Panasonic
ideas for life

FP-e Series

Programmable Controllers

05/2007

FP-e Series

The universal compact PLC

Do this, do that, do everything. All in One!

● 3-color Display

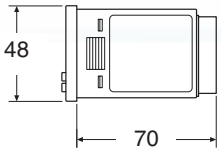
Simple characters and numerical values can be displayed. Simple messages as well as timer/counter settings and elapsed values can also be displayed.

● Built-in operation switch

Setting values can be changed. The operation switch can also be used for input.

● Compact and Space-saving

Panel mountable, little space is taken up on the control panel. The size is only 48 × 48 × 70 mm (behind faceplate).



● Matches FP0 intelligence (equivalent to FP0-C14)

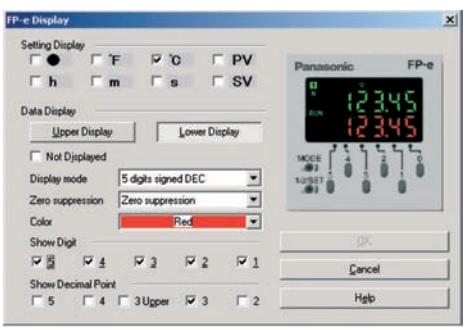
● Panel mounted type (in accordance with IP66, IEC standard)

To match panel design, the color can be changed to black.

Same programming tools used as with the FP Series

One programming software for all PLC types

Programming software and cables are common for all FP Series PLCs, so that any program created for the FP Series can be used by the FP-e as well. FPWIN Pro Ver.5 and FPWIN GR from Ver.2.3 offer a dialog to configure the screen display of the FP-e easily. You can check the result of the configuration directly with the display in the dialog.



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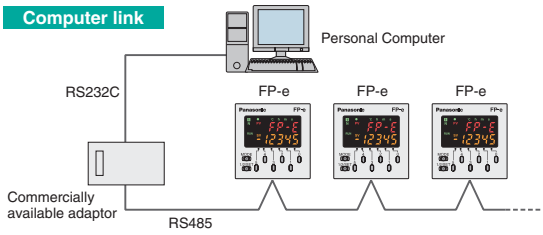
FP-e Series

Optimised for a wide range of applications

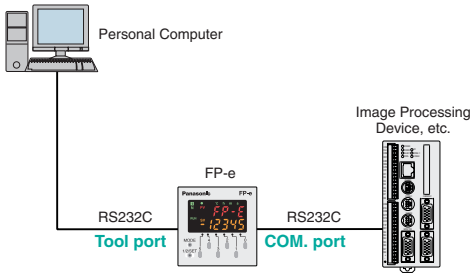
Equipped with RS485 and RS232C interfaces

● Up to 99 computer link stations are possible with RS485. (RS485 type)

Up to 32 computer link stations are possible using a C-NET adaptor and up to 99 are possible using a commercially available adaptor. This makes it possible to monitor operation status or perform control.



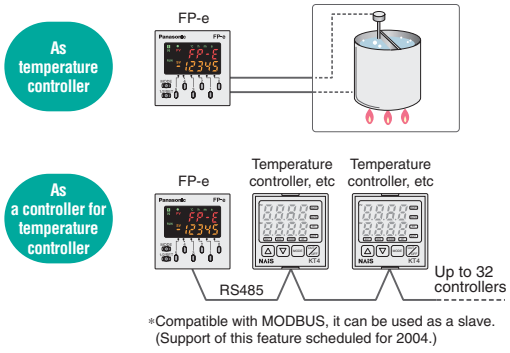
● With RS232C, communication with up to two ports is possible. (RS232C type)



Can even handle temperature control

● Two-point K-type thermocouple (–30 to 300°C) connection is possible. (equipped with thermocouple input)

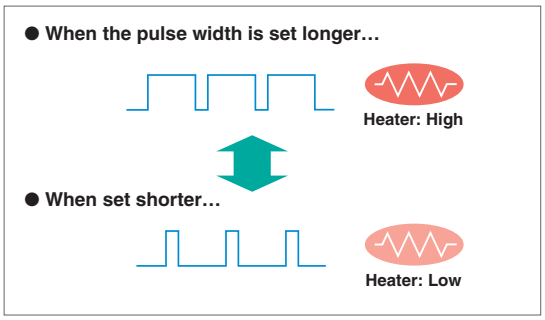
Can be used in place of a temperature controller or used to control them.



*Compatible with MODBUS, it can be used as a slave. (Support of this feature scheduled for 2004.)

