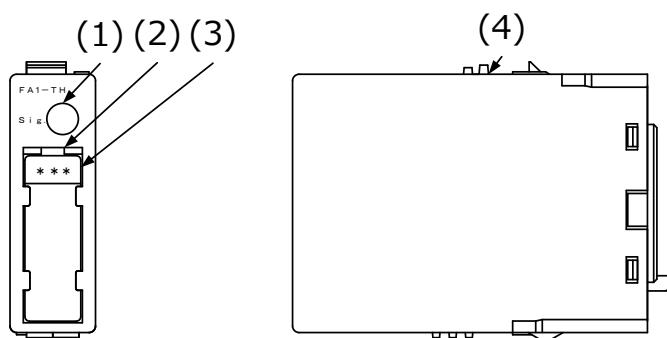


Base unit (8 points)



No.	Name	Description
(1)	Operating status LED (PW)	The LED indicates the status of the base unit. Lit: Running Off: Power OFF
(2)	IN cable port	This port is used to attach additional cables or cables that connect programmable controllers.
(3)	OUT cable port	This port is used to attach additional cables. Remove the supplied protective cap before using the port.
(4)	Module mounting slot	This slot is used to mount modules. When a module is not mounted in a slot, use the dummy module (FA1-TM1ND sold separately) to protect the slot from dust and foreign matter.
(5)	External power supply terminal block	This terminal block is used to connect an external power supply (24VDC).
(6)	Input terminal block	This terminal block is used to connect external input signals.
(7)	DIN rail latch	This latch is used to install and remove the base unit onto/from a DIN rail.
(8)	Base unit installation hole	This screw hole is used to install the base unit into a control panel.

4-2. Modules (FA1-TM1X100/200A/24D/48D/100D/24RA and FA1-TM1ND4)



No.	Name	Description														
(1)	Operating status LED (Sig.)	<p>The LED indicates whether input signals are ON or OFF.</p> <p>Lit: Input signals ON</p> <p>Off: Input signals OFF</p> <p>The dummy module (FA1-TM1ND) does not have an operating status LED.</p>														
(2)	Slot for removing marker strip	This slot is used to remove the marker strip by inserting a tool into the slot.														
(3)	Marker strip	<p>Marker strip</p> <p>Information (such as wire gauges) can be written on these strips.</p> <p>Modules can be distinguished by strip color.</p> <table><tr><td>100VAC input (FA1-TM1X100A):</td><td>Orange</td></tr><tr><td>200VAC input (FA1-TM1X200A):</td><td>Red</td></tr><tr><td>24VDC input (FA1-TM1X24D):</td><td>Black</td></tr><tr><td>48VDC input (FA1-TM1X48D):</td><td>Sky blue</td></tr><tr><td>100VDC input (FA1-TM1X100D):</td><td>Purple</td></tr><tr><td>24VDC relay input (FA1-TM1X24RA):</td><td>Navy blue</td></tr><tr><td>Dummy module (FA1-TM1ND):</td><td>Green</td></tr></table>	100VAC input (FA1-TM1X100A):	Orange	200VAC input (FA1-TM1X200A):	Red	24VDC input (FA1-TM1X24D):	Black	48VDC input (FA1-TM1X48D):	Sky blue	100VDC input (FA1-TM1X100D):	Purple	24VDC relay input (FA1-TM1X24RA):	Navy blue	Dummy module (FA1-TM1ND):	Green
100VAC input (FA1-TM1X100A):	Orange															
200VAC input (FA1-TM1X200A):	Red															
24VDC input (FA1-TM1X24D):	Black															
48VDC input (FA1-TM1X48D):	Sky blue															
100VDC input (FA1-TM1X100D):	Purple															
24VDC relay input (FA1-TM1X24RA):	Navy blue															
Dummy module (FA1-TM1ND):	Green															
(4)	Latch	This latch is used to mount and remove the module.														

5. CONNECTING METHOD

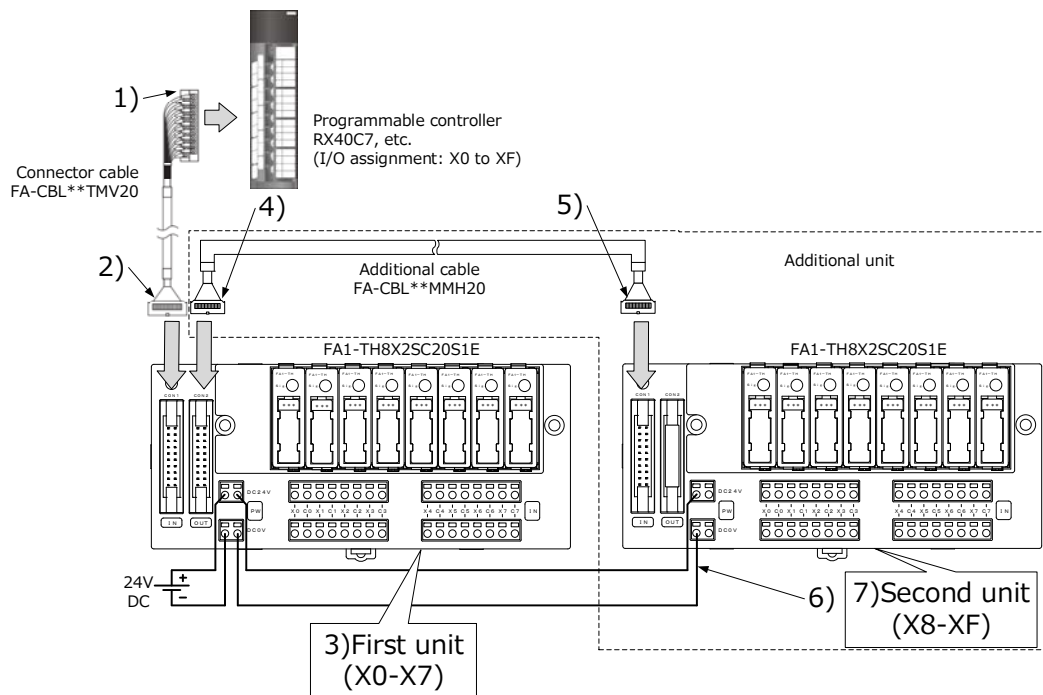
5-1. Routing cables

Wire the programmable controller and digital signal converter as shown below.

5-1-1. Using cables that have terminal blocks

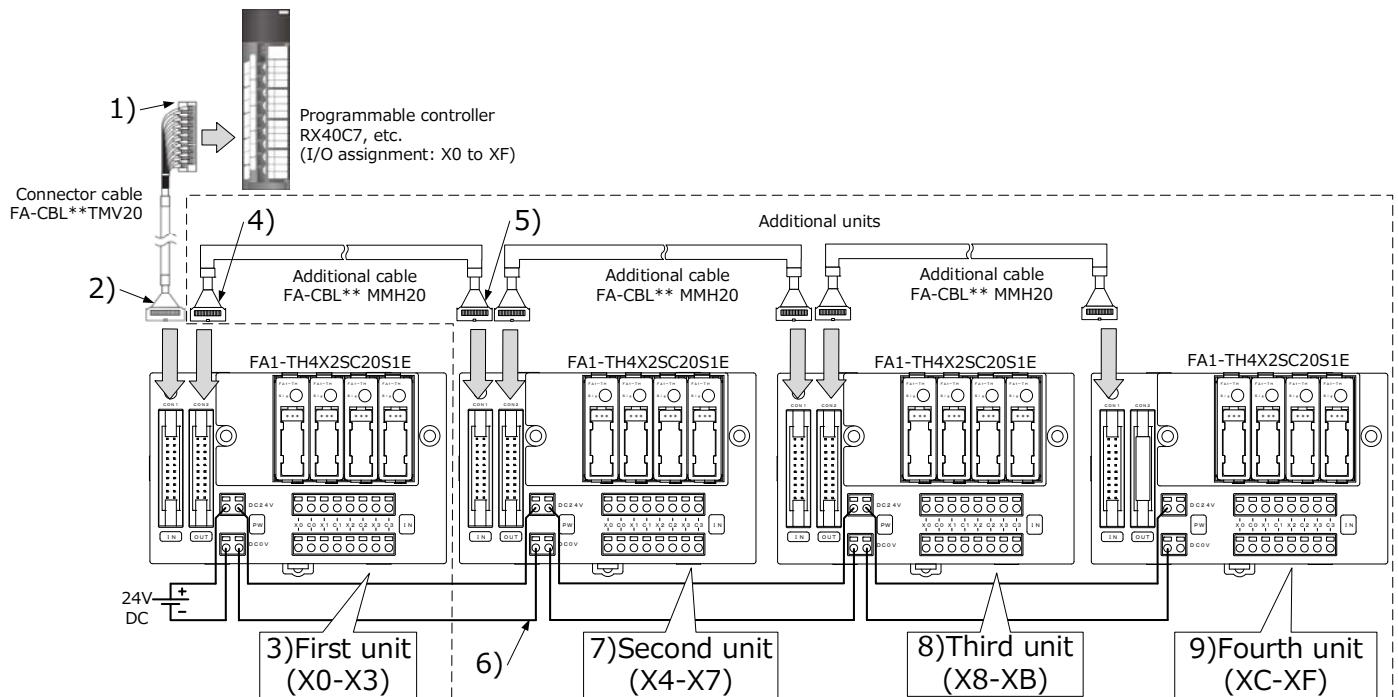
(Example 1) Connecting two FA1-TH8X2SC20S1E units

- 1) Insert the terminal block firmly into the port on the programmable controller and tighten the screws.
- 2) Insert the connector firmly into the IN cable port as far as it will go.
- 3) The first FA1-TH8X2SC20S1E will be assigned to X0 to X7.
- 4) Insert the connector firmly into the OUT cable port on the first unit as far as it will go.
- 5) Insert the connector firmly into the IN cable port on the second unit as far as it will go.
- 6) Supply power to the second unit from the first unit by wiring them in series to an external power supply.
- 7) The second FA1-TH8X2SC20S1E will be assigned to X8 to XF.



(Example 2) Connecting four FA1-TH4X2SC20S1E units

- 1) Insert the terminal block firmly into the port on the programmable controller and tighten the screws.
- 2) Insert the connector firmly into the IN cable port as far as it will go.
- 3) The first FA1-TH4X2SC20S1E will be assigned to X0 to X3.
- 4) Insert each connector firmly into the OUT cable port on all of the relevant units as far as it will go.
- 5) From the second unit onward, insert each connector firmly into the IN cable port on all the units as far as it will go.
- 6) Supply power to the second unit onward from the first unit by wiring them in series to an external power supply.
- 7) The second FA1-TH4X2SC20S1E will be assigned to X4 to X7.
- 8) The third FA1-TH4X2SC20S1E will be assigned to X8 to XB.
- 9) The fourth FA1-TH4X2SC20S1E will be assigned to XC to XF.



