

**Panasonic**

PROGRAMMABLE CONTROLLERS

# FP7 CPU Hardware

User's Manual

## Before beginning

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### Limited warranty

If physical defects caused by distribution are found, PEWEU will replace/repair the product free of charge. Exceptions include:

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- When physical defects are due to defective equipment other than the distributed product.
- When physical defects are due to modifications/repairs by someone other than PEWEU.
- When physical defects are due to natural disasters.

## Warnings used in this manual

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One or more of the following warnings may be used in this documentation:

### DANGER



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

### WARNING



Indicates a hazardous situation which, if not avoided, could result in serious or moderate injury.

### CAUTION



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

### NOTICE

Indicates a property damage message.

## Scope of this manual

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This manual covers:

- CPU parts and functions
- tips on power supply selection
- restrictions on unit combinations
- FP7 power supply parts and functions
- I/O allocation methods
- installation, wiring, and operating instructions
- SD memory card and backup instructions
- troubleshooting information
- maintenance instructions
- an appendix with:
  - specifications of FP7 CPU types
  - specifications of FP7 power supply units
  - error codes
  - unit dimensions

Please refer to the FP Series Programming Manual, or to the online help of Control FPWIN Pro for information on:

- system instructions
- special internal relays
- data registers
- system variables
- memory area tables
- programming examples

For documentation on other units used with the FP7, please refer to the hardware manual for that unit.

All manuals can be downloaded from the Panasonic Web site (<http://www.panasonic-electric-works.com>).

# Safety measures

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## Operating environment

After installing the unit, make sure to use it within the range of the general specifications:

- Ambient temperature: 0°C to +55°C
- Ambient humidity: 10%–95% RH (at 25°C, non-condensing)
- Pollution degree: 2
- Do not use the unit in the following environments:
  - Direct sunlight
  - Sudden temperature changes causing condensation
  - Inflammable or corrosive gases
  - Excessive airborne dust, metal particles or salts
  - Benzine, paint thinner, alcohol or other organic solvents or strong alkaline solutions such as ammonia or caustic soda
  - Vibration, shock or direct drop of water
  - Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges. Maintain at least 100mm of space between these devices and the unit.

## Static electricity

Before touching the unit or equipment, always touch some grounded metal to discharge any static electricity you may have generated (especially in dry locations). The discharge of static electricity can damage parts and equipment.

## Protection of power supply

- Use a twisted power supply wire.
- Isolate the wiring systems to the CPU, input/output devices, and mechanical power apparatus.
- An insulated power supply with an internal protective circuit should be used (FP power supply). The power supply for the CPU is a non-insulated circuit, so if an incorrect voltage is directly applied, the internal circuit may be damaged or destroyed.

- If using a power supply device without an internal protective circuit, always make sure power is supplied to the unit through a protective element such as a fuse.
- Be sure to supply power to a CPU and an expansion unit from the same power supply, and turn the power on and off simultaneously for both.

## **Power supply sequence**

Make sure the power supply of the CPU turns off before the power supply for input and output. If the power supply for input and output is turned off first, the CPU will detect the input fluctuations and may begin an unexpected operation.

## **Before turning on the power**

When turning on the power for the first time, be sure to take the precautions given below.

- During installation, check that there are no scraps of wiring, particularly conductive fragments, adhering to the unit.
- Verify that the power supply wiring, I/O wiring, and power supply voltage are all correct.
- Sufficiently tighten the installation and terminal screws.
- Set the operation mode selector to PROG mode.

## **Request concerning program storage**

To prevent the accidental loss of programs, the user should consider the following measures:

- Backing up programs: To avoid accidentally losing programs, destroying files, or overwriting the contents of a file, use the backup or export functions of Control FPWIN Pro and store the files in a safe place. Additionally, you can print out the entire project documentation.
- Specifying passwords: The password setting is designed to avoid programs being accidentally overwritten. If the password is forgotten, however, it will be impossible to overwrite the program even if you want to. Also, if a password is forcibly bypassed, the program is deleted. Therefore, please note the password in a safe location.

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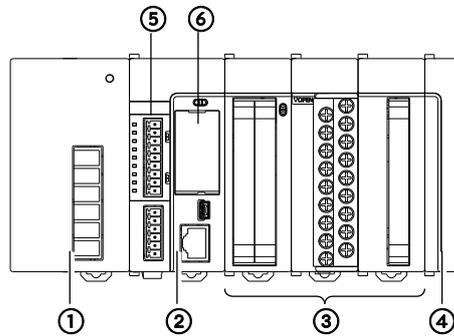
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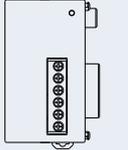
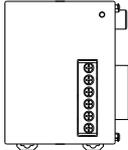
# Chapter 1

## Overview

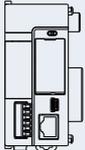
### 1.1 Unit types



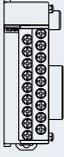
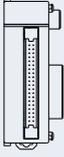
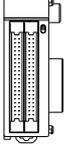
#### ① Power supply unit

Product	Description	Product no.
	100–240V AC, 24W	AFP7PSA1
	100–240V AC, 43W	AFP7PSA2

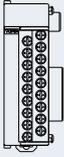
#### ② CPU

Product	Ethernet function	Product no.
	●	AFP7CPS41E
	●	AFP7CPS31E
	–	AFP7CPS31

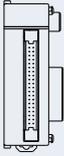
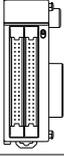
### ③ Digital I/O unit

Product	Description	Product no.
	Input unit, 16 inputs, 12–24V DC	AFP7X16DW
	Output unit, 16 outputs Relay	AFP7Y16R
	Output unit, 16 outputs, sink (NPN)	AFP7Y16T
	Output unit, 16 outputs, source (PNP)	AFP7Y16P
	Input unit, 32 inputs, 24V DC, MIL connector	AFP7X32D2
	Output unit, 32 outputs, sink (NPN), MIL connector	AFP7Y32T
	Output unit, 32 outputs, source (PNP), MIL connector	AFP7Y32P
	Input unit, 64 inputs, 24V DC, MIL connector	AFP7X64D2
	Output unit, 64 outputs, sink (NPN), MIL connector	AFP7Y64T
	Output unit, 64 outputs, source (PNP), MIL connector	AFP7Y64P
	Mixed I/O unit, 32 inputs, 32 outputs, sink (NPN), MIL connector	AFP7XY64D2T
	Mixed I/O unit, 32 inputs, 32 outputs, source (PNP), MIL connector	AFP7XY64D2P

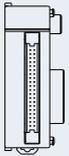
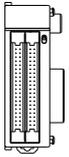
### ③ Analog I/O unit

Product	Description	Product no.
	Input unit, 4 channels	AFP7AD4H
	Output unit, 4 channels	AFP7DA4H

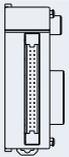
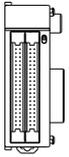
### ③ High-speed counter unit

Product	Description	Product no.
	2 channels	AFP7HSC2T
	4 channels	AFP7HSC4T

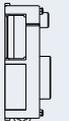
## ③ Pulse output unit

Product	Description	Product no.
	2 axes, pulse train Open collector output, 500kpps	AFP7PG02T
	2 axes, pulse train Line driver output, 4Mpps	AFP7PG02L
	4 axes, pulse train Open collector output, 500kpps	AFP7PG04T
	4 axes, pulse train Line driver output, 4Mpps	AFP7PG04L

## ③ Positioning unit

Product	Description	Product no.
	2 axes, pulse train Open collector output, 500kpps	AFP7PP02T
	2 axes, pulse train Line driver output, 4Mpps	AFP7PP02L
	4 axes, pulse train Open collector output, 500kpps	AFP7PP04T
	4 axes, pulse train Line driver output, 4Mpps	AFP7PP04L

## ③ Serial communication unit

Product	Description	Product no.
	Holds any combination of two communication cassettes with RS232C, RS422, or RS485 ports	AFP7NSC

## ④ End unit

Product	Description	Product no.
	Must be attached at the end of the unit system	AFP7END

⑤ Add-on cassette

- Communication cassette

Product	Description	Product no.
	1xRS232C	AFP7CCS1
	2xRS232C	AFP7CCS2
	1xRS422/RS485	AFP7CCM1
	2xRS422/RS485	AFP7CCM2
	1xRS232C, 1xRS485	AFP7CCS1M1
	1xEthernet	AFP7CCET1

- Application cassette

Product	Description	Product no.
	2-channel analog input, 1-channel analog output	AFP7FCA21
	2-channel analog input	AFP7FCAD2
	2-channel thermocouple input	AFP7FCTC2

⑥ CPU options

- Backup battery

Product	Description	Product no.
	Required for clock/calendar function	AFPX-BATT

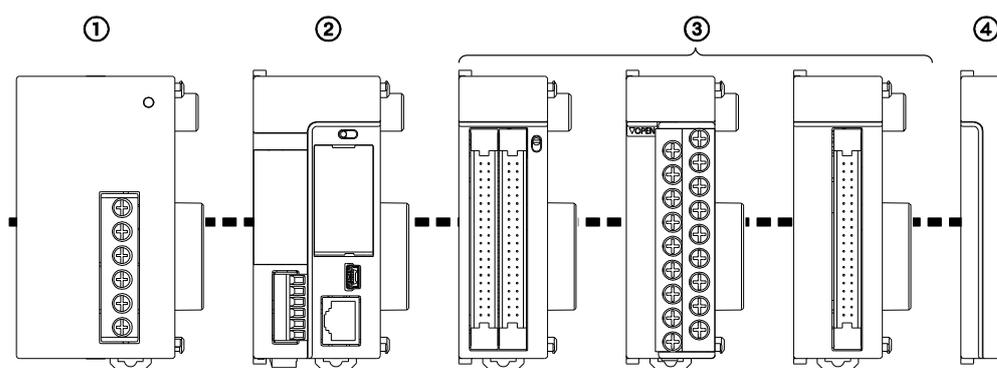
- SD memory card

Product	Description
	Commercially available SD card For project backup and SD memory card operation

## 1.2 Restrictions on unit combination

A maximum of 16 expansion units can be connected to the FP7 CPU, these expansion units being either I/O expansion units or intelligent units. An end unit must be connected to the end of the system.

Power for the internal circuit is either supplied by connecting an FP7 power supply unit or by directly connecting the CPU to an external 24V DC power supply. Make sure the selected power supply is larger than the capacity of the units.



- ① Power supply unit
- ② CPU
- ③ Up to 16 I/O units or intelligent units
- ④ End unit

### 1.2.1 Maximum number of units

Type of unit	Max. number of attachable units
Power supply unit	1
CPU	1
Serial communication unit	8
Other units	16

### 1.2.2 Combination of add-on cassettes

Type of unit	Max. number of attachable cassettes	Add-on cassettes		
		Communication cassette		Application cassette AFP7FC*
		AFP7CCS* AFP7CCM1* (no Ethernet)	AFP7CCET1 (Ethernet)	
CPU	1	●	●	●
Serial communication unit	2/unit	●	-	-

### 1.2.3 Availability of communication ports

Communication mode	Available communication ports
PLC Link	Up to 2 communication ports can be used. When using 2 ports, allocate different link areas to them. <ul style="list-style-type: none"> <li>• CPU with communication cassette (COM1)</li> <li>• Serial communication unit (COM1)</li> </ul>
MEWTOCOL-COM Master Modbus RTU Master	Up to 16 communication ports and corresponding connections can be used simultaneously. <ul style="list-style-type: none"> <li>• CPU with communication cassette (COM1, COM2)</li> <li>• Serial communication unit (COM1–COM4)</li> <li>• CPU with built-in Ethernet port (1–16 user connections)</li> </ul>
MEWTOCOL-COM Slave MEWTOCOL7-COM Slave Modbus RTU Slave	Up to 15 communication ports and corresponding connections can be used simultaneously. <ul style="list-style-type: none"> <li>• CPU with communication cassette (COM1, COM2)</li> <li>• Serial communication unit (COM1–COM4)</li> <li>• CPU with built-in Ethernet port (1–4 system connections, 1–16 user connections)</li> </ul>
Program controlled	No restriction

## 1.3 Selection of power supply

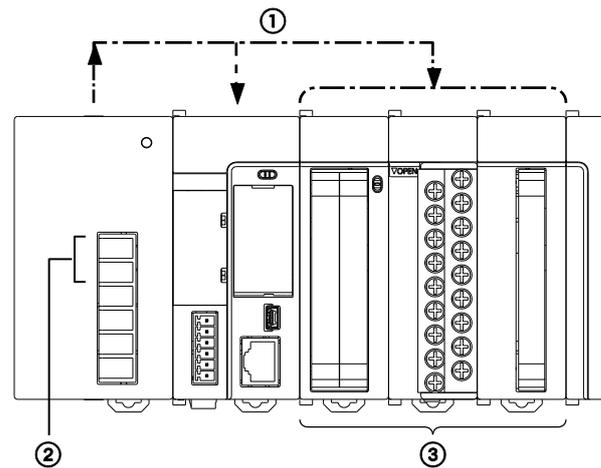
### 1.3.1 Power supply for internal circuit

Power for the internal circuit is either supplied by connecting an FP7 power supply unit or by directly connecting the CPU to an external 24V DC power supply. Make sure the selected power supply is larger than the capacity of the units.

#### Connecting an FP7 power supply unit

Select the expansion units so that the sum of internal current consumptions of the connected units does not exceed the capacity of the power supply unit.

When a power supply unit is used, do not connect another DC power supply to the CPU unit.



- ① Internal bus to each unit
- ② External power supply: 100-240V AC
- ③ Up to 16 I/O units or intelligent units

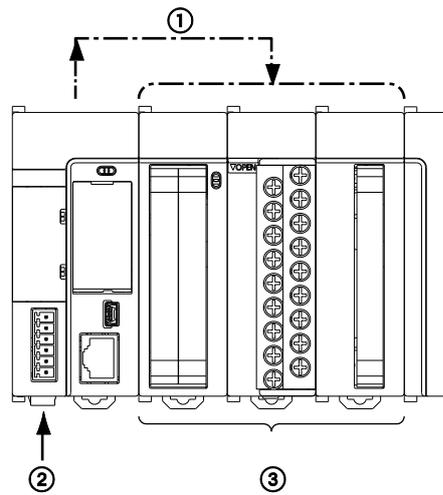
### Connecting an external 24V DC power supply

Select the expansion units so that the sum of internal current consumptions of the connected units does not exceed 2A.

Make sure the selected power supply is larger than the capacity of the units. In the minimum configuration, select a power supply of 24W or larger.

To protect the system against faulty voltages from the power supply line, use an insulated power supply with an internal protective circuit.

If using a power supply device without an internal protective circuit, always make sure power is supplied to the unit through a protective element such as a fuse.