● PWM output function

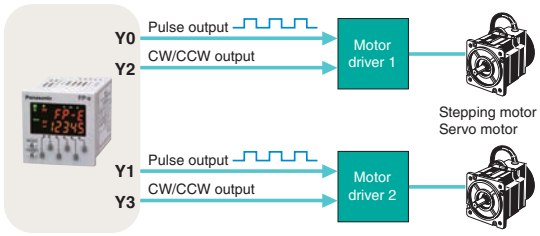
Equipped with two PWM (pulse-width modulation) outputs, which allow the FP-e to perform simple temperature control.



Equipped with high-speed counter for support of 2-axis independent positioning

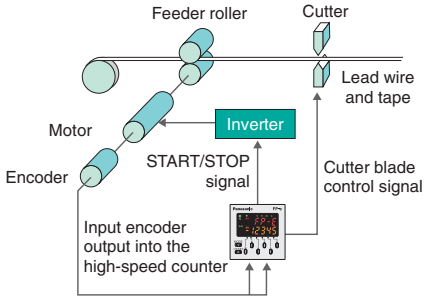
● Pulse output function

The unit comes equipped with 2 channels for pulse output of up to 10 kHz pulses.
Since these two channels can be separately controlled, the FP-e is also suitable for 2-axis independent positioning.



● High-speed counter function

In single phase, the 4-channel total is 10 kHz, and in 2-phase the 2-channel total is 2 kHz total speed, making the suitable for inverter control, and so forth.
(One half for the type with thermocouple input.)



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FP-e Control Units

Decisive advantages in its class

FP-e Control Unit

New Born! Advanced Controller!
Timer, Counter, Hour meter, Temperature Controller and PLC in a Unit

Features

1. 5-character, 2-line, 3-color Display
Simple characters and numerical values can be displayed. Simple error messages as well as operation instructions and timer/counter set values can be displayed.

2. Front Operation Switch
Timer/Counter set values can be changed using front operation switches. The switches can also be used as input switches (X30 to X3F), which save the need for installing external switches.

3. Equivalent to FP0-C14 Intelligence of Small PLCs
Addition to the functions of programmable controller FP0, pulse output and high-speed counter functions can be used. Other than a tool port, a unit is equipped with COM. port (RS232C/RS485) for communication.

4. Easy Programming Using Wizard
Screen display instructions can be easily created using a programming tool FPWIN GR Wizard.

5. Smooth Debug
Monitoring the memory area data and I/O status facilitates debug using the R (register) and I (I/O monitor) display modes.

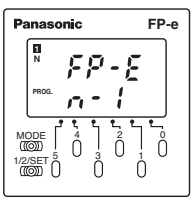
6. Panel Mounted Type
The front of a Unit is water-proof (in accordance with IP66, IEC standard).

Type

Name	Type	Calendar timer	Thermocouple input	COM. port	Product No.
FP-e control unit	Standard type (RS232C)	Not available	Not available	RS232C	AFPE224300
	Calendar timer type (RS232C)	Available	Not available	RS232C	AFPE224305
	Thermocouple input type (RS232C)	Available	Available	RS232C	AFPE214325
	Standard type (RS485)	Not available	Not available	RS485	AFPE224302
	Thermocouple input type (RS485)	Not available	Available	RS485	AFPE214322

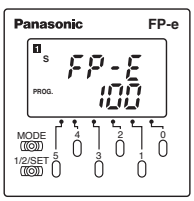
Display modes and functions

1 N mode
(Normal mode)



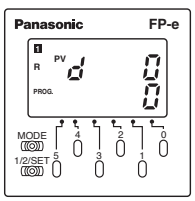
Displays any characters and numerical values, and numerical data can be changed.

2 S mode
(Switch mode)



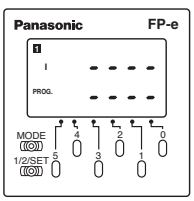
Can also display characters and numerical values. Operation switches can be used for input.

3 R mode
(Register mode)



Operation memory in the controller can be monitored and its data can be changed.

4 I mode
(I/O monitor mode)



I/O status (X, Y) in the controller can be monitored.

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FP-e Series

Specification table

■ Performance specifications

Item	Model	AFPE224300 Standard type (RS232C)	AFPE224302 Standard type (RS485)	AFPE224305 Calendar timer type (RS232C)	AFPE214325 Thermocouple input type (RS232C)	AFPE214322 Thermocouple input type (RS485)
Programming method/Control method		Relay symbol/Cyclic operation				
Number of controllable I/O points	Control unit	14 points [Input: 8, Output: 6 (Tr. NPN: 5/Ry: 1)]			12 points [Input: 6, Output: 6 (Tr. NPN: 5/Ry: 1)]	
	Front switch input	8 points				
Program memory	Built-in memory	Built-in EEP-ROM				
Program capacity		2,720 steps				
Number of instruction	Basic	83				
	High-level	117				
Operation speed		0.9 μs/step (Basic instruction)				
I/O update and Base time		2 ms			Typical 2 to 3 ms Max. 15 ms Note 1)	
Operation memory points — Relays	Internal relay (R)	1,008 points (R0 to R62F)				
	Special internal relay (R)	64 points (R9000 to R903F)				
	Timer/Counter (T/C)	144 points (Initial setting: 100 timer points, T0 to T99/44 counter points, C100 to C143 Note 2) Timer range (1 ms, 10ms, 100ms, 1 s): selected by instruction				
Operation memory points — Memory areas	Data register (DT)	1,660 words (DT0 to DT1659)				
	Special data register (DT)	112 words (DT9000 to DT9111)				
	Index registers (IX. IY)	2 points				
Differential points		Unlimited number of points				
Master control relay points (MCR)		32 points				
Number of labels (JP and LOOP)		64 labels				
Number of step ladders		128 stages				
Number of subroutines		16 subroutines				
Number of interrupt programs		7 programs (external: 6, internal 1)				
Self-diagnostic function		Watchdog timer, program syntax check, etc.				
Clock/calendar function Note 3)		Not available		Available (year, month, day, hour, minute, second and day of week) However, this can only be used when a battery has been installed.		Not available
Battery life		Not available		220 days or more (actual usage value: approx. 870 days (25°C) (Periodic replacement interval: 1 year) (Value applies when no power is supplied at all.)		Not available
Pulse catch input		6 points in total (X0 and X1: 50 μs, X2 to X5: 100 μs)				
Interrupt input						
COM. port Note 4)		RS232C	RS485	RS232C	RS232C	RS485
Periodical interrupt		0.5 ms to 30 s				
Constant scan		Available				
Password		Available				
Special functions — High-speed counter function * The combinations 1-phase × 2 ch. and 2-phase × 1 ch. are also possible for the high-speed counter.		Counter mode: Addition/subtraction (1-phase) Note 5) - Input points: 4 ch. (Max.) - Max. speed: 10 kHz (total of 4 ch.) : 5 kHz (total of 4ch.) - Input contact: X0: count input (ch. 0), X1: count input (ch. 1), X2: reset input Note 6) X3: count input (ch. 2), X4: count input (ch. 3), X5: reset input Note 6) - Min. input pulse width: X0 and X1: 50 μs (10 kHz) X0 and X1: 100 μs (5 kHz) X3 and X4: 100 μs (5kHz) Counter mode: 2-phase/individual/direction decision (2-phase) - Input points: 2 ch (Max.) - Max. speed: 2 kHz (total of 2 ch.) : 1 kHz (total of 2ch.) - Input contact: X0: count input (ch. 0), X1: count input (ch. 0), X2: reset input X3: count input (ch. 2), X4: count input (ch. 2), X5: reset input - Min. input pulse width: X0 and X1: 50 μs (10 kHz) X0 and X1: 100 μs (5 kHz) X3 and X4: 100 μs (5 kHz)				
Special functions — Pulse output function	Output points	2 independent points (Y0 and Y1) (No interpolation function)				
	Output frequency	40 Hz to 10 kHz (Y0/Y1: 1-point) Note 7) 40 Hz to 5 kHz (Y0/Y1: 2-point)			40 Hz to 5 kHz (1-point) 40 Hz to 2.5 kHz (2-point)	
Special functions — PWM output function	Output points	2 points (Y0 and Y1)				
	Output frequency	Frequency: 0. 15 Hz to 1 kHz Duty: 0.1 % to 99.9 %				
Memory backup Note 8) — Timer		Non-hold type: (all points)				
Memory backup Note 8) — Counter	Non-hold type	From set value to C139				
Memory backup Note 8) — Counter	Hold type	4 points (elapsed values) C140 to C143				
Memory backup Note 8) — Internal relay	Non-hold type	976 points (R0 to R60F) 61 words (WR0 to WR60)				
	Hold type	32 points (R610 to R62F) 2 words (WR61 to WR62)				
Memory backup Note 8) — Data register	Non-hold type	1,652 words (DT0 to DT1651)				
	Hold type	8 words (DT1652 to DT1659)				