5-1-2. Using a 40P connector cable

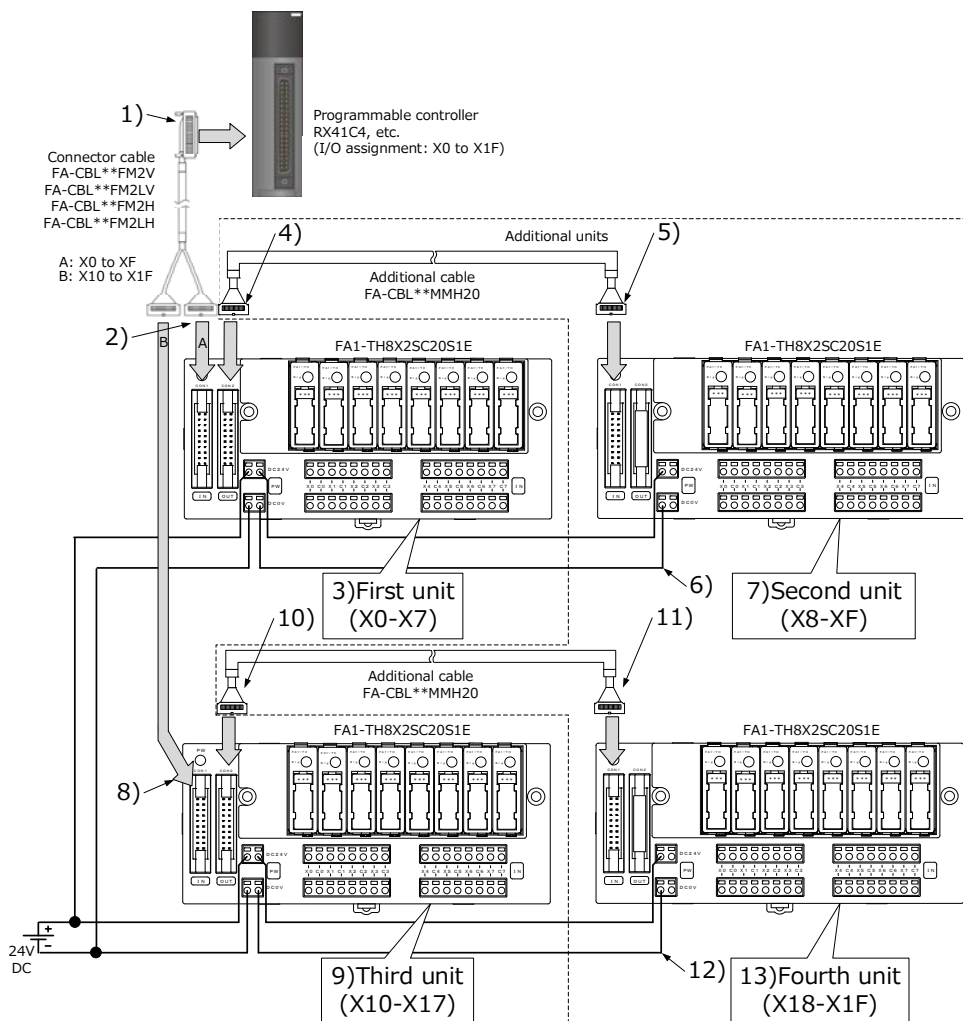
(Example 3) Connecting four FA1-TH8X2SC20S1E units

Assigning X0 to XF

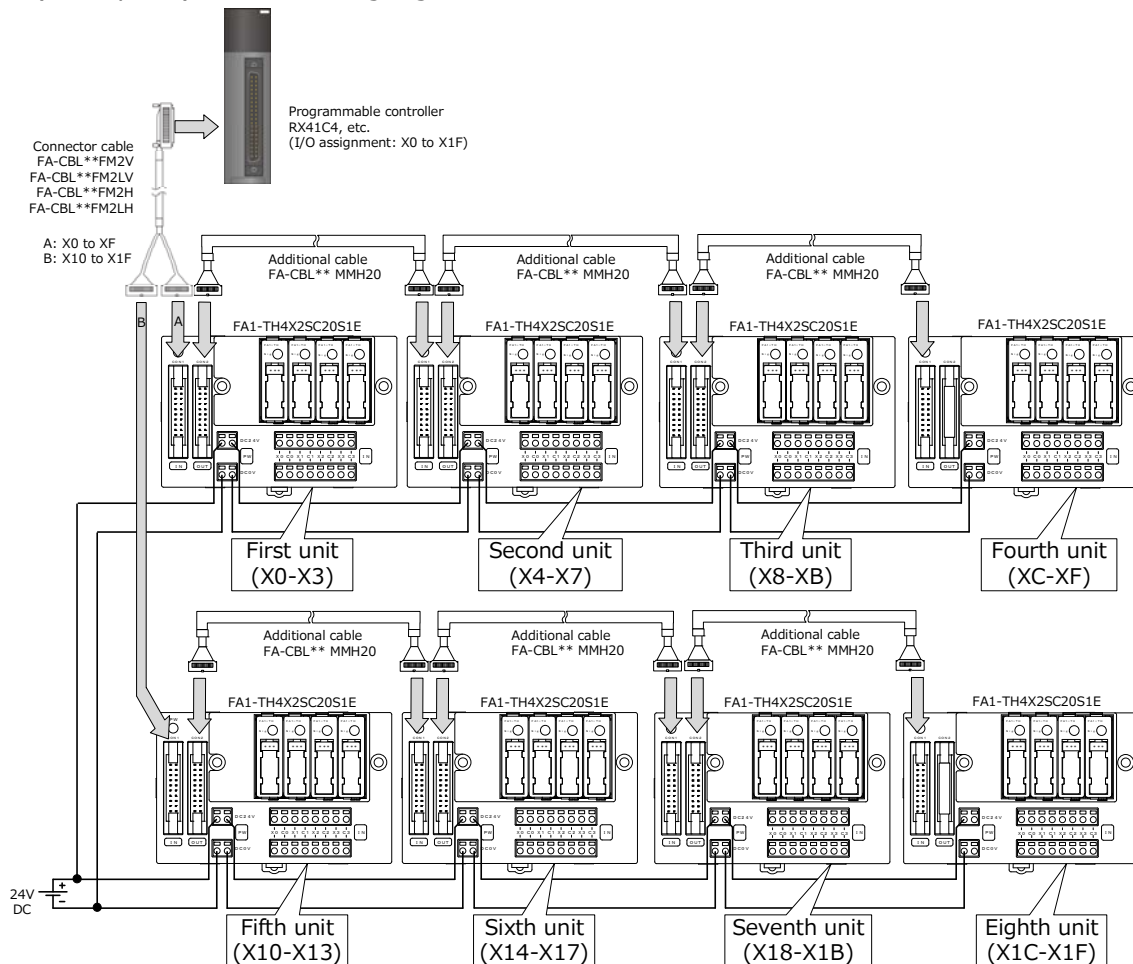
- 1) Insert the terminal block firmly into the port on the programmable controller and tighten the screws.
- 2) Insert the A-side connector firmly into the IN cable port on the first unit as far as it will go.
- 3) The first FA1-TH8X2SC20S1E will be assigned to X0 to X7.
- 4) Insert the connector firmly into the OUT cable port on the first unit as far as it will go.
- 5) Insert the connector firmly into the IN cable port on the second unit as far as it will go.
- 6) Supply power to the second unit from the first unit by wiring them in series to an external power supply.
- 7) The second FA1-TH8X2SC20S1E will be assigned to X8 to XF.

Assigning X10 to X1F

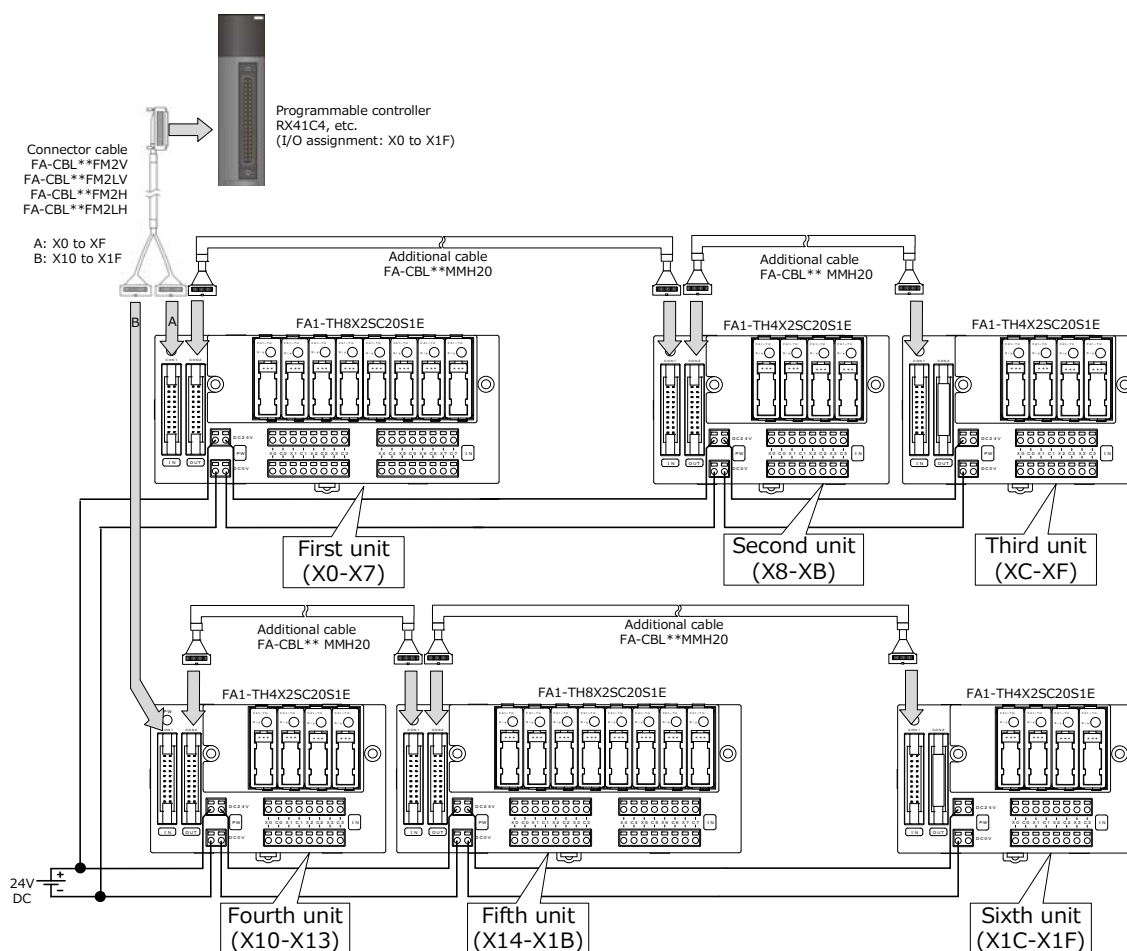
- 8) Insert the B-side connector firmly into the IN cable port on the third unit as far as it will go.
- 9) The third FA1-TH8X2SC20S1E will be assigned to X10 to X17.
- 10) Insert the connector firmly into the OUT cable port on the third unit as far as it will go.
- 11) Insert the connector firmly into the IN cable port on the fourth unit as far as it will go.
- 12) Supply power to the fourth unit from the third unit by wiring them in series to an external power supply.
- 13) The fourth FA1-TH8X2SC20S1E will be assigned to X18 to X1F.



