

Programmable relays

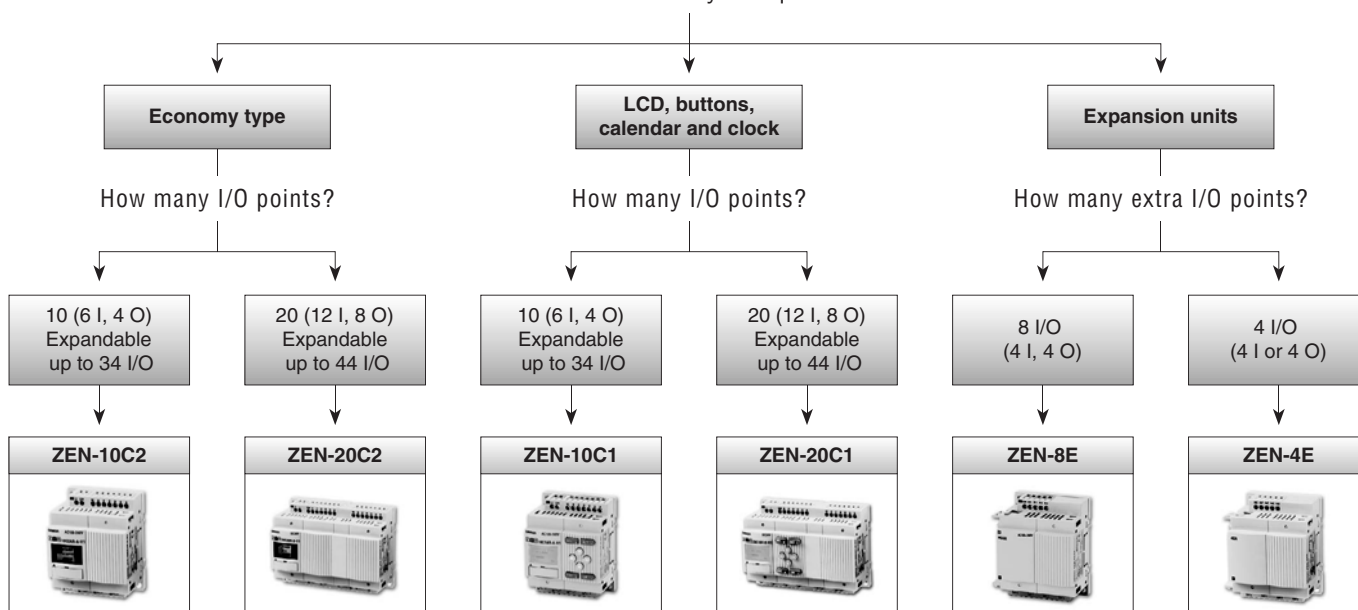
ZEN – the logical automatic tools for small-scale flexible control

The ZEN is a modular, expandable, programmable relay that is designed to provide flexible, automatic control for small-scale machines and facilities. The ZEN combines all the functionality of timers, counters and relays to control multiple input and output signals, while being easy to install and program. It enables any daily routine that involves switching and control to be easily automated, which saves time and effort. And it is the perfect solution for building automation applications where multiple timer control is very important.



- 10 I/O models with 6 inputs and 4 outputs, expandable up to 34 I/Os
- 20 I/O models with 12 inputs and 8 outputs, expandable up to 44 I/Os
- With LCD screen, including calendar and clock function or LED indicator
- DC power supply units have analogue input
- Expansion units for 10 & 20 I/O versions with relay output or transistor



What functionality is required?



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Category		ZEN															
Selection criteria																	
	Model	ZEN-10C1A R-A-V1	ZEN-10C2A R-A-V1	ZEN-10C1D R-D-V1	ZEN-10C2D R-D-V1	ZEN-10C1D T-D-V1	ZEN-10C2D T-D-V1	ZEN-20C1A R-A-V1	ZEN-20C2A R-A-V1	ZEN-20C1D R-D-V1	ZEN-20C2D R-D-V1	ZEN-20C1D T-D-V1	ZEN-20C2D T-D-V1				
	Type	LCD	LED	LCD	LED	LCD	LED	LCD	LED	LCD	LED	LCD	LED				
	Number of I/O points	10 expandable up to 34 I/O						20 expandable up to 44 I/O									
	Inputs	6		6		6		12		12		12					
	Inputs / power supply	100 to 240 VAC		24 VDC		24 VDC		100 to 240 VAC		24 VDC		24 VDC					
	Outputs	4		4		4		8		8		8					
Features		Relays		Relays		Transistors		Relays		Relays		Transistors					
	LCD, buttons, calendar and clock	■		■		■		■		■		■					
	Analogue input (PNP)			■	■	■	■			■	■	■	■				
	Timers	16															
	Holding timers	8															
	Counters	16															
	Weekly timers	16		16		16		16		16		16					
	Calendar timers	16		16		16		16		16		16					
	Displays	16		16		16		16		16		16					
	Work bits	16															
	Holding bits	16															
	Analogue comparators (PNP)					4								4			
	Comparators	16															
	Page	E-3															

Accessories and options	EEPROM (for data security and copying)	ZEN-ME01	Enables programs and parameter settings to be saved or copied to another ZEN
	Battery (keeps time, date and bit values for 10 years at 25 °C)	ZEN-BAT01	10 year min. battery life (at 25 °C)
	Connecting cable for the programming software, RS-232C cable, 9-way 'D' connector for PC	ZEN-CIF01	2 m RS-232C (9-pin D-sub connector)
	Support software for Windows	ZEN-SOFT01-V3	Runs on Windows 95, 98, 2000, ME, XP, or NT 4.0
	PS unit 24 VDC, 1.3 A (30 W)	ZEN-PA03024	ZEN power supply unit
	ZEN kit - with LCD display AC version	ZEN-KIT01-EV3	Set containing CPU unit (ZEN-10C1AR-A-V1), support software connecting cable, ZEN support software and manual
	ZEN kit - with LCD Display DC version	ZEN-KIT02-EV3	Set containing CPU unit (ZEN-10C1DR-D-V1), support software connecting cable, ZEN support software and manual



Category		ZEN Expansion Modules					
Selection criteria							
	Model	ZEN-4EA	ZEN-4ED	ZEN-4ER	ZEN-8EAR	ZEN-8EDR	ZEN-8EDT
	Type						
	Number of I/O points	4			8		
	Inputs	4	4		4	4	4
	Inputs / power supply	100 to 240 VAC	24 VDC	24 VDC	100 to 240 VAC	24 VDC	24 VDC
	Outputs			4	4	4	
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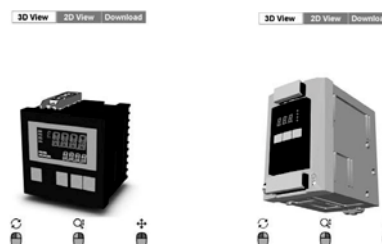
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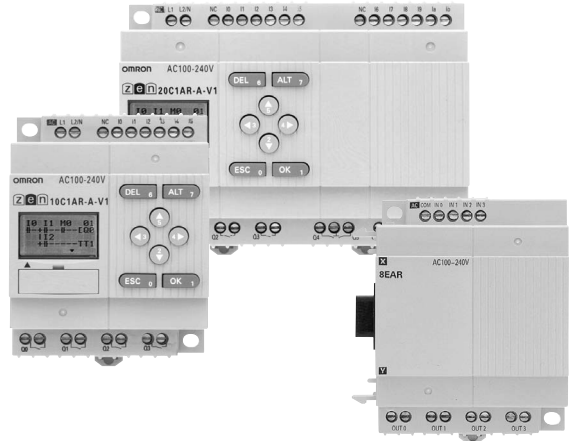
- Large number of formats supported for greater flexibility
- Readily available
- Convenience that saves you time



Programmable Relay ZEN

Flexible Automation

- Two standard CPU's sizes; 10 I/O & 20 I/O
- All CPU models are extendable with maximum 3 expansion units.
- ZEN 10 I/O expandable up to 34 I/O
- ZEN 20 I/O expandable up to 44 I/O
- Version C1 are with LCD display with 4 lines and 12 characters, 8 programming / control buttons, Inputs / Power Supply, calendar & clock functionality.
- Version C2 is an economic type with LED status
- DC-models have 2 analogue inputs
- Inputs/Power Supply: 24 VDC or 100-240VAC
- Outputs: - Relays, 8A, 250 VAC
- Transistors, 24 VDC, 500 mA
- Programming software optional