Note 1) The proportion of timer points to counter points can be changed using a system register.
Note 2) Precision of calendar timer:
- At 0°C/32°F, less than 200 seconds of error per month
- At 25°C/77°F, less than 70 seconds of error per month
- At 55°C/131°F, less than 240 seconds of error per month

Note 3) When using the COM. port for communication, retransmission is recommended. The RS232C driver IC for the COM. port conforms completely to EIA/TIA-232E and CCITT V. 28 standards
Note 4) The max. counting speed (10 kHz) is the counting speed with a rated input voltage of 24 V DC and an ambient temperature of 25°C. The counting speed (frequency) will decrease depending on the voltage and temperature.
Note 5) If the unit is equipped with both reset inputs X0 and X1, X2 serves as the reset input for X1. If X3 and X4 are used, X5 serves as the reset input for X4.
Note 6) When the positioning control instruction "F168" is performed, the maximum output frequency is 9.5 kHz.
Note 7) The program, system registers and the hold type area (internal relay, data register, and timer/counter) are backed up by the built-in EEP-ROM. When a battery is replaced with a new one in the FP-e unit with a calendar timer function, settings can be changed without installing a battery. The data cannot be stored even when the settings are changed using the system register.
Note 8) F180 (SCR) and F181 (DSP) instructions are supported from Control FPWIN GR Ver. 2.2. and FPWIN Pro V 4.1.

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FP-e Series

Technical data

■ General specifications

Item	Description		
Rated voltage	24 V DC		
Operating voltage range	21.6 to 26.4 V DC		
Allowed momentary power off time	10 ms		
Ambient temperature	0 to +55°C		
Storage temperature	–20 to +70°C		
Ambient humidity	30 to 85%RH (non-condensing)		
Storage humidity	30 to 85%RH (non-condensing)		
Breakdown voltage	Input terminals (COM, X0 to Xn) Output terminals (Y0 to Y4)	⟷ Power supply terminal, Function earth Input terminal (A0, A1) COM. (RS232C) terminal	500 V AC for 1 minute
	Output terminal (Y5)	⟷ Power supply terminal, Function earth Input terminal (COM, X0 to Xn, A0, A1) COM. (RS232C) terminal	1500 V AC for 1 minute
	Input terminals (COM, X0 to Xn)	⟷ Output terminals (Y0 to Y4)	500 V AC for 1 minute
Insulation resistance	Input terminals (COM, X0 to Xn) Output terminals (Y0 to Y5)	⟷ Power supply terminal, Function earth Input terminal (A0, A1) COM. (RS232C) terminal	Min. 100 M? (measured with 500 V DC)
	Input terminals (COM, X0 to Xn)	⟷ Output terminals (Y0 to Y5)	
Vibration resistance	10 to 55 Hz, 1 cycle/min. Double amplitude: 0.75 mm, 10 min. on X, Y, and Z axes		
Shock resistance	98 m/s^2 or more, 4 times on X, Y, and Z axes		
Noise resistance	1000V (p-p) with pulse widths 50 ns and 1 µs (based on in-house measurements)		
Operating condition	Free from corrosive gases and excessive dust		
Current consumption	200 mA or less (24 V DC)		
Protection	IP66-compliant front section (Only when a rubber packing is used)		
Mass	Approx. 130 g		

■ DC input specifications (X0 to X7)

Item		Description
Number of input		8 points (6 points for thermocouple input type)
Insulation method		Optical coupler
Rated input voltage		24 V DC
Operating voltage range		21.6 to 26.4 V DC
Rated input current		Approx. 4.3 mA
Input points per common		8 points/common (6 points/common for thermocouple input type) Either the positive or negative of the input power supply can be connected to common terminal
ON voltage/ON current		19.2 V or less/4 mA or less
OFF voltage/OFF current		2.4 V or more/1 mA or more
Input impedance		Approx. 5.1 k? (X0, X1) Approx. 5.6 k? (X2 to X7)
Response time	OFF to ON	50 µs or less (X0, X1) Note 1)
		100 µs or less (X2 to X5) Note 1)
		2 ms or less (X6, X7)
	ON to OFF	50 µs or less (X0, X1) Note 1)
		100 µs or less (X2 to X5) Note 1)
		2 ms or less (X6, X7)
Operating mode indicator		LCD display (I/O monitor mode)

Note 1) X0 through X5 are inputs for the high-speed counter and have a fast response time. If used as normal inputs, you should insert a timer in the program as chattering and noise may be interpreted as an input signal.
Also, the above specifications apply when the rated input voltage is 24V DC and the temperature is 25°C.

■ Thermocouple input specifications

Item	Description
Number of input	2 points (CH0: WX1, CH1: WX2)
Temperature sensor type	Thermocouple type K
Input range	–30 to 300°C *1) (–22 to 572°F)
Accuracy	±0.5%FS±1.5°C (FS = –30 to 300°C)
Resolution	0.1°C
Conversion time	250 ms/2CH *2)
Insulation method	Between internal circuit and thermocouple input circuit: noninsulated *3) Between CH0 and CH1 of thermocouple input: PhotoMOS insulation
Detection function of wire disconnection	Available

*1) Temperature can be measured up to 330°C (626°F). When the measured temperature exceeds 330°C (626°F) or the thermocouple wiring is disconnected, "K20000" is written to the register.
*2) Temperature conversion for thermocouple input is performed every 250 ms. The conversion data is updated on the internal data register after the scan is completed.
*3) The internal circuit and thermocouple input circuit are not insulated. Therefore, use the nongrounding type thermocouples and sheath tubes.

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Technical data

■ Transistor NPN output specifications (For Y0 to Y4)

Item		Description
Insulation method		Optical coupler
Output type		Open collector
Rated load voltage		5 to 24 V DC
Operating load voltage range		4.75 to 26.4 V DC
Max. load current		0.5 A
Max. surge current		1 A
Output points per common		5 points/common
OFF state leakage current		100 μA or less
ON state voltage drop		1.5 V or less
Response time	OFF → ON	50 μs or less (For Y0 and Y1), 1 ms or less (For Y2,Y3 and Y4)
	ON → OFF	50 μs or less (For Y0 and Y1), 1 ms or less (For Y2,Y3 and Y4)
External power supply (For driving internal circuit)	Voltage	21.6 to 26.4 V DC
	Current	6 mA/point (For Y0 and Y1) 3 mA/point (For Y2, Y3, and Y4)
Surge absorber		Zener diode
Operating indicator		LCD display (I/O monitor mode)

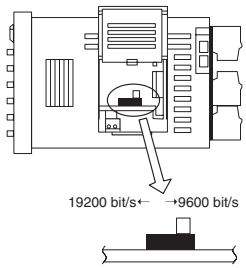
■ Relay output specifications (Y5)

Item		Description
Output type		Normally open (1 Form A)
Rated control capacity		2 A 250 V AC, 2 A 30 V DC
Output points per common		1 point/common
Response time	OFF → ON	Approx. 10 ms
	ON → OFF	Approx. 8 ms
Life time	Mechanical	Min. 2×10^7 operations
	Electrical	Min. 10^5 operations (resistive load)
Surge absorber		None
Operating indicator		LCD display (I/O monitor mode)

■ COM. port communication specifications *1)

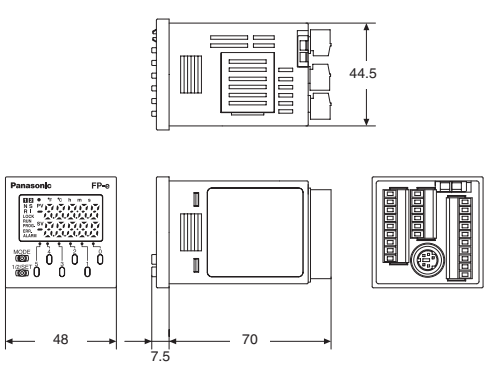
Item	Description	
COM. port type	RS232C *2)	RS485
Isolation status with the internal circuit	Non-isolated	Isolated
Transmission distance	15 m	1200 m
Baud rate *3)	300, 600, 1200, 2400, 4800, 9600, 19200 bit/s	9600,19200 bit/s *4)
Communication method	Half-duplex	
Synchro system	Synchronous communication method	
Transmission format	Stop bit: 1 bit/2 bit	
	Parity: Not available/Available (Odd number/Even number)	
	Data length: 7 bit/8 bit	
	Beginning code: STX available/STX not available	
	Ending code: CR/CR+LF/not available/ETX	
Data output order	Starting from 0 bit per character	
No. of connected units	—	99 *5) *6)
Communication mode	• General-purpose communication • Computer link	• General-purpose communication • Computer link

*1) When communicating between FP-e and other device, it is recommneded to perform resend processing.
*2) For RS232C wiring, be sure to use shield wires for higher noise immunity.
*3) Set the baud rate of RS485 to both FP-e system register and FP-e internal switch. Set the baud rate of RS232C to FP-e system register.
*4) When sending a command from the FP-e is completed in RS485 communication, send a response from the receive device to the FP-e after the following time has been elapsed:
9600 bit/s: 2 ms or longer 19200 bit/s: 1 ms or longer
It takes at least 1 scan time (at least 2 ms) for the FP-e to send back a response after receiveing the command.
*5) When our C-NET Adapter or other RS485 device than recommended is connected in the system, the maximum connection number is limited to 32 units.
*6) For a RS485 converter on the computer side, SI-35 (from LINE EYE Co., Ltd.) is recommended.
When SI-35 is used in the system, up to 99 units can be connected.

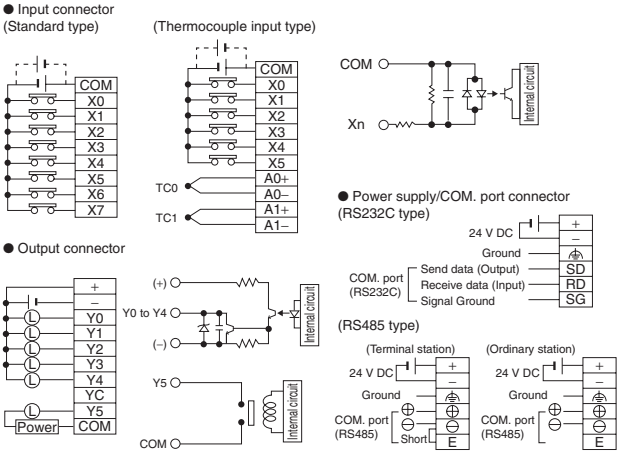


■ Dimensions

(mm)



■ Wiring diagram



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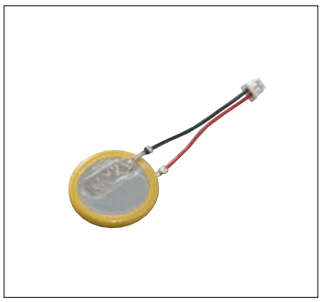
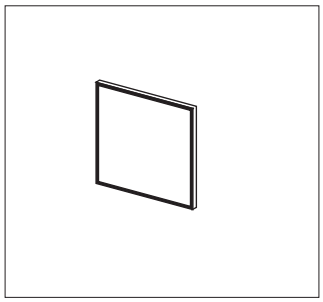
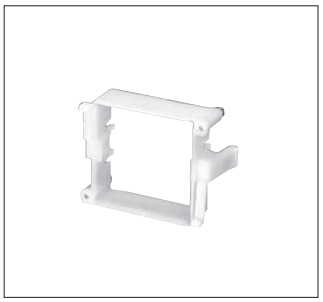
■ Options



Backup battery
Included with calendar timer type
Part No.: **AFPG804**

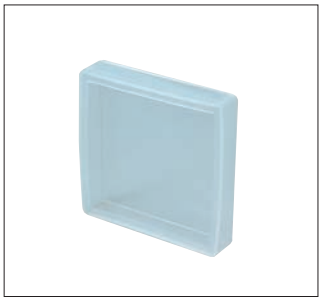


Rubber gasket
Included with unit
Part No.: **ATC18002**

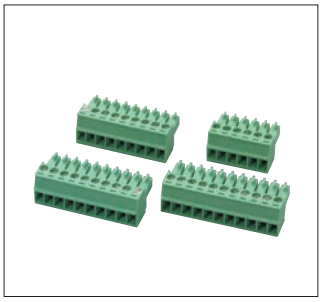


Mounting frame
Included with unit
Part No.: **AT8-DA4**

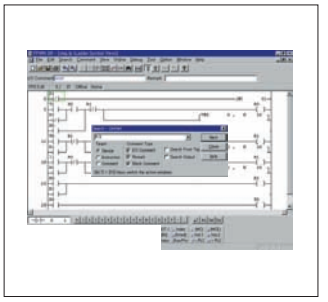
Panel cover
Color: Black
Part No.: **AFPE803** (20 sets)



Protective cover
Part No.: **AQM4803**



Terminal socket set
4 type sockets, additional part
Part No.: **AFPE804**



Programming tool software

Panasonic®