FA-3S SERIES

PROGRAMMABLE CONTROLLERS

USER'S MANUAL

IEC SPECIFICATIONS

PF3S-CP11/PF3S-CP11T/PF3S-CP12/PF3S-CP13

idec

SAFETY PRECAUTIONS

- Read this user's manual to make sure of correct operation before starting installation, wiring, operation, maintenance, and inspection of the FA-3S programmable controllers.
- All FA-3S PLCs are manufactured under IDEC's rigorous quality control system, but users must add a backup or failsafe provision to the control system using the FA-3S in applications where heavy damage or personal injury may be caused in case the FA-3S should fail.
- In this user's manual, safety precautions are categorized in order of importance to Warning and Caution:

⚠ Warning — **Warning notices are used to emphasize that improper operation may cause severe personal injury or death.**

⚠ Caution — **Caution notices are used where inattention might cause personal injury or damage to equipment.**

⚠ Warning

- Turn power off to the FA-3S before starting installation, removal, wiring, maintenance, and inspection on the FA-3S. Failure to turn power off may cause electrical shocks or fire hazard.
- Special expertise is required to install, wire, program, and operate the FA-3S. People without such expertise must not use the FA-3S.
- Emergency and interlocking circuits must be configured outside the FA-3S. If such a circuit is configured inside the FA-3S, failure of the FA-3S may cause disorder of the control system, damage, or accidents.

⚠ Caution

- Install the FA-3S according to instructions described in this user's manual. Improper installation will result in falling, failure, or malfunction of the FA-3S.
- FA-3S is designed for installation in equipment. Do not install the FA-3S outside of equipment.
- Install the FA-3S in environments described in this user's manual. If the FA-3S is used in places where the FA-3S is subjected to high-temperature, high-humidity, condensation, corrosive gases, excessive vibrations, and excessive shocks, then electrical shocks, fire hazard, or malfunction will result.
- The pollution degree of the FA-3S is "Pollution degree 2." Use the FA-3S in environments of pollution degree 2 (according to IEC664-1).
- All DC power type FA-3S units are "PS2" type (according to EN61131).
- Prevent the FA-3S from falling while moving or transporting the FA-3S, otherwise damage or malfunction of the FA-3S will result.
- Prevent metal fragments and pieces of wire from dropping inside the FA-3S housing. Put a cover on the FA-3S during installation and wiring. Ingress of such fragments and chips may cause fire hazard, damage, or malfunction.
- Use a power supply of the rated value. Use of a wrong power supply may cause fire hazard.
- Use wires of a proper size to meet voltage and current requirements. Tighten M3.5 terminal screws to a proper tightening torque of 0.8 N-m.
- Use an IEC127-approved fuse on the power line outside the FA-3S. This is required when exporting equipment containing FA-3S to Europe.
- Use an IEC127-approved fuse on the output circuit. This is required when exporting equipment containing FA-3S to Europe.
- Use an EU-approved circuit breaker. This is required when exporting equipment containing FA-3S to Europe.
- Make sure of safety before starting and stopping the FA-3S or when operating the FA-3S to force outputs on or off. Incorrect operation on the FA-3S may cause machine damage or accidents.
- If relays or transistors in the FA-3S output circuit fail, outputs may remain on or off. For output signals which may cause heavy accidents, provide a monitor circuit outside of the FA-3S.
- Do not connect to the ground directly from the FA-3S. Connect a protective ground to the equipment containing FA-3S using an M4 or larger screw. This is required when exporting equipment containing FA-3S to Europe.
- Do not disassemble, repair, or modify the FA-3S.
- When disposing of the FA-3S, do so as an industrial waste. Dispose of the memory pack in accordance with pertaining regulations (memory packs PFA-1M21, PFA-1M24, and PFA-1M28 contain a battery).

Power Indicator (POWER)
Turns on when power is supplied to FA-3S.

Operation Indicator (RUN)
Turns on when FA-3S is running.

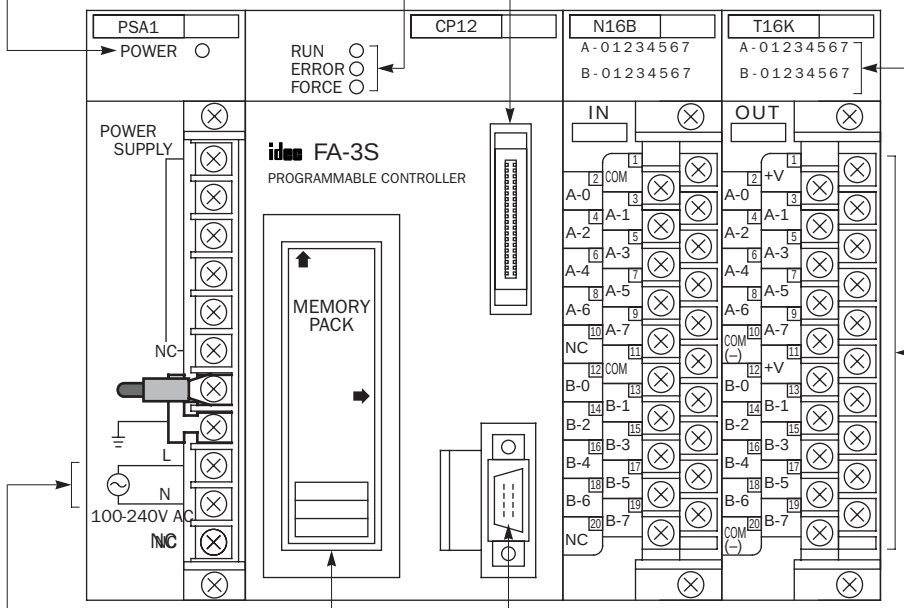
Error Indicator (ERROR)
Turns on when an error occurs in FA-3S.

Force Indicator (FORCE)
Turns on when forced operations are taking place.

Data Bus Connector
For connecting remote I/O master station modules, serial interface modules, and high-speed I/O modules.

Input Indicators
Turn on when the corresponding inputs are on.

Output Indicators
Turn on when the corresponding outputs are on.



Memory Pack
For storing a user program. Available in CMOS-RAM, EPROM, and EEPROM memory packs.

Input Terminals
For connecting input signals from input devices such as sensors, pushbuttons, and limit switches.
Available in 16- and 32-input modules.

Output Terminals
For connecting output signals to output devices such as electromechanical relays and solenoid valves.
Available in 8-, 16-, and 32-output modules.

Power Supply Terminals
Connect power supply to these terminals. Power voltage is available in three types:
100-240V AC,
100-120 or 200-240V AC, and
24V DC

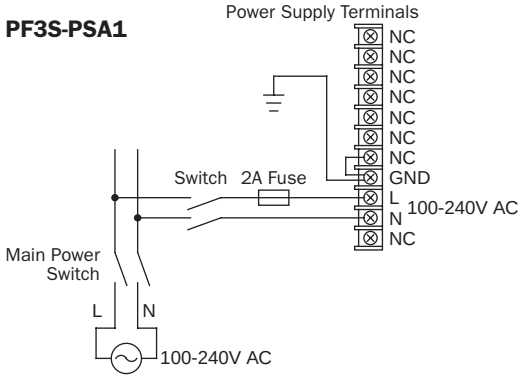
Loader Cable Connector
For connecting the program loader or computer.

General Specifications

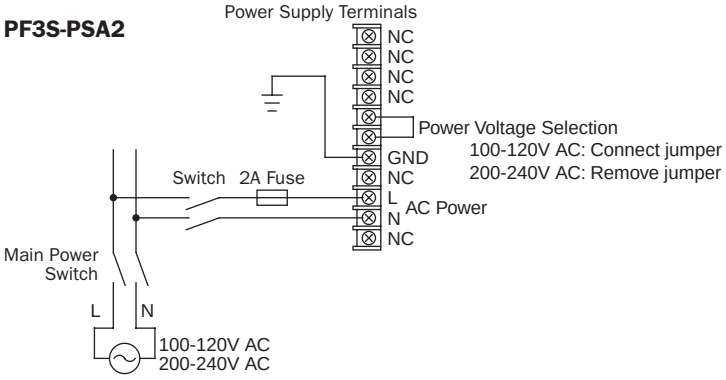
Power Module		PF3S-PSA1	PF3S-PSA2	PF3S-PSD1	PF3S-EPA1
Power Supply	Rated Power Voltage	100 to 240V AC	100 to 120V AC 200 to 240V AC	24V DC	100 to 120V AC 200 to 240V AC
	Allowable Voltage Range	–15 to +10%	–15 to +10%	–15 to +20% (Additional AC components of ±5% the rated voltage is allowable.)	–15 to +10%
	Dielectric Strength	Between power terminal and FG: 1500V AC, 1 minute Between I/O terminal and FG: 1500V AC, 1 minute			
	Repetitive Peak Current	1.5A maximum	1.0A maximum	———	2.5A maximum
	Input Current	0.4A maximum	0.2A maximum	2.0A maximum	1.0A maximum
	Rated Output	12V DC, 1.25A	12V DC, 2.0A	12V DC, 1.7A	24V DC, 1.0A
	Rated Frequency	50/60 Hz (48 to 63 Hz)	50/60 Hz (48 to 63 Hz)	———	50/60 Hz (48 to 63 Hz)
	Power Consumption	50 VA maximum	85 VA maximum	32W maximum	85 VA maximum
	Allowable Momentary Power Interruption	20 msec max. (maximum load)	20 msec max. (maximum load)	10 msec max. Level PS-2	15 msec max. (maximum load)
	Insulation Resistance	Between power terminal and FG: 10 MΩ minimum (500V DC megger) Between I/O terminal and FG: 10 MΩ minimum (500V DC megger)			
	Inrush Current	40A maximum			
	Protective Ground	Allowable current: 30A maximum, 2 minutes Grounding resistance: 100Ω maximum Grounding wire: 2 mm^2 minimum			
Effect of Improper Power Supply Connection	Reverse Polarity	No trouble	No trouble	No operation, no damage	No trouble
	Improper Voltage or Frequency	Permanent damage may be caused.			
	Improper Lead Connection	Connection failure may be caused.			