(Example 4) Connecting eight FA1-TH4X2SC20S1E units



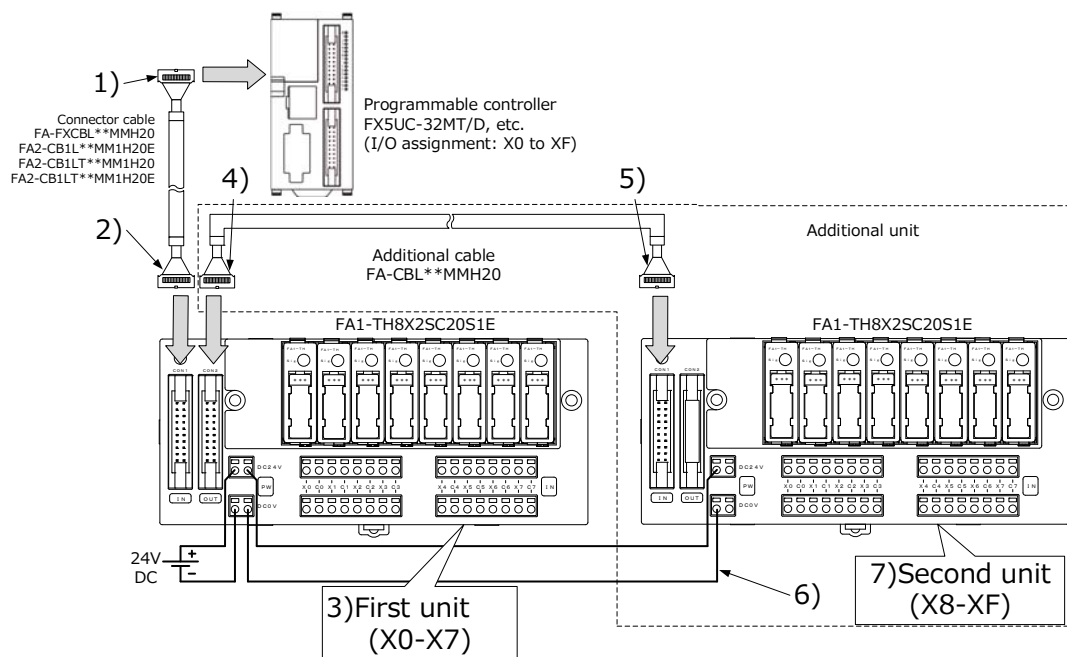
(Example 5) Connecting the FA1-TH8X2SC20S1E and FA1-TH4X2SC20S1E



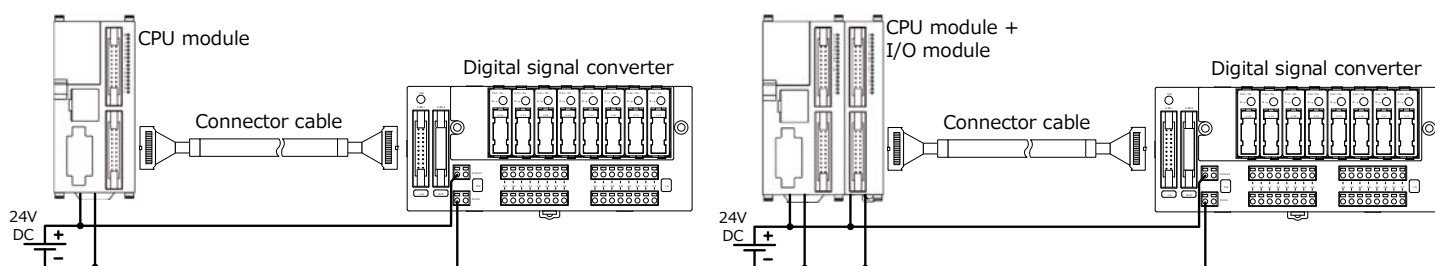
5-1-3. Using a 20P connector cable

(Example 6) Connecting two FA1-TH8X2SC20S1E units

- 1) Insert the terminal block firmly into the port on the programmable controller and tighten the screws.
- 2) Insert the connector firmly into the IN cable port as far as it will go.
- 3) The first FA1-TH8X2SC20S1E will be assigned to X0 to X7.
- 4) Insert the connector firmly into the OUT cable port on the first unit as far as it will go.
- 5) Insert the connector firmly into the IN cable port on the second unit as far as it will go.
- 6) Supply power to the second unit from the first unit by wiring them in series to an external power supply.
- 7) The second FA1-TH8X2SC20S1E will be assigned to X8 to XF.



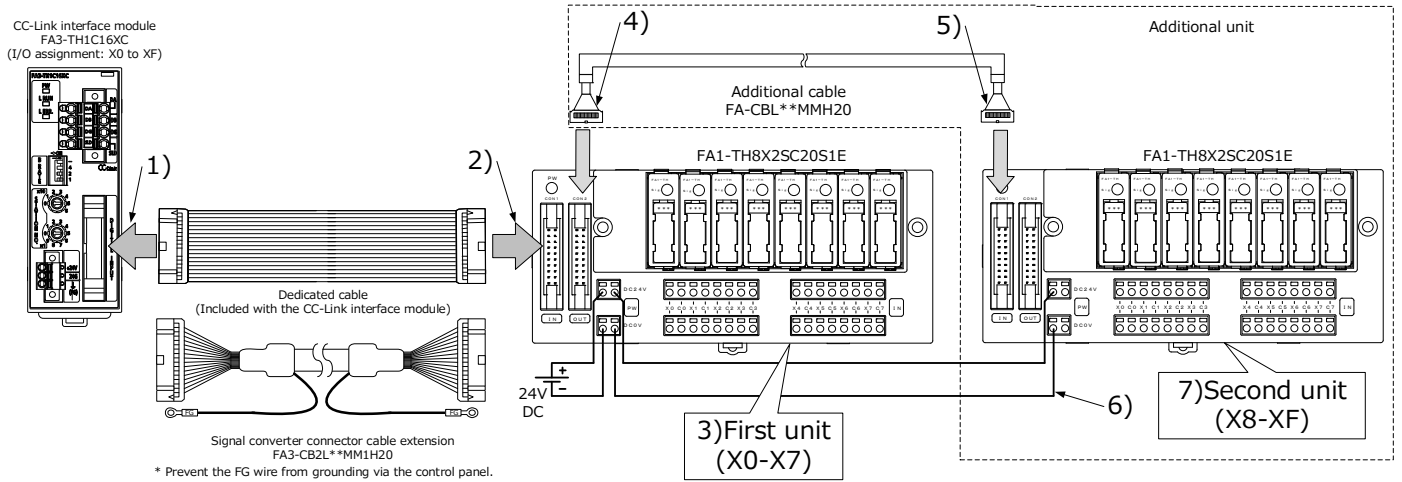
(Note) Use the same 24VDC external power supply to supply power to the MELSEC iQ-F / MELSEC-F module and the digital signal converter.



5-1-4. Using a dedicated interface module cable

(Example 7) Connecting two FA1-TH8X2SC20S1E units

- 1) Insert the terminal block firmly into the port on the interface module and tighten the screws.
- 2) Insert the connector firmly into the IN cable port as far as it will go.
- 3) The first FA1-TH8X2SC20S1E will be assigned to X0 to X7.
- 4) Insert the connector firmly into the OUT cable port on the first unit as far as it will go.
- 5) Insert the connector firmly into the IN cable port on the second unit as far as it will go.
- 6) Supply power to the second unit from the first unit by wiring them in series to an external power supply.
- 7) The second FA1-TH8X2SC20S1E will be assigned to X8 to XF.



5-2. Installing the base unit

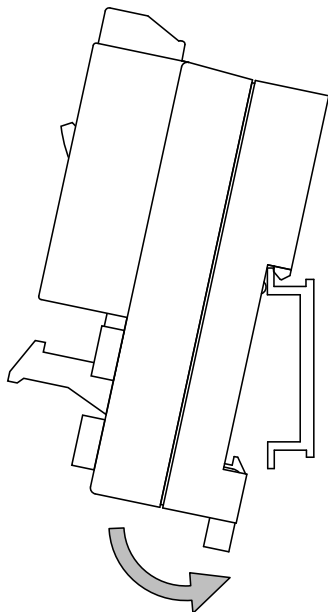
This section explains how to install the base unit in a control panel.

5-2-1. Installation using a DIN rail

Install the base unit on a DIN rail as shown below.

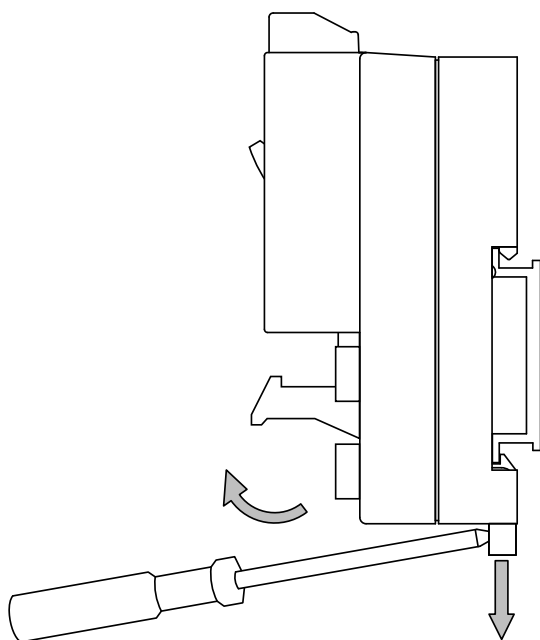
(1) Installation

- ① Hook the upper latch of the base unit on the DIN rail.
- ② Push the base unit against the DIN rail until it locks into place.