- ① Internal bus to each unit
- ② External power supply: 24V DC
- ③ Up to 16 I/O units or intelligent units

### Output current of FP7 power supply units

Power supply unit	Product number	Rated output current [mA]
100–240V AC, 24W	AFP7PSA1	1000
100–240V AC, 43W	AFP7PSA2	1800

## Current consumption of FP7 units

Type of unit		Product number	Current consumption	
CPU	196k steps, Ethernet	AFP7CPS41E	≤200mA	
	120k steps, Ethernet	AFP7CPS31E	≤200mA	
	120k steps, no Ethernet	AFP7CPS31	≤200mA	
Communication cassette (attached to CPU) <sup>1) 2)</sup>	1xRS232	AFP7CCS1	≤35mA	
	2xRS232	AFP7CCS2	≤60mA	
	1xRS422/RS485	AFP7CCM1	≤60mA	
	2xRS422/RS485	AFP7CCM2	≤90mA	
	1xRS232, 1xRS485	AFP7CCS1M1	≤70mA	
	Ethernet	AFP7CCET1	≤35mA	
Application cassette	Analog I/O cassette	AFP7FCA21	≤75mA	
	Analog input cassette	AFP7FCAD2	≤40mA	
	Thermocouple cassette	AFP7FCTC2	≤45mA	
Input unit	DC input	16 inputs, 5–24V DC Terminal block	AFP7X16DW	≤25mA
		32 inputs, 24V DC MIL connector	AFP7X32D2	≤30mA
		64 inputs, 24V DC MIL connector	AFP7X64D2	≤35mA
Output unit	Relay	16 outputs Terminal block	AFP7Y16R	≤180mA
	Transistor	16 outputs, sink (NPN) Terminal block	AFP7Y16T	≤35mA
		32 outputs, sink (NPN) MIL connector	AFP7Y32T	≤50mA
		64 outputs, sink (NPN) MIL connector	AFP7Y64T	≤75mA
		16 outputs, source (PNP) Terminal block	AFP7Y16P	≤35mA
		32 outputs, source (PNP) MIL connector	AFP7Y32P	≤50mA
		64 outputs, source (PNP) MIL connector	AFP7Y64P	≤75mA

Type of unit		Product number	Current consumption
Mixed I/O unit	32 inputs/32 outputs, sink (NPN) MIL connector	AFP7XY64D2T	≤55mA
	32 inputs/32 outputs, source (PNP) MIL connector	AFP7XY64D2P	≤55mA
Analog input unit	4 channels	AFP7AD4H	≤100mA
Analog output unit	4 channels	AFP7DA4H	≤250mA
High-speed counter unit	2 channels	AFP7HSC2T	≤65mA
	4 channels	AFP7HSC4T	≤65mA
Pulse output unit	2 axes Open collector output	AFP7PG02T	≤65mA
	4 axes Open collector output	AFP7PG04T	≤65mA
	2 axes Line driver output	AFP7PG02L	≤65mA
	4 axes Line driver output	AFP7PG04L	≤65mA
Positioning unit	2 axes Open collector output	AFP7PP02T	≤120mA
	4 axes Open collector output	AFP7PP04T	≤120mA
	2 axes Line driver output	AFP7PP02L	≤120mA
	4 axes Line driver output	AFP7PP04L	≤120mA
Serial communication unit (with communication cassettes) <sup>1) 2)</sup>		AFP7NSC	≤50mA
	1xRS232	AFP7CCS1	≤20mA
	2xRS232	AFP7CCS2	≤40mA
	1xRS422/RS485	AFP7CCM1	≤30mA
	2xRS422/RS485	AFP7CCM2	≤60mA
	1xRS232, 1xRS485	AFP7CCS1M1	≤50mA
PHLS master unit		AFP7RMTM	≤85mA
GT series touch panel (5V type) <sup>1) 3)</sup>		-	≤100mA

<sup>1)</sup> The values indicate the increased current consumption of the CPU.

<sup>2)</sup> The current consumption of the communication cassettes varies depending on the attachment location of the cassette (on CPU or on serial communication unit).

<sup>3)</sup> For 24V power supply types, please see the corresponding hardware specifications.

### 1.3.2 Power supply for external circuits

A 24V DC voltage is supplied to the inputs and to the output circuits of the I/O units from the external terminals of each unit.

#### Current consumption (24V)

The values for the inputs indicate the current that flows into the internal circuit.

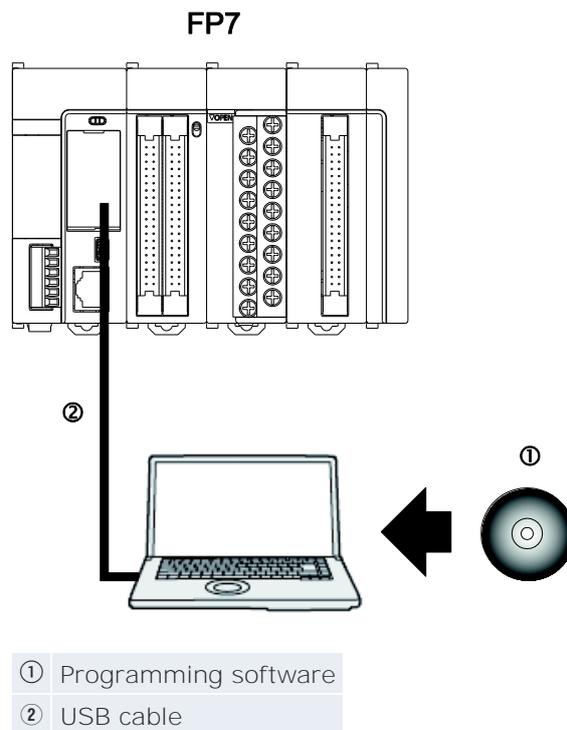
The values for the outputs indicate the current required for driving the internal circuit. These values do not include the load current of the output units.

Type of unit			Product number	Current consumption
Input unit	DC input	16 inputs, 5–24V DC Terminal block	AFP7X16DW	6mA/input
		32 inputs, 24V DC MIL connector	AFP7X32D2	2.7mA/input
		64 inputs, 24V DC MIL connector	AFP7X64D2	2.7mA/input
Output unit	Relay	16 outputs Terminal block	AFP7Y16R	–
	Transistor	16 outputs, sink (NPN) Terminal block	AFP7Y16T	≤70mA
		32 outputs, sink (NPN) MIL connector	AFP7Y32T	≤110mA
		64 outputs, sink (NPN) MIL connector	AFP7Y64T	≤140mA
		16 outputs, source (PNP) Terminal block	AFP7Y16P	≤70mA
		32 outputs, source (PNP) Terminal block	AFP7Y32P	≤130mA
		64 outputs, source (PNP) Terminal block	AFP7Y64P	≤180mA
Mixed I/O unit		32 inputs/ 32 outputs, sink (NPN) MIL connector	AFP7XY64D2T	2.7mA/input Output: 70mA
		32 inputs/ 32 outputs, source (PNP) MIL connector	AFP7XY64D2P	3.4mA/input Output: 90mA

#### Reference

For the current consumption of the I/O circuits of high-speed counter units, pulse output units, and positioning units connected to 24V DC, please see the manuals for these units.

## 1.4 Programming tools



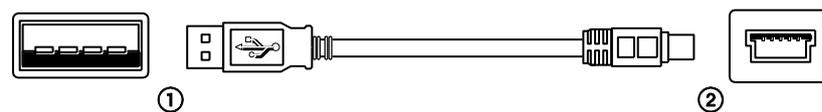
### Programming software

You can use the following programming software to program the FP7:

- Control FPWIN Pro Version 7 or later
- FPWIN GR7

### PC connection cable

Cable	Connector	Description	Product no.
USB cable	5-pin Mini-B type	USB 2.0 Full Speed (or 1.1), 2m	CABMINIUSB5D



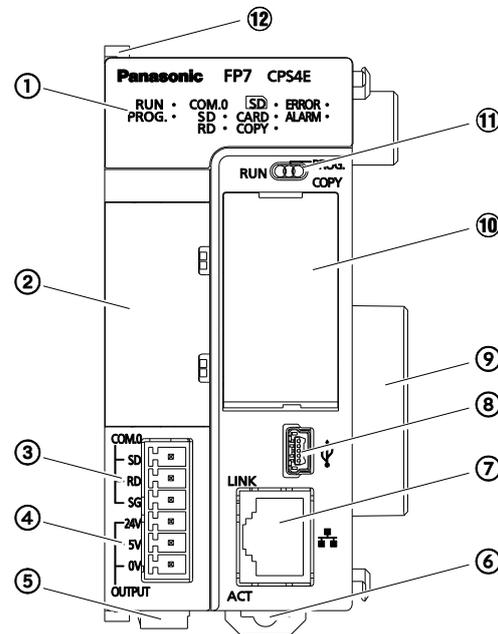
- |   |                                    |
|---|------------------------------------|
| ① | A type (male), PC side             |
| ② | 5-pin Mini-B type (male), PLC side |

Instead of Panasonic's USB cable any commercial USB cable meeting the above specifications may be used. The maximum permissible cable length is 5m.

## Chapter 2

# Parts and functions

## 2.1 CPU

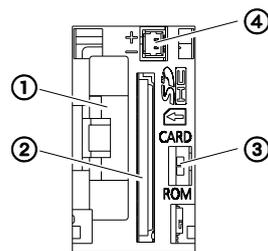


- ① Operation status LEDs – Display the current operation mode or the occurrence of an error.

LED	Color	Description
–	Blue	Lights when the CPU power is on.
RUN	Green	Lights in RUN mode. Flashes when forcing I/Os.
PROG.	Green	Lights in PROG mode.
COM.0	SD	Green Lights when data is being sent from COM port 0.
	RD	Green Lights when data is being received from COM port 0.
SD	Green	Lights when the SD card is being accessed.
CARD	Green	Lights when SD memory card operation is selected.
COPY	Green	Lights during COPY operation.
ERROR	Red	Lights when a self-diagnostic error has been detected.
ALARM	Red	Lights when a watchdog timeout occurs due to a hardware or program error.

- ② Add-on cassette – Attach an optional communication cassette or application cassette.
- ③ COM port 0 (RS232C)
- ④ GT power supply terminal (for 5V and 24V DC)

- ⑤ Power supply connector – Used to connect an external 24V DC power supply. When a power supply unit is used, do not connect another DC power supply to the CPU unit.
- ⑥ DIN rail attachment lever – Used for easy attachment to a DIN rail.
- ⑦ Ethernet port (AFP7CPS41E, AFP7CPS31E) – Used to connect the PLC to Ethernet.
- ⑧ USB port – Used to connect a programming tool.
- ⑨ Expansion connector – Connects to the internal circuit of I/O units and intelligent units.
- ⑩ SD card cover



① Battery holder	Attach a battery.
② SD memory card slot	Insert an SD card.
③ Card operation switch	Switch between ROM and SD memory card operation. When SD memory card operation is selected, project execution from the SD memory card is possible.
④ Power supply connector	Connect the battery cable.

- ⑪ Operation mode selector – Used to change the operation mode of the PLC.

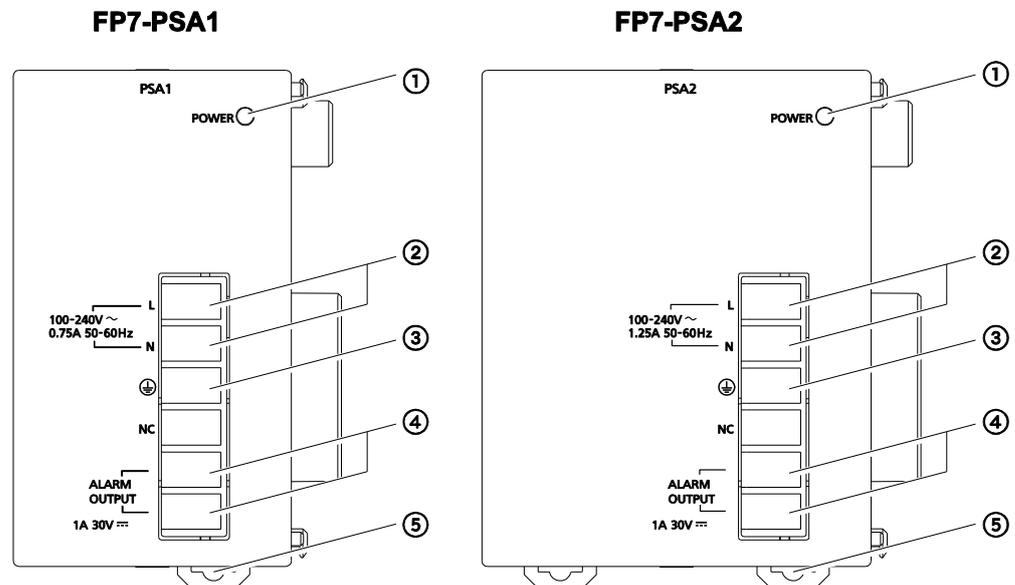
Switch position	Operation mode
RUN (left)	Sets RUN mode. The program is executed and operation begins.
PROG. (center)	Sets PROG mode. Operation stops. In this mode, programming via the TOOL port is possible.
COPY (right, momentary)	Sets COPY mode. A project stored in the internal RAM/ROM1 is transmitted to ROM2 as a backup project.

When the operation mode selector is set to RUN or PROG., remote switching can be performed from the programming software. When the

power of the PLC is turned on again, the operation mode set with the operation mode selector is selected.

- ⑫ Fixing hook – Used to fix a power supply unit to the CPU.

## 2.2 FP7 power supply unit



- ① POWER LED (blue) – Lights when the power is on.
- ② Power supply terminals – Terminal block for power supply wiring.
- ③ Ground terminals – To minimize effects from noise and prevent electrical shocks, connect this terminal with a ground resistance of max. 100Ω.
- ④ Alarm output terminal – The relay contact is closed when the power supply is on. If a watchdog timeout occurs due to a hardware or program error, the relay contact is opened.
- ⑤ DIN rail attachment lever – Used for easy attachment to a DIN rail.

## Chapter 3

# I/O allocation

### 3.1 General

Each unit attached to the CPU must be configured in an I/O map which is registered in the CPU. An I/O map can be created in two ways:

- Entering I/O maps manually (see page 27)
- Uploading I/O maps in online mode from the PLC (see page 28)

The current I/O map can be displayed in the dialog "I/O map and unit configuration". It shows the slot numbers and starting word numbers of the CPU and its expansion units.

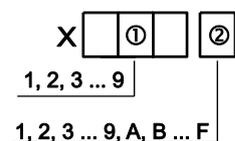
The I/O map is saved in the project and will be registered in the PLC when the project is downloaded.

#### Slot numbers

Slot numbers start with 0 for the CPU and continue in ascending order from left to right.

#### I/O addresses

I/O addresses are bit addresses which are counted in units of 16 inputs or outputs. They start with the letter X for input or Y for output. This letter is followed by a combination of a decimal number specifying the starting word number ① and a hexadecimal bit number ②:



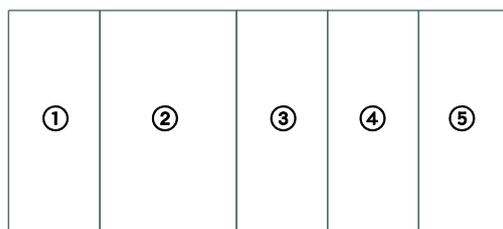
I/O addresses are determined by the unit type and the unit's installation location.

By default, the starting word number of the CPU is 500. A fixed area is allocated to the COM port and to the Ethernet port. The starting word number of the unit next to the CPU is 0. Consequently, the I/O addresses start with X0 or Y0.

For mixed I/O units and intelligent units, the same numbers are used for inputs and outputs. For example, if the input addresses are X80–X9F, the unit's output addresses are Y80–Y9F. For all other units, different numbers must be used for inputs and outputs. For example, if a digital input unit uses X00–X3F, a digital output unit cannot use Y00–Y3F.

The starting word number of each unit can be changed using the programming software. See page 27.

### Examples of I/O allocation



①	Power supply unit	–	
②	CPU	10 words	X500–X509
③	Input unit, 64 inputs	4 words	X00–X3F
④	Output unit, 64 outputs	4 words	Y40–Y7F
⑤	Mixed I/O unit, 32 inputs, 32 outputs	2 input words, 2 output words	X80–X9F, Y80–Y9F

### Mapping errors

When the power supply is turned on, the PLC checks the actual mounting status of all units attached to the CPU and compares it to the I/O map registered in the CPU. If there are differences, a self-diagnostic error occurs and the ERROR LED flashes. See page 55.

## 3.2 Occupied word and bit addresses by unit

Type of unit		Product no.	Number of occupied word and bit addresses		
			Input	Output	
CPU	COM0-COM2 ports	-	2 words (32 bits) Offset 0-1	2 words (32 bits) Offset 0-1	
	Communication cassette (Ethernet type)	AFP7CCET1	4 words (64 bits) Offset 0-3	2 words (32 bits) Offset 0-1	
	Analog I/O cassette	AFP7FCA21	2 words (32 bits) Offset 2-3	1 word (16 bits) Offset 2	
	Analog input cassette	AFP7FCAD2		-	
	Thermocouple cassette	AFP7FCTC2		-	
	System area	-	Offset 2-6	Offset 2-6	
	Built-in Ethernet port	AFP7CPS41E AFP7CPS31E	3 words (48 bits) Offset 7-9	3 words (48 bits) Offset 7-9	
I/O units	Input unit 16 inputs	AFP7X16DW	1 word (16 bits)	-	
	Input unit 32 inputs	AFP7X32D2	2 words (32 bits)	-	
	Input unit 64 inputs	AFP7X64D2	4 words (64 bits)	-	
	Output unit 16 outputs	AFP7Y16R AFP7Y16T AFP7Y16P	-	1 word (16 bits)	
	Output unit 32 outputs	AFP7Y32T AFP7Y32P	-	2 words (32 bits)	
	Output unit 64 outputs	AFP7Y64T AFP7Y64P	-	4 words (64 bits)	
	Mixed I/O unit 32 inputs/32 outputs	AFP7XY64D2T AFP7XY64D2P	2 words (32 bits)	2 words (32 bits)	
Intelligent units	Analog input unit	AFP7AD4H	8 words (128 bits)	4 words (64 bits)	
	Analog output unit	AFP7DA4H	4 words (64 bits)	8 words (128 bits)	
	High-speed counter unit	AFP7HSC2T	8 words (128 bits)	4 words (64 bits)	
		AFP7HSC4T			
	Pulse output unit	AFP7PG02T AFP7PG02L	2 words (32 bits)	2 words (32 bits)	
		AFP7PG04T AFP7PG04L	4 words (64 bits)	4 words (64 bits)	
		Positioning unit	AFP7PP02T AFP7PP02L AFP7PP04T AFP7PP04L	12 words (196 bits)	12 words (196 bits)
	Serial communication unit		AFP7NSC	2 words (32 bits)	2 words (32 bits)
	PHLS master unit		AFP7PHLSM	63 words (1008 bits)	63 words (1008 bits)

In the CPU, 10 input words (160 bit addresses, offset 0–9) and 10 output words (160 bit addresses, offset 0–9) are allocated for communication functions, regardless of whether these functions are actually used. The starting word number of the other units can be set using the programming software.

For the PHLS master unit, the actual number of inputs and outputs that can be used varies depending on the number of slave units connected. The maximum number of I/Os is 63 input words (1008 bit addresses) and 63 output words (1008 bit addresses).

### 3.3 Entering I/O maps manually

When entering I/O addresses manually, I/O allocations are decided at the time of system design and are registered in the CPU using Control FPWIN Pro. At this time, registration can be performed before any expansion unit has been installed. However, before operation can start, the I/O units must be mounted as required by the system design.

#### Procedure

1. Double-click "PLC" in the navigator
2. Double-click "I/O map and unit configuration"
3. Double-click the desired slot number

To allocate I/O addresses, you must select slots consecutively one after the other. Assign the CPU to slot 0.

For all other unit types, proceed as follows.

4. Select a unit category
5. Select a unit type

The starting word number, number of input words and number of output words are automatically entered. You can change the starting word number as required.

I/O addresses are allocated based on the starting word number.

6. [OK]
7. Repeat steps 4 to 6 to add more units as required
8. [OK]

The I/O map is saved in the project and will be registered in the PLC when the project is downloaded.

The following additional settings can be made in the "I/O map and unit configuration" dialog:

- "Input time constant"

Input time constants for input units or mixed I/O units can be changed as necessary. The selected time constant is added to the hardware-specific response time of the unit.

- "Automatically shift the starting word number for subsequent slots"

Select this check box to automatically adapt the I/O addresses of the following units when a unit is inserted into the list.

- "Exclude this unit from I/O verification"

When the state of installation of an I/O unit has changed since the power was turned on, no error will be output if this check box has been selected.

- [Advanced]

Choose [Advanced] to configure intelligent units.

### 3.4 Uploading I/O maps in online mode

Instead of entering I/O addresses manually, you can upload them from the PLC. The FP7 CPU also saves configuration settings for intelligent units, e.g. analog units or high-speed counter units. These unit configurations can also be uploaded from the CPU.

Select from three different options for uploading the I/O map and unit configurations:

- "Upload attached unit types and set default values"

When this option is selected, all units attached to the CPU are scanned and the unit types are uploaded into the programming software. The I/O addresses will be reassigned and the unit configurations will be set to default values.

- "Upload attached unit types and assign current unit configurations"

When this option is selected, all units attached to the CPU are scanned and the unit types are uploaded into the programming software. The I/O addresses and unit configurations from the "I/O map and unit con-

figuration" dialog will be applied. Default values will be set for new units.

- "Upload unit types and configurations saved in the CPU"

When this option is selected, the units attached to the CPU are not scanned. Instead, the unit types, I/O addresses, and unit configurations saved in the CPU will be uploaded. Any units which have been added or removed are not detected, that is, the uploaded data may be different from the actually attached units.

### Procedure

1. **Online** → **Online mode** or 
2. Double-click "PLC" in the navigator
3. Double-click "I/O map and unit configuration"
4. [Upload from PLC...]
5. Select desired upload option

## Chapter 4

# Installation and wiring

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## 4.1 Installation

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Please follow the installation instructions carefully to prevent failure or malfunctions.

### 4.1.1 Installation environment and space

---

#### Operating environment

After installing the unit, make sure to use it within the range of the general specifications:

- Ambient temperature: 0–+55°C
- Ambient humidity: 10%–95% RH (at 25°C, non-condensing)
- Pollution degree: 2
- Maximum altitude: 2000m
- Equipment class: 1
- Overvoltage category: II
- Installation location: inside control panel

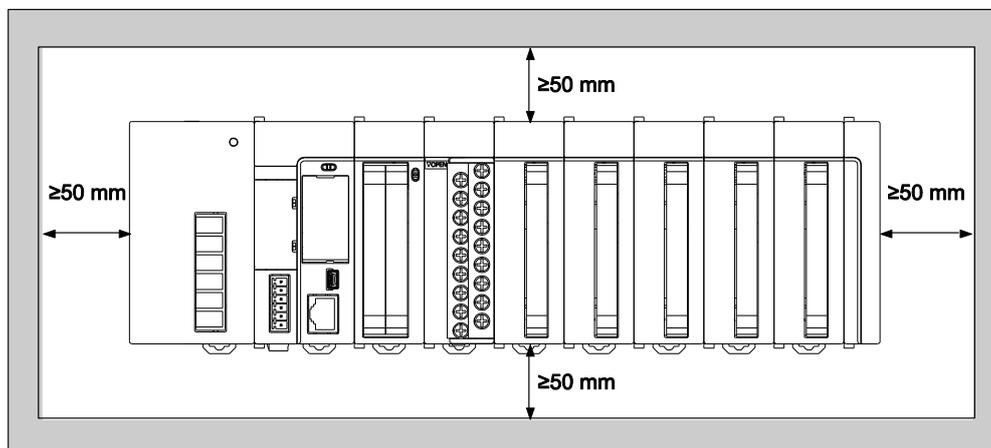
Be sure to install the unit in locations designed for electrical equipment, e.g. in a closed metal cabinet such as a switch cabinet.

Do not use the unit in the following environments:

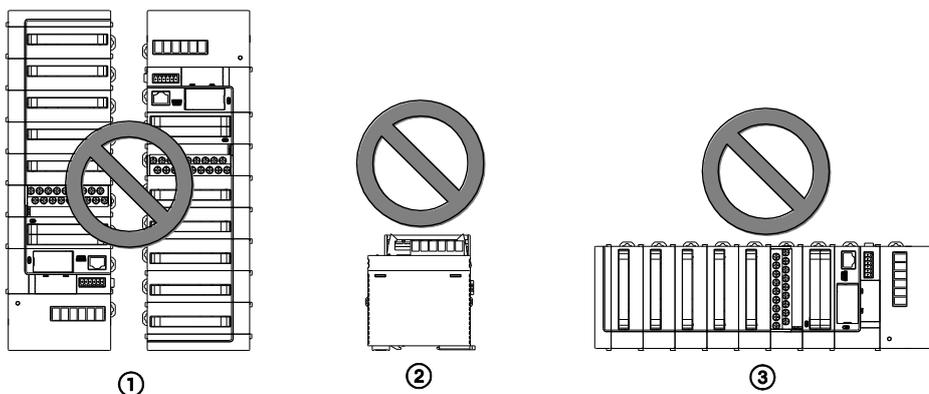
- Direct sunlight
- Sudden temperature changes causing condensation
- Inflammable or corrosive gases
- Excessive airborne dust, metal particles or salts
- Benzine, paint thinner, alcohol or other organic solvents or strong alkaline solutions such as ammonia or caustic soda
- Vibration, shock or direct drop of water
- Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges. Maintain at least 100mm of space between these devices and the unit.

## Installation space

- Leave at least 50mm of space between the wiring ducts of the unit and other devices to allow heat radiation and unit replacement.

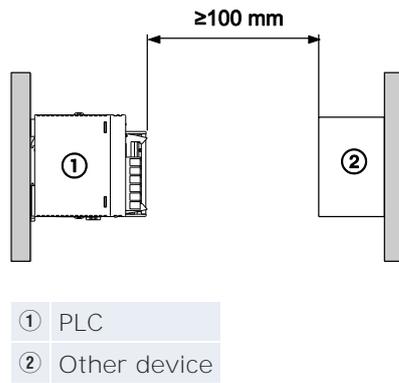


- Do not install the units stacked up, horizontally or upside down. Doing so will prevent proper cooling of the units and cause overheating inside.

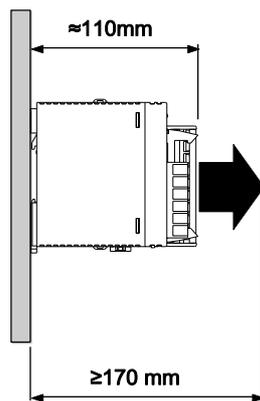


- |   |                                     |
|---|-------------------------------------|
| ① | Stacked up installation             |
| ② | Horizontal installation of the unit |
| ② | Upside-down                         |

- Do not install the unit above devices which generate heat such as heaters, transformers or large-scale resistors.
- Maintain a minimum of 100mm between devices to avoid adverse effects from noise and heat when installing a device or panel door to the front of the unit.



- Leave at least 170mm of space from the mounting surface for programming tool connections and wiring.



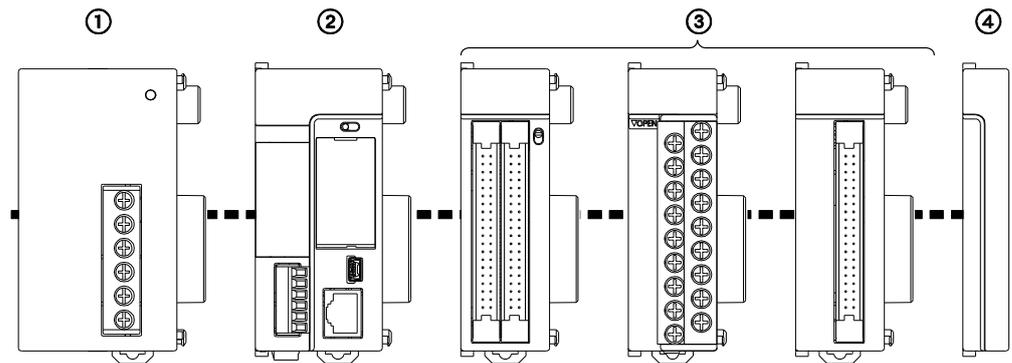
#### 4.1.2 Attaching units

The expansion units are connected to the right side of the CPU. Use the expansion connectors and the expansion hooks on the side of each unit.

Make sure to connect an end unit to the right of the last unit. After attaching the units, attach the assembly to the DIN rail.

#### NOTICE

- Make sure to turn off the power supply before attaching a unit.
- Do not directly touch the expansion connector.
- Protect the expansion connector from stress.



- ① Power supply unit
- ② CPU
- ③ Up to 16 I/O units or intelligent units
- ④ End unit

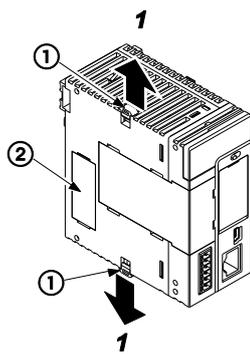
Procedure

**Attachment**

1. Raise expansion hooks on top and bottom of the unit

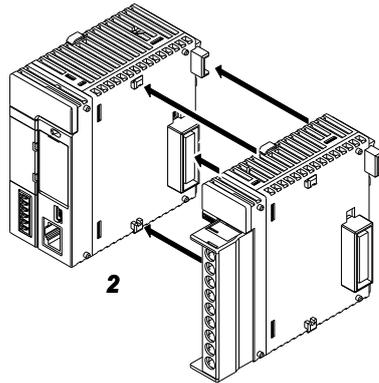
When attaching a power supply unit:

Remove expansion cover

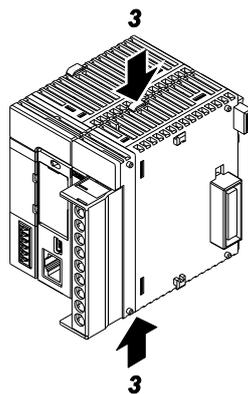


- ① Expansion hook
- ② Connector cap

2. Attach expansion connectors on the side of each unit



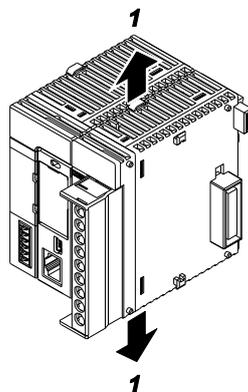
3. Push expansion hooks back into place



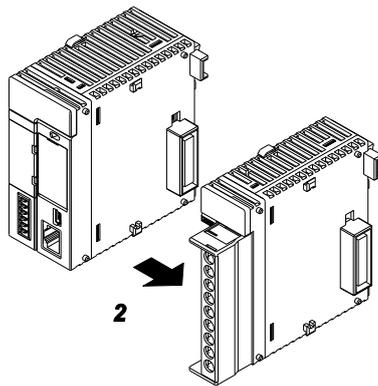
Procedure

**Removal**

1. Release expansion hooks on top and bottom of the unit



- Slide unit horizontally to remove it

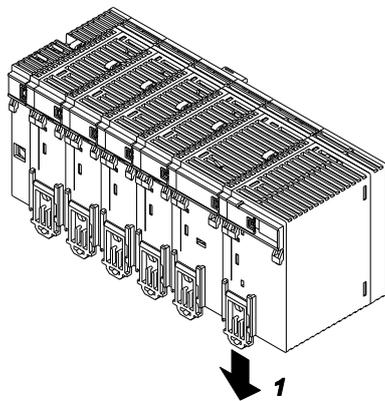


### 4.1.3 Using DIN Rails

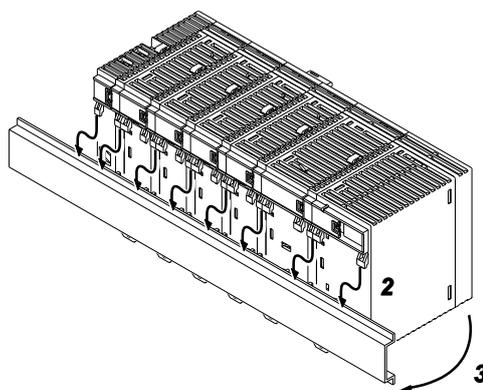
#### Procedure

#### Attachment

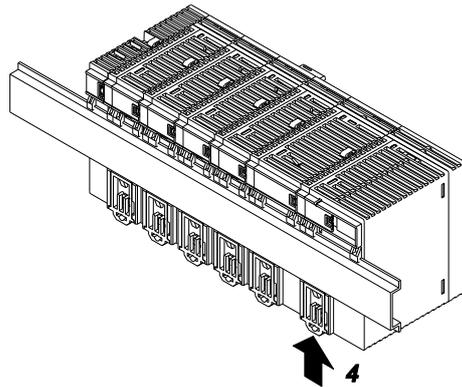
- Pull out DIN rail attachment lever on unit's back



- Fit upper hook of unit onto DIN rail
- Without moving upper hook, press on lower hook to fit unit into position



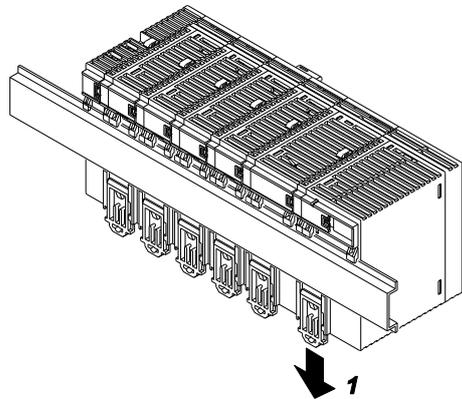
4. Push up DIN rail attachment lever on unit's back until it clicks into place



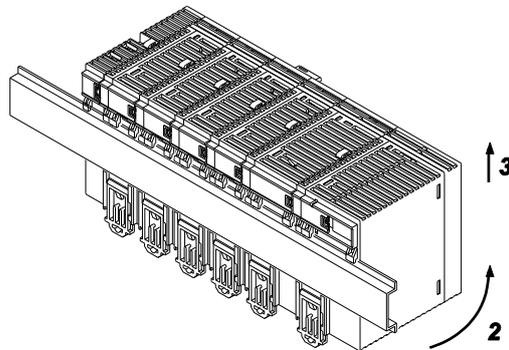
Procedure

**Removal**

1. Pull out DIN rail attachment lever on unit's back



2. Pull bottom of unit forward



3. Lift up unit and remove from rail

## 4.2 Safety instructions for wiring

In certain applications, malfunction may occur for the following reasons:

- Power ON timing differences between the PLC system and input/output devices or mechanical power apparatus
- A response time lag when a momentary power drop occurs
- Abnormality in the PLC, external power supply circuit, or other devices

In order to prevent a malfunction that results in a system shutdown, choose the adequate safety measures listed below:

### Interlock circuit

When a motor's clockwise/counter-clockwise operation is controlled, provide an interlock circuit that prevents clockwise and counter-clockwise signals from being input into the motor at the same time.

### Emergency stop circuit

Provide an emergency stop circuit externally to turn off the power supply of controlled devices in order to prevent a system shutdown or an irreparable accident if a malfunction occurs.

### Start-up sequence

The PLC should be started after booting the input/output devices and mechanical power apparatus.

When stopping the operation of the PLC, have the input/output devices turned off after the PLC has stopped operating.

### Grounding

When installing the PLC next to devices that generate high voltages from switching, such as inverters, do not ground them together. Use an exclusive ground for each device.

### Momentary power failures

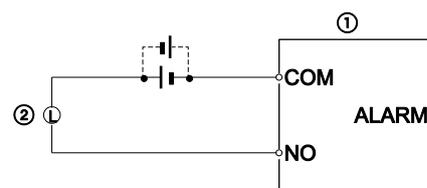
The FP7 continues to operate normally for a certain period of time in case of a momentary power failure. We call this the momentary power off time. However, if the power failure exceeds this period of time, operation de-

depends on the combination of units, the power supply voltage, etc. In some cases, operation mirrors a power supply reset.

For the momentary power off time values, see "General specifications" on p. 64.

## Alarm output

The power supply units have an alarm output that can be used to release alarm signals in the event of an error. The relay contact is closed when the power supply is on. If a watchdog timeout occurs due to a hardware or program error, the relay contact is opened.



- |   |                   |
|---|-------------------|
| ① | Power supply unit |
| ② | Alarm signal lamp |

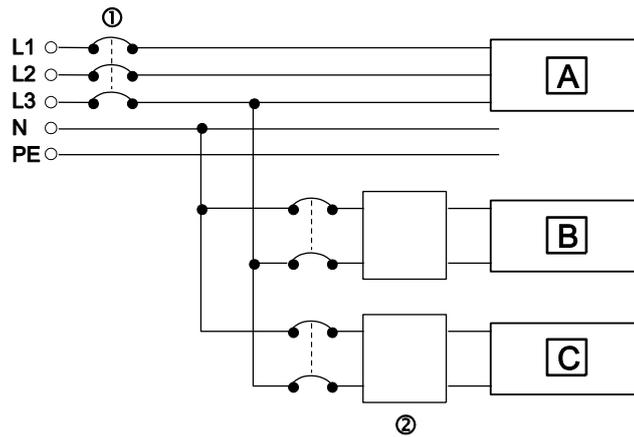
In the event of a watchdog timeout, the ALARM LED of the CPU lights. If a power supply unit is attached, its alarm output is activated at the same time. All outputs to output devices are turned off and the CPU is put in a halted state. All processing as well as communication with the programming tool stops.

## 4.3 Wiring the power supply

### Precautions

- Use a low-noise power supply.
- The unit has sufficient noise immunity against the noise generated on the power line. However, it is recommended to take measures for reducing noise such as supplying power through an insulation transformer.
- To minimize adverse effects from noise, twist the brown and blue wires of the power supply cable.

- Isolate the wiring systems to the CPU, input/output devices, and mechanical power apparatus.

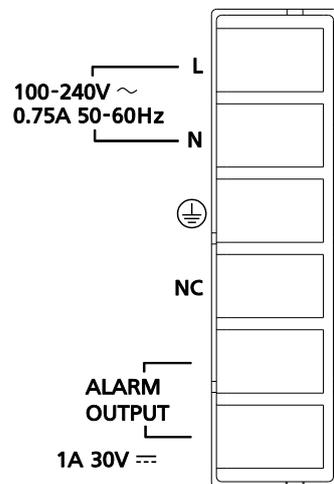


<b>A</b>	Mechanical power apparatus
<b>B</b>	Input/output devices
<b>C</b>	CPU
①	Circuit breaker
②	Insulated DC power supply

- Make sure the power supply of the CPU turns off before the power supply for input and output. If the power supply for input and output is turned off first, the CPU will detect the input fluctuations and may begin an unexpected operation.

### 4.3.1 Wiring the FP7 power supply unit

#### Terminal layout



## Specifications

Make sure the voltage applied is within the operating voltage range.

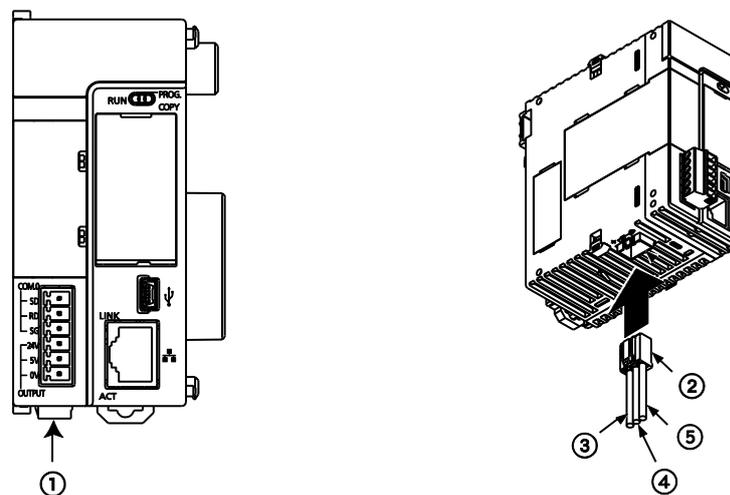
Product no.	Rated input voltage	Operating voltage range	Rated output capacity	Rated output current
AFP7PSA1	100–240V AC	85–264V AC	24W	1A
AFP7PSA2			43W	1.8A

## Suitable wire

	Size	Cross-sectional area [mm <sup>2</sup> ]	Tightening torque [Nm]
Power supply and grounding	AWG14	2.0	0.5–0.6
Alarm output	AWG22–14	0.3–2.0	

### 4.3.2 Wiring an external 24V DC power supply

Use the power supply cable provided. Attach as shown.



- ① External power supply: 24V DC
- ② Power supply cable (AFPG805)
- ③ Brown: 24V DC
- ④ Blue: 0V
- ⑤ Green: Function earth

## Specifications

Make sure the voltage applied is within the operating voltage range.

Rated input voltage	Operating voltage range	Rated output capacity
24V DC	20.4–28.8V DC	≥24W

When a GT series touch panel is connected to the GT power supply terminal (24V), the operating voltage range is 21.6–26.4V DC.

## Selecting a power supply

Make sure the selected power supply is larger than the capacity of the units. In the minimum configuration, select a power supply of 24W or larger. For details, see p. 14.

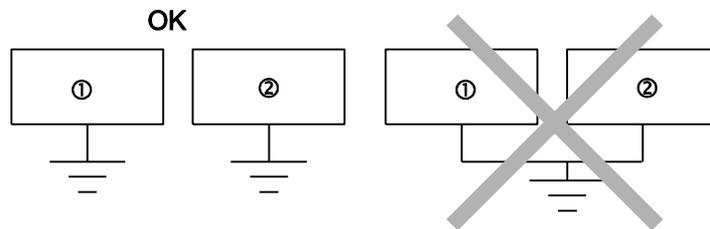
To protect the system against faulty voltages from the power supply line, use an insulated power supply with an internal protective circuit. The regulator on the unit is a non-insulated type.

If using a power supply device without an internal protective circuit, always make sure power is supplied to the unit through a protective element such as a fuse.

### 4.3.3 Grounding

If necessary, ground the instrument to increase the noise resistance.

- The point of grounding should be as close to the PLC as possible. The ground wire should be as short as possible.
- Always use an exclusive ground for PLCs and other devices. If two devices share a single ground point, it may produce an adverse effect.



①	PLC
②	Other device (inverter etc.)

- Earth terminals for an AC power supply unit should be grounded at a grounding resistance of  $100\Omega$  or less.
- When 24V DC is directly supplied to the CPU, connect the attached function earth (green).

# Chapter 5

## Operation

### 5.1 Before turning on the power

Once wiring has been completed, check the following points before turning on the power and perform a trial run.

#### Check points

Items	Description
Unit attachment	<ul style="list-style-type: none"> <li>Does the unit name match the unit name on the device list of the designed system?</li> <li>Are the unit mounting screws properly tightened?</li> </ul>
Wiring	<ul style="list-style-type: none"> <li>Are the terminal screws properly tightened?</li> <li>Are the wires connected to the correct terminals?</li> <li>Are the wires thick enough to handle the expected current?</li> </ul>
PC connection cable	<ul style="list-style-type: none"> <li>Is the cable securely connected?</li> </ul>
CPU settings	<ul style="list-style-type: none"> <li>Is the operation mode selector set to PROG.?</li> <li>Is the card operation switch set correctly?</li> </ul>
Others	<ul style="list-style-type: none"> <li>Carefully check if there is potential for accidents.</li> </ul>

#### Trial operation

##### Procedure

1. Turn the power on

Check that the CPU's POWER LED (blue) and PROG. LED (green) are ON. When a power supply unit is used, check that the power supply unit's POWER LED is ON.

2. Enter a project

Create a project using Control FPCWIN Pro.

3. Use **Object** → **Check** or  to check the program for syntax errors
4. Check the output wiring

Use I/O forcing to check the output wiring.

5. Check the input wiring

Use the input LEDs or the monitoring function of Control FPWIN Pro to check the input wiring.

6. Start trial operation

Set the operation mode selector to RUN and check that the RUN LED is on.

7. Check the program operation

8. Debug and correct the program

If required, check the project using the monitoring function of Control FPWIN Pro.

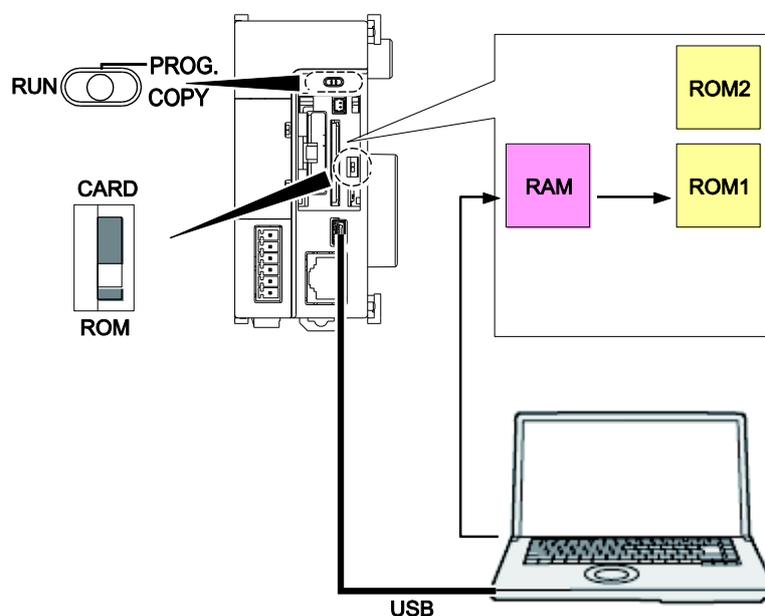
9. Save the project

## 5.2 RAM/ROM operation

### Downloading projects to PLC

When a project is downloaded from the PC to the PLC, the data is saved in the built-in RAM and is also automatically saved in the ROM.

Switch	Setting
Operation mode selector	PROG.
Card operation switch	ROM



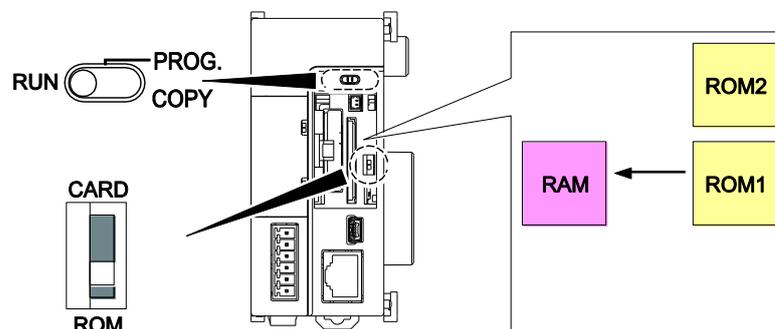
### Procedure

1. Change to PROG mode
2. Set card operation switch to ROM
3. Turn on the power supply of the FP7
4. Download project to PLC

### Operation after power-on

After the power supply of the CPU has been turned on, whether in PROG mode or in RUN mode, the project is transferred from ROM1 to RAM.

Switch	Setting
Operation mode selector	PROG. or RUN
Card operation switch	ROM



### Retaining data during power outages

The FP7 CPU backs up most of the data in the ROM (non-volatile) memory:

- Project data (programs, configuration data, comments)
- Hold type data in the operation memory
- System monitor values, system records (e.g. hour meter data, error logs)

Clock/calendar data is held by the built-in capacitor and by the backup battery.

### Note

- The clock/calendar function continues operation for about one week thanks to the built-in capacitor, even if no battery is used. In order to charge the built-in capacitor, supply power to the CPU for at least 30 minutes.

## Online editing

The FP7 CPU supports online editing. The online edit mode is available in PROG or in RUN mode.

Online editing allows you to change your program in the RAM memory. The data in the RAM is transferred to ROM1.

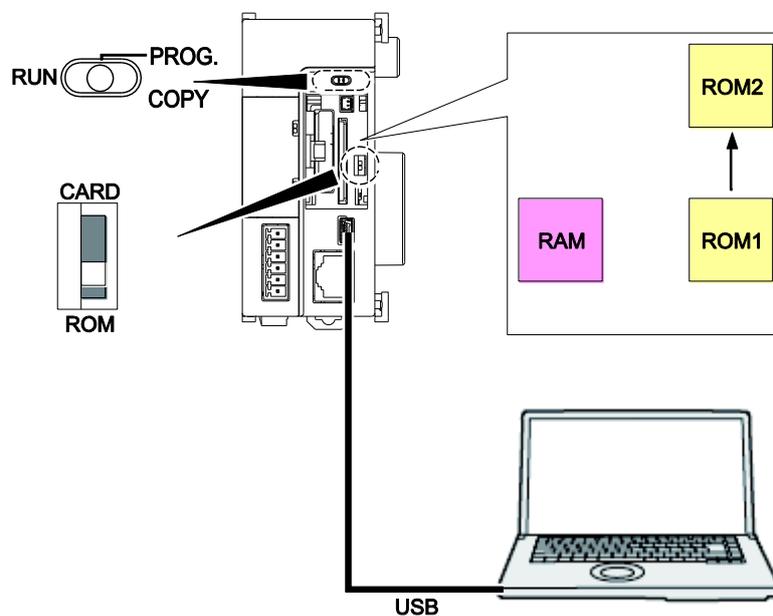
In PROG mode, it is possible to download entire projects, to edit system register settings as well as the I/O map. In RUN mode you can make changes to the body of your PLC program. When online editing in RUN mode, operation stops for a time proportionate to the size of the program code.

## 5.3 Project backup

### Back up project from ROM1 to ROM2

In normal operation, a copy of your project is automatically saved in ROM1. In PROG mode, you can additionally save a backup of your project in ROM2. This includes program code, system registers, and comment memory (project data).

Switch	Setting
Operation mode selector	PROG.
Card operation switch	ROM



## Procedure

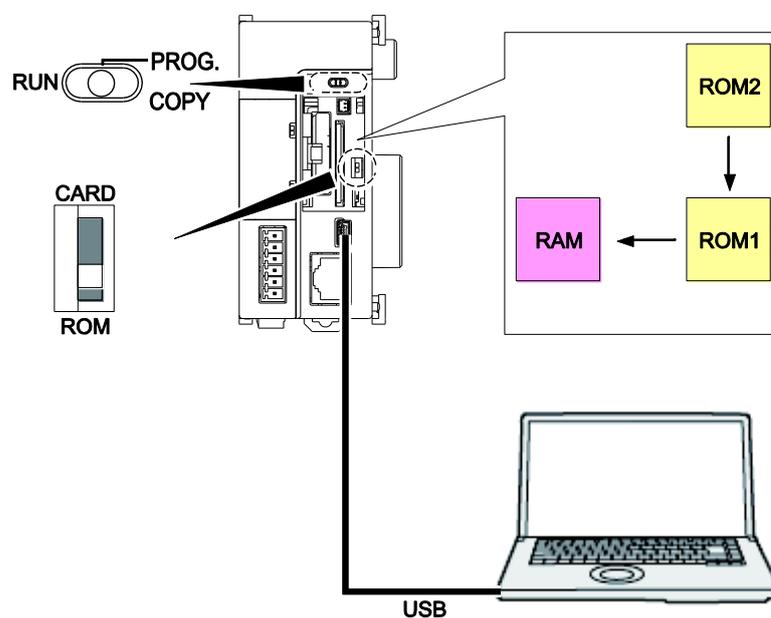
1. Change to PROG mode
2. **Online** → **Memory transfer services...**
3. Select "Back up project from ROM1 to ROM2" to transfer the project to ROM2

A copy of your project in the operation memory is transferred to the backup memory.

## Restore project from ROM2 to ROM1

The project in ROM2 can be easily transferred back to RAM for execution. A copy is automatically saved in ROM1.

Switch	Setting
Operation mode selector	PROG.
Card operation switch	ROM



## Procedure

1. Change to PROG mode
2. **Online** → **Memory transfer services...**
3. Select "Restore project from ROM2 to ROM1" to transfer the project back to RAM/ROM1

**Note**

Turning off the power of the CPU does not affect the data saved in the backup memory ROM2.

## 5.4 SD memory card operation

Control FPWIN Pro projects may be executed from an SD memory card or transferred from the SD memory card to the operation memory.

Save the PLC configuration and the program code under \AUTO\autoexec.fp7 on the SD memory card.

### Precautions

- The data on the SD memory card will be lost in the following cases. We assume no responsibility whatsoever for the loss of saved data.
  - The user or a third party has misused the SD memory card.
  - The SD memory card has been affected by static electricity or electric noise.
  - The SD memory card was taken out, or the CPU was powered off, while the card was being accessed (e.g. saving data into the card, deleting data from the card).
- Never remove the card or turn off the power of the PLC while the SD LED is flashing (data is being read from or written to the card). Data may be damaged.
- Do not remove the card while the COPY LED is on. The project may be damaged.
- If the card operation switch is set to CARD although no SD memory card is inserted, a self-diagnostic error will occur.
- If the CPU cannot access a project on the SD memory card while the card operation switch is set to CARD, a self-diagnostic error will occur.
- It is recommended to save important data in another medium for backup.
- Do not use an SD memory card with a higher capacity than indicated in the specifications. Data in the card may be damaged.

## Usable SD memory cards

We recommend Panasonic SD memory cards (for industrial use). SD memory cards of other manufacturers have not been tested with the FP7.

Logo on CPU	Usable SD memory cards	
	Card type	Capacity
	SD memory card	2GB
	SDHC memory card	4GB–32GB

## Formatting of SD memory cards

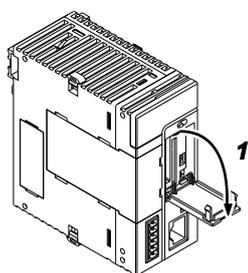
In principle, SD memory cards have been formatted by the time of purchase, and no formatting by the user is required. If formatting becomes necessary, download formatting software for SD memory cards on the SD Association's website: <https://www.sdcard.org/home/>.

A file system formatted by the PC's standard formatting software does not satisfy the SD memory card specifications. Please use the dedicated formatting software.

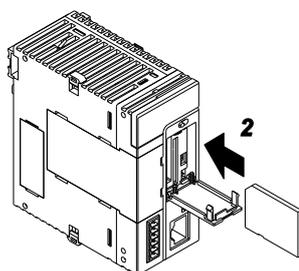
### 5.4.1 Installing an SD memory card

#### Procedure

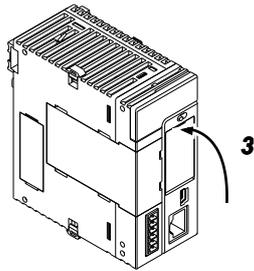
1. Open SD card cover on CPU



2. Insert SD memory card into slot until it locks



3. Close card cover

**Note**

- Close card cover before you can access the files on the SD card.
- If the card cover is opened while the SD memory card is being accessed, a self-diagnostic error occurs and operation stops.
- Before removing an SD memory card, make sure the SD LED on the CPU is off.

## 5.4.2 Executing projects from an SD memory card

To enable execution of a project from an SD memory card, it is necessary to convert the created project into an auto execution file and to save it on the SD memory card.

### Saving an execution file on the SD memory card

**Procedure**

1. **Project** → **Save as** → **Project on SD card...**
2. Select "SD card will be plugged in PLC"
3. Select target folder

The PLC will only detect the auto execution file if it is located in an SD card folder named "\AUTO"!

4. [Save]

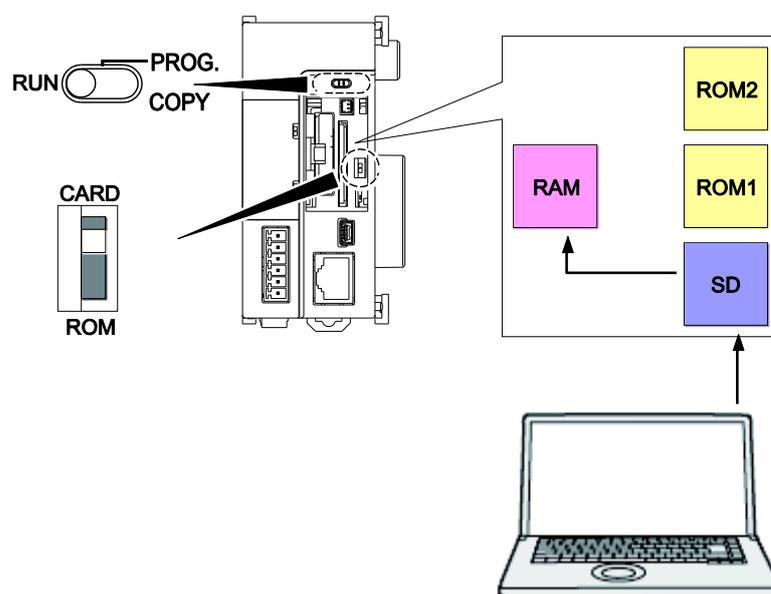
An auto execution file autoexec.fp7 is created.

5. Create a folder named "\AUTO" on the SD memory card
6. Copy autoexec.fp7 into the new folder on the SD card

## Execution of a project saved in an SD memory card

To enable execution of a project saved in the card, insert an SD memory card, set the operation mode selector to RUN, and set the card operation switch to CARD.

Switch	Setting
Operation mode selector	RUN
Card operation switch	CARD



### Procedure

1. Turn off the power of the CPU
2. Insert an SD memory card containing autoexec.fp7 into the CPU

Autoexec.fp7 is the project to be executed. Use **Project** → **Save as** → **Project on SD card...** to create autoexec.fp7.

3. Set the card operation switch to CARD
4. Close SD card cover
5. Turn on the power of the CPU
6. Set the operation mode selector to RUN

The project saved in the SD memory card is transmitted to the operation memory.

## Switching from ROM operation to SD memory card operation

When the card operation switch is set to ROM you can change the switch setting to CARD and then change to RUN mode to start SD memory card operation. From SD memory card operation you cannot switch to RAM/ROM operation without turning off the power of the CPU.

### Procedure

1. Turn on the power of the CPU
2. Set the card operation switch to CARD
3. Set the operation mode selector to RUN

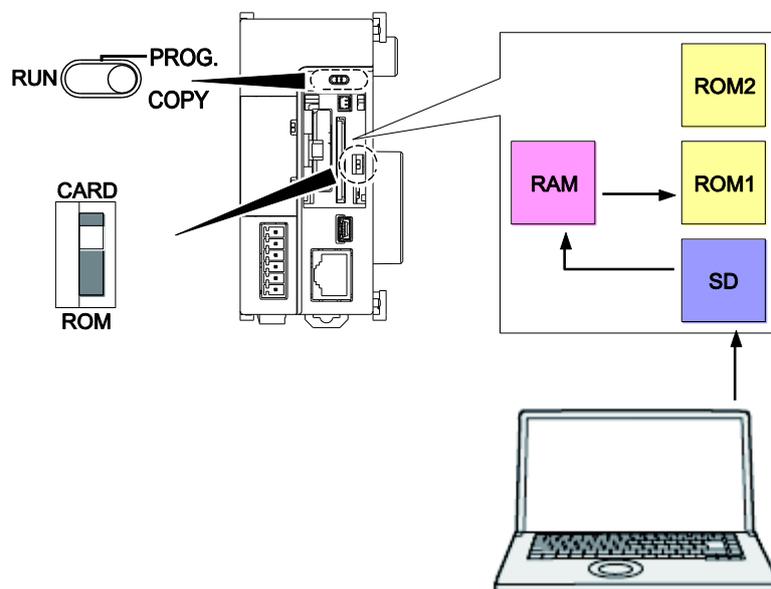
### Note

Online editing is not available during SD memory card operation (a protection error occurs).

## Transfer from SD memory card to ROM1

To transfer a project from an SD memory card to ROM1, insert the card and set the operation mode selector to COPY.

Switch	Setting	
	Power is off	Power is on
Operation mode selector	RUN→COPY	PROG.→COPY
Card operation switch	CARD	ROM→CARD



## Procedure

**When power is off**

1. Insert an SD memory card containing autoexec.fp7 into the CPU

Autoexec.fp7 is the project to be transferred to the CPU. Use **Project** → **Save as** → **Project on SD card...** to create autoexec.fp7.

2. Close SD card cover
3. Turn on the power of the CPU
4. Set the operation mode selector to COPY.

Hold the switch until the COPY LED starts flashing (≈5s).

Transmission of the project data begins. Once the COPY LED starts flashing and transmission begins, you may release the switch. The COPY LED turns off when transmission is complete.

## Procedure

**When power is on**

1. Change to PROG mode
2. Insert an SD memory card containing autoexec.fp7 into the CPU

Use **Project** → **Save as** → **Project on SD card...** to create autoexec.fp7.

3. Close SD card cover
4. Set the operation mode selector to COPY.
5. Hold the switch until the COPY LED starts flashing (≈5s).

Transmission of the project data begins. Once the COPY LED starts flashing and transmission begins, you may release the switch. The COPY LED turns off when transmission is complete.

## Note

Setting the card operation switch to CARD automatically starts operation of a project from an SD memory card. Setting the switch to ROM starts operation from the operation memory. Data transfer using in COPY mode is performed independent of the card operation switch setting.

# Chapter 6

## Troubleshooting

### 6.1 LED display for operation status

When an error occurs, the status of the operation status LEDs on the CPU changes as shown in the table below.

#### Operation status LEDs on CPU

	LED status				Description	Operation status
	RUN (Green)	PROG. (Green)	ERROR (Red)	ALARM (Red)		
Normal condition	On	Off	Off	Off	Normal operation	Continue
	Off	On	Off	Off	PROG mode	Stop
	Flashes	Off	Off	Off	Forcing on/off in RUN mode	Continue
Abnormal condition	On	Off	Flashes	Off	A self-diagnostic error has occurred (continue operation)	Continue
	Off	On	Flashes	Off	A self-diagnostic error has occurred (halt operation)	Stop
	Off	On	Varies	On	System watchdog timeout has occurred	Stop
	Off	Flashes	Varies	Off	Waiting for connection to PHLS slave	Stop

### 6.2 Operation on error

The CPU has a self-diagnostic function which identifies errors and stops operation if necessary. For some errors, the user may select whether operation shall continue or stop when the error occurs.

#### Procedure

1. Double-click "PLC" in the navigator
2. Double-click "System registers"
3. Double-click **"Act on Error"**

Select the desired setting for each type of error.

**Example**

Operation is to continue even though a calculation error has occurred: Set the system register "Operation error" to "Continue". Operation errors will be handled as an error, but operation will continue.

## 6.3 ERROR LED is flashing

Check the error code using the programming software.

**Procedure**

- In online mode: **Monitor** → **PLC status** or 

The error code is displayed in the "Self-diagnostic error" section.

### For self-diagnostic errors other than a syntax error

- Eliminate the cause of the error.

### For error codes 80 and higher

There are three ways to clear the error:

- Choose [Clear] in the "PLC status" dialog while in PROG mode
- Turn the power supply off/on while in PROG mode (this clears all of the contents of the operation memory except hold type data)
- Execute the self-diagnostic error set instruction F148\_ERR

**Note**

When an operation error occurs, the address at which the error occurred is stored in a system data register. Monitor the address at which the error occurred before canceling the error.

## 6.4 PROG mode does not change to RUN

If PROG mode does not change to RUN, a syntax error or a self-diagnostic error that caused operation to stop has occurred.

- Check to see if the ERROR or ALARM LED is on.
- Locate the syntax error by executing **Monitor** → **PLC status** or .

## 6.5 ALARM LED is ON

If the ALARM LED is on, a system watchdog timeout has occurred and the operation of the PLC has been stopped.

### Procedure

1. Set the operation mode selector of the PLC from RUN to PROG. and turn the power off and then on
  - If the ALARM LED lights again, there is probably an abnormality in the CPU. Please contact your dealer.
  - If the ALARM LED goes out after the power supply is turned on again, the problem may have been caused by noise or another temporary phenomenon.

2. Switch to RUN mode

If the ALARM LED turns on, the program execution time is too long. Review and modify the program, if necessary.

- Check if there is an infinite loop in the program, resulting from instructions such as JP or LOOP that control the program flow.
- Make sure that multiple interrupt instructions are being executed consecutively.

3. Check the environment for influence of noise

If there is no problem with the program, there may be a problem in the environment. Check the wiring, including the earth wiring. In particular, make sure that the RS232C wiring is not too close to power cables and that the wiring is shielded.

## 6.6 POWER LED on power supply unit is OFF

If the POWER LED does not turn ON, power supply to the unit may be insufficient.

- Turn off the power and check the power supply wiring.
- Check if the output current of the power supply unit is in the range of the rating.

If the internally supplied power of 24V is insufficient, investigate different unit combinations.

- Disconnect the power supply wiring to the other devices if the power supplied to the unit is shared with them.

If the LED on the power supply unit turns on at this moment, undercapacity of the power supply is possible. Review the power supply design.

## 6.7 Password protection error message

If a protection error message appears, a password has been set.

To access a PLC for which a password has been set, a login is required whenever the power is turned on.

### Procedure

1. **Online** → **Security settings**
2. Enter your password under "PLC Access"
3. Choose [Login]

### NOTICE

If you are not logged in, [Clear Password] will erase not only the password but also the program and parameters stored in the PLC's comment memory.

## 6.8 Diagnosing output malfunction

---

If the outputs do not function correctly, both software (e.g. program, I/O allocation) and hardware (e.g. wiring, power supply) may be responsible. Check the output side first and then the input side.

### If the output status LEDs are ON:

- Check the wiring of the loads.
- Check if the power is properly supplied to the loads.
  - If the power is properly supplied to the load, there is probably an abnormality in the load.
  - If the power is not supplied to the load, there is probably an abnormality with the outputs.

### If the output status LEDs are OFF:

- Monitor the output condition using Control FPWIN Pro.
  - If the output monitored is TRUE, there is probably a duplicate output error.
- Set the output to TRUE by force using Control FPWIN Pro.
  - If the output status LED is turned ON, you must check the input side.
  - If the output status LED remains OFF, there is probably an abnormality with the outputs.

### If the input status LEDs are OFF:

- Check the wiring of the input devices.
- Check that the power is properly supplied to the input terminals.
  - If the power is properly supplied to the input terminal, there is probably an abnormality with the inputs.
  - If the power is not supplied to the input terminal, there is probably an abnormality in the input device or input power supply. Check the input device and input power supply.

### If the input status LEDs are ON:

Monitor the input condition using Control FPWIN Pro.

- If the input monitored is FALSE, there is probably an abnormality with the inputs.
- If the input monitored is TRUE, check the leakage current at the input devices (e.g. two-wire type sensor) and check the program again, referring to the following:
  - Check for duplicate output errors and for outputs having been re-written by high-level instructions.
  - Check the program flow when instructions such as MC or JP are used.
  - Check if the I/O map agrees with the actual mounting status.

# Chapter 7

## Maintenance

### 7.1 Preventive maintenance

Although the FP7 system has been designed in such a way as to minimize maintenance and offer trouble-free operation, several maintenance aspects should be taken into consideration. If preventive maintenance is performed periodically, you will minimize the possibility of system malfunctions.

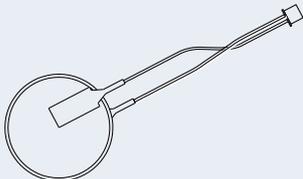
#### Inspection items

Item	Description	Criteria	Reference
Power supply unit	Check POWER LED	Normal if ON	See p. 23
	Lifetime	Periodic replacement	See p 70.
CPU display	Check RUN LED	ON in RUN mode	See p. 21
	Check ERROR LED	Normal if OFF	
	Check ALARM LED	Normal if OFF	
Installation	Looseness of units on DIN rail	Securely mounted	See p. 30
Connection status	<ul style="list-style-type: none"> <li>Loose terminal screw</li> <li>Proximity of crimp terminals</li> <li>Loose connector</li> </ul>	<ul style="list-style-type: none"> <li>No looseness of screws or connectors</li> <li>Screws should be evenly fastened</li> <li>Crimp terminals do not touch</li> </ul>	See p. 32 to 40.
Power supply	Power supply unit	100–240V AC	See p. 30 and 70.
	CPU	24V DC	See p. 14 and (see p. 64).
Operating environment	Ambient temperature	0–+55°C	See p. 30
	Ambient humidity	10%–95% RH	
	Operation conditions	Free from corrosive gases and excessive dust	
Backup battery	Battery for CPU	Periodic replacement	See p. 61

## 7.2 Backup battery

A separately sold backup battery must be installed to use the clock/calendar function.

### Battery (optional)

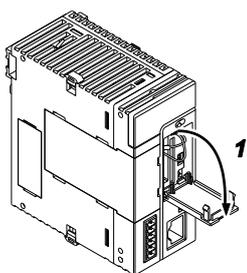
	Product	Description	Product no.
	Backup battery	With connector	AFPX-BATT

#### Note

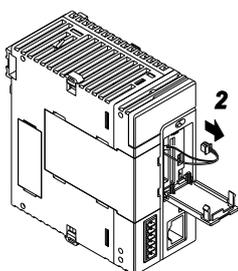
- The clock/calendar function continues operation for about one week thanks to the built-in capacitor, even if no battery is used. In order to charge the built-in capacitor, supply power to the CPU for at least 30 minutes.

#### Procedure

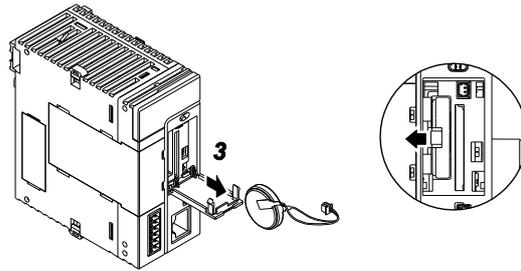
1. Open SD memory card cover



2. Remove battery connector



- Pressing back the lever, take out battery from battery holder



- Pressing back the lever, insert new backup battery
- Connect battery connector to CPU
- Close SD card cover

#### Note

- The battery can be replaced while the power is on. When replacing the battery while the power is off, replace it only after power has been supplied for at least 5 minutes in order to charge the built-in capacitor. Replace the battery within 10 minutes from turning off the powering. If the built-in capacitor has not been sufficiently charged, the data value of the clock/calendar may become indefinite.
- Make sure that the battery connector cable is not pinched by the SD card cover.

### Lifetime and replacement interval

Battery life	Suggested replacement interval
≥3.3 years	5 years

The battery lifetime is the value when no power at all is supplied. The actual lifetime may be shorter than the typical lifetime depending on the conditions.

Battery life is consumed by the backup battery detection circuit even while power is being supplied. Lifetime while power is being supplied is approx. two times longer than without power supply.

Promptly replace the battery, though clock/calendar data are retained for about one week from the detection of a backup battery error, even if no power at all is supplied.

## Battery error detection

When voltage of the backup battery declines, the system variables `sys_blsBatteryErrorHold` and `sys_blsOperationErrorHold` turn to TRUE. If necessary, create a program for reporting the error.

If the system register "Battery error indication" has been set to "Enable", the CPU's ERROR LED flashes.

### Note

- One week after an empty battery has been detected (the system variables `sys_blsBatteryErrorHold` and `sys_blsOperationErrorHold` turn to TRUE or the ERROR LED flashes) the retained clock/calendar data value may become indefinite if no power is supplied.
- The system variables `sys_blsBatteryErrorHold` and `sys_blsOperationErrorHold` turn to TRUE when a backup battery error is detected, whether "Battery error indication" in the system registers has been disabled or not.
- Always supply power to the CPU for at least 5 minutes before replacing a backup battery, regardless of the time passed from detection of a backup battery error.

# Chapter 8

## Appendix

### 8.1 Specifications

#### 8.1.1 General specifications

Item	Description
Rated operating voltage	24V DC
Operating voltage range	20.4–28.8V DC <sup>1)</sup>
Momentary power off time	With external power supply: 4ms (using 20.4V), 7ms (using 24V), 10ms (using 28.8V) With FP7 power supply unit: 10ms
Ambient temperature	0–+55°C
Storage temperature	-40–+70°C
Ambient humidity	10%–95% RH (at 25°C, non-condensing)
Storage humidity	10%–95% RH (at 25°C, non-condensing)
Breakdown voltage (Cutoff current: 50mA)	500V AC for 1min for COM port, USB port, Ethernet port, all power supply terminals and function earth terminals
Insulation resistance (measured with a 500V DC megger)	Min. 100MΩ for COM port, USB port, Ethernet port, all power supply terminals and function earth terminals
Vibration resistance <sup>2)</sup>	5–8.4Hz, amplitude of 3.5mm 8.4–150Hz, constant acceleration of 9.8m/s <sup>2</sup> 10min on 3 axes (in X, Y, and Z direction), 10 sweeps (1 octave/min)
Shock resistance <sup>2)</sup>	147m/s <sup>2</sup> , 3 times on 3 axes (in X, Y, and Z direction)
Noise immunity (Power supply terminal)	1000Vp-p, with pulse widths 50ns and 1μs (based on in-house measurements)
Operation conditions	Free from corrosive gases and excessive dust
Overtoltage category	II
Pollution degree	2

<sup>1)</sup> When a GT series touch panel is connected to the GT power supply terminal (24V), the operating voltage range is 21.6–26.4V DC.

<sup>2)</sup> Based on JIS B 3502 and IEC 61131-2.

## 8.1.2 Weight

Type of unit			Product number	Weight
Power supply unit	100–240V AC, 24W		AFP7PSA1	≈240g
	100–240V AC, 3W		AFP7PSA2	≈290g
CPU			AFP7CPS	≈220g
Communication cassette			AFP7CCS1, AFP7CCS2, AFP7CCM1, AFP7CCM2, AFP7CCS1M1	≈25g
			AFP7CCET1	≈20g
Application cassette			AFP7FCA21, AFP7FCAD2, AFP7FCTC2	≈25g
Input unit	12–24V DC	16 inputs Terminal block	AFP7X16DW	≈125g
		32 inputs MIL connector	AFP7X32D2	≈95g
		64 inputs MIL connector	AFP7X64D2	≈110g
Output unit	Relay	16 outputs Terminal block	AFP7Y16R	≈180g
	Transistor	16 outputs Terminal block	AFP7Y16T, AFP7Y16P	≈125g
		32 outputs MIL connector	AFP7Y32T, AFP7Y32P	≈95g
		64 outputs, MIL connector	AFP7Y64T, AFP7Y64P	≈115g
Mixed I/O unit		32 inputs, 32 outputs MIL connector	AFP7XY64D2T, AFP7XY64D2P	≈115g
Analog input unit		4 channels	AFP7AD4H	≈130g
Analog output unit		4 channels	AFP7DA4H	≈130g
High-speed counter unit			AFP7HSC2T, AFP7HSC4T	≈130g
Pulse output unit	2 axes		AFP7PP02T, AFP7PP02L	≈130g
	4 axes		AFP7PG04T, AFP7PG04L	≈150g
Positioning unit	2 axes		AFP7PP02T, AFP7PP02L	≈145g
	4 axes		AFP7PP04T, AFP7PP04L	≈145g
Serial communication unit			AFP7NSC	≈110g
PHLS master unit			AFP7RMTM	≈110g
PHLS slave unit	8 I/Os Terminal block		AFPRP1X08D2	≈140g
	16 I/Os Terminal block		AFPRP1X16D2, AFPRP1Y16T, AFPRP1XY16D2T	≈210g
	e-Con		AFPRP2X08D2E	≈75g
	Small terminal block		AFPRP2X16D2, AFPRP2Y16T, AFPRP2XY16D2T, AFPRP2Y04R	≈75g

### 8.1.3 Performance specifications

Item		Description	
Programming method/control method		Relay symbol/cyclic operation	
Maximum number of I/Os	Basic configuration	1024 (64 I/Os × 16 slots)	
	Using the PHLS remote I/O system	16128 (1008 I/Os × 16 slots)	
Program memory	Internal memory (non-volatile)	Operation memory (RAM and ROM1) Backup memory (ROM2)	
	Program capacity (steps)	Configurable <sup>1)</sup>	
Comment memory		3MB	
Operation speed		Basic instructions: ≥11ns/step	
Basic instructions		≈100	
High-level instructions		≈206	
Memory areas <sup>3)</sup>	1 bit	Inputs (X)	8192 (X0–X511F) <sup>2)</sup>
		Outputs (Y)	8192 (Y0–Y511F) <sup>2)</sup>
		Internal relays (R)	32768 (R0–R2047F)
		Link relays (L)	16384 (L0–L1023F)
		Timer relays (T)	4096 (T0–T4095) 1–4294967295 (in units of 10μs, 1ms, 10ms, 100ms, 1s)
		Counter relays (C)	1024 (C0–C1023) 1–4294967295
		System relays (SR)	1120 (≈70 words)
		Pulse relays (P)	4096 (P0–P255F)
		Error alarm relays (E)	4096 (E0–E4095)
	16 bits	Data registers (DT)	Configurable <sup>1)</sup>
		Link registers (LD)	16384 words (LD0–LD16383)
		Unit memory (UM)	≤512K words per unit
		System data (SD)	110 words
	32 bits	Index registers	15 double words (I0–IE)
		Timer set value registers (TS)	4096 double words (TS0–TS4095)
		Timer elapsed value registers (TE)	4096 double words (TE0–TE4095)
		Counter set value registers (CS)	1024 double words (CS0–CS1023)
		Timer/counter elapsed value registers (CE)	1024 double words (CE0–CE1023)
	Master control relays (MCR)		Unlimited (no numbers)
	Number of labels (JP and LOOP)		≤65535
Differential points (DF, DFI)		Depending on program capacity	
Number of SFC steps		No restriction	
Number of subroutines		≤65535	
Periodical interrupt		1 interrupt/cycle Unit: 0.1ms or 1ms	

Item	Description
	High-speed counter units: 8 interrupts/unit, max. 8 units/project
Constant scan time	0.5ms–125ms
Memory backup when power is cut off	Automatic backup of project data (program and PLC configuration) and operation memory (except for clock/calendar data) by built-in non-volatile memory.
Clock/calendar function <sup>4)</sup>	Available (optional backup battery <sup>5)</sup> required)
Self-diagnostic function	Watchdog timer, program syntax check
Online edit mode	Available
Security function	Password function, upload protection, encryption for program and PLC configuration

<sup>1)</sup> Program capacity, number of data registers and maximum number of program blocks vary depending on the CPU type and the memory configuration set in the system registers.

Memory type	Memory configurations for CPU type CPS4 (values in parentheses refer to CPS3)				
	1	2	3	4	5
Program capacity (steps)	234000 (121500)	221500 (96000)	196000 (64000)	144500 (32000)	51500
Data registers (words)	65536 (131072)	131072 (262144)	262144 (425984)	524288 (589824)	999424

<sup>2)</sup> Figures in the table indicate the number of inputs and outputs that can be used in the program. The actual number that can be used varies by configuration.

<sup>3)</sup> Memory areas are categorized into "hold type" areas, which keep their state during a power failure or when the PLC is switched to PROG mode, and "non-hold type" areas, which reset their state. Internal relays, data registers, link relays and link registers can be defined as either non-hold or hold areas using Control FPWIN Pro. Counters and error alarm relays are hold areas, all other areas are non-hold areas. However, a maximum of 262144 words can be used as hold area.

<sup>4)</sup> Precision of the clock/calendar function: at 0°C: error <95s/month; at 25°C: error <15s/month; at 55°C: error <130s/month.

When the unit is connected to an Ethernet network, the time is synchronized by SNTP.

<sup>5)</sup> Battery life: ≥3.3 years, suggested replacement interval: 5 years. The clock/calendar function continues operation for about one week thanks to the built-in capacitor, even if no battery is used. In order to charge the built-in capacitor, supply power to the CPU for at least 30 minutes.

## 8.1.4 Communication specifications

### USB port (for programming software)

Item	Description
Standard (baud rate)	USB 2.0 Full Speed
Communication mode	MEWTOCOL-COM Slave, MEWTOCOL7-COM Slave

### COM0 port

Item	Description
Interface	RS232C
Transmission distance	15m
Baud rate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bit/s
Communication method	Half-duplex
Synchronous method	Start stop synchronous system
Communication format	Data length: 7 bits/8 bits Parity: None/Odd/Even Stop bit: 1 bit/2 bits End code: CR/CR+LF/None/ETX Start code: No STX/STX
Data transmission order	Transmits from bit 0 character by character.
Communication mode	MEWTOCOL-COM Master/Slave, MEWTOCOL7-COM Slave Modem connection Program controlled Modbus RTU Master/Slave

#### Note

- Baud rate, communication format, and communication mode must be set using Control FPWIN Pro.
- For baud rates of 38400bit/s or higher, use a cable not longer than 3m. For wiring the RS232C port, use a shielded wire to increase noise resistance.
- When connecting a commercially available device, please confirm operation using the actual device.

**Ethernet port (AFP7CPS41E, AFP7CPS31E)**

Item	Description
Interface	100BASE-TX / 10BASE-T
Baud rate	100Mbit/s, 10Mbit/s (switching by auto-negotiation)
Transmission method	Baseband
Max. segment length	100m <sup>1)</sup>
Communication cable	U/UTP (Category 5)
Max. distance between nodes	100BASE-TX: 2 segments
	10BASE-T: 5 segments
No. of nodes	254
Number of simultaneous connections	User connections: 16
	System connections <sup>2)</sup> : 4
Protocol	TCP/IP, UDP/IP
DNS	Supports name server
DHCP	Automatic getting of IP address
FTP server	File transmission, server function, no. of users: 3
SNTP	Time synchronization function
Communication mode	MEWTOCOL-DAT Master/Slave, MEWTOCOL-COM Master/Slave MEWTOCOL7-COM Slave MODBUS-TCP Master/Slave Program controlled (16KB per connection)

<sup>1)</sup> The standards cite 100m as the maximum, but in some cases a ferrite core may be necessary to increase noise resistance. Also, it is recommended to position a hub near the control board, and limit the length to 10m.

<sup>2)</sup> A system connection is used when connecting the programming software via LAN.

## 8.1.5 FP7 power supply unit

### General specifications

Item	Description	
Ambient temperature	0–+55°C	
Storage temperature	-40–+70°C	
Ambient humidity	10%–95% RH (at 25°C, non-condensing)	
Storage humidity	10%–95% RH (at 25°C, non-condensing)	
Breakdown voltage (Cutoff current: 10mA)	Input terminals ↔ Output terminals	2300V AC for 1min
	Input terminals ↔ Function earth	1500V AC for 1min
	Input terminals ↔ Alarm terminals	2300V AC for 1min
Insulation resistance (measured with a 500V DC megger)	Input terminals ↔ Output terminals	≥100MΩ
	Input terminals ↔ Function earth	
	Input terminals ↔ Alarm terminals	
Vibration resistance <sup>1)</sup>	5–8.4Hz, amplitude of 3.5mm 8.4–150Hz, constant acceleration of 9.8m/s <sup>2</sup> , 10min on 3 axes (1 octave/min)	
Shock resistance <sup>1)</sup>	147m/s <sup>2</sup> , 3 times on 3 axes (in X, Y, and Z direction)	
Noise immunity	1500Vp-p, with pulse widths 50ns and 1μs (based on in-house measurements)	
Operation conditions	Free from corrosive gases and excessive dust	
Conformity to CE Directives	EMC: EN 61131-2, LVD: EN 61131-2	
Overtoltage category	II	
Pollution degree	2	
Weight	AFP7PSA1: ≈240g AFP7PSA2: ≈290g	

<sup>1)</sup> Based on JIS B 3502 and IEC 61131-2

## Performance specifications

	Item	Description
Primary side	Rated input voltage	100–240V AC
	Operating voltage range	85–264V AC
	Rated frequency	50/60Hz
	Frequency range	47–63Hz
	Phases	1
	Input current	AFP7PSA1: 0.75A AFP7PSA2: 1.25A
	Inrush current	≤40A (0-P) on cold start
	Leakage current	Input terminals ↔ Function earth: ≤0.75mA
	Momentary power off time	≥10ms
Secondary side	Rated output current <sup>1)</sup>	AFP7PSA1: 24V DC, 1A AFP7PSA2: 24V DC, 1.8A
	Overcurrent protection function	Available To recover, turn off the primary side and wait at least 180s before turning it on again.
Guaranteed life		27000h at +55°C
Terminal block		Built-in (cannot be replaced)

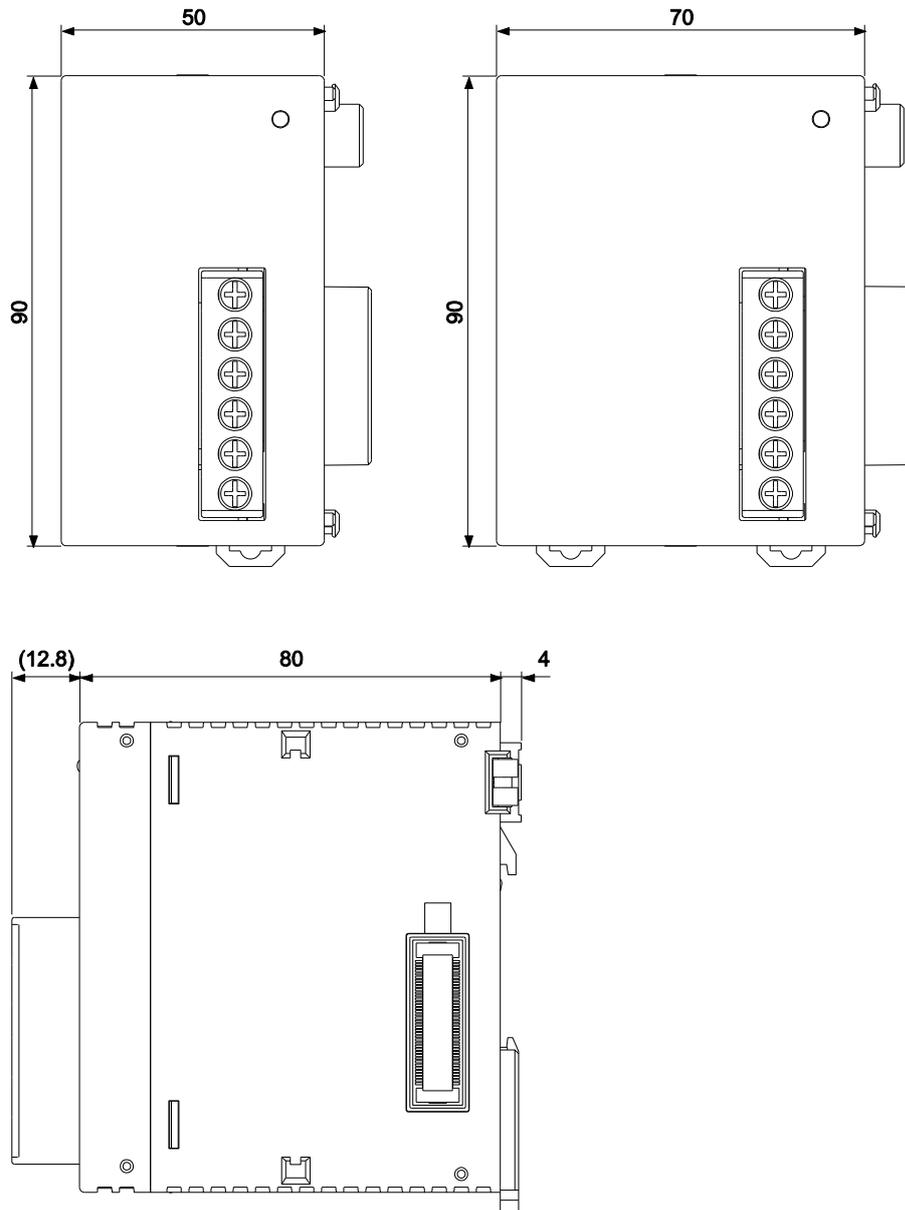
<sup>1)</sup> Use the unit within the rated output current.

## Alarm output specifications

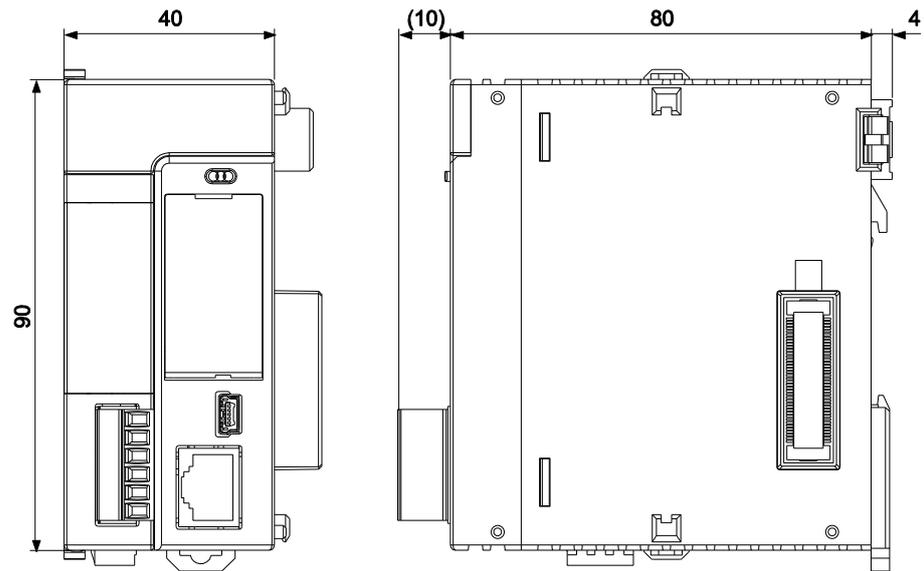
Item	Description
Contact load	1A 30V DC
Alarm contact operation	Contact OFF when CPU alarm occurs

## 8.2 Dimensions

### 8.2.1 FP7 power supply units

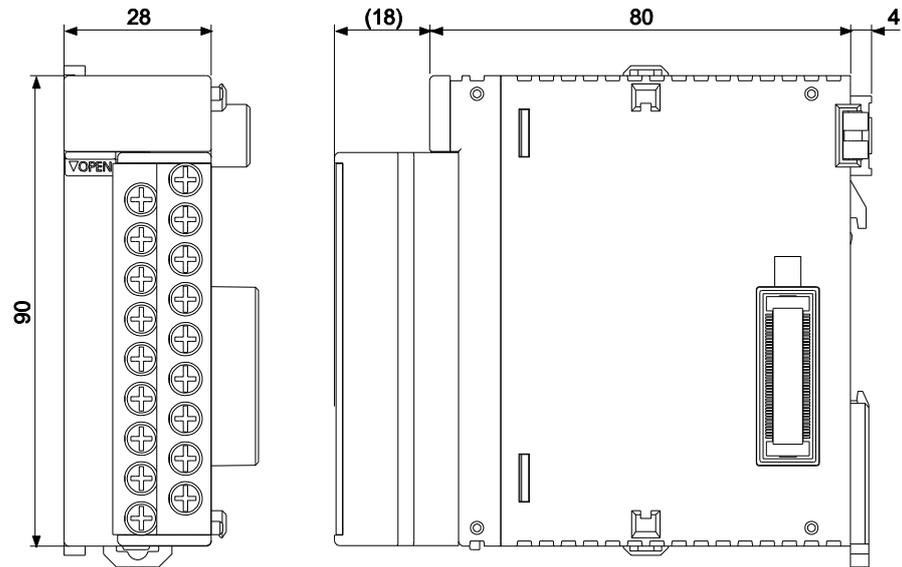


## 8.2.2 CPU



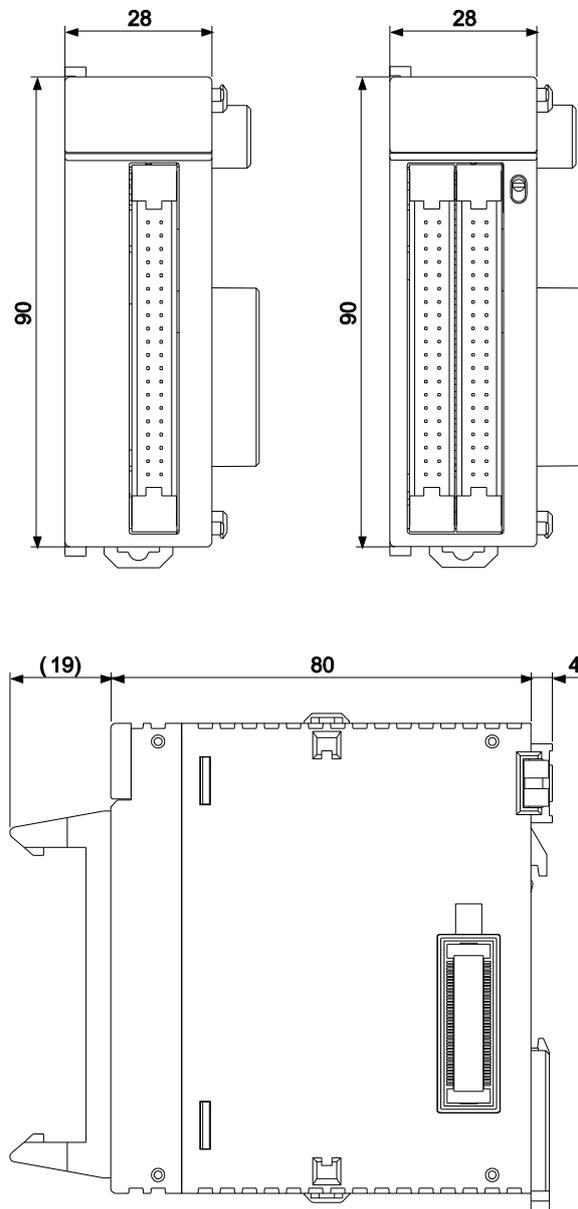
## 8.2.3 Terminal type units

- Digital I/O unit (16 I/Os)
- Analog I/O unit



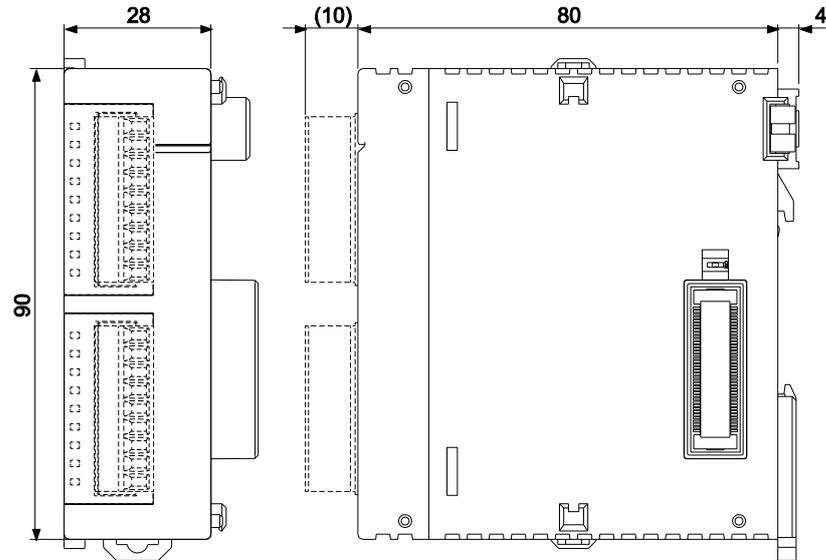
## 8.2.4 Connector type units

- Digital I/O unit (32/64 I/Os)
- High-speed counter unit
- Pulse output unit
- Positioning unit

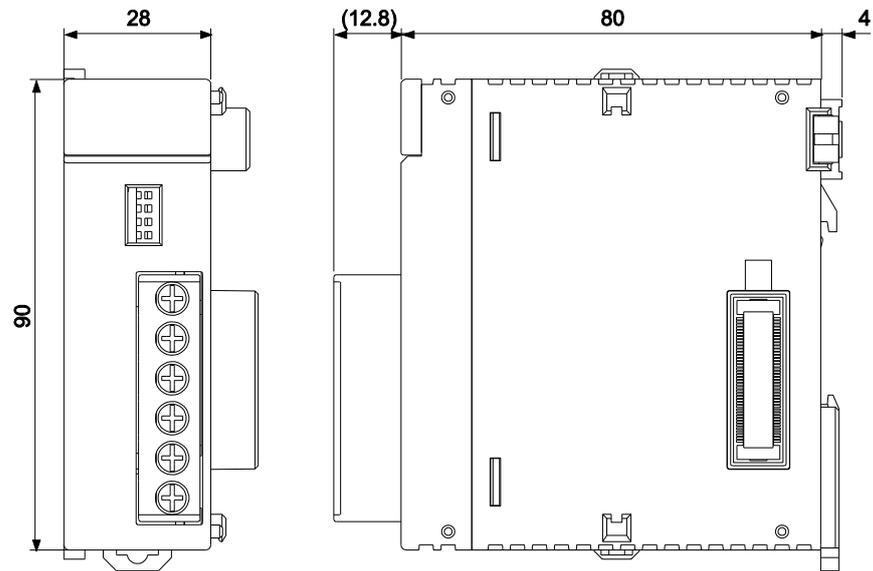


### 8.2.5 Serial communication unit

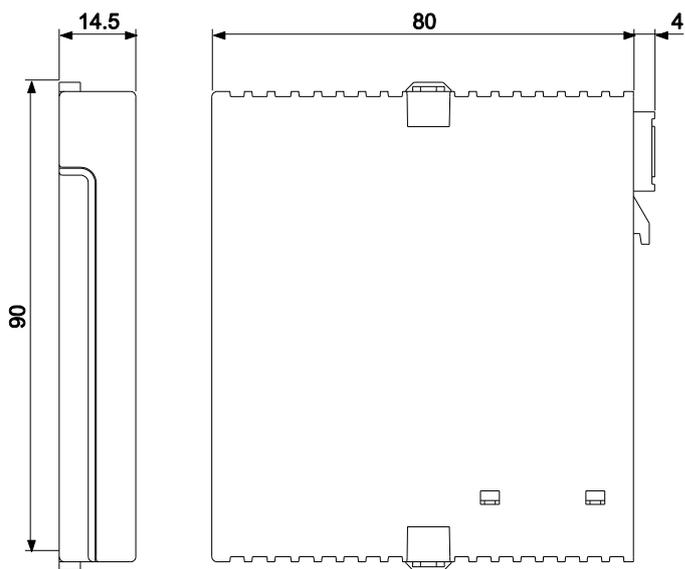
The drawing shows the serial communication unit with two cassettes attached.



### 8.2.6 PHLs master unit

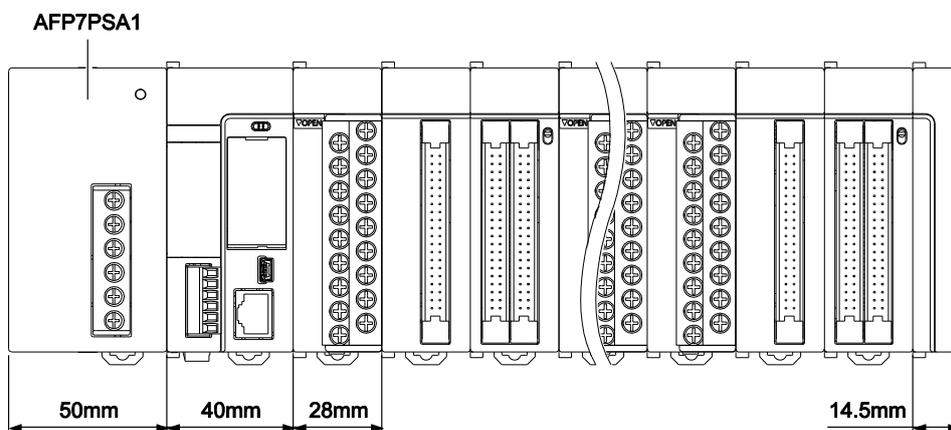


### 8.2.7 End unit



### 8.2.8 PLC systems

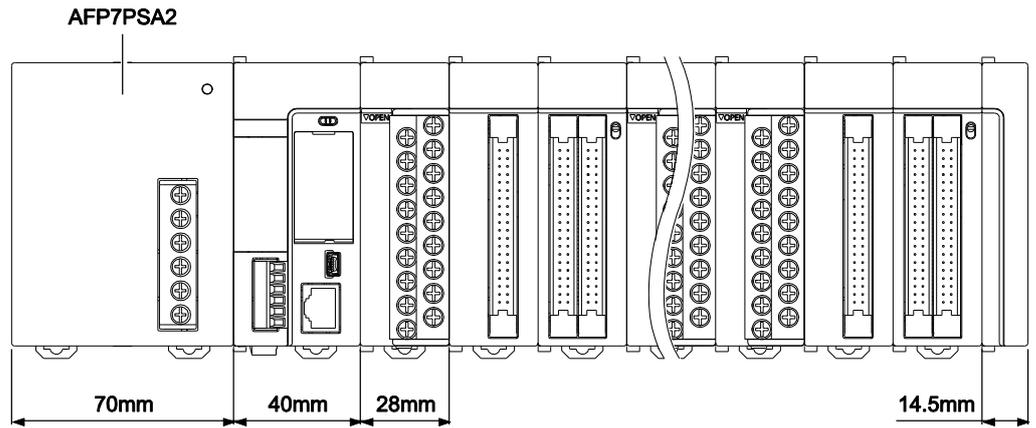
#### Using power supply unit AFP7PSA1



AFP7PSA1	CPU	n devices (I/O units, intelligent units)	End unit
50mm	40mm	n × 28mm	14.5mm

Total system width = 104.5mm + (n × 28mm)

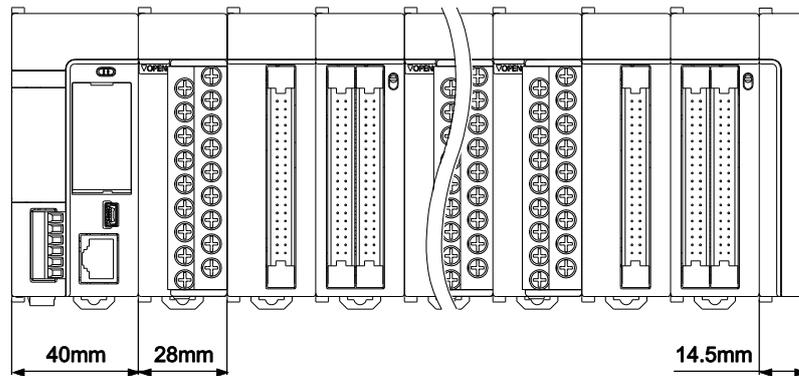
### Using power supply unit AFP7PSA2



AFP7PSA2	CPU	n devices (I/O units, intelligent units)	End unit
70mm	40mm	n × 28mm	14.5mm

Total system width = 124.5mm + (n × 28mm)

### Without power supply unit



CPU	n devices (I/O units, intelligent units)	End unit
40mm	n × 28mm	14.5mm

Total system width = 54.5mm + (n × 28mm)

## 8.3 Error codes

Errors marked in the table as "Auto clears" automatically clear themselves when the power is turned off or when the PLC is changed to RUN mode again after the error has been corrected.

If the operation status is marked as "Selectable", it can be configured in the system registers under "Act on error".

Error code	Name of error	Operation status of PLC	Description and steps to take
E1	CPU hardware error 1	Stops	Probably a hardware problem. Please contact your dealer.
E2	CPU hardware error 2	Stops	
E3	I/O bus power supply error	Stops	There may be an error in the I/O bus, e.g. the end unit is not attached. Check the installation of the units.
E4	Unit attachment limit exceeded	Stops	The number of installed units exceeds the limit. Check the system configuration.
E20 (see note)	Syntax error	Stops Auto clears	A program with a syntax error has been written. Change to PROG mode and correct the error.
E21 (see note)	Duplicated output error	Stops Auto clears	Two or more operation results are output to the same relay. Change to PROG mode and correct the error. This error is also detected during online editing. No changes will be downloaded and operation will continue.
E22	Not paired error	Stops Auto clears	For instructions which must be used in a pair such as jump (JP and LBL), one instruction is either missing or in an incorrect position. Change to PROG mode and correct the error.
E24 (see note)	Program area error	Stops Auto clears	An instruction was written to the wrong program area (main program area or subprogram area). Change to PROG mode and correct the error. This error is also detected during online editing. No changes will be downloaded and operation will continue.

Error code	Name of error	Operation status of PLC	Description and steps to take
E25 (see note)	High-level instruction type error	Stops Auto clears	In the program, high-level F and P instructions are triggered by the same operation result. (While the execution condition is TRUE, F instructions are executed in every scan. P instructions are executed only once, at the rising edge of the execution condition.) Correct the program so that the high-level instructions executed in every scan and at the rising edge are triggered separately.
E27 (see note)	Compile memory full error	Stops Auto clears	The program stored in the PLC is too large to compile in the program memory. Change to PROG mode and correct the error.
E40	Copy failure: cover open	Stops Auto clears	Copying cannot be executed because the SD card cover is open. Close the cover.
E41	Copy failure: no SD card	Stops Auto clears	Copying cannot be executed because there is no SD memory card. Insert an SD memory card.
E42	Copy failure: SD card reading error	Stops Auto clears	Copying cannot be executed because the SD memory card is damaged. Insert a normal SD memory card.
E43	Copy failure: no file	Stops Auto clears	Copying cannot be executed because there is no file in the SD memory card. Check whether a project file has been saved in the card.
E44	Copy failure: password inconsistency	Stops Auto clears	Copying cannot be executed because the password for the project file saved in the SD memory card is not consistent with the password for the execution project saved in the built-in ROM. Check the password settings.
E45	Copy failure: invalid project data	Stops Auto clears	Copying cannot be executed because an error has been identified in the project data saved in the SD memory card. Check the project data.
E50	SD card operation impossible: cover open	Stops Auto clears	SD memory card operation cannot be executed because the card cover is open. Close the cover.
E51	SD card operation impossible: no SD card	Stops Auto clears	SD memory card operation cannot be executed because there is no SD memory card. Insert an SD memory card.
E52	SD card operation impossible: SD card reading error	Stops Auto clears	SD memory card operation cannot be executed because the SD memory card is damaged. Insert a normal SD memory card.
E53	SD card operation impossible: no file	Stops Auto clears	SD memory card operation cannot be executed because there is no file in the SD memory card. Check whether a project file has been saved in the card.

Error code	Name of error	Operation status of PLC	Description and steps to take
E54	SD card operation impossible: password inconsistency	Stops Auto clears	SD memory card operation cannot be executed because the password for the project file saved in the SD memory card is not consistent with the password for the execution project saved in the built-in ROM. Check the password settings.
E55	SD card operation impossible: invalid project data	Stops Auto clears	SD memory card operation cannot be executed because an error has been identified in the project data saved in the SD memory card. Check the project data.
E60	Duplicate or excessive collected I/O maps	Stops Auto clears	There is an error with I/O map configurations. Please check!
E61	Duplicate or excessive registered I/O maps	Stops Auto clears	There is an error with I/O maps that have been registered in the CPU. Please check!
E62	Interrupt error 1	Stops Auto clears	Probably a hardware problem. Please contact your dealer.
E63	Interrupt error 2	Stops Auto clears	The interrupt program may have disappeared during online editing. Check the program.
E80	Unit alarm	Selectable Default: Stops	An alarm has occurred in an attached unit. Check the status of the unit in the slot number saved in system data register SD1.
E81	Unit error	Selectable Default: Stops	An error has occurred in an attached unit. Check the status of the unit in the slot number saved in system data register SD2. Verify the configuration settings.
E82	I/O verification error	Selectable Default: Stops	The connection condition of a unit has changed compared to that at the time of power-up. Check the status of the unit in the slot number saved in system data register SD4.
E83	Unit verification error	Selectable Default: Stops	The number of units differs from that registered in the I/O map. Check the I/O map and the attachment status.
E84	Unit initialization timeout	Selectable Default: Stops	An error has occurred during unit startup. Check the unit's LED status.
E85	Unit configuration data inconsistency	Selectable Default: Stops	The unit's configuration data is not consistent with the applicable unit. Check the I/O map and the configuration data.
E86	Operation error	Selectable Default: Stops	Operation has become impossible after a high-level instruction was executed and a calculation error occurred. The causes of operation errors vary depending on the instruction. Use <b>Monitor</b> → <b>Special relays and registers</b> → <b>Basic error messages</b> to monitor the system data registers storing the error addresses.

Error code	Name of error	Operation status of PLC	Description and steps to take
E100	Bus current error	Selectable Default: Continues	Probably a bus error occurred. Please contact your dealer.
E104	Service power supply current error	Selectable Default: Continues	An error has been detected in the GT power supply terminal. Check if it is connected correctly.
E105	CPU temperature error 1	Selectable Default: Continues	A temperature rise has been detected in the hardware. In general, select "Continue".
E106	CPU temperature error 2	Selectable Default: Continues	
E120	RTC data error <sup>1)</sup>	Continues	An error has been detected in the clock data of the real-time clock.
E121	Power supply unit lifetime warning	Continues	An alarm occurred indicating the end of the power supply unit's lifetime. Replace the power supply unit.
E122	Battery voltage decline	Continues	Voltage of the optional battery has dropped. Replace the battery. If no battery is used, disable the battery error alarm in the system registers.
E123	Gold capacitor voltage decline	Continues	An alarm occurred indicating a voltage drop of the CPU's built-in gold capacitor. Charge the CPU.
E124	SNTP time acquisition failure	Continues	Acquisition of time data has failed during time synchronization via the Ethernet port.
E125	Log settings mismatch	Continues	An error has been detected in the log settings.
E126	Log data error	Continues	An error has been detected in the log data.
E127	Comment data error	Continues	An error has been detected in the comment data.
E1000– E1999	Self-diagnostic error set by F148_ERR	Stops	The self-diagnostic error specified by the F148_ERR instruction has occurred. Use <b>Monitor</b> → <b>PLC status</b> or  to check the error code.
E2000– E2999		Continues	

<sup>1)</sup> If an RTC data error is detected, the date is set to "April 1, 2012".

#### Note

In Control FPWIN Pro, these errors are detected by the compiler. Therefore, they are not critical.



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