Terminal Arrangement of Power Supply Interface

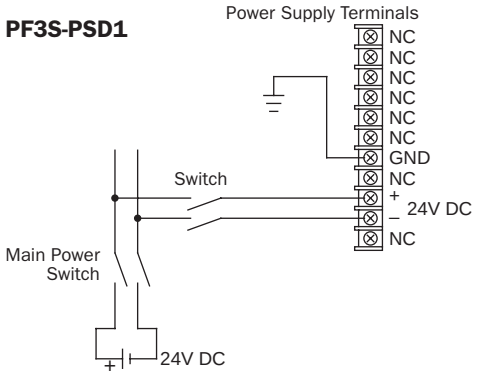
PF3S-PSA1



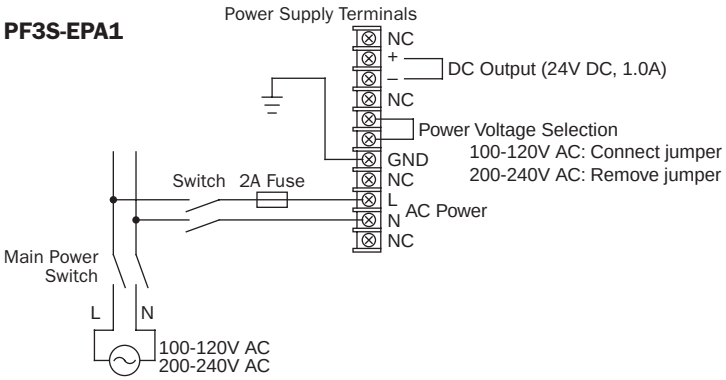
PF3S-PSA2



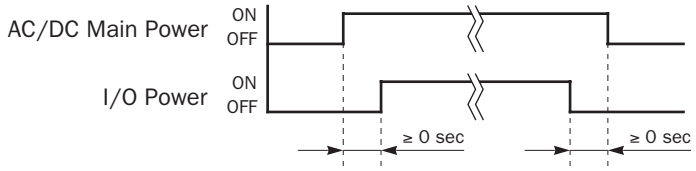
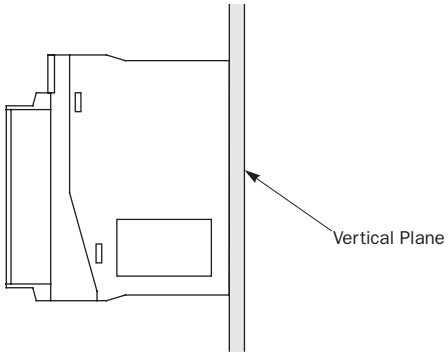
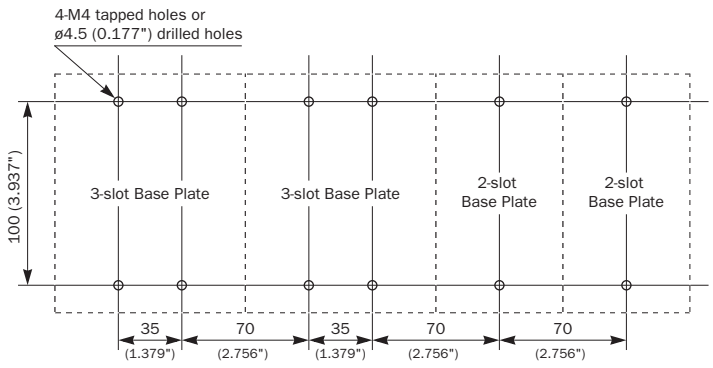
PF3S-PSD1



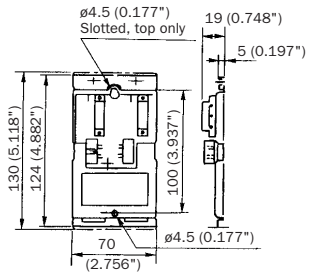
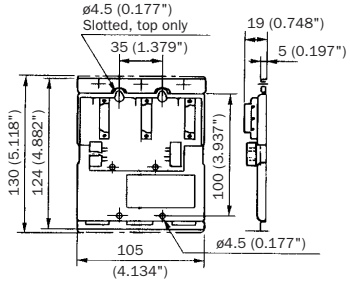
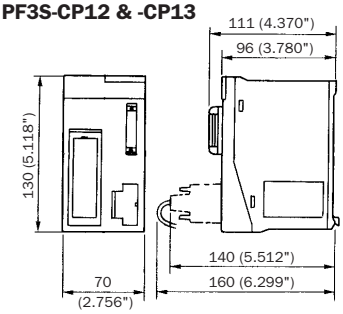
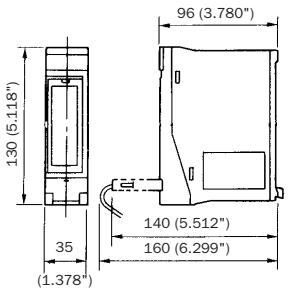
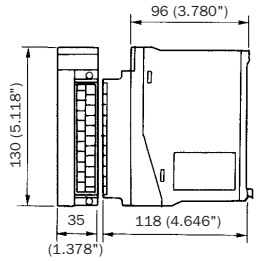
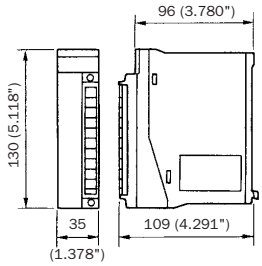
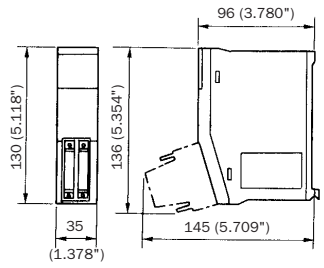
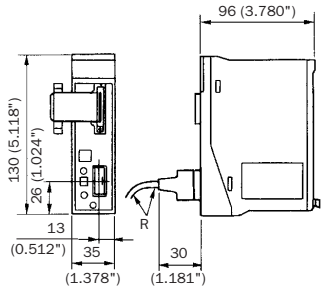
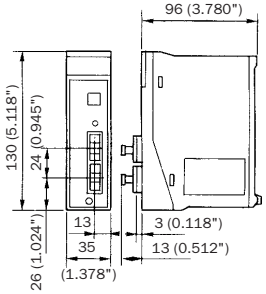
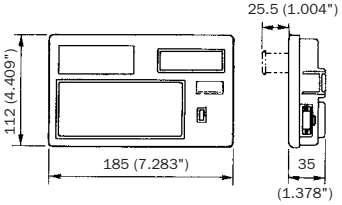
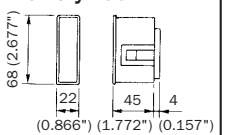
PF3S-EPA1



General Specifications, continued

Power Up/Down Order		AC or DC main power must be turned on not later than I/O power. AC or DC main power must be turned off not earlier than I/O power. 
Memory Backup	**Backup Duration**	Internal RAM: Approx. 7 days (backed up by a super capacitor)
	Battery	Lithium primary battery (CMOS-RAM memory pack)
	Super Capacitor Charging Speed	Approx. 2 hours from 0% to 90% of full charge
	Backup Subjects	Data registers, internal relays, shift registers, counters
	Battery Life	Approx. 7 years (at 25°C)
	Battery Replaceability	Impossible
	User Program Storage	Memory pack and internal RAM
Operating Temperature		0 to 55°C (fiber optics parts: –10 to +60°C)
Storage Temperature		–20 to +70°C (fiber optics parts: –20 to +65°C)
Relative Humidity		Relative humidity severity level RH1, 30 to 95% (non-condensing)
Pollution Degree		2 (IEC 664)
Altitude		Operation: 0 to 2,000m (0 to 6,565 feet) Transport: 0 to 3,000m (0 to 9,840 feet)
Vibration Resistance (IEC 68-2-6)		5 to 55 Hz, 60 m/sec^2, 2 hours each in 3 axes
Shock Resistance (IEC 62-2-27)		300 m/sec^2, 11 msec, 3 shocks each in 3 axes
Wiring		Core wire 0.75 to 1.25 mm^2 (AWG18 to AWG16) Input lines must be separated from power, output, and motor lines. M3.5 screw terminal
Installation Direction		FA-3S must be mounted on a vertical plane. 
Mounting Hole Layout		