(2) Removal

- ① Insert a flathead screwdriver into the DIN rail latch.
- ② Push down the latch (using the lower part of the base unit as a fulcrum) to remove the unit from the DIN rail.

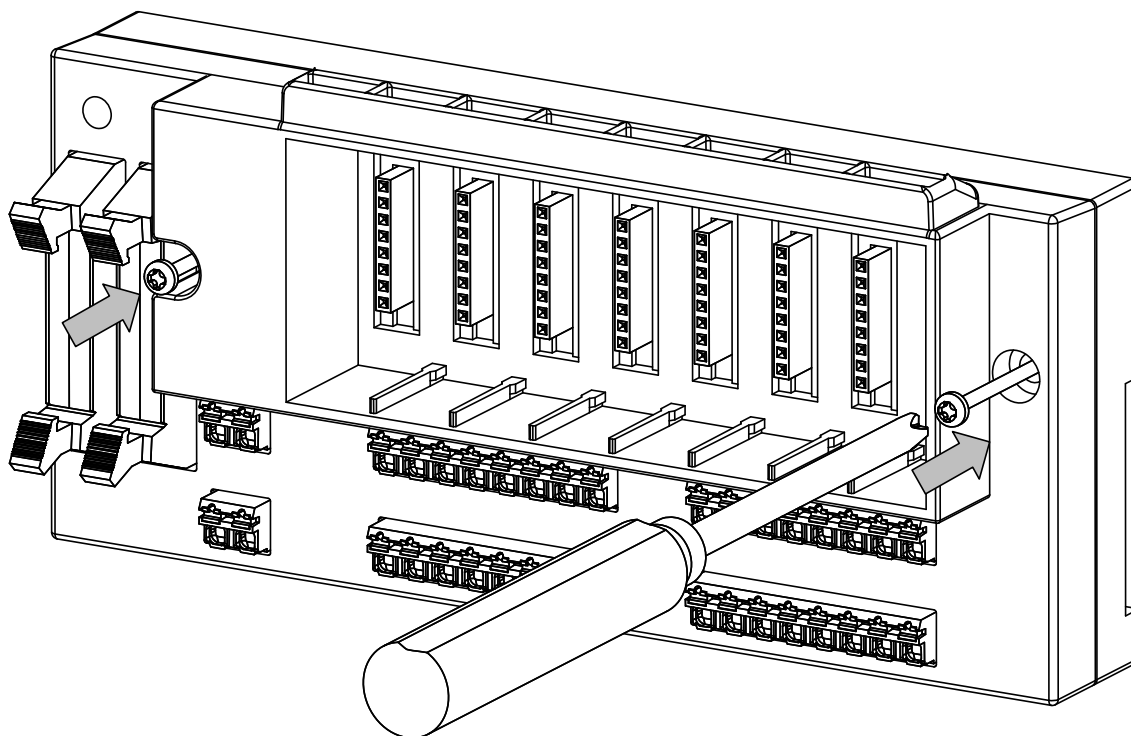


5-2-2. Installation using screws

Install screws as shown below.

- ① Tighten the two screws to install the base unit into a control panel or other areas.

Screw size	M4 × 0.7mm × 27mm or more
Tightening torque	78 to 118N·cm (8 to 12kgf·cm, 7 to 10lbf·in)

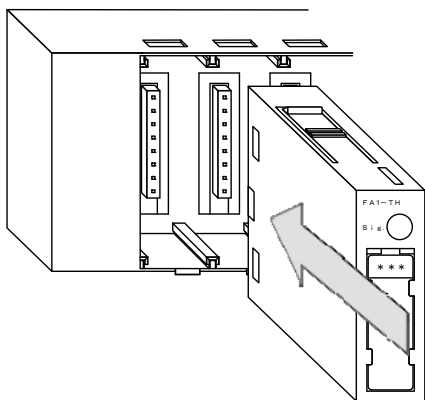


5-3. Installing and removing a module

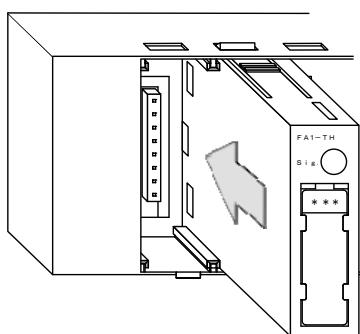
Install a module into or remove it from the base unit as shown below.

(1) Installation

- ① Align the module with the base unit slot.

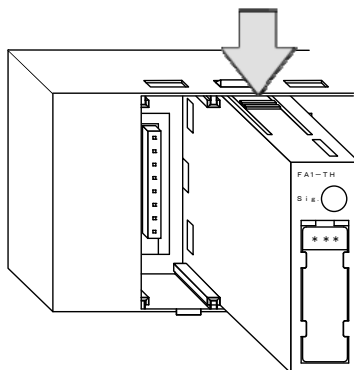


- ② Push the module in until the latch clicks into place.

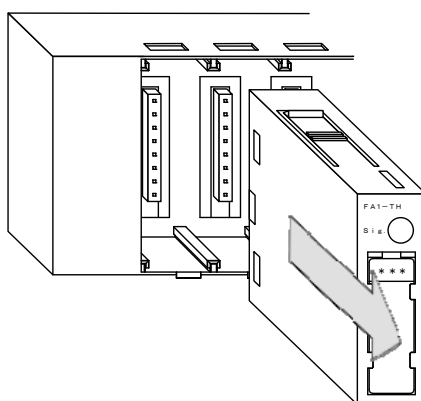


(2) Removal

- ① Hold down the latch.



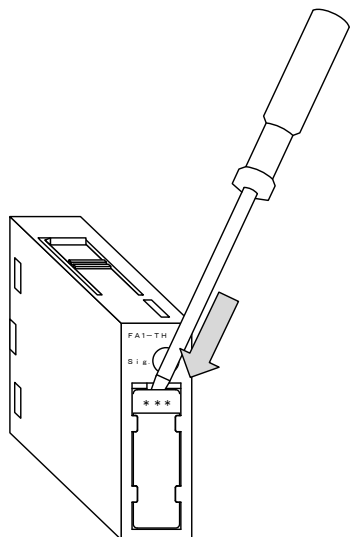
- ② Pull out the module.



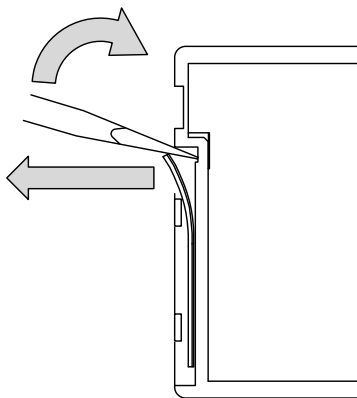
5-4. Using module marker strips

Use the strips as shown below.

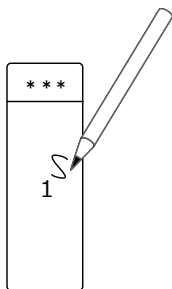
- ① Insert a flathead screwdriver between the back side of the marker strip and the module through the slot.



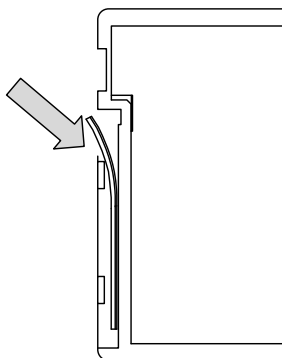
- ② Lift up the screwdriver so that the strip and clear plastic cover bend toward you, then pull them out.



- ③ Write information such as destination devices on the strip.



- ④ Return the strip and clear plastic cover to their original positions.



The strip data can be downloaded from our website "MEEFAN".

URL : <http://www.mee.co.jp/sales/fa/meefan>

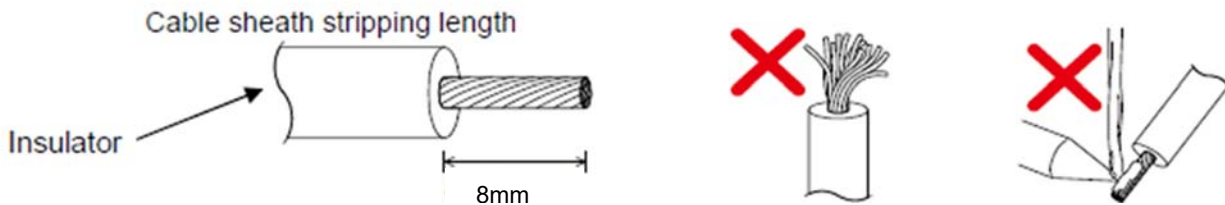
5-5. Wiring

Wire the base unit according to the information below.

(1) Wires routing

(a) Fabrication on cable insulator

Strip the wire as follows. If the length of the sheath peeled is too long, a short circuit may occur with neighboring wires. If the length is too short, wires might come off. Wire the stripped cable after twisting it to prevent it from becoming loose. In addition, do not solder it.



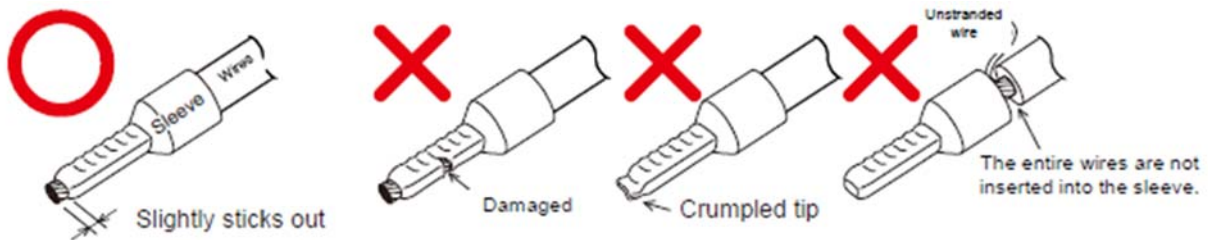
(b) Using a ferrule terminal

Insert wires to a ferrule terminal and crimp it.

Make sure that core wire slightly comes out of the ferrule.

Check the condition of the ferrule terminal after crimping. Do not use a ferrule terminal of which the crimping is inappropriate, or the face is damaged.

* Ferrule terminals crimped onto one wire are applicable to the terminal block of this product.