Programmable
relays

Model Number Structure

Model Number Legend

CPU units

ZEN-□□C□□□□-V1
1 2 3 4 5 6

1 & 2. CPU model

- 10 10 I/O model
- 20 20 I/O model

3. Type classifier

- 1 LCD display, buttons, calendar & clock
- 2 LED indication

4. Input type

- A AC input
- D DC input

5. Output type

- R Relay output
- T Transistor output

6. Supply voltage

- A AC power supply
- D DC power supply

Expansions units

ZEN-□E□□
1 2 3

1. Number of I/O

- 8 4 inputs & 4 outputs
- 4 4 points or 4 outputs

2. Input type

- A AC input
- D DC input
- No input available

3. Output type

- R Relay output
- T Transistor output
- No output available

Ordering Information

List of models

Name	No. of I/O points	Display type	Power Supply voltage	Inputs		Outputs		Buttons, calendar & clock	Analog input	Model number
CPU Units	10	LCD	100 to 240 VAC	6	100 to 240 VAC	4	Relays	Yes	No	ZEN-10C1AR-A-V1
		LED						No	No	ZEN-10C2AR-A-V1
		LCD	24 VDC	6	24 VDC	4	Relays	Yes	Yes	ZEN-10C1DR-D-V1
		LED						No	Yes	ZEN-10C2DR-D-V1
		LCD	24 VDC	6	24 VDC	4	Transistors	Yes	Yes	ZEN-10C1DT-D-V1
		LED						No	Yes	ZEN-10C2DT-D-V1
	20	LCD	100 to 240 VAC	12	100 to 240 VAC	8	Relays	Yes	No	ZEN-20C1AR-A-V1
		LED						No	No	ZEN-20C2AR-A-V1
		LCD	24 VDC	12	24 VDC	8	Relays	Yes	Yes	ZEN-20C1DR-D-V1
		LED						No	Yes	ZEN-20C2DR-D-V1
		LCD	24 VDC	12	24 VDC	8	Transistors	Yes	Yes	ZEN-20C1DT-D-V1
		LED						No	Yes	ZEN-20C2DT-D-V1
Expansion I/O Units	8	-		4	100 to 240 VAC	4	Relays	-	-	ZEN-8EAR
		-		4	24 VDC	4	Relays	-	-	ZEN-8EDR
		-		4	24 VDC	4	Transistors	-	-	ZEN-8EDT
	4	-		4	100 to 240 VAC	-	-	-	-	ZEN-4EA
		-		4	24 VDC	-	-	-	-	ZEN-4ED
		-		-	-	4	Relays	-	-	ZEN-4ER

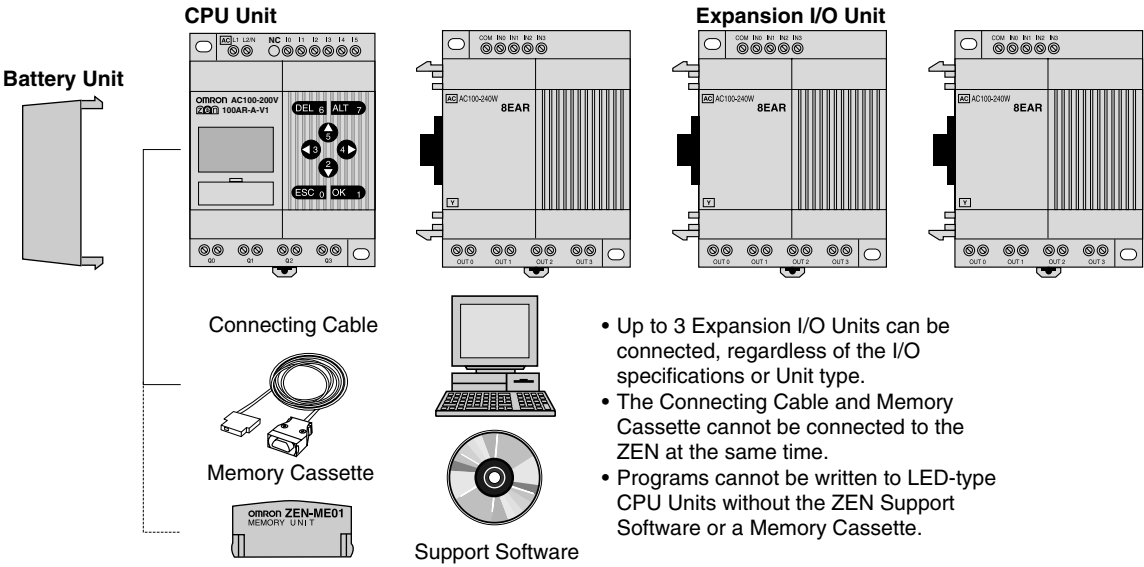
Accessories

Name	Specifications	Remarks			Model number
Memory cassette	EEPROM (for data security and copying)	Enables programs and parameter settings to be saved or copied to another ZEN (See note.)			ZEN-ME01
			LCD type	LED type	
		Transfer from ZEN to Memory Cassette	Supported	Not Supported	
		Transfer from Memory Cassette to ZEN	Supported	Supported (Automatic transfer when power turned ON)	
		Memory Cassette initialization	Supported	Not Supported	
Connecting cable	2-m RS-232C (9-pin sub-D connector)	-			ZEN-CIF01
Battery Unit	10 years min. Battery life (at 25° C)	The program and parameter settings are backed up in the CPU Unit's internal EEPROM and will not be lost. Use the Battery Unit to prevent loss of calendar/clock, holding bits, holding timer present values, counter present values, and other data when the power is turned OFF for an extended time (for 2 days or more at 25° C). This data is otherwise backed up using RAM and a super-capacitor.			ZEN-BAT01
ZEN Support Software	Runs on Windows 95, 98, 2000, ME, XP or NT 4.0.	Specifically designed for the ZEN (CD-ROM).			ZEN-SOFT01-V3

Note: Memory Cassettes created using the CPU Unit can be read to the CPU Unit, regardless of which model is used, however the following points must be taken into consideration.

- When using a Memory Cassette created with a V1 CPU Unit for a Pre-V1 CPU Unit, use the Memory Cassette within the ranges for the Pre-V1 CPU Unit's timers, holding timers, counters, weekly timers, calendar timers, and displays.
- When using a Memory Cassette created with a CPU Unit with 20 I/O points for a CPU Unit with 10 I/O points, use only up to 6 inputs and 4 outputs for the I/O bit area.

System Configuration



Support Software and CPU Unit Combinations

Support Software Version		ZEN-SOFT01 Ver. 1.00	ZEN-SOFT01-V2 Ver. 2.00	ZEN-SOFT01-V3 Ver. 3.00
Pre-V1 Units		Can be used.	Can be used.	Can be used.
V1 Units	10 I/O points	Can be used, with restrictions (See note.)	Can be used, with restrictions (See note.)	Can be used.
	20 I/O points	Cannot be used.	Cannot be used.	Can be used.

Note: Only half of each of the timer, holding timer, counter, weekly timer, calendar timer, and display function areas can be used (i.e., the Pre-V1 bit range).

Specifications

■ General Specifications

Item	Specification	
	ZEN-□0C□AR-A-V1	ZEN-□0C□D□-D-V1
Power supply voltage	100 to 240 VAC	24 VDC
Rated power supply voltage	85 to 264 VAC	20.4 to 26.4 VDC
Power consumption	30 VA max. (With 3 Expansion Units connected)	6.5 W max. (With 3 Expansion Units connected)
Inrush current	40 A max.	10 A max.
Insulation resistance	Between power supply AC external and input terminals, and relay output terminals: 20 M Ω min. (at 500 VDC)	
Dielectric strength	Between power supply AC external and input terminals, and relay output terminals: 2,300 VAC, 50/60 Hz for 1 minute with leakage current of 1 mA max.	
Noise immunity	Conforms to IEC61000-4-4, 2 kV (power supply line)	
Vibration resistance	Conforms to JIS C0040, 10 to 57 Hz, amplitude 0.075 mm, 57 to 1,500 Hz, acceleration: 9.8 m/s ² 80 minutes in X, Y, and Z directions (sweep time: 8 min (No. sweeps: 10 = 80 min.))	
Shock resistance	Conforms to JIS C0041. 147 m/s ² , 3 times in X, Y, and Z directions.	
Ambient temperature	LCD-type CPU Unit (operation panel and calendar/clock function): 0 to 55°C LED-type CPU Unit (no operation panel or calendar/clock function): -25 to 55°C	
Ambient humidity	10% to 90% (with no condensation)	
Ambient conditions	No corrosive gases	
Ambient storage temperature	LCD-type CPU Unit (operation panel and calendar/clock function): -20 to 75°C LED-type CPU Unit (no operation panel or calendar/clock function): -40 to 75°C	

■ Performance Specifications

Item	Specification
Control method	Stored program control
I/O control method	Cyclic scan
Programming language	Ladder diagram
Program capacity	96 lines (3 input conditions and 1 output per line)
Max. No. of control I/O points	44 points CPU Unit: 12 inputs and 8 outputs Expansion I/O Units: 4 inputs and 4 outputs each, up to 3 Units.
LCD display	12 characters x 4 lines, with backlight (LCD-type CPU Unit only)
Operation keys	8 (4 cursor keys and 4 operation keys) (LCD-type CPU Unit only)
Memory backup	Internal EEPROM (or optional Memory Cassette) <ul style="list-style-type: none"> • User programs • Parameter settings Internal RAM, super-capacitor hold (or optional Battery Unit) <ul style="list-style-type: none"> • Holding bits • Holding timer and counter values Super capacitor hold (or optional Battery Unit) <ul style="list-style-type: none"> • Calendar and clock
Super-capacitor holding time	2 days min. (25°C)
Battery life (ZEN-BAT01)	10 years min. (25°C)
Time function (RTC)	ZEN□0C1□□-□ only, accuracy: 1 to 2 min/month (at 25°C)
Terminal block	Solid wiring terminal block (Used solid wire or pin crimp terminals.)
Power supply holding time	ZEN-□0C□AR-A: 10 ms min. ZEN-□0C□D□-D: 2 ms min.
Weight	300 g max.

Input Specification

CPU Unit

AC Inputs (Not Isolated)

Item	Specifications	Circuit drawing
Input voltage	100 to 240 VAC +10%, -15%, 50/60 Hz	
Input impedance	680 k	
Input current	0.15 mA/100 VAC, 0.35 mA/240 VAC	
ON voltage	80 VAC min.	
OFF voltage	25 VAC max.	
ON response time	50 ms or 70 ms at 100 VAC (See note.)	
OFF response time	100 ms or 120 ms at 240 VAC (See note.)	

Note: Can be selected using the input filter settings

DC Inputs I0 to I3 (I0 to I9 for Units with 20 I/O points), V1 Units (Photocoupler Isolated).

Item	Specifications	Circuit drawing
Input voltage	24 VDC +10%, -15%	
Input impedance	5 k	
Input current	5 mA (typ.)	
ON voltage	16.0 VDC min.	
OFF voltage	5.0 VDC max.	
ON response time	15 ms or 50 ms (See note.)	
OFF response time		

Note: Can be selected using the input filter settings

DC Inputs I14 and I15 (Ia and Ib for Units with 20 I/O points), V1 Units (Not Isolated)

Item	Specifications	Circuit drawing
DC inputs	Input voltage	24 VDC +10%, -15%
	Input impedance	5 k
	Input current	5 mA (typ.)
	ON voltage	14.0 VDC min.
	OFF voltage	4.5 VDC max.
	ON response time	15 ms or 50 ms (See note.)
	OFF response time	
Analog inputs	Input range	0 to 10 V
	External input impedance	150 k_ min.
	Resolution	0.1 V (1/100 FS)
	Overall accuracy (-25 to 55°C)	10% FS
	AD conversion data	0 to 10.5 V (in increments of 0.1 V)

Note: Can be selected using the input filter settings.

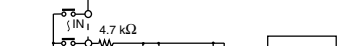
Expansion I/O Unit

AC Inputs (Photocoupler Isolated)

Item	Specifications	Circuit drawing
Input voltage	100 to 240 VAC +10%, -15%, 50/60 Hz	
Input impedance	83 k	
Input current	1.2 mA/100 VAC, 2.9 mA/240 VAC	
ON voltage	80 VAC min.	
OFF voltage	25 VAC max.	
ON response time	50 ms or 70 ms at 100 VAC (See note.)	
OFF response time	100 ms or 120 ms at 240 VAC (See note.)	

Note: Can be selected using the input filter settings.

DC Inputs (Photocoupler Isolated)

Item	Specifications	Circuit drawing	
Input voltage	24 VDC +10%, −15%		
Input impedance	4.7 k		
Input current	5 mA (typ.)		
ON voltage	16.0 VDC min.		
OFF voltage	5.0 VDC max.		
ON response time	15 ms or 50 ms (See note.)		
OFF response time			

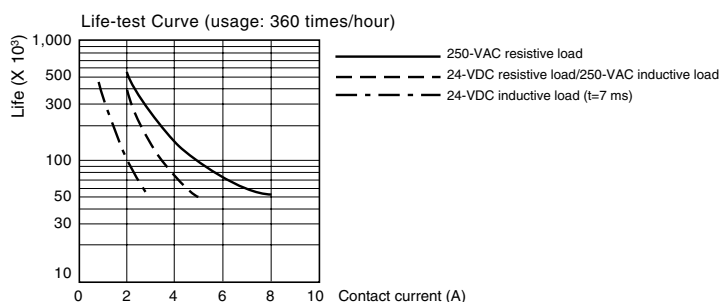
Note: Can be selected using the input filter settings.

Output Specifications (CPU Unit/Expansion I/O Unit)

Relay Output Type

Item	Specifications	Circuit drawing
Maximum switching capacity	250 VAC/8 A (Resistive load: $\cos = 1$) 24 VDC/5 A (Resistive load)	
Minimum switching capacity	5 VDC/10 mA (Resistive load)	
Relay life	Electrical	
	Mechanical	
ON response time	15 ms max.	
OFF response time	5 ms max.	

The life, under the worst conditions, of the output contacts used in ZEN relay outputs is given in the above table. Guidelines for the normal life of the relays are shown in the diagram on the right.



Transistor Output Type

Item	Specifications	Circuit drawing
Maximum switching capacity	24 VDC +10%, -15%, 500 mA	<p>Each circuit is composed of an independent common circuit.</p>
Leakage current	0.1 mA max.	
Residual voltage	1.5 V max.	
ON response time	1 ms max.	
OFF response time	1 ms max.	

Operation

■ Bits

Name	Symbol	Bit addresses	No. of points	Operation			Details ²
Input bits	I	I0 to Ib*	12	Reflect the ON/OFF status of the input devices connected to the input terminals on the CPU Unit.			-
Expansion input bits	X	X0 to Xb	12	Reflect the ON/OFF status of the input devices connected to the input terminals on the Expansion I/O Units.			
Output bits	Q	Q0 to Q7*	8	The ON/OFF status of these output bits is used to control the output devices connected to the output terminals on the CPU Unit.			1
Expansion output bits	Y	Y0 to Yb	12	The ON/OFF status of these output bits is used to control the output devices connected to the output terminals on the Expansion I/O Units.			
Work bits	M	M0 to Mf	16	Work bits can be used only within the ZEN program. I/Os for external devices cannot be made (i.e., all I/O is internal).			
Holding bits	H	H0 to Hf	16	Used the same as the work bits. However, if the power to the ZEN is turned OFF, these bits also maintain the previous ON/OFF status.			
Timers	T	T0 to Tf	16	X: ON-delay timer ■: (box) OFF-delay timer O: One-shot pulse timer F: Flashing pulse timer	Functions are selected from the screen when parameter settings are made.	Time units can be selected from the following: 0.01-s unit: 0.01 to 99.99 s min/s unit: 00 min 01 s to 99 min 59 s h/s unit: 00 h 01 min to 99 h 59 min	2
Holding timers	#	#0 to #7	8	Hold the present value being counted even if the trigger input or power supply is turned OFF and continue timing when the trigger input or power is restored.			
Counters	C	C0 to Cf	16	Reversible counters that can be incremented and decremented.			3
Weekly timers	@	@0 to @f	16	Turn ON and OFF during specified times on specified days.			4
Calendar timers	*	*0 to *f	16	Turn ON and OFF between specified dates.			5
Display bits	D	D0 to Df	16	Display any character string, time, or analog-converted display of timer or counter present values.			6
Analog comparator bits	A	A0 to A3	4	Used as program input conditions to output analog comparator comparison results. These bits can be used only for 24-VDC input CPU Units.			7
Timer/counter comparator bits	P	P0 to Pf	16	Compare the present values of timers (T), holding timers (#), and counters (C). Comparison can be made between the same two counters or timers, or with constants.			8
Button input bits	B	B0 to B7	8	Used as program input conditions and turn ON when operation keys are pressed in RUN Mode. These input bits can be used only with LCD-type CPU Units.			9

Note: * CPU Units with 10 I/O points have 6 input bits (I0 to I5) and 4 output bits (Q0 to Q3).

² More detail information on the coming pages

1 Additional Bit Output Functions

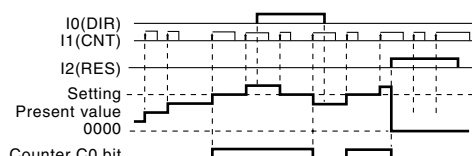
[: Normal	S: Set	R: Reset	A: Alternate
Q0 will turn ON or OFF depending on the ON/OFF status of the execution condition I0.	Q1 will stay ON once the execution condition I1 has turned ON once. A reset is used to turn Q1 OFF.	Q1 is forced OFF when the execution condition I2 is turned ON.	Q2 alternates between turning ON and OFF when the execution condition I3 turns ON.

2 Using Timers and Holding Timers

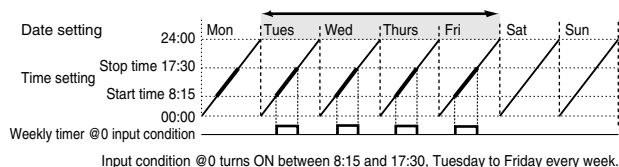
Available timers	Holding timers (#0 to #7)	Timers (T0 to Tf)			
Timer type	X	X	■	O	F
	ON-delay timer only	ON-delay timer	OFF-delay timer	One-shot pulse timer	Flashing pulse timer
Operation	Turns ON after set delay after the trigger input turns ON.	Turns ON after set delay after the trigger input turns ON.	Stays ON while the trigger input is ON and turns OFF after a set delay after the trigger input has turned OFF.	Turns ON for a set period after the trigger input turns ON and regardless of how long the trigger input remains ON.	Repeatedly turns ON and OFF in a set cycle while the switch is ON.
Trigger input Reset input Setting Present value Timer input condition					
Main applications	To continue operation after momentary power loss or power interruptions. When delayed operation or a time lag is required.		Useful for OFF delay circuits for lights or fans.	Useful for set operations where operation is always required during a regular period only.	Useful for flashing emergency lights or sounding buzzers as the output for an alarm circuit.

3 Counter Operation

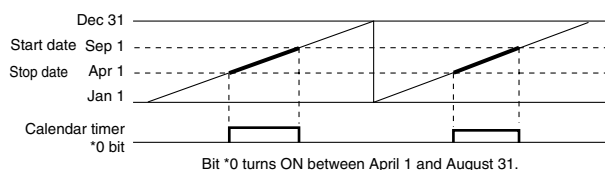
The counter bit turns ON when the counter value (present value) reaches the set value (present value \geq set value). The count returns to 0 and the counter bit turns OFF when the reset input turns ON. Count inputs are not accepted while the reset input is turned ON. The counter present value and counter bit (ON/OFF) are held even if the operating mode is changed or the power supply is interrupted



4 Weekly Timer Operation



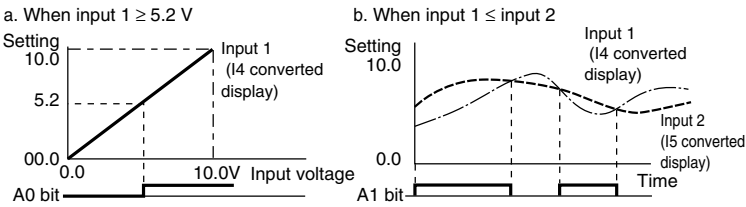
5 Calendar Timer Operation



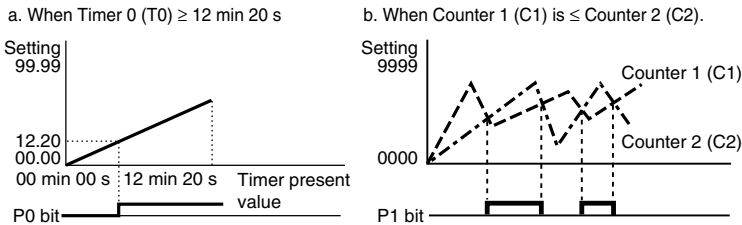
6 Display Settings

Backlight Terminal mode switching	L0: No backlight; Manual display L1: Backlight; Manual display L2: No backlight; Automatic display L3: Backlight; Automatic display	
Display start position	X (digit): 00 to 11 Y (line): 0 to 3	<div><div>X00X11</div><div>Y0 to Y3</div></div>
Display object	CHR	Characters (up to 12 characters - English, numerals, symbols)
	DAT	Month/day (5 digits <input type="text"/>)
	CLK	Hour/minute (5 digits <input type="text"/>)
	I4 to I5	Analog-converted value (4 digits <input type="text"/>)
	T0 to Tf	Timer present value (5 digits <input type="text"/>)
	#0 to #7	Holding timer present value (5 digits <input type="text"/>)
	C0 to Cf	Counter present value (4 digits <input type="text"/>)
Monitoring	A: Can read settings during operation. D: Cannot read settings during operation.	

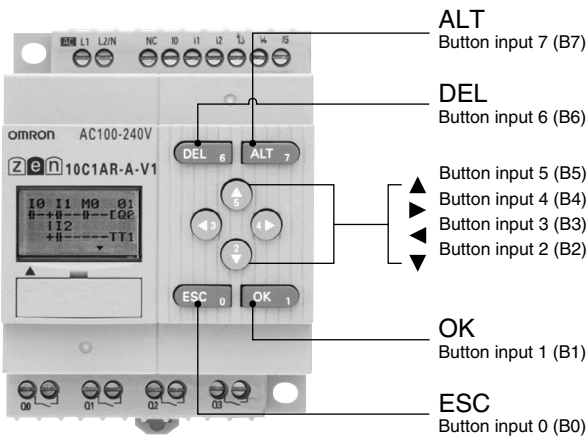
7 Analog Comparator Operation Example



8 Timer/Counter Comparator Operations



9 Specifications for Button Input Bits



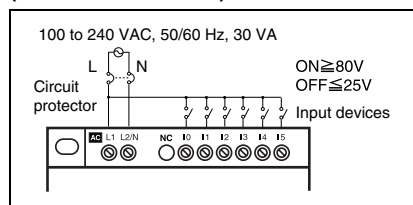
Connections

Input Circuit Wiring

CPU units with 10 I/O points

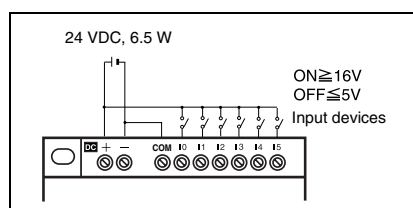
AC input

CPU Units with 10 I/O Points
(V1 and Pre-V1 Units)



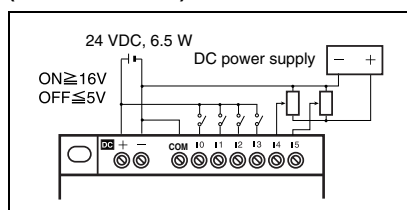
DC input

For connections to negative (–) common
(V1 Units) (PNP-connection)



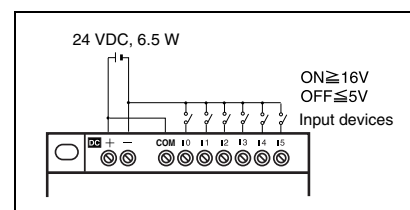
Note: Provide power to the COM and power supply terminals at the same time.

Input terminal I4/I5 analog input device
connections (input range: 0 to 10 V)
(PNP-connection)



Note: Always connect analog input devices to the negative (–) COM terminal.

For connections to positive (+) common
(V1 Units) (NPN-connection)

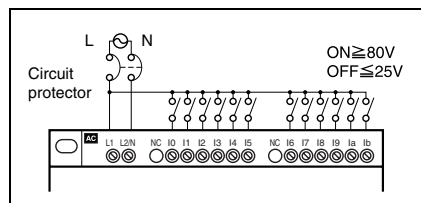


Note: I4/I5 cannot be used as analog input terminals with a positive (+) common terminal connection.

CPU Units with 20 I/O points

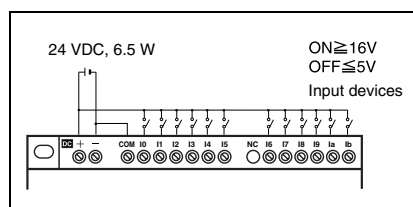
AC input

CPU Units with 20 I/O Points



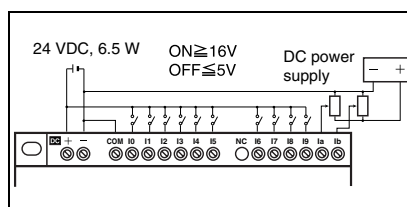
DC input

For connections to negative (–) common
(PNP-connection)



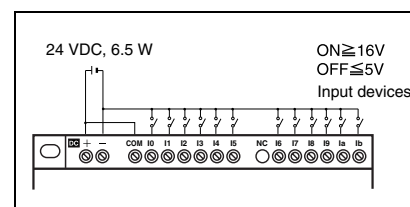
Note: Provide power to the COM and power supply terminals at the same time.

Input terminal I1/I2 analog input device
connections (input range: 0 to 10 V)
(PNP-connection)



Note: Always connect analog input devices to the negative (–) COM terminal.

For connections to positive (+) common
(NPN-connection)



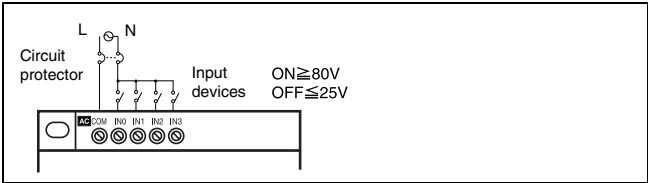
Note: I1/I2 cannot be used as analog input terminals with a positive (+) common terminal connection.

Note: Provide power to the COM and power supply terminals at the same time.

Expansion I/O Units

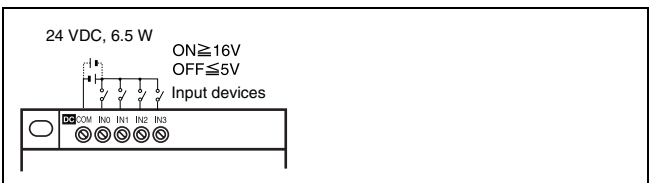
AC input

Expansion I/O Units



DC input

Expansion I/O Units (DC input type)

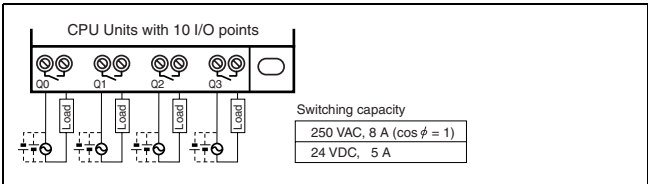


Note: Expansion I/O Units can be connected to either the positive (+) or negative (–) common terminal.

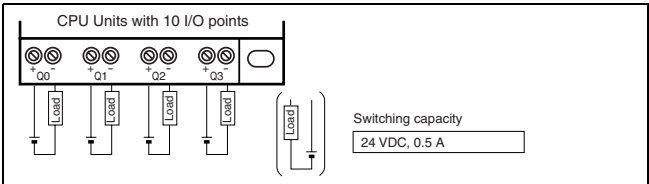
Output Circuit Wiring

CPU units with 10 I/O points

Relay output

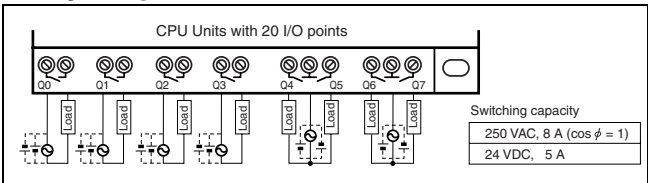


Transistor output

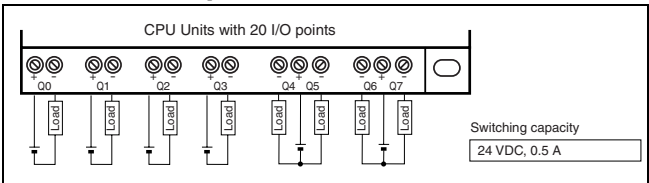


CPU units with 20 I/O points

Relay output

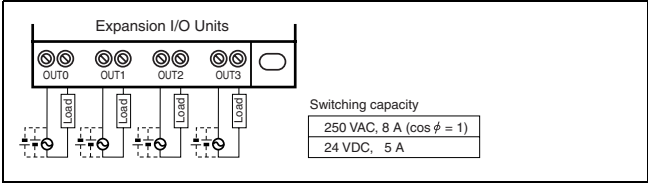


Transistor output

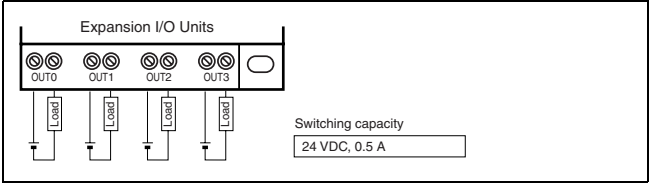


Expansion units with 10 I/O points

Relay output



Transistor output



Note: Units with Relay Outputs

All four relay output circuits in both CPU Units with 10 I/O points and Expansion I/O Units have independent contacts. CPU Units with 20 I/O points have 4 independent contacts (Q0 to Q3) and the remaining four (Q4 to Q7) have 2 points/common. There are no restrictions for polarity.

Note: Transistor Output Type

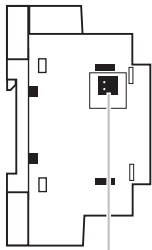
All four transistor output circuits in both CPU Units with 10 I/O points and Expansion I/O Units have independent contacts. CPU Units with 20 I/O points have 4 independent contacts (Q0 to Q3) and the remaining four (Q4 to Q7) have 2 points/common. The terminals have polarity, but the power supply and load connections can be swapped

Nomenclature

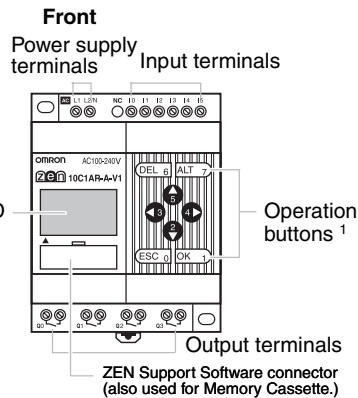
LCD type

10 I/O Units

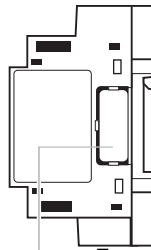
Left Side



Battery Unit connector
(Remove the seal to
connect the Battery Unit.)



Right Side



Expansion Unit
connector cover.
Remove this cover to
connect Expansion Unit.

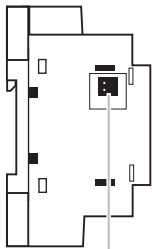
Icon Meanings



Icon	Meaning
RUN	Displayed while in RUN mode.
ERR	Indicates an error.
▲	Displayed when there is a higher-level menu or ladder program line than the one currently displayed.
▼	Displayed when there is a lower-level menu or ladder program line than the one currently displayed.
○	Displayed when a password has been set.

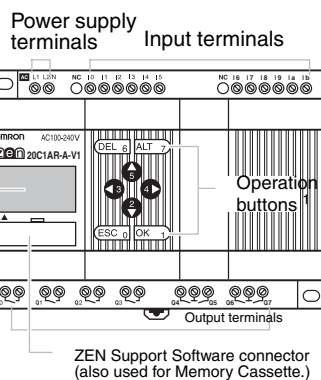
20 I/O Units

Left Side

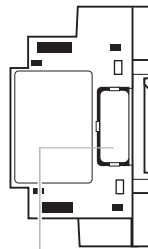


Battery Unit connector
(Remove the seal to
connect the Battery Unit.)

Front



Right Side

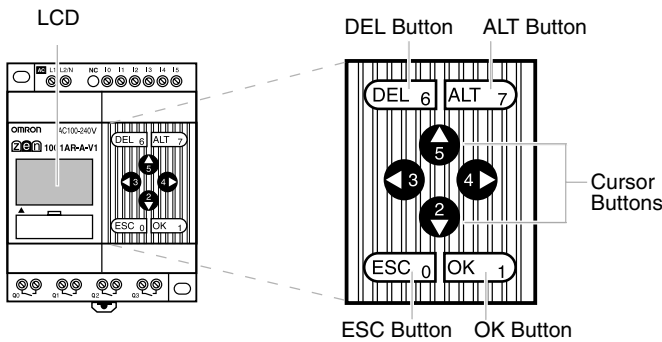


Expansion Unit
connector cover.
Remove this cover to
connect Expansion Unit.

Note: ¹ See page E-11 for Specifiactios Buttons Input Bits

Display Screen and Basic Operations

The display screen for the LCD-type CPU Units and the operations of the buttons are shown below



Icon Meanings



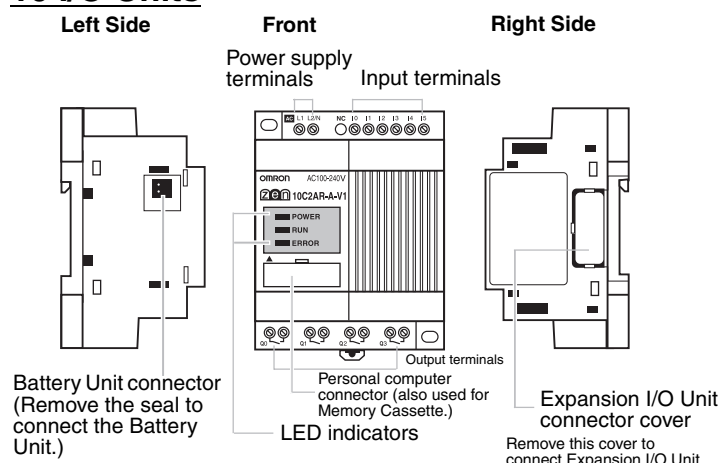
Icon	Meaning
RUN	Displayed while in RUN mode.
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▼	Displayed when there is a lower-level menu or ladder program line than the one currently displayed.
○	Displayed when a password has been set.

Operation Button Names and Operations

Button	Function			
	Menus	Writing ladder program	Setting parameters	Button switch (See page E-11)
DEL	---	Deletes inputs, outputs, connection lines, and blank lines.	---	B6 ON
ALT	---	Switches between normally open and normally closed conditions. Changes to connection line write mode. Inserts a line.	---	B7 ON
Up	Moves the cursor up and down.	Moves the cursor up and down.	Moves the cursor up and down. Changes numerals and parameters.	B5 ON
Down		Selects bit types and functions.		B2 ON
Left	---	Moves the cursor right and left.	Moves the cursor right and left.	B3 ON
Right				B4 ON
ESC	Returns to the previous screen.	Cancels the setting and returns to the previous operation.	Cancels the setting and returns to the previous operation.	B0 ON
OK	Selects the menu item at the cursor position.	Confirms the setting.	Confirms the setting.	B1 ON

■ LED type

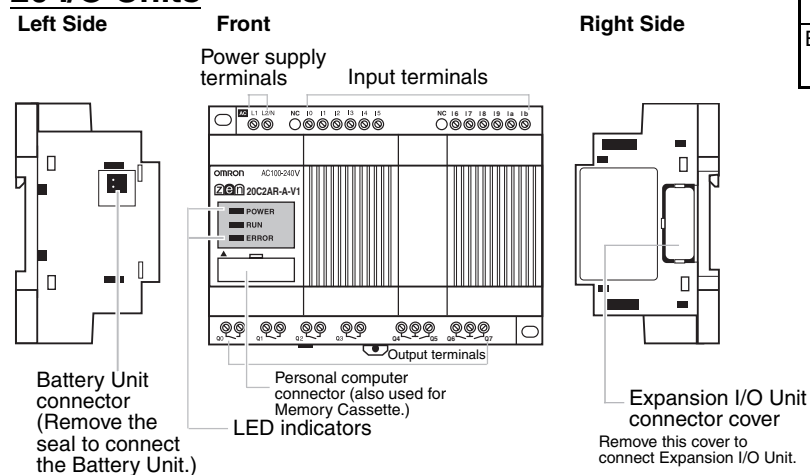
10 I/O Units



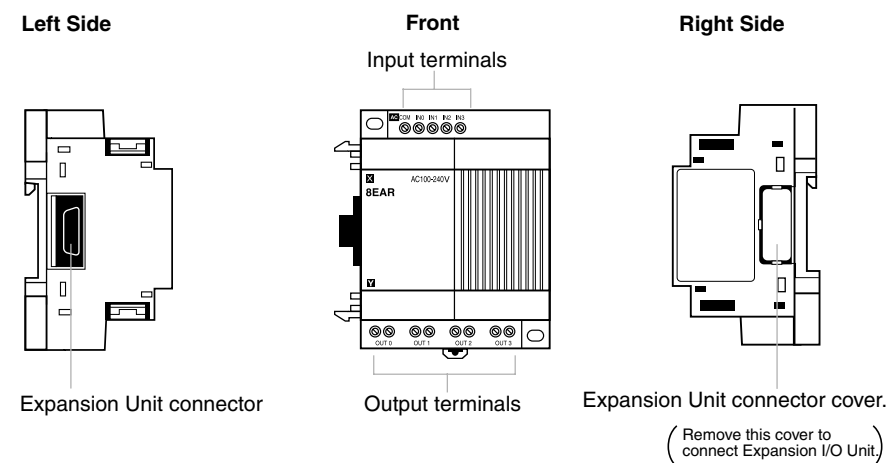
Indicators

Name	Color	Meaning	
POWER	Green	Lit	Power supplied
		Not lit	No power
RUN	Green	Lit	Operating (RUN)
		Not lit	Stopped (STOP)
ERROR	Red	Lit	Error
		Not lit	Normal

20 I/O Units

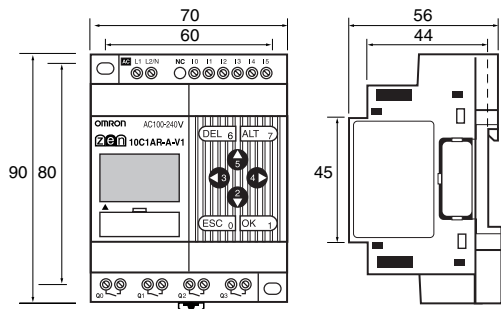


■ Expansion units

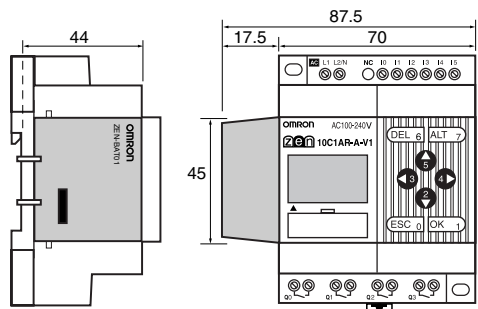


Dimensions (Unit: mm)

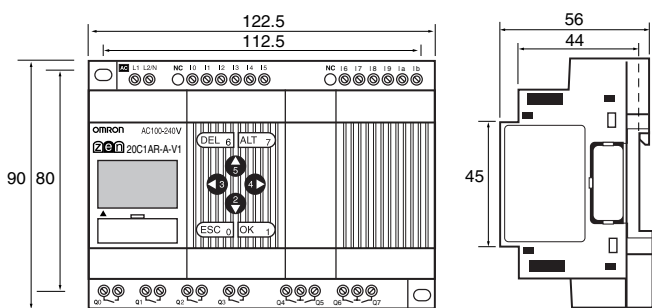
CPU Units with 10 I/O Points (LCD/LED Types)



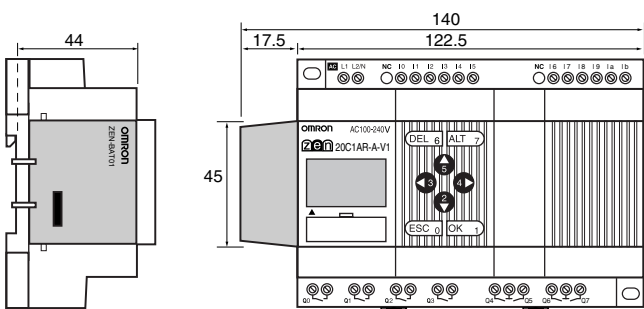
With Battery Unit Mounted



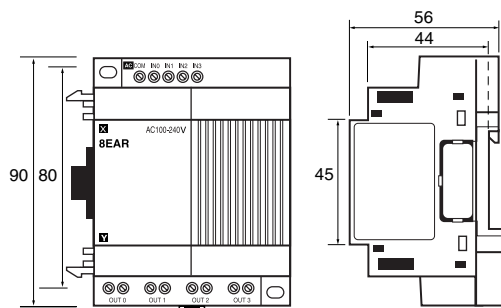
CPU Units with 20 I/O Points (LCD/LED Types)



With Battery Unit Mounted



Expansion I/O Units (4 inputs, 4 outputs, 8 I/O)



Unit Mounting Hole (Same for all Units)



Precautions

For information on precautions please refer to ZEN operation manual Cat. No. Z183-E1.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

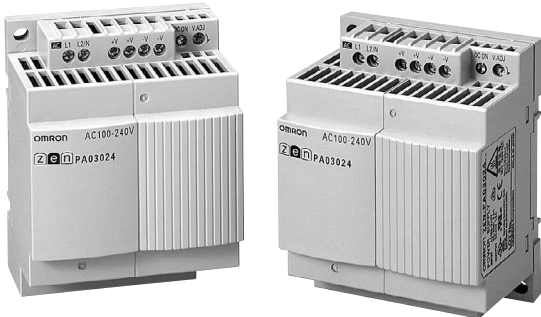
Switching Mode Power Supply

ZEN-PA03024

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments. Refer to *Warranty and Application Considerations* (page E-26), and *Safety Precautions* (page E-24)

New Compact Power Supply (30 W) for ZEN Programmable Relays

- Slim size with a depth of 56 mm (W × H × D: 70 × 90 × 56 mm).
- EMI: Conforms to EN61000-6-3 (Class B).
- Allows parallel operation.
- Output voltage: 24 VDC; Output current: 1.3 A; Capacity: 30 W
- Safety standards: UL508/60950/1604,
CSA C22.2 No. 14/60950/213,
EN60950(VDE0806), EN50178(VDE0160)
- Uses lead-free soldering.
- Six-language instruction manual provided.



Programmable
relays

Model Number Structure

Model Number Legend

ZEN-PA 030 24
1 2 3

- 1. Unit**
PA: Power supply unit
- 2. Power Ratings**
030: 30 W
- 3. Output voltage**
24: 24 V

Ordering Information

List of Models

Power ratings	Input voltage	Output voltage	Output current	Model number
30 W	100 to 240 VAC	24 VDC	1.3 A	ZEN-PA03024

Accessories (Order Separately)

Name		Models
Mounting DIN-rail	50 cm (l) × 7.3 mm (t)	PFP-50N
	1 m (l) × 7.3 mm (t)	PFP-100N
	1 m (l) × 16 mm (t)	PFP-100N2
End Plate		PFP-M
Spacer		PFP-S

Specifications

■ Ratings/Characteristics

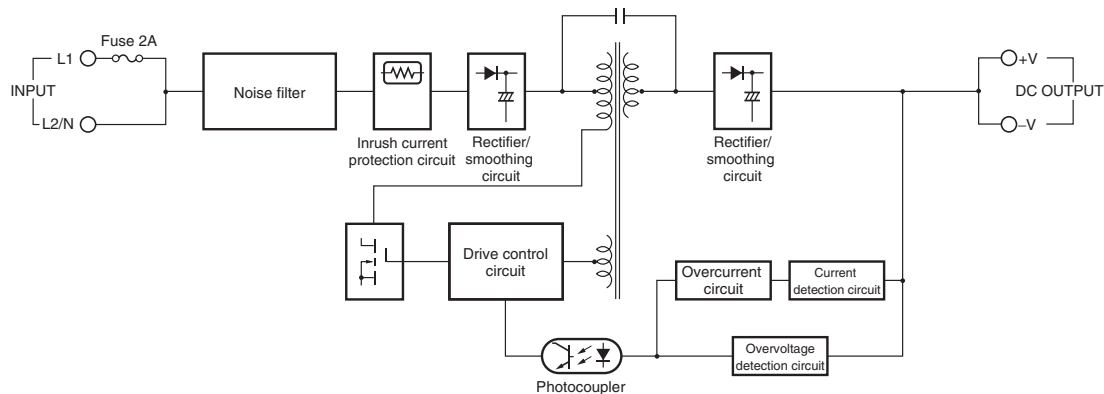
Efficiency (typical)			80% min.
Input	Voltage		100 to 240 VAC (85 to 264 VAC), 95 to 350 VDC (See note 1.)
	Frequency		50/60 Hz (47 to 450 Hz)
	Current	100 VAC input	0.8 A max.
		200 VAC input	0.45 A max.
	Leakage current	100 VAC input	0.4 mA max.
		200 VAC input	0.75 mA max.
	Inrush current (See note 2.)	100 VAC input	25 A max.
200 VAC input		50 A max.	
Output	Voltage adjustment range (See note 3.)		-10 to 15% (with V.ADJ) of rated output voltage
	Ripple		2% (p-p) max. (-25 to -10°C: 4% max.)
	Input variation influence		0.5% max.
	Load variation influence (rated input voltage)		1.5% max.
	Temperature variation influence		0.05%/°C max.
	Start up time (See note 2.)		1,000 ms max. (100 VAC or 200 VAC, at rated output voltage)
	Hold time (See note 2.)		15 ms min., 20 ms (typical) (100 VAC or 200 VAC, at rated output voltage)
Additional functions	Overload protection (See note 2.)		105% to 135% of rated load current, inverted L drop, intermittent, automatic reset
	Parallel operation		Yes (2 units max. For details, refer to the derating curve in <i>Engineering Data</i> . For DC input, parallel operation is possible only for 110 to 350 VDC.)
	Series operation		No
Others	Ambient temperature		Operating: Refer to the derating curve in <i>Engineering Data</i> . (with no icing or condensation) Storage: -25 to 75°C (with no icing or condensation)
	Ambient humidity		Operating: 10 to 90% Storage: 10 to 90%
	Mounting method		DIN-rail mounting, surface mounting
	Dielectric strength		2.0 kVAC for 1 min. (between all inputs and exposed non-current-carrying metal parts; detection current: 10 mA max.) 3.0 kVAC for 1 min. (between all inputs and all outputs; detection current: 20 mA max.) 1.0 kVAC for 1 min. (between all outputs and non-current-carrying metal parts; detection current: 10 mA max.)
	Insulation resistance		100 MΩ min. (between all outputs and all inputs/exposed non-current-carrying metal parts) at 500 VDC
	Vibration resistance		10 to 55 Hz, 0.375-mm single amplitude for 2 h each in X, Y, and Z direction
	Shock resistance		300 m/s ² , 3 times each in ±X, ±Y, ±Z directions
	Output indicator		Yes (color: green)
	EMI	Conducted emissions	Conforms to EN61000-6-3 (Class B)
		Radiated emissions	Conforms to EN61000-6-3 (Class B)
	Approved standards		UL: UL508 Listing Class 2, 60950, 1604 (Class I/Division 2) cUL: CSA C22.2 No. 14 Class 2, No. 60950, No. 213 (Class I/Division 2) EN/VDE: EN60950 (=VDE0805), EN50178 (=VDE0160) Conforms to VDE0106/P100 (Finger protection)
	Weight		240 g max.

- Note:** 1. This product has been approved for safety standards only when an AC input is used. It has not been approved when a DC input is used.
 2. Refer to the Engineering Data section on page E-22 for details.
 3. If the V. ADJ adjuster is turned, the voltage will increase by more than 15% of the voltage adjustment range.
 Check the output voltage of the power supply when converting the output voltage, and make sure that the load will not be damaged.

Connections

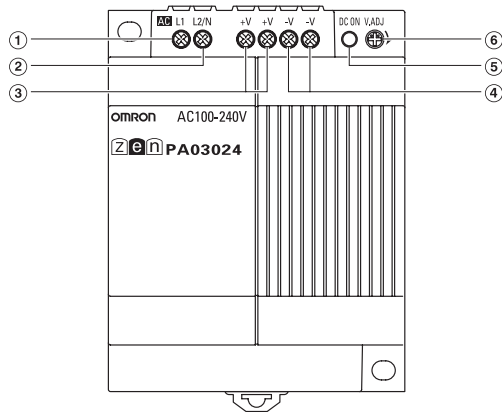
Block Diagram

ZEN-PA03024



Note: The Power Supply is provided with reinforced insulation between the input and output terminals.

Installation



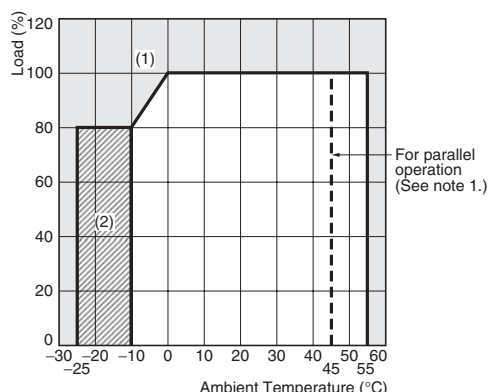
No.	Name	Function
1	AC input terminal (L1)	Connect the input line to this terminal. A fuse is included in the circuit.
2	AC input terminal (L2/N)	Connect the input line to this terminal. Negative pole for DC input.
3	DC output terminals (+V)	Connect the load lines to these terminals.
4	DC output terminals (-V)	Connect the load lines to these terminals.
5	Output indicator (DC ON: Green)	Lights while a direct current (DC) output is ON.
6	Output voltage adjuster (V.ADJ)	Use to adjust the voltage.

Programmable
relays

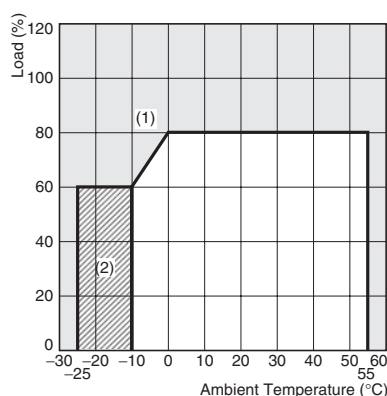
Engineering Data

Derating Curve

85 to 264 VAC or 110 to 350 VDC input



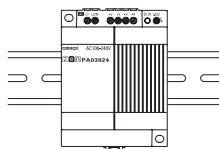
95 to 110 VDC input



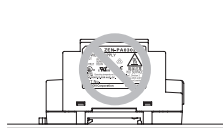
- Note:**
1. The maximum ambient temperature for parallel operation is 45°C.
 2. Parallel operation is not possible for an input of 95 to 110 VDC.
 3. Although operation is possible in the (2) portion of the derating curve, performance may be adversely affected, i.e., ripple noise may increase.
 4. Internal parts may occasionally deteriorate or be damaged. Do not use the Power Supply in areas outside the derating curve (i.e., the area shown by shading (1) in the above graph).

Installation

Correct



Incorrect



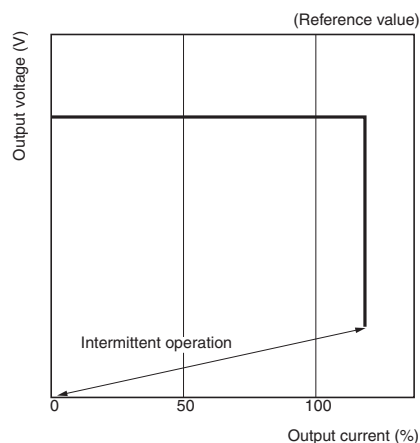
Standard mounting

Face-up mounting

- Note:**
1. Improper mounting will interfere with heat dissipation and may occasionally result in deterioration or damage of internal parts. Use the standard mounting.
 2. If there is a derating problem, use forced air-cooling. The ambient temperature is specified for a point 50 mm below the Power Supply.

Overload Protection

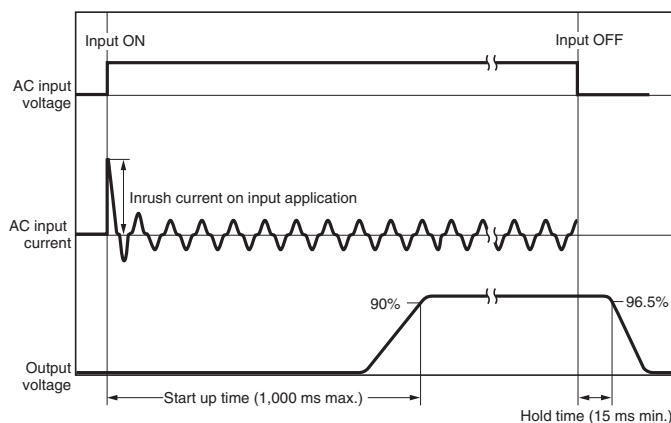
The Power Supply is provided with an overload protection function that protects the load and the power supply from possible damage by overcurrent. When the output current rises above 105% min. of the rated current, the protection function is triggered, decreasing the output voltage. When the output current falls within the rated range, the overload protection function is automatically cleared.



The values shown in the above diagrams are for reference only.

- Note:**
1. Internal parts may occasionally deteriorate or be damaged if a short-circuited or overcurrent state continues during operation.
 2. Internal parts may possibly deteriorate or be damaged if the Power Supply is used for applications with frequent inrush current or overloading at the load end. Do not use the Power Supply for such applications.

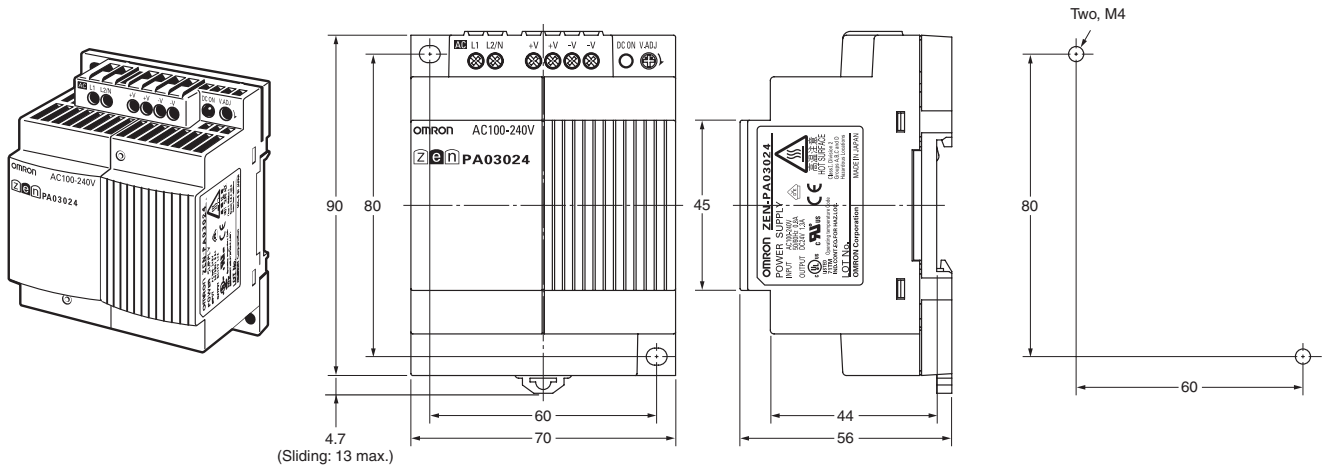
Inrush Current, Start Up Time, Hold Time



Dimensions

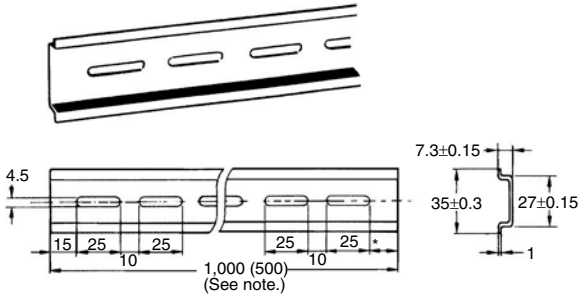
Note: All units are in millimeters unless otherwise indicated.

ZEN-PA03024



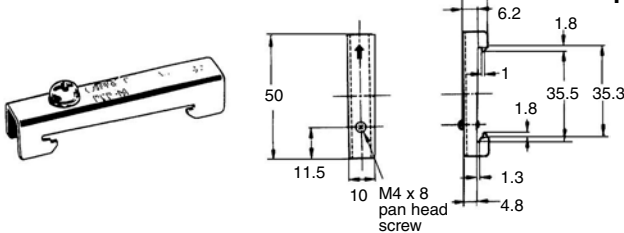
■ Accessories (Order Separately)

Mounting DIN-rail PFP-100N, PFP-50N

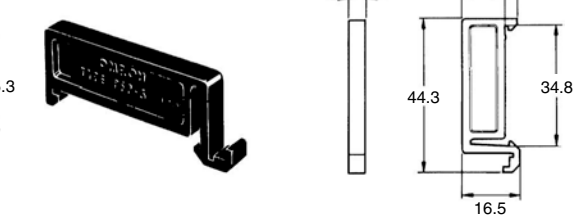


Note: The values shown in parentheses are for the PFP-50N.

End Plate PFP-M



Spacer PFP-S



Safety Precautions

CAUTION

Minor electric shock may occasionally occur. Do not disassemble the product or touch internal parts.

Minor fires may occasionally occur. Do not attempt to repair or modify the product.

Minor burns may occasionally occur. Do not touch the product while power is being supplied or immediately after power is turned OFF.

Minor fires may occasionally occur. Tighten terminal screws to a torque of 0.5 to 0.6 N·m so that they do not become loose.

Minor electric shock may occasionally occur during operation. Do not touch the input and output terminals while power is being supplied.

The product may occasionally be damaged. Do not allow any clippings or cuttings to enter the product during installation work.

Working voltage can be 350 V max. inside. This voltage can be also available 10 s after the switch off.

Precautions for Safe Use

The following precautions must be observed to ensure safety.

Mounting

- Mounting Direction
(Refer to *Installation in Engineering Data* on page E-22.)

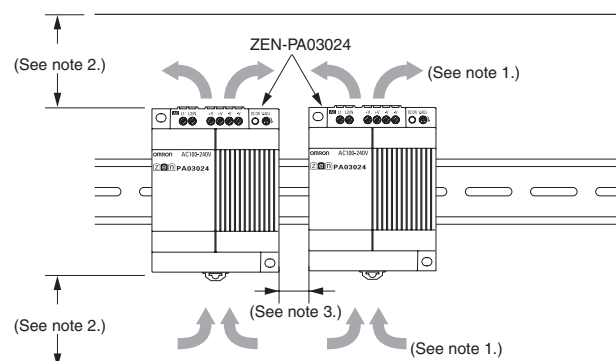
Standard Mounting	Valid
Horizontal Mounting	Invalid
Other Mounting	Invalid

The internal parts may occasionally deteriorate or be broken due to adverse heat dissipation depending on the mounting status. Do not use the product in any way other than the standard mounting direction.

- Mounting Space

Make sure that sufficient heat dissipation is provided when installing the Power Supply to increase its long-term reliability. Install the product in a location that allows a natural airflow to occur around the Power Supply. We recommend using End Plates (PFP-M) to secure the Power Supply and to ensure that a space of at least 10 mm is maintained between Power Supplies.

If the installation space above and below the Power Supply is less than 50 mm, reduce the ambient temperature by 5°C. A minimum space of 20 mm is required.



- Note:**
1. Convection of air
 2. 50 mm min.
 3. 10 mm min.

Wiring

- Minor fire may possibly occur. Ensure that input and output terminals are wired correctly.
- Use the following material for the wires to be connected to the Power Supply to prevent smoking or ignition caused by abnormal loads.

Use solid wires. Always attach pin crimp terminals when using stranded wire. The stripping distance should be 6.5 mm.

Recommended Wire Type

Solid wire	Cross section 0.5 to 2.5 mm ² (Equivalent to AWG20 to AWG14)
Stranded wire	Cross section 0.5 to 2.5 mm ² (Equivalent to AWG20 to AWG14)
Pin crimp terminals	Dia.: 1.1 to 2.3 mm

- Do not apply more than 100 N force to the terminal block when tightening the terminals.
- Be sure to remove the sheet covering the product before turning ON the Power Supply and confirm that nothing is interfering with heat dissipation.

Installation Environment

- Do not use the Power Supply in locations subject to shocks or vibrations. In particular, install the Power Supply as far away as possible from contactors or other devices that are a vibration source.
- Install the Power Supply well away from any sources of strong, high-frequency noise.

Operating and Storage Conditions

- When installing the Power Supply, check for any signs that the product or packaging has been struck. If internal parts have been damaged, overvoltages may be output depending on the location of the damage.
- Internal parts may occasionally deteriorate or be damaged. Store the Power Supply at a temperature of -25 to 65°C and a humidity of 10% to 90%.
- Internal parts may occasionally deteriorate or be damaged. Do not use the Power Supply in areas outside the derating curve (i.e., the area shown by shading (1) in the graph on page E-22). For UL508 Listing, the surrounding air temperature should be 40°C.
- Use the Power Supply at a humidity of 10% to 90%.
- Do not use the Power Supply in locations where condensation may occur due to high humidity or where temperature changes are severe.
- Do not use the Power Supply in locations subject to direct sunlight.
- Do not use the Power Supply in locations where liquids, foreign matter, or corrosive gases may enter the interior of products.

Overload Protection

- Internal parts may possibly deteriorate or be damaged if a short-circuited or overcurrent state continues during operation.
- Internal parts may possibly deteriorate or be damaged if the Power Supply is used for applications with frequent inrush current or overloading at the load end. Do not use the Power Supply for such applications.

Charging the Battery

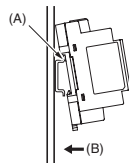
- This product is not intended to function as a battery charger. If a battery is to be connected as the load, mount an overcurrent limiting circuit and an overvoltage protection circuit.

Output Voltage Adjuster

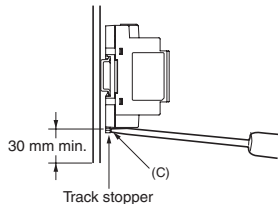
- The output voltage adjuster (V.ADJ) may possibly be damaged if it is turned with unnecessary force. Do not turn the adjuster with excessive force.
- After changing the setting of the adjuster, make sure that the output capacity and output current do not exceed the rated output capacity and rated output current.
- Output voltage is adjustable with the output voltage adjuster (V.ADJ) on the front surface of the product from -10% to +15% of the rated output voltage.
Do not increase the output voltage by more than 10% when connected to a ZEN CPU Unit rated for 24 VDC.

DIN-rail Mounting

To mount the Power Supply on a DIN-rail, hook portion (A) of the Power Supply onto the track and press the Power Supply in direction (B).

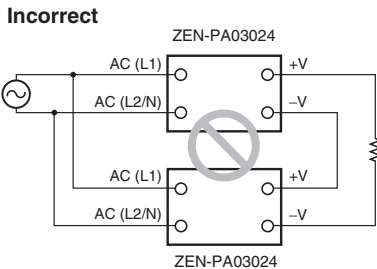


To dismount the Power Supply, pull down portion (C) with a flat-blade screwdriver and pull out the Power Supply.



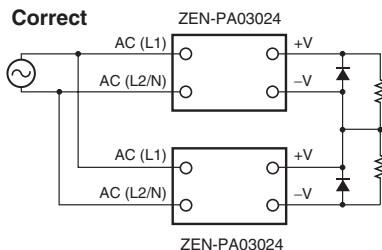
Series Operation

The Power Supply is not designed for series operation.



Output voltage (\pm)

Two Power Supplies can be used to create a \pm output.



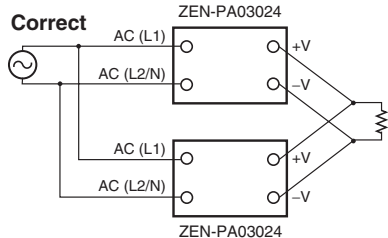
Note: When the load is an operational amplifier or other device allowing series operation, a startup failure may occur when the Power Supply is turned ON and internal circuits may be damaged. Connect a diode as shown in the figure to prevent this.

Use the following guidelines to select the diode.

Type	Schottky Barrier diode
Dielectric strength (V_{RRM})	Twice the rated output voltage or above
Forward current (I_F)	Twice the rated output voltage or above

Parallel Operation

Two Power Supplies can be operated in parallel.



- Note:**
1. For parallel operation, a maximum of two Power Supplies of the same model can be connected.
 2. For a DC input, parallel operation is possible only for 110 to 350 VDC.
 3. To ensure that the voltage drop between each Power Supply and the load is the same, use the same wire length and thickness to connect the load.
 4. The load current will become imbalanced if the output voltages are different, possibly causing a serious reduction in the life of one of the Power Supplies. Adjust the output voltages of the Power Supplies to the same value.

In Case there is No Output Voltage

The possible cause for no output voltage may be the presence of an overload or overvoltage condition, or may be due to the functioning of a latching protective device. The latching protection may operate if a large amount of surge voltage such as a lightening surge occurs while turning ON the Power Supply.

In case there is no output voltage, please check the following points before contacting us:

- Check the overload protected status:
Check whether the load is in overload status or is short-circuited. Remove wires to load when checking.
- Attempt to clear the latching protection function:
Turn the power supply OFF once, and leave it OFF for at least 1 minute. Then turn it on again to see if this clears the condition.

Insulation Resistance Test

When performing the test, be sure to short-circuit all the output terminals to protect them from damage.

Dielectric Strength Test

- When a high voltage is applied between the input terminals and the output terminals, electric energy builds up across the inductor L and capacitor C of the internal noise filter. This energy may generate a voltage surge when a high voltage is applied to the Power Supply by a switch or timer, and as a result, the internal parts of the Power Supply may possibly be damaged. To prevent voltage impulses when testing, decrease the applied voltage using the variable resistor on the dielectric strength testing equipment, or apply the voltage so that it crosses the zero point when it rises or falls.
- When performing the test, be sure to short-circuit all the output terminals to protect them from damage.

Warranty and Application Considerations

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.