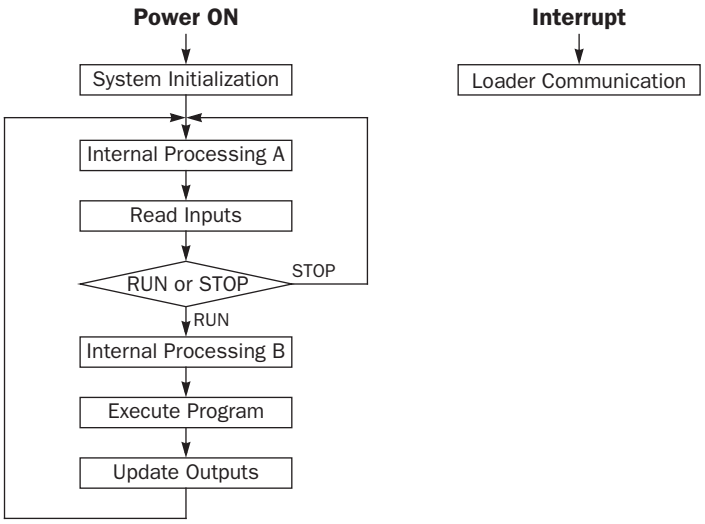
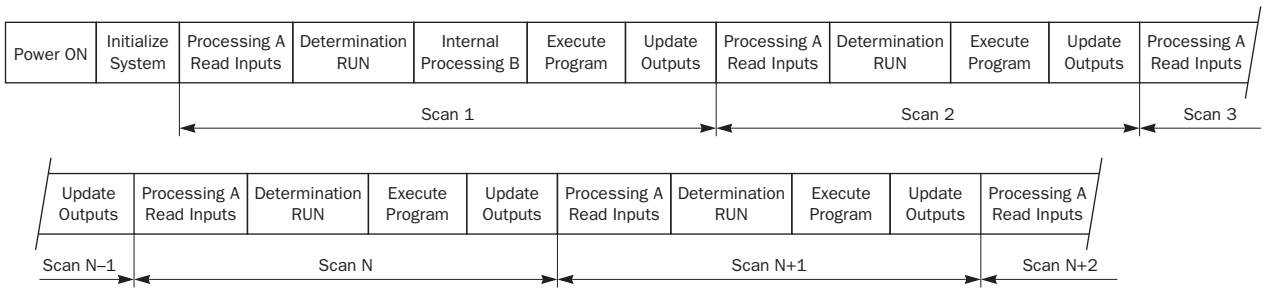
General Specifications, continued

Dimensions	**2-slot Base Module**  **3-slot Base Module**  **PF3S-CP12 & -CP13**  **PF3S-CP11 & -CP11T**  **Module with Double Terminal Block**  **Module with Single Terminal Block**  **Connector Type I/O Modules**  **Remote Master Station Module**  **Remote Slave Station Module**  **Program Loader**  **Memory Pack**  **Dimensions in mm (inches).**
Applied Standard	EN61131
Certified Standard	EN61131 (TÜV Product Service)

Function Specifications

CPU Module		PF3S-CP11	PF3S-CP11T	PF3S-CP12	PF3S-CP13
Program Capacity	PF3S-CP11	964 steps (when using 1K memory pack) 3300 steps (when using 4K memory pack)			
	PF3S-CP11T	3300 steps			
	PF3S-CP12	964 steps (when using 1K memory pack) 4036 steps (when using 4K memory pack)			
	PF3S-CP13	964 steps (when using 1K memory pack) 4036 steps (when using 4K memory pack) 8072 steps (when using 8K memory pack)			
Memory		CMOS-RAM (backed up by a battery), EPROM, EEPROM			
Backup Function	PF3S-CP11 PF3S-CP12 PF3S-CP13	A user program is transferred from the program loader to the memory pack. **When using CMOS-RAM memory pack:** Install a memory pack into the CPU module, and transfer a user program from the program loader to the memory pack installed in the CPU module. The user program in the CMOS-RAM memory pack is backed up by a lithium primary battery. The user program and data in the CPU RAM are backed up by an internal super capacitor. **When using EPROM or EEPROM memory pack:** Install a memory pack into the program loader, and transfer a user program from the program loader to the memory pack installed in the program loader. The user program is written into non-volatile memory in the memory pack. Remove the memory pack from the program loader, and install the memory pack into the CPU module. The user program and data in the CPU RAM are backed up by an internal super capacitor.			
	PF3S-CP11T	Transfer a user program from the program loader to the EEPROM in the CPU module (memory pack is not used). The user program and data in the CPU RAM are backed up by a super capacitor and a lithium primary battery. If the data in the CPU RAM is destroyed after a power failure longer than the backup period, an error code is stored when the CPU is powered up. When the lithium battery becomes exhausted, the BATT NG indicator and internal relay M634 go on to signal that the data in the CPU RAM cannot be backed up. If the CPU is powered down at this point, the data in the CPU RAM may be destroyed.			
Control System		Stored program system			
Instruction Words		For details about instruction words, see the FA-3S User's Manual.			
Maximum I/O Points		Input: 128 points maximum Output: 128 points maximum Total I/O: 256 points maximum		Input: 256 points maximum Output: 256 points maximum Total I/O: 512 points maximum	
Processing Time		6 µsec/basic instruction (average)		0.3 µsec/basic instruction (average)	
Internal Relay		608 points (240 points can be maintained)		1024 points (240 points can be maintained)	
Special Internal Relay		16 points	18 points	32 points	
Data Register		400 points (all points can be maintained)		1000 points (all points can be maintained)	
Shift Register		128 points (all points can be maintained)		224 points (all points can be maintained)	
Timer		80 points		256 points	
10-msec Timer		80 points (advanced instruction T10MS used)			
Adding Counter		45 points (all points can be maintained)		100 points (all points can be maintained)	
Reversible Counter		2 points (maintained): Dual-pulse reversible and up/down selection reversible counters			

Function Specifications, continued

<table>
<tr><td rowspan="8">Self-diagnostic Function</td><td>Flow Chart</td><td>PLC Execution Cycle
 
</td></tr>
<tr><td>System Initialization</td><td>Keep data sum check</td></tr>
<tr><td>Internal Processing A</td><td>Power failure check, WDT (watchdog timer) check, user program sum check</td></tr>
<tr><td>Read Inputs</td><td>Update input data</td></tr>
<tr><td>Internal Processing B</td><td>Processed only once immediately after starting to run:
User program CRC check, timer/counter preset value CRC check</td></tr>
<tr><td>Execute Program</td><td>Execute the user program</td></tr>
<tr><td>Update Outputs</td><td>Update outputs</td></tr>
<tr><td>Loader Communication</td><td>User program syntax check, user program writing check</td></tr>
<tr><td colspan="3">Scanning Process and WDT
 

When the scan time is longer than the WDT preset value (500 msec), error indicator ERROR flashes and the PLC stops operation.</td></tr>
<tr><td colspan="2">Basic Instruction Execution Time</td><td>For details, see the user's manual.
PF3S-CP11: 6 µsec
PF3S-CP11T: 6 µsec
PF3S-CP12: 0.3 µsec
PF3S-CP13: 0.3 µsec</td></tr>
<tr><td colspan="2">Total Response Time</td><td>8 sec maximum</td></tr>
<tr><td colspan="2">Effect on Processing Time by physically/logically connecting/disconnecting non-permanent peripheral equipment</td><td>The scan time is extended by a maximum of 5 msec.</td></tr>
<tr><td colspan="2">Start/Stop Method</td><td>Turning power on and off.
Turning special internal relay M301 (701) and M302 (702) on and off.</td></tr>
<tr><td rowspan="3">Restart</td><td>Cold Restart</td><td>Possible to restart using a user program</td></tr>
<tr><td>Warm Restart</td><td>Possible to restart using program loader, power supply, or special internal relay</td></tr>
<tr><td>Hot Restart</td><td>Impossible because timer data cannot be maintained</td></tr>
<tr><td colspan="2">Stop/Reset Using External Signal</td><td>Possible using inputs designated by FUN4 and FUN5 as a stop or reset input</td></tr>
</table>

Function Specifications, continued

			Mode	PF3S-CP11	PF3S-CP11T	PF3S-CP12	PF3S-CP13
System Statuses during Running, Reset, Stop, and Restart	Outputs		Run	Operating	Operating	Operating	Operating
			Reset	OFF	OFF	OFF	OFF
			Stop	OFF	OFF	OFF	OFF
			Restart	Unchanged	Unchanged	Unchanged	Unchanged
	Internal Relays, Shift Registers, Adding Counters (Current Value)	Keep Type	Run	Operating	Operating	Operating	Operating
			Reset	Clear	Clear	Clear	Clear
			Stop	Unchanged	Unchanged	Unchanged	Unchanged
			Restart	Unchanged	Unchanged	Unchanged	Unchanged
		Clear Type	Run	Operating	Operating	Operating	Operating
			Reset	Clear	Clear	Clear	Clear
			Stop	Unchanged	Unchanged	Unchanged	Unchanged
			Restart	Clear	Clear	Clear	Clear
	100-msec Timers (Current Value)		Run	Operating	Operating	Operating	Operating
			Reset	Unchanged	Unchanged	Reset to zero	Reset to zero
			Stop	Unchanged	Unchanged	Unchanged	Unchanged
			Restart	Reset to preset	Reset to preset	Reset to preset	Reset to preset
	10-msec Timers (Current Value)		Run	Operating	Operating	Operating	Operating
			Reset	Unchanged	Unchanged	Reset to zero	Reset to zero
			Stop	Unchanged	Unchanged	Unchanged	Unchanged
			Restart	Unchanged	Unchanged	Unchanged	Unchanged
	Reversible Counters C45 and C46 (Current Value)		Run	Operating	Operating	Operating	Operating
			Reset	Unchanged	Unchanged	Reset to zero	Reset to zero
			Stop	Unchanged	Unchanged	Unchanged	Unchanged
			Restart	Unchanged	Unchanged	Unchanged	Unchanged
	Data Registers		Run	Operating	Operating	Operating	Operating
			Reset	Reset to zero	Reset to zero	Reset to zero	Reset to zero
			Stop	Unchanged	Unchanged	Unchanged	Unchanged
			Restart	Unchanged	Unchanged	Unchanged	Unchanged

Communication Specifications

General		The communication port is used to connect to the program loader, and is also used to set up a computer link system. For details, see 1:1 and 1:N Personal Computer Link System User Manuals.
Name		Program channel
Connection to Program Loader		Using loader extension cable PFA-1A11
Cable	**1:1 Computer Link**	Using computer link cable PFA-1A54
	1:N Computer Link	Using ø0.9mm shielded twisted-pair cable
	Conductor Resistance	85 Ω/km maximum
	Shield Resistance	12 Ω/km maximum
Slave Stations in 1:N Computer Link		32 slave stations maximum
Total Cable Length		1.2 km maximum Between FA-3S units: 300m Between computer and link main unit: Approx. 15m
Link Main Unit		PFJ-U22
Link Unit		PFJ-U21
Link Adapter		PF2-CLA
Standard		Compliance with EIA RS485 standard (termination resistor is not needed)
Warning and Caution when Changing Control Status		Change the control status while the FA-3S is stopped.