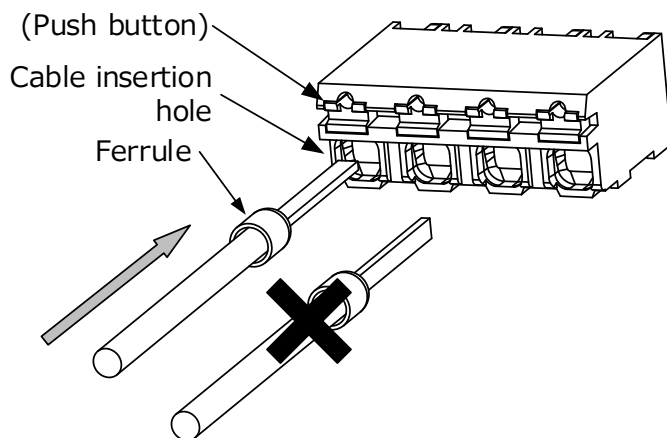
(c) Inserting wires

The wire with ferrule or solid cable can be inserted into the wire insertion hole. After inserting, pull the wire lightly to confirm that the wire is surely connected.

For the correct terminal insertion direction, refer to the figure below.

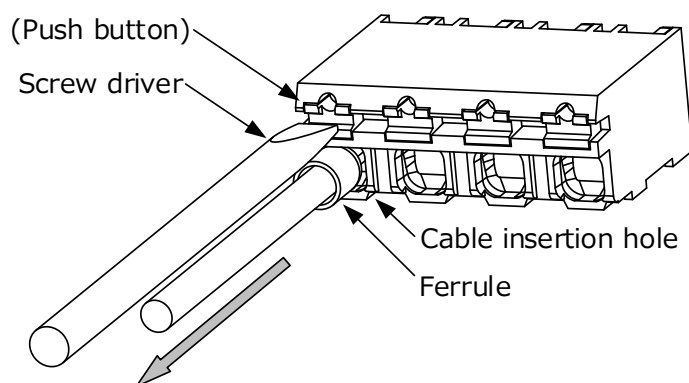
When binding twisted wires, press the push button using the screw driver, then insert the twisted wires into the wire insertion hole.

* Make sure to insert the wire straight as far as it will go.



(2) Wires removal

Press the push button all the way using the screw driver, then pull out the wire.



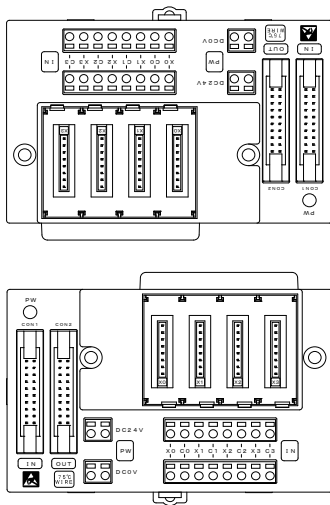
Use the screw driver shown in the table below.

Recommended tool (screw driver)		
Manufacturer	Model	Blade edge size
PHOENIX CONTACT	SZS 0,4×2,5 VDE	2.5x0.4mm

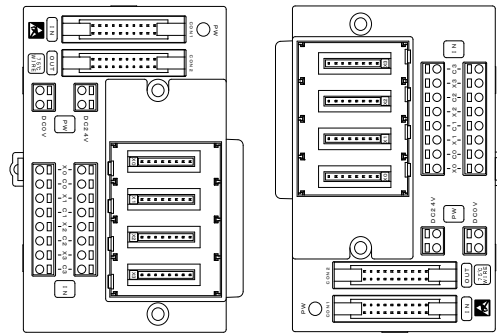
6. INSTALLATION ORIENTATION

6-1. FA1-TH4X2SC20S1E

Horizontal installation



Vertical installation



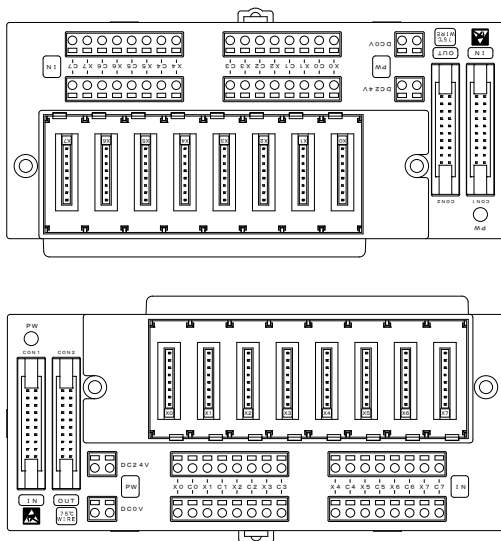
Upward installation



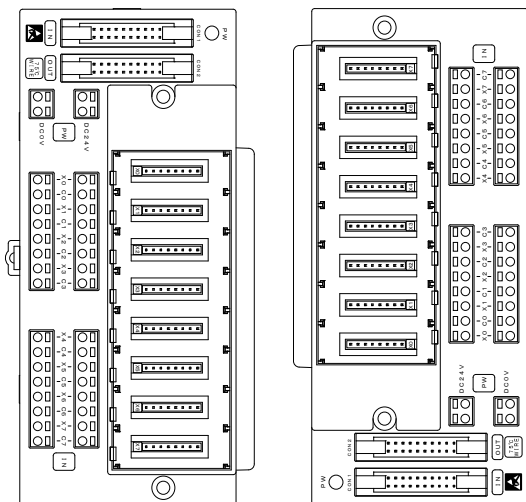
*1: Do not install the module in any direction other than the above.

6-2. FA1-TH8X2SC20S1E

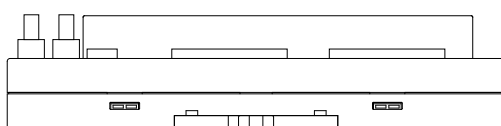
Horizontal installation



Vertical installation



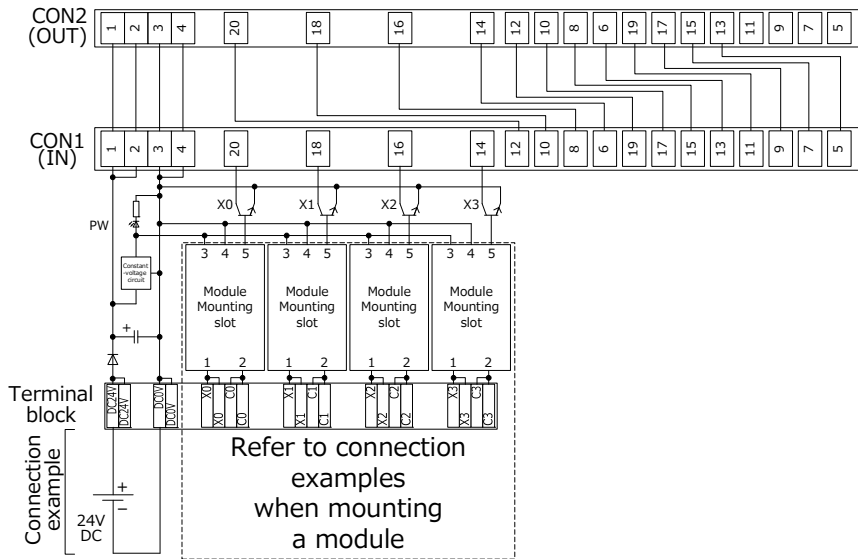
Upward installation



*1: Do not install the module in any direction other than the above.

7. EXTERNAL CONNECTION EXAMPLE

7-1. FA1-TH4X2SC20S1E

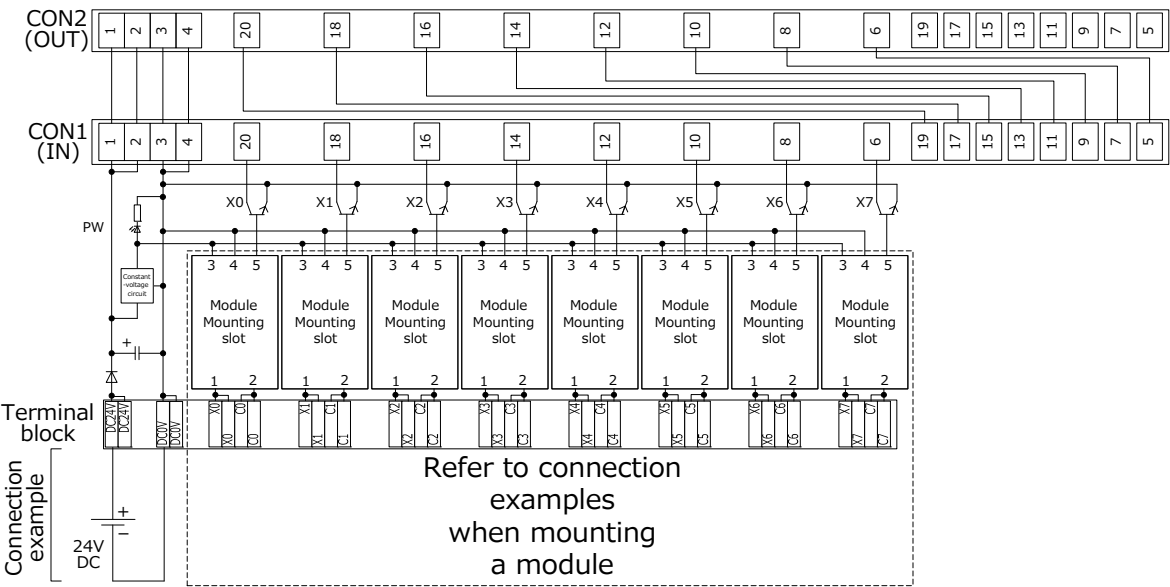


[Connection examples when mounting a module]

<p>(1) FA1-TM1X100A (100VAC input)</p> <p>Connection example</p>	<p>(2) FA1-TM1X200A (200VAC input)</p> <p>Connection example</p>	<p>(3) FA1-TM1X24D(24VDC input)</p> <p>1) Positive common input</p> <p>Connection example</p>	<p>2) Negative common input</p> <p>Connection example</p>	<p>(4) FA1-TM1X48D(48VDC input)</p> <p>1) Positive common input</p> <p>Connection example</p>	<p>2) Negative common input</p> <p>Connection example</p>
<p>(5) FA1-TM1X100D(100VDC input)</p> <p>1) Positive common input</p> <p>Connection example</p>	<p>2) Negative common input</p> <p>Connection example</p>	<p>(6) FA1-TM1X24RA(24VDC relay input)</p> <p>1) Positive common input</p> <p>Connection example</p>	<p>2) Negative common input *1</p> <p>Connection example</p>		

*1: When connecting the FA1-TM1X24RA with a negative common input, read X0 to X7 as C0 to C7, and C0 to C7 as X0 to X7.

7-2. FA1-TH8X2SC20S1E



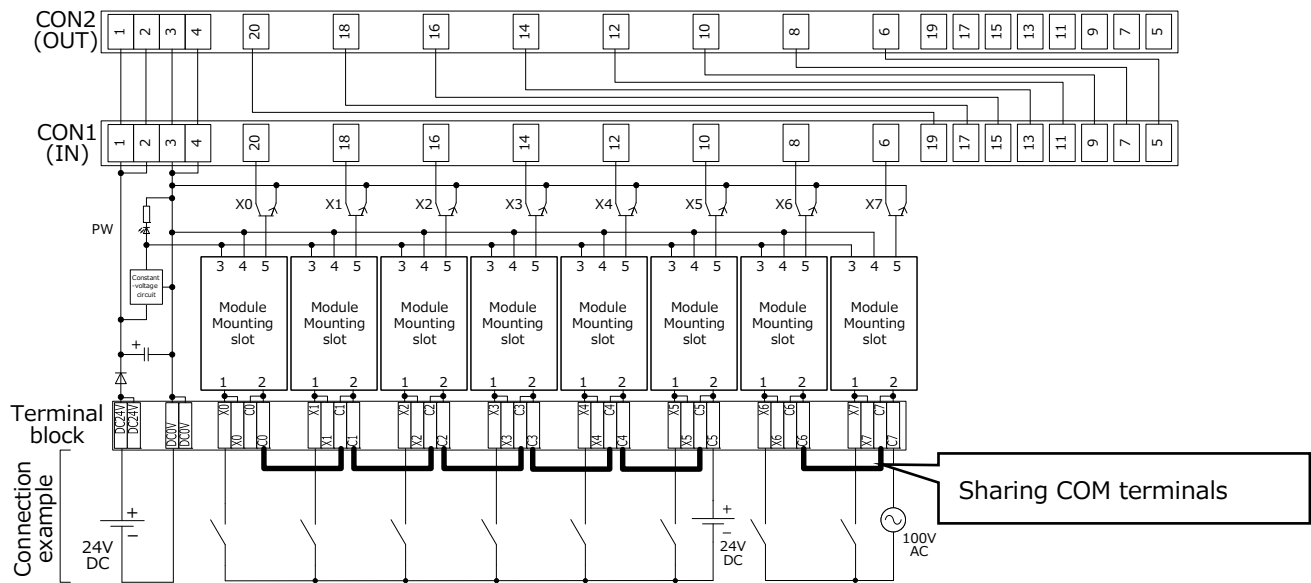
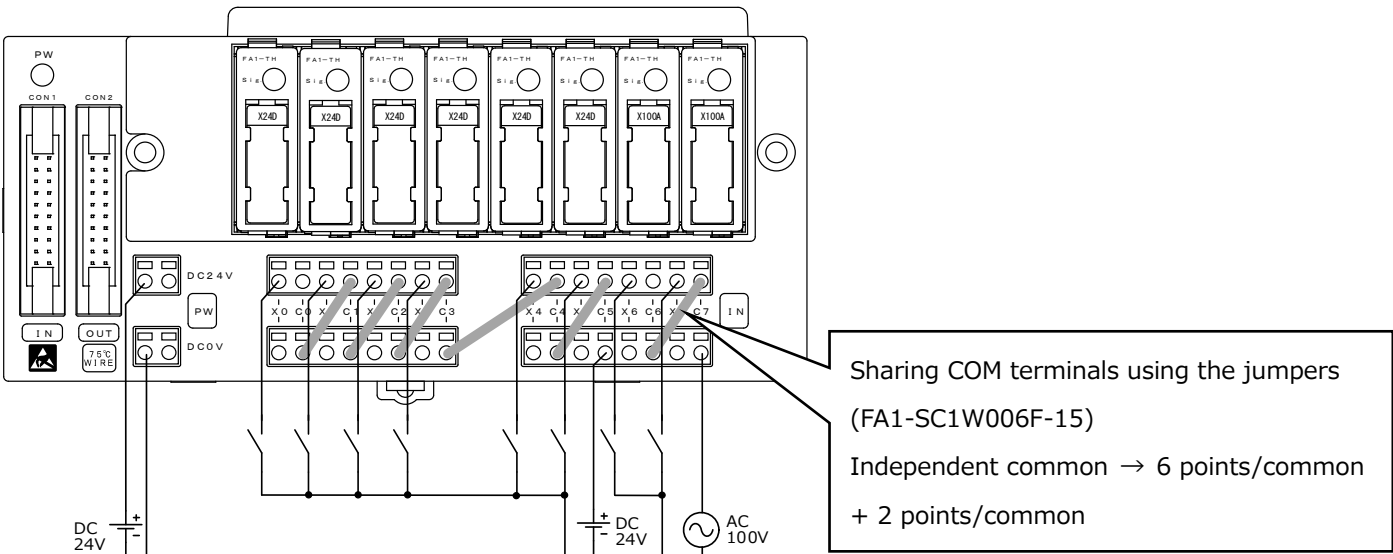
[Connection examples when mounting a module]

(1) FA1-TM1X100A (100VAC input)		(2) FA1-TM1X200A (200VAC input)		(3) FA1-TM1X24D(24VDC input)		(4) FA1-TM1X48D(48VDC input)	
				1) Positive common input	2) Negative common input	1) Positive common input	2) Negative common input
(5) FA1-TM1X100D(100VDC input)				(6) FA1-TM1X24RA(24VDC relay input)			
1) Positive common input		2) Negative common input		1) Positive common input	2) Negative common input *1		

*1: When connecting the FA1-TM1X24RA with a negative common input, read X0 to X7 as C0 to C7, and C0 to C7 as X0 to X7.

7-3. Sharing common terminals

The unit has two sets of terminals.
Shorting common terminals with jumpers allows for common terminals to be shared.
(Example) Sharing common terminals: 6 points/common, 2 points/common



8. APPLICABLE SOLDERLESS TERMINALS

Manufacturer	Type	Applicable ferrule ^{*1}	Crimp tool
	Applicable wire size		
PHOENIX CONTACT	0.25/24	AI 0.25-8 YE	CRIMPFOX 6
	0.3, 0.34/22	AI 0.34-8 TQ	
	0.5/20	AI 0.5-8 WH	
	0.75/18	AI 0.75-8 GY	
WAGO	0.08 to 0.34 mm ² /AWG28 to 22	216-302	206-220
	0.34 mm ² /AWG24 and 22	216-302	206-1204 206-204
	0.5 mm ² /AWG22 and 20	216-201	
	0.75 mm ² /AWG20 and 18	216-202	

*1: UL certification is obtained by solid/stranded wires.

9. TARGET PLC MODULES AND CONNECTION CABLES

9-1. Programmable controllers

Module model for a programmable controller *1				Cable model	Base Unit model	Module model
MELSEC iQ-R series	Input module Positive/negative common shared type Connector type	RX41C4 RX42C4 RX41C6HS	Positive common	FA-CBL**FM2V* ² FA-CBL**FM2LV* ² FA-CBL**MMH20(For distribution)	FA1-TH8X2SC20S1E* ⁷ FA1-TH4X2SC20S1E* ⁷	FA1-TM1X100A FA1-TM1X200A FA1-TM1X24D FA1-TM1X48D FA1-TM1X100D FA1-TM1X24RA
	I/O combined module Input: Positive/negative common shared type Connector type	RH42C4NT2P	Input side positive common	FA-CBL**FM2V* ² FA-CBL**FM2LV* ² FA-CBL**MMH20(For distribution)		
	Input module Positive/negative common shared type Screw type terminal block	RX40C7	Positive common	FA-CBL**M20 FA-CBL**YM20 FA-CBL**TMV20 FA-CBL**MMH20(For distribution)		
MELSEC iQ-F series	Input module Sink Connector type	FX5-C16EX/D FX5-C32EX/D	Input side	FA-FXCBL**MMH20* ³ FA2-CB1LT**MM1H20* ³ * ⁴ * ⁶ FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Sink Connector type	FX5UC-32MT/D FX5UC-64MT/D FX5UC-96MT/D FX5-C32ET/D				
	Input module Sink/source shared type Connector type	FX5-C16EX/DS FX5-C32EX/DS	Sink input	FA2-CB1L**MM1H20E* ³ FA2-CB1LT**MM1H20E* ³ * ⁵ * ⁶ FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Sink/source shared type Connector type	FX5-C32ET/DSS FX5UC-32MT/DSS FX5UC-64MT/DSS FX5UC-96MT/DSS	Input side sink			
MELSEC-Q series	Input module Positive common Connector type	QX41 QX41-S1 QX41-S2 QX42 QX42-S1	Input side	FA-CBL**FM2V* ² FA-CBL**FM2LV* ² FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Positive common Connector type	QH42P QX41Y41P		FA-CBL**FM2V* ² FA-CBL**FM2LV* ² FA-CBL**MMH20(For distribution)		
	Input module Positive common Screw type terminal block	QX40 QX40-S1		FA-CBL**M20 FA-CBL**YM20 FA-CBL**TMV20 FA-CBL**MMH20(For distribution)		
MELSEC-L series	Input module Positive/negative common shared type Connector type	LX41C4 LX42C4	Positive common	FA-CBL**FM2V* ² FA-CBL**FM2LV* ² FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Positive/negative common shared type Connector type	LH42C4NT1P LH42C4PT1P	Input side positive common	FA-CBL**FM2V* ² FA-CBL**FM2LV* ² FA-CBL**MMH20(For distribution)		
	Input module Positive/negative common shared type Screw type terminal block	LX40C6	Positive common	FA-CBL**M20 FA-CBL**YM20 FA-CBL**MMH20(For distribution)		
MELSEC-F series	Input module Sink Connector type	FX2NC-16EX FX2NC-32EX	Input side	FA-FXCBL**MMH20* ³ FA2-CB1LT**MM1H20* ³ * ⁴ * ⁶ FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Sink Connector type	FX3GC-32MT/D FX3UC-16MT/D FX3UC-32MT/D FX3UC-32MT-LT FX3UC-32MT-LT-2 FX3UC-64MT/D FX3UC-96MT/D				
	Input module Sink/source shared type Connector type	FX2NC-16EX-DS FX2NC-32EX-DS	Sink input	FA2-CB1L**MM1H20E* ³ FA2-CB1LT**MM1H20E* ³ * ⁵ * ⁶ FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Sink/source shared type Connector type	FX3GC-32MT/DSS FX3UC-16MT/DSS FX3UC-32MT/DSS FX3UC-64MT/DSS FX3UC-96MT/DSS	Input side sink			

*1 : For use with 24 V DC only.

*2 : Use the same power supply for the modules to be connected.

*3 : Use the same 24VDC external power supply for the MELSEC iQ-F or MELSEC-F series module and the digital signal converter.

*4 : When the operating ambient temperature is -20 to 55°C, use the FA2-CB1LT**MM1H20.

*5 : When the operating ambient temperature is -20 to 55°C, use the FA2-CB1LT**MM1H20E.

*6 : For use below 0°C, check the Operating ambient temperature of programmable controller.

*7 : Attaching an additional cable can increase the number of input points. Use the FA-CBL**MMH20 as an additional cable.

Module model for a programmable controller *1				Cable model	Base Unit model	Module model
CC-Link IE TSN series	Input module Positive/negative common shared type Connector type	NZ2GNCF1-32D	Positive common	FA-CBL**FM2H*2 FA-CBL**FM2LH*2 FA-CBL**MMH20(For distribution)	FA1-TH8X2SC20S1E*4 FA1-TH4X2SC20S1E*4	FA1-TM1X100A FA1-TM1X200A FA1-TM1X24D FA1-TM1X48D FA1-TM1X100D FA1-TM1X24RA
	Input module Positive/negative common shared type Screw type terminal block *3	NZ2GN2B1-32D	Positive common	FA-CBL**M20 FA-CBL**YM20 FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Positive common Screw type terminal block *3	NZ2GN2B1-32DT	Input side			
CC-Link IE Field Basic series	Input module Positive/negative common shared type Screw type terminal block *3	NZ2MFB1-32D	Positive common	FA-CBL**M20 FA-CBL**YM20 FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Positive common Screw type terminal block *3	NZ2MFB1-32DT	Input side			
CC-Link IE Field series	Input module Positive/negative common shared type Connector type	NZ2GFCF1-32D	Positive common	FA-CBL**FM2H*2 FA-CBL**FM2LH*2 FA-CBL**MMH20(For distribution)		
	Input module Positive/negative common shared type Screw type terminal block *3	NZ2GF2B1N1-16D NZ2GF2B1-32D	Positive common	FA-CBL**M20 FA-CBL**YM20 FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Positive common Screw type terminal block *3	NZ2GF2B1-32DT	Input side			
CC-Link series	Input module Positive/negative common shared type Connector type	AJ65SBTCF1-32D	Positive common	FA-CBL**FM2H*2 FA-CBL**FM2LH*2 FA-CBL**MMH20(For distribution)		
	Input module Positive/negative common shared type Screw type terminal block *3	AJ65SBTB1-16D AJ65SBTB1-16D1 AJ65SBTB3-16D AJ65SBTB3-16KD AJ65SBTB1-32D AJ65SBTB1-32D1 AJ65SBTB1-32KD	Positive common	FA-CBL**M20 FA-CBL**YM20 FA-CBL**MMH20(For distribution)		
	I/O combined module Input: Positive common Screw type terminal block *3	AJ65SBTB1-32DT	Input side			
	Input module Positive/negative common shared type Spring clamp terminal block *3	AJ65VBT3-16D	Positive common	FA-CBL**M20 FA-CBL**MMH20(For distribution)		

*1 : For use with 24 V DC only.

*2 : Use the same power supply for the modules to be connected.

*3 : Can be connected by connecting the FA-CBL**M20 (connection cable (discrete cable)) or FA-CBL**YM20(connection cable with Y-shaped solderless terminal) to a digital signal converter.

*4: Attaching a unit cable can increase the number of input points. Use the FA-CBL**MMH20 as a unit cable.

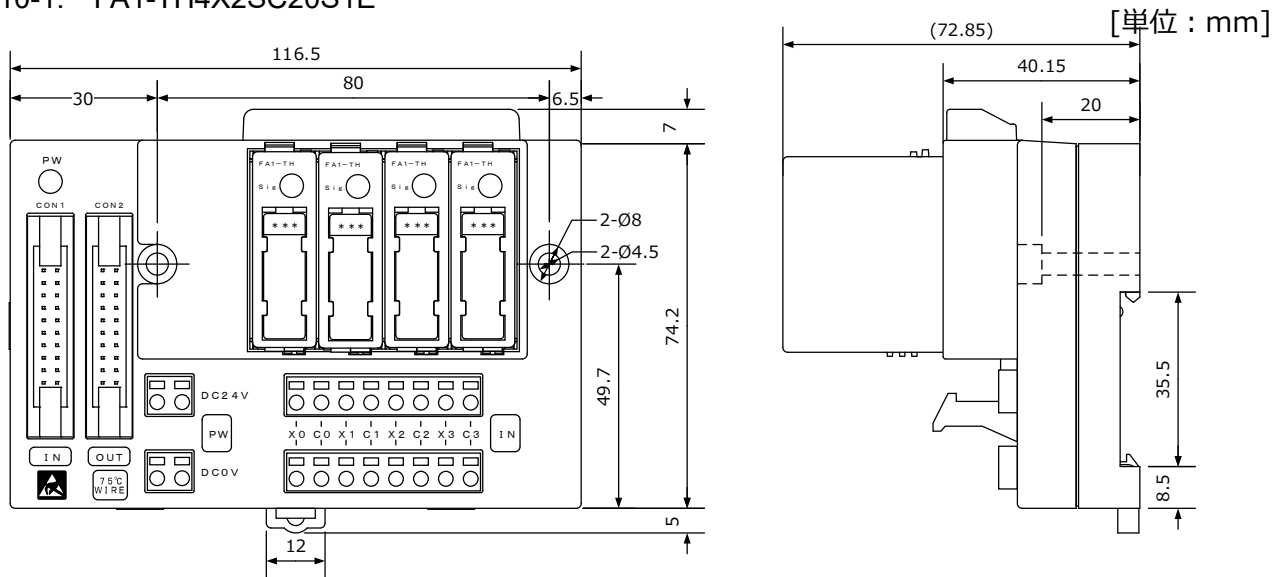
9-2. CC-Link interface module for digital signal converter

Model	Interface module cable		Unit model	Model
CC-Link interface module for digital signal converter	FA3-TH1C16XC-01C	FA3-TH1C16XC Dedicated cable (Included with the CC-Link interface module)	— FA-CBL**MMH20(For distribution)	FA1-TM1X100A FA1-TM1X200A FA1-TM1X24D FA1-TM1X48D FA1-TM1X100D FA1-TM1X24RA
		Signal converter connection extension cable	FA3-CB2L**MM1H20 FA-CBL**MMH20(For distribution)	
	FA3-TH1C16XC	Signal converter connection extension cable	FA3-CB2L**MM1H20 FA-CBL**MMH20(For distribution)	

*1: Attaching an additional cable can increase the number of input points. Use the FA-CBL**MMH20 as an additional cable.

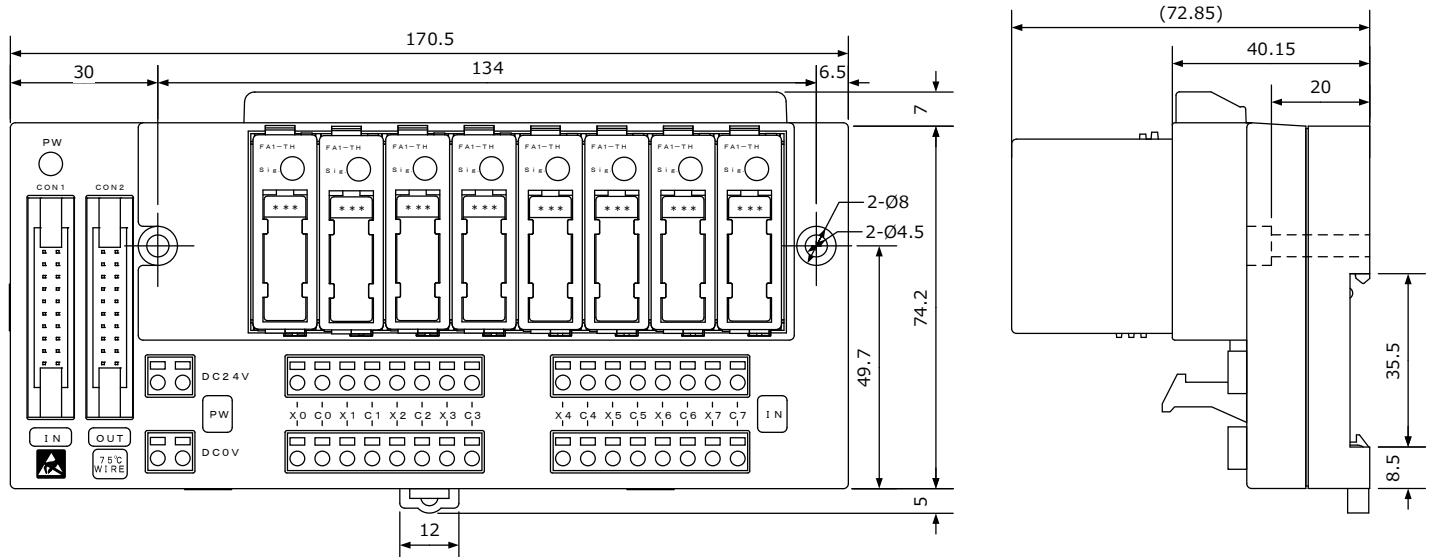
10. EXTERNAL DIMENSIONS

10-1. FA1-TH4X2SC20S1E



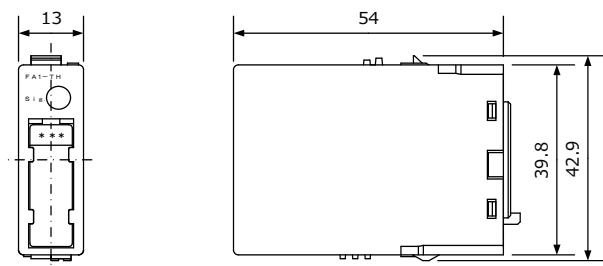
[単位 : mm]

10-2. FA1-TH8X2SC20S1E

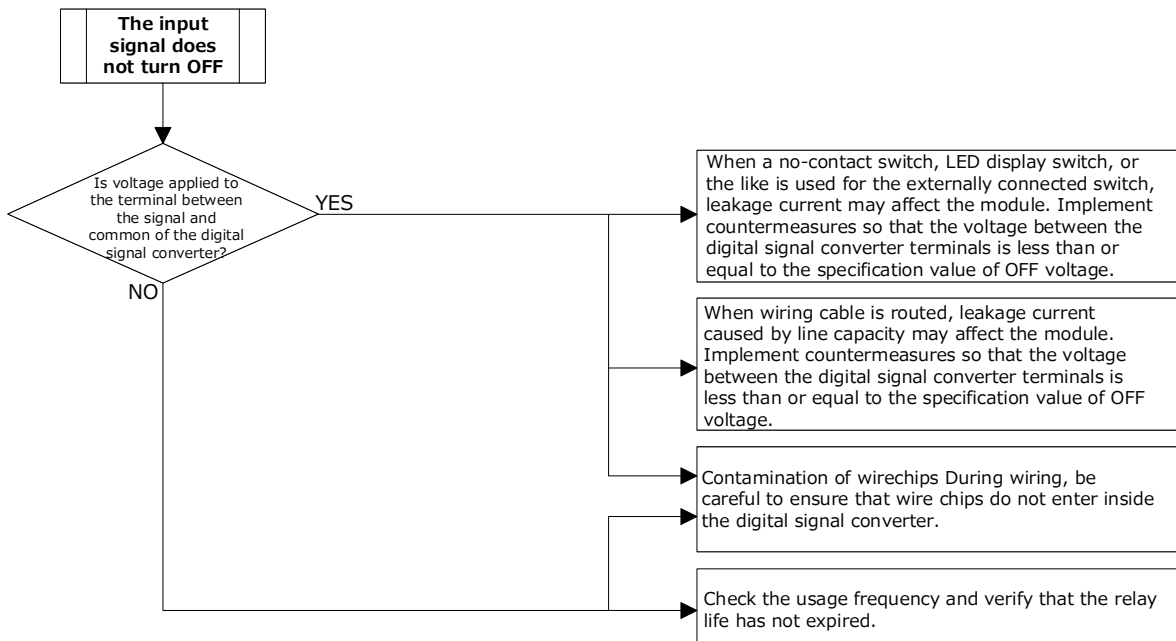
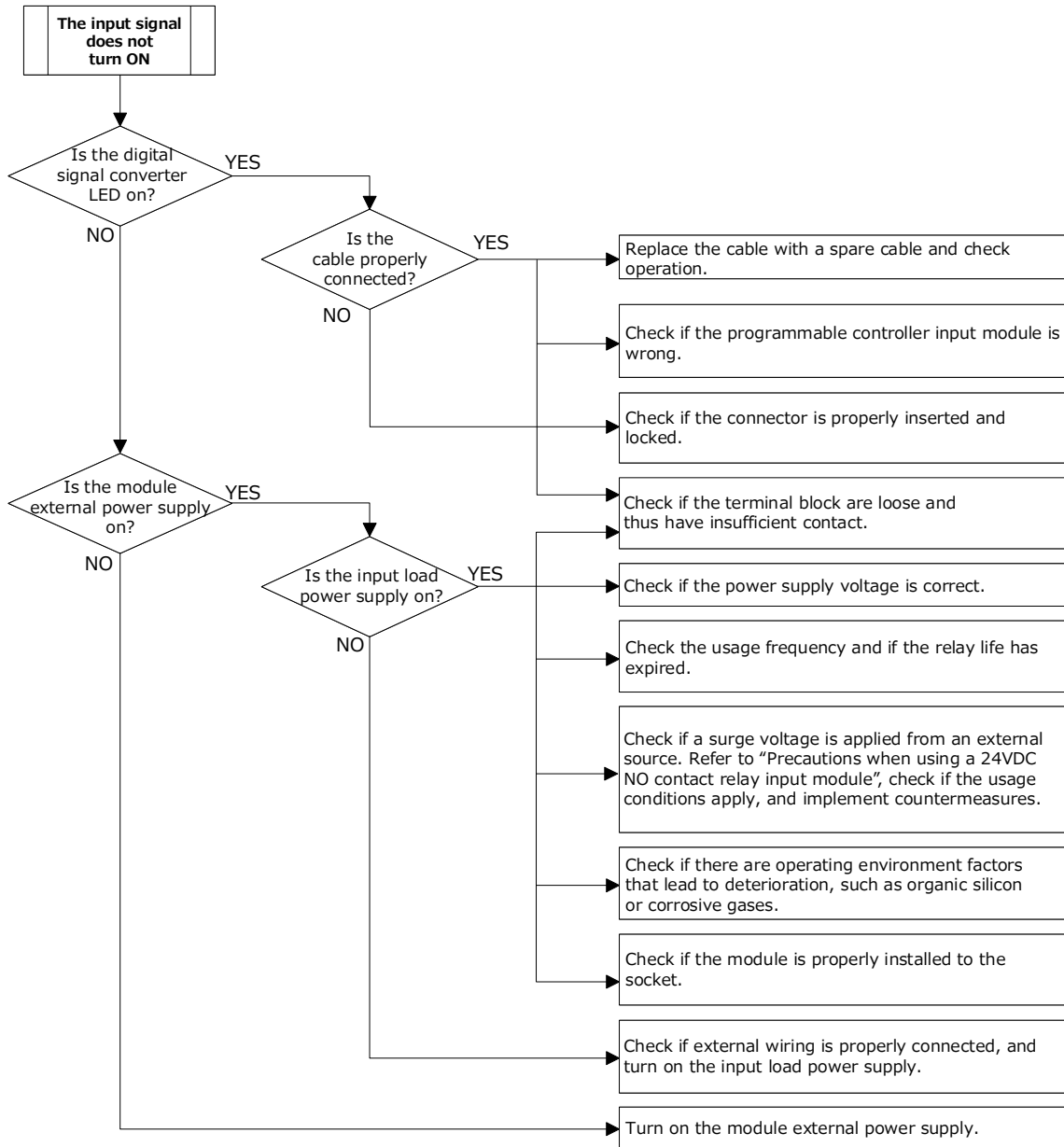


[単位 : mm]

10-3. FA1-TM1X100/200A/24D/48D/100D/24RA, FA1-TM1ND4



11. TROUBLESHOOTING



[Precautions when using a 24VDC NO contact relay input module]

(1) Relay switching frequency

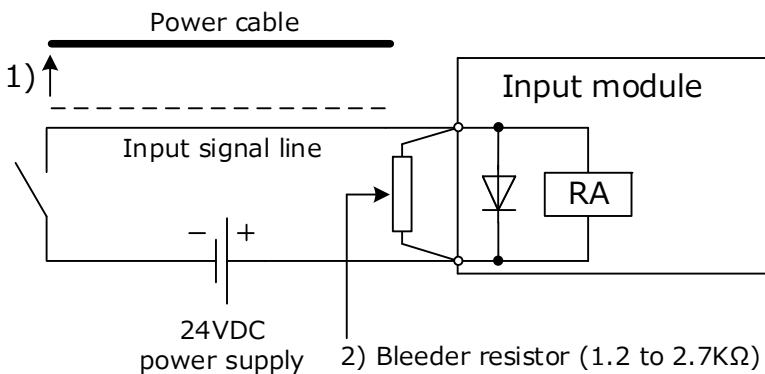
- Use the module with a maximum input signal switching frequency of one-second or longer ON, and one-second or longer OFF.

(2) Input line surge / induced voltage

- Do not install the 24VDC input signal line together with the main circuit lines, power cables, or the like, or wire the 24VDC input signal line close to such wiring.
- As a general rule, keep a distance of 100mm or more between them.
- Failure to do so may cause the input signal to turn ON when set to OFF, or not turn OFF when switched from ON to OFF due to the induced voltage from the main circuit or power cables.
- Such wiring may also cause a high surge voltage to occur during ON ↔ OFF of the main circuit, power cables, etc., thereby damaging the diode inserted in parallel with the module relay.

[Countermeasures]

- 1) Arrange the input signal line far away from the main circuit, power cables, etc. (Do not make the input signal lines, main circuit, power cable, etc., the same cable or install the cables together.)
- 2) Insert a bleeder resistor in parallel with the input signal to lower the input impedance of the input signal.



2) Bleeder resistor (1.2 to 2.7K Ω)

- For the bleeder resistor, select a resistance value by starting from the large value and gradually decreasing it to find the value at which malfunction does not occur.

12. PRECAUTIONS

- (1) For wiring to the terminal block, refer to the manual of the programmable controller module to be connected, published by Mitsubishi Electric.

13. GRATIS WARRANTY TERMS AND GRATIS WARRANTY RANGE

If any fault or defect (hereinafter referred to as "Failure") attributable to Mitsubishi Electric Engineering should occur within the gratis warranty period, Mitsubishi Electric Engineering shall replace the product free of charge via the distributor from whom you made your purchase.

- Gratis warranty period

The gratis warranty period of this product shall be one (1) year from the date of purchase or delivery to the designated place.

Note that the gratis warranty period shall be limited to 18 months after manufacturing, which includes six months as the distribution period in the market.

In addition, the gratis warranty period of the product after repair is the same as that of the product before repair.

- Gratis warranty range

- (1) The gratis warranty range shall be limited to normal use based on the usage conditions, methods and environment, etc., defined by the terms and precautions, etc., given in the instruction manual, user's manual, and caution labels on the product.
- (2) In the following cases, a repair fee shall be applied even if within the gratis warranty period.
 - 1) Failure resulting from inappropriate storage or handling, carelessness or negligence by the user, or Failure caused by the user's hardware or software design.
 - 2) Failure caused by unapproved modifications, etc., to the product by the user.
 - 3) Failure that could have been avoided if, when the Mitsubishi Electric Engineering product was assembled into the user's device, safeguards defined by legal regulations applicable to the user's device or functions or structures considered standard by the industry had been provided.
 - 4) Failure recognized as preventable if the consumed products specified in instruction manuals, etc., were normally maintained or replaced.
 - 5) Replacement of consumable parts (relays, etc.).
 - 6) Failure caused by external factors beyond anyone's control such as fires or abnormal voltage, and Failure caused by Force Majeure such as earthquakes, lightning, or wind and water damage.
 - 7) Failure caused by reasons unpredictable by scientific technology standards at the time of shipment from Mitsubishi Electric Engineering.
 - 8) Any other failure not attributable to Mitsubishi Electric Engineering or found by the user to not be attributable to Mitsubishi Electric Engineering.

14. EXCLUSION FROM LIABILITY FOR OPPORTUNITY LOSS AND SECONDARY LOSS

Regardless of the gratis warranty period, Mitsubishi Electric Engineering shall not be liable for compensation for damages arising from causes not attributable to Mitsubishi Electric Engineering, opportunity losses or lost profits incurred by the user due to Failures of Mitsubishi Electric Engineering products, damages or secondary damages arising from special circumstances, whether foreseen or unforeseen by Mitsubishi Electric Engineering, compensation for accidents, compensation for damages to products other than Mitsubishi Electric Engineering products, or compensation for replacement work, readjustment of onsite machinery and equipment, startup test runs or other duties carried out by the user.

15. TRADEMARKS

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In some cases, trademark symbols such as '™' or '®' are not specified in this manual.

FOR SAFE OPERATIONS

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi Electric Engineering.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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Specifications subject to change without notice.

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