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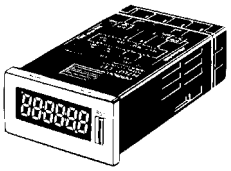
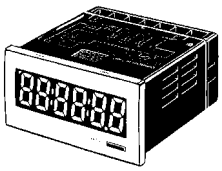
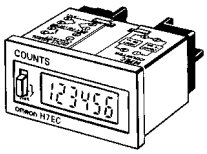
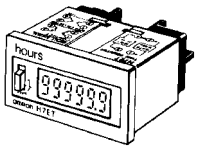
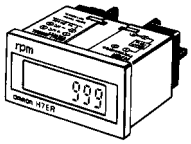
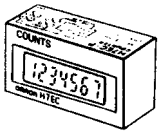
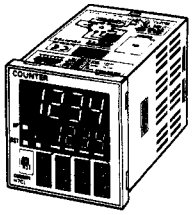
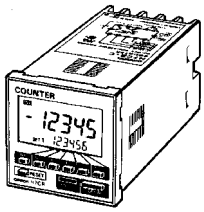
Selection Guide

Classification	Self-powered Counter			
	Total Counter/Time Counter (DIN 48 x 24)	Total Counter/Time Counter (DIN 72 x 36)	Totalizing Counter	Time Counter
Model	H7GP	H7HP	H7EC	H7ET
Appearance				
Counting mode	Up type	Reversible type	Up type	Up type
Supply voltage	24 to 240 VAC (50/60 Hz), 12 to 120 VDC	24 to 240 VAC (50/60 Hz), 12 to 120 VDC	Self-powered	Self-powered
Number of digits displayed	6	6 or 8	6 or 7	6 or 7
Display	7-segment, negative transmissive LCD with red backlight	7-segment, negative transmissive LCD with red backlight	Digital display (LCD)	Digital display (LCD)
Counting speed	30 Hz/5 kHz	30 Hz/5 kHz	Contact input and solid-state input: 30 Hz Solid-state input: 1 kHz AC/DC voltage input: 20 Hz	---
Control input	Contact, transistor	Contact, transistor	No-voltage input: Contact and solid-state inputs Voltage input: DC voltage input, AC/DC voltage input	No-voltage input: Contact and solid-state inputs Voltage input: DC voltage input, AC/DC voltage input
Reset system	External and manual resets Reset tine: 0.02 s (time counter), 0.02 s or 0.001 s (total counter)	External and manual resets Reset tine: 0.02 s (time counter), 0.02 s or 0.001 s (total counter)	Manual reset: Reset time: 0.02 s External reset: Reset time: 0.02 s	Manual reset: Reset time 0.02 s External reset: Reset time: 0.02 s
Power consumption	Approx. 6.5 VA Approx. 0.6 W	Approx. 6.5 VA Approx. 0.6 W	---	---
Control output	---	---	---	---
Power source for external supply	50 mA at 12 VDC	50 mA at 12 VDC	---	---
Terminal connection method	Screw	Screw	Wire-wrap/screw	Wire-wrap/screw
EMC standards	Conforms to EN50081-2, prEN50082-2	Conforms to EN50081-2, prEN50082-2	Conforms to EN50081-2, prEN50082-2	Conforms to EN50081-2, prEN50082-2
Weight	Approx. 76 g	Approx. 106 g	Approx. 60 g	Approx. 60 g
Safety standards	UL, CSA, conforms to EN61010-1/IEC1010-1, CE marking	UL, CSA, conforms to EN61010-1/IEC1010-1, CE marking	UL, CE marking	UL, CE marking
Page	24	24	40	48

Classification	Self-powered Counter		Solid-state Counter	
	Tachometer	PC Board-use Counter	Electronic Counter	Digital Counter
Model	H7ER	H7E-P	H7CL	H7CR
Appearance				
Counting mode	Up type	Up type	Up/Down type	Up/Down/Reversible type
Supply voltage	Self-powered	Self-powered	100 to 240 VAC (50/60 Hz), 12 to 24 VDC	100 to 240 VAC (50/60 Hz), 24 VAC 12 to 24 VDC
Number of digits displayed	4 or 5	4, 5, or 7	−3 to 4	6 or 4
Display	Digital display: (LCD)	Digital display: (LCD)	7-segment LEDs	LCD with backlight
Counting speed	1 kcps 10 kcps	30 cps 1 kcps 10 kcps	30 Hz or 5 kHz	30/1 k/5 kHz
Control input	No-voltage input: Contact and solid-state Voltage input: DC voltage input	No-voltage input: Contact and solid-state Voltage input: DC voltage input	No-voltage input: Via NPN transistor, or switching of contact	Contact, transistor, or voltage
Reset system	---	External (electrical) reset, power-OFF reset, and automatic reset	External (min. pulse width; 1 ms, 20 ms selectable), manual, and automatic resets	External (min. pulse width: selectable), power supply (0.5 s), manual (1 s), and automatic resets
Power consumption	---	---	Approx. 10 VA, Approx. 3 W	Approx. 6.6 VA
Control output	---	---	Contact: SPD, 3 A at 250 VAC, resistive load ($\cos\phi = 1$); Min. applicable load; 10 mA at 5 VDC, 10 mA at 24 VDC Transistor output: NPN open collector: 100 mA max. at 30 VDC max,; residual voltage: 1.5 VDC max.	Contact or voltage
Power source for external supply	---	---	50 mA at 12 VDC ±10%	100 mA at 12 VDC 50 mA at 24 VDC
Terminal connection method	Wire-wrap/screw	Wire-wrap/screw	Socket, screw	Screw, socket
EMC standards	Conforms to EN50081-2, prEN50082-2	Conforms to EN50081-2, prEN50082-2	Conforms to EN50081-2, prEN50082-2	Conforms to EN50081-2, prEN50082-2
Weight	Approx. 60 g	Approx. 20 g	Approx. 130 g or 110 g	Approx. 230 g or 170 g
Safety standards	UL, CE marking	UL, CE marking	UL, CSA, CE marking	UL, CSA, conforms to EN61010-1/IEC1010-1, CE marking
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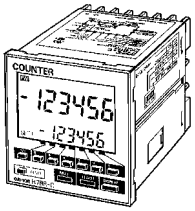
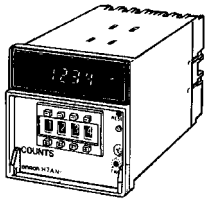
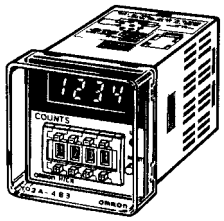
Selection Guide

Classification	Solid-state Counter		
	Digital Counter	Preset Counter	Preset Counter
Model	H7BR	H7AN	H7CN
Appearance		 Types with backup power supply function for memory protection also available	 Types with backup power supply function for memory protection also available
Counting mode	Up/Down/Reversible type	Up/Down/Reversible type	Up/Down/Reversible type
Supply voltage	100 to 240 VAC (50/60 Hz), 24 VAC/12 to 24 VDC	100 to 240, 24 VAC (50/60 Hz), 12 to 24 VDC	100 to 240, 24 VAC (50/60 Hz), 12 to 48 VDC
Number of digits displayed	–5 to 6	2, 4, 6, or 8	4
Display	LCD with backlight	Digital display: LED Indicators: Count-in and count-up indicators	Digital display: LED Indicator: Count-up indicator
Counting speed	30/1 k/5 k/10 kHz	Contact input and solid-state input: 30 cps Solid-state input: 5 kcps	Contact input and solid-state input: 30 cps Solid-state input: 5 kcps
Control input	No-voltage input: Via opening and closing of contact Voltage input: Via high and low signal voltage	Contact input: By short-circuiting or opening contact Solid-state input: Voltage input by transistor collector	Contact input: By short-circuiting or opening contact Solid-state input: By ON/OFF of open-collector transistor
Reset system	External (min. pulse width; 1 ms, 20 ms selectable), manual, and automatic resets	Power-OFF reset: Minimum power OFF time: 0.5 s Reset time following power application: 0.05 s External reset & manual reset: Reset time: 0.02 s Automatic reset	Power-OFF reset: Minimum power OFF time: 0.5 s Reset time following power application: 0.05 s External reset & manual reset: Reset time: 0.02s reset time following signal application: 0.05 s
Power consumption	Approx. 10 VA at 50 Hz, 240 VAC; Approx. 6 W at 24 VDC	Approx. 10 VA (at 240 VAC, 50 Hz) Approx. 5 W (at 24 VDC)	Approx. 12 VA at 240 VAC 50 Hz) Approx. 2.5 W (at 48 VDC)
Control output	Contact: 3 A at 250 VAC, resistive load ($\cos\phi = 1$); Transistor output: Open collector: 100 mA max. at 30 VDC max,; residual voltage: 2 VDC max.	Contact output: SPDT (DPST-NO for double-preset counter) 250 VAC 3 A $\cos\phi = 1$ (resistive load) Solid-state output: Open collector 30 VDC max. 100 mA max. (Both outputs can be produced simultaneously.)	Contact output: SPDT 250 VAC 3 A $\cos\phi = 1$ (resistive load) Solid-state output: Open collector 30 VDC max. 100 mA max.
Power source for external supply	160 mA at 12 VDC ±10%; 80 mA at 24 VDC ±10%	80 mA at 12 VDC ±10%	---
Terminal connection method	Screw	Screw	Socket
EMC standards	Conforms to EN50081-2, prEN50082-2	---	---
Weight	Approx. 270 g	Approx. 360 g	Approx. 150 g
Safety standards	UL, CSA, onforms to EN61010-1/IEC1010-1, CE marking	UL, CSA	UL, CSA
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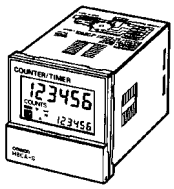
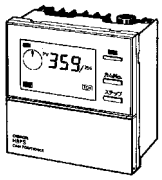
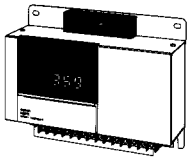
Classification	Solid-state Counter	Multi-maintenance Counter	Cam Positioner	
	Preset Counter	Preset Counter		
Model	H8CA-S	H8BM	H8PS	H8PR
Appearance				
Counting mode	Reversible type	Up type	---	---
Supply voltage	24 to 240 VAC (50/60 Hz), 12 to 120 VDC	24 VDC	24 VDC	100 to 240 VAC (50/60 Hz)
Number of digits displayed	6	6	3 (0° to 359°)	3 (0° to 359°)
Display	Digital display: LED	Digital display: (LCD with backlight)	LCD with backlight	Digital display: LED
Counting speed	Contact input and solid-state input: 30 cps Solid-state input: 5 kcps	30 cps	330 rpm	833 rpm
Control input	Contact input Solid-state input Voltage input	Voltage input	Encoder input: connections to a special absolute encoder	Encoder input: connections to a special absolute encoder
Reset system	External reset and manual reset: 0.02 s Automatic reset	External, and manual resets Reset time: 0.1 s	---	---
Power consumption	Approx. 2.2 VA (at 240 VAC, 50 Hz) Approx. 1 W (at 120 VDC)	Approx. 1.8 W (at 24 VDC)	Approx. 4 W	Approx. 10 W (at 240 VAC, 50 Hz)
Control output	Contact output: SPDT 250 VAC 3 A cosϕ = 1 (resistive load) Solid-state output: Open collector 30 VDC max. 100 mA max.	Open-collector output: 30 VDC max. 100 mA max.	Solid-state output: Open collector 30 VDC max. 100 mA max.	Solid-state output: Open collector 30 VDC max. 100 mA max.
Power source for external supply	---	---	(To rotary encoder)	(To rotary encoder)
Terminal connection method	Socket	Screw	Screw	Screw
EMC standards	---	---	Conforms to EN50081-2, prEN50082-2	---
Weight	Approx. 130 g	Approx. 290 g	Approx. 300 g	Approx. 1.3 kg
Safety standards	UL, CSA	UL, CSA	UL, CSA	UL, CSA
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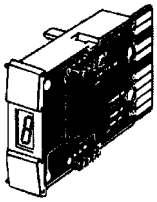
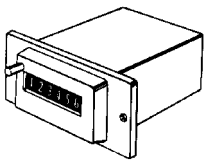
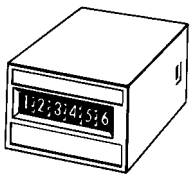
Selection Guide

Classification	Intelligent Signal Processor	Solid-state Counter	Electromagnetic Counter	
		Preset totalizing Counter	Totalizing Counter	Totalizing Counter
Model	K3TC	H7S	CSK	CSKE
Appearance				
Counting mode	Up/Down type	Up/Reversible type	Up type	Up type
Supply voltage	100 to 240 VAC (50/60 Hz); 12 to 24 VDC	5 VDC	100, 200 VAC (50/60 Hz), 6, 12, 24, 48, 100 VDC	24, 48, 100 VAC (50/60 Hz), 6, 12, 24, 48, 100 VDC
Number of digits displayed	5	1 to 8 (Building block system)	4 or 6	6 or 7
Display	7-segment LED	Digital display: (LCD with backlight) Indicator: Count-up indicator	Digital display	Digital display
Counting speed	Non-voltage contact (30 Hz (cps) max.	30 cps 1 kcps	DC: 20 cps (contact input) AC: 15 cps (contact input)	10 cps (contact input)
Control input	No-voltage input: Contact and solid-state	No-voltage input: Contact and solid-state Voltage input: DC voltage input	Contact input: Voltage input	Contact input: Voltage input
Reset system	External reset: Reset time: 16 ms max.	External reset: Reset time: 0.02 s	Manual reset	---
Power consumption	15 VA max. (max. AC load with all indicators lit) 10 W max. (max. DC load with all indicators lit)	50 to 75 mW per unit	Approx. 3 VA (at 200 VAC, 50 Hz) Approx. 3.5 W (DC)	Approx. 2 VA (AC) Approx. 2 W (DC)
Control output	Contact: 5 A at 250 VAC/5 A at 30 VDC, resistive load ($\cos\phi$ = 1); 1.5 A at 250 VAC/1.5 A at 30 VDC, inductive load ($\cos\phi$ =0.4, L/R=7 ms) Min. applicable load; 10 mA at 5 VDC Transistor output: 12 to 24 VDC $^{+10\%}/_{-15\%}$, 50 mA max.	Solid-state output: Open collector 30 VDC max. 100 mA max.	---	---
Power source for external supply	---	---	---	---
Terminal connection method	Screw	Card edge connector	Lead wire/wire-wrap	Lead wire
EMC standards	Conforms to EN50081-2, prEN50082-2	---	---	---
Weight	Approx. 450 g	---	Approx. 100 to 110 g	Approx. 100 g
Safety standards	UL, CSA	---	---	---
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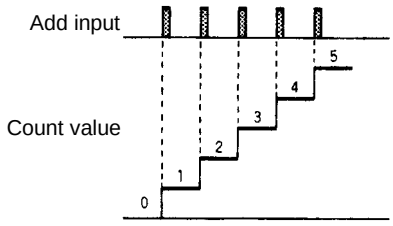
Glossary

Addition-type (Up/Incrementing) counter

A counter having an add input and thus capable of counting in an ascending order.



Ambient temperature (operating)

The ambient temperature at which a device can be used in the continuously operated state.

Ambient temperature (storage)

The ambient temperature at which a device without power applied, may be stored safely.

Automatic reset

To automatically return the counter to the "0" state after the lapse of a given time.

Counting capacity

The maximum value up to which the counter can count. The counting capacity is usually expressed in decimal digits.

Count-up

The point in time or the state in which the output section of the counter operates when the number of counts reaches the preset value.

Dielectric strength

The maximum voltage a dielectric can withstand without being damaged.

Electromagnetic reset

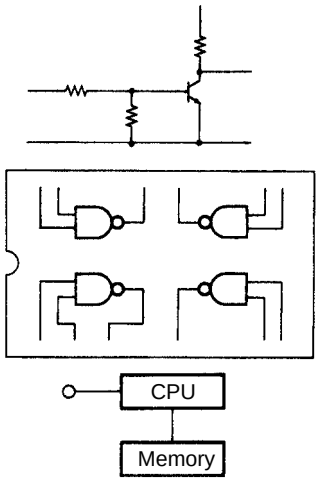
To electromagnetically reset the counter by applying a reset signal.

Electromagnetic counter

A counter which performs counting by energizing or de-energizing the built-in electromagnet.

Electronic counter

A counter which mainly consists of transistors, ICs, micro-computers, etc.



Electrical life expectancy

The life expectancy of a counter when the control output is operated to switch a specified voltage/current load connected to the control output.

External reset

To reset the counter by a required signal applied from an external source to the reset input signal terminals of the counter.

Holding output

The control output of the counter without a self-resetting function.

The output is continuously held as long as the counter is not reset by the power, external, manual, or electromagnetic reset.

Humidity

The ambient humidity at which a device can be used for continuous operation.

Insulation resistance

The resistance offered by an insulating material to the flow of current resulting from a DC voltage.

Life expectancy (mechanical)

The life expectancy of a counter when the control output of the counter is operated without a load.

Manual reset

To mechanically reset the counter by manual means.

Maximum counting speed

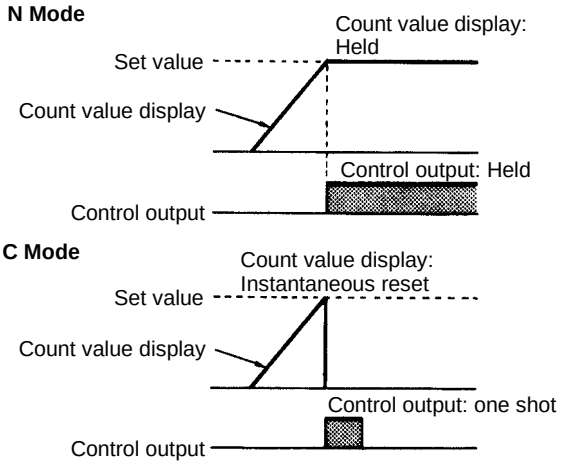
The maximum counting speed at which the display or output section of the counter operates accurately without miscounting. The maximum counting speed is expressed in units of counts per second (cps).

Memory protective function during power failure

The function by which the number of counts at the time of a power failure is memorized until power is again applied to the counter.

Operating mode

Control output patterns or display patterns that appear when counted up to the value set by the preset counter.



Operating voltage range

The allowable fluctuation range of the voltage required to operate a device (e.g. control and signal voltage).

One-shot output

A counter control output of fixed duration which can be reset by a self-reset.

ON-OFF ratio

The ratio of the ON signal time of a given input signal to the OFF signal time of the same input signal. The maximum counting speed of each counter is determined by a counting input signal with an ON-OFF ratio of 1:1.

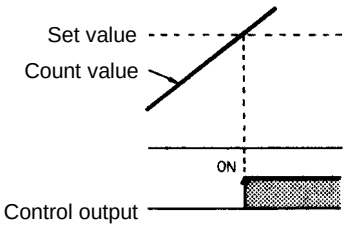
Power consumption

The maximum wattage used by a device within its operating range at the specified temperature and humidity.

Depending on the internal power circuit system of the model, both apparent power and active power are indicated for the AC power supply. Refer to the apparent power when designing a transformer.

Preset solid-state counter

A counter whose control output operates when it counts up to the set value and which employs a semiconductor circuit for the counting element.



Readout counter

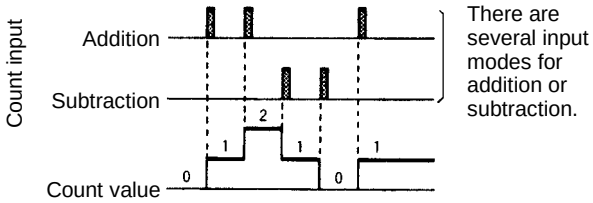
A counter in which an output signal is normally generated corresponding to the count value.

Reset

To restore the counting, display and output sections of the counter, to their initial states.

Reversible-type counter

A counter with the capability of counting in an ascending or descending order, depending on the up-down inputs. Also called an up-down counter.



Power reset

To reset the counter by cutting off the operating supply voltage.

Self-reset

To reset the counter by a signal generated by internal circuitry.

Shock resistance (destruction)

The threshold of shock beyond which an abnormality is expected to occur in the appearance or function of a device.

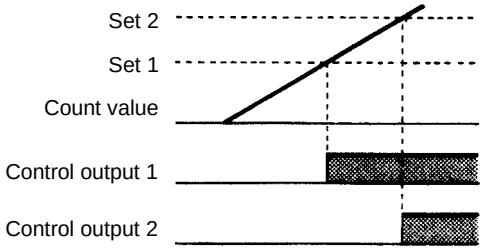
Shock resistance (malfunction)

The threshold of shock beyond which a device can be longer operate properly according to prescribed ratings

Stage

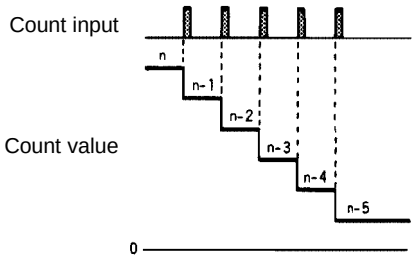
Number of preset values that correspond with the number of control outputs.

Example: Two-stage Counter



Subtraction-type (Down/Decrementing) counter

A counter with a subtract input and thus capable of counting in descending order.



Totalizing counter

A counter which indicates the total value of the counting inputs and is not provided with a control output.

Vibration resistance (destruction)

The threshold of vibration beyond which an abnormality is expected to occur in the appearance or function of a device.

Vibration resistance (malfunction)

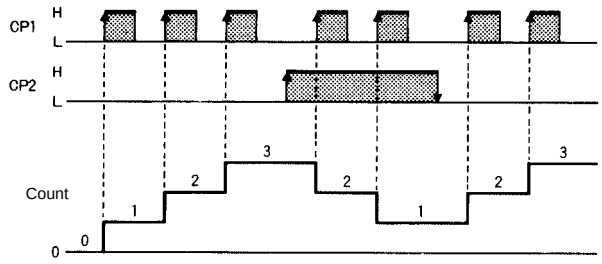
The threshold of shock beyond which a device can be longer operate properly by satisfying the prescribed ratings.

Counting Function

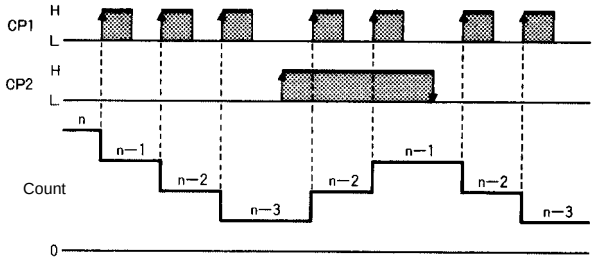
Refer to the following timing charts for the input modes of the incremental, decrementing, and up/down (or reversible-type) Counters.

Up/Down

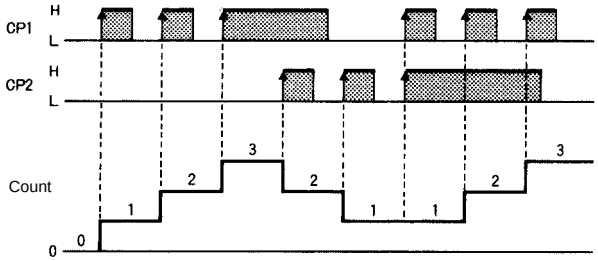
Up/Down A Control Input



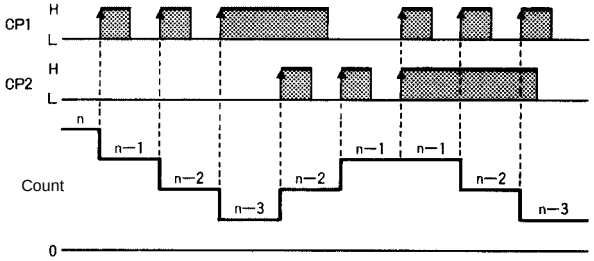
Up/Down D Control Input



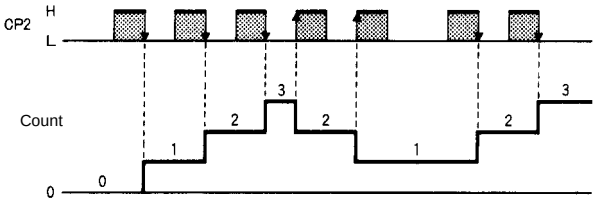
Up/Down B Individual Input



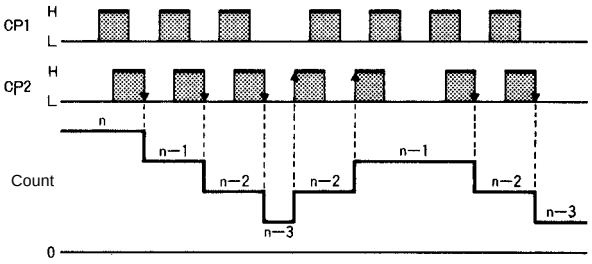
Up/Down E Individual Input



Up/Down C Phase-difference Input



Up/Down F Phase-difference Input



Technical Information

■ Precautions

Refer to the precautions for the individual products as well.

⚠ Caution The following products use lithium batteries.

1. Products with Built-in Lithium Batteries
   The H7S and H8PR- j j have built-in batteries. Do not disassemble the products, deform them with pressure, or subject to heat at more than 100°C, otherwise the battery may explode or burn.
2. Products with Replaceable Lithium Batteries
   The Y92S-20, which is used for the H7CN(-M), is a replaceable lithium battery. Do not short the positive and negative poles, recharge or disassemble, or dispose in a fire, otherwise the battery may explode, burn, or leak liquid.

Operation

Operating Environment

- When using the counter, make sure that the ambient temperature and humidity are within the permissible ranges.
- When storing the counter, make sure that the storage temperature and humidity are within the permissible ranges. Before supplying power to a counter that has been kept at a temperature of −10°C or below, leave the counter at room temperature for at least three hours.
- Be sure to operate the counter within its permissible vibration, shock, water, and oil resistance ranges.
- Do not use the counter in places with excessive dust, corrosive gas, or direct sunlight.
- When using the counter in places with sources of excessive static electricity, such as places with molding materials and powders, and where liquids are being transported, separate the counter from these sources.
- Keep away organic solvents, such as paint thinner and benzine, strong alkalis, and strong acids from the counter, to protect the coverings of the counter from damage.
- Do not remove the coverings of the counter.

Input Signal Processing

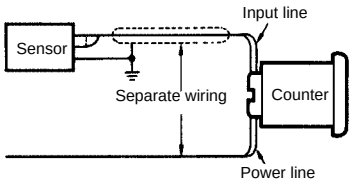
Do not wire the input line of the counter alongside power lines or high-tension lines in the same conduit.

Isolate the input line from power lines or high-tension lines, otherwise the counter may malfunction due to inductive noise generated from the power lines or high-tension lines.

Use shielded wire or metal conduits.

Keep input signal lines as short as possible.

The above points are most important for electronic counters operating at high speed.

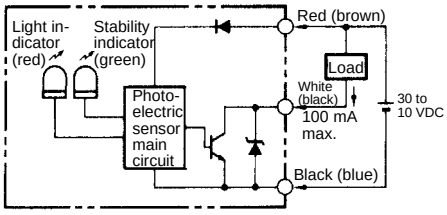


Connection

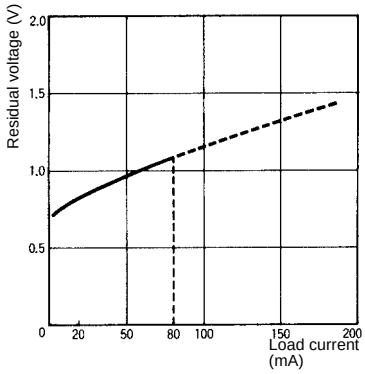
Input

Consider the residual voltage of the input sensor and make sure that the input conditions of the counter conform with the rated conditions.

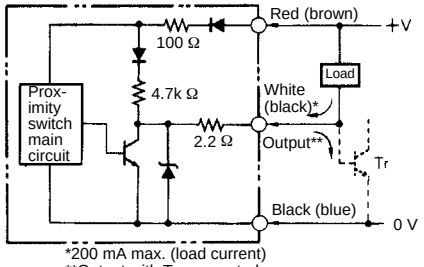
Connection Example with Photoelectric Sensor: E3X-A11



Note: The residual voltage is the voltage between the output and 0-V lines when the transistor is ON (i.e., the total voltage between both edges of the transistor and diode bridge).

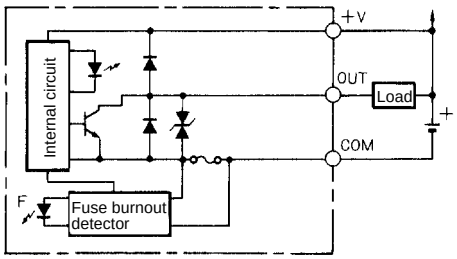


Connection Example with Proximity Switch: E2E-X j E



*200 mA max. (load current)
**Output with T_1 connected.

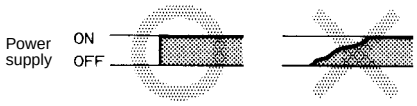
Connection Example with Programmable Controller: C200H-OD411/OD211/OD213/OD212



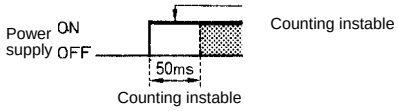
The C200H-OD211 has no fuse burnout detector.
The C200H-OD411 or C200H-OD211 has no Zener diode.

Power Supply

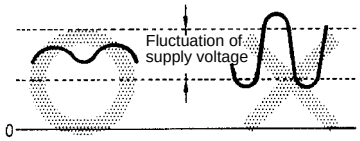
1. Supply all power instantly to the counter through a switch or relay.



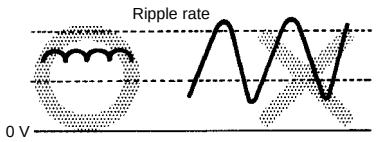
2. The counter requires 50 ms for stable operation after power is supplied if the counter is other than the H7CL, H7GP, or H7HP, which requires 250 ms for stable operation after power is supplied. Do not input any signal before the counter is in stable operation.



3. Make sure that the fluctuation of the supply voltage is within the permissible range.



4. Make sure that the ripple rate of the supply voltage is within the permissible range if DC is supplied.

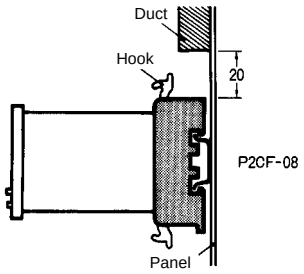


5. Make sure that the load current of the control output is within the permissible range, otherwise the relay or transistor used for the counter may be damaged.

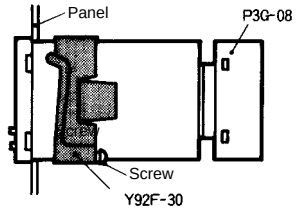
Mounting

Although the counter can be mounted in any direction, it is recommended that the counter be mounted horizontally and securely.

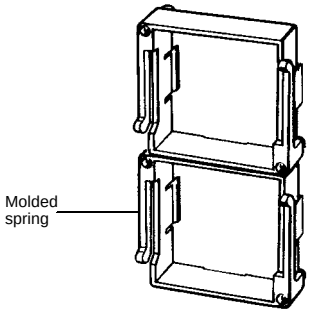
- Surface Mounting
  When mounting two or more counters vertically with P2CF Sockets, make a space of approximately 20 mm on the top and bottom of each P2CF Socket so that the hooks of the P2CF Socket can be moved easily.



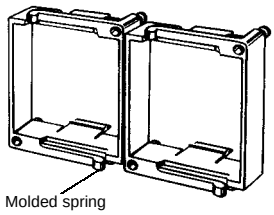
- Flush Mounting
  To mount the counter to a panel with the Y92F-30 Flush-mounting Bracket, insert the front part of the counter into the square hole of the panel, attach the Y92F-30 to the rear end of the counter, and press the Y92F-30 towards the panel and reduce the space between the panel and Y92F-30 as much as possible. Then secure the Y92F-30 with the screw of the Y92F-30.



To mount two or more counters vertically side by side with Y92F-30 Flush-mounting Brackets, locate the Y92F-30 Flush-mounting Brackets so that the molded springs of each Y92F-30 are located on the left and right of the Y92F-30.

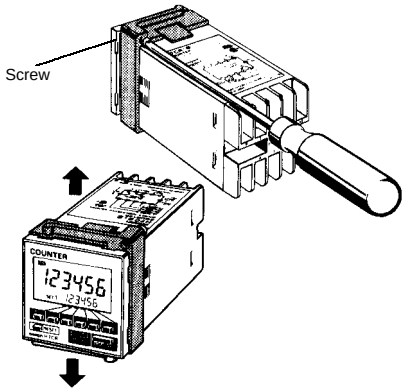


To mount two or more counters horizontally side by side with Y92F-30 Flush-mounting Brackets, locate the Y92F-30 Flush-mounting Brackets so that the molded springs of each Y92F-30 are located on the top and bottom of the Y92F-30.



Dismounting

To dismount the Y92F-30 Flush-mounting Bracket from the counter, loosen the screw of the Y92F-30 and move both hooks upwards and downwards respectively.



Others

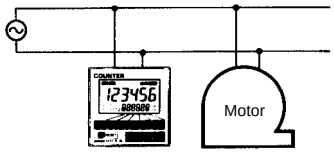
- Refer to the following to carry out dielectric strength, impulse voltage, and insulation resistance tests of the electric circuitry and non-charged metal parts of the counter that has been mounted to a control panel.
  1. Electrically isolate the counter from the electric circuitry of the control panel by disconnecting the socket or external wires from the counter.
  2. Short-circuit all the terminals of the counter, which will prevent the internal circuit of the counter from damage that may be caused by a machine or component in the control panel with poor dielectric strength or insulation resistance.
     - The impulse voltage test of the power terminals is carried out in conformity with the Japanese JEC-210 standards before shipping. Use a surge absorber, AC MP, or oil capacitor that has a capacity of 0.1 to 1 μF if there is an impulse voltage outside a range from −1.2 x 50 to 1.2 x 50 μs.
     - The counter reads input signals anytime. The counter can be set so that it will read input signals when it is reset if it is the H7AN-R j . Be aware that the counter will have an output signal if the data input change coincides with counter input.
     - Do not tighten any terminal screw excessively.
     - Counter-electromotive voltage is generated by any inductive load that is turned on or off. For the purpose of surge absorption, when using the counter to switch an electromagnetic device, such as a solenoid valve, apply a diode if the electromagnetic device is in DC circuitry and a surge absorber if the electromagnetic device is in AC circuitry, otherwise counter damage or malfunctioning may result.

Troubleshooting

Refer to the following for the troubleshooting of the counter if the counter malfunctions or has errors.

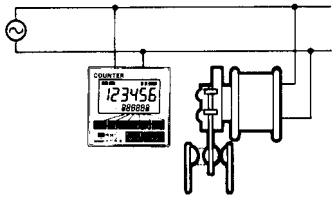
1. The following may result if a heavy inductive load, such as a high-capacity motor or solenoid, shares the power line connected to the counter or is present near the counter.
   - The counter may count up or down without any input signal.
   - The power supply circuit of the counter may be damaged.

   To prevent this, keep the motor or solenoid away from the counter or connect a noise filter to the power supply circuit.



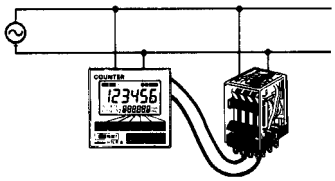
2. The following may result if a device with contacts generating arcs shares the power line connected to the counter or is present near the counter.
   - The counter may count up or down without any input signal.

   To prevent this, connect an arc suppressor to the device.



3. The following may result if the input device has a relay without highly reliable contacts.
   - The counter may not count up or down when the contacts are activated.

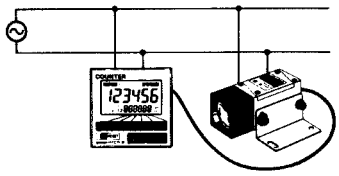
   To prevent this, replace the relay with one that has highly reliable contacts.



4. The following may result if the input signal line is excessively long.
   - The power line connected to the counter may cause the counter to count up or down.

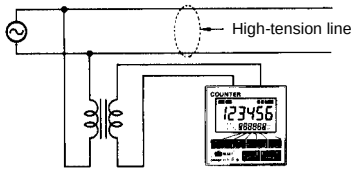
     To prevent this, refer to page 10, *Input Signal Processing.*
   - The residual voltage may make it impossible for the counter to check the interval between input signals, thus obstructing the counting operation of the counter.

     To prevent this, make the input signal line as short as possible and insert a 0.01- to 0.1-μF capacitor into the signal line close to the signal input terminal of the counter.



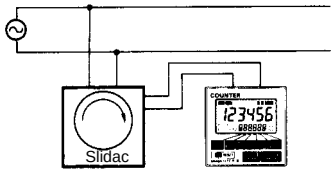
5. The following may result if the power line is close to a high-tension line.
   - The high-tension line may cause the counter to count up or down.

     To prevent this, refer to page 10, *Input Signal Processing.*



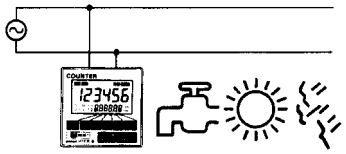
6. The following may result if the supply voltage is imposed gradually.
   - The counter may not operate normally or the counter displays an inaccurate value.

     To prevent this, supply all power instantly to the counter through a switch or relay.



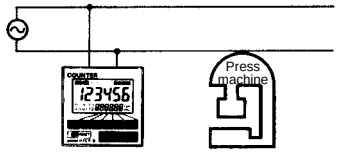
7. The following may result if the counter is used for a long time in a place with excessive dust, direct sunlight, or sprayed water or oil that affects the counter.
   - The counter may not count up properly or operate normally and the coverings of the counter is deformed.

     To prevent this, protect the counter from water, oil, dust, and sunlight. A hard front cover will protect the counter from dust and drops of water.



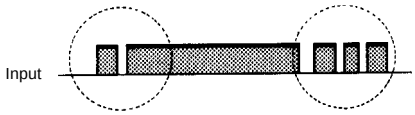
8. The following may result if the counter is used in a place with excessive or continuous vibration or shock.
   - Contact chattering may cause sequencing errors.
   - The built-in parts of the counter may malfunction due to the stress imposed on the built-in parts.

     To prevent this, reduce the vibration by putting a rubber cushion under the vibration source. Do not mount the counter directly to the vibration source.



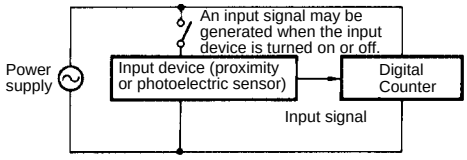
9. The following may result if the counter is in high-speed counting operation with relay input signals.
   - The counter may count more than the actual number of input signals.

     To prevent this, set the counting speed to 30 Hz (cps).



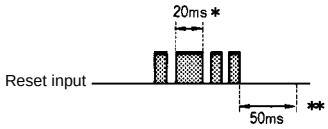
Contact chattering is counted.

10. If the proximity or photoelectric sensor used as the input device is turned on or off while supply voltage is imposed on the counter, excessive pulses may be generated from the input device and input to the counter.



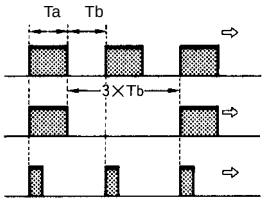
11. If the count input is a transistor input at a speed of 30 Hz (cps) maximum, setting the maximum counting speed to 30 Hz (cps) will improve the noise immunity of the counter.

12. The counter can be reset with a reset signal, which must be 20 ms long minimum, from the relay or transistor regardless of the maximum counting speed or input method of the counter.



* The reset signal with distorted waves or chattering waves is acceptable as long as the reset signal is stable for 20 ms minimum.
** The CP1 and CP2 can be input if it passes 50 ms after the reset signal input is completed.

13. The maximum counting speed is the response speed of the counter when signals with the minimum permissible signal width are input at an ON-to-OFF ratio of 1:1.
    If the ratio is not 1:1, the minimum signal width must be higher than the combined specified value for the ON width and OFF width. The response speed will thus be lower.
    If the width of each signal or interval between adjacent signals is less than the minimum permissible signal width, the counter will not respond even for an input signal that is less than the maximum counting speed.

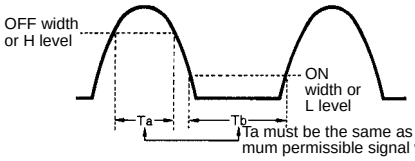


Ta (ON width) and Tb (OFF width) must be more than the minimum permissible signal width.
30 cps: 16.7 ms; 1 kps: 0.5 ms

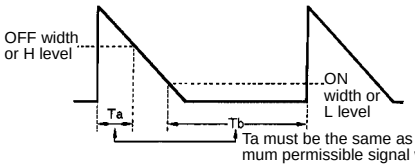
The maximum counting speed is 1/2 of the rated value if the on-to-off ratio is 1:3.

The counter does not respond because Ta is less than the minimum permissible signal width.

14. If transistor input signals are other than square-wave signals, such as sine-wave, triangular-pulse, or saw-tooth-pulse signals, all the ON and OFF widths or H- and L-level periods must be more than the minimum permissible signal width.



Ta must be the same as or more than the minimum permissible signal width and so must Tb.



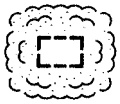
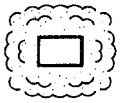
Ta must be the same as or more than the minimum permissible signal width and so must Tb.

■ Enclosure Ratings

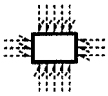
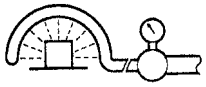
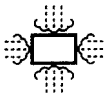
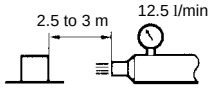
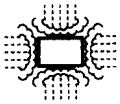
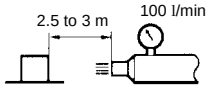
IP - 6 6 G

- Protection Specification Code (International Protection) (IEC529)
- Protection against solid foreign objects
- Protection against harmful ingress of water
- Japan Electrical Manufacturers Association's standards (JEM1030)
  Protection against oil

Protection Against Solid Foreign Objects

Grade	Protection	Criteria
5	Dust protected 	Limited ingress of dust permitted (no harmful deposit).
6	Dust-tight 	Totally protected against ingress of dust.

Protection Against Harmful Ingress of Water

Grade	Protection	Criteria	Examination method
4	Water splash from all directions 	Protected against water splashed from all directions; limited ingress permitted.	Spray water from all directions for 10 minutes using the test device shown below.  Flow per water spray hole: 0.07 l/min
5	Housing jets from all directions 	Protected against low-pressure jets of water from all directions; limited ingress permitted.	Spray water from all directions for one minute per m^2 of external surface area and for a total time of no less than 3 minutes using the test device shown below.  Discharging nozzle dia.: 6.3
6	Strong hosing jets from all directions 	Protected against strong jets of water, e.g. for use on shipdecks; limited ingress permitted.	Spray water from all directions for one minute per m^2 of external surface area and for a total time of no less than 3 minutes using the test device shown below.  Discharging nozzle dia.: 12.5

JEM Standards
Protection Against Oil

Grade	Protection	Criteria	Criteria
F	Oilproof	Protected against improper operation due to oil drops or spray from any direction.	No penetration of oil to the extent of interfering with proper operation after dropping the specified cutting oil on a test device for 48 hours at a rate of 0.5 l per hour.
G	Oil resistant	Protected against penetration of oil drops or spray from any direction.	No penetration of oil after dropping the specified cutting oil on a test device for 48 hours at a rate of 0.5 l per hour.

■ Applicable OMRON Sensors/Encoders

■ Photomicrosensors

3-wire DC NPN

Model	Specifications				H7CR-A	H7CR-AV	H7BR-B/-C H7CR-B/-C	H7BR-BV/-CV H7CR-BV/-CV	H7CL	H7GP
	Supply voltage	Load switching current (Control output)	Residual voltage	Others						
E3X-A11, A21, E3X-VG11, VG21,	10 to 30 VDC	100 mA max.	0.75 V max. with 10 mA	---	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Direct connection to the Counter is possible.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Direct connection to the Counter is possible.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.
E3S-CL			1.2 V max. with 10 mA							
E3X-F21, E3S-GS, E3S-R, E3S-VS, E3R, E3L, E3HF, E3HS, E3HT, E3HC	12 to 24 VDC	80 mA max.	0.75 V max. with 10 mA					Direct connection to the Counter is possible.		Direct connection to the Counter is possible.
E3C-A, E3C-C, E3C-GE4, E3C-WE4										
E3S- j G4 j , E3S-LS5C4, E3S-LS20C4, E3C-JC4P		100 mA max.	0.7 V max. with 10 mA					Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.		Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.
E3C-WH4F, E3X-NL, E3V3- j 6 j , E3X-NV/NVG			1 V max. with 10 mA							
E3N		200 mA max.								Direct connection to the Counter is possible
E3ML		80 mA max.								
E3S-LS3C1D	5 to 12 VDC	30 mA max.								Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.

3-wire DC PNP

Model	Specifications				H7CR-A	H7CR-AV	H7BR-B/-C H7CR-B/-C	H7BR-BV /-CV H7CR-BV /-CV	H7CL	H7GP
	Supply voltage	Load switching current (Control output)	Residual voltage	Others						
E3S- j B4, E3S-LS5B4, E3S-LS20B4	12 to 24 VDC	100 mA max.	0.8 V max. with 10 mA	---	Possible to connect to the Counter but the operation is reversed.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Possible to connect to the Counter but the operation is reversed.	Direct connection to the Counter is possible.	Possible to connect to the Counter but the operation is reversed.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.
E3V3- j 8 j			1 V max. with 10 mA							
E3S-CL			2 V max. with 10 mA							

■ Proximity Sensors

3-wire DC NPN

Model	Specifications				H7CR-A	H7CR-AV	H7BR-B/-C H7CR-B/-C	H7BR-BV /-CV H7CR-BV /-CV	H7CL	H7GP
	Supply voltage	Load switching current (Control output)	Residual voltage	Others						
E2EC-C	5 to 24 VDC	100 mA max.	0.5 V max. with 10 mA	---	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Direct connection to the Counter is possible.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Direct connection to the Counter is possible.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.
TL-Q5MC	12 to 24 VDC	50 mA max.								
E2C-JC4A, E2E-X1C, TL-W j MC, E2EV, E2K-F j C		100 mA max.								
E2C-GE4, TL-N j E, TL-F j E, TL-H j E								Direct connection to the Counter is possible.		Direct connection to the Counter is possible.
E2E-X j E, E2F-X j E, TL-W5E, E2K-C j E		200 mA max.								
E2C-AM4A, E2C-WH4A, E2Q-N j E3										
TL-X j E			1 V max. with 10 mA							
E2M- j P	24 VDC±15%		0.5 V max. with 10 mA					Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.		Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.

3-wire DC PNP

Model	Specifications				H7CR-A	H7CR-AV	H7BR-B/-C H7CR-B/-C	H7BR-BV /-CV H7CR-BV /-CV	H7CL	H7GP
	Supply voltage	Load switching current (Control output)	Residual voltage	Others						
E2C-GF4	12 to 24 VDC	100 mA max.	0.5 V max. with 10 mA	---	Possible to connect to the Counter but the operation is reversed.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Possible to connect to the Counter but the operation is reversed.	Direct connection to the Counter is possible.	Possible to connect to the Counter but the operation is reversed.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.
E2C-AM4A					Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.		Direct connection to the Counter is possible.		Direct connection to the Counter is possible.	
TL-T j F					Possible to connect to the Counter but the operation is reversed.		Possible to connect to the Counter but the operation is reversed.		Possible to connect to the Counter but the operation is reversed	
E2F-X j F, TL-W j F, TL-X j F, E2Q-N j F3		200 mA max.								

2-wire DC NPN

Model	Specifications				H7CR-A	H7CR-AV	H7BR-B/-C H7CR-B/-C	H7BR-BV /-CV H7CR-BV /-CV	H7CL	H7GP
	Supply voltage	Load switching current (Control output)	Residual voltage	Others						
E2E-XD	12 to 24 VDC	5 to 100 mA max.	2.8 V max. with 10 mA	Current leakage: 0.75 mA	Possible to connect to the Counter but the operation is reversed.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Possible to connect to the Counter but the operation is reversed.	Connection to the Counter is possible if the Photomicrosensor is used with a resistive load or independent power supply.	Direct connection to the Counter is possible.	Impossible to connect to the Counter.

■ Encoders

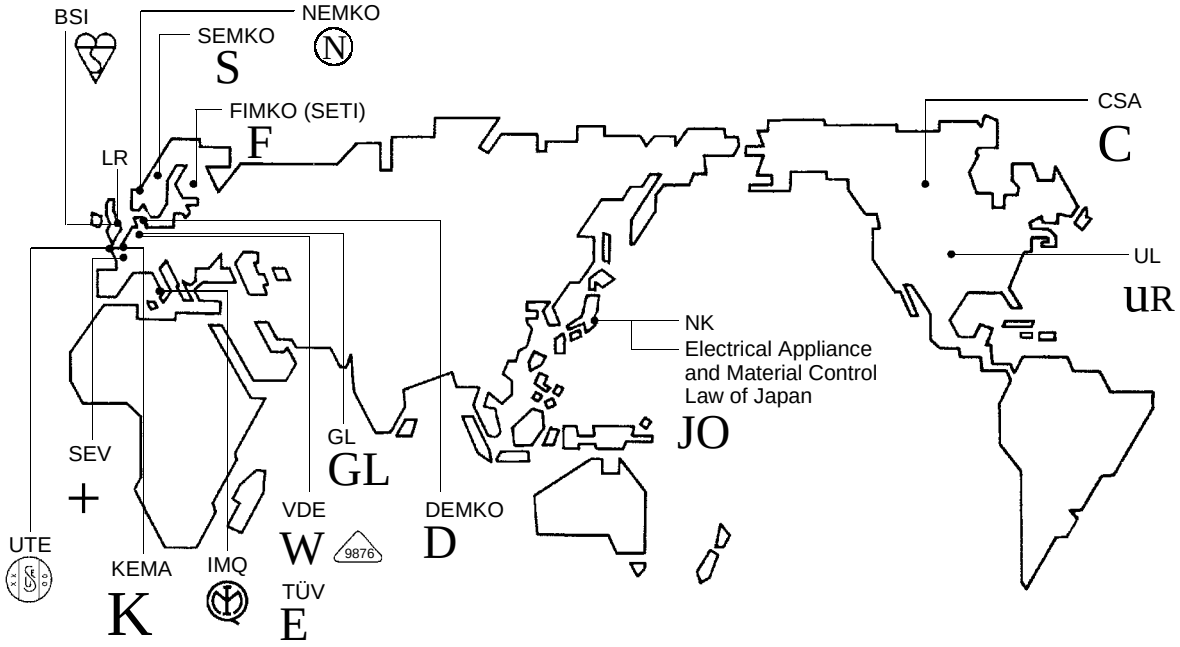
Item		Specification			H7BR	H7CR	H7ER	H8PR	H8PS
		Supply voltage	Load current	Residual voltage					
E6A2	E6A2-CS3E, E6A2-CW3E, E6AS-CWZ3E	5 to 12 VDC	20 mA	0.4 V max. with 20 mA	Direct connection to the Counter is possible (See note 1, 2)	Direct connection to the Counter is possible (See note 1)	Direct connection to the Counter is possible (See note 1, 2)	Impossible to connect to the counter.	Impossible to connect to the counter.
	E6A2-CS3C, E6A2-CW3C, E6A2-CWZ3C		30 mA	0.4 V max. with 30 mA	Direct connection to the Counter is possible (See note 2)	Direct connection to the Counter is possible (See note 2)	Direct connection to the Counter is possible (See note 2)		
	E6A2-CS5C, E6A2-CW5C	12 to 24 VDC							
E6C-C, E6D	E6C-CWZ3E	5 to 12 VDC	20 mA	0.4 V max. with 20 mA	Direct connection to the Counter is possible (See note 1)	Impossible to connect to the counter.	Direct connection to the Counter is possible (See note 1)		
	E6C-CWZ5C	12 to 24 VDC	80 mA	0.4 V max. with 20 mA, 1 V max. with 80 mA	Direct connection to the Counter is possible (See note 2)		Direct connection to the Counter is possible (See note 2)		
	E6D-CWZ1E	5 VDC	35 mA	0.7 V max. with 10 mA	Impossible to connect to the counter.		Impossible to connect to the counter.		
	E6D-CSZ2C	12 VDC		0.7 V max. with 10 mA, 1 V max. with 35 mA	Direct connection to the Counter is possible (See note 2)		Direct connection to the Counter is possible (See note 2)		
E6B2, E6H	E6B2-CWZ3E	5 to 12 VDC	20 mA	0.4 V max. with 20 mA	Direct connection to the Counter is possible (See note 1, 2)	Direct connection to the Counter is possible (See note 1, 2)	Direct connection to the Counter is possible (See note 1, 2)		
	E6B2-CW6C	5 to 24 VDC	35 mA	0.4 V max. with 35 mA	Direct connection to the Counter is possible (See note 2)	Direct connection to the Counter is possible (See note 2)	Direct connection to the Counter is possible (See note 2)		
	E6H-CWZ6C			0.7 V max. with 35 mA					
	E6H-CWZ3E	5 to 12 VDC	30 mA	0.7 V max. with 30 mA	Direct connection to the Counter is possible (See note 1, 2)	Direct connection to the Counter is possible (See note 1, 2)	Direct connection to the Counter is possible (See note 1, 2)		
E6CP	E6CP-AG5C-C	12 to 24 VDC	16 mA	0.4 V max. with 16 mA	Impossible to connect to the counter.	Impossible to connect to the counter.	Impossible to connect to the counter.		Direct connection to the Counter is possible.
E6F	E6F-AG5C-C		35 mA	0.4 V max. with 35 mA				Direct connection to the Counter is possible.	Impossible to connect to the counter.

Note: 1. Power supply voltage to the Encoder: 12-VDC type only

2. Counter input that matches the Encoder output must be selected.

Standards

■ National Standards



IEC (International Electrotechnical Commission)

The IEC is a standardization commission founded in 1908 to promote unification and coordination of international standards relating to electricity. It is headquartered in Geneva, Switzerland.

At present there are 43 member nations in the IEC including Japan, and these member nations are quickly conforming to the IEC standards.

UL Standards (Underwriters Laboratories INC.)

A nonprofit organization established in 1894 by the American association of fire insurance companies.

Underwriters Laboratories (abbreviated to UL hereafter) conducts approval testing on all kinds of electrical products. In many U.S. cities and states, UL approval is legally required on all electrical items sold.

In order to obtain UL approval on an electrical product, all major internal components also require UL approval.

UL offers two classifications of approvals, the listing mark and the recognition mark.

A Listing Mark constitutes an entire approval of a product. Products display the Listing Mark shown below.

u

LISTING MARK

The Recognition Mark applies to the components used in a product, and therefore constitutes a more conditional approval of a product. Products display the Recognition Mark shown below.

R

RECOGNITION MARK

CSA Standards (Canadian Standards Association)

This association descended from a nonprofit, non-government standardization organization established in 1919. In addition to industrial standardization, the association now carries out safety testing on electrical products.

CSA has closer ties to government agencies than UL, so that electrical products not approved by CSA cannot be sold in Canada. Non-approved goods being sold illegally may have to be withdrawn.

CSA approval is known as “certification,” and consequently, CSA-approved equipment is referred to as “certified equipment.” Products display the mark shown below. For a conditional certification, products display component acceptance mark.

C

CERTIFICATION MARK

CENELEC (Comite Europeen de Normalisation Electrotechnique)

CENELEC is the "European Committee for Electrotechnical Standardization" jointly founded in 1973 by the EEC (European Economic Community) and EFTA (European Free Trade Association). It is headquartered in Brussels, Belgium and currently has 18 member nations.

Faced with European market unification in 1992, CENELEC took on the very important task of creating unified European standards and is energetically proceeding with the creation of standards.

The CENELEC standards can be broadly divided into two groups: EN (European Norm) and HD (Harmonized Document).
EC member nations must use the EN standards for national standards without any changes, but they can use national standards that are have the same general content as the HD standards, so some differences in content are allowed with the HD standards.

VDE Standards (Verband Deutscher Electrotechnischer e.V.)

The VDE (German electrical technician's association), established in 1893, is mainly responsible for carrying out safety testing and approval administration of electrical products.
Compliance with VDE standards is not proscribed under German law, however, the extremely heavy penalties imposed on the manufacturer of an unapproved product which causes an electric-shock or fire mean that compliance is effectively compulsory in practice.

The VDE offers two major classifications of approval: the VDE Mark (below left) for products that can be used independently on the market, and the Monitoring Mark (below right) for components that are built into other products. The number inside the Monitoring Mark is the VDE registration number.

VDE MARK

MONITORING MARK

LR (Lloyd's Register of Shipping)

These are the standards of the Lloyd's Register of Shipping, headquartered in London. All of the OMRON control components approved in LR are UMS ships, the unmanned engine-room ship classification in the Lloyd's Register.

Unlike the safety standards such as UL, the devices are checked to ensure that they can function sufficiently under the environmental conditions when they are used in ships.
When a device is approved, Lloyd's Register doesn't apply the passing mark on the product, but includes it on the list of approved products that it publishes every year.

NK (Nippon Kaiji Kyokai)

Automation equipment and devices receive tests and inspections based on the provisions of the steel-ship regulations and can be formally approved if the tests are passed.

Testing at the production factory can be partially or entirely omitted when automation equipment and devices that have been formally approved are installed on ships.

As a general rule, manufacturers of approved products indicate that the products being shipped have been approved. (It is also acceptable to affix a label to products which require it.)

Electrical Appliance and Material Control Law of Japan

The products governed by the Electrical Appliance and Material Control Law (EAMCL) are electrical appliances generally used in the home or office. It does not apply to other industrial electrical equipment.

Electrical equipment falling under the auspices of the EAMCL are known as electrical appliances and divided into first-grade and second-grade appliances according to their dangerousness and how widespread their use.
First-grade appliances can display the symbol shown on the upper-left with an authorization number and be manufactured and sold if they pass the formal authorization tests prior to manufacture. Second-grade appliances can display the symbol shown on the lower-left with an authorization number and be manufactured and sold if the manufacturer reports the main principles of manufacturing.

First-grade
appliance symbol

Second-grade
appliance symbol

Reference

1. CE Marking

This mark is applied to products shown to conform to all relevant EC directives.

The EC directives that apply directly to this company's products are the Low-voltage directives and EMC directives. The Machinery directives apply indirectly.

As a general rule, the CE marking is required for final products that appear on the market, but isn't required for the internal components in the product.

2. TÜV (Technischer Überwachungs - Verein)

The TÜV organizations are private, non-profit organizations whose parent organization, the German Boilermaker's Federation, was founded in 1875 to prevent boiler accidents. There are 14 independent TÜV organizations within Germany (such as TÜV Rheinland, TÜV Bayern, etc.).

The TÜV organizations inspect a broad range of industrial machinery and equipment, but is also entrusted by the government to inspect and approve electrical products based on the VDE standards.

TÜV approval is equally valid as VDE approval, and TÜV approval by any of the 14 independent organizations is valid with the others.

There are two types of approval marks, the mark on the upper-left is applied to equipment and the mark on the lower-left is applied to parts within the equipment.

3. BEAB (British Electrotechnical Approvals Board)

This non-profit organization was established in 1960 and tests mainly household electrical appliances based on BS standards.

There are two types of BEAB approval marks, the mark on the left is applied to equipment and the mark on the right is applied to parts within the equipment. Application of the parts approval mark is optional.

4. Switches and Relays Rated for Televisions (UL, CSA)

Both UL and CSA require normal TV rating approval for switches and relays used for power supply switching in appliances such as televisions and radios. UL accepts tungsten ratings (25,000 switch operations) for relays.

The TV ratings test is performed using a normal tungsten load on 6 samples. The tungsten lamp load has a inrush current about 10 times the normal current and the switching test is performed 25,000 times on each sample.

The TV ratings display indicates the tested amperage. For example, a switch passing the test for a normal current of 2 A (at 120 VAC) would be indicated by "TV–2."

5. Types of Loads

The conditions for loads other than resistive loads are different for the North American standards (UL and CSA) and the standards for each European country (VDE, SEMKO, etc.).

In North America, the tests for loads other than resistive loads are normally performed with a "general purpose load" with a 0.75 to 0.80 power factor, but in European countries the tests are performed with an inductive load with a 0.4 power factor.

■ EMC

Directive 89/336/EEC Concerning Electromagnetic Compatibility

The EMC Directive is a new-approach directive laying down equipment protection requirements and leaving it to standards, primarily harmonized standards or, failing that, national standards, to define product characteristics.

The EMC Directive is a total harmonization directive, i.e., its provisions replace the national provisions concerned.

The EMC Directive must be transposed into national law by 1st July 1991. Its provisions have applied since 1st January 1992.

The wide scope of the EMC Directive has demonstrated the overriding need to provide for a transitional period, so as to ensure a harmonious changeover from the application of systems of a purely national character to an exclusive Community system.

That is why, on 28 April 1992, the Council adopted Directive 92/31/EEC with a view to allowing a transitional period until 31 December 1995.

During this transitional period, a manufacturer will have the choice of placing on the market/putting into service:

- Products manufactured in accordance with the EMC Directive, whereby the free movement of the product is guaranteed pursuant to the Directive, or
- Products manufactured in accordance with national regulations or possibly with technical specifications of a non-mandatory nature, whereby free movement of the product will be guaranteed pursuant to Article 30 of the EEC Treaty, albeit subject to the possible derogations provided for in Article 36 and the jurisprudence of the European Community Court of Justice.

Normative References

EN50081-1
1992

Electromagnetic compatibility –
Emission standard
Part 1: Residential, commercial and light industry

EN50081-2
1993

Electromagnetic compatibility –
Emission standard
Part 2: Industrial environment

EN50082-1
1992

Electromagnetic compatibility –
Immunity standard
Part 1: Residential, commercial and light industry

prEN50082-2
1994

Electromagnetic compatibility –
Immunity standard
Part 2: Industrial environment

EN55011
1990

Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medial (ISM) radio-frequency equipment

EN55022
1985

Limits and methods of measurement of radio disturbance characteristics of information technology equipment

EN60204-1
1992

Safety of machinery –
Electrical equipment of machines
Part 1: General requirements

EN61000-4-8
1993

Electromagnetic compatibility
Part 4: Testing and measurement techniques
Section 8: Power frequency magnetic field immunity test

ENV50140
1993

Electromagnetic compatibility –
Basic immunity standard
Radiated, radio-frequency electromagnetic field –
Immunity test

ENV50141
1993

Electromagnetic compatibility –
Basic immunity standard
Conducted disturbances inducted by radio-frequency fields –
Immunity test

IEC801-2
1991

Electromagnetic compatibility for industrial-process measurement and control equipment
Part 2: Electrostatic discharge requirements

IEC801-3
1984

Electromagnetic compatibility for industrial-process measurement and control equipment
Part 3: Radiated electromagnetic field requirements

IEC801-4
1988

Electromagnetic compatibility for industrial-process measurement and control equipment
Part 4: Electrical fast transient/burst requirements

IEC801-5 (Draft)
1993

Electromagnetic compatibility for industrial-process measurement and control equipment
Part 5: Surge voltage immunity requirements

IEC801-6 (Draft)
1993

Electromagnetic compatibility for industrial-process measurement and control equipment
Part 6: Immunity to conducted disturbances induced by radio frequency fields.

IEC68-2-2
1974

Environmental testing
Tests B: Dry heat

IEC68-2-30
1980

Environmental testing
Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)

IEC68-2-36
1973

Environmental testing
Test Fdb: Random vibration wide band
Reproducibility Medium

IEC529
1983

Degrees of protection provided by enclosures

MIL-STD-810E
1989

Method 514.4: Vibration

ASTM D 4728
1987

Standard test method for random vibration testing of shipping containers

Note: Abbreviations

EMC:	Electromagnetic compatibility
EMS:	Electromagnetic susceptibility
EMI:	Electromagnetic interference
RF:	Radio frequency
ISM:	Industrial, scientific and medical equipment

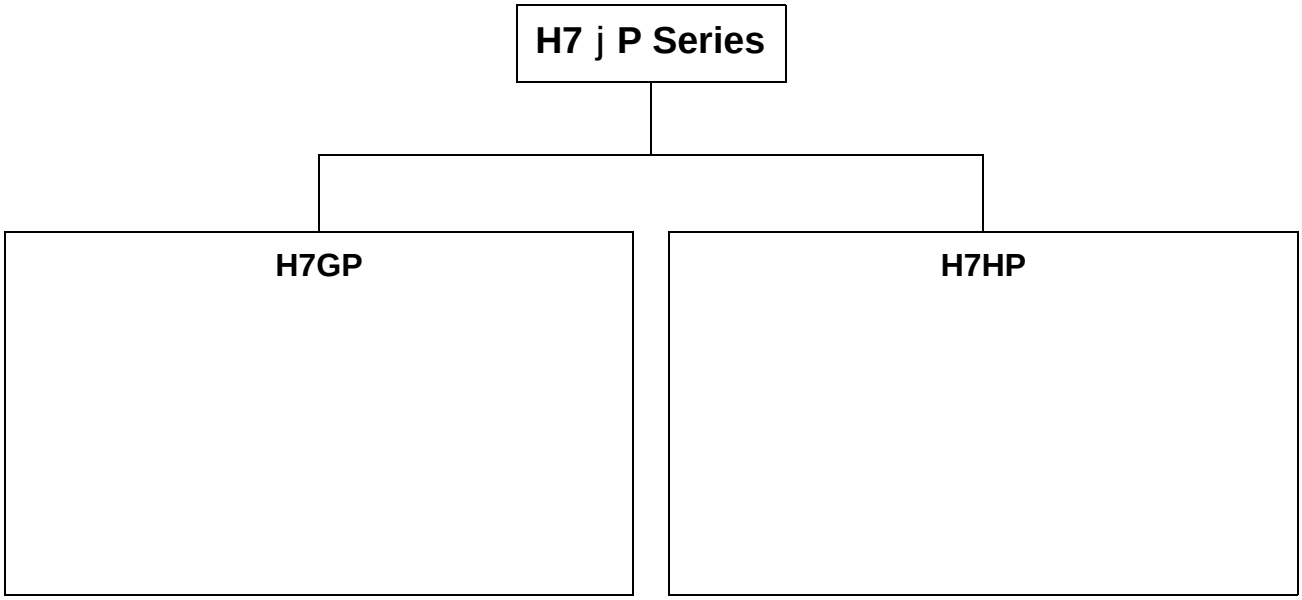
OMRON

Total Counter/Time Counter

H7GP/H7HP

High-visibility, IP66/NEMA4 Protection Total Counter/Time Counter Range

- IP66 (JEM standard IP66G: oil resistance) and NEMA4 protection standards.
- Switch between NPN and PNP operation.
- Both external and manual resets provided.
- Finger-protection terminal block cover prevents electrical shocks conforming to VDE0106/100.
- Conforms to EMC standards.
- Conforms to IEC standards, and approved by UL and CSA.
- Wide power supply range.
- Six-language instruction manual provided.



- 6-digit total counter
- 6-digit time counter
- DIN 48 x 24

- 6-digit total counter/time counter
- 8-digit total counter
- DIN 72 x 36

Contents

OMRON

Total Counter/Time Counter (DIN 48 x 24) H7GP

Compact Total Counters and Time Counters with Easy-to-read Displays and IP66G/NEMA4 Water and Oil Resistance

- High-visibility, negative transmissive LCD display with 8.5-mm-high characters and built-in red LED backlight at low power consumption.
- Compact (80 mm) body.

CE RC

Ordering Information

Supply voltage	6-digit total counter		6-digit time counter	
	Light gray	Black	Light gray	Black
100 to 240 VAC	H7GP-C	H7GP-CB	H7GP-T	H7GP-TB
12 to 24 VDC	H7GP-CD	H7GP-CDB	H7GP-TD	H7GP-TDB

Model Number Legend:

H7GP- j j j
(1 2 3)

1. Classification
C: Total counter
T: Time counter

2. Supply Voltage
None: 100 to 240 VAC
D: 12 to 24 VDC

3. Case Color of Front Section
None: Light gray (Munsell 5Y7/1)
B: Black

Specifications

■ Ratings

Item		6-digit total counter		6-digit time counter	
		H7GP-C	H7GP-CD	H7GP-T	H7GP-TD
Rated supply voltage		100 to 240 VAC (50/60 Hz)	12 to 24 VDC (see note 1)	100 to 240 VAC (50/60 Hz)	12 to 24 VDC (see note 1)
External power supply		50 mA at 12 VDC	---	50 mA at 12 VDC	---
Operating voltage range		85% to 110% of rated supply voltage			
Power consumption		100 to 240 VAC: 6.5 VA max. 12 to 24 VDC: 0.6 W max.			
Dimensions		48 x 24 x 80 mm (W x H x D)			
Mounting method		Flush mounting			
External connections		Screw terminals			
Enclosure ratings		Panel surface: JEM IP66G and NEMA Type 4 (indoors)			
Display		7-segment, negative transmissive LCD (with red backlight)			
Digits		6 digits (8.5-mm-high characters)			
Input mode		Up (increment)		Accumulative	
Max. counting speeds		30 Hz (cps) or 5 kHz (kcps) (selected via DIP switch)		---	
Counting range		0 to 999999		---	
Time specification		---		0.1 to 99999.9 h/1 s to 99 h 59 min 59 s	
Timing accuracy		---		±100 ppm (−10°C to 55°C)	
Memory backup		EEP-ROM: 200,000 operations min.			
Input	Input signals	Count, reset, and key protection (see note 2)		Start, reset, and key protection (see note 2)	
	Input method	No-voltage input (NPN transistor input) or voltage input (PNP transistor input) (selected via DIP switch)			
	Count, reset, start	No-voltage input (NPN transistor input) Short-circuit (ON) impedance: 1 KΩ max. Short-circuit (ON) residual voltage: 2 VDC max. Open (OFF) impedance: 100 kΩ min. Voltage input (PNP transistor input) Short-circuit (ON) impedance: 1 KΩ max. ON voltage: 9 to 24 VDC OFF voltage: 5 VDC max. Open (OFF) impedance: 100 kΩ min.			
	Key protection	No-voltage input (NPN transistor input) Short-circuit (ON) impedance: 1 KΩ max. Short-circuit (ON) residual voltage: 0.5 VDC max. Open (OFF) impedance: 100 kΩ min.			
Input response speed	Reset	20 or 1 ms (automatically switched according to counting speed)		20 ms	
	Start	---		20 ms	
	Key protection	Approx. 1 s		Approx. 1 s	
Reset system		External and manual resets			

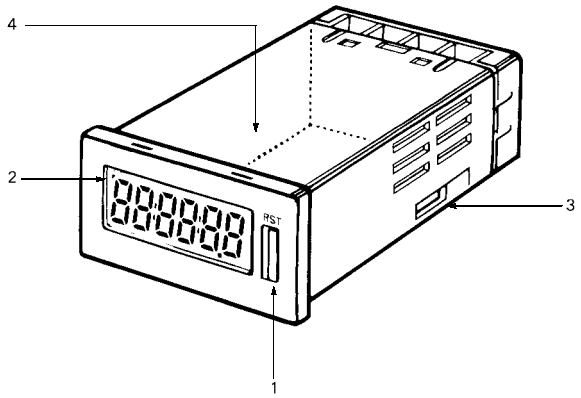
Note: 1. Contains 20% ripple (p-p) max.

2. Only a non-voltage input (NPN transistor) is possible for the key protection input. Switching between the NPN and PNP input methods does not affect the key protection input, i.e., a PNP input cannot be used.

■ Characteristics

Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between current-carrying terminal and exposed non-current-carrying metal parts (AC model) 1,000 VAC, 50/60 Hz for 1 min between current-carrying terminal and exposed non-current-carrying metal parts (DC model) 2,000 VAC, 50/60 Hz for 1 min between power terminals and control input terminals (AC model)
Impulse withstand voltage	3 kV (between power terminals) (1 kV for 12-to-24-VDC models) 4.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts) (1.5 kV for 12-to-24-VDC models)
Noise immunity	±1.5 kV (between AC power terminals), ±480 V (between DC power terminals), ±480 V (between input terminals); square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)
Static immunity	Display: Malfunction: 8 kV Destruction: 15 kV DIP switch: Malfunction: 4 kV Destruction: 8 kV
Vibration resistance	Destruction: 10 to 55 Hz with 0.75-mm single amplitude each in three directions Malfunction: 10 to 55 Hz with 0.5-mm single amplitude each in three directions
Shock resistance	Destruction: 294 m/s^2 (30G) each in three directions Malfunction: 196 m/s^2 (20G) each in three directions
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85%
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line 2 kV I/O signal-line
Approved standards	UL508, CSA22.2 No.14, conforms to IEC1010-1/EN61010−1 (VDE0411/P100), EN50081-2, EN50082-2, VDE0106/P100
Case color	Rear section: Gray smoke; Front section: 5Y7/1 (light gray) or N1.5 (black)
Weight	Approx. 76 g

Nomenclature



1. **Reset Key**
   Resets the count value, but will not operate while the keys are protected.
2. **Key Protection Indicator**
   Lit while the keys are protected.
3. **NPN/PNP DIP Switch**
   (Count or start with reset)
   When the setting has been changed, turned power off and on to continue. The display will show “0” when the power is turned back on. See below for details.
4. **Counting Speed DIP Switch (H7GP-C)**
   Time Range DIP Switch (H7GP-T)
   When the setting has been changed, turned power off and on to continue. The display will show “0” when the power is turned back on. Refer to *DIP Switch Setting* for details.

Operation

■ DIP Switch Settings

Set all DIP switches before mounting the Counter to a control panel. All switches are set toward the display panel before shipping.

H7GP-C/-CD

Switch	Item	Function	
3 (On right side from front)	Input mode (note 1)	Display side	NPN
		Terminal side	PNP
4 (On left side from front)	Counting speed (note 1)	Display side	30 Hz
		Terminal side	5 kHz

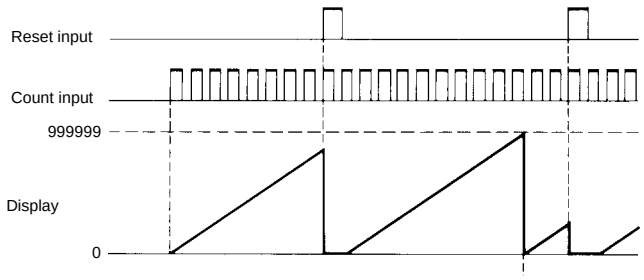
H7GP-T/-TD

Switch	Item	Function	
3 (On right side from front)	Input mode (note 1)	Display side	NPN
		Terminal side	PNP
4 (On left side from front)	Time range (note 1)	Display side	99999.9h (note 2)
		Terminal side	99 h 59 m 59 s

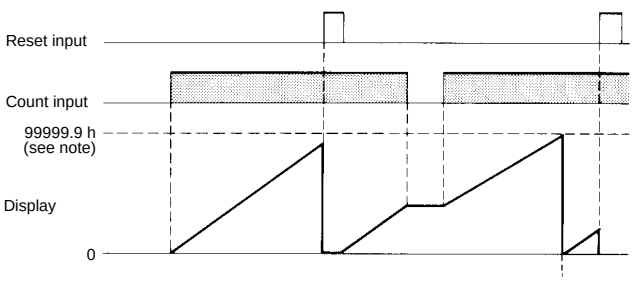
Note: 1. When the setting has been changed, turned power off and on to continue. The display will show “0” when the power is turned back on.
2. The decimal point will flash every second when “99999.9 h” is set.

■ Operating Modes

Total Counters



Time Counters

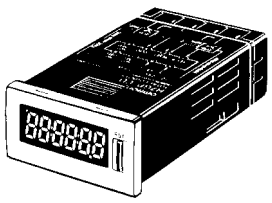


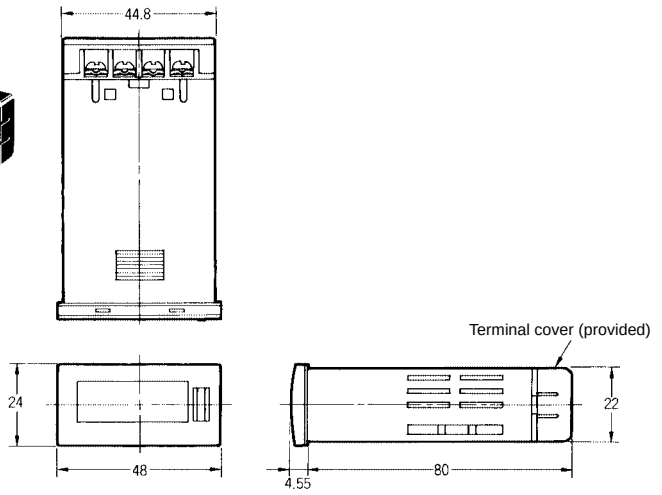
Note: Display values are shown for full scale set to 99999.9 h.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

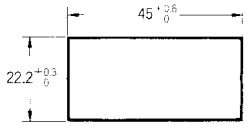
H7GP-C
H7GP-T





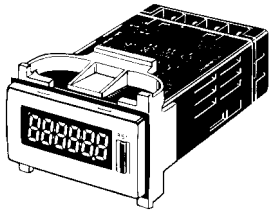
Panel Cutouts

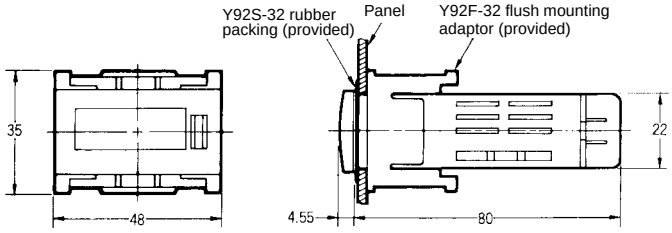
Panel cutouts are as shown below (according to DIN43700).



Note:
1. The mounting panel thickness should be 1 to 6 mm.
2. Water resistance will be lost if Counters are mounted side-by-side.

With Flush Mounting Adaptor



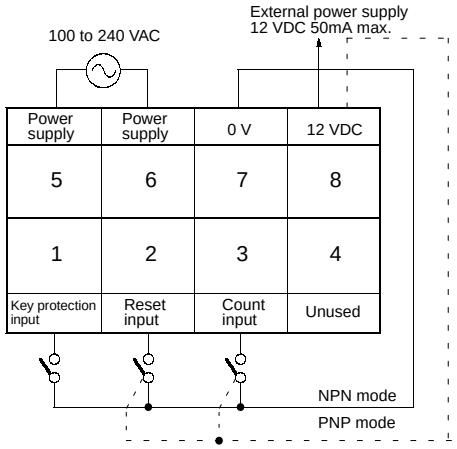


Installation

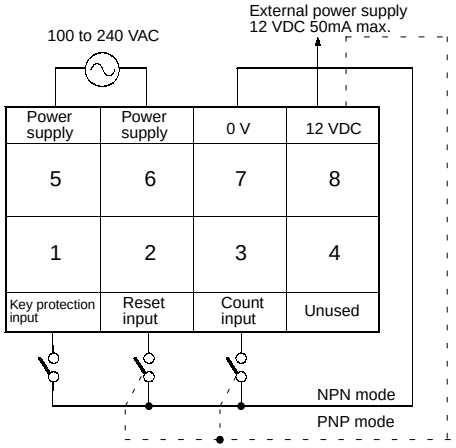
■ Terminal Arrangement

AC Models

H7GP-C

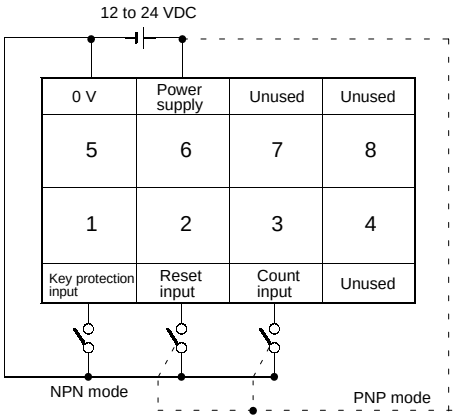


H7GP-T

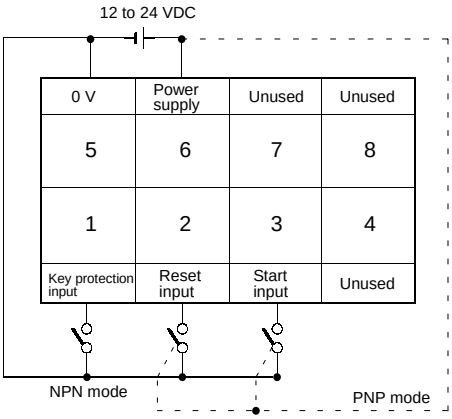


DC Models

H7GP-CD



H7GP-TD



OMRON

Total Counter/Time Counter (DIN 72 x 36) H7HP

Compact Total Counters and Time Counters with Easy-to-read Displays and IP66G/NEMA4 Water and Oil Resistance

- Large, easy-to-read displays: 15-mm-high characters for 6-digit models; 12-mm-high characters for 8-digit models.
- High-visibility, negative transmissive LCD display with built-in red LED backlight at low power consumption.
- Compact (66 mm) body.
- Switch 6-digit models between total counter and time counter operation.

CE RC

Ordering Information

Supply voltage	6-digit total counter/time counter		8-digit total counter	
	Light gray	Black	Light gray	Black
100 to 240 VAC	H7HP-A	H7HP-AB	H7HP-C8	H7HP-C8B
12 to 24 VDC	H7HP-AD	H7HP-ADB	H7HP-C8D	H7HP-C8DB

Model Number Legend:

H7HP- j j j j
(1 2 3 4)

1. Classification
A: Total counter/time counter
C: Total counter

2. Digits
None: 6 digits
8: 8 digits

3. Supply Voltage
None: 100 to 240 VAC
D: 12 to 24 VDC

4. Case Color
None: Light gray (Munsell 5Y7/1)
B: Black

Specifications

■ Ratings

Item		6-digit total counter/time counter		8-digit total counter	
		H7HP-A	H7HP-AD	H7HP-C8	H7HP-C8D
Rated supply voltage		100 to 240 VAC (50/60 Hz)	12 to 24 VDC (see note 1)	100 to 240 VAC (50/60 Hz)	12 to 24 VDC (see note 1)
External power supply		50 mA at 12 VDC	---	50 mA at 12 VDC	---
Operating voltage range		85% to 110% of rated supply voltage			
Power consumption		100 to 240 VAC: 6.5 VA max. 12 to 24 VDC: 0.6 W max.			
Dimensions		72 x 36 x 66 mm (W x H x D)			
Mounting method		Flush mounting			
External connections		Screw terminals			
Enclosure ratings		Panel surface: IEC IP66 (JEM standard IP66G) and NEMA Type 4 (indoors)			
Display		7-segment, negative transmissive LCD (with red backlight)			
Digits		6 digits (15-mm-high characters)		8 digits (12-mm-high characters)	
Function		Total counter/time counter (selected via DIP switch)		Total counter	
Input mode		Up/down (total counter) or accumulative (time counter)		Up/down	
Max. counting speeds		30 Hz (cps) or 5 kHz (kcps) (selected via DIP switch)			
Counting range		−99999 to 999999		−9999999 to 99999999	
Time specification		0.1 to 99999.9 h/1 s to 99 h 59 min 59 s		---	
Timing accuracy		±100 ppm (−10°C to 55°C)		---	
Memory backup		EEP-ROM: 200,000 operations min.			
Input	Input signals	Count 1 (increment), count 2 (decrement), reset, and key protection (see note 2)			
	Input method	No-voltage input (NPN transistor input) or voltage input (PNP transistor input) (selected via DIP switch)			
	Count, start, gate, reset	No-voltage input (NPN transistor input) Short-circuit (ON) impedance: 1 KΩ max. Short-circuit (ON) residual voltage: 2 VDC max. Open (OFF) impedance: 100 kΩ min. Voltage input (PNP transistor input) Short-circuit (ON) impedance: 1 KΩ max. ON voltage: 9 to 24 VDC OFF voltage: 5 VDC max. Open (OFF) impedance: 100 kΩ min.			
	Key protection	No-voltage input (NPN transistor input) Short-circuit (ON) impedance: 1 KΩ max. Short-circuit (ON) residual voltage: 0.5 VDC max. Open (OFF) impedance: 100 kΩ min.			
Input response speed	Reset	Time counter: 20 ms; total counter: 20 or 1 ms (automatically switched according to counting speed)			
	Start	Time counter: 20 ms			
	Key protection	Approx. 1 s		Approx. 1 s	
Reset system		External and manual resets			

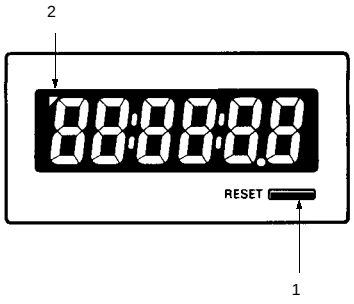
Note: 1. Contains 20% ripple (p-p) max.

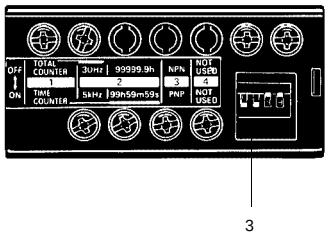
2. Only a non-voltage input (NPN transistor) is possible for the key protection input. Switching between the NPN and PNP input methods does not affect the key protection input, i.e., a PNP input cannot be used.

■ Characteristics

Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between current-carrying terminal and exposed non-current-carrying metal parts (AC model) 1,000 VAC, 50/60 Hz for 1 min between current-carrying terminal and exposed non-current-carrying metal parts (DC model) 2,000 VAC, 50/60 Hz for 1 min between power terminals and control input terminals (AC model)
Impulse withstand voltage	3 kV (between power terminals) (1 kV for 12-to-24-VDC models) 4.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts) (1.5 kV for 12-to-24-VDC models)
Noise immunity	±1.5 kV (between AC power terminals), ±480 V (between DC power terminals), ±480 V (between input terminals); square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)
Static immunity	Display: Malfunction: 8 kV Destruction: 15 kV DIP switch: Malfunction: 4 kV Destruction: 8 kV
Vibration resistance	Destruction: 10 to 55 Hz with 0.75-mm single amplitude each in three directions Malfunction: 10 to 55 Hz with 0.5-mm single amplitude each in three directions
Shock resistance	Destruction: 294 m/s^2 (30G) each in three directions Malfunction: 196 m/s^2 (20G) each in three directions
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85%
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line 2 kV I/O signal-line
Approved standards	UL508, CSA22.2 No.14, conforms to IEC1010-1/EN61010−1 (VDE0411/P100), EN55011, EN50081-2, EN50082-2, VDE0106/P100
Case color	Rear section: Gray smoke; Front section: 5Y7/1 (light gray) or N1.5 (black)
Weight	Approx. 106 g

Nomenclature





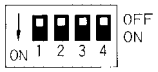
(The figure shows the DIP switch label stuck to the rear of the case.)

1. **Reset Key**
   Resets the count value, but will not operate while the keys are protected.
2. **Key Protection Indicator**
   Lit while the keys are protected.
3. **DIP Switch**
   Use to change a setting. Refer to *DIP Switch Settings* for details.

Operation

■ DIP Switch Settings

Switches 1 to 4 are all set to OFF before shipping.



H7HP-A/-AD

Pin no.	Item	OFF	ON
1	Function	Total counter	Time counter
2	Counting speed	30 Hz	5 kHz
	Time range	99999.9 h	99 h 59 m 59 s
3	Input mode (note)	NPN	PNP
4	Unused	---	---

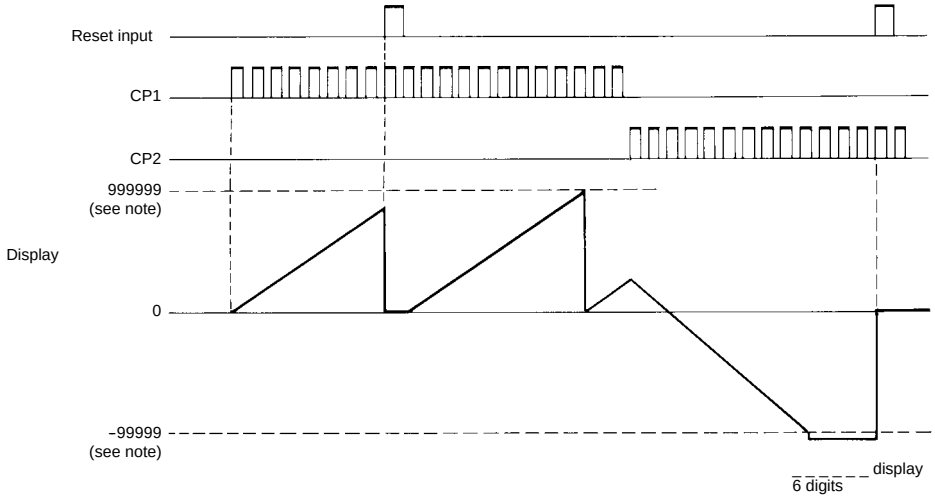
H7HP-C8/-C8D

Pin no.	Item	OFF	ON
1	Unused	---	---
2	Counting speed	30 Hz	5 kHz
3	Input mode (note)	NPN	PNP
4	Unused	---	---

Note: When the setting has been changed, turned power off and on to continue. The display will show "0" when the power is turned back on.

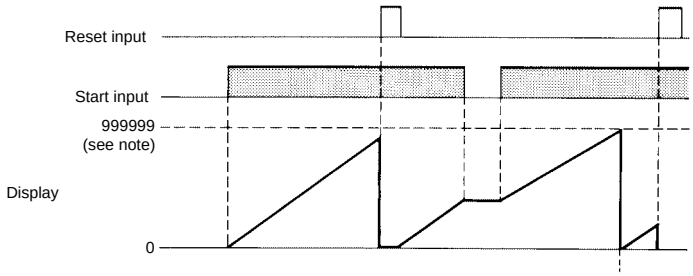
■ Operating Modes

Total Counters



Note: Display values are shown for a 6-digit model.

Time Counters

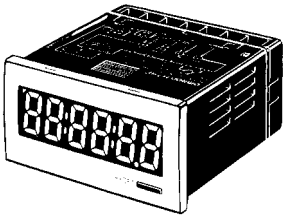


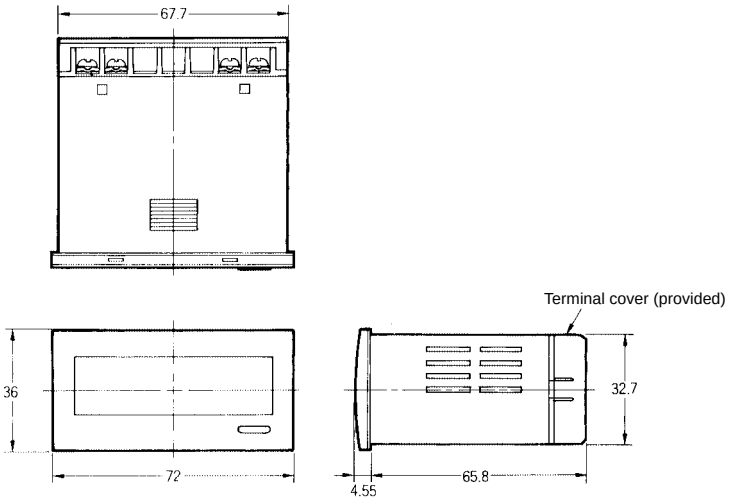
Note: 1. Display values are shown for full scale set to 99999.9 h.
2. Gate input stops the elapsing of time.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

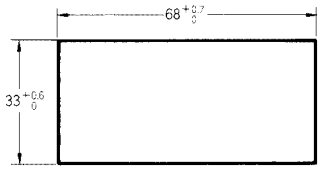
H7HP-A
H7HP-C8





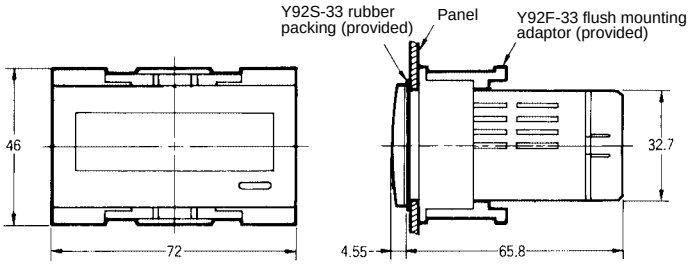
Panel Cutouts

Panel cutouts are as shown below (according to DIN43700).



Note:
1. The mounting panel thickness should be 1 to 6 mm.
2. Water resistance will be lost if Counters are mounted side-by-side.

With Flush Mounting Adaptor

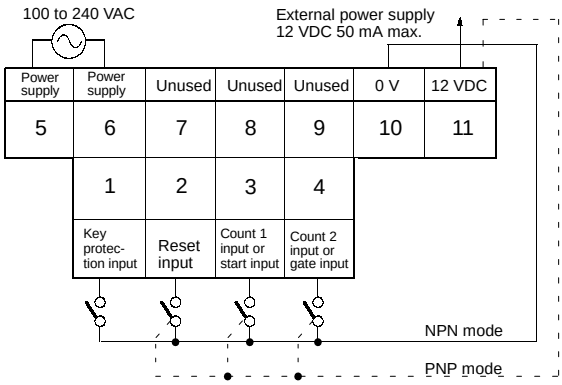


Installation

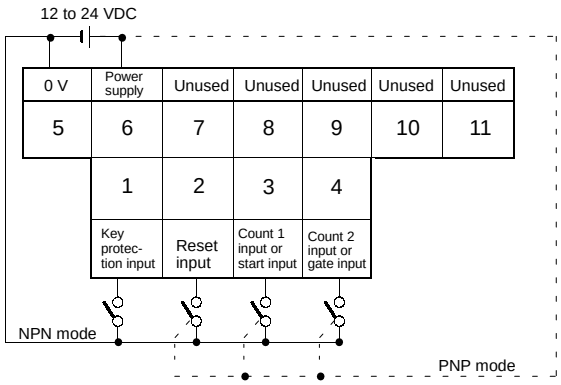
■ Terminal Arrangement

AC Models

H7HP-A

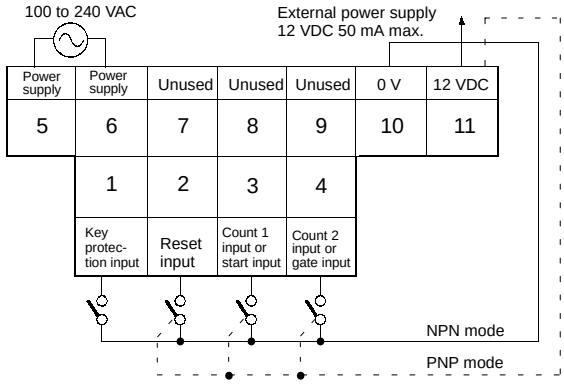


H7GP-T

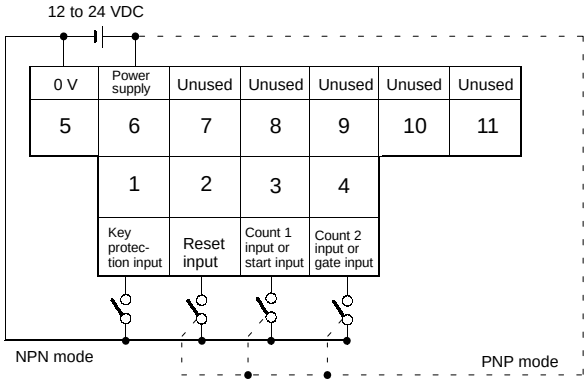


DC Models

H7GP-CD



H7GP-TD



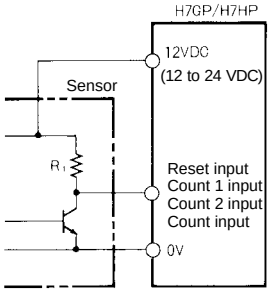
Note: Incremented for count 1 (CP1) inputs; decremented for count 2 (CP2) inputs.

■ Input Connections

Note: The undermentioned is common for all H7GP/H7HP models.

No-voltage Input (NPN Input Mode)

Reset, Count 1, Count 2, and Count Inputs

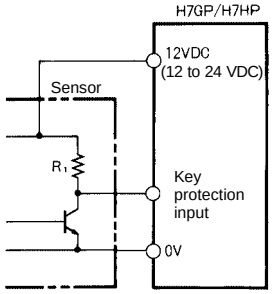


Reset, Count 1, Count 2, and Count Inputs Specification

Short-circuit (ON) impedance:	1 kΩ max.
Short-circuit (ON) residual voltage:	2 VDC max.
Current flow for 0-Ω short-circuit:	Approx. 2 mA
Open (OFF) impedance:	100 kΩ min.

Note: Two-line sensors cannot be used.

Key Protection Input



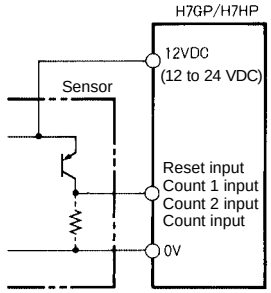
Key Protection Inputs Specification

Short-circuit (ON) impedance:	1 kΩ max.
Short-circuit (ON) residual voltage:	0.5 VDC max.
Current flow for 0-Ω short-circuit:	Approx. 0.5 mA
Open (OFF) impedance:	100 kΩ min.

Note: Two-line sensors cannot be used.

Voltage Input (PNP Input Mode)

Reset, Count 1, Count 2, and Count Inputs



Reset, Count 1, Count 2, and Count Inputs Specification

Short-circuit (ON) impedance:	1 kΩ max.
ON voltage:	9 to 24 VDC
OFF voltage:	5 VDC max.
Open (OFF) impedance:	100 kΩ min.

Note: Two-line sensors cannot be used.

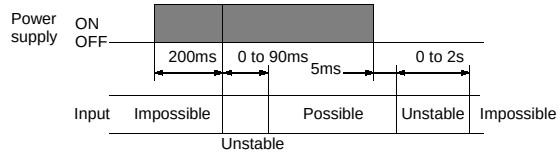
Precautions

Note: The undermentioned is common for all H7GP/H7HP models.

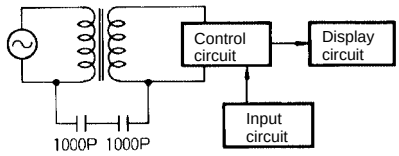
Power Supplies

When turning the power ON and OFF, input signal reception is possible, unstable, or impossible as shown in the diagram below.

Apply the power supply voltage through a relay or switch in such a way that the voltage reaches a fixed value immediately.



Although the H7GP/H7HP power supply (primary side) is isolated from control circuits (secondary side) by a transformer, the primary and secondary sides of the transformer are linked by a capacitor, making it possible for high-frequency components to leak to the secondary side. Take adequate precautions against electrical shock. Do not connect input circuits to exposed parts (such as the machine body) and be sure that the power supply is turned off before wiring.



Self-diagnostic Function

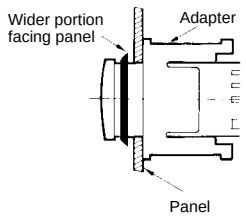
The following displays will appear if an error occurs.

Display	Error	Correction
----	-99999 max. (6-digit model) -99999999 max. (8-digit model)	Press RST Key or reset input
e1	CPU	Press RST Key or turn power OFF and then ON
e2	Memory	

Flush Mounting

The panel surface is water-resistive (conforming to NEMA 4 and IP66). In order to prevent the internal circuit from water penetration through the space between the counter and operating panel, attach a rubber packing between the counter and operating panel and secure the rubber packing with the Y92F-3 j flush-mounting adaptor.

Be sure the rubber packing is installed in the correct direction. The wider portion must be facing the panel when installed, as shown in the following illustration. Using a flat-head screwdriver, press in the Mounting Adapter until it cannot be pressed in any further in order to ensure water-resistive performance.



Other

Water resistance may deteriorate depending on the environment. Periodically check water resistance.

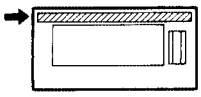
Oil resistance is not applicable to all types of oil. Be sure to test any specific oils before actual application.

Labels

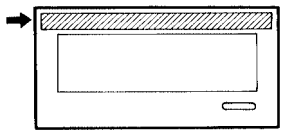
Unit labels are included with the H7GP/H7HP and DIP switch labels are included with the H7HP. Attach these labels as shown in the following illustrations.

Unit Labels

H7GP

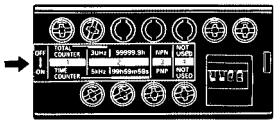


H7HP



DIP Switch Labels

H7HP



Accessories

The accessories listed in the following table are included with the H7GP/H7HP. Be sure you understand the use of these accessories and use them correctly.

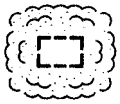
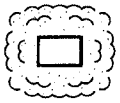
Name	H7GP	H7HP
Rubber packing	Y92S-32	Y92S-33
Flush mounting adaptor	Y92F-32	Y92F-33

Enclosure Ratings

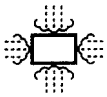
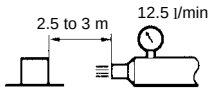
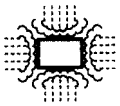
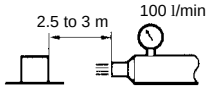
IP - 6 6 G

- Protection Specification Code (International Protection) (IEC529)
- Protection against solid foreign objects
- Protection against harmful ingress of water
- Japan Electrical Manufacturers Association's standards (JEM1030) Protection against oil

Protection Against Solid Foreign Objects

Grade	Protection	Criteria
5	Dust protected 	Limited ingress of dust permitted (no harmful deposit).
6	Dust-tight 	Totally protected against ingress of dust.

Protection Against Harmful Ingress of Water

Grade	Protection	Criteria	Examination method
5	Housing jets from all directions 	Protected against low-pressure jets of water from all directions; limited ingress permitted.	Spray water from all directions for one minute per m^2 of external surface area and for a total time of no less than 3 minutes using the test device shown below.  Discharging nozzle dia.: 6.3
6	Strong hosing jets from all directions 	Protected against strong jets of water, e.g. for use on shipdecks; limited ingress permitted.	Spray water from all directions for one minute per m^2 of external surface area and for a total time of no less than 3 minutes using the test device shown below.  Discharging nozzle dia.: 12.5

JEM Standards
Protection Against Oil

Grade	Protection	Criteria	Criteria
F	Oilproof	Protected against improper operation due to oil drops or spray from any direction.	No penetration of oil to the extent of interfering with proper operation after dropping the specified cutting oil on a test device for 48 hours at a rate of 0.5 l per hour.
G	Oil resistant	Protected against penetration of oil drops or spray from any direction.	No penetration of oil after dropping the specified cutting oil on a test device for 48 hours at a rate of 0.5 l per hour.

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

Cat. No. M49-E1-2A

OMRON

Self-powered Counter

H7EC

Subminiature Totalizing Counter
Requires No External Power Supply

- DIN-sized 48 × 24 mm
- Wire-wrap terminal and screw terminal types available.
- AC/DC voltage, DC voltage, and No-voltage input types available.
- Time Counter (H7ET), Tachometer (H7ER), and PCB versions (H7E-P) also available; see sections following H7EC.
- Panel adapters for existing cutouts available; see Accessories section.
- Conforms to EMC standards.
- H7EC-FBV conforms to EN61010-1/IEC1010-1.
- Approved by UL.

CE R

Ordering Information

■ Totalizing Counters

Operating mode		Up type								
Display		LCD digital (character height: 6.7 mm)								
Reset		External (electrical) reset					External/Manual reset			
Number of digits		7					6			
Count input		AC/DC voltage input	DC voltage input		No-voltage input (contact/solid-state)		DC voltage input		No-voltage input (contact/solid-state)	
Max. counting speed (see note)		20 cps	1 kcps	30 cps	1 kcps	30 cps	1 kcps	30 cps	1 kcps	30 cps
Terminals	**Wire-wrap**	---	H7EC-V	H7EC-VL	H7EC	H7EC-L	H7EC-VM	H7EC-VLM	H7EC-M	H7EC-LM
	Screw	H7EC-FBV	H7EC-BV	H7EC-BVL	H7EC-B	H7EC-BL	H7EC-BVM	H7EC-BVLM	H7EC-BM	H7EC-BLM
Approved standards		UL								

Note: For details about matching the counting speed with the appropriate input device, see the Precautions section.

Specifications

■ Ratings

Supply voltage		Not required (powered by built-in battery)
Count input	**AC/DC voltage input**	High (logic) level: 24 to 240 VAC, 50/60 Hz, or 6 to 240 VDC Low (logic) level: 0 to 1.5 VAC, 50/60 Hz, or 0 to 2 VDC
	DC voltage input	High (logic) level: 4.5 to 30 VDC Low (logic) level: 0 to 2 VDC
	No-voltage input	Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 500 kΩ min.
Max. counting speed (see note)		1 kcps: Minimum signal width 0.5 ms 30 cps: Minimum signal width 16.7 ms 20 cps: Minimum signal width 25 ms
Reset system		External reset and manual reset types (6-digit models): 20 ms External reset types (7-digit models): 20 ms

Note: ON/OFF ratio 1:1

■ Characteristics

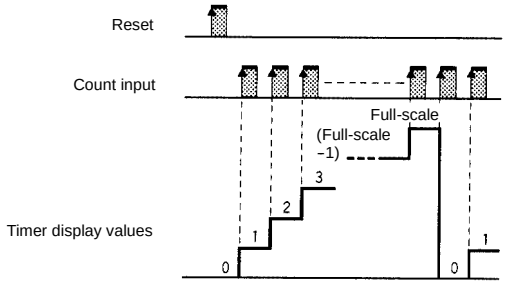
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute between current-carrying terminal and exposed non-current-carrying metal parts.
Impulse withstand voltage	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts.
Noise immunity	Square-wave between input terminals using a noise simulator: ± 500 V.
Vibration resistance	Mechanical: 10 to 55 Hz; 0.75 mm double amplitude Malfunction: 10 to 55 Hz; 0.3 mm double amplitude
Shock resistance	Mechanical: 294 m/s^2 (approx. 30 G) Malfunction: 98 m/s^2 (approx. 10 G)
Ambient temperature	Operating: −10°C to 55°C Storage: −25°C to 65°C
Ambient humidity	Operating: 35% to 85%
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line 2 kV I/O signal-line
Battery life	30 cps type: 7 years min. with continuous input 20 cps, 1 kcps type: 6 years min. with continuous input
Case color	Light gray (Munsell 5Y7/1)
Weight	AC/DC voltage input type: approx. 90 g (including mounting bracket) DC voltage & No-voltage input type: approx. 60 g (including mounting bracket)

Operation

■ Operating Modes

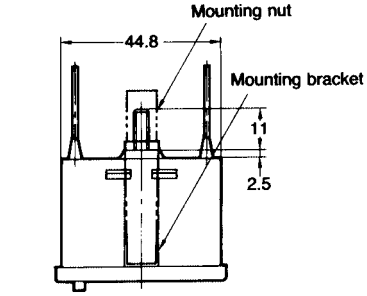
H7EC Totalizing Counter

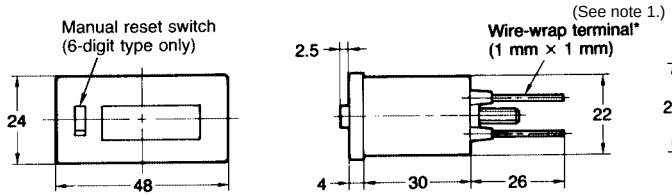
Incrementing Operation (Up)



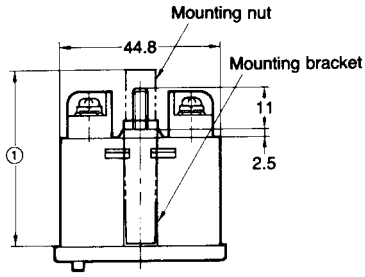
Dimensions

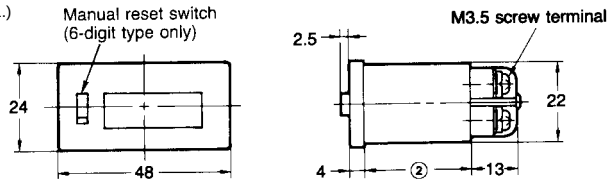
Wire-wrap Terminal Type (see note 1)





Screw Terminal Type (see note 2)



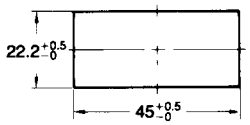


Note: 1. The wire-wrap terminal type can also be surface mounted.

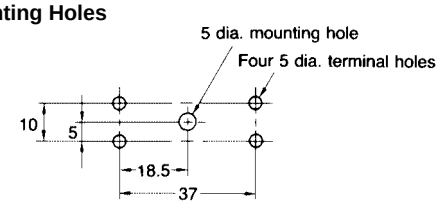
2. As shown in the chart below, two dimensions of the AC/DC voltage input type differ from other screw-terminal types.

Dimension	AC/DC voltage input type	DC voltage input types No-voltage input types
①	78.9	48.9
②	60	30

Panel Cutout



Mounting Holes

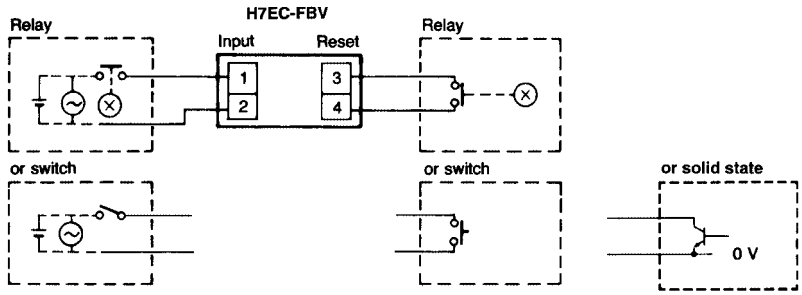


Installation

■ Connections

AC/DC Voltage Input Type

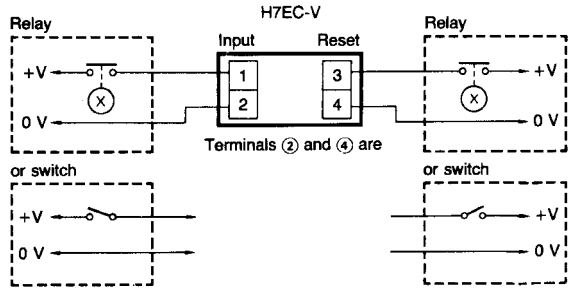
1. Contact Input (Voltage Input Through a Relay or Switch Contact)



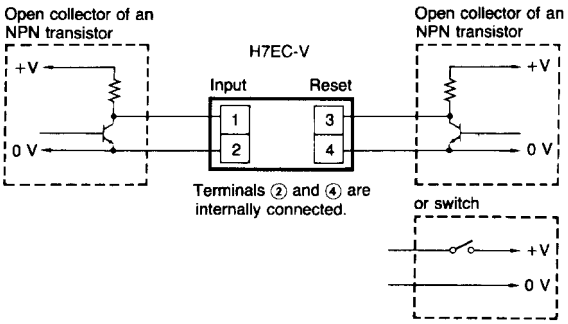
DC Voltage Input Type

Note: Select input transistors according to the following:
Dielectric strength of the collector ≧ 50 V
Leakage current < 1 μA

1. Contact Input (Input by a Relay or Switch Contact)



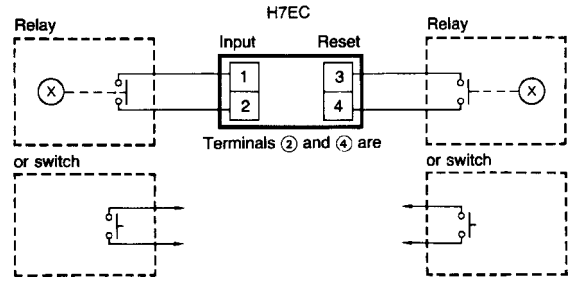
2. Solid-state Input (Open Collector Input of an NPN Transistor)



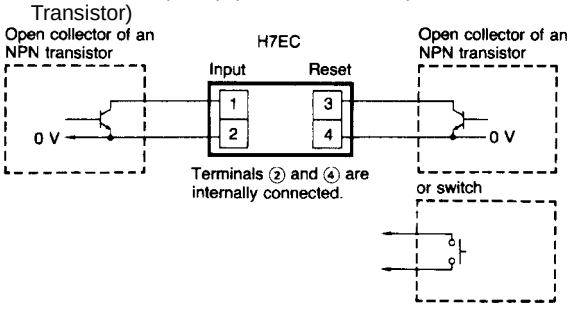
No-voltage Input Type

Note: Select input transistors according to the following:
Dielectric strength of the collector ≧ 50 V
Leakage current < 1 μA

1. Contact Input (Input by a Relay or Switch Contact)



2. Solid-state Input (Open Collector Input of an NPN Transistor)



Note: Use relays and switches that have high contact reliability because the current flowing from terminals 1 or 3 is as small as approx. 10 μA. It is recommended that OMRON's G3TA-IA/ID be used as an SSR.

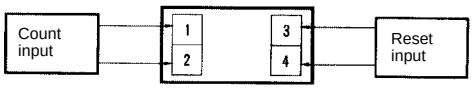
Note: Residual voltage in the output section of proximity sensors or photoelectric sensors becomes less than 0.5 V because the current flowing from terminals 1 or 3 is as small as approx. 10 μA, thus allowing easy connection.

■ Terminal Arrangement

Bottom View: View of the Totalizing Counter Rotated Horizontally 180°

H7EC Totalizing Counter

DC voltage input type, No-voltage input type, AC/DC voltage input type, non-restrictive voltage input type

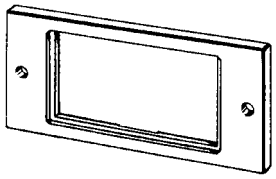


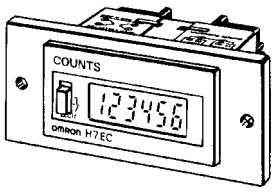
Note: Terminal 2 and terminal 4 are connected in the following manner:
DC voltage input type/No voltage input type: Short-circuited, not insulated
AC/DC voltage input type: Insulated

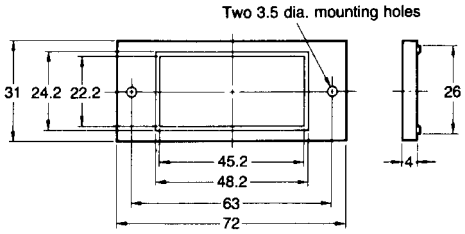
Accessories (Order Separately)

The H7EC are supplied with the mounting bracket and nut. Additionally, the panel adapters shown here allow the H7E models to be fitted to existing panel cutouts.

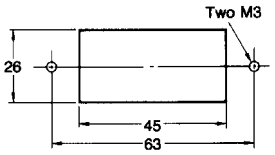
Flush Mounting Adapter Y92F-75
for 26 × 45 Rectangular Cutout
Use mounting bracket supplied with the Counter



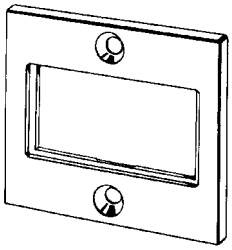


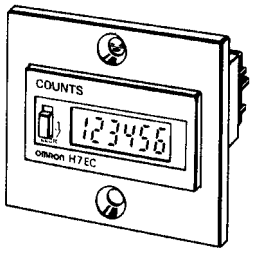


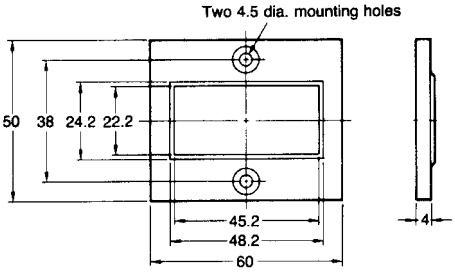
Panel Cutout



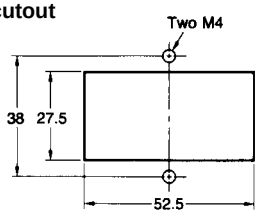
Flush Mounting Adapter Y92F-76
for 27.5 × 52.5 Rectangular Cutout
Use mounting bracket supplied with the Counter





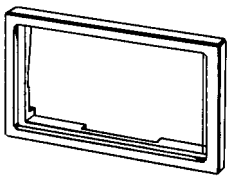


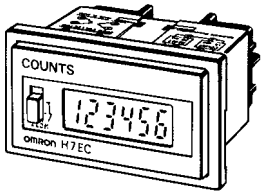
Panel cutout

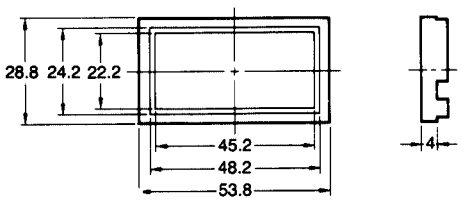


Flush Mounting Adapter Y92F-77
for 24.8 × 48.8 Rectangular Cutout

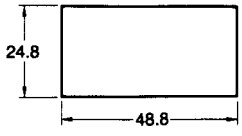
Note: Use the Y92F-77 Adapter with the attached No.2 Mounting Bracket. The -FBV and -SBV models cannot be used.







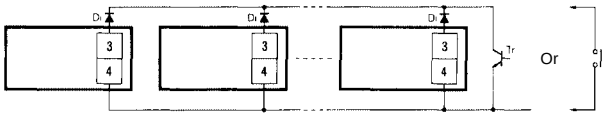
Panel Cutout



Precautions

Reset Input or Count Input to More than One H7E Counter at a Time

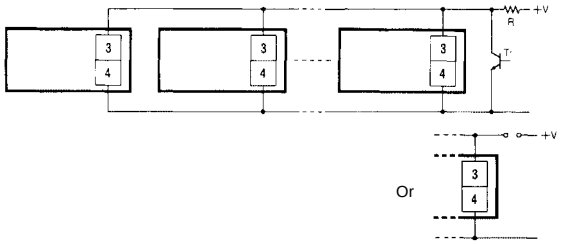
- No-voltage Input



Note: 1. The leakage current of the transistor used for input must be less than 1 μA.

2. The forward voltage of the D_1 must be as low as possible (i.e., 0.1 V maximum with an IF of 20 μA) so that the voltage between terminals 3 and 4 will be 0.5 V when reset input is ON.

- Voltage Input

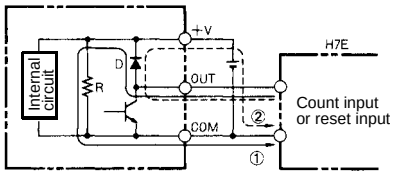


Note: H (Reset ON) level must be 4.5 V minimum.

$$H = \frac{4.7\ (k\Omega)/N + V}{4.7\ (k\Omega)/N + R}$$

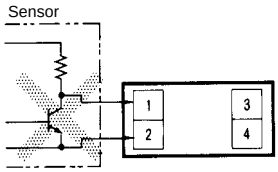
Reset Input and Count Input

The H7E operates using its built-in battery. If the H7E is connected to a device that has +V and OUT terminals that are connected with a diode as shown in the circuit diagram, the circuit indicated by arrow 1 or 2 will be formed when the device is turned off. As a result, the H7E may be reset or count by one. It is recommended that such devices not be connected to the H7E.

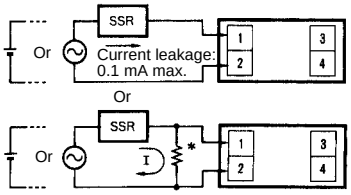


Input and Power Supply

- Do not impose voltage on the Counter if the Counter is a model that operates with no-voltage input, otherwise the internal circuit of the Counter may be damaged.
  Do not connect any single input signal in parallel to Counter models operating with non-voltage input and those operating with voltage input, otherwise the Counters may malfunction.
- When connecting a sensor to the Counter that operates with no-voltage input, make sure that the sensor has open collector output.



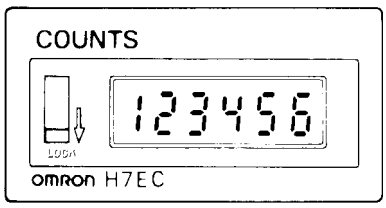
- When using shielded wire, stray capacitance may occur. The operation of the Counter might be affected when using wires which have a capacitance exceeding 500 pF (about 10 m, with parallel wires of 2 mm^2). Keep all wires as short as possible.
- When connecting an open collector input from a transistor to the Counter that operates with no-voltage input, make sure that the leakage current of the transistor is 5 μA maximum.
- When connecting count input from an SSR to the Counter that operates with free-voltage input, use OMRON's G3TA-IA or G3TA-ID SSR, otherwise make sure that the leakage current of the SSR is 0.1 mA maximum or connect a bleeder resistor in parallel to the input circuit of the Counter.



*Bleeder resistor
The voltage between terminals 1 and 2 must be 1.5 V maximum when the SSR is OFF.

Manually Resetting Counters (-M Models)

Reset the Counter by pressing the reset button, located to the left of the display window. To prevent an accidental reset, lock the reset button by sliding the button downward, without depressing it. A small "click" sound may be heard, both when locking and unlocking the reset button. Slide the button up to unlock.



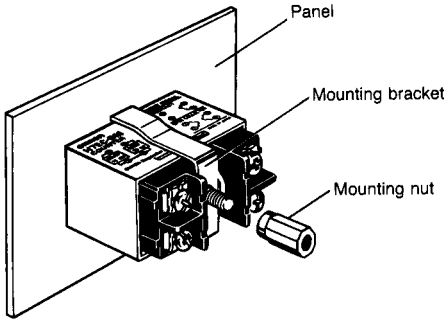
Wire-wrap Terminals

The dimensions of the terminals used on H7E wire-wrap models measure 1 × 1 mm. When wiring a Counter with wire-wrap terminals, select one of the three gauges of wire from the table below. Also listed in the table are the appropriate wiring hardware.

Wire gauge	Bit	Sleeve	Method
AWG22	2-A	2-B	Normal wire-wrap
AWG24	1-A	1-B	Normal wire-wrap
AWG26	3-A	3-B	Normal wire-wrap

How to Mount the Counter

Insert the H7E Counter from the front of the mounting panel. Slide the mounting bracket into place from the rear of the panel, and tighten the knurled nut by hand. Do not use tools (such as pliers) to tighten the nut. Excessive tightening may damage the Counter.



⚠ Caution

The H7EC has a built-in lithium battery. Be sure to dispose of the old H7EC properly, as lithium batteries are likely to explode if incinerated.

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

OMRON

Self-powered Time Counter | H7ET

Subminiature Time Counter Requires No External Power Supply

- Subminiature (DIN-sized 48 × 24 mm).
- Wire-wrap terminal and screw terminal types available.
- Displays cumulative time by counting the output signals received from a sensor.
- AC/DC voltage, DC voltage, and No-voltage input types available.
- Panel adapters for existing cutouts available; see H7EC Accessories section.
- Conforms to EMC standards.
- H7ET-FBV j conforms to EN61010-1/IEC1010-1.
- Approved by UL.

CE R

Ordering Information

■ Time Counters

Operating mode		Up type				
Display		LCD digital (character height: 6.7 mm)				
Reset system		See note below				
Count input		AC/DC voltage input	DC voltage input		No-voltage input	
Terminals		Screw	Wire-wrap	Screw	Wire-wrap	Screw
Time range (Number of digits)	**0.0 to 99999.9 h (6 digits: w/manual reset switch)**	---	H7ET-VM	H7ET-BVM	H7ET-M	H7ET-BM
	0.0 to 999999.9 h (7 digits)	H7ET-FBV	H7ET-V	H7ET-BV	H7ET	H7ET-B
	0.0 s to 99 h 59 m 59.9 s (7 digits)	H7ET-FBV1	---	H7ET-BV1	---	H7ET-B1
	0.0 m to 9999 h 59.9 m (7 digits)	H7ET-FBV2	---	H7ET-BV2	---	H7ET-B2
	0.0 h to 3999 d 23.9 h (7 digits)	H7ET-FBV3	---	H7ET-BV3	---	H7ET-B3
Approved standards		UL				

Note: 6-digit types (with the -M suffix) are provided with both manual and external (electric) resetting features. 7-digit types (without the -M suffix) are provided with external reset terminals.

Specifications

■ Ratings

Supply voltage		Not required (driven by built-in battery)
Input	**AC/DC voltage input**	High (logic) level: 24 to 240 VAC, 50/60 Hz, or 6 to 240 VDC Low (logic) level: 0 to 1.5 VAC, 50/60 Hz, or 0 to 2 VDC
	No-voltage input	Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 500 kΩ min. Minimum pulse width: 50 ms
Reset system		External and manual reset types (6-digit models): 20 ms reset signal External reset types (7-digit models): 20 ms reset signal

■ Characteristics

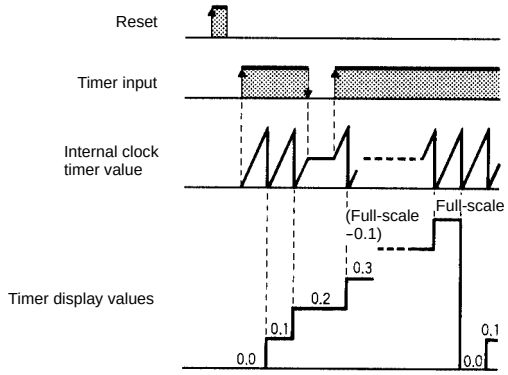
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	1,000 VAC 50/60Hz for 1 minute between current-carrying terminal and exposed non-current-carrying metal parts.
Impulse withstand voltage	4.5 kV for 1 minute between current-carrying terminal and exposed non-current-carrying metal parts.
Noise immunity	Square-wave between input terminals using a noise simulator: ± 500 V.
Vibration resistance	Mechanical: 10 to 55 Hz; 0.75 mm double amplitude Malfunction: 10 to 55 Hz; 0.3 mm double amplitude
Shock resistance	Mechanical: 294 m/s^2 (approx. 30 G) Malfunction: 98 m/s^2 (approx. 10 G)
Ambient temperature	Operating: −10C° to 55°C (with no icing) Storage: −25C° to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85%
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line 2 kV I/O signal-line
Battery life	10 years min. of continuous operation
Case color	Light gray (Munsell 5Y7/1)
Weight	AC/DC voltage input type: approx. 90 g (including mounting bracket) DC voltage & No-voltage input type: approx. 60 g (including mounting bracket)

Operation

■ Operating Modes

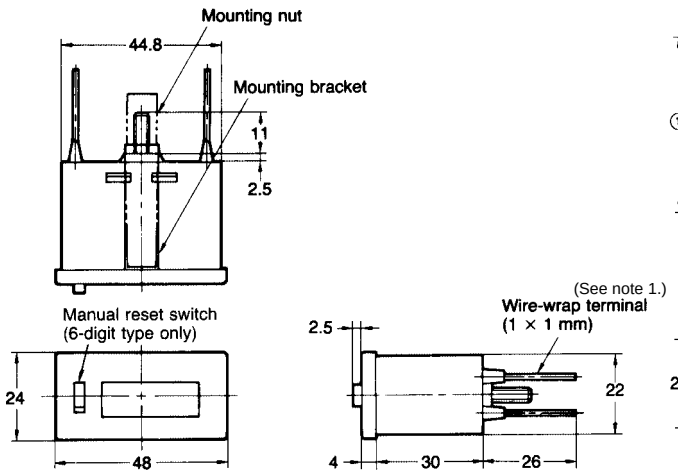
H7ET Time Counter

Incrementing Operation (Up)

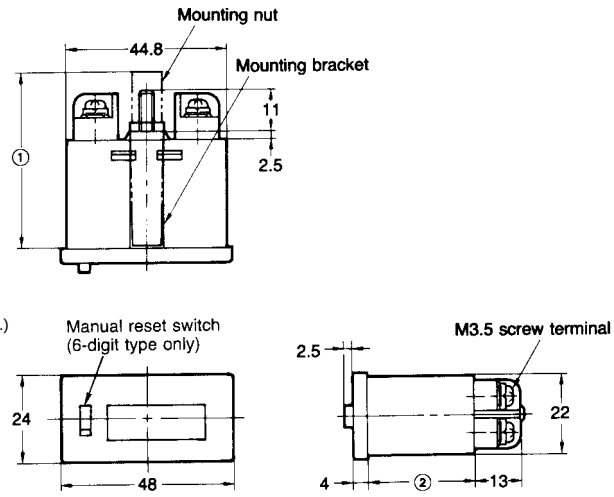


Dimensions

Wire-wrap Terminal Type



Screw Terminal Type

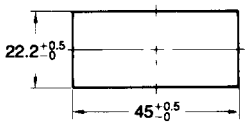


Note: 1. The wire-wrap terminal type can also be surface mounted.

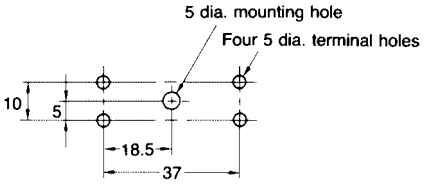
2. As shown in the chart below, two dimensions of the AC/DC voltage input type differ from other screw-terminal type.

Dimension	AC/DC voltage input type	DC voltage input types No-voltage input types
①	78.9	48.9
②	60	30

Panel Cutout



Mounting Holes

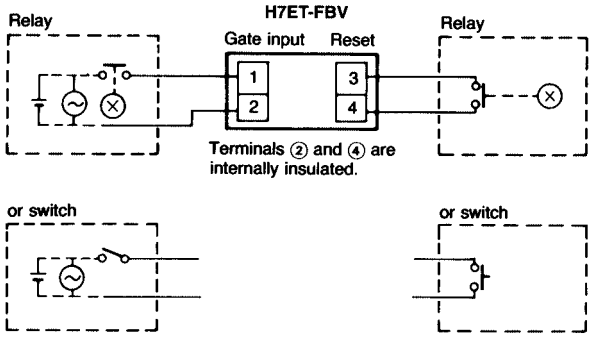


Installation

■ Connections

AC/DC Voltage Input Type

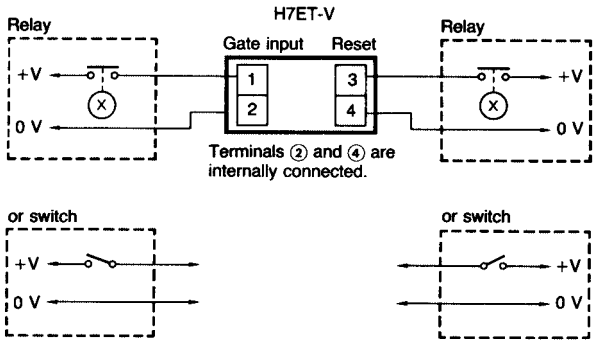
1. Contact Input (Voltage Input Through a Relay or Switch Contact)



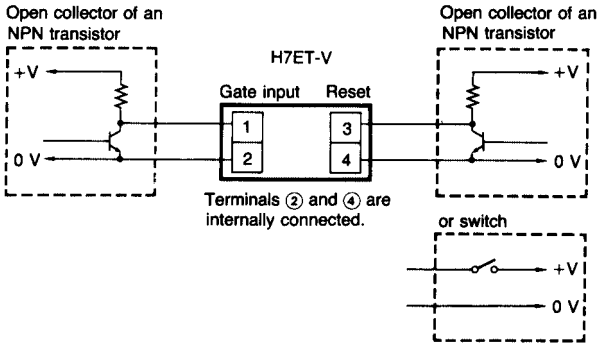
DC Voltage Input Type

Note: Select input transistors according to the following:
Dielectric strength of the collector ≧ 50 V
Leakage current < 1 μA

1. Contact Input (Input by a Relay or Switch Contact)



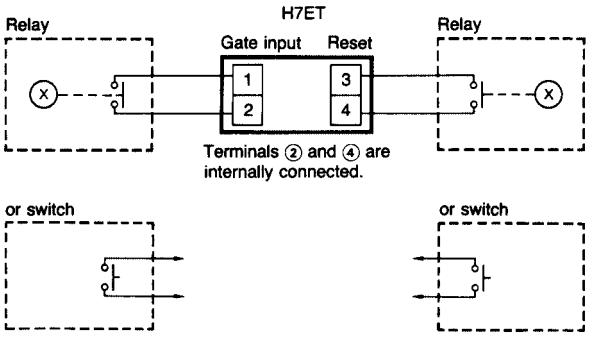
2. Solid-state Input (Open Collector Input of an NPN Transistor)



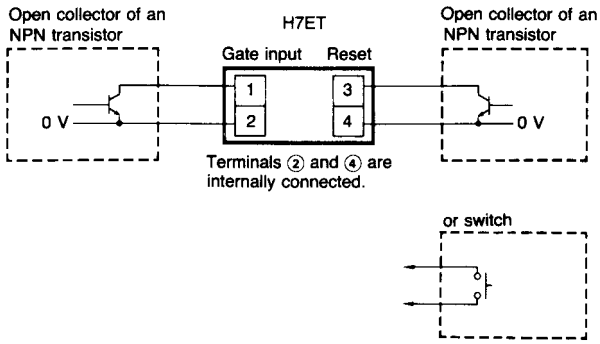
No-voltage Input Type

Note: Select input transistors according to the following:
Dielectric strength of the collector ≧ 50 V
Leakage current < 1 μA

1. Contact Input (Input by a Relay or Switch Contact)



2. Solid-state Input (Open Collector Input of an NPN Transistor)



Note: Use relays and switches that have high contact reliability because the current flowing from terminals 1 or 3 is as small as approx. 10 μA. It is recommended that OMRON's G3TA-IA/ID be used as an SSR.

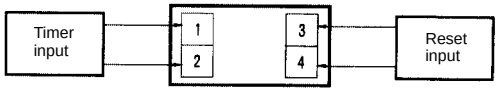
Note: Residual voltage in the output section of proximity sensors or photoelectric sensors becomes less than 0.5 V because the current flowing from terminals 1 or 3 is as small as approx. 10 μA, thus allowing easy connection.

■ Terminal Arrangement

Bottom View: View of the Time Counter rotated horizontally 180°

H7ET Time Counter

Standard type, non-restrictive voltage input type



Note: Terminal 2 and terminal 4 are connected in the following manner:
DC voltage input/No-voltage input type: Short-circuited, not insulated
AC/DC voltage input type: Insulated

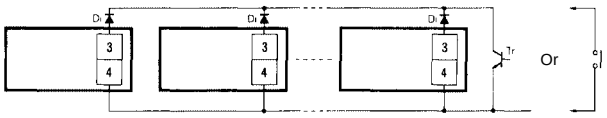
Accessories (Order Separately)

The H7ET is supplied with mounting bracket and nut.
Additionally, Flush Mounting Adapters shown in the *Accessories* section of the H7EC allow the H7ET models to be fitted to existing panel cutouts.

Precautions

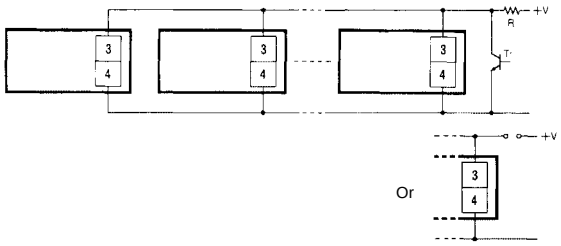
Reset Input or Count Input to More than One H7E Counter at a Time

- No-voltage Input



Note: 1. The leakage current of the transistor used for input must be less than 1 μA.
2. The forward voltage of the D_1 must be as low as possible (i.e., 0.1 V maximum with an IF of 20 μA) so that the voltage between terminals 3 and 4 will be 0.5 V when reset input is ON.

- Voltage Input

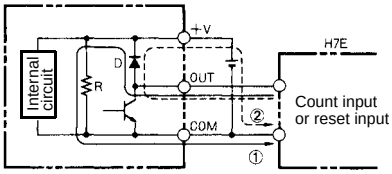


Note: H (Reset ON) level must be 4.5 V minimum.

$$H = \frac{4.7\ (k\Omega)/N + V}{4.7\ (k\Omega)/N + R}$$

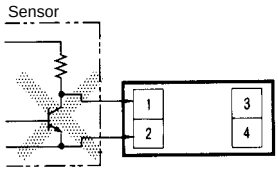
Reset Input and Count Input

The H7E operates using its built-in battery. If the H7E is connected to a device that has +V and OUT terminals that are connected with a diode as shown in the circuit diagram, the circuit indicated by arrow 1 or 2 will be formed when the device is turned off. As a result, the H7E may be reset or count by one. It is recommended that such devices not be connected to the H7E.

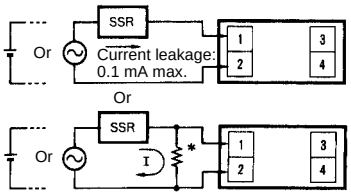


Input and Power Supply

- Do not impose voltage on the Counter if the Counter is a model that operates with no-voltage input, otherwise the internal circuit of the Counter may be damaged.
  Do not connect any single input signal in parallel to Counter models operating with non-voltage input and those operating with voltage input, otherwise the Counters may malfunction.
- When connecting a sensor to the Counter that operates with no-voltage input, make sure that the sensor has open collector output.



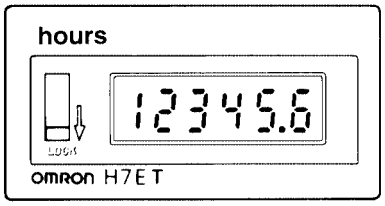
- When using shielded wire, stray capacitance may occur. The operation of the Counter might be affected when using wires which have a capacitance exceeding 500 pF (about 10 m, with parallel wires of 2 mm^2). Keep all wires as short as possible.
- When connecting an open collector input from a transistor to the Counter that operates with no-voltage input, make sure that the leakage current of the transistor is 5 μA maximum.
- When connecting count input from an SSR to the Counter that operates with free-voltage input, use OMRON's G3TA-IA or G3TA-ID SSR, otherwise make sure that the leakage current of the SSR is 0.1 mA maximum or connect a bleeder resistor in parallel to the input circuit of the Counter.



*Bleeder resistor
The voltage between terminals 1 and 2 must be 1.5 V maximum when the SSR is OFF.

Manually Resetting Counters (-M Models)

Reset the Counter by pressing the reset button, located to the left of the display window. To prevent an accidental reset, lock the reset button by sliding the button downward, without depressing it. A small "click" sound may be heard, both when locking and unlocking the reset button. Slide the button up to unlock.



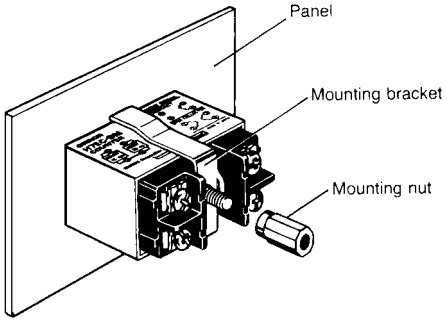
Wire-wrap Terminals

The dimensions of the terminals used on H7E wire-wrap models measure 1 × 1 mm. When wiring a Counter with wire-wrap terminals, select one of the three gauges of wire from the table below. Also listed in the table are the appropriate wiring hardware.

Wire gauge	Bit	Sleeve	Method
AWG22	2-A	2-B	Normal wire-wrap
AWG24	1-A	1-B	Normal wire-wrap
AWG26	3-A	3-B	Normal wire-wrap

How to Mount the Counter

Insert the H7E Counter from the front of the mounting panel. Slide the mounting bracket into place from the rear of the panel, and tighten the knurled nut by hand. Do not use tools (such as pliers) to tighten the nut. Excessive tightening may damage the Counter.



Input Verification with the H7ET Time Counter

The decimal point of the LCD blinks every other second while an input signal is being applied. If the decimal point is not blinking, the input signal is not being received correctly. Check the input signal connections.

⚠ Caution

The H7ET has a built-in lithium battery. Be sure to dispose of the old H7ET properly, as lithium batteries are likely to explode if incinerated.

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

OMRON

Self-powered Tachometer

H7ER

Subminiature Tachometer Requires No External Power Supply

- Subminiature (DIN-sized, 48 × 24 mm).
- Wire-wrap and screw terminal types available.
- DC-powered model can display the number of revolutions of an encoder in user-selectable units of measure.
- No-voltage, DC voltage input types available.
- Panel adapters for existing cutouts available; see H7EC Accessories section.
- Conforms to EMC standards.
- Approved by UL.

CE R

Ordering Information

■ Tachometer

Operating mode		Up type						
Display		LCD digital (character height: 6.7 mm)						
Reset system		Not provided						
Number of digits (see note 1)		4			5			
Count input		No-voltage input		DC voltage input				
Max. counting speed		1 kcps			10 kcps			
Max. revolutions displayed (see note 2)		1,000 rps	1,000 rpm	1,000 rps	1,000 rps	10,000 rpm	1,000 rpm	Selectable (see note 3)
Applicable encoder resolution		1 pulse/rev.			10 pulses/rev.	60 pulses/rev.	600 pulses/rev.	selectable (see note 3)
Terminals	**Wire-wrap**	H7ER	---	H7ER-V	H7ER-V1	H7ER-V2	H7ER-V3	---
	Screw	H7ER-B	H7ER-B2	H7ER-BV	H7ER-BV1	H7ER-BV2	H7ER-BV3	H7ER-SBV
Approved standards		UL						

Note: 1. When there is no input, 0.0 or 0 is displayed.

2. The maximum number or revolution which may be displayed depends on the output specifications of the encoder to be used.

3. Many kinds of encoders can be used with the H7ER-SBV. Confirm pulse compatibility by referring to specific values listed in "Setting the RPM Display of the H7ER-SBV," in the connections section.

Specifications

■ Ratings

External Supply voltage		H7ER-SBV: 5 to 24 VDC ±10%, Contains 5% ripple (p-p) max. DC voltage & No-voltage input types: Not required (powered by built-in battery)
Power consumption		H7ER-SBV: Approx. 800 mW (at 24 VDC)
Current consumption		H7ER-SBV: 30 mA (at 24 VDC), 15 mA (at 12VDC), 8 mA (at 5 VDC)
Count input	**DC Voltage input**	High (logic) level: 4.5 to 30 VDC Low (logic) level: 0 to 2 VDC
	No-voltage input	Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 500 kΩ min.
Max. counting speed		1 kcps (gate time: 1 second) with the 4-digit version. 10 kcps (gate time: 1 second) with the 5-digit version.
Reset system		Automatic (no external or manual reset)

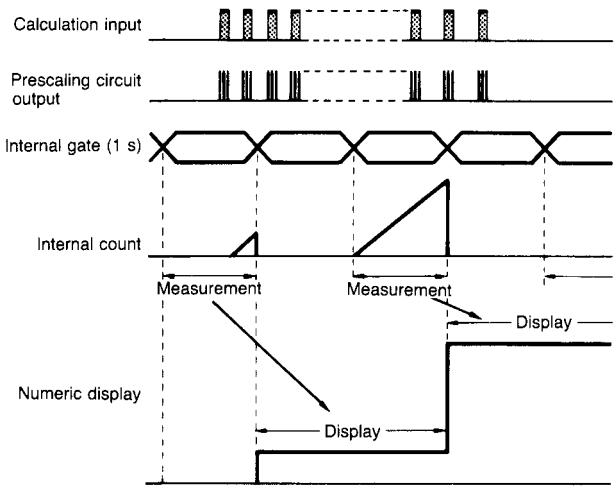
■ Characteristics

Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	1,000 VAC 50/60 Hz for 1 minute between current-carrying terminals and exposed non-current-carrying metal parts
Impulse withstand voltage	4.5 kV for 1 minute between current-carrying terminal and exposed non-current-carrying metal parts
Noise immunity	4-digit type: Input terminal ±500V 5-digit type: Input terminal ±300V
Vibration resistance	Mechanical: 10 to 55 Hz; 0.75 mm double amplitude Malfunction: 10 to 55 Hz; 0.3 mm double amplitude
Shock resistance	Mechanical: 294 m/s^2 (approx. 30 G) Malfunction: 98 m/s^2 (approx. 10 G)
Ambient temperature	Operating: −10C° to 55°C Storage: −25C° to 65°C
Ambient humidity	Operating: 35% to 85%
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge, 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line, 2 kV I/O signal-line
Battery life	7 years min. of continuous operation
Case color	Light gray (Munsell 5Y7/1)
Weight	H7ER-SBV: approx. 80 g (including mounting bracket) DC voltage & No-voltage input types: approx. 60 g (including mounting bracket)

Operation

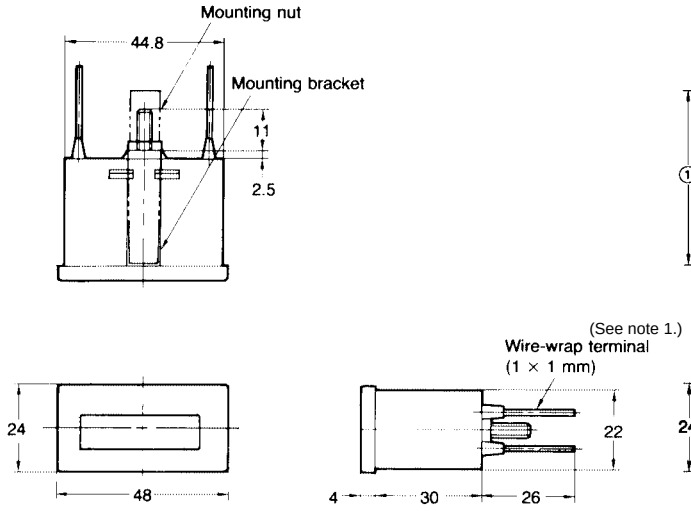
■ Operating Mode

Calculation
H7ER Digital Tachometer
Additions per Second

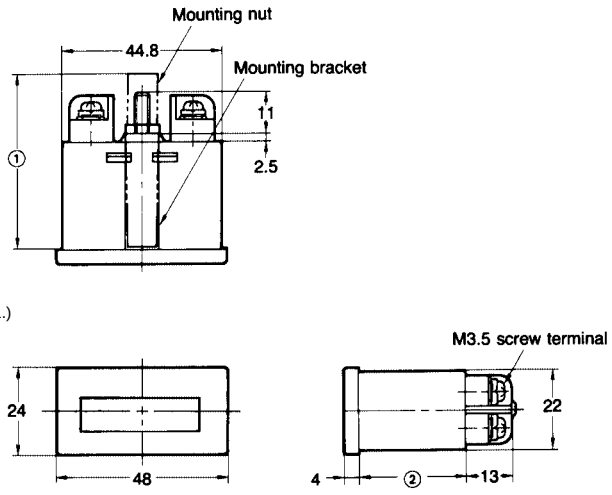


Dimensions

Wire-wrap Terminal Type (see note 1)



Screw Terminal Type (see note 2)

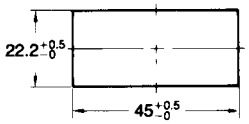


Note: 1. The wire-wrap terminal type can also be surface mounted.

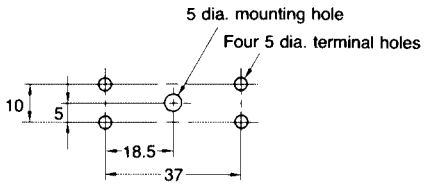
2. As shown in the chart below, two dimensions of the H7ER-SBV differ from other screw-terminal types.

Dimension	H7ER-SBV	DC voltage input types No-voltage input types
①	78.9	48.9
②	60	30

Panel Cutout



Mounting Holes

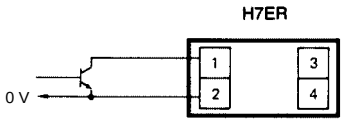


Installation

■ Connections

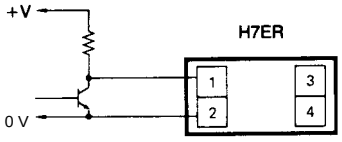
Refer to page 10, *Technical Information* for the applicable encoders.

No-voltage Input Type
Solid-state Input (Open Collector of an NPN Transistor)



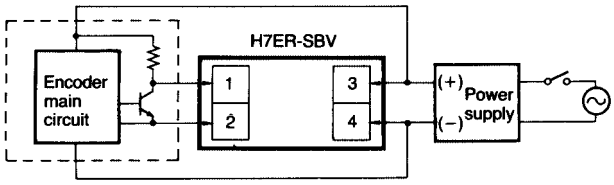
Note: Do not connect or use terminals 3 and 4 for any reason.

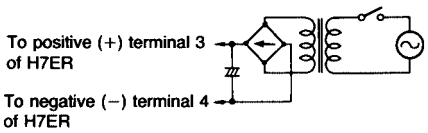
DC Voltage Input Type
Solid-state Input (Open Collector Input of an NPN Transistor)



Note: 1. Do not connect or use terminals 3 and 4 for any reason.
2. Select input transistors according to the following:
Dielectric strength of the collector ≧ 50 V
Leakage current < 1 μA

H7ER-SBV



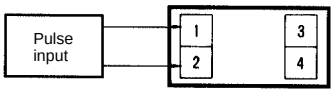


Note: Keep the effective DC voltage value to within 7 to 19 V when a smoothing capacitor is not used.

■ Terminal Arrangement

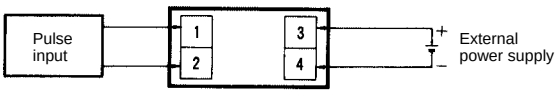
Bottom View: View of the Tachometer rotated horizontally 180°

H7ER



Note: Do not use terminals 3 and 4 as interrupts.

H7ER-SBV

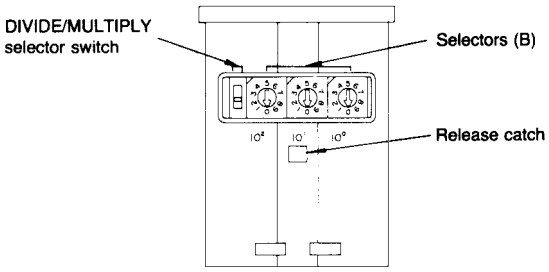


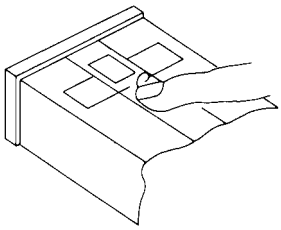
Note: There is a short circuit between terminal 2 and terminal 4.

Operation (H7ER-SBV)

Setting the RPM Display of the H7ER-SBV

The H7ER-SBV Tachometer is able to display the rotating speed (in either revolutions per second, or per minute) of different encoders. The Tachometer is set by using a sliding selector switch and three selectors, located under flip-up cover on the Tachometer.
Settings and accurately-displayed values depend upon the revolutions output of encoder.
Gain access to the switches by pressing the Tachometer cover, near the hinged cover.





Setting Procedure

The H7ER-SBV Tachometer has a prescale function that converts input pulses. Set to an appropriate prescale value depending on the output pulse specifications of the encoder. (Refer to the following table.)

Unit to be displayed	Number of pulses per one encoder rotation	Prescale setting	Applicable revolution	
			Upper limit	Lower limit
rpm (number of revolutions per minute)	1	x 60	60 rpm	10,000 rpm
	2	x 30	30 rpm	
	3	x 20	20 rpm	
	4	x 15	15 rpm	
	5	x 12	12 rpm	
	6	x 10	10 rpm	
	10	x 6	6 rpm	
	12	x 5	5 rpm	
	15	x 4	4 rpm	
	20	x 3	3 rpm	
	30	x 2	2 rpm	
	60	÷ 1	1 rpm	
	120	÷ 2		5,000 rpm
	180	÷ 3		3,333 rpm
	240	÷ 4		2,500 rpm
	300	÷ 5		2,000 rpm
	360	÷ 6		1,666 rpm
	420	÷ 7		1,428 rpm
	480	÷ 8		1,250 rpm
	540	÷ 9		1,111 rpm
	600	÷ 10		1,000 rpm
rps (number of revolutions per second)	1	÷ 1	1 rps	10,000 rps
	2	÷ 2		5,000 rps
	3	÷ 3		3,333 rps
	4	÷ 4		2,500 rps
	5	÷ 5		2,000 rps
	6	÷ 6		1,666 rps
	7	÷ 7		1,428 rps
	8	÷ 8		1,250 rps
	9	÷ 9		1,111 rps
	10	÷ 10		1,000 rps

For example, if the encoder you plan to use has a resolution of 180, and you desire the tachometer to display revolutions per minute, set the tachometer switches as follows:

DIVIDE/MULTIPLY switch: DIVIDE
Left selector (10^2): 0
Center selector (10^1): 0
Right selector (10^0): 3

In this example, the tachometer display will read accurately from 1 to 3,333 rpm. Should the encoder input be outside this range, the tachometer readout will be inaccurate.

Calculating Tachometer Settings

If the encoder you plan to use has a resolution which is not listed in the table, it will be necessary to calculate the tachometer switch settings.

rps Settings

If the tachometer is to display rps, set the DIVIDE/MULTIPLY switch to DIVIDE. The selector settings correspond exactly to the resolution value of the encoder.

For example, if the encoder you plan to use has a resolution of 287, and you desire the tachometer to display in units of revolutions per second, set the tachometer switches as follows:

DIVIDE/MULTIPLY switch: DIVIDE
Left selector (10^2): 2
Center selector (10^1): 8
Right selector (10^0): 7

rpm Settings

If the tachometer is to display rpm, the settings may be easily calculated. However, the encoder resolution value must be a factor of 60, or divisible evenly into 60, and equal to or greater than 60.

When set to j MULTIPLY using the prescale setting, the rpm is displayed in the unit of j (preset value).

When the resolution of the encoder is less than 60, set the DIVIDE/MULTIPLY switch to MULTIPLY.

Calculate the selector settings with the following formula:

$B = 60 \div A$

Where: B = value to be set on the selector switches
A = resolution of the encoder

For example, if the encoder has a resolution of 5, the calculation would be:

$60 \div 5 = 12$

thus, the tachometer settings would be:

DIVIDE/MULTIPLY switch: MULTIPLY
Left selector (10^2): 0
Center selector (10^1): 1
Right selector (10^0): 2

When the resolution of the encoder is equal to, or greater than 60, set the DIVIDE/MULTIPLY switch to DIVIDE.

Calculate the DIP switch settings with the following formula:

$B = A \div 60$

For example, if the encoder has a resolution of 720, the calculation would be:

$720 \div 60 = 12$

thus, the tachometer settings would be:

DIVIDE/MULTIPLY switch: DIVIDE
Left selector (10^2): 0
Center selector (10^1): 1
Right selector (10^0): 2

Calculating Minimum (Rmin) and Maximum (Rmax) Revolutions

In all of the above cases, the number of revolutions the encoder transmits must fall within a calculated minimum and maximum range. If the encoder's output exceeds or falls below this range, the number of revolutions will not be displayed accurately. Also, be aware that the tachometer is not capable of representing values greater than 10,000 even if the calculated value indicates otherwise.

Calculating the maximum number of revolutions (Rmax)
When displaying in rpm
Rmax = 10,000 $\times$ 60/A (rpm) or 10,000 (rpm), whichever is smaller

When displaying in rps
Rmax = 10,000/A (rps)

Calculating the minimum number of revolutions (Rmim)
With selector switch set to DIVIDE
Rmin = 1 (rpm or rps)

With selector switch set to MULTIPLY
Rmin = 60/A (rpm)

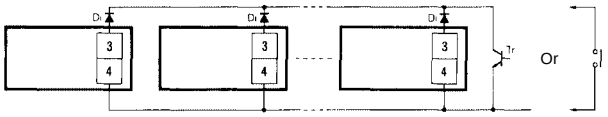
Accessories (Order Separately)

The H7ER is supplied with mounting bracket and nut.
Additionally, Flush Mounting Adapters shown in the *Accessories* section of the H7EC allow the H7ER models to be fitted to existing panel cutouts.

Precautions

Reset Input or Count Input to More than One H7E Counter at a Time

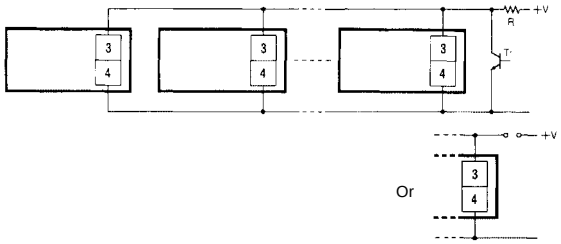
- No-voltage Input



Note: 1. The leakage current of the transistor used for input must be less than 1 μA.

2. The forward voltage of the D_1 must be as low as possible (i.e., 0.1 V maximum with an IF of 20 μA) so that the voltage between terminals 3 and 4 will be 0.5 V when reset input is ON.

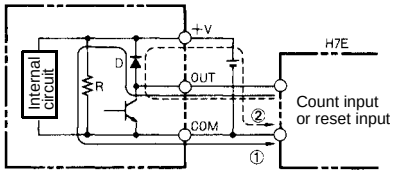
- Voltage Input



Note: H (Reset ON) level must be 4.5 V minimum.

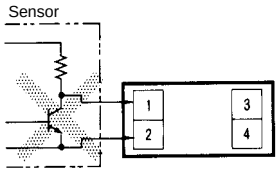
Reset Input and Count Input

The H7E operates using its built-in battery. If the H7E is connected to a device that has +V and OUT terminals that are connected with a diode as shown in the circuit diagram, the circuit indicated by arrow 1 or 2 will be formed when the device is turned off. As a result, the H7E may be reset or count by one. It is recommended that such devices not be connected to the H7E.

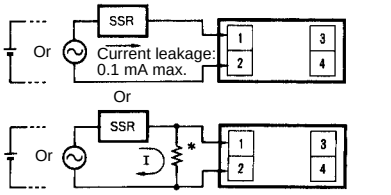


Input and Power Supply

- Do not impose voltage on the Counter if the Counter is a model that operates with no-voltage input, otherwise the internal circuit of the Counter may be damaged.
  Do not connect any single input signal in parallel to Counter models operating with non-voltage input and those operating with voltage input, otherwise the Counters may malfunction.
- When connecting a sensor to the Counter that operates with no-voltage input, make sure that the sensor has open collector output.



- When using shielded wire, stray capacitance may occur. The operation of the Counter might be affected when using wires which have a capacitance exceeding 500 pF (about 10 m, with parallel wires of 2 mm^2). Keep all wires as short as possible.
- When connecting an open collector input from a transistor to the Counter that operates with no-voltage input, make sure that the leakage current of the transistor is 5 μA maximum.
- When connecting count input from an SSR to the Counter that operates with free-voltage input, use OMRON's G3TA-IA or G3TA-ID SSR, otherwise make sure that the leakage current of the SSR is 0.1 mA maximum or connect a bleeder resistor in parallel to the input circuit of the Counter.



*Bleeder resistor
The voltage between terminals 1 and 2 must be 1.5 V maximum when the SSR is OFF.

- Apply DC voltage (including full-wave rectification) to the H7ER-SBV as its source power. Applying voltage of half-wave rectification or phase control will cause display errors.

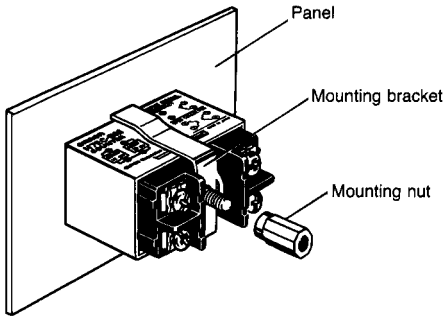
Wire-wrap Terminals

The dimensions of the terminals used on H7E wire-wrap models measure 1 × 1 mm. When wiring a Counter with wire-wrap terminals, select one of the three gauges of wire from the table below. Also listed in the table are the appropriate wiring hardware.

Wire gauge	Bit	Sleeve	Method
AWG22	2-A	2-B	Normal wire-wrap
AWG24	1-A	1-B	Normal wire-wrap
AWG26	3-A	3-B	Normal wire-wrap

How to Mount the Counter

Insert the H7E Counter from the front of the mounting panel. Slide the mounting bracket into place from the rear of the panel, and tighten the knurled nut by hand. Do not use tools (such as pliers) to tighten the nut. Excessive tightening may damage the Counter.



⚠ Caution

The H7ER has a built-in lithium battery. Be sure to dispose of the old H7ER properly, as lithium batteries are likely to explode if incinerated.

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

OMRON

PC Board-use Counter

H7E-P

Miniature Counter for PC Board Use

- LSI with a built-in digital filter ensures excellent noise immunity.
- Machine insertable.
- Can be mounted on a 28-pin IC socket.
- Totalizing Counter, Time Counter, and Tachometer available.
- Conforms to EMC standards.
- Approved by UL.

CE R

Ordering Information

■ Totalizing Counters

Model	H7EC-P	H7EC-LP
Operating mode	Up type	
Display	LCD digital (character height: 6.7 mm)	
Reset system	External (electrical) reset, power-OFF reset	
Number of digits	7	
Count input	No-voltage (solid-state) input	No-voltage (contact, solid-state) input
Max. counting speed	1 kcps	30 cps
Mounting method	Mounts directly on PCB, or with 28-pin IC socket	
Approved standards	UL	

■ Time Counter

Model	H7ET-P
Operating mode	Up type
Display	LCD digital (character height: 6.7 mm)
Reset system	External (electrical) reset, power-OFF reset
Number of digits	7 (0.0 to 999999.9 h)
Count input	No-voltage (contact, solid state) input
Mounting method	Mounts directly on PCB, or with 28-pin IC socket
Approved standards	UL

■ Digital Tachometers

Model	H7ER-P	H7ER-VP	H7ER-V2P
Operating mode	Up type		
Display	LCD digital (character height: 6.7 mm)		
Reset system	Automatic (No external reset)		
Number of digits	4		5
Count input	No-voltage (solid-state)	DC voltage input	
Max. counting speed	1 kcps		10 kcps
Applicable encoder resolution	1 pulse/rev		60 pulses/rev
Max. revolutions displayed	1,000 rps		10,000 rpm
Mounting method	Mounts directly on PCB, or with 28-pin IC socket		
Approved standards	UL		

Specifications

■ Ratings

Supply voltage		3 VDC
Operating voltage range		90 to 110% of supply voltage
Power consumption		H7EC- j P & H7ER- j j P: 60 μW max. (at 3 VDC, 25°C) H7ET-P: 45 μW max. (at 3 VDC, 25°C)
Count input (see note 1)	DC Voltage input	High (logic) level: 4.5 to 30 VDC Low (logic) level: 0 to 2 VDC (input impedance: approx. 4.7 kΩ)
	No-voltage input	Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 500 kΩ min.
Max. counting speed (see note 2)		H7EC-P (1 kcps): Minimum signal width 0.5 ms H7EC-LP (30 cps): Minimum signal width 16.7 ms H7ER-P/VP (1 kcps): Minimum signal width 0.5 ms H7ER-V2P (10 kcps): Minimum signal width 0.05 ms
Reset time		External reset types: 20 ms Power-OFF type: 100 ms (with 0 V residual voltage at power OFF)
Gate time (H7ER only)		1 second

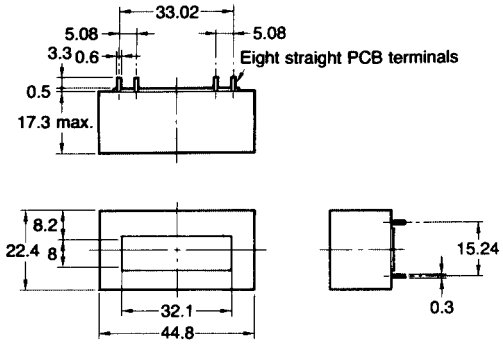
Note: 1. The maximum voltages allowed on the input, or gate terminals are as follows:
No-voltage models: 3 VDC
DC voltage models: 30 VDC

2. ON/OFF ratio 1:1

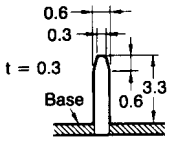
■ Characteristics

Noise immunity	±200 V between input terminals with square-wave noise applied by noise simulator
Vibration resistance	Mechanical: 10 to 55 Hz, 0.75 mm double amplitude Malfunction: 10 to 55 Hz, 0.3 mm double amplitude
Shock resistance	Mechanical: 294 m/s^2 (30 G) Malfunction: 98 m/s^2 (10 G)
Ambient temperature	Operating: −10°C to 55°C Storage: −25°C to 65°C
Ambient humidity	35% to 85%
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line 2 kV I/O signal-line
Case color	Light gray (Munsell 5Y7/1)
Weight	Approx. 20 g
Altitude	2000 m max.
Installation category	II
Pollution degree	2

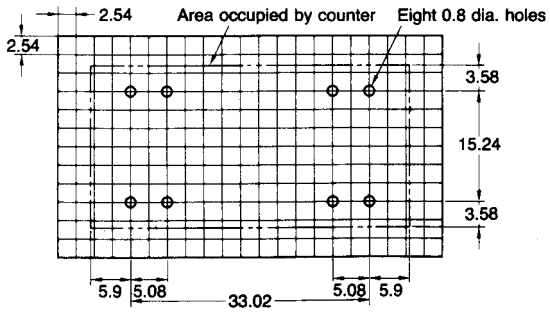
Dimensions



Detailed Drawing of Straight PCB Terminal



PCB Mounting Holes



Mounting hole dimensions conform to the pin pitch of a standard 28-pin IC socket.

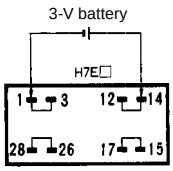
Note: When machine inserting the H7E PC-board Use Counters, these holes must be 1.2 mm diameter.

Installation

■ Connections

Power Supply and Battery Connections

Battery Connections



When designing a circuit, keep the power wiring connections shorter than 50 mm. Refer to the connection diagram above for the proper wiring polarity.

The life expectancy of a battery power source can be calculated by the following formula:

$t = A/I_c$

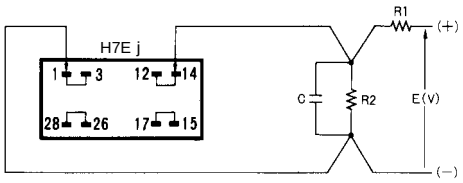
Where,
t: life expectancy of battery (h)
A: battery capacity (mAh)
I_c: current consumed by H7E j - j P (mA)

Example:
Battery life when using a 3-V lithium battery with a capacity of 1,200 mAh for the H7E j -P

t = 1,200 [mAh]/20 x 10^{-3} [mA] = 60,000 hours (approx. 6.8 years)

The battery capacity varies depending on the type of battery used; oxidized silver, mercury, or lithium battery.

Voltage Division of Power Source Circuit
When necessary, the voltage from the battery may be divided by resistances:



When doing so, however, ensure that the following equation balances:

E (V) × R_2 / (R_1 + R_2) = 3 V

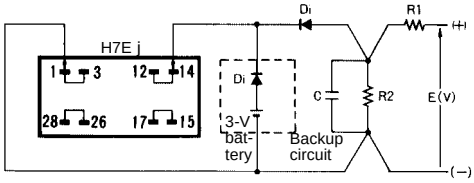
R	E		
	5 V	12 V	24 V
R_1	2 kΩ	9.1 kΩ	33 kΩ
R_2	3 kΩ	3 kΩ	4.7 kΩ

Allow a current high enough to flow through R_1 so that the H7E j - j P receives adequate current.

C is a film capacitor, of about 0.1 μF, and is intended to absorb noise induced by the power lines.

Keep the wiring between the H7E j - j P and R_2 as short as possible (within 50 mm).

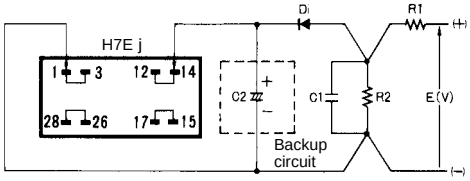
Backup Circuit for Protection Against Power Failure



Use a diode (Di) having a forward voltage as small as possible (0.1 V max. at I_F of 1 mA).

Determine the ratio of R_1 to R_2 in accordance with the forward voltage of the diode to be used. Be aware that when the supply voltage of power source E (V) has dropped to less than the voltage of the backup circuit, the battery discharges.

To protect the circuit against a momentary power failure, an aluminum electrolyte capacitor can also be used in place of a battery, as shown below:



When a capacitor is used, its backup time can be calculated by the following formula:

t = C (V_1 − V_2) / I_c

Where,
t: Backup time (s)
C: Capacitance (μF)
V_1: Supply voltage before power failure (V)
V_2: Minimum operating voltage of H7E j - j P (V)
I_c: H7E j - j P current consumption (μA)

Example:
Backup time by an aluminum electrolytic capacitor of 10 μF (Minimum operating voltage of H7E j -P is 2.55 V.)

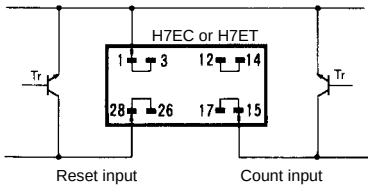
t = 100 μFx (3−2.55 V)/20 μA = 100 x 0.45/20 = 2.25 seconds

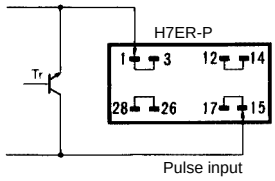
Note that the above calculation provides an approximate value, which varies depending on the environment under which the Counter is used and also on the type of capacitors used. Provide some allowance in selecting capacitors.

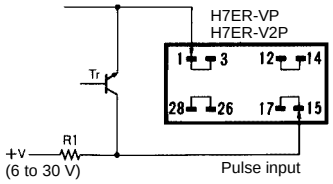
Minimize the wiring distance between the H7E j -P and the ends of the R_2.

Input Connections

Solid-state Input of Open-collector Transistor

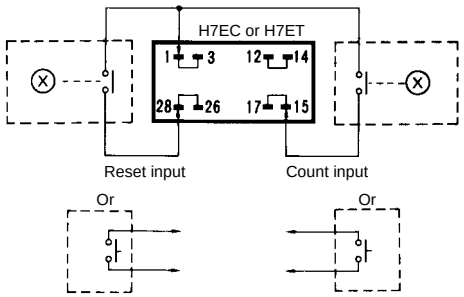




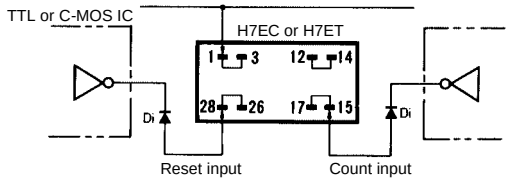


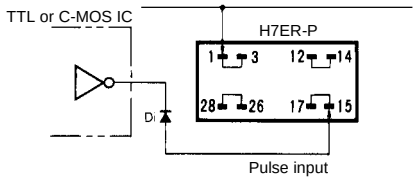
Use a transistor for input that satisfies the following conditions:
Collector breakdown voltage ≧ 50 V
Leakage current < 1 μA
Use a diode (Di) having a forward voltage as small as possible (0.1 V max. at I_F of 20 μA).

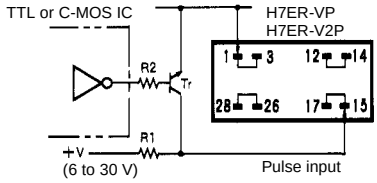
Input Connection Contact Input



By TTL or C-MOS IC





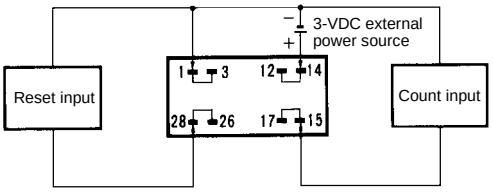


Use a transistor for input that satisfies the following conditions:
Collector breakdown voltage ≧ 50 V
Leakage current < 1 μA
Use a diode (Di) having a forward voltage as small as possible (0.1 V max. at I_F of 20 μA).

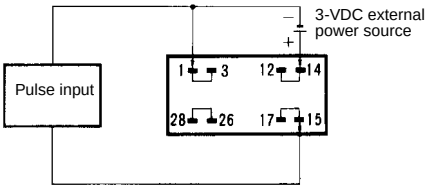
■ Terminal Arrangement

Bottom View: View of the Counter Rotated Horizontally 180°.

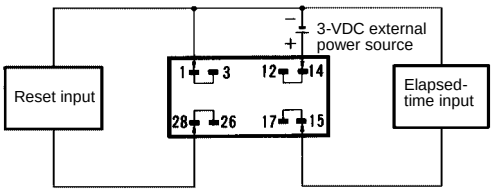
H7EC- j P



H7ER- j j P



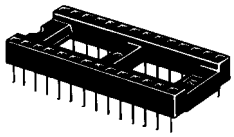
H7ET-P



Accessories (Order Separately)

■ Connecting Socket

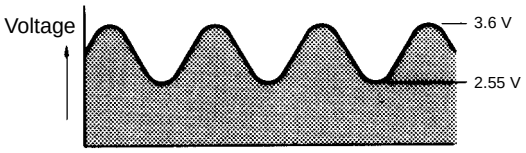
Description	Part number
28-pin (standard quality)	XR2A-2801
28-pin (premium quality)	XR3A-2801



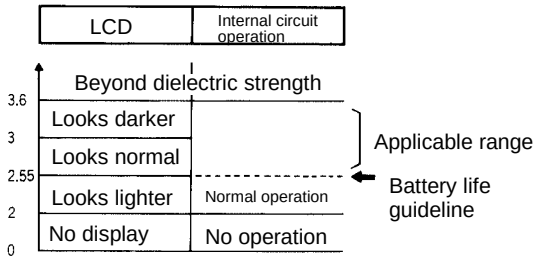
Precautions

Power Supply

- Use the power supply within the applicable range indicated by the following waveform, while considering the ripple and voltage fluctuations of the circuit power source.



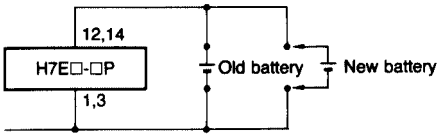
- The H7E j -P changes its mode as shown below depending on the applied supply voltage.



Battery Replacement

To prevent unwanted reset when replacing the battery, connect the new battery before disconnecting the old one. Otherwise, the voltage supplied to the counter circuit drops, causing the present count value to reset.

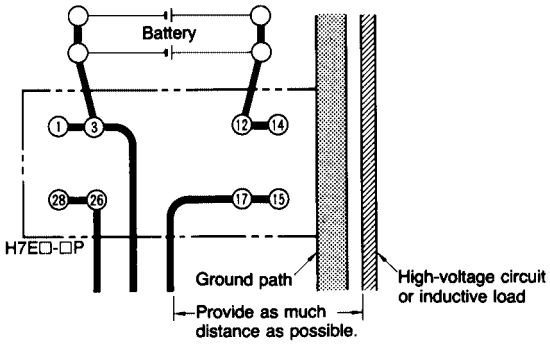
When designing the circuit board, providing two extra terminals for battery connection will make the switch must simpler. See the schematic diagram below:



Wiring polarity must be carefully observed, in order to prevent permanent damage to the Counters. Exercise caution when inserting the Counter in the socket, to prevent reversed polarity.

Inputs

Do not route the wiring of the count, gate, or reset inputs in the vicinity of, or in parallel to the wiring of high-voltage or inductive load circuits (such as motors and relays). Also, keep the wiring as short as possible.



Be careful not to apply voltages exceeding the following values to the count, gate, or reset terminals, otherwise the internal circuit may be damaged.

No-voltage input: 3 VDC
Voltage input: 30 VDC

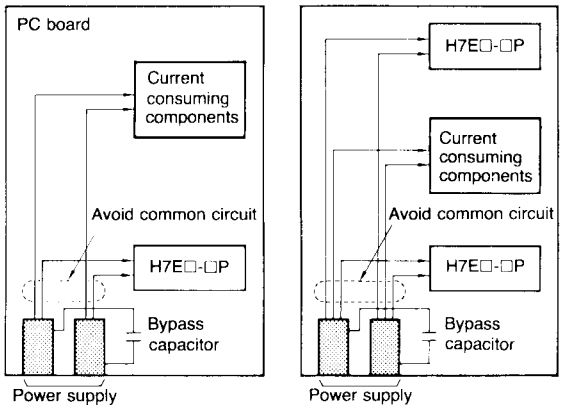
General Information

The terminals are solder-plated. Finish soldering the terminals within 5 seconds, at a solder iron tip temperature of 250°C ± 10°.

Since the Counter is not flux-tight, do not use flux when soldering.

Avoid automatic and dip soldering. Manually solder the Counter onto a PC board, and avoid cleaning as much as possible.

When mounting the Counter on a PC board with components which consume higher current than the Counter, place the Counter in the vicinity of the power supply. Avoid placing the Counter in a circuit with poser-consuming components. Above all, never place the count input circuit of the Counter in a circuit common to power-consuming components.



To Conform to EN/IEC Standards

Input terminals have no insulation from power supply terminals. The power supply terminals and the input terminals must be supplied from a SELV source in accordance with IEC1010-1 Annex H. SELV (separated extra-low voltage) source is a power supply having double or reinforced insulation between the primary and the secondary circuit and having output voltage of 30 V r.m.s. max. and 42.4 V peak max. or 60 VDC max.

Cleaning

To prevent damage, the exterior of the Counter must not be exposed to organic solvents (3.g. paint thinner or benzine), strong alkalis, or strong acids.

Others

- No user-serviceable parts.
- Return to OMRON for all repairs.

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

Cat. No. X13-E1-9A

OMRON

Electronic Counter

H7CL

DIN 48 x 48 mm LED Counter with IP66/NEMA 4 Protection for a Wide Variety of Applications

- Water- and dust-protected for severe environments.
- Large, high-visibility LED displays.
- Simple setting with Increment and Decrement Keys.
- Conforms to EMC standards.
- Conforms to IEC standards, and approved by UL and CSA.
- Six-language instruction manual provided.

CE RC

Ordering Information

Outputs	Control power supply	Model	
		Without Shock Prevention Cover	With Shock Prevention Cover
Contact output	100 to 240 VAC	H7CL-A	---
	12 to 24 VDC	H7CL-AD	H7CL-AD-500
Transistor output (Photocoupler)	100 to 240 VAC	H7CL-AS	---
	12 to 24 VDC	H7CL-ADS	H7CL-ADS-500

■ Accessories (Order Separately)

Name	Model
Soft Cover	Y92A-48F1
Hard Cover	Y92A-48
Shock Prevention Cover (for DC models only)	Y92A-48T
Back Connecting Socket for flush mounting (for AC models only)	P3GA-11
DIN Track/Surface Mounting/Front Connecting Socket (for AC models only)	P2CF-11
Rubber Packing (see note)	Y92S-29
Flush Mounting Adaptor (see note)	Y92F-30

Note: Supplied with each Unit.

■ Model Number Legend

H7CL-A j j j
1 2 3 4

1. **Fixed**
2. **D: DC input**
3. **S: Transistor output**

Specifications

Item	H7CL-A j (AC models)	H7CL-AD j (DC models)
Classification	1-stage preset counter	
Mounting method	DIN track, surface, and flush mounting	Flush mounting
External connections	Socket	Screw terminals
Enclosure ratings	Panel surface: IEC IP66 and NEMA Type 4 (indoors) when Y92S-29 rubber packing is used.	
EMC standards	Conforms to EN50081-2, prEN50082-2.	
Approved standards	UL 508, CSA C22.2 No.14	
Input modes	Up (Incrementing) and Down (decrementing) (selectable)	
Input signals	Count, gate, reset, and key protection	
Input method	No-voltage input: Via NPN transistor, or switching of contact	
Operating modes	N, F, C, K	
Control outputs	Contact output: SPDT, 3 A at 250 VAC, resistive load (cosϕ = 1) Min. applicable load: 10 mA at 5 VDC, 10 mA at 24 VDC (P level, for reference value) Transistor output: NPN open collector: 100 mA max. at 30 VDC max, residual voltage: 1.5 VDC max.	
Reset system	External (min. pulse width: 1 ms, 20 ms selectable), manual, and automatic (internal according to C mode operation) resets	
External power supply	50 mA at 12 VDC (±10%)	---
Display	7-segment LEDs (12 mm high, red LEDs for the present value and 8 mm high, green LEDs for the set value)	
Digits	−3 digits to 4 digits (−999 to 9,999)	
Memory backup	EEPROM, which can store data for 20 years min.	

■ Ratings

Item	H7CL-A j (AC)	H7CL-AD j (DC)
Rated supply voltage	100 to 240 VAC, 50/60 Hz	12 to 24 VDC (contains 20% ripple max.)
Operating voltage range	85 to 264 VAC, 50/60 Hz	10.8 to 26.4 VDC
Current consumption	Approx. 10 VA	Approx. 3 W
Max. counting speeds	30 cps or 5 kcps (selectable) (ON : OFF ratio = 1 : 1)	
Gate input	Min. pulse width: 20 ms	
Key protection input	Response time: 1 s max.	
One-shot time	50 or 500 ms (selectable)	
Case	Light gray (Munsell 5Y7/1)	

■ Characteristics

Item	H7CL-A j (AC models)	H7CL-AD j (DC models)
Insulation resistance	100 MΩ min. (at 500 VDC) (between current-carrying terminal and exposed non-current-carrying metal parts, and between non-continuous contacts)	
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min (between current-carrying terminal and exposed non-current-carrying metal parts) 1,000 VAC, 50/60 Hz for 1 min (between non-continuous contacts)	2,000 VAC (AD: between current-carrying terminal and exposed non-current-carrying metal parts) 1,000 VAC (ADS: between current-carrying terminal and exposed non-current-carrying metal parts) 1,000 VAC (between non-continuous contacts)
Impulse withstand voltage	3 kV (between power terminals) 4.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts)	1 kV (between power terminals) 1.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts)
Noise immunity	±1.5 kV (between power terminals) ±600 V (between input terminals), square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)	±480 V (between power terminals) ±600 V (between input terminals), square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)
Static immunity	Malfunction: 8 kV Destruction: 15 kV	
Vibration resistance	Destruction: 10 to 55 Hz, 0.75-mm single amplitude each in three directions Malfunction: 10 to 55 Hz, 0.5-mm single amplitude each in three directions	
Shock resistance	Destruction: 294 m/s^2 (30G) each in three directions Malfunction: 98 m/s^2 (10G) each in three directions	
Ambient temperature	Operating: −10°C to 55°C (−10° to 50°C if Counters are mounted side by side) (with no icing) Storage: −25°C to 65°C (with no icing)	
Ambient humidity	Operating: 35% to 85%	
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge, 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line, 2 kV I/O signal-line	
Life expectancy	Mechanical: 10 million operations min. Electrical: 100,000 operations min. (3 A at 250 VAC, resistive load)	
Weight	Approx. 130 g	Approx. 110 g

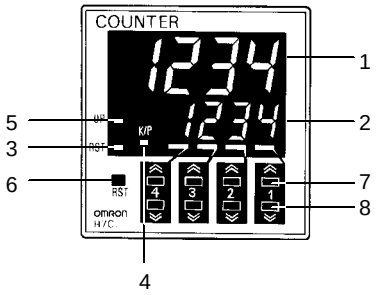
Nomenclature

Indicator

1. **Present Value**
   Red LEDs with a character height of 12 mm; leading zeros suppressed
2. **Set Value**
   Green LEDs with a character height of 8 mm; leading zeros suppressed
3. **Reset Indicator**
4. **Key Protection Indicator**
5. **Control Output Indicator**

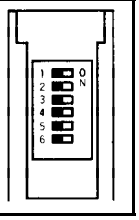
Operation Key

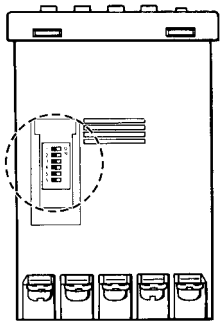
6. **Reset (RST) Key**
   The RST Key initializes the present value and control output.
7. **Increment Keys (1 to 4)**
   Up Keys 1 to 4 increment the set value.
8. **Decrement Keys (1 to 4)**
   Down Keys 1 to 4 decrement the set value.



Operation

■ DIP Switch Setting

Pin no.	Item	OFF	ON	
1	**Counting speed**	30 cps	5 kcps	
2	**Input modes**	Up (Increment)	Down (Decrement)	
3, 4	**Operating modes**	See table below.		
5	**One-shot time (see note 1)**	500 ms	50 ms	
6	**Reset min. pulse width**	20 ms	1 ms	



(The same DIP switch settings apply to AC and DC models)

Note: 1. DIP switch settings change when the power is turned on. Its setting changes become disabled while the power is on.

2. The one-shot time is valid only when the C mode or K mode is selected.

Operating Modes

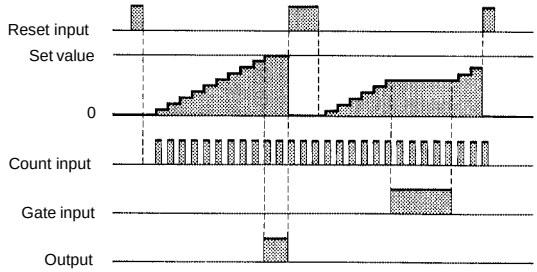
3	4	Operating modes	
OFF	OFF	N	**Count Stop, Output Hold Mode** The output and present value are on hold until reset input is ON.
ON	OFF	F	**Over-count, Output Hold Mode** The Counter continues incrementing/decrementing the present value but the output is on hold until reset.
OFF	ON	C	**Auto-reset, One-shot Output Mode** The Counter is automatically reset when counted up. The control output is a one-shot output type.
ON	ON	K	**Over-count, One-shot Output Mode** The Counter continues incrementing/decrementing the present value but the output is a one-shot output type.

Note: Switches 1 to 6 are all set to OFF before shipping.

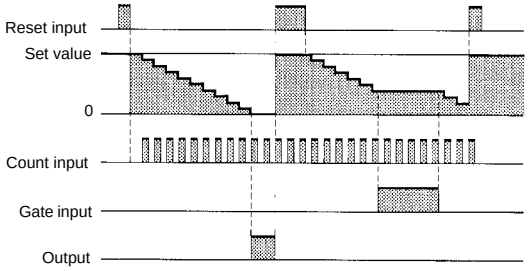
■ Operating Modes

N Mode
Counting stop, output is on hold.

Up (Increment) Mode

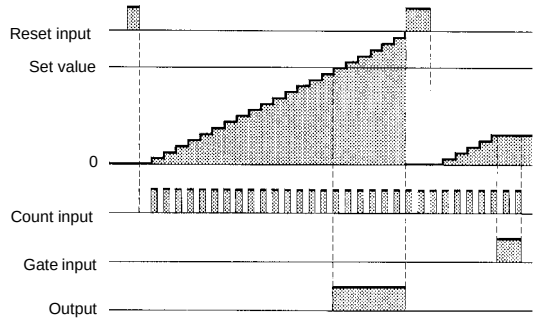


Down (Decrement) Mode

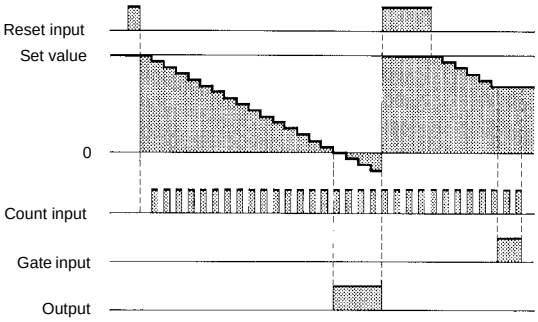


F Mode
Over-count, output is on hold.

Up (Increment) Mode

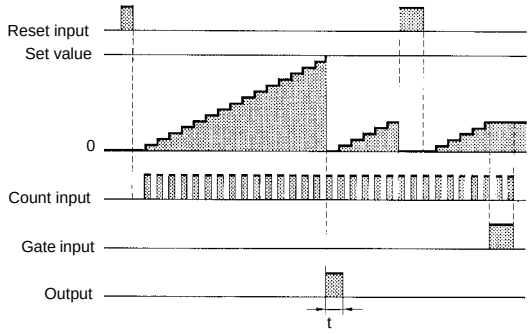


Down (Decrement) Mode

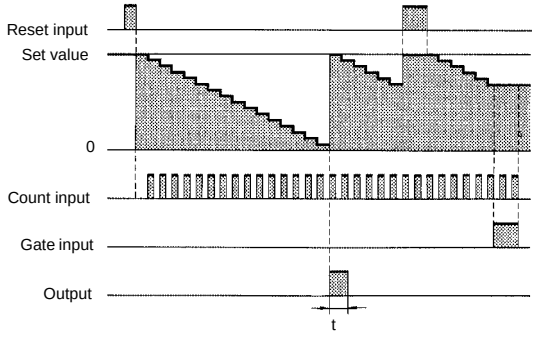


C Mode
Auto-reset, one-shot output is ON.

Up (Increment) Mode

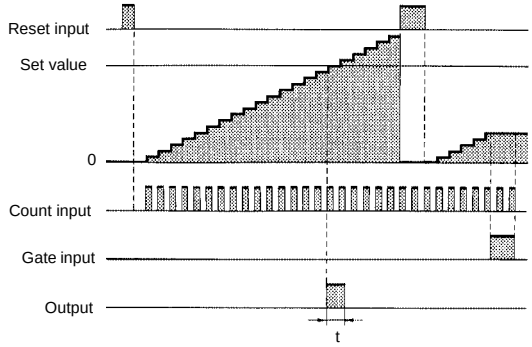


Down (Decrement) Mode

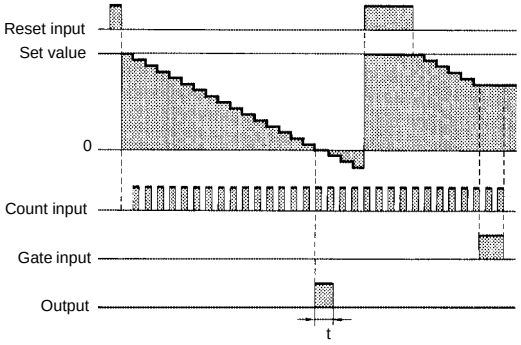


K Mode
Over-count, one-shot output is ON.

Up (Increment) Mode



Down (Decrement) Mode



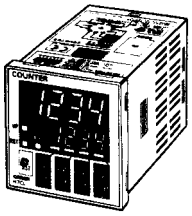
Note: t = one-shot time; 500 ms or 50 ms

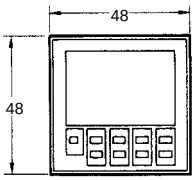
Dimensions

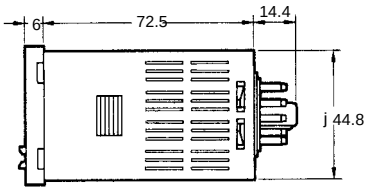
Note: All units are in millimeters unless otherwise indicated.

H7CL-A j

DIN Track/Surface/Flush Mounting

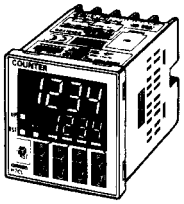


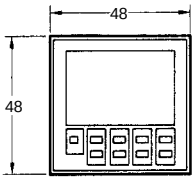


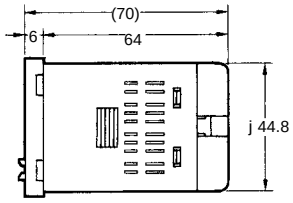


H7CL-AD j

Flush Mounting

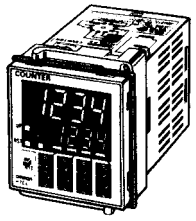


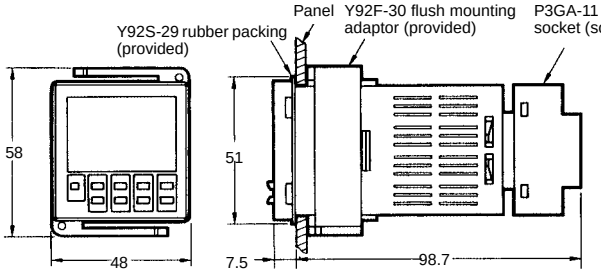




H7CL-A j

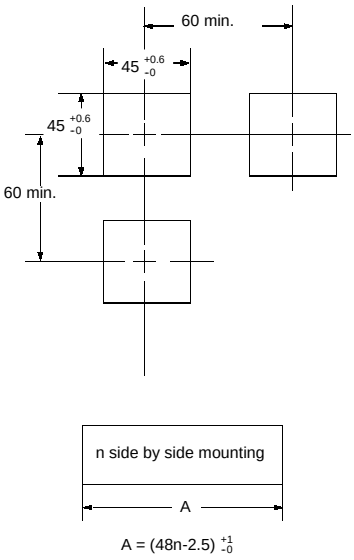
With Flush Mounting Adaptor





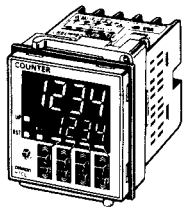
Panel Cutouts

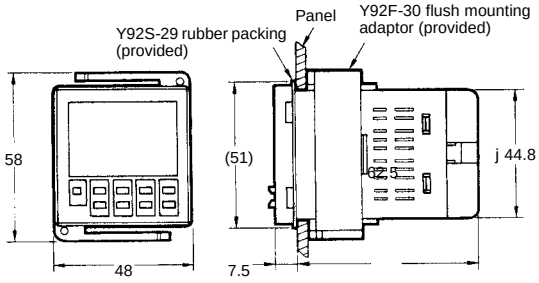
Panel cutouts are as shown below.
(according to DIN43700).



H7CL-AD j

With Flush Mounting Adaptor



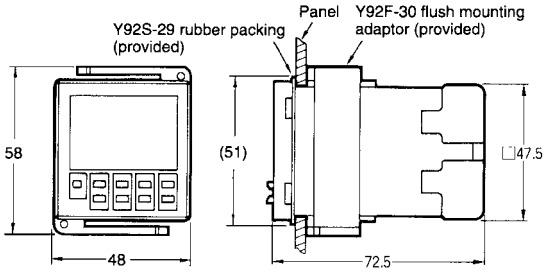


A = (48n-2.5) +1 -0

Note 1. The mounting panel thickness should be 1 to 4 mm.
2. It is possible to mount Counters side by side, but only horizontally.

H7CL-AD j **-500**

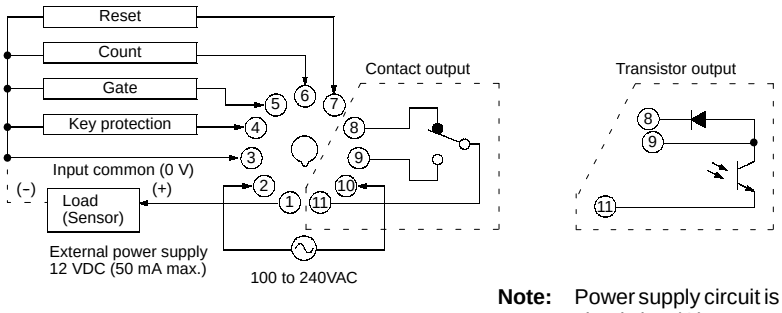
The cover conforms to finger protection standard against electric shock. (VDE 0106/P100)



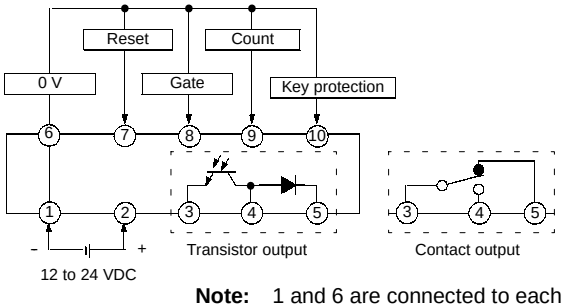
Installation

■ Terminal Arrangement

AC Models



DC Models



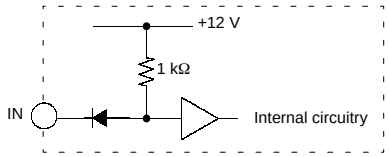
Note: Power supply circuit is insulated from the internal circuit (or I/O).

Note: 1 and 6 are connected to each other internally.

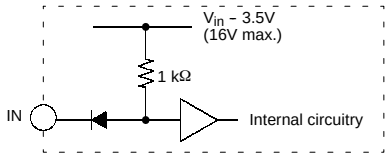
■ Input Circuitry

Count, Reset, and Gate Input

H7CL-A j (AC Models)

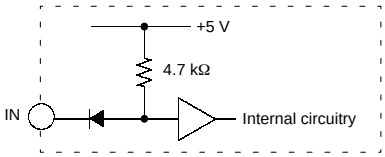


H7CL-AD j (DC Models)



V_{in}: Supply voltage

Key Protection Input

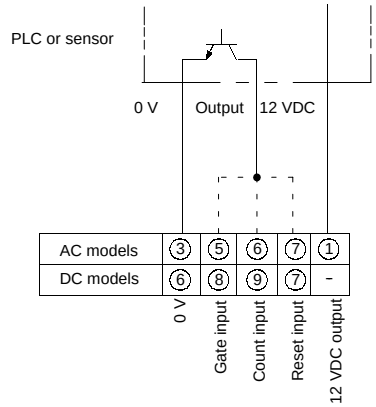


Note: No key input is effective while key protection input is ON.

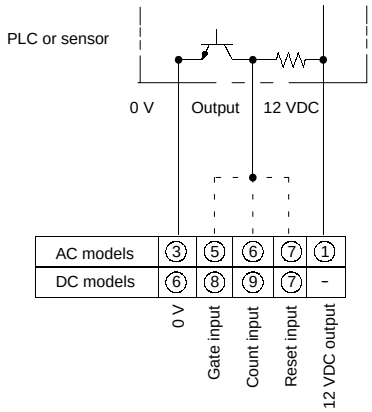
■ Input Connections

Refer to the *Technical Information* section for applicable Sensors.

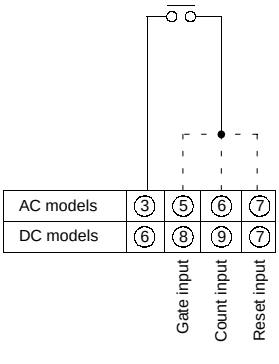
Open Collector Output



Voltage Output



Contact input

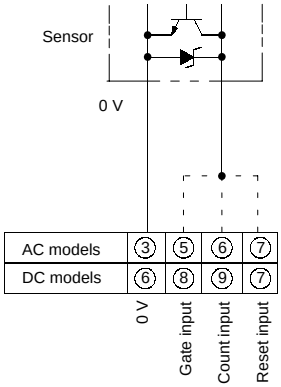


Count, Reset, and Gate Input Specification

ON impedance: 500Ω max. (the leakage current is 5 to 20 mA when the impedance is 0Ω.)
ON residual voltage: 2 V max.

OFF impedance: 100kΩ min.
Maximum applied voltage: 30 VDC max.

Two-wire Sensor

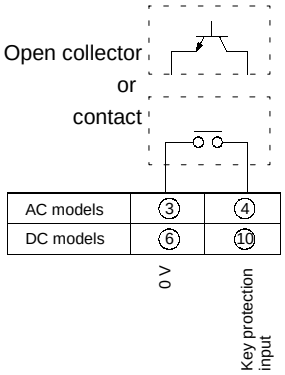


Applicable Two-wire Sensor

Leakage current: 1.5 mA max.
Switching capacity: 5 mA min.
Residual voltage: 3 V max.
Operating voltage: 10 VDC

Note: When connecting a two-wire sensor to a DC models, supply 24 VDC (21.6 to 26.4 VDC) to the Counter.

Key Protection Input



Key Protection Input

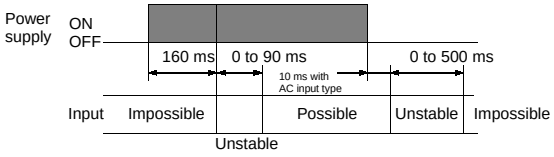
ON impedance: 1 kΩ max.
(the leakage current is approx. 1 mA when the impedance is 0Ω.)
ON residual voltage: 0.5 V max.
OFF impedance: 100 kΩ min.
Maximum applied voltage: 30 VDC max.

Note: The used contact should switch 1 mA at 5 V.

Precautions

Power Supplies

When turning the power ON and OFF, input signal reception is possible, unstable, or impossible as shown in the diagram below.



Apply the power supply voltage through a relay or switch in such a way that the voltage reaches a fixed value immediately.

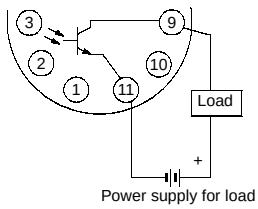
Turn the power ON and OFF with relay with a rated capacity of 10 A minimum to prevent contact deterioration due to inrush current caused by turning the power ON and OFF.

Transistor Output

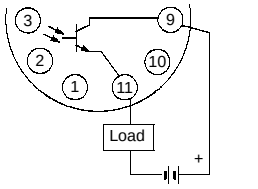
The transistor output of the H7CL is insulated from the internal circuitry by a photocoupler, so the transistor output can be used as both NPN and PNP output.

AC Models

NPN Output

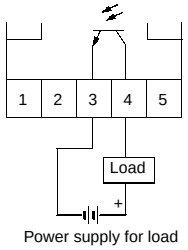


PNP Output

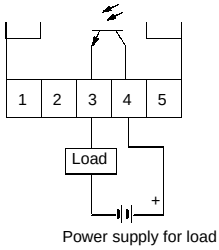


DC Models

NPN Output



PNP Output



Self-diagnostic Function

The following displays will appear if an error occurs.

Display	Error	Output status	Correction	Set value after correction
----	Present value underflow (see note)	No change	Press RST Key or reset input	No change
e1	CPU	OFF	Press RST Key or turn power off	
e2	Memory		and then ON	0

Note: Given when present value falls below the minimum value (–999) in Down (decrement) Mode.

Operating Environment

When using the Counter in an area with excess electronic noise, separate the Counter, wiring, and the equipment which generates the input signals as far as possible from the noise sources. It is also recommended to shield the input signal wiring to prevent electronic interference.

Organic solvents (such as paint thinner), as well as very acidic or basic solutions can damage the outer casing of the Counter.

Set Value Change

If the user changes the set value while the Counter is operating, the user should be aware that the H7CL's output will be ON when the set value is the same as the present value.

Reset with a Set Value of 0

When the set value is 0, after the Counter is reset, the output is ON (while reset, output is OFF).

Reset Time

It takes 1 ms or 20 ms (selectable) to turn the output OFF with the following deflection ranges.

Time required for resetting	Deflection range
1 ms	0.8 to 1.2 ms (Reference value)
20 ms	15 to 25 ms (Reference value)

Output Delay

The following table shows the delay from when the present value passes the set value until the output is produced.

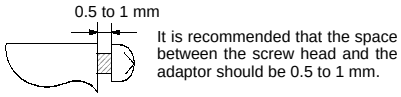
Actual measurements in N and K modes.

Control output	Max. counting speed	Output delay*
Contact output	30 cps	16.5 to 24.0 ms
	5 kcps	3.7 to 5.6 ms
Transistor output	30 cps	12.0 to 20.0 ms
	5 kcps	0.2 to 0.55 ms

*The variation in delays is due to different modes and conditions.

Flush Mounting

The H7CL's panel surface is water-resistive (conforming to NEMA 4 (indoors) and IP66). In order to prevent the internal circuit from water penetration through the space between the Counter and operating panel, attach a rubber packing (provided with the H7CL) between the Counter and operating panel and secure the rubber packing with the Y92F-30 flush-mounting adaptor.



Other

In case of performing a dielectric strength test, etc., on the H7CL mounted to a control panel, disconnect the H7CL from the connecting circuitry, or short-circuit all the terminals of the H7CL. Otherwise the H7CL may be damaged.

Terminal 1 (power supply terminal) and terminal 6 (input common: 0 V for input) of DC model H7CL are internally connected to each other.

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

Cat. No. L81-E1-1B

OMRON

Digital Counter

H7CR

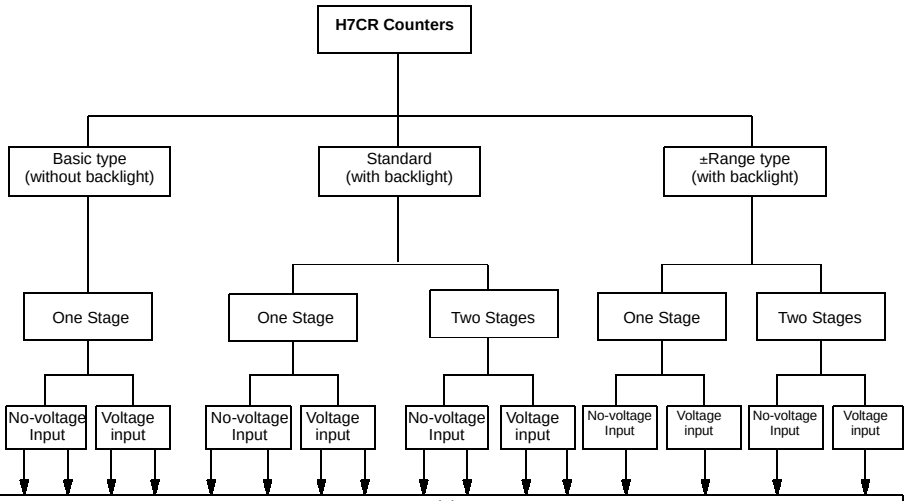
DIN 48 x 48 mm Counters with Easy-to-use Functions

- Designed with an emphasis on ease of operation.
- All models (except -A, and -SA type) equipped with prescale function which displays in units of actual physical parameters (length, volume, etc.).
- H7CR-C/SC large/small discrimination mode useful for positioning and production control.
- High-speed response allows 5,000 counts per second.
- High-visibility LCD display with built-in backlight.
- Online change of set value possible.
- Meets UL and CSA standards.
- Conforms to IEC1010-1/EN61010-1 standard.
- H7CR-S short type only 64 mm deep.
- H7CR-8/11 plug-in types can be DIN-track mounted.
- H7CR-8 has a built-in power supply reset function.
- Conforms to EMC standards.
- Six-language instruction manual provided.

CE RC

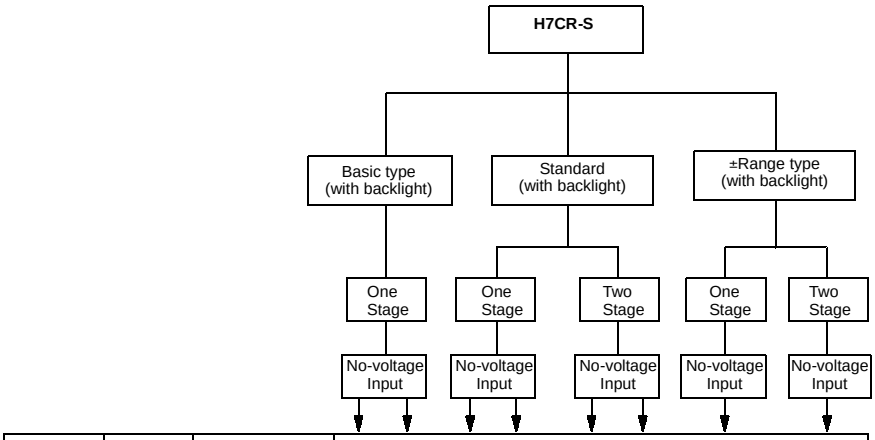
Ordering Information

H7CR-A/B/C



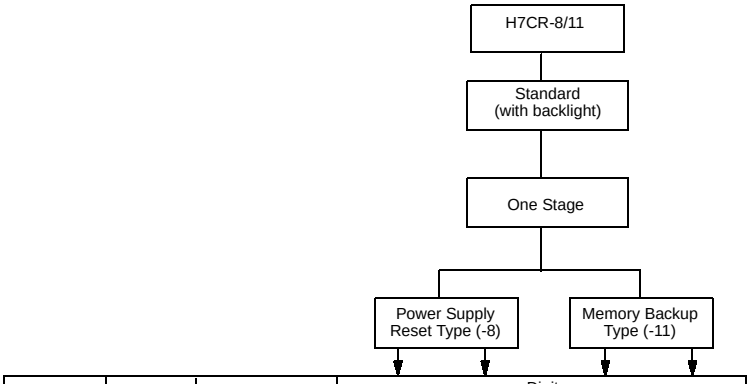
External power supply	Outputs	Control supply voltage	Digits															
			6 digits	4 digits	6 digits	4 digits	6 digits	4 digits	6 digits	4 digits	6 digits	4 digits	6 digits	4 digits	6 digits	4 digits	6 digits	4 digits
Unused	Contact	100 to 120/ 200 to 240 VAC 50/60 Hz	H7CR-A	H7CR-4A	H7CR-AV	---	---	---	---	---	---	---	---	---	---	---	---	---
		24 VAC	H7CR-A	H7CR-4A	H7CR-AV	---												
	Transistor	100 to 120/ 200 to 240 VAC 50/60 Hz	H7CR-AS	H7CR-A4S	H7CR-AVS	---												
		24 VAC	H7CR-AS	---	H7CR-AVS	---												
12 VDC (100 mA)	Contact	100 to 240 VAC 50/60 Hz	---				H7CR-B	H7CR-B4	H7CR-BV	H7CR-B4V	H7CR-BW	H7CR-BW	H7CR-BWV	H7CR-BWV	H7CR-C	H7CR-CV	H7CR-CW	H7CR-CWV
		24 VAC 12 to 24 VDC					H7CR-B	---	H7CR-BW	H7CR-B4W	H7CR-BW	H7CR-BW	H7CR-BWV	H7CR-BWV	H7CR-C	H7CR-CV	H7CR-CW	H7CR-CWV
	Transistor	100 to 240 VAC 50/60 Hz					H7CR-BS	H7CR-B4S	H7CR-BVS	H7CR-B4VS	H7CR-BWS	H7CR-BWS	H7CR-BWVS	H7CR-BWVS	H7CR-CS	H7CR-CVS	H7CR-CWS	H7CR-CWVS
		24 VAC 12 to 24 VDC					H7CR-BS	---	H7CR-BVS	H7CR-BVS	H7CR-BWS	H7CR-BWS	H7CR-BWVS	H7CR-BWVS	H7CR-CS	H7CR-CVS	H7CR-CWS	H7CR-CWVS
24 VDC (50 mA)	Contact	100 to 240 VAC 50/60 Hz	---				H7CR-BG	H7CR-B4G	H7CR-BVG	H7CR-B4VG	H7CR-BWG	H7CR-BWG	H7CR-BWVG	H7CR-BWVG	H7CR-CG	H7CR-CVG	H7CR-CWG	H7CR-CWVG
		24 VAC 12 to 24 VDC					H7CR-BG	---	H7CR-BVG	H7CR-B4VG	H7CR-BWG	H7CR-BWG	H7CR-BWVG	H7CR-BWVG	H7CR-CG	H7CR-CVG	H7CR-CWG	H7CR-CWVG
	Transistor	100 to 240 VAC 50/60 Hz					H7CR-BSG	H7CR-B4SG	H7CR-BVSG	H7CR-B4VSG	H7CR-BWSG	H7CR-BWSG	H7CR-BWVSG	H7CR-BWVSG	H7CR-CSG	H7CR-CVSG	H7CR-CWSG	H7CR-CWVSG
		24 VAC 12 to 24 VDC					H7CR-BSG	---	H7CR-BVSG	H7CR-BVSG	H7CR-BWSG	H7CR-BWSG	H7CR-BWVSG	H7CR-BWVSG	H7CR-CSG	H7CR-CVSG	H7CR-CWSG	H7CR-CWVSG

H7CR-S (Short Body)



External power supply	Outputs	Control supply voltage	Digits							
			6 digits	4 digits	6 digits	4 digits	6 digits	4 digits	6 digits	4 digits
Unused	Contact	12 to 24 VDC	H7CR-SAL	H7CR-SA4L	H7CR-SBL	H7CR-SB4L	---	---	H7CR-SCL	---
	Transistor		H7CR-SASL	H7CR-SA4SL	H7CR-SBSL	H7CR-SB4SL	H7CR-SBWSL	H7CR-SB4WSL	H7CR-SCSL	H7CR-SCWSL

H7CR-8/11 (Plug-in Socket)

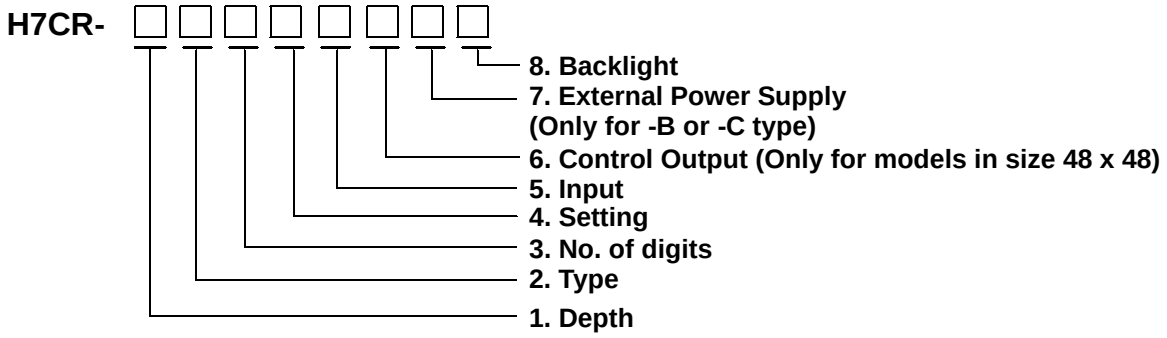


External power supply	Outputs	Control power source	Digits			
			6 digits	4 digits	6 digits	4 digits
Unused	Contact	100 to 240 VAC 50/60 Hz	H7CR-8	H7CR-84	H7CR-11	H7CR-114
		24 VAC 12 to 24 VDC	H7CR-8	---	H7CR-11	H7CR-114
	Transistor	100 to 240 VAC 50/60 Hz	H7CR-8S	---	H7CR-11S	
		24 VAC 12 to 24 VDC	H7CR-8S	---	H7CR-11S	

Note: Specify both the model and control supply voltage when ordering.
With shock prevention cover types are named “H7CR- j j j -500.”

■ Model Number Legend

This model legend does not mean that all combinations of the following features are available.



1. Depth

S: Short (Only for models in size 48 x 48)
---: Not short

2. Type

A: Basic type (Only for models of size 48 x 48)
B: Standard type
C: ± Range type (Only for 6-digit display models)
8: Plug-in power reset (Only for models of size 48 x 48)
11: Plug-in power failure backup (Only for models of size 48 x 48)

3. No. of digits

4: 4 (Only for models of size 48 x 48)
---: 6

4. Setting

W: 2-stage setting (Only for -B or -C type)
---: 1-stage setting

5. Input

V: Voltage input (Not for short body or plug-in type models)
---: No-voltage input

6. Control Output (Only for models of size 48 x 48)

S: Transistor output
---: Contact output

7. External Power Supply (Only for -B or -C type)

G: 24-VDC power supply
---: Other than 24-VDC power supply

8. Backlight

L: Short body with backlight (Only for models of size 48 x 48)
---: Other than short body with backlight

■ Accessories (Order Separately)

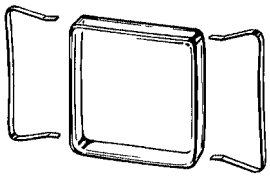
Name	Model
Soft Cover (with two mounting clips)	Y92A-48F1
Shock Prevention Cover	Y92A-48T
Panel Mounting Bracket	Y92F-30
Surface Mounting Bracket	P2CF-08
Flush Mounting Bracket	P3G-08

Operating Environment

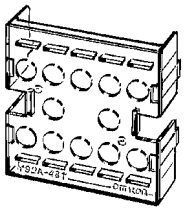
The counter has a water-resistive structure, thus preventing the internal circuitry from drops of water that may penetrate through the space between the keys and operating panel. Before operating with wet or oily hands, however, put a soft cover (sold separately) onto the operating panel. Although the soft cover protects the instrument to IPS4, avoid places where the counter is directly exposed to water or oil.

A Y92F-30 Panel Mounting Adaptor is supplied with each counter. (It can also be ordered independently.)

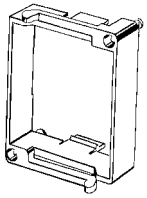
Soft Cover/Y92A-48F1



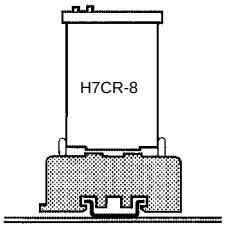
Shock Prevention Cover/Y92A-48T
Conforms to VDE 106/P100



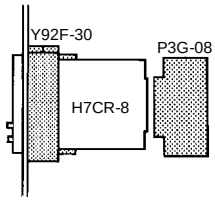
Panel Mounting Bracket/Y92F-30



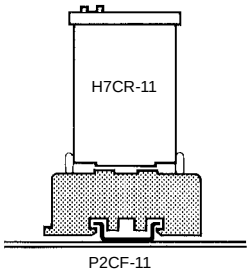
Surface Mounting Bracket/ P2CF-08



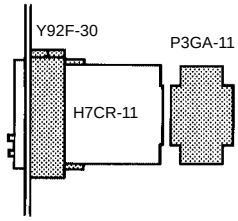
Flush Mounting Bracket/ P3G-08



Surface Mounting Bracket/ P2F-11



Flush Mounting Bracket/ P3GA-11



Note: Models with a Shock Prevention Cover can be ordered by adding “-500” to the end of the model number.
Example: H7CR-BW-500 (100 to 240 VAC, 50/60 Hz) (except plug-in type, H7CR-8/11)

Specifications

H7CR-A/B/C

Model	H7CR-A/A4 (Basic type)	H7CR-B/B4 (Standard type)	H7CR-C (±Range type)
Classification	Digital preset counter		
Mounting method	Flush mounting		
External connections	Screw terminals		
Enclosure ratings	IP54 (panel surface)		
Approved standards	UL: File no. E41515 CSA: File no. LR22310		
Input modes*	Up (incrementing), Down (decrementing), and reversible (Up/Down) Up/Down A (command inputs), Up/Down B (individual inputs), Up/Down C (phase difference inputs)		Reversible Up/Down A (command inputs), Up/Down B (individual inputs), Up/Down C (phase difference inputs)
Output modes*	N, F	N, F, C, R, K, P, Q, A	K, D, L, H
Reset system	External and manual resets	External, manual and automatic resets (internal according to C, R, P, and Q mode operation)	External and manual resets
Prescaling function	---	Yes (0.001 to 99.999)	
Decimal point adjustment	---	Yes (Rightmost 3 digits)	
Sensor power supply	---	12 VDC or 24 VDC (according to model)	
Input signals	Count and reset	Count, reset, and key protection	
Input method	No-voltage input: Via opening and closing of contact Voltage input: Via high and low signal voltages	No-voltage input: Via opening and closing of contact Voltage input: Via high and low signal voltages (key protection is no-voltage input only)	
Control outputs	SPST-NO contact or transistor (NPN open collector) output	1 stage model: SPST-NO contact or transistor (NPN open collector) output 2 stage model: 2 stages of SPST-NO contact or transistor (NPN open collector) output	
Display	LCD	LCD with backlight	
Digits	6 digits (0 to 999,999), 4 digits (0 to 9,999)		5 digits negative and 6 digits positive (-99,999 to 999,999)
Memory backup	Backup time for power interruption: Approx. 10 years at 20_C		

*Refer to timing charts for input and output mode operation.

H7CR-S/8/11

Model	H7CR-SA/SA4 (Basic type)	H7CR-SB/SB4 (Standard type)	H7CR-SC (±Range type)	H7CR-8/84 (Standard type)	H7CR-11/114 (Standard type)
Classification	Digital preset counter				
Mounting method	Flush mounting			Flush mounting, surface mounting	
External connections	Screw terminals			Socket	
Enclosure ratings	IP54 (panel surface)				
EMC standards	Conforms to EN50081-2, prEN50082-2				
Input modes*	Up (incrementing), Down (decrementing), and reversible (Up/Down) Up/Down A (command inputs), Up/Down B (individual inputs), Up/Down C (phase difference inputs)		Reversible Up/Down A (command inputs), Up/Down B (individual inputs), Up/Down C (phase difference inputs)	Incrementing, decrementing, and reversible (Up/Down) Up/Down A (command inputs), Up/Down B (individual inputs), Up/Down C (phase difference inputs)	
Output modes*	N, F	N, F, C, R, K, P, Q, A	K, D, L, H	N, F, C, R, K, P, Q, A	
Reset system	External and manual resets	External, manual, automatic resets (internal according to C, R, P, and Q mode operation)	External and manual resets	External, manual, power supply, and automatic resets (internal according to C, R, P, and Q mode operation)	External, manual, automatic resets (internal according to C, R, P, and Q mode operation)
Prescaling function	---	Yes (0.001 to 99.999)			
Decimal point adjustment	---	Yes (Rightmost 3 digits)			
Input signals	Count and reset	Count, reset, and key protection		Count and reset	Count, reset, and key protection
Input method	No-voltage input: Via opening and closing of contact				
Control outputs	SPST-NO contact or transistor (NPN open collector) output	1 stage model: SPST-NO contact or transistor (NPN open collector) output 2 stage model: DPST-NO contact or transistor (NPN open collector) output		SPST-NO contact or transistor (NPN open collector) output	SPDT-NO contact or transistor (NPN open collector) output
Display	LCD with backlight				
Digits	6 digits (0 to 999,999) 4 digits (0 to 9,999)		5 digits negative and 6 digits positive (-99,999 to 999,999)	6 digits (0 to 999,999) 4 digits (0 to 9,999)	
Memory backup	Backup time for power interruption: Approx. 10 years at 20_C				

■ Ratings

H7CR-A/B/C

Model	H7CR-A/A4 (Basic type)	H7CR-B/B4 (Standard type)	H7CR-C/C4 (±Range type)
Rated supply voltage	100 to 120 VAC/200 to 240 VAC, 50/60 Hz, 24 VAC	100 to 240 VAC, 50/60 Hz, 24 VAC/12 to 24 VDC (ripple: 20% max.)	
Operating voltage range	85% to 110% of rated voltage		
Current consumption	Approx. 6.0 VA (at 50 Hz, 240 VAC); approx. 1.3 VA (at 25 VAC) *	Approx. 6.6 VA (at 50 Hz, 240 VAC); approx. 3.2 W (at 24 VDC)**	
Max. counting speeds	30/1k/5kcps (same setting for CP1 and CP2)		
Reset	Min. pulse width for external reset: 20 ms, manual reset	Min. pulse width for external reset: 1 or 20 ms, manual reset	
Key protection	---	Response time: 1 s	
One-shot time	---	10, 50, 100, 200, and 500 ms (separate setting for stages 1 and 2)	
Count, reset inputs	No-voltage input ON impedance: 1 kΩ max. (Approx. 2 mA when 0 Ω) ON residual voltage: 2 V max. OFF impedance: 100 kΩ max. Voltage input (input resistance: approx. 4.7 kΩ) High level: 4.5 to 30 VDC Low level: 0 to 2 VDC		
Key protection input	---	No-voltage input ON impedance: 1 kΩ max. (Approx. 2 mA when 0 Ω) ON residual voltage: 1 V max. OFF impedance: 100 kΩ min.	
Control outputs	Contacts: 3 A at 250 VAC, resistance load (cos ϕ = 1) Transistor output: Open collector 100mA at 30 VDC max. residual voltage 2 V max. (Approx. 1 V)		
External power supply	---	100 mA, 12 VDC ±10% (5% ripple max.) 50 mA, 24 VDC ±10% (5% ripple max.)	

*When power is turned ON, approx. 2 A (24 VAC) inrush current flows for about 2 ms.
**When power is turned ON, approx. 5 A (240 VAC), 8 A (24 VDC, 24 VAC) inrush current flows for about 2 ms.

H7CR-S/8/11

Model	H7CR-SA/SA4 (Basic type)	H7CR-SB/SB4 (Standard type)	H7CR-SC (±Range type)	H7CR-8/84 (Standard type)	H7CR-11/114 (Standard type)
Rated supply voltage	12 to 24 VDC (contains 20% ripple max.)			100 to 240 VAC, 50/60 Hz, 24 VAC/12 to 24 VDC (ripple: 20% max.)	
Operating voltage range	85% to 110% of rated voltage				
Current consumption	Approx. 1.3 W (at 24 VDC) *			Approx. 2.8 VA (at 50 Hz, 240 VAC) * approx. 1.3 W (at 24 VDC) **	
Max. counting speeds (CP1, CP2 count input)	30/1k/5kcps (same setting for CP1 and CP2)				
Reset	Min. pulse width for external reset: 20 ms manual reset	Min. pulse width for external reset: 1 or 20 ms manual reset		Min. pulse width for external reset: 1 or 20 ms, manual reset, power reset: 0.5 s	Min. pulse width for external reset: 1 or 20 ms manual reset
Key protection	---	Response time: approx. 1 s			
One-shot time	---	10, 50, 100, 200, and 500 ms (separate setting for stages 1 and 2)		10, 50, 100, 200, and 500 ms	
Count, reset inputs	No-voltage input ON impedance: 1 kΩ max. (Approx. 2 mA when 0 Ω) ON residual voltage: 2 V max. OFF impedance: 100 kΩ max.				
Key protection input	---	No-voltage input ON impedance: 1 kΩ max. (Approx. 2 mA when 0 Ω) ON residual voltage: 1 V max. OFF impedance: 100 kΩ min.		---	No-voltage input ON impedance: 1 kΩ max. (Approx. 2 mA when 0 Ω) ON residual voltage: 1 V max. OFF impedance: 100 kΩ min.
Control outputs	Contacts: 3 A at 250 VAC, resistance load (cos ϕ= 1) Transistor output: Open collector 100mA at 30 VDC max. residual voltage 2 V max. (Approx. 1 V)				

*When power is turned ON, approx. 5 A (24 VDC, 240 VAC) inrush current flows for about 2 ms.

**When power is turned ON, approx. 8 A (24 VDC, 24 VAC) inrush current flows for about 2 ms.

■ Characteristics

Insulation resistance	100 MΩ min. (at 500 VDC) (between current-carrying terminal and exposed non-current-carrying metal parts, and between non-continuous contacts)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min (between current-carrying terminal and exposed non-current-carrying metal parts) for 100 to 240 VAC type 1,000 VAC for 24VAC/12 to 24 VDC type and for transistor output type
Impulse withstand voltage	3 kV (between power terminals) for 100 to 240 VAC type, 1 kV for 24 VAC/12 to 24 VDC 4.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts for 100 to 240 VAC type, 1.5 kV for 24 VAC/12 to 24 VDC.
Noise immunity	±2 kV (between power terminals) and ±600 V (between input terminals), square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise) ±480 V (between power terminals) for H7CR-S type
Static immunity	Destruction: 15 kV Malfunction: 8 kV
Vibration resistance	Destruction: 10 to 55 Hz with 0.75-mm single amplitude each in three directions Malfunction: 10 to 55 Hz with 0.5-mm single amplitude each in three directions
Shock resistance	Destruction: 300 m/s^2 (Approx. 30G) each in three directions. Malfunction: 100 m/s^2 (Approx. 10G) each in three directions.
Life expectancy	Mechanical: 10 million operations min. Electrical: 100,000 operations min. 5A at 250 VAC in load resistance
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85%
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kVcontact discharge 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line 2 kV I/O signal-line
Case color	Light gray (Munsell 5Y7/1)
Weight	H7CR-A/A4 (AC type): approx. 230 g; H7CR-B/B4/C: approx. 170 g H7CR-S/S4: approx. 120 g; H7CR-8/84/11/114: approx. 150 g

■ I/O Functions

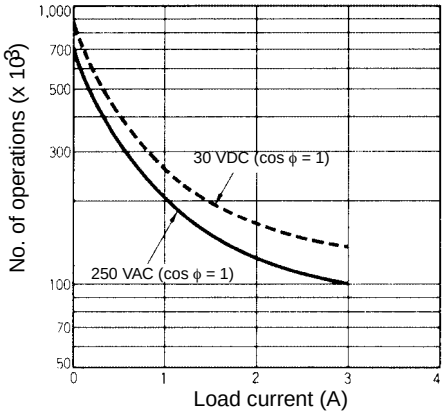
Inputs	**CP1/CP2**	Count signal inputs. Up, Down, and Up/Down (command, individual, or phase difference) inputs accepted.
	Reset	Resets present value. (to zero in Up modes, to preset with 1-stage models in Down mode, and to preset with 2-stage models.) Count inputs are not accepted while reset input is ON. Reset indicator lit while reset input is ON.
	Key protection (See note)	Makes keys inoperative according to key protection level. Key protection indicator lit while key protection input is ON. Effective when power supply is turned off. Effective when protect terminals are shorted.
Outputs	**OUT 1.2**	Outputs made according to designated output mode when corresponding preset is reached.

Note: Not set for the Basic type and H7CR-8.

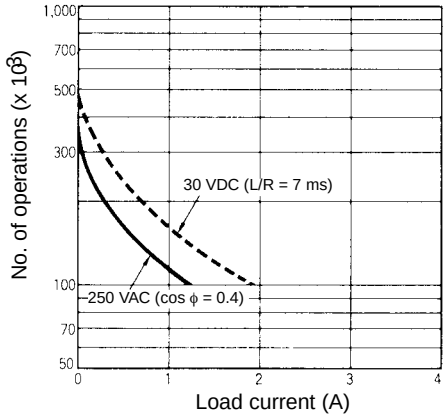
Engineering Data

■ Life Expectancy of Contacts

Electrical Life Expectancy (Resistive Load)



Electrical Life Expectancy (Inductive Load)

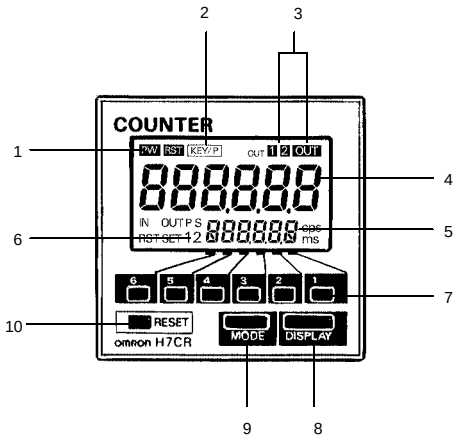


Reference: A current of 0.15 A max. can be switched at 125 VDC (cos ϕ =1) and a current of 0.1 A max. can be switched if L/R = 7 ms. In both cases, a life of 100,000 operations can be expected.

Nomenclature

Indicator

1. Power indicator
2. Key protection indicator
3. Control output indicator
   OUT: 1 stage
   OUT1, OUT2: 2 stages
4. Present value
   (character height: 8 mm)
   (Zeroes suppressed)
5. Set value
   (character height: 4 mm)
   (Indicates data in function setting mode)
6. Set value 1,2 stage indicator.

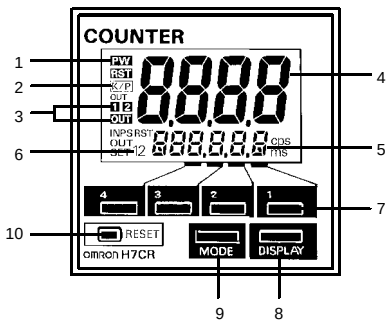


Operation Key

7. Increment Keys (1 to 6)
   (Used to change the corresponding digit of the set value. Increment Key (6) of H7CR-C/SC also can be switching for ±code. Used to change data in the function setting mode.)
8. Display Key
   (Switches to the setting displays. For 2 stage model, switch set value 1,2.)
9. Mode Key
   (Switches from run mode to function setting mode. Changes items in the function setting mode.
10. Reset Key
    (Resets present value and outputs.)

Indicator

1. Power indicator
2. Key protection indicator
3. Control output indicator
   OUT: 1 stage
   OUT1, OUT2: 2 stages
4. Present value
   (character height: 12 mm)
   (Leading zeros suppressed)
5. Set value
   (character height: 4.5 mm)
   (Indicates value in function Setting Mode)
6. Set value stage 1 and 2 indicators.



Operation Key

7. Increment Keys (1 to 4)
   (Used to change the corresponding digit of the set value. Used to change data in the function Setting Mode.)
8. Display Key
   (Switches to the setting displays. For 2-stage models, switches set value 1 and 2.)
9. Mode Key
   (Switches from Run Mode to Setting Mode. Changes items in the Setting Mode.
10. Reset Key
    (Resets present value and outputs.)

Operation

■ Factory Settings

The following table shows the timer settings when it is shipped. Please change the settings as necessary to suit the system before operation. Settings and the display receive power from the internal battery and are therefore unaffected by external power interruptions.

H7CR-A/B/C

Model	H7CR-A/A4 (Basic type)	H7CR-B/B4 (Standard type)	H7CR-C (±Range type)
Present value	0	0	0
Presets	0	0	0
Input mode	Up	Up	Up/Down C (phase difference)
Output mode	N	N	K
Output 2 time	(HOLD)	(HOLD)	500 ms
Output 1 time	---	HOLD	500 ms
Counting speeds	30 cps	30 cps	30 cps
Min. reset time	(20 ms)	20 ms	20 ms
Decimal point	(no fractions)	Far right (no fractions)	Far right (no fractions)
Prescale	(1,000)	1,000	1,000
Key protection level	---	KP-1	KP-1

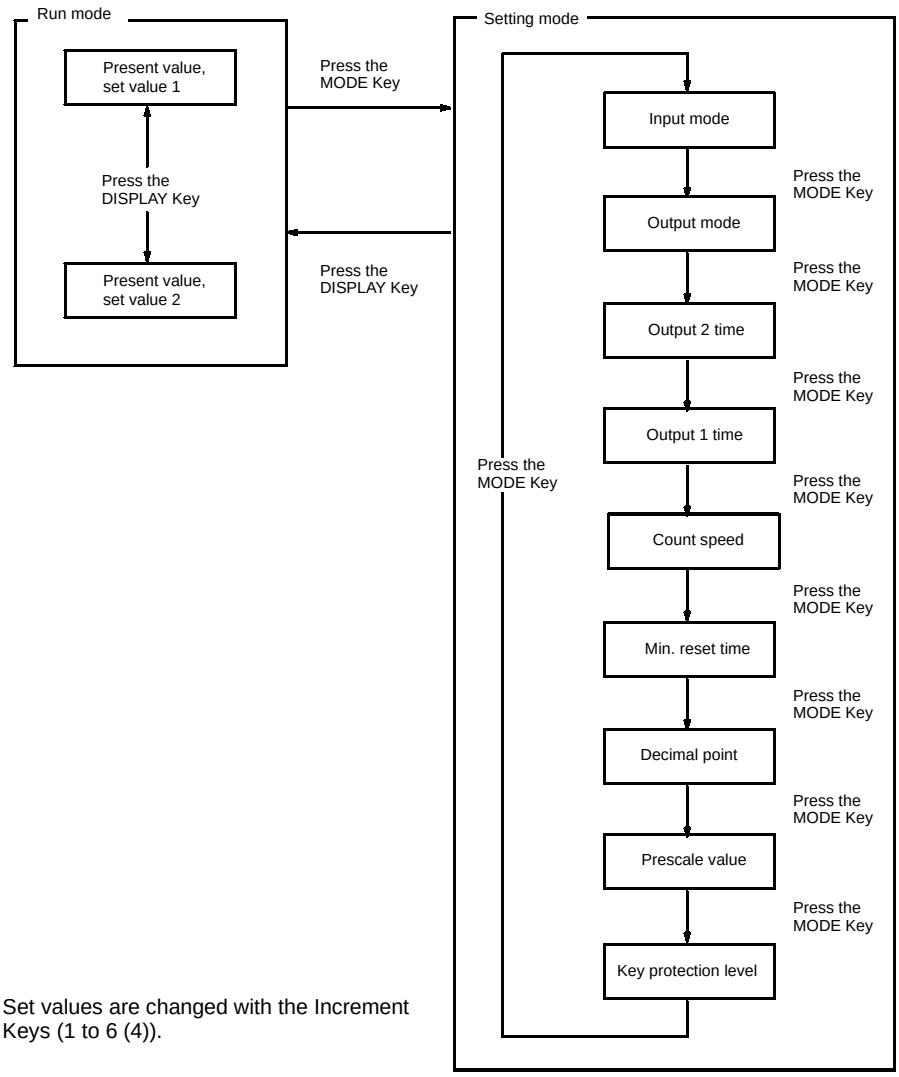
Note: With the initial settings, there will be no output even if the power supply is connected. External inputs and outputs cannot be used without a power supply.

H7CR-S/8/11

Model	H7CR-SA/SA4 (Basic type)	H7CR-SB/SB4 (Standard type)	H7CR-SC (±Range type)	H7CR-8/11/84/114 (Standard type)
Present value	0	0	0	0
Presets	0	0	0	0
Input mode	Up	Up	Up/Down C (phase difference)	Up
Output mode	N	N	K	N
Output 2 time	(HOLD)	(HOLD)	500 ms	(HOLD)
Output 1 time	---	HOLD	500 ms	---
Counting speeds	30 cps	30 cps	30 cps	30 cps
Min. reset time	(20 ms)	20 ms	20 ms	20 ms
Decimal point	(no fractions)	Far right (no fractions)	Far right (no fractions)	Far right (no fractions)
Prescale	(1,000)	1,000	1,000	1,000
Key protection level	---	KP-1	KP-1	KP-1 (H7CR-11 only)

Note: With the initial settings, there will be no output even if the power supply is connected. External inputs and outputs cannot be used without a power supply.

■ Operational Overview



Note: Set values are changed with the Increment Keys (1 to 6 (4)).

■ Setting Item Table

Mode	Setting item	Applicable model H7CR					Description	Setting procedure
		-A/ A4/ SA/ SA4	-B/ B4/ SB/ SB4	-C/ SC	-8 /84	-11/ 114		
Run mode	Set value 1, 2	No	Yes	Yes	No	No	Compared to the present value. Determines the timing of the control output according to the output mode. The DISPLAY Key switches between set value 1 and 2. (2-stage model only.)	Sequence when changing a digit using the Increment Keys (1 to 6 (4)). 0 → 1 → ····· → 8 → 9 → (-) Note: (-) is H7CR-C and -SC type (Increment Key 6) only.
Function setting mode	Input mode	Yes	Yes	Yes	Yes	Yes	Determines the input mode selecting from Up, Down, Up/Down modes.	Press keys 1 to 6 (4) to change the displayed mode. u* (Up) → d* (Down) → ud-a (Up/Down A) → ud-b (Up/Down B) → ud-c (Up/Down C) *No input mode for -C/SC type.

Mode	Setting item	Applicable model H7CR					Description	Setting procedure
		-A/ A4/ SA/ SA4	-B/ B4/ SB/ SB4	-C/ SC	-8 /84	-11/ 114		
Function setting mode	Output mode	Yes	Yes	Yes	Yes	Yes	Determines the form of the control output. (Refer to the present value vs. output diagrams on pages 93 to 95.) Determines the output time for control output (Output 2).	Press keys 1 to 6 (4) to change the displayed mode. H7CR-A/SA n (N) → f (F) H7CR-B/SB/8/11 n (N) → f (F) → c (C) → R (R) → K (K) → p (P) → Q (Q) → a (A) H7CR-C/SC K (K) → d (D) → l (L) → h* (H) 2-stage model only. Press keys 1 to 6 (4) to change the Output 2 time. (Applicable to output modes C, R, K, P, Q, and A only. 10ms → 50ms → 100ms → 200ms → 500ms
	Output time 1 (2-stage model only)	No	Yes	Yes	No	No	Determines the output time of the control output (OUT 1) for 2-stage model counters.	Press keys 1 to 6 (4) to change the displayed mode. 10ms → 50ms → 100ms → 200ms → 500ms → hold* *H7CR-BW/SBW only.
	Count speed	Yes	Yes	Yes	Yes	Yes	Switches the count input filter to protect against errant counts due to interference.	Press keys 1 to 6 (4) to change the displayed mode. 30 (30cps) → 1K (1kcps) → sK (5kcps)
	Min. reset time	No	Yes	Yes	Yes	Yes	Determines the initial signal width of the external reset.	Press keys 1 to 6 (4) to change the displayed mode. (1 ms) 1 ⟷ 20 (20 ms)
	Decimal point	No	Yes	Yes	Yes	Yes	Determines the decimal point position of the present and set values.	Move the decimal point position from left to right with keys, 1 to 6 (4).
	Prescale value	No	Yes	Yes	Yes	Yes	Can calculate and display a physical parameter (volume, length, etc.) from the present value. For example, if one count input represented a movement of 0.02 mm, the prescale value would be 0.02. Values from 0.001 to 99.999 are possible.	Change the value of the digits with the corresponding keys, 1 to 6 (4). 0 → 1 → 2 → ····· → 8 → 9 5 4 3 2 1
	Key protection level	No	Yes	Yes	No	Yes	Locks certain keys to prevent accidental operation. The key protection level, kP-1 to kP-4, determines which keys are locked when the key protection input is ON. The locked keys are crossed out in the diagram on the right.	Sequence when changing the key protection level using the Increment Keys (1 to 6 (4)). Kp-1 → Kp-2 → Kp-3 → Kp-4 <KP-1> <KP-2> <KP-3> <KP-4>

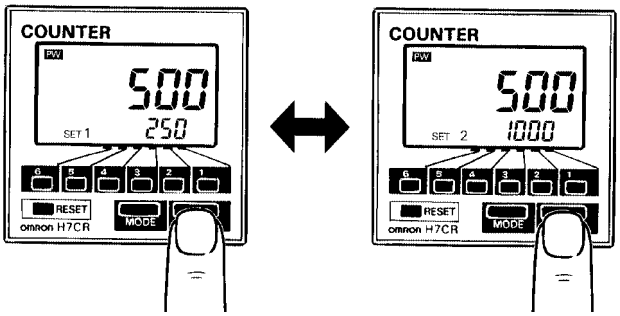
Note: Settings changed in setting mode are not effective until run mode is entered.

■ Examples

Run Mode

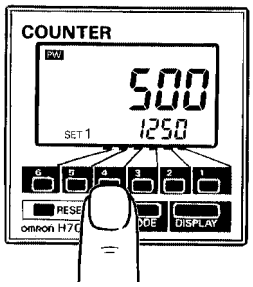
Changing the Set Value

1. Press the DISPLAY Key to change the displayed preset value 1 and 2 during operation.



2. Change the set value from 250 to 1,250.

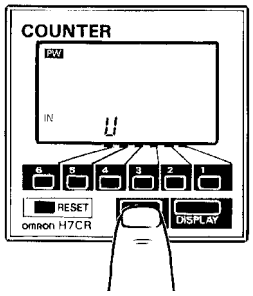
- Pressing keys 1 through 6 (1 through 4 for 4-digit models) increments the corresponding column by1.
- Non-significant zeros are normally not shown on the set value display.



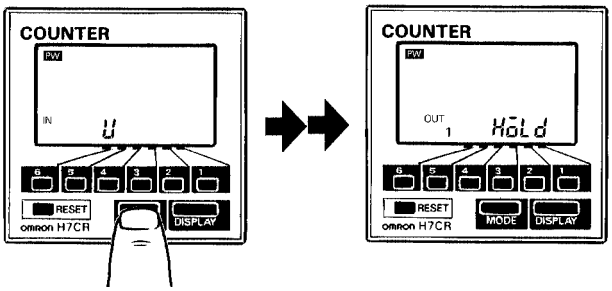
Setting Mode

Changing Settings in the Function Setting Mode

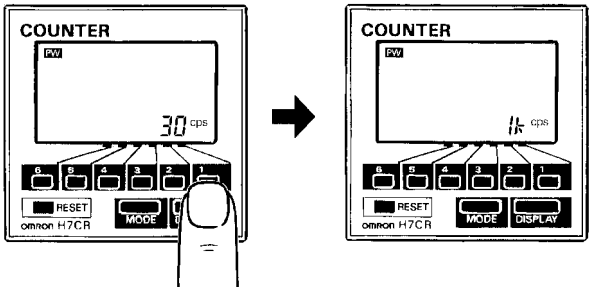
1. Press the MODE Key to switch from run mode to setting mode.
   - The Counter will continue operation if switched from run mode to function setting mode during operation.
   - The MODE Key will be locked if the key protection function is enabled.
   - Settings changed in the function setting mode are not effective until run mode is entered. As the operating conditions will change in this case, always reset operation with the RESET Key or a reset input.



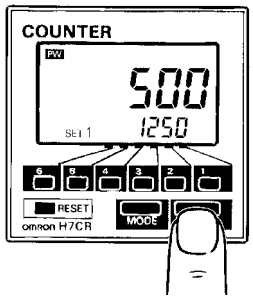
2. Press the MODE Key to scroll successively through the items that can be set. Release the MODE Key to select the desired item.



3. Changing the selected item
   - Press the MODE Key until the desired item appears
   - Change the item setting by pressing keys 1 through 6 (1 through 4 for 4-digit models). (Press the DISPLAY Key to switch back from function setting mode to run mode.)

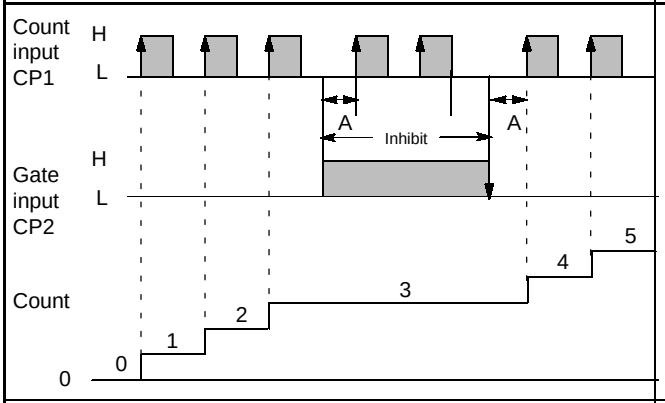


   - Press the DISPLAY Key to return to Run mode from Setting mode.

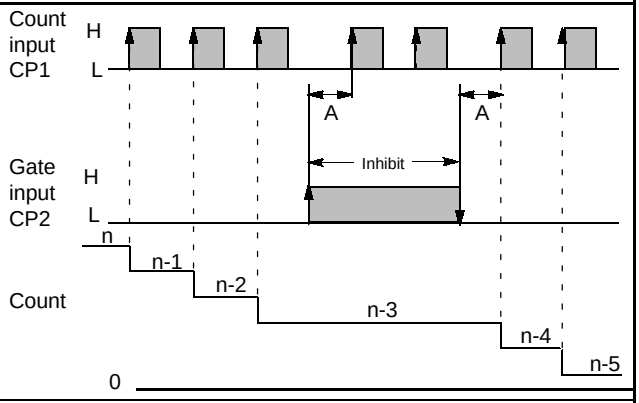


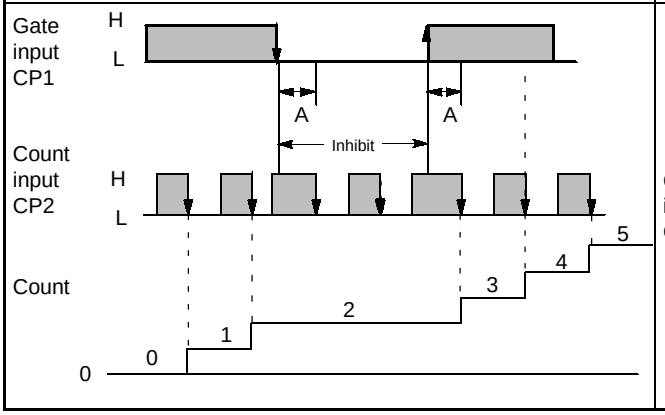
■ Input Modes and Count Value

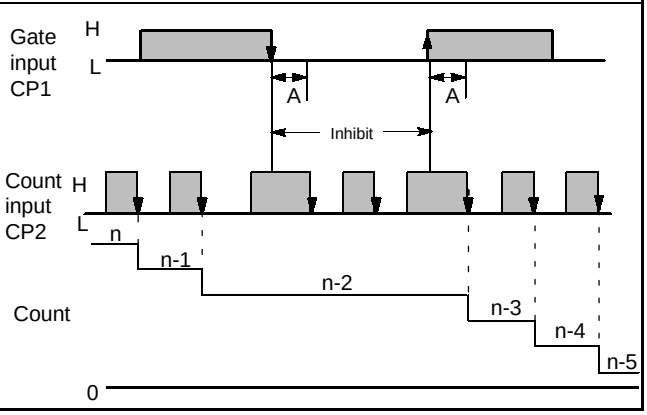
Up (increment) mode



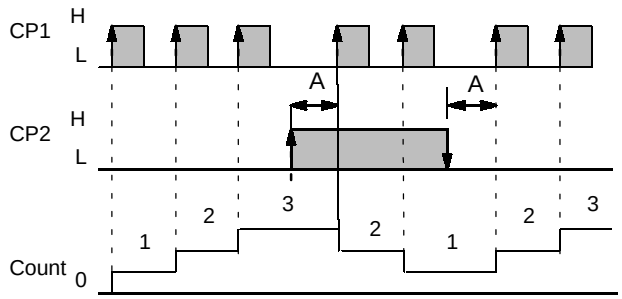
Down (decrement) mode



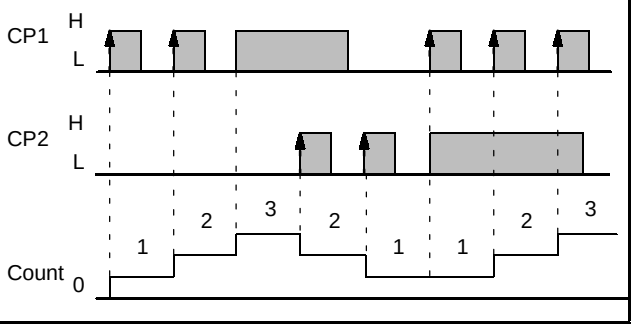




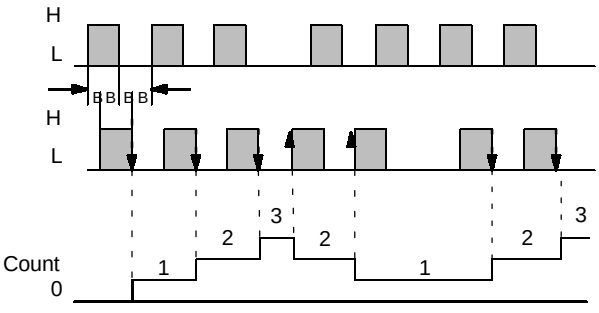
Up/Down A Command input mode



Up/Down B Individual input mode



Up/Down C Phase difference input mode



Note 1 A: Minimum signal width; B: Must be at least 1/2 of minimum signal width. Signals may not be counted if the minimums for A and B are not met.

Note 2 Set the same counting speed for CP1 and CP2 when in Up/Down C mode.

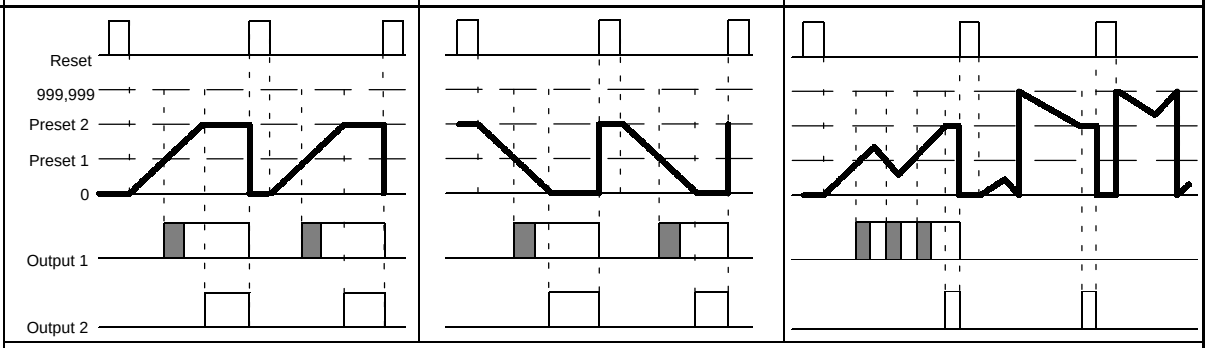
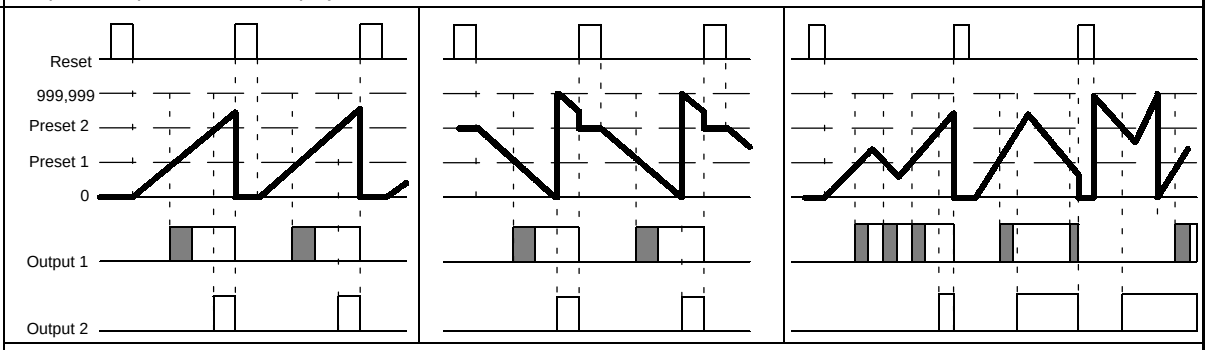
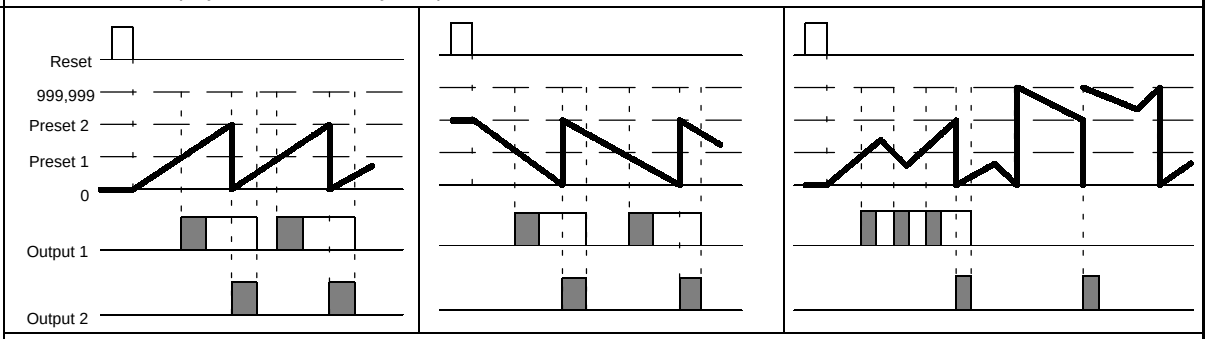
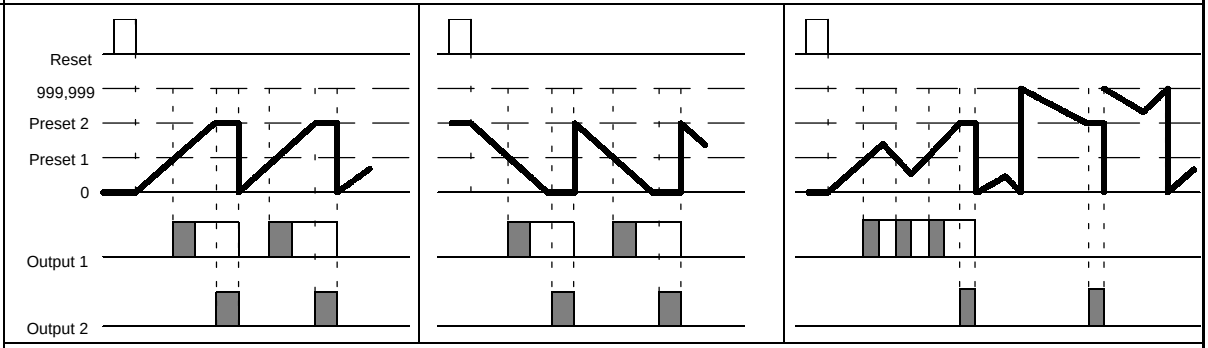
Note 3 H and L

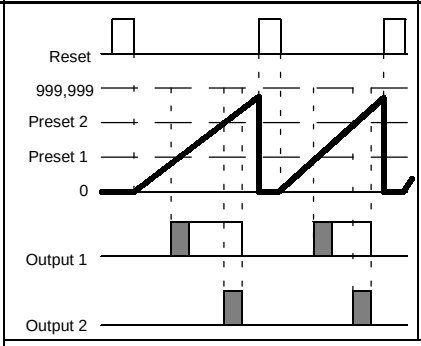
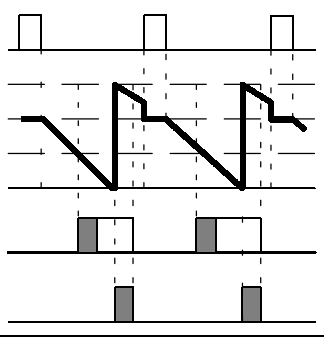
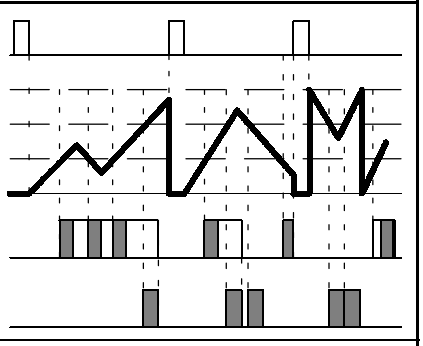
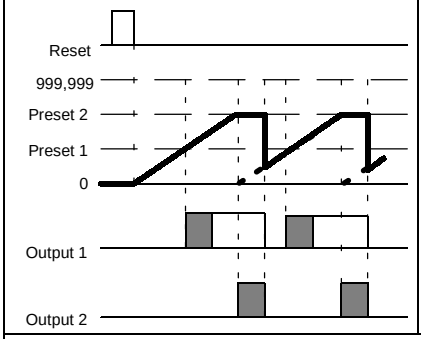
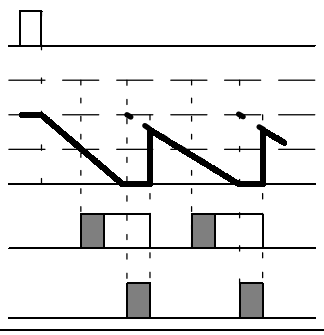
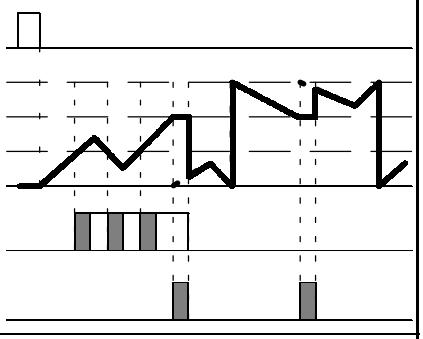
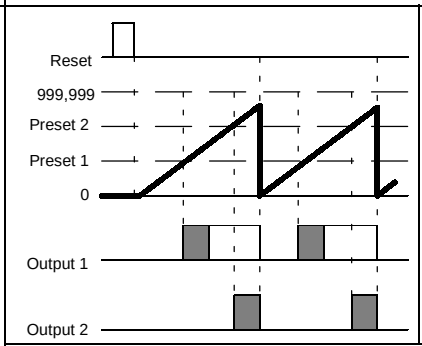
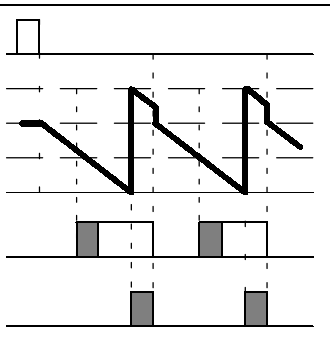
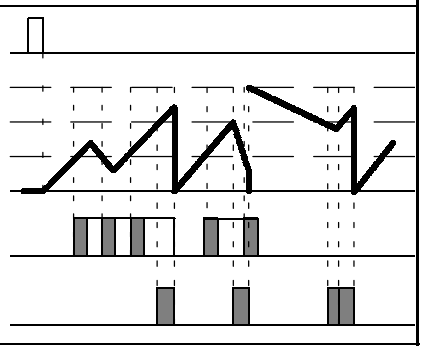
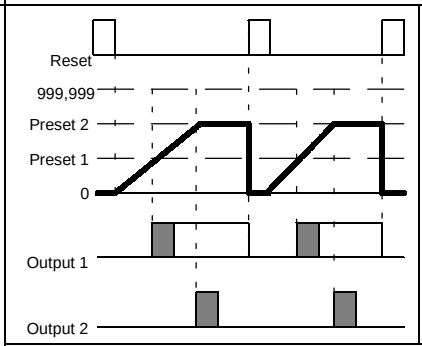
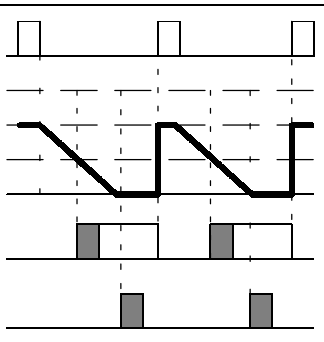
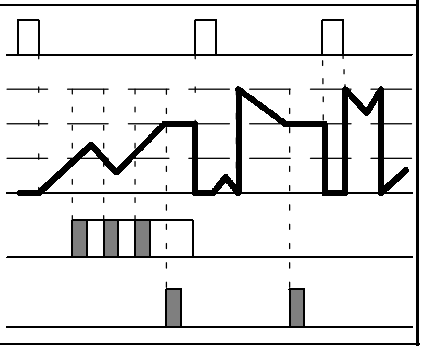
Signal	No-voltage input	Voltage input
H	Short circuit	4.5 to 30 VDC
L	Open circuit	0 to 2 VDC

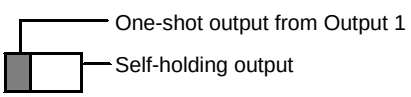
■ Input/Output Mode Setting

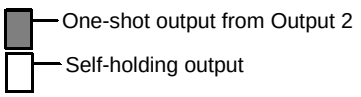
H7CR-A/A4/B/B4/SA/SA4/SB/SB4/8/84/11/114 (N and R modes only apply to the -A and -SA types.)

Output 2 operation applies for 1-stage models only.

<table>
<tr><th>Output mode</th><th colspan="3">Input mode</th></tr>
<tr><th></th><th>Up</th><th>Down</th><th>Up/Down A.B.C</th></tr>
<tr><td>N</td><td colspan="3"> 
</td></tr>
<tr><td></td><td colspan="3">Outputs and present value display are maintained until reset.</td></tr>
<tr><td>F</td><td colspan="3"> 
</td></tr>
<tr><td></td><td colspan="3">Present value display runs continuously. Outputs are maintained until reset.</td></tr>
<tr><td>C</td><td colspan="3"> 
</td></tr>
<tr><td></td><td colspan="3">Present value is placed in reset start status as soon as count up is reached. The count up is not displayed. Outputs are 1-shot and operate repeatedly. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.</td></tr>
<tr><td>R</td><td colspan="3"> 
</td></tr>
<tr><td></td><td colspan="3">Present value is placed in reset start status as soon as count up is reached. Outputs are 1-shot and operate repeatedly. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.</td></tr>
</table>

Output mode	Input mode		
	Up	Down	Up/Down A.B.C
K			
	Present value runs continuously. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.		
P			
	Present value display does not change during 1-shot time period, but reset start status is returned to as soon as count is reached. Outputs are 1-shot and operate repeatedly. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.		
Q			
	Present value runs continuously through 1-shot time period and returns to reset start status immediately afterward. Outputs are 1-shot and operate repeatedly. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.		
A			
	Present value and output 1 maintain status until reset. Output 1 and 2 operate independently.		

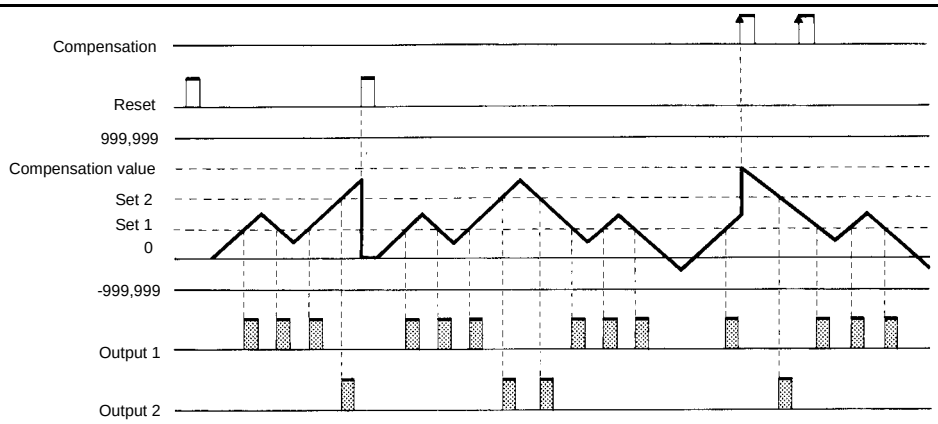
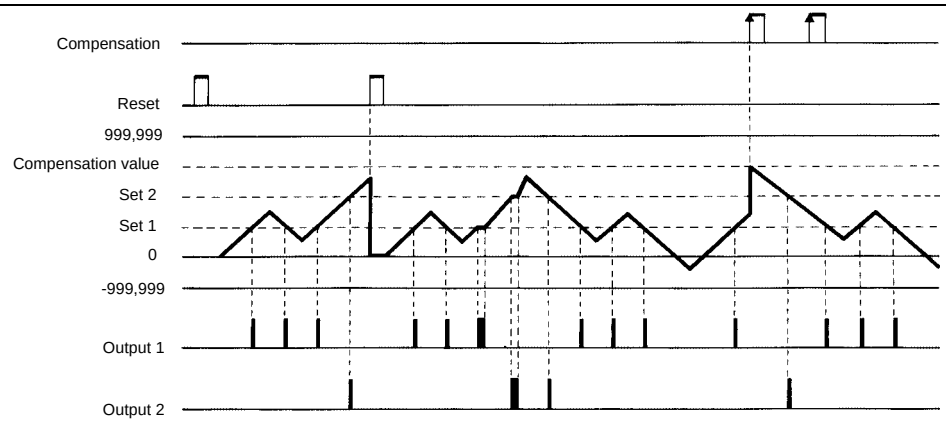
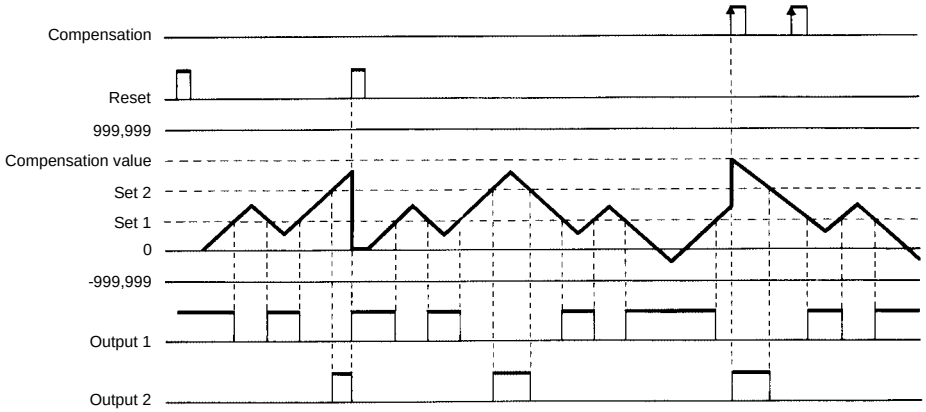
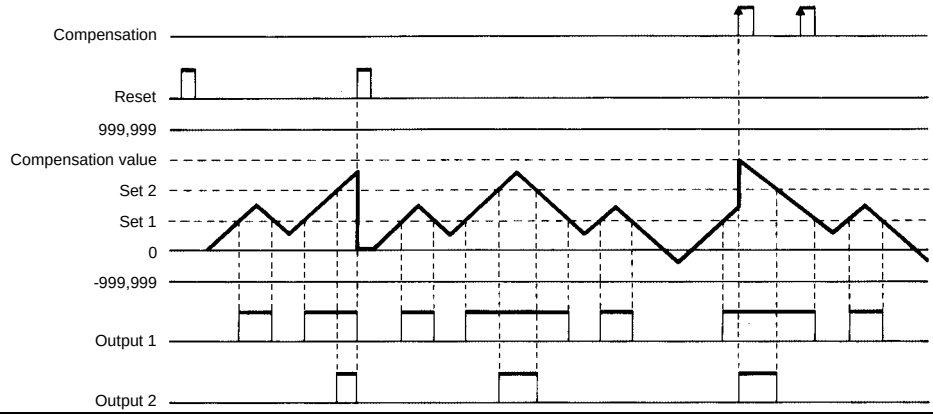


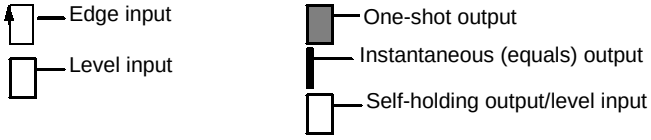


One-shot outputs can be set to between 10 and 500 ms.

H7CR-C/SC

Output 2 operation applies for 1-stage models only.

Output mode	Input mode Up/Down A.B.C	Operation after count up
K		Present value increments and decrements within displayable range. Outputs go ON for one-shot.
D		Present value increments and decrements within displayable range. Outputs are ON during the count is equal.
L		Present value increments and decrements within displayable range. Output 1 is ON whenever present value is less than or equal to Set 1; Output 2 is ON whenever present value is greater than or equal to Set 2.
H		Present value increments and decrements within displayable range. Output 1 is ON whenever present value is greater than or equal to Set 1; Output 2 is ON whenever present value is greater than or equal to Set 2.



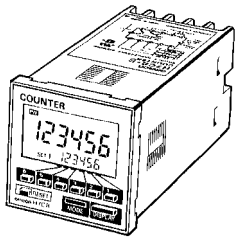
One-shot outputs can be set to between 10 and 500 ms.

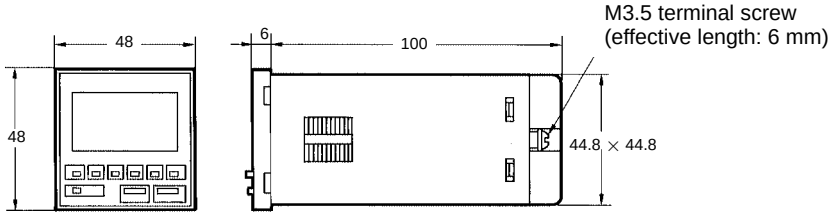
Note: 1. Counting inputs are not applied while the reset input is ON.
2. One-shot outputs, when ON, are turned OFF when the reset input goes ON.
3. One-shot outputs, when ON, are reset and the one-shot output is restarted if a preset designating the output is reached.

Dimensions

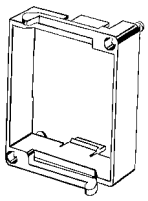
Note: All units are in millimeters unless otherwise indicated.
The dimensions are the same for both the 4-digit and 6-digit models.

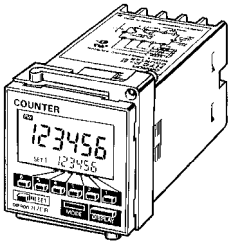
H7CR-A/B/C

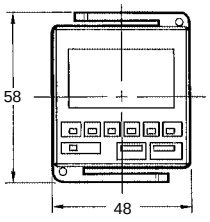


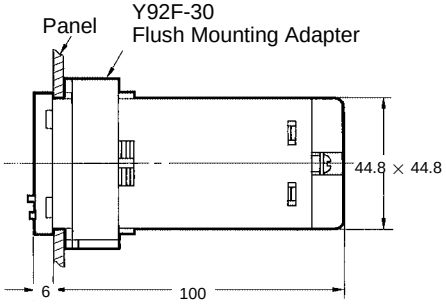


Flash Mounting Adapter



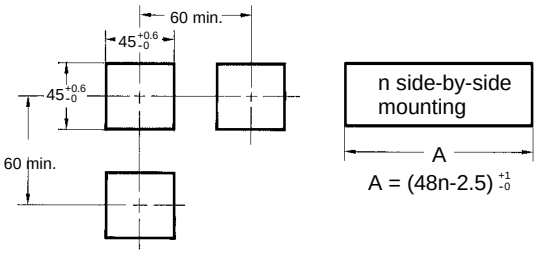






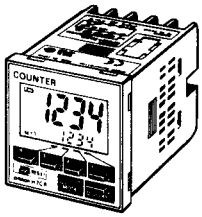
Panel Cutouts

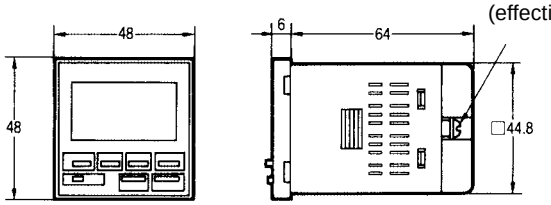
Panel cutouts are as shown at right. (according to DIN43700).



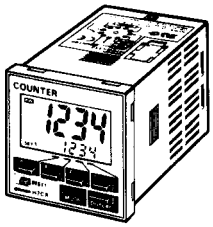
Note 1. The mounting panel thickness should be 1 to 4 mm.
2. It is possible to mount Counters side by side, but one way only.

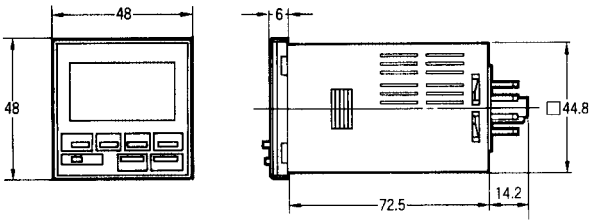
H7CR-S (Short Body)





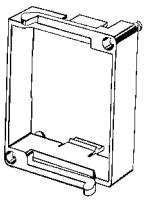
H7CR-8/11

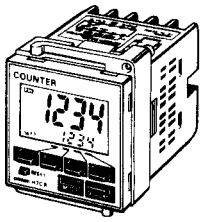


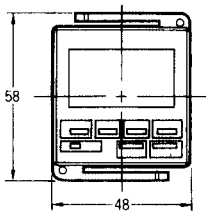


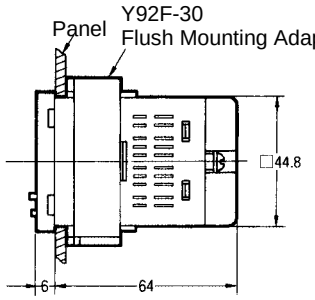
Flash Mounting Adapter

H7CR-S

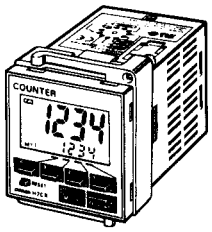


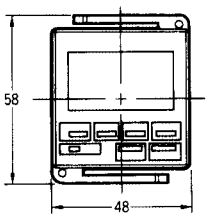


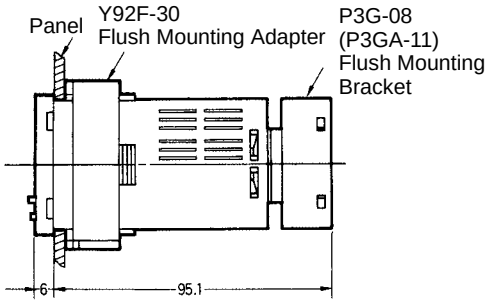




H7CR-8/11

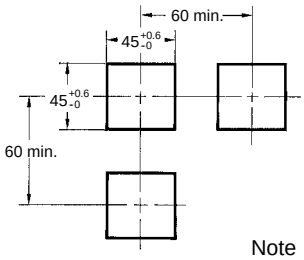


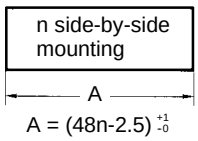




Panel Cutouts

Panel cutouts are as shown at right. (according to DIN43700).

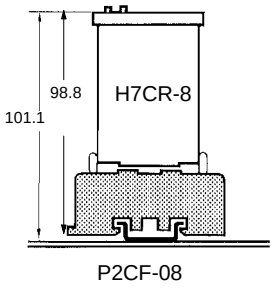




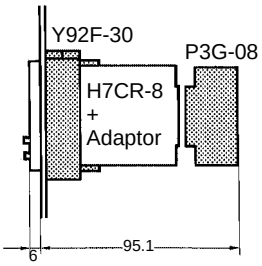
Note 1. The mounting panel thickness should be 1 to 4 mm.
2. It is possible to mount Counters side by side, but only horizontally.

H7CR-8/11 Mounting Styles

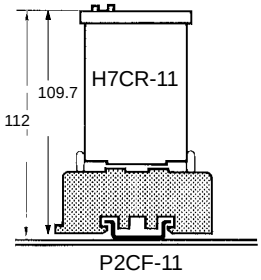
Surface Mounting



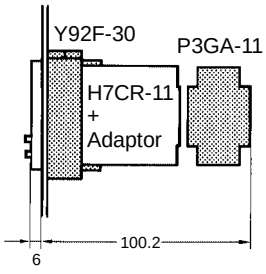
Flush Mounting



Surface Mounting



Flush Mounting



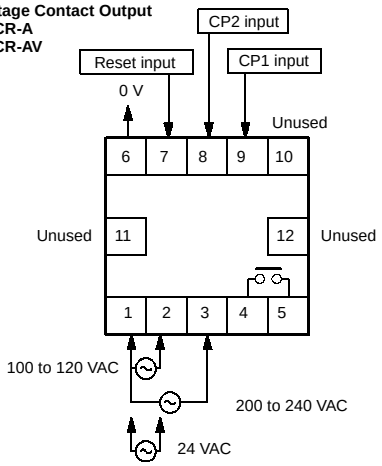
Installation

■ Terminal Arrangement

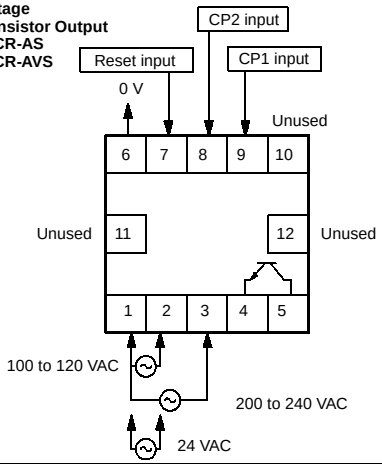
Terminal arrangements for the 4-digit models are the same as those shown below.

H7CR-A (Basic type)

1 Stage Contact Output
H7CR-A
H7CR-AV

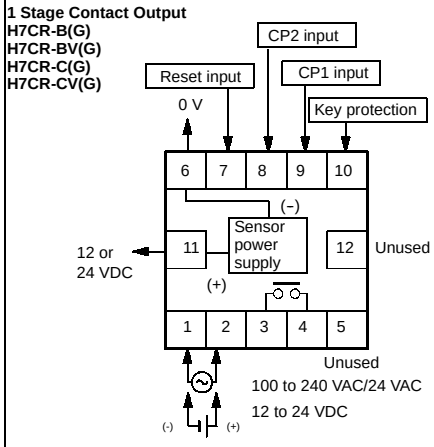


1 Stage Transistor Output
H7CR-AS
H7CR-AVS

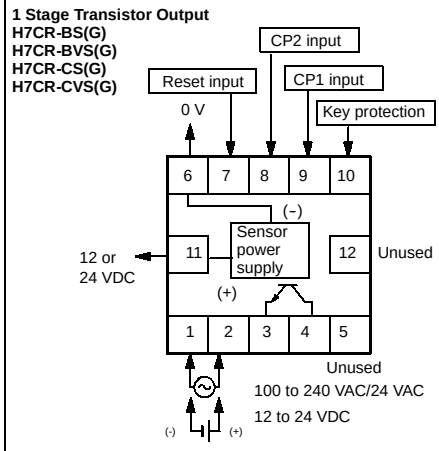


H7CR-B (Standard type), H7CR-C (±Range type)

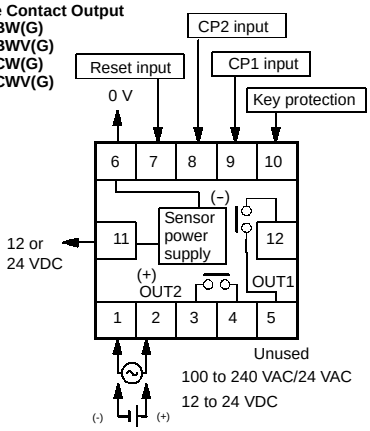
1 Stage Contact Output
H7CR-B(G)
H7CR-BV(G)
H7CR-C(G)
H7CR-CV(G)



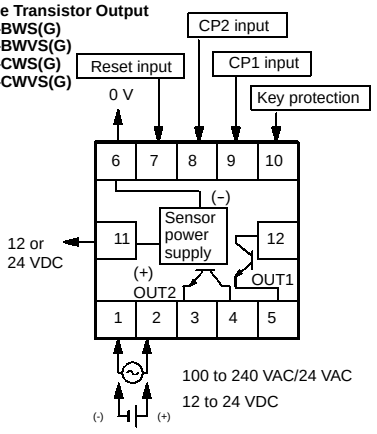
1 Stage Transistor Output
H7CR-BS(G)
H7CR-BVS(G)
H7CR-CS(G)
H7CR-CVS(G)



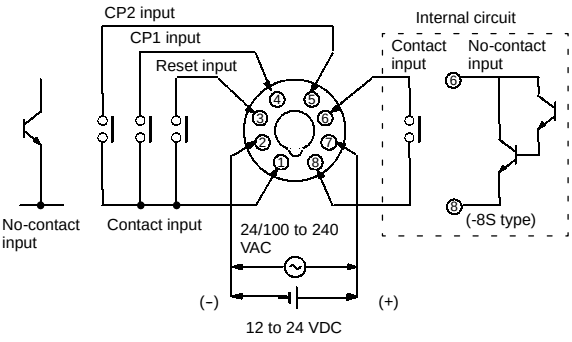
2 Stage Contact Output
H7CR-BW(G)
H7CR-BWV(G)
H7CR-CW(G)
H7CR-CWV(G)



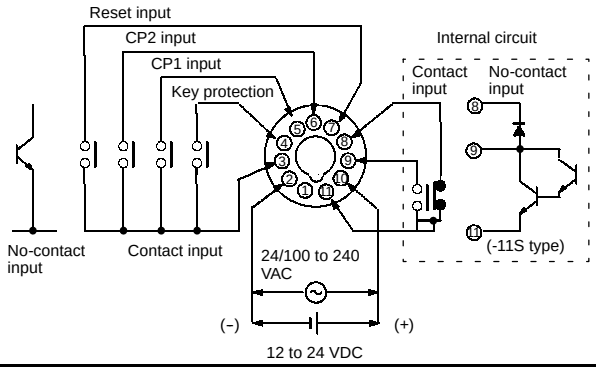
2 Stage Transistor Output
H7CR-BWS(G)
H7CR-BWVS(G)
H7CR-CWS(G)
H7CR-CWVS(G)

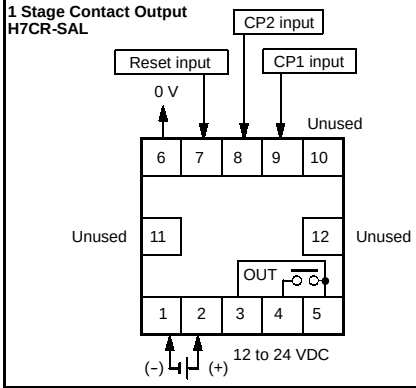
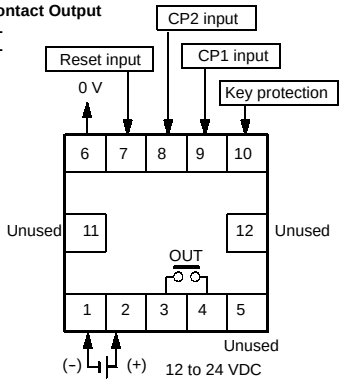
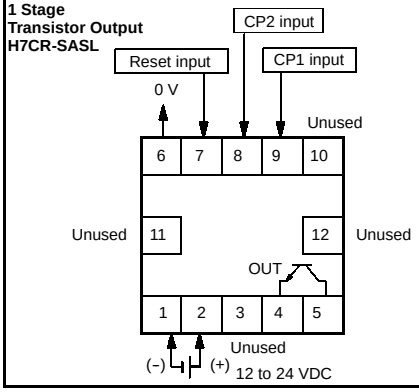
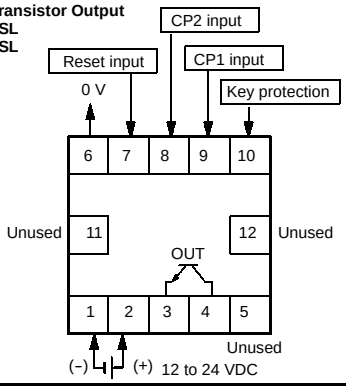
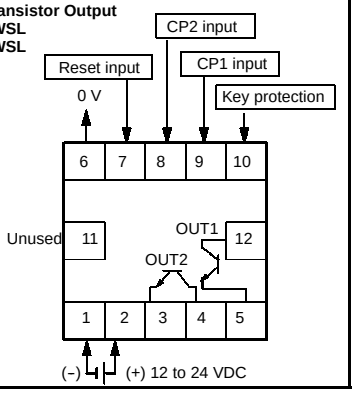


H7CR-8 (Standard type)



H7CR-11 (Standard type)



H7CR-SA (Basic type)	H7CR-SB (Standard type), H7CR-SC (±Range type)	
1 Stage Contact Output **H7CR-SAL** 	**1 Stage Contact Output** **H7CR-SBL** **H7CR-SCL** 	---
1 Stage **Transistor Output** **H7CR-SASL** 	**1 Stage Transistor Output** **H7CR-SBSL** **H7CR-SCSL** 	**2 Stage Transistor Output** **H7CR-SBWSL** **H7CR-SCWSL** 

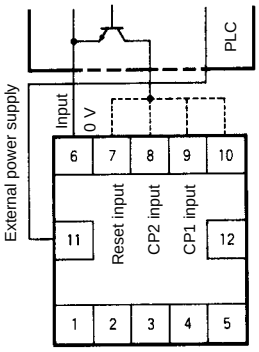
Note: Do not connect unused terminals.

■ Connections

The inputs of the H7CR are no-voltage (short circuit or open) inputs and voltage inputs. (Key protection only for no-voltage inputs)

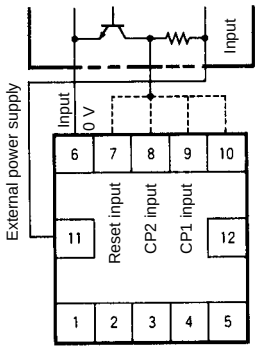
No-voltage Inputs (With an External Power Supply)

Open Collector



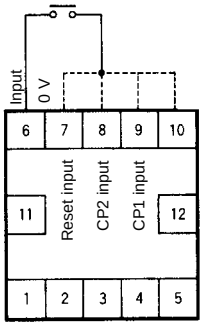
High: transistor ON

Voltage Output



High: transistor ON

Contact

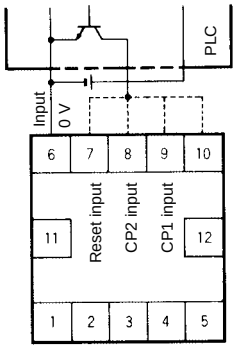


High: contact ON

Note: The DC power supply must be 30 VDC max.

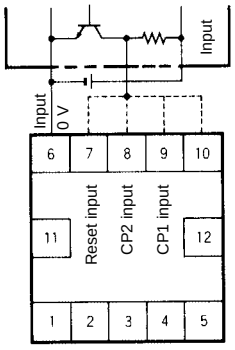
No-voltage Inputs (Without an External Power Supply)

Open Collector



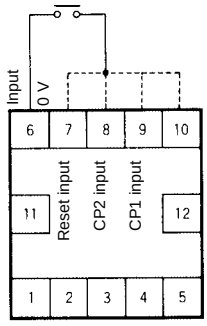
High: transistor ON

Voltage Output



High: transistor ON

Contact



High: contact ON

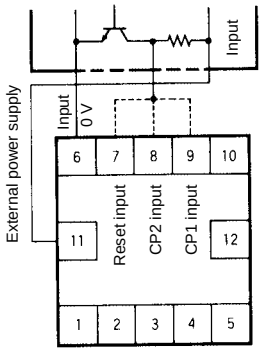
Note: The DC power supply must be 30 VDC max.

No-voltage Input Signal Levels

No-contact input	1. High level Transistor ON Residual voltage: 2 V max. Impedance when ON: 1 kΩ max.
	2. Low level Transistor OFF Impedance when OFF: 100 kΩ max.
Contact input	Use contacts which can adequately switch 2 mA at 5 V

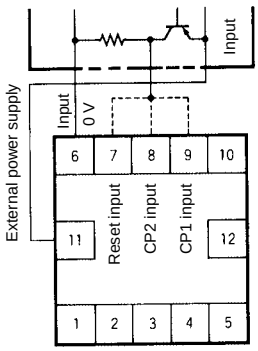
Voltage Inputs (With an External Power Supply)

NPN Transistor



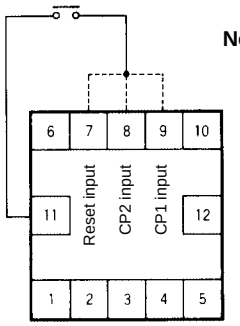
High: transistor OFF

PNP Transistor



High: transistor ON

Contact

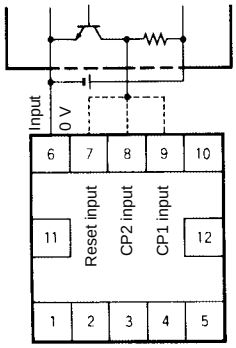


High: contact ON

Note: The DC power supply must be 30 VDC max.

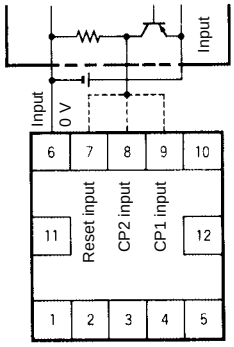
Voltage Inputs (Without an External Power Supply)

NPN Transistor



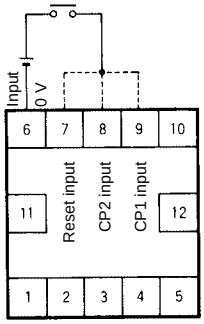
High: transistor OFF

PNP Transistor



High: transistor ON

Contact



High: contact ON

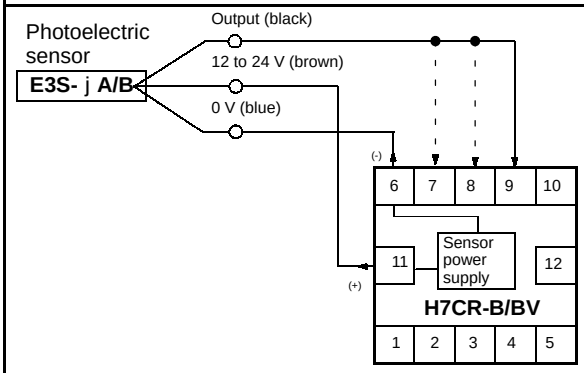
Note: The DC power supply must be 30 VDC max.

Voltage Input Signal Levels

1. High level 4.5 to 30 VDC
2. Low level 0 to 2 VDC

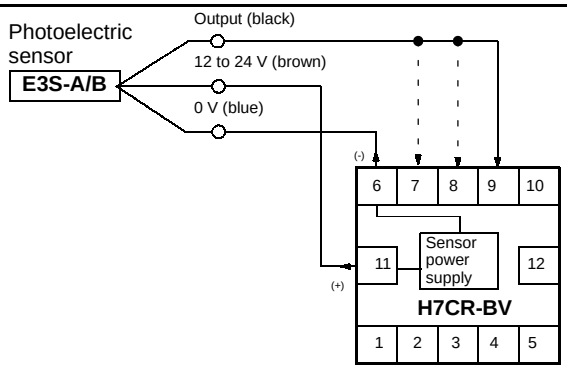
■ Connection Examples with OMRON Sensors

3-wire DC type(NPN)

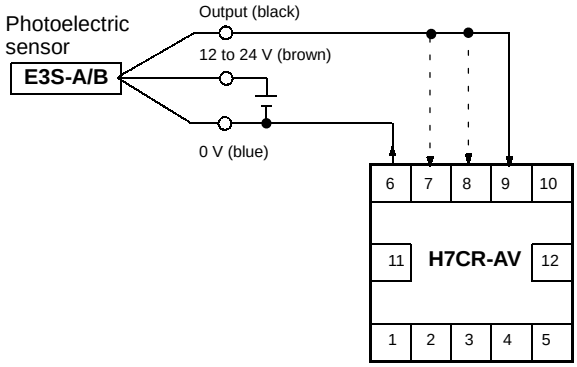


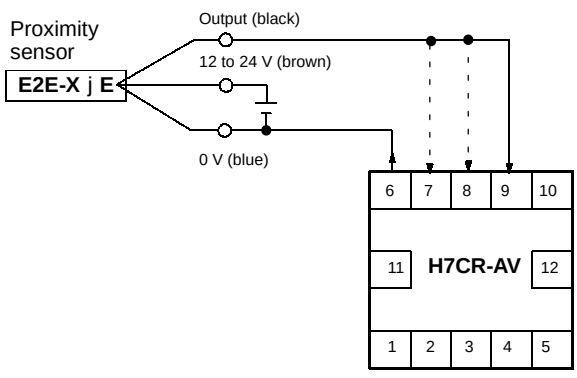
*Models ending in -BV have reversed logic.

3-wire DC type (PNP)

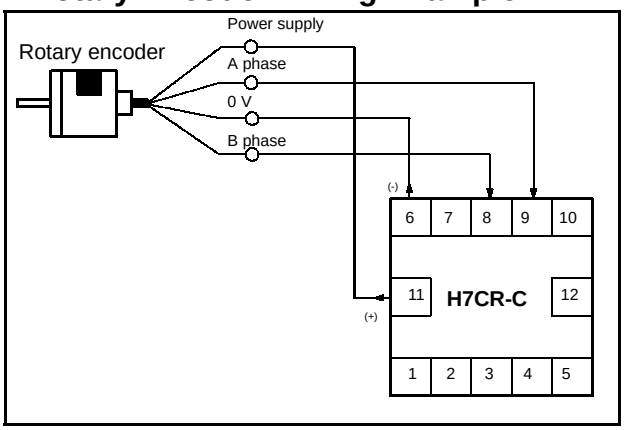


Using the external power supply





■ Rotary Encoder Wiring Example

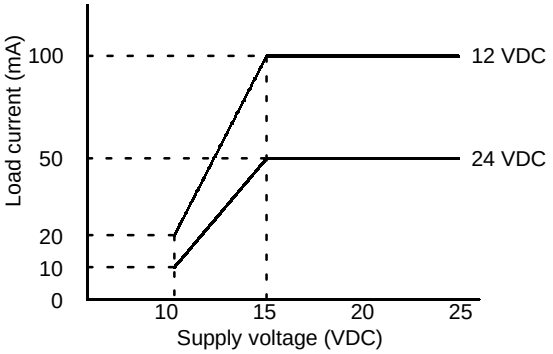


Note: Refer to page 10, *Technical Information* for the applicable Sensors and Encoders.

Precautions

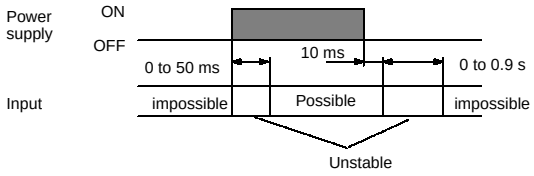
■ Sensor Power Supply

- The capacity of the external power supply is 100 mA at 12 V/50 mA at 24 V. When using a 24 VAC/12 to 24 VDC power supply, reduce the load with the power supply voltage, as shown in the following diagram (DC power supplies only).



■ Power Supplies

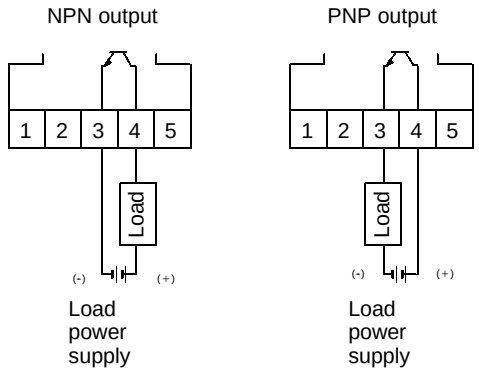
- When turning the power ON and OFF, input signal reception is possible, unstable, or impossible as shown in the diagram below. The unstable period will vary with power supply voltage, and the load conditions on external power supplies.



- A switching regulator is used in the internal circuits of counters with 100-to-240-VAC or 12-to-24-VAC specifications, causing an inrush current (approx. 1.5 A) to flow when power is turned on. If the capacity of the power supply to the counter is insufficient, the counter may not start operation. Be sure to provide adequate capacity (recommended supply capacity; H7CR: 15 W min. and H7CR-S: 5 W min.)
- Connect the power supply voltage through a relay or switch in such a way that the voltage reaches a fixed value immediately.

■ Transistor Output

- The H7CR transistor output is insulated from the internal circuitry by a photocoupler, so either NPN or PNP output is possible.



■ DIP Switch Setting Changes

Any changes in the DIP switch settings while power is being supplied is invalid. Restart the power supply.

■ Self-diagnostic Function

- The following displays will appear if an error occurs. The present value and output enter the same status as after pressing the RESET Key.

Display	Error	Output status	Correction	Function setting
------*	Present value below min.	No change	Press RESET Key	No change
ffffff**	Present value above max.		or reset input	
e1	CPU	OFF	Press RESET Key	
e2	Memory			Set at the factory

*Displayed when the present value has fallen below the min. value in the H7CR-C/SC (±range type).

**Displayed when the present value has exceeded the max. value in the H7CR-C/SC (±range type).

■ Operating Environment

- When using the Counter in an area with much electronic noise, separate the Timer, wiring, and the equipment which generates the input signals as far as possible from the noise sources. It is also recommended to shield the input signal wiring to prevent electronic interference.
- Organic solvents (such as paint thinner), as well as very acidic or basic solutions might damage the outer casing of the Counter.

■ Using the Prescale Function

- When setting the prescale value, be sure that the set value satisfies this equation: set value “max. value - prescale value’. (if the prescale value is 1,250, 999.999 - 1,250 = 998.749 max.)
- If a higher value is used, the output may be affected, so make sure that the output is produced before starting operation.

■ Changing Set Values

- When changing the set value while the Counter is operating, the output will be produced if the set value ever equals the present value. To avoid triggering the output, begin by incrementing a higher digit to a large number.

■ Resetting with a Set Value of 0

- When resetting is performed with the set value set to “0,” no output will be given for the safety reasons once the reset is turned OFF (except for the H7CR-C).

■ Output Delay

- The following table shows the delay from when the present value passes the set value until the output is produced. (The delay is the result of output control time, signal transmission time, relay switching time, etc.)

Actual measurements in N and K modes.

Control output	Max. counting speed	Output delay*
Contact output 1, 2	30 cps	18 to 24 ms
	1 kcps	4.7 to 5.8 ms
	5 kcps	4.4 to 5.4 ms
Transistor output 1, 2	30 cps	13.5 to 20 ms
	1 kcps	0.59 to 0.81 ms
	5 kcps	0.29 to 0.44ms

*The variation in delays is due to different modes and conditions. For systems where the delay is a problem, take actual measurements under operating conditions.

■ Other

- When the Counter is installed in a control box and tests are conducted which may damage the Counter's internal circuitry (for example, a test measuring the maximum voltage difference between the control circuit and metal components), remove the Counter from the control box or short circuit the terminals.

⚠ Caution

This product contains a lithium battery. Lithium batteries explode if incinerated. Dispose of the Digital Counter as a non-combustible item.

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

Cat. No. M12-E1-1A

OMRON

Digital Counter

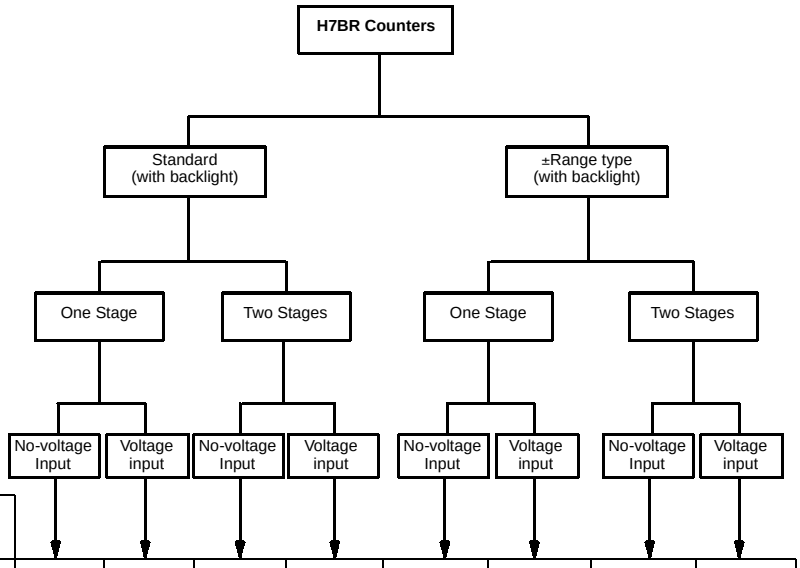
H7BR

DIN 72 x 72 mm Counters with Easy-to-use Functions

- Designed with an emphasis on ease of operation.
- All models equipped with prescale function which displays in units of actual physical parameters (length, volume, etc.).
- H7BR-C large/small discrimination mode useful for positioning and production control.
- High-speed response allows 10,000 counts per second.
- High-visibility LCD display with built-in backlight.
- Online change of set value possible.
- Meets UL and CSA standards.
- Conforms to EMC standards.
- Conforms to EN61010-1/IEC1010-1.
- Six-language instruction manual provided.

CE RC

Ordering Information



External power supply	Outputs	Control power source								
12/24 VDC (switching) [160 mA at 12 VDC; 80 mA at 24 VDC]	Contact and NPN transistor output	100 to 240 VAC 50/60 Hz	H7BR-B	H7BR-BV	H7BR-BW	H7BR-BWV	H7BR-C	H7BR-CV	H7BR-CW	H7BR-CWV
		24 VAC 12 to 24 VDC	H7BR-B	H7BR-BV	H7BR-BW	H7BR-BWV	H7BR-C	H7BR-CV	H7BR-CW	H7BR-CWV
	Contact and PNP transistor output	100 to 240 VAC 50/60 Hz	H7BR-BP	H7BR-BVP	H7BR-BWP	H7BR -BWVP	H7BR-CP	H7BR-CVP	H7BR-CWP	H7BR -CWVP
		24 VAC 12 to 24 VDC	H7BR-BP	H7BR-BVP	H7BR-BWP	H7BR -BWVP	H7BR-CP	H7BR-CVP	H7BR-CWP	H7BR -CWVP

Note: Specify both the model and control power supply when ordering.
With shock prevention cover types are named “H7BR- j j j j -500.”

■ Model Legend

H7BR-□□□□

1 2 3 4

1. Type
B: Standard
C: +/- range

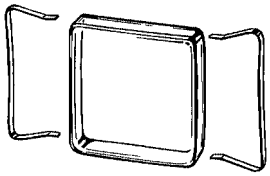
2. Classification
None: 1-stage set counter
W: 2-stage set counter

3. Input type
None: No-voltage input
V: Voltage input

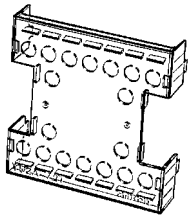
4. Output type
None: NPN output
P: PNP output

■ Accessories (Order Separately)

Soft Cover/Y92A-72F1
Hard Cover/Y92A-72



Shock Prevention Cover/Y92A-72T



Note: Models with a Shock Prevention Cover can be ordered by adding “-500” to the end of the model number.
e.g., H7BR-B-500 (100 to 240 VAC, 50/60 Hz)

Specifications

Model	H7BR-B (Standard type)	H7BR-C (±Range type)
Classification	Digital preset counter	
Mounting method	Flush mounting	
External connections	Screw terminals	
Enclosure ratings	IP54 (panel surface)	
Approved standards	UL: File no. E41515 CSA: File no. LR22310	
Input modes*	Up (Incrementing), Down (decrementing), and reversible Up/Down A (command inputs), Up/Down B (individual inputs), Up/Down C (phase difference inputs)	Reversible Up/Down A (command inputs), Up/Down B (individual inputs), Up/Down C (phase difference inputs
Output modes*	N, F, C, R, K, P, Q, A	K, D, L, H
Reset system	External, manual and automatic resets (internal according to C, R, P, AND Q mode operation)	External and manual resets
Prescaling function	Yes (0.001 to 99.999)	
Decimal point adjustment	Yes (Rightmost 3 digits)	
Teaching function	---	Yes
Batch counting function	Yes	---
Set compensation	---	Yes
Gate input	Yes	
Sensor power supply	12 VDC/24 VDC (switching)	
Input signals	Count, reset, key protection, and gate inputs	
	Batch count reset input	Compensation input
Input method	No-voltage input: Via opening and closing of contact Voltage input: Via high and low signal voltage (key protection is no-voltage input)	
Control outputs	1 stage model: SPST-NO contact and transistor (NPN or PNP open collector) output 2 stage model: 2 stages of SPST-NO contact and transistor (NPN or PNP open collector) output Transistor output can be changed by switch.(except for batch count output)	
Batch outputs	Transistor output (NPN or PNP open collector)	
Display	LCD with backlight	
Digits	6 digits (0 to 999,999)	±6 digits (-999,999 to 999,999)
Memory backup	Backup time for power interruption: Approx. 10 years at 20°C (lithium battery)	

■ Ratings

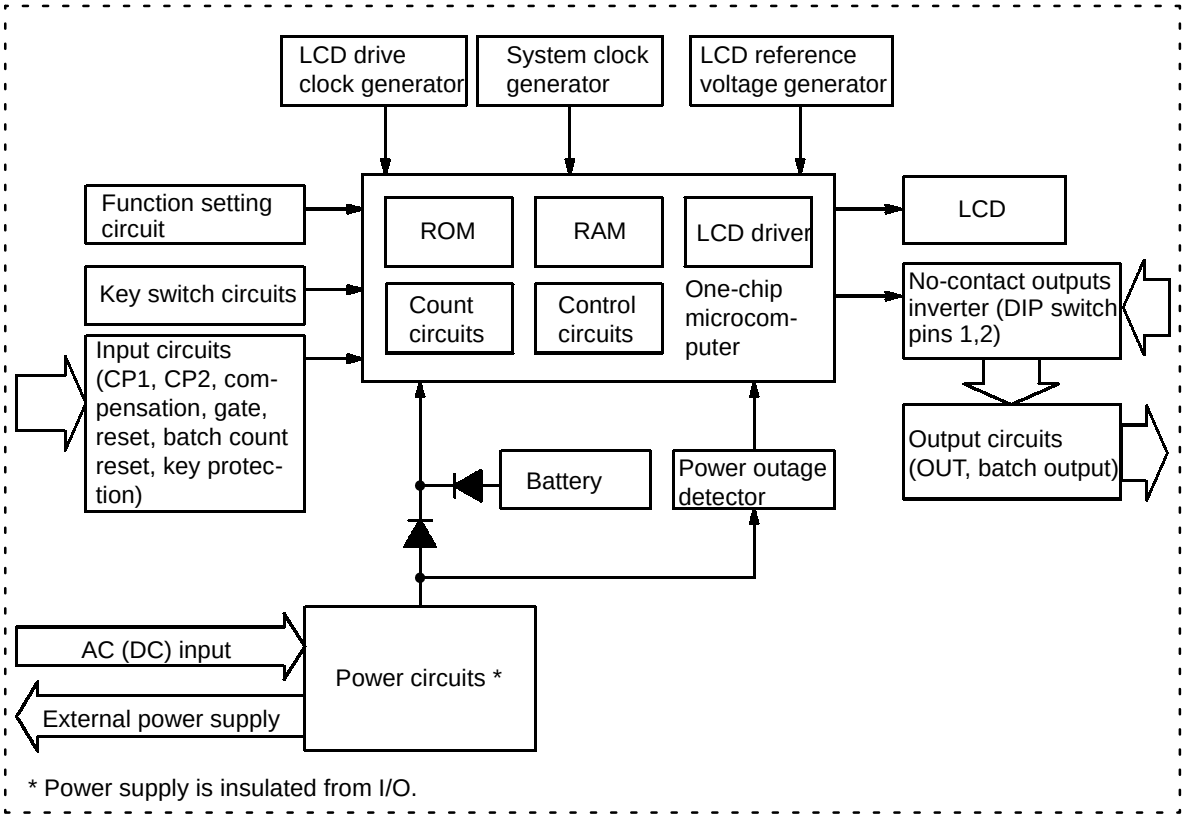
Rated supply voltage	100 to 240 VAC, 50/60 Hz 24 VAC/12 to 24 VDC (contains 20% ripple max.)
Operating voltage range	85% to 110% of rated voltage
Current consumption	Approx. 10 VA at 50 Hz, 240 VAC; approx. 6 W at 24 VDC *
Max. counting speeds (CP1, CP2)	30/1k/5k/10 kcps (separate setting for CP1 and CP2)
Compensation and gate input	Set to the faster of the CP1 and CP2 max. counting speeds
Reset	Min. pulse width for external reset: 1 or 20 ms, also manual reset
Batch count reset	Min. pulse width: Approx. 20 ms
Key protection	Response time: 1 s
One-shot time	10, 50, 100, 200, 500, and 1,000 ms (separate setting for stages 1 and 2)
Count, compensation, reset, batch count reset, and gate inputs	No-voltage input ON impedance: 1 kΩ max. (Approx. 2 mA when 0 kΩ) ON residual voltage: 2 V max. OFF impedance: 100 kΩ max. Voltage input (input resistance: approx. 4.7 kΩ) High level: 4.5 to 30 VDC Low level: 0 to 2 VDC
Key protection input	No-voltage input ON impedance: 1 kΩ max. (Approx. 2 mA when 0 kΩ) ON residual voltage: 1 V max. OFF impedance: 100 kΩ min.
Control outputs	Contacts: 3 A at 250 VAC, resistive load (cos ϕ = 1) Transistor output: Open collector 100mA at 30 VDC max. residual voltage 2 V max. (Approx. 1 V)
External power supply	160 mA, 12 VDC ±10% (5% ripple max.) 80 mA, 24 VDC ±10% (5% ripple max.)

*When power is turned ON, approx. 8 A inrush current flows for about 2 ms. (24 VDC, 240 VAC)

■ Characteristics

Insulation resistance	100 MΩ min. (at 500 VDC) (between current-carrying terminal and exposed non-current-carrying metal parts, and between non-continuous contacts)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min (between current-carrying terminal and exposed non-current-carrying metal parts)
Impulse withstand voltage	3 kV (between power terminals) for 100 to 240 VAC type, 1 kV for 24 VAC/12 to 24 VDC 4.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts for 100 to 240 VAC type, 1.5 kV for 24 VAC/12 to 24 VDC.
Noise immunity	±2 kV (between power terminals) and ±600 V (between input terminals), square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)
Static immunity	Malfunction: 8 kV; destruction: 15 kV
Vibration resistance	10 to 55 Hz with 0.75-mm single amplitude each in three directions 10 to 55 Hz with 0.5-mm single amplitude each in three directions
Shock resistance	300 m/s^2 (Approx. 30G) each in three directions 100 m/s^2 (Approx. 10G) each in three directions
Life expectancy	10 million operations min. 100,000 operations min. 5 A at 250 VAC in load resistance)
Weight	Approx. 270 g
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85%
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line 2 kV I/O signal-line
Case color	Light gray (Munsell 5Y7/1)

■ Block Diagram



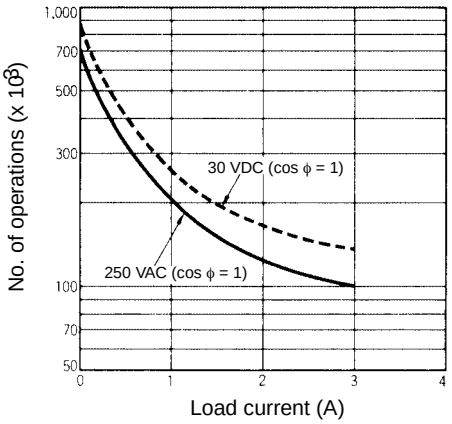
■ I/O Functions

Inputs	**CP1/CP2**	Count signal inputs. Up, Down, and Up/Down (command, individual, or phase difference) inputs accepted.
	Reset	Resets present value. (to zero in Up modes, to preset with 1-stage models in Down mode, and to preset with 2-stage models.) Count inputs are not accepted while reset input is ON. Reset indicator lit while reset input is ON.
	Compensation input (±Range type)	On rising edge of up count signal, present count is reset to compensation value and, therefore, count inputs are accepted even if the compensation input is set to ON (not effective for down count signals.)
	Batch count reset (Standarad type)	Resets batch count to zero and batch output turns OFF. Signals are taken in on the ON edge. Batch count signals are not accepted while batch count reset is ON.
	Key protection	Makes keys inoperative according to key protection level. Key protection indicator lit while key protection input is ON. Effective when power supply is turned off. Effective when protect terminals are shorted.
	Gate	Inhibits counter operation when gate input is ON.
Outputs	**OUT 1.2**	Outputs made according to designated output mode when corresponding preset is reached. Outputs inhibit on the teaching mode.
	Batch output (Standard type)	Outputs made when batch counter is up to preset number of batches. Batch output remains ON until batch count reset goes ON. When the number of batches is set to zero, batch counting is performed but batch outputs are not made. Batch counter counts the number of completed counts to the preset for 1-stage models amd to preset 2 for 2-stage models.

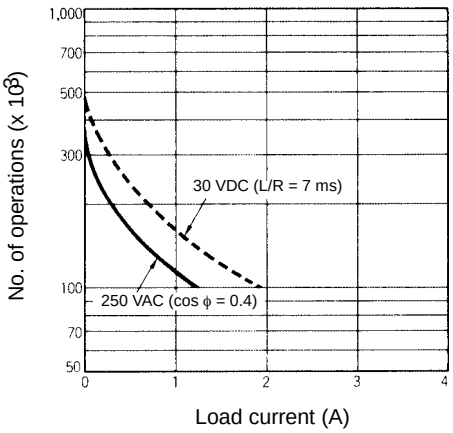
Engineering Data

■ Life Expectancy of Contacts

Electrical Life Expectancy (Resistive Load)



Electrical Life Expectancy (Inductive Load)



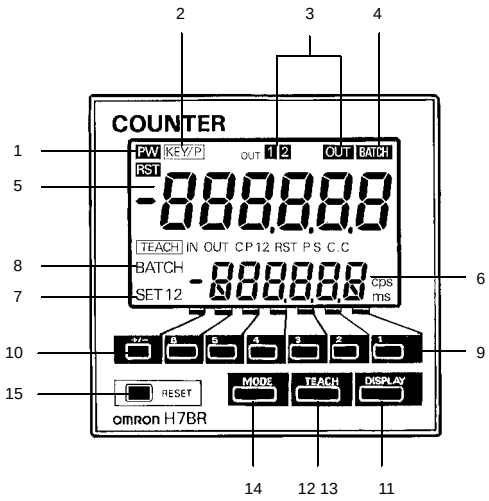
Reference: A current of 0.15 A max. can be switched at 125 VDC (cos ϕ =1) and a current of 0.1 A max. can be switched if L/R = 7 ms. In both cases, a life of 100,000 operations can be expected.

Nomenclature

■ Front View

Indicator

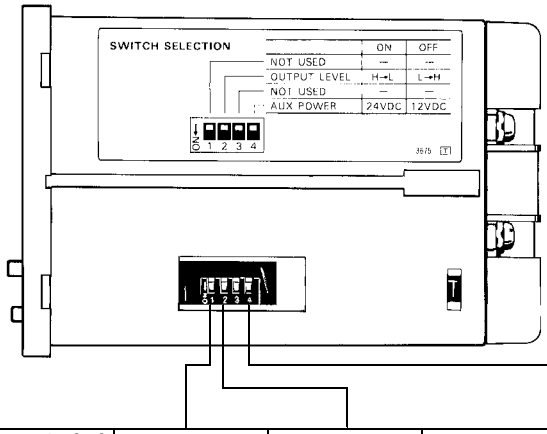
1. Power indicator
2. Key protection indicator
3. Control output indicator
   OUT: 1 stage
   OUT1, OUT2: 2 stages
4. Batch output indicator
   (H7BR-B only)
5. Present value
   (character height: 12mm)
   (Zeroes suppressed)
6. Set value
   (character height: 8 mm)
   (Indicates data in function setting mode)
7. Set value 1,2 stage indicator.
8. Batch indicator
   (Displays batch count indicator.)



Operation Key

9. Increment Keys (1 to 6)
   (Used to change the corresponding digit of the set value. Used to change data in the function setting mode.)
10. Code Key (H7BR-C type only)
    (Changes ±code of setting value.)
11. Display Key
    (Switches to the batch count, teaching mode, setting displays. For 2 stage model, switch set value 1,2.)
12. Batch Key (H7BR-B type only)
    (Switches to the batch display.)
13. Teaching Key (H7BR-C type only)
    (Switches to the teaching mode.)
14. Mode Key
    (Switches from run mode to function setting mode. Changes items in the function setting mode.
15. Reset Key
    (Resets present value and outputs.)

■ Side View



Dip switch

Models	Switch No.	1	2	3	4
		Operation of each transistor output when count up		Invalid	External power supply
One-stage	OFF	---	Output OFF to ON	---	12 VDC
	ON	---	Output ON to OFF	---	24 VDC
Two-stage	OFF	Output 1 OFF to ON	Output 2 OFF to ON	---	12 VDC
	ON	Output 1 ON to OFF	Output 2 ON to OFF	---	24 VDC

Note: All DIP Switches are set to OFF at the factory.

Operation

■ Factory Settings

The following table shows the timer settings when it is shipped. Please change the settings as necessary to suit the system before operation. Settings and the display receive power from the internal battery and are therefore unaffected by external power interruptions.

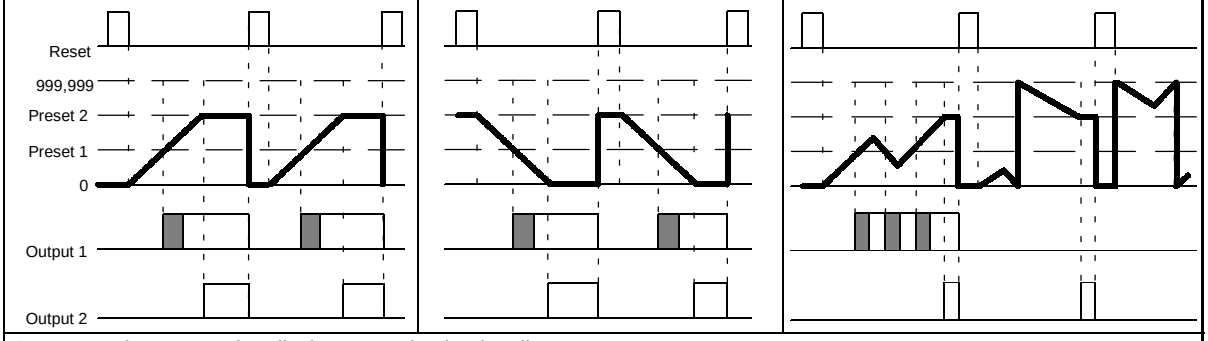
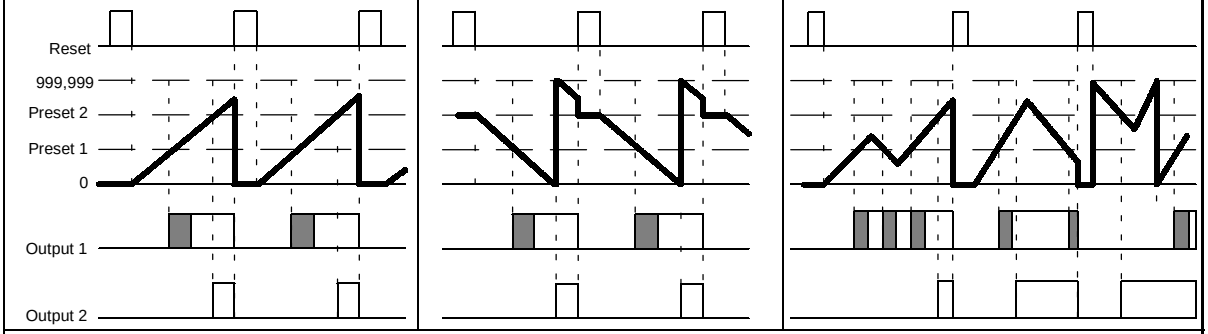
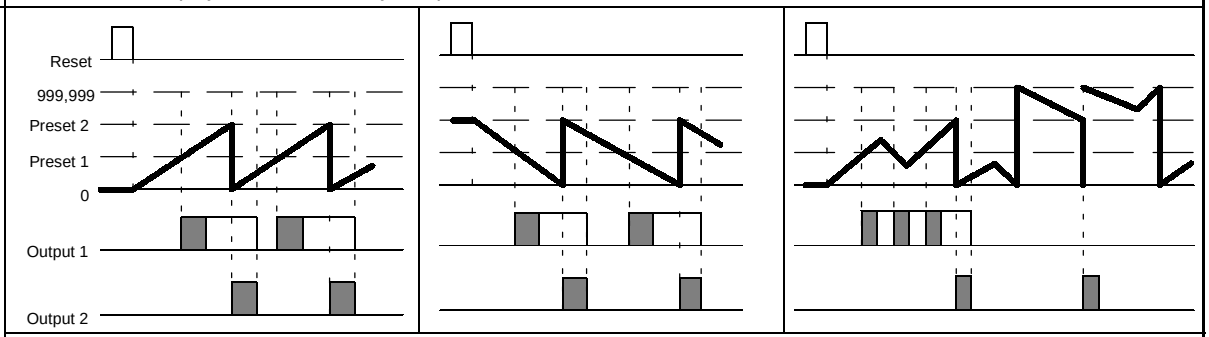
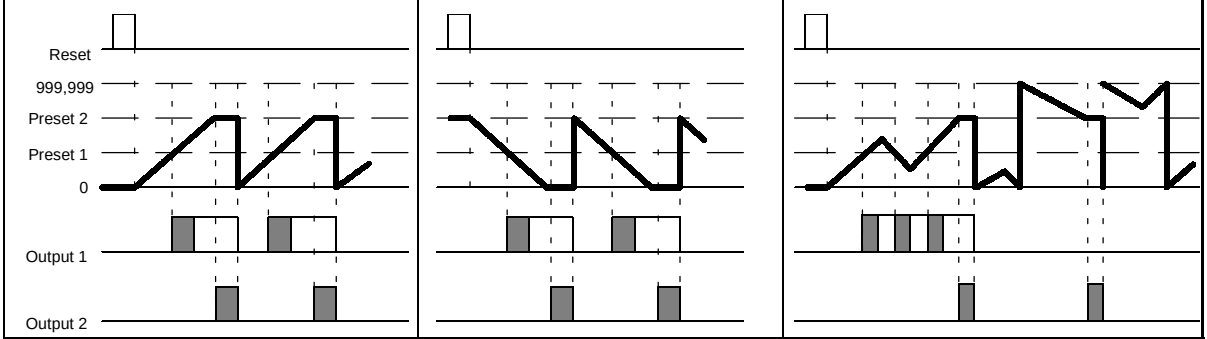
Model	H7BR-B	H7BR-C
Present value	0	0
Presets	0	0
Batch present count	0	---
Batch setting count	0	---
Input mode	Up	Up/Down C (phase difference)
Output mode	N	K
Output 2 time	(Hold)	1,000 ms
Output 1 time (2-stage only)	Hold	1,000 ms
CP1 and CP2 counting speeds	30 cps	30 cps
Min. reset time	20 ms	20 ms
Decimal point	Far right (no fractions)	Far right (no fractions)
Prescale	1,000	1,000
Compensation count value	---	0
Key protection level	KP-1	KP-1

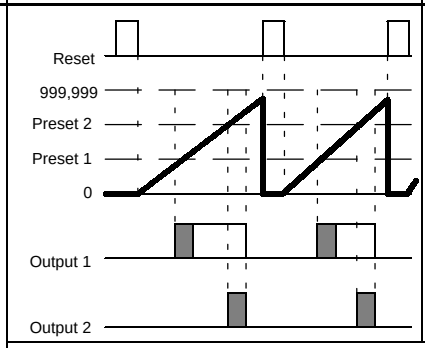
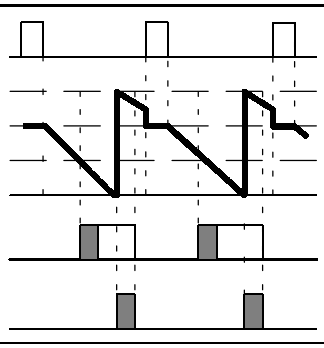
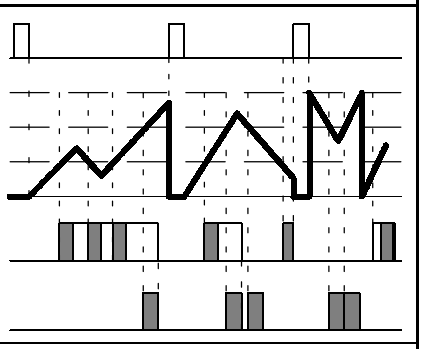
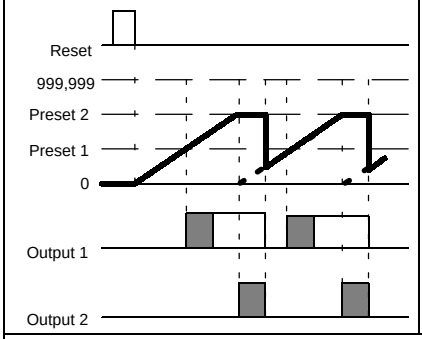
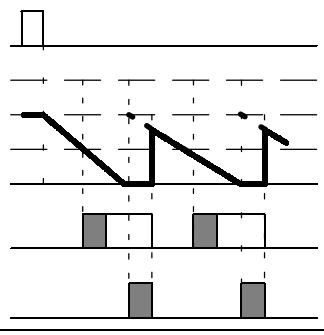
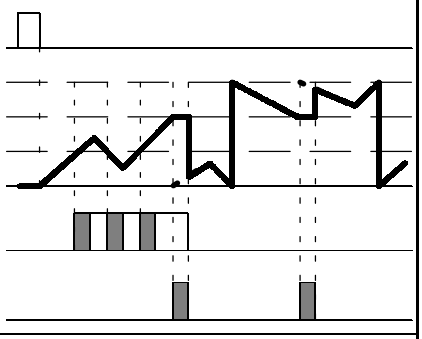
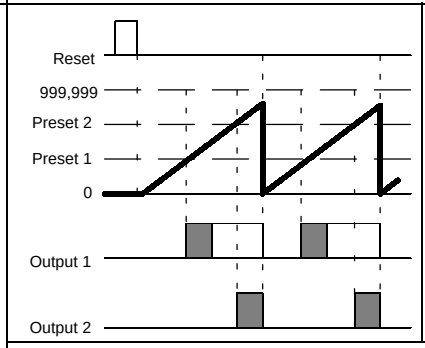
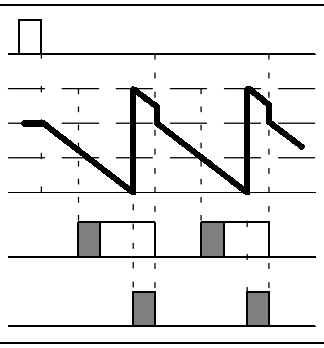
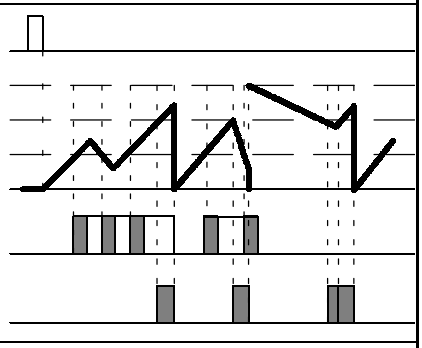
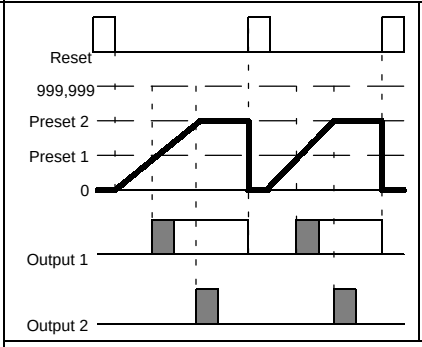
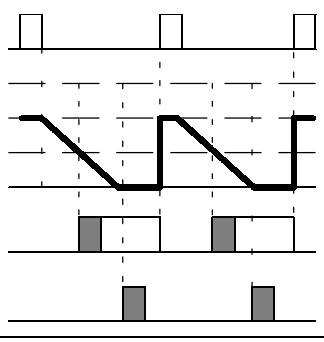
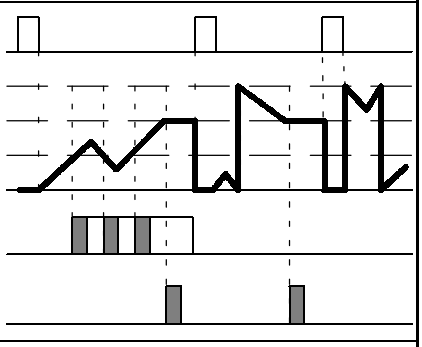
Note: With the initial settings, there will be no output even if the power supply is connected. External inputs and outputs cannot be used without a power supply.

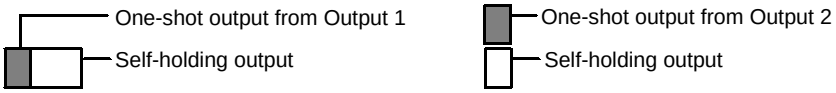
■ Input/Output Mode Setting

H7BR-B

Output 2 operation applies for 1-stage models only.

Output mode	Input mode		
	Up	Down	Up/Down A.B.C
N			
	Outputs and present value display are maintained until reset.		
F			
	Present value display runs continuously. Outputs are maintained until reset.		
C			
	Present value is placed in reset start status as soon as count up is reached. The count up is not displayed. Outputs are 1-shot and operate repeatedly. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.		
R			
	Present value is placed in reset start status as soon as count up is reached. Outputs are 1-shot and operate repeatedly. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.		

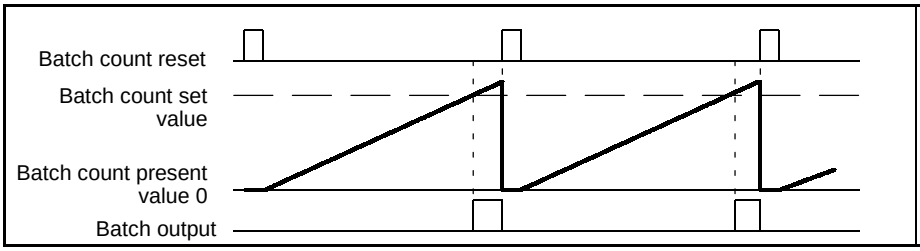
Output mode	Input mode		
	Up	Down	Up/Down A.B.C
K			
	Present value runs continuously. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.		
P			
	Present value display does not change during 1-shot time period, but reset start status is returned to as soon as count is reached. Outputs are 1-shot and operate repeatedly. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.		
Q			
	Present value runs continuously through 1-shot time period and returns to reset start status immediately afterward. Outputs are 1-shot and operate repeatedly. Output 1 is self-holding, and goes off after expiration of the 1-shot period for Output 2. One-shot time periods for Output 1 and 2 are independent.		
A			
	Present value and output 1 maintain status until reset. Output 1 and 2 operate independently.		



One-shot outputs can be set to between 10 and 1,000 ms.

Batch Counter Operation

The batch counter counts the number of times set value is reached for 1-stage models, and the number of times set 2 is reached for 2-stage models.

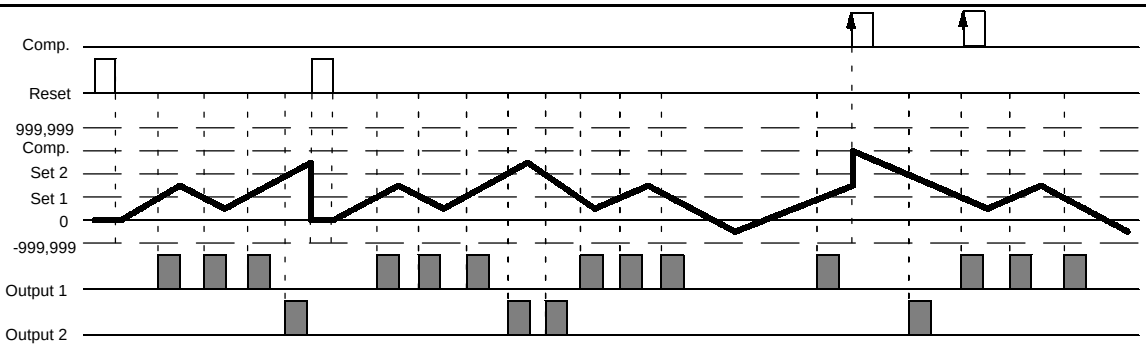
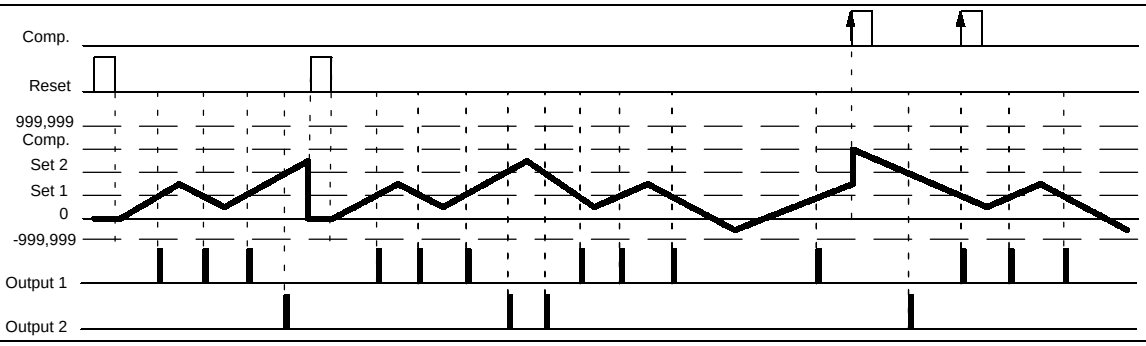


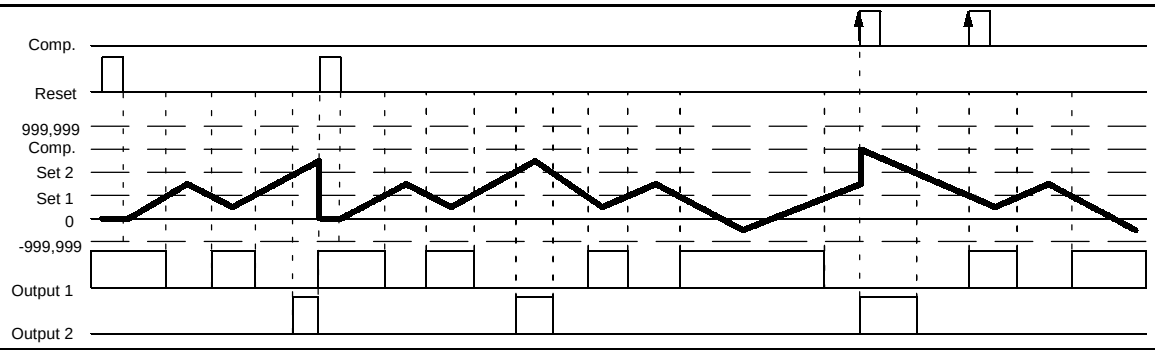
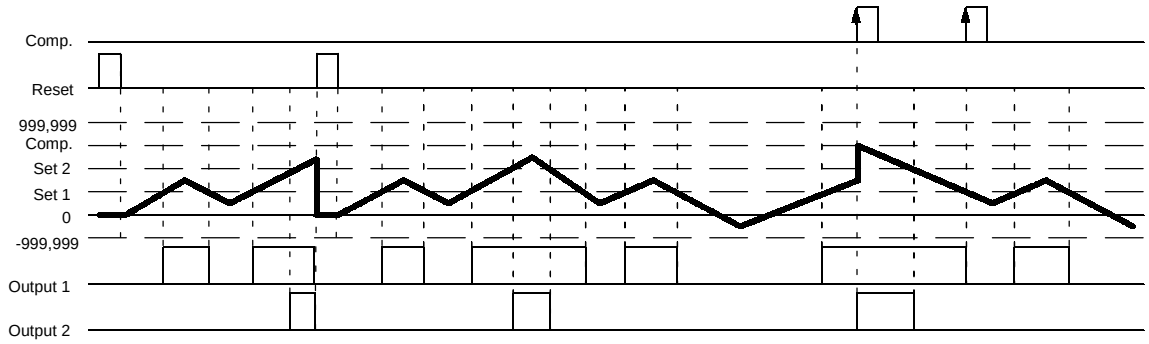
The batch count output holds until reset by the batch count reset.
The present value of the batch count advances continuously.

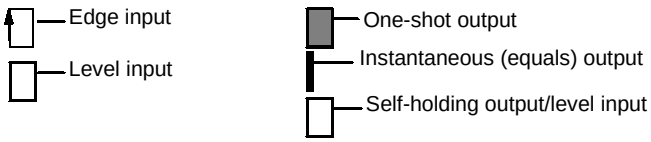
1. The batch count present value remains at 0 while the batch count reset is ON.
2. When the batch count set value is 0, the batch count will proceed, but there will be no output.
3. When the batch count present value exceeds 9999, it returns to 0.
4. The batch count present value and output do not affect the RESET Key or reset input.
5. When power is interrupted and the batch count output is ON, the output will be ON when power returns.
6. When a batch count set value which is greater than the present value is changed to a set value which is less than the present value, the output will go ON.
7. If, after the output has gone ON, the set value is changed to a set value which is greater than the present value, the output will remain ON.

H7BR-C

Output 2 operation applies for 1-stage models only.

Output mode	Input mode Up/Down A.B.C
K	
	Present value increments and decrements within displayable range. Outputs go ON for one-shot.
D	
	Present value increments and decrements within displayable range. Outputs are ON during the count is equal.

Output mode	Input mode Up/Down A.B.C
L	
	Present value increments and decrements within displayable range. Output 1 is ON whenever present value is less than or equal to Set 1; Output 2 is ON whenever present value is greater than or equal to Set 2.
H	
	Present value increments and decrements within displayable range. Output 1 is ON whenever present value is greater than or equal to Set 1; Output 2 is ON whenever present value is greater than or equal to Set 2.



One-shot outputs can be set to between 10 and 1,000 ms.

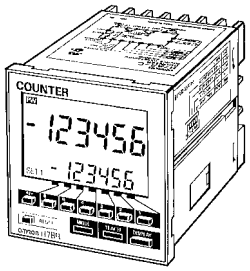
Note:
1. Counting inputs are not applied while the reset input is ON.
2. One-shot outputs, when ON, are turned OFF when the reset input goes ON.
3. One-shot outputs, when ON, are left ON for the one-shot time period when the compensation input goes ON
4. One-shot outputs, when ON, are reset and the one-shot output is restarted if a preset designating the output is reached.
5. The compensation input is valid only when the present value is being incremented.

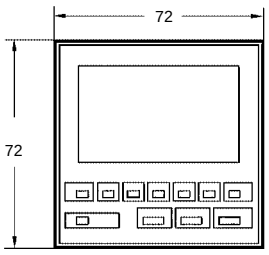
Dimensions

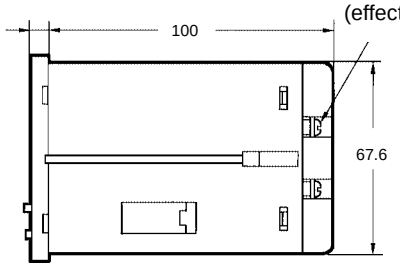
Note: All units are in millimeters unless otherwise indicated.

H7BR

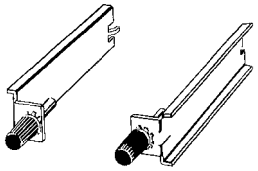
Flash Mounting

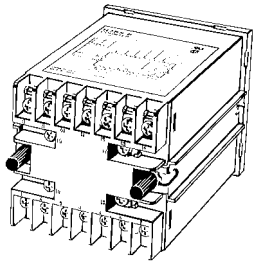


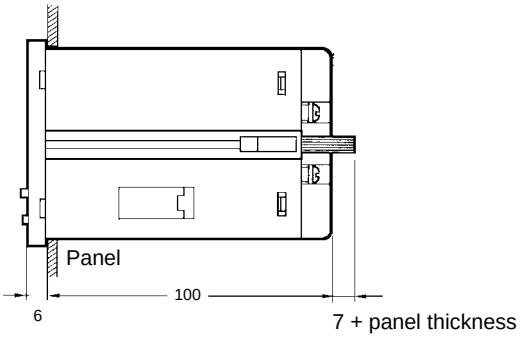




Flash Mounting Adapter

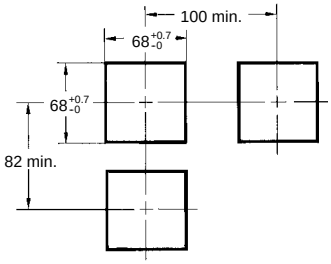






Panel Cutouts

Panel cutouts are as shown at right. (according to DIN43700).

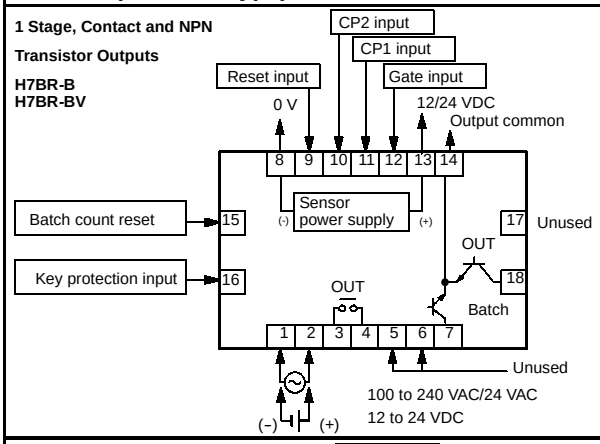


Installation

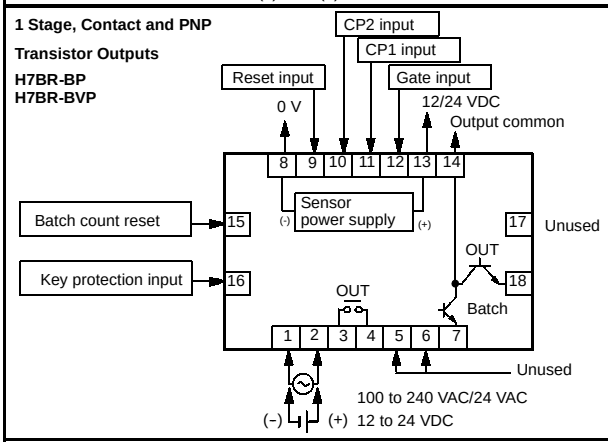
■ Terminal Arrangement

H7BR-B (standard type)

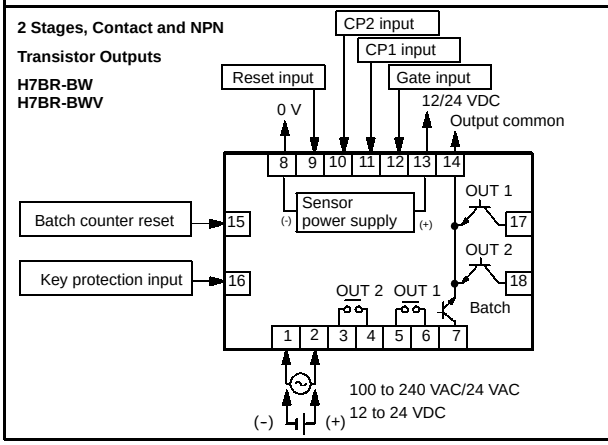
1 Stage, Contact and NPN
Transistor Outputs
H7BR-B
H7BR-BV



1 Stage, Contact and PNP
Transistor Outputs
H7BR-BP
H7BR-BVP

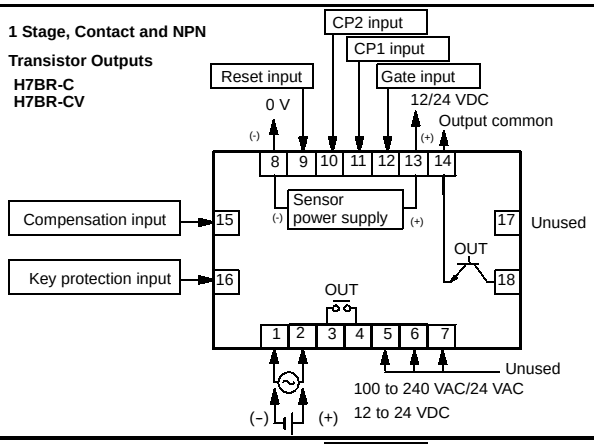


2 Stages, Contact and NPN
Transistor Outputs
H7BR-BW
H7BR-BWV

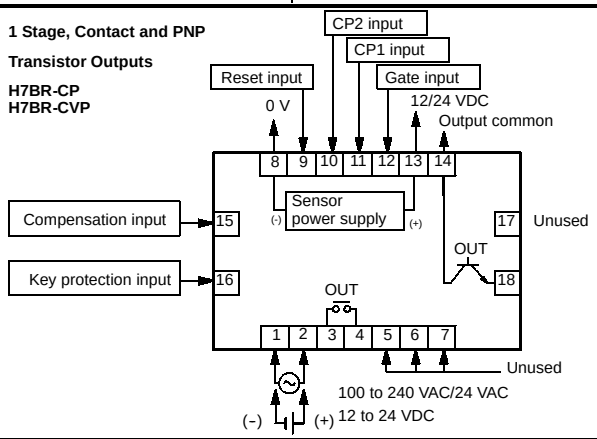


H7BR-C (± range type)

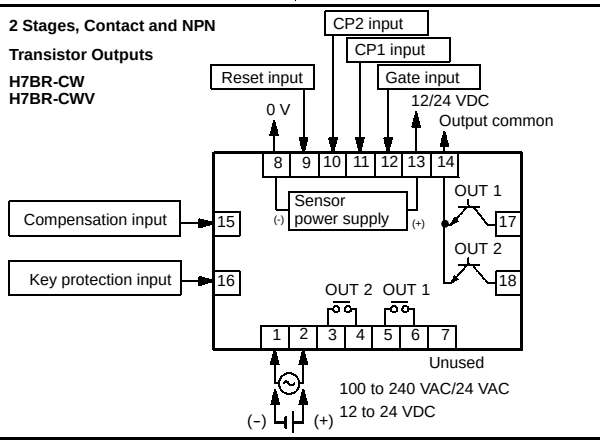
1 Stage, Contact and NPN
Transistor Outputs
H7BR-C
H7BR-CV



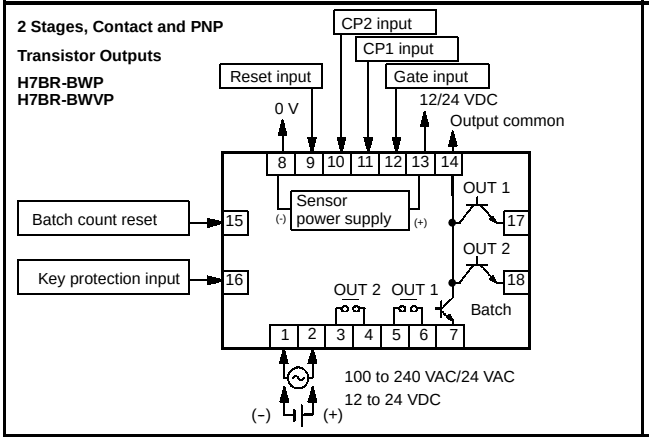
1 Stage, Contact and PNP
Transistor Outputs
H7BR-CP
H7BR-CVP



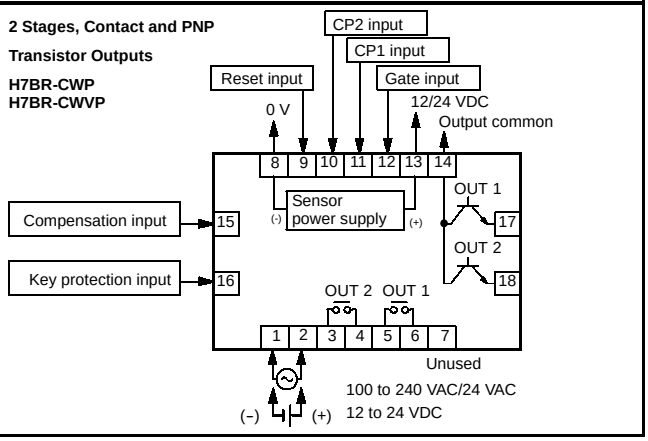
2 Stages, Contact and NPN
Transistor Outputs
H7BR-CW
H7BR-CWV



H7BR-B (standard type)



H7BR-C (± range type)



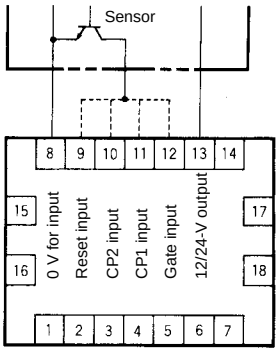
Note: Do not connect unused terminals.

■ Connections

The inputs of the H7BR are no-voltage (short circuit or open) inputs and voltage inputs.
(Key protection only for no-voltage inputs)

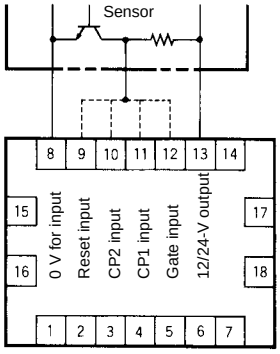
No-voltage Inputs

Open Collector



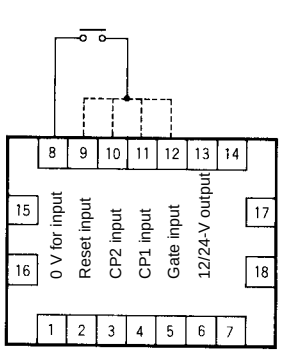
*H: Transistor ON

Voltage Output



*H: Relay ON

Contact Input



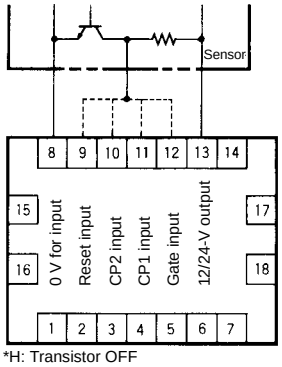
*H: Transistor ON

No-voltage Input Signal Levels

No-contact input	1. High level Transistor ON Residual voltage: 2 V max. Impedance when ON: 1 kΩ max.
	2. Low level Transistor OFF Impedance when OFF: 100 kΩ max.
Contact input	Use contacts which can adequately switch 2 mA at 5 V

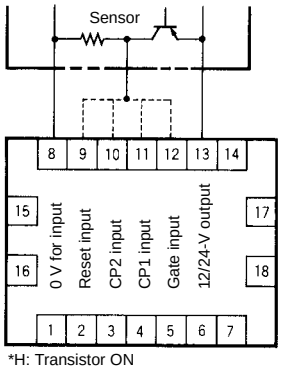
Voltage Inputs

NPN Transistor



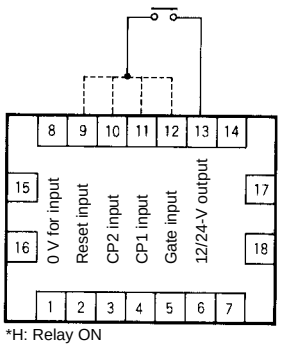
*H: Transistor OFF

PNP Transistor



*H: Transistor ON

Contact Input