Cable Link Main Unit PFJ-U22

Power Voltage	100 to 200V AC +10% to –15%, 50/60 Hz
Storage Temperature	–20 to +70°C
Operating Temperature	0 to +55°C
Indicators	Power, data transmit, data receive
Power Consumption	6 VA
Weight	Approx. 800g

Cable Link Unit PFJ-U21

Power Voltage	12V DC ±10% (supplied from FA-3S)
Storage Temperature	–20 to +70°C
Operating Temperature	0 to +55°C
BUSY Indicator	Stand-by: Dim ON, During communication: Bright ON
Current Draw	120 mA
Weight	Approx. 250g

Cable Link Transmission

Transmission System	Between computer and cable link main unit: Compliance with RS232C serial interface EIA Between units: Compliance with RS422 EIA
Communication System	One-way, half-duplex
Communication Mode	1:N (network communication)
Transmission Line	4-core twisted pair cable, ø0.9mm minimum (shielded cable)
Transmission Speed	9,600 bps
Transmission Delay Time	Approx. 2.5 µsec (cable length 300m per unit)
Synchronization System	Start-stop synchronization
Error Check	Even parity, check sum
Transmission Procedure	Special
Connectable Units	32 units maximum
Transmission Distance	Between computer and cable link main unit: 15m maximum Between units: 300m

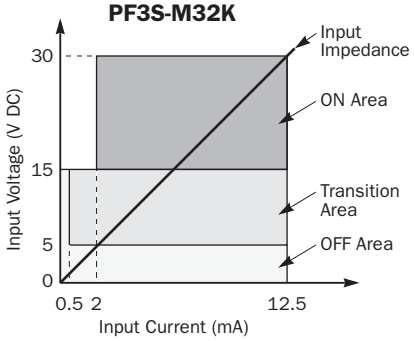
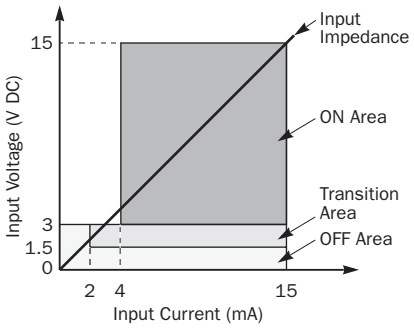
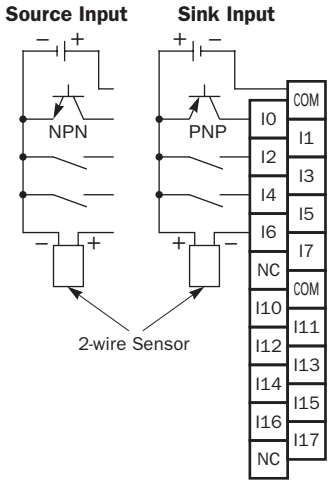
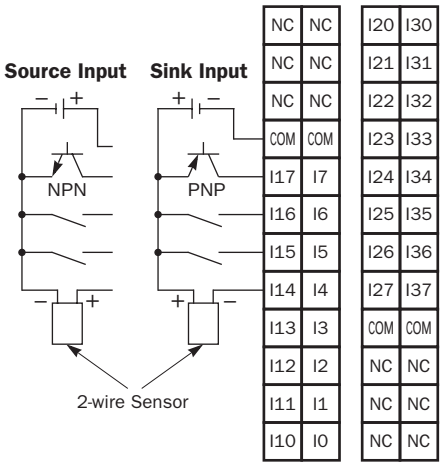
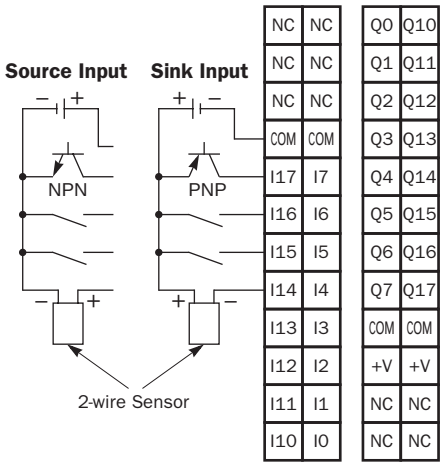
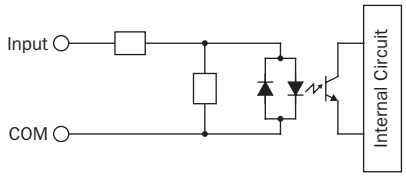
Link Adapter PF2-CLA

Transmission System	Compliance with RS232C serial interface EIA
Communication System	4-wire half-duplex start-stop synchronization
Transmission Distance	Between FA-3S and computer: 15m maximum
Data Format	Baud rate: 9,600 bps Start bit: 1 bit Stop bit: 1 bit Parity: Even parity Data bits: 8 bits Used code: ASCII code (character code)
Operating Temperature	0 to +55°C
Power Voltage	12V DC ±10% (supplied from FA-3S)
Internal Current Draw	20 mA (while communicating between FA-3S CPU module and computer)
Weight	Approx. 160g

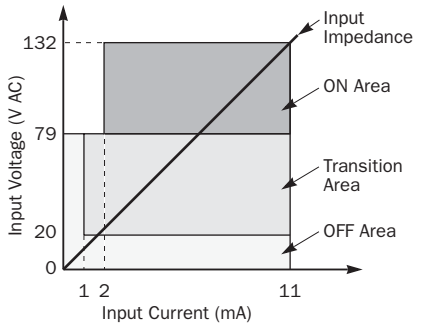
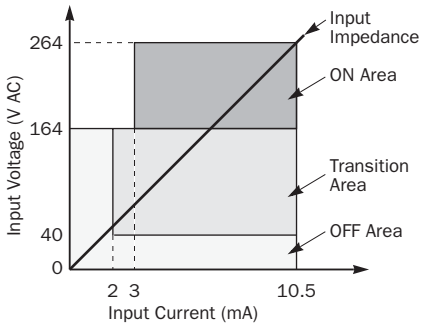
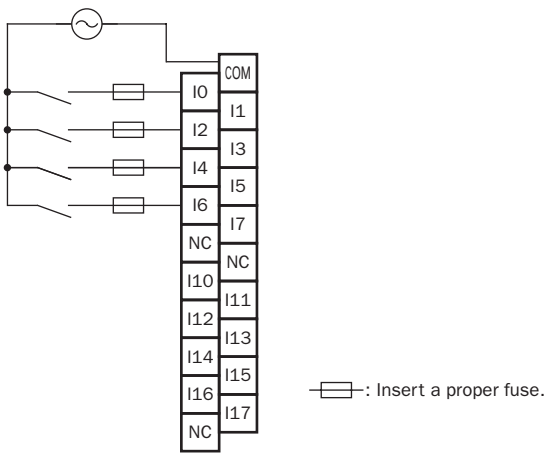
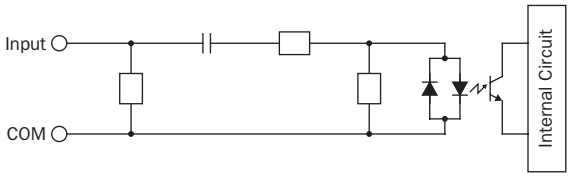
Noise Immunity Specifications

Damped Oscillatory Wave		Serial mode	
	Power Terminals	±2.0 kV minimum	
	I/O Terminals	±2.0 kV minimum	
	Loader Port	±2.0 kV minimum	
Electrostatic Discharge		Contact discharge: ±6 kV Aerial discharge: ±8 kV	
Fast Transient Burst		Common mode	
	Power Terminals	±2.0 kV minimum	
	I/O Terminals	±2.0 kV minimum	
	Loader Port	±1 kV minimum (coupling box)	
Dielectric Shock		Line to line	Line to ground
	Power Terminals	+2.5 kV, –1.5 kV	±2.5 kV
Electromagnetic Field		10 V/m	
Electromagnetic Interference's FCC EN55022		Class A	

Digital DC Input Specifications

Rated Input Voltage		24V DC (sink/source input type) 5V DC (sink/source input type)
Input Operating Range		**PF3S-N16B** **PF3S-N32B** **PF3S-M32K**  **PF3S-N325B** **PF3S-M325K** 
Input Impedance		2.4 kΩ (24V DC input type), 1 kΩ (5V DC input type)
Input Delay Time	**Turn ON Time**	3 msec maximum
	Turn OFF Time	5 msec maximum
Common and Input Points		PF3S-N16B: 16 input points connected in 2 common lines PF3S-N32B and -N325B: 32 input points connected in 4 common lines PF3S-M32K and -M325K: 16 input points connected in 2 common lines
Isolation		Between input terminals: Not isolated Internal circuit: Photocoupler isolated
Input Type		Type 1 (IEC 1131)
External Load for I/O Interconnection		Not needed
Signal Determination Method		Static
Installation/Removal of Modules while Power is on		Permanent damage or malfunction may be caused.
Effect of Improper Input Connection		Permanent damage may be caused.
Input Terminal Arrangement and Wiring Diagram		**PF3S-N16B**  **PF3S-N32B** **PF3S-N325B**  **PF3S-M32K** **PF3S-M325K** 
Input Internal Circuit		

Digital AC Input Specifications

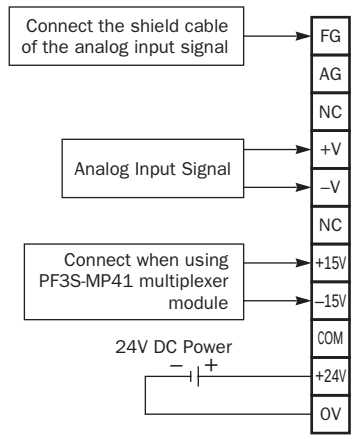
Rated Input Voltage		100V AC and 200V AC (2 types)
Input Operating Range		**PF3S-N16A1 (100V AC Input)**  **PF3S-N16A2 (200V AC Input)** 
Input Impedance		12 kΩ (100V AC input type), 25 kΩ (200V AC input type)
Input Delay Time	**Turn ON Time**	20 msec maximum (100V AC input type) 25 msec maximum (200V AC input type)
	Turn OFF Time	20 msec maximum (100V AC input type) 25 msec maximum (200V AC input type)
Common and Input Points		16 input points connected in 1 common line (16-input module)
Isolation		Between input terminals: Not isolated Internal circuit: Photocoupler isolated
Input Type		Type 1 (IEC 1131)
Input Signal Phase		All input signals must be of the same phase.
External Load for I/O Interconnection		Not needed
Signal Determination Method		Static
Installation/Removal of Modules while Power is on		Permanent damage or malfunction may be caused.
Effect of Improper Input Connection		Permanent damage may be caused.
Input Terminal Arrangement and Wiring Diagram		**PF3S-N16A1** **PF3S-N16A2** 
Input Internal Circuit		

Analog Input Specifications

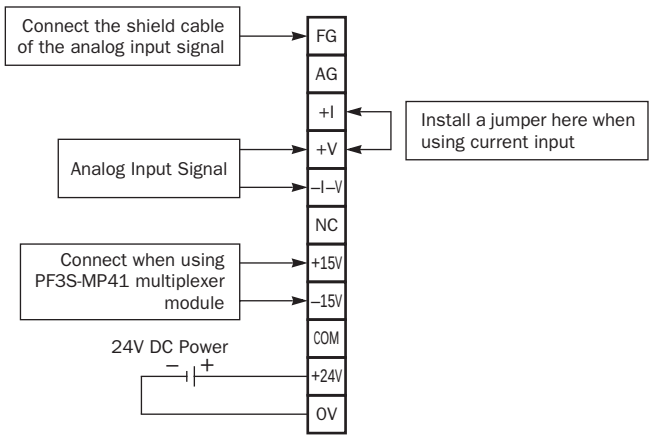
Rated Input Range		PF3S-AD121: 0 to 10V DC PF3S-AD122: 1 to 5V DC or 4 to 20 mA selectable
Input Impedance		PF3S-AD121: 2.2 MΩ minimum PF3S-AD122: 2.2 MΩ minimum (voltage input mode) 250Ω (current input mode)
Input Error	**Maximum Error at 25°C**	±0.5% of full scale
	Temperature Coefficient	0.018 %/°C maximum
	Maximum Error over Full Temperature Range	±1% of full scale
Non-lineality		0.2% maximum
Repeatability after Stabilization Time		0.5% maximum
Monotonicity		Yes
Digital Resolution		4096 increments
Conversion Method		V/F conversion
Data Format Returned to User Program		BCD
Conversion Time		2 scans maximum (when scan time is 4 msec or more) 2 scans + 4 msec maximum (when scan time is less than 4 msec)
Total Input System Transfer Time		1 msec maximum
Sample Duration Time		18 msec maximum
Sample Repetition Time		1 msec maximum
Operating Mode		Self-scan
Input Value of LSB (Least Significant Bit)		PF3S-AD121: 2.4 mV PF3S-AD122: 1.0 mV (voltage input mode), 3.9 µA (current input mode)
Maximum Permanent Allowed Overload (No Damage)		PF3S-AD121: ±15V PF3S-AD122: ±15V (voltage input mode), ±30 mA (current input mode)
Digital Output Reading at Overload		4096
Type of Input		Differential input
Common Mode Characteristics		Common mode reject ratio (CMRR) –80 dB minimum
Other Inputs		Thermocouples cannot be used.
Quantity of Inputs		1 channel
Isolation		Photocoupler isolated
External Load for I/O Interconnection		Not needed
Calibration or Verification to Maintain Rated Accuracy		Once within every 6 months
Maximum Temporary Deviation during Electrical Noise Tests and Test Conditions		The noise test is evaluated on the final equipment. Maximum deviation of the analog input module alone is ±1% of full scale.

Terminal Arrangement and Wiring Diagram

PF3S-AD121

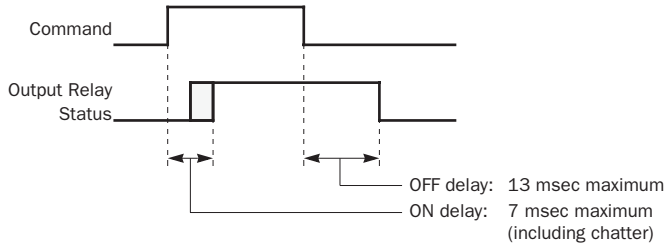
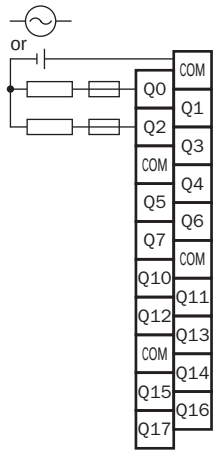
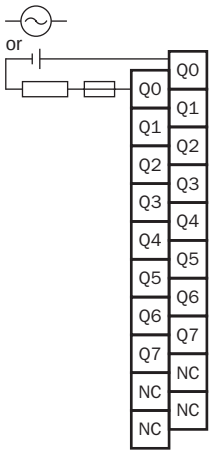


PF3S-AD122

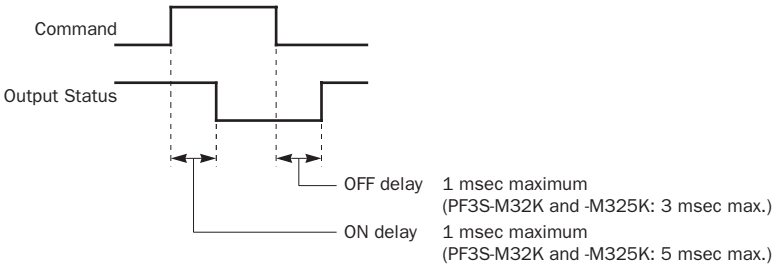


Effect of Improper Lead Connection	Connecting power supply to the analog input terminal may cause damage.

Digital AC/DC Output (RelayOutput) Specifications

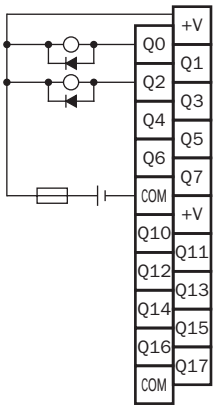
Output Protection		Without protection
Output Delay		
Output Terminal Arrangement and Wiring Diagram		**PF3S-R161 (Relay Output)**  **PF3S-R081 (Relay Output)**  : Insert a proper fuse depending on the load.
Output Points and Common Lines		PF3S-R161: 16 output points in 4 common lines PF3S-R081: Independent 8 output points PF3S-S161: 16 output points in 2 common lines
Relay Output Terminal Ratings	**Relay Contact Rating**	240V AC, 2A (Gen/Res) 30V DC, 2A (Gen/Res) 240V AC, 1.5A (AC-15)
	Minimum Switching Load	1 mA/5V DC (reference value)
	Initial Contact Resistance	50 mΩ maximum
	Electrical Life	100,000 operations minimum (rated load 1,800 operations/hour)
	Mechanical Life	20,000,000 operations minimum (no load 18,000 operations/hour)
Effect of Improper Output Connection		When a current larger than the rated current flows, permanent damage such as contact welding may be caused.
Output Status by MPU Operation	**Stop**	OFF
	Power Interruption over 20 msec	OFF
	Power Interruption over 10 msec up to 20 msec	When using AC power module: ON/OFF status maintained When using DC power module: OFF
	Power Interruption up to 10 msec	ON/OFF status maintained
	Power Up	OFF until MPU starts to run

Digital DC Output (Transistor Output) Specifications

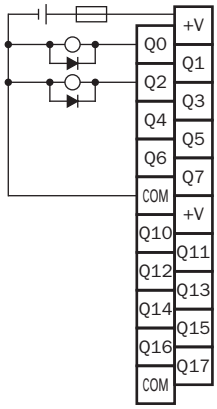
Output Protection		Without protection
Output Delay		
Output Terminal Ratings	**Rated Load Voltage**	12 to 24V DC (PF3S-T325K and -M325K: 5 to 12V DC)
	Operating Load Voltage Range	10.8 to 26.4V DC (PF3S-T325K and -M325K: 4.5 to 13.2V DC)
	Maximum Load Current	PF3S-T16K and -T16S: 0.5A per output point, 3.0A per common line PF3S-T32K: 0.1A per output point, 0.5A per common line Others: 0.1A per output point, 0.8A per common line
	Voltage Drop (ON Voltage)	1.5V maximum (voltage between COM and output terminal when output is on)
	Maximum Inrush Current	PF3S-T16K and -T16S: 8.0A PF3S-T32K: 0.5A Others: 1A
	Leakage Current	PF3S-M32K: 500 µA maximum Others: 100 µA maximum

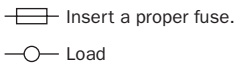
Output Terminal Arrangement and Wiring Diagram

PF3S-T16K

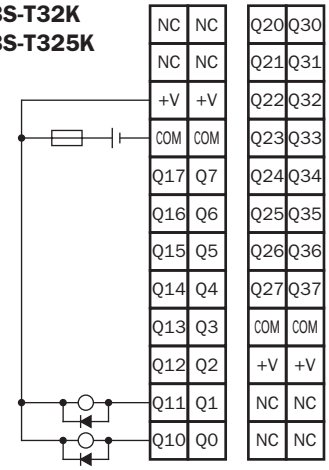


PF3S-T16S

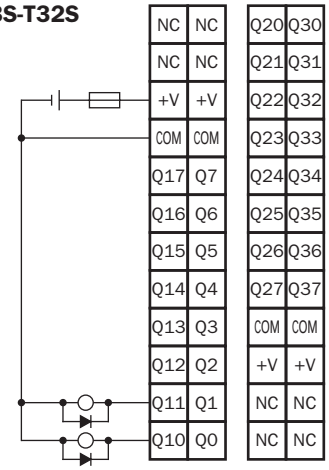




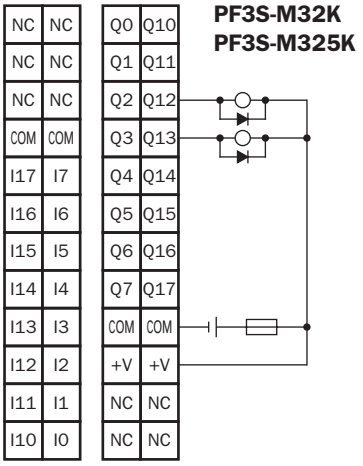
PF3S-T32K
PF3S-T325K



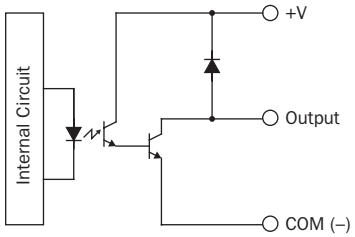
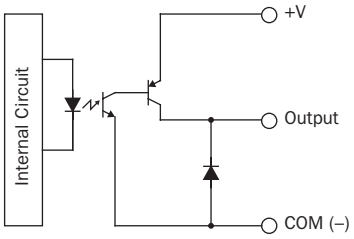
PF3S-T32S



PF3S-M32K
PF3S-M325K



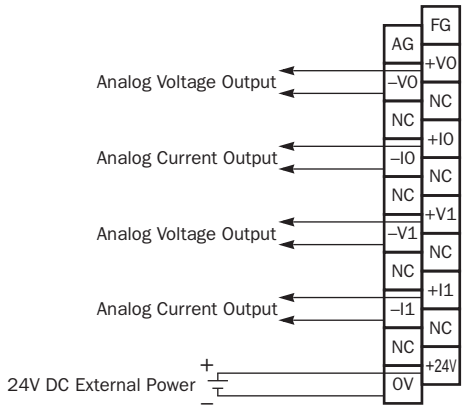
Digital DC Output (Transistor Output) Specifications, continued

Output Points and Common Lines		PF3S-T16K and -T16S: 16 output points in 2 common lines PF3S-T32K, -T32S, and -T325K: 32 output points in 4 common lines PF3S-M32K and -M325K: 16 output points in 2 common lines
External Current Draw		PF3S-T16K and -T16S: 40 mA maximum per common line PF3S-T32K and -T32S: 25 mA maximum per common line PF3S-T325K and -M325K: 35 mA maximum per common line PF3S-M32K: 20 mA maximum per common line
Isolation		Between output terminal and FG: 1,500V AC Between output terminal and internal circuit: Photocoupler isolated Between output terminals: Not isolated
Output Internal Circuit		**Sink Output Type**  **Source Output Type** 
Effect of Improper Output Connection		When a current larger than the rated current flows, permanent damage may be caused on output elements.
Output Status by MPU Operation	**Stop**	OFF
	Power Interruption over 20 msec	OFF
	Power Interruption over 10 msec up to 20 msec	When using AC power module: ON/OFF status maintained When using DC power module: OFF
	Power Interruption up to 10 msec	ON/OFF status maintained
	Power Up	OFF until MPU starts to run

Analog Output Specifications

Rated Output Range		0 to 10V DC or 4 to 20 mA selectable
Allowable Load Impedance		110Ω maximum (voltage output mode) 270Ω maximum (current output mode)
Output Error	**Maximum Error at 25°C**	±0.5% of full scale
	Temperature Coefficient	0.018 %/°C maximum
	Maximum Error over Full Temperature Range	±1% of full scale
Non-lineality		0.2% maximum
Repeatability after Stabilization Time		0.5% maximum
Monotonicity		Yes
Digital Resolution		4096 increments
Data Format Returned to User Program		BCD
Total Output System Transfer Time		1 msec maximum
Output Value of LSB (Least Significant Bit)		2.4 mV (voltage output mode) 3.9 µA (current output mode)
Settling Time after Maximum Range Change		0.5 sec maximum after changing from 0% to 95%
Overshoot		0%
Maximum Voltage Drop across Output Terminals over Full Output Range		1 LSB maximum
Isolation		Photocoupler isolated
Quantity of Outputs		2 channels
Allowable Load Type		Resistive load
Output Ripple		1 LSB maximum

Analog Output Specifications, continued

Output Response at Power Up and Down	Power Up: Converted value Power Down: OFF
External Current Draw	135 mA maximum
Calibration or Verification to Maintain Rated Accuracy	Once within every 6 months
Maximum Temporary Deviation during Electrical Noise Tests and Test Conditions	The noise test is evaluated on the final equipment. Maximum deviation of the analog output module alone is ±1% of full scale.
Terminal Arrangement and Wiring Diagram	
Effect of Improper Lead Connection	Damage may be caused.

Remote I/O Specifications

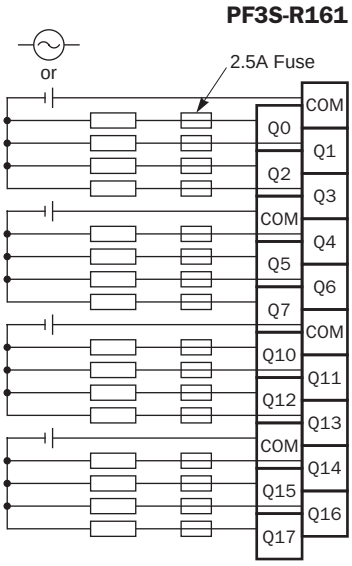
Specifications of Cables and Units for Remote I/O Communication	See FA-3S User's Manual EM267, chapters 4 and 27.
Remote I/O System Setup	See FA-3S User's Manual EM267, chapter 27.
Remote I/O Network Types	See FA-3S User's Manual EM267, chapters 4 and 27.
Data Transfer Capability	See FA-3S User's Manual EM267, chapters 4 and 27.
Communication Speed	See FA-3S User's Manual EM267, chapter 4.
Remote I/O Timing Diagrams and Delay	See FA-3S User's Manual EM267, chapter 27.
Data on Structure	See FA-3S User's Manual EM267, chapter 27.
I/O Modules Incompatible with Remote I/O	PF3S-HSL1 high-speed I/O module cannot be used in Remote I/O.
Redundancy Characteristics and Structure	None
Modem and Repeater	Modem and repeater cannot be used in Remote I/O.
Termination Parts	Protection cover (See FA-3S User's Manual EM267, chapter 27.)
Electrical and Mechanical Characteristics of Communication Interface	See FA-3S User's Manual EM267, chapters 4 and 27.
Standard Link Interface	Original protocol using optical communication
Function and Protective Ground	Not needed
Connection/Disconnection Order	Connection must be done before system power up. Disconnection must be done before system power down.

Peripherals

Precautions for Changing Control Status	Stop the FA-3S operation before changing the control status.
Applicability of Peripherals to Remote I/O	Impossible

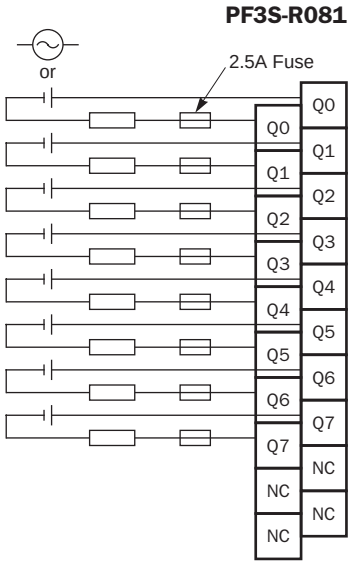
Selecting Fuse against Output Overload and Short-circuitry

For Output Circuits of 16-point Relay Output Module PF3S-R161



Insert a fuse of 2.5A per output point on the positive side of each load.
Use IEC-approved Time-Lag High-Breaking type fuses.
The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

For Output Circuits of 8-point Independent Relay Output Module PF3S-R081

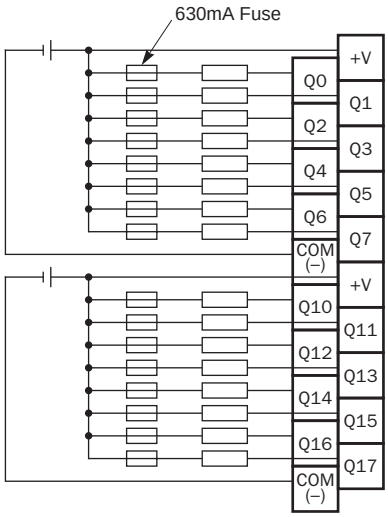


Insert a fuse of 2.5A per output point on the positive side of each load.
Use IEC-approved Time-Lag High-Breaking type fuses.
The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

Selecting Fuse against Output Overload and Short-circuitry, continued

For Output Circuits of 16-point Transistor Sink Output Module PF3S-T16K

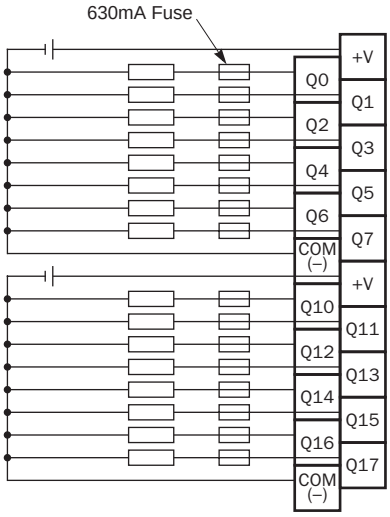
PF3S-T16K



Insert a fuse of 630 mA per output point on the positive side of each load.
Use IEC-approved Time-Lag High-Breaking type fuses.
When using an inductive load, connect a diode to protect the internal output elements.
The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

For Output Circuits of 16-point Transistor Source Output Module PF3S-T16S

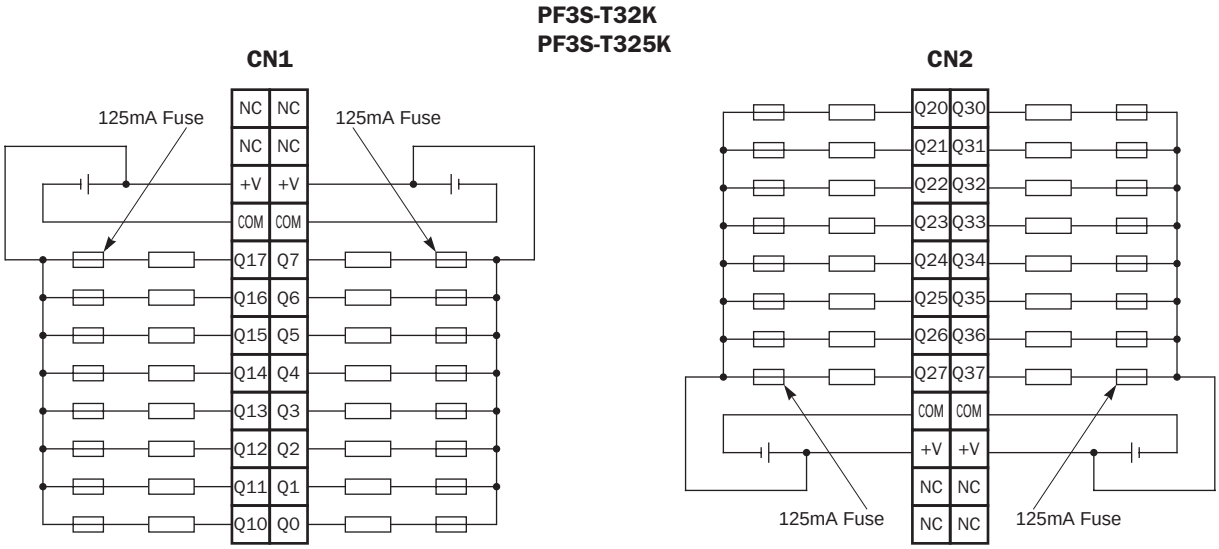
PF3S-T16S



Insert a fuse of 630 mA per output point on the positive side of each load.
Use IEC-approved Time-Lag High-Breaking type fuses.
When using an inductive load, connect a diode to protect the internal output elements.
The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

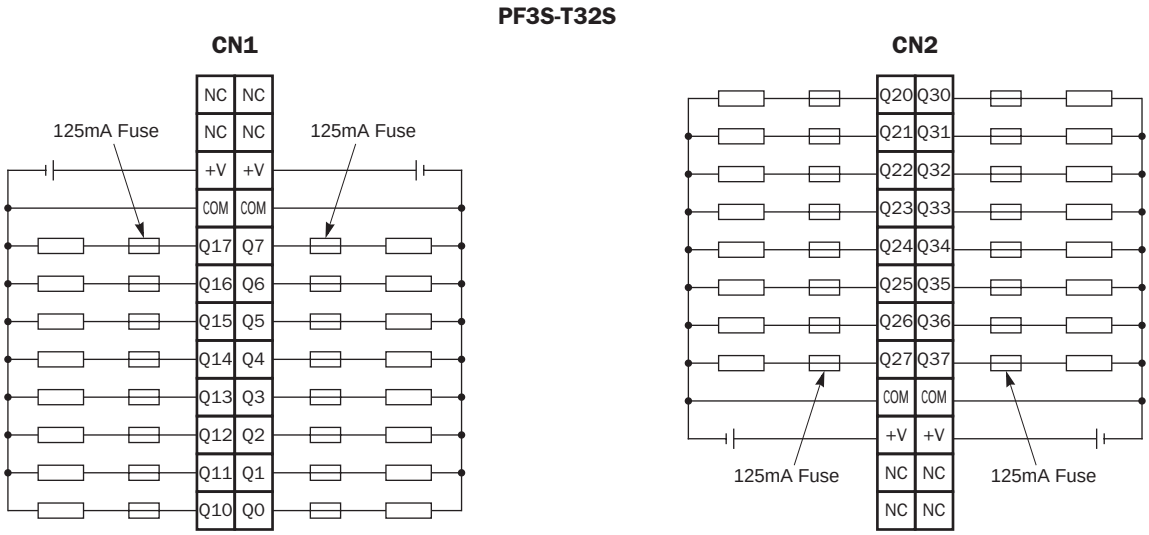
Selecting Fuse against Output Overload and Short-circuitry, continued

For Output Circuits of 32-point Transistor Sink Output Modules PF3S-T32K and PF3S-T325K



Insert a fuse of 125 mA per output point on the positive side of each load.
Use IEC-approved Time-Lag High-Breaking type fuses.
When using an inductive load, connect a diode to protect the internal output elements.
The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

For Output Circuits of 32-point Transistor Source Output Module PF3S-T32S



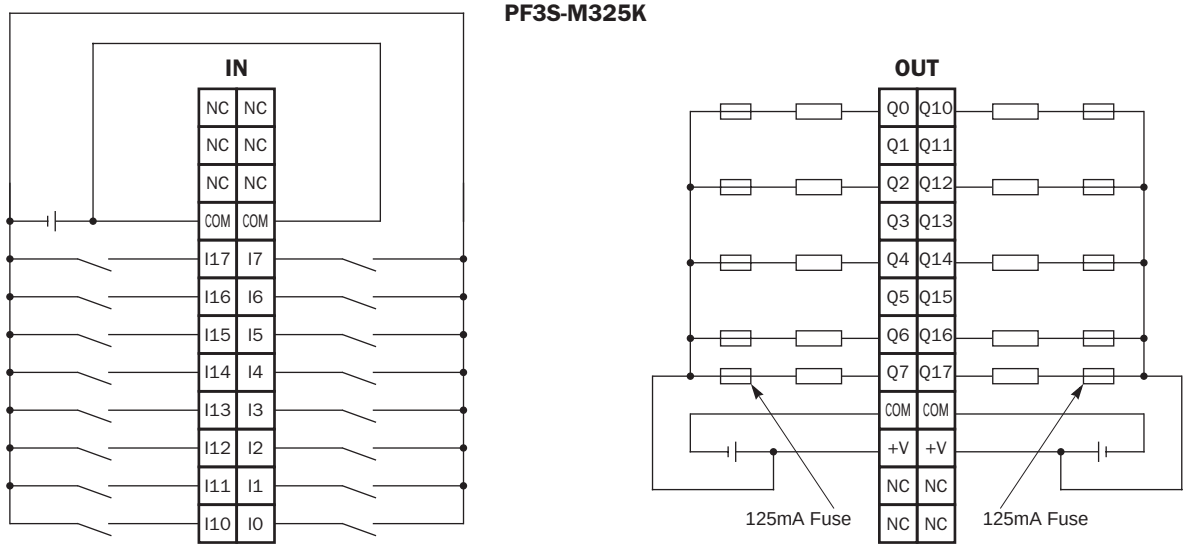
Insert a fuse of 125 mA per output point on the positive side of each load.
Use IEC-approved Time-Lag High-Breaking type fuses.
When using an inductive load, connect a diode to protect the internal output elements.
The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

Selecting Fuse against Output Overload and Short-circuitry, continued

For Transistor Sink Output Circuits of 32-point I/O Modules PF3S-M32K and PF3S-M325K

Note: The PF3S-M32K has maximum load current ratings of 0.1A per output point and 0.5A per common line. When using at the maximum load, only 5 outputs can be used per common line simultaneously. The PF3S-M325K can use 8 outputs per common line simultaneously at the maximum load.

PF3S-M32K
PF3S-M325K



Insert a fuse of 125 mA per output point on the positive side of each load.

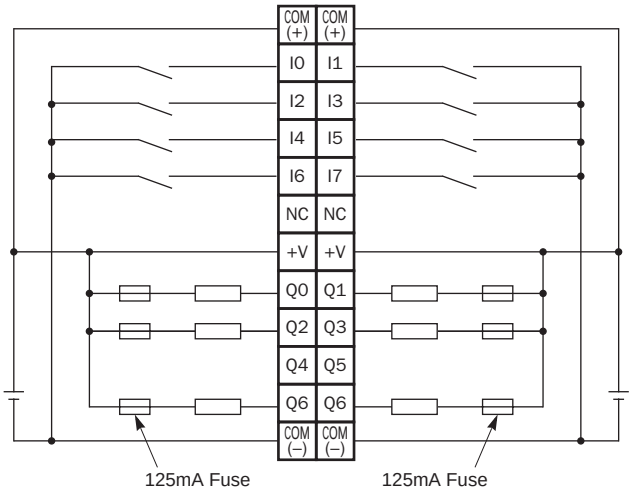
Use IEC-approved Time-Lag High-Breaking type fuses.

When using an inductive load, connect a diode to protect the internal output elements.

The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

For Transistor Sink Output Circuits of High-speed I/O Module PF3S-HSL1

PF3S-HSL1



Note: The PF3S-HSL1 has maximum load current ratings of 0.1A per output point and 0.6A total. When using at the maximum load, only 6 outputs can be used simultaneously. Since the two COM(–) terminals are connected together internally, the PF3S-HSL1 has only one common output line.

Insert a fuse of 125 mA per output point on the positive side of each load.

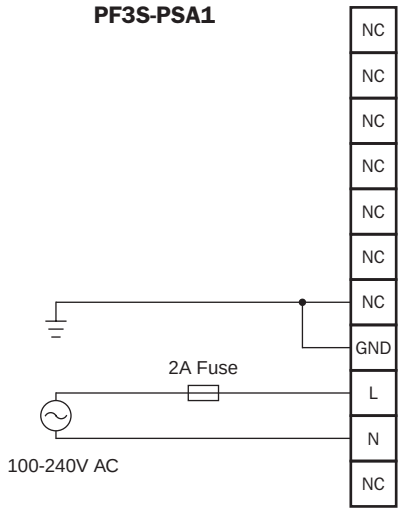
Use IEC-approved Time-Lag High-Breaking type fuses.

When using an inductive load, connect a diode to protect the internal output elements.

The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

Selecting Fuse for Power Module

For Power Circuits of Standard Power Module PF3S-PSA1



Insert a fuse of 2A on the L side of the AC power line.

Use IEC-approved Time-Lag High-Breaking type fuses.

The figure above illustrates a method to comply with EN61131. In practical applications, select a proper fuse depending on the load, and insert the fuse at a proper place.

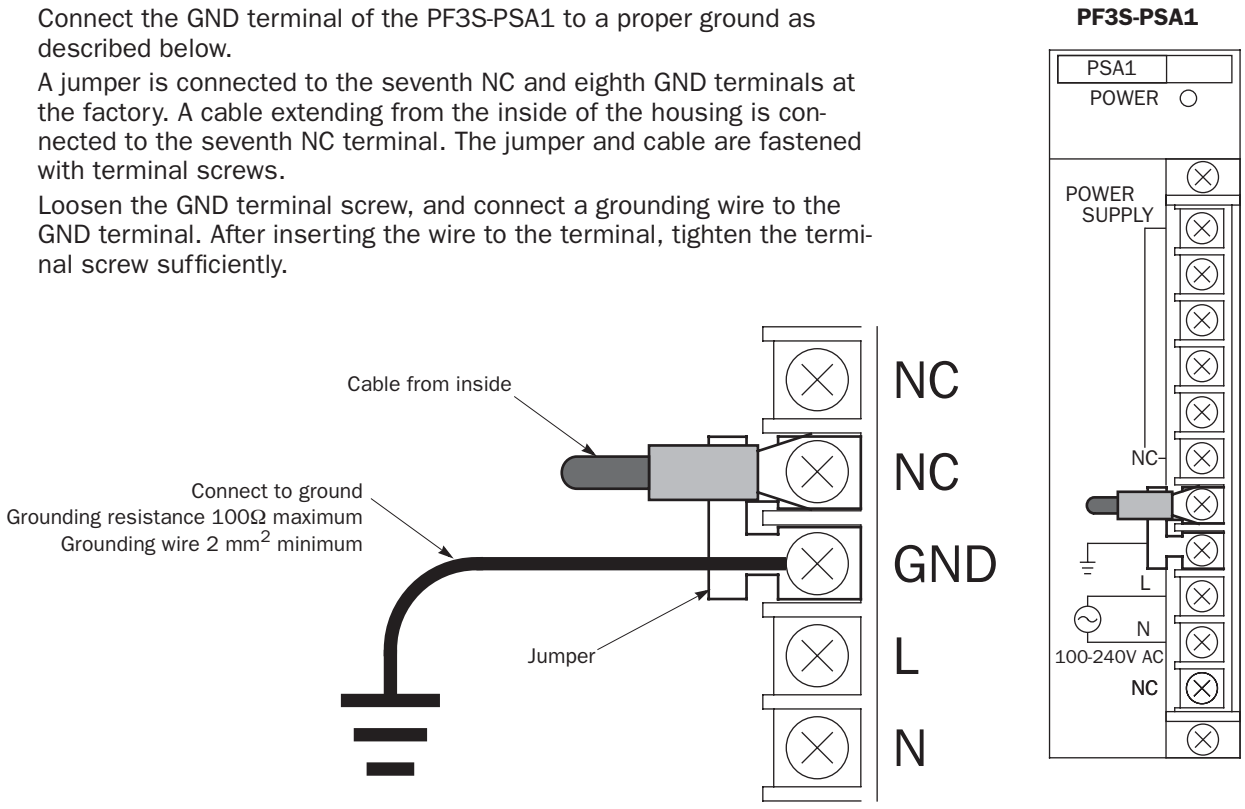
Grounding the Power Module

For the Ground Terminal of Standard AC Power Module PF3S-PSA1

Connect the GND terminal of the PF3S-PSA1 to a proper ground as described below.

A jumper is connected to the seventh NC and eighth GND terminals at the factory. A cable extending from the inside of the housing is connected to the seventh NC terminal. The jumper and cable are fastened with terminal screws.

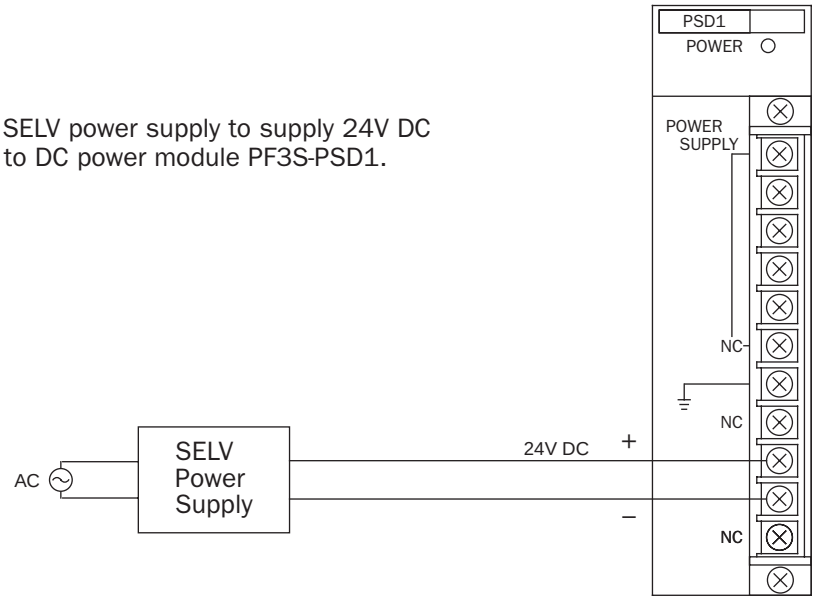
Loosen the GND terminal screw, and connect a grounding wire to the GND terminal. After inserting the wire to the terminal, tighten the terminal screw sufficiently.



Notes for Using DC Power—SELV (Safety Extra Low Voltage) Power Supply

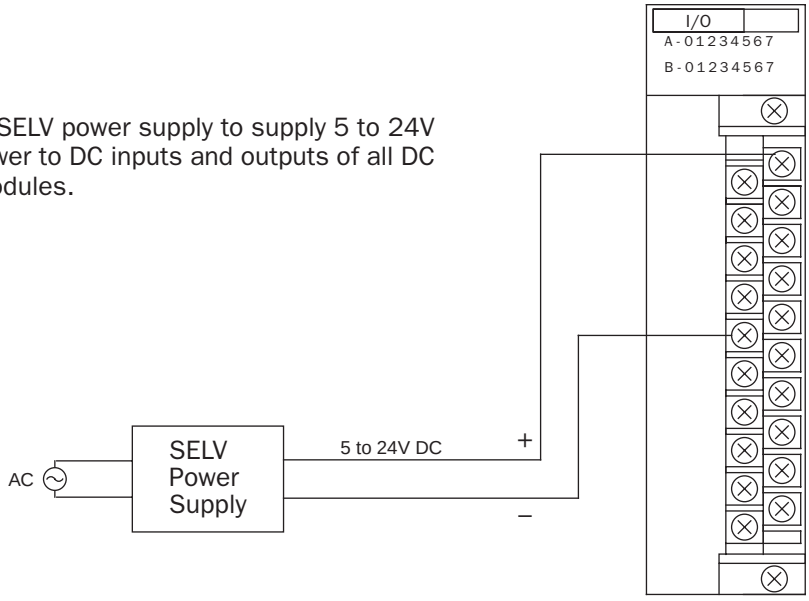
For Power Supply of DC Power Module PF3S-PSD1

Use a SELV power supply to supply 24V DC power to DC power module PF3S-PSD1.



For Power Supply of DC Input and Output Circuits in All DC I/O Modules

Use a SELV power supply to supply 5 to 24V DC power to DC inputs and outputs of all DC I/O modules.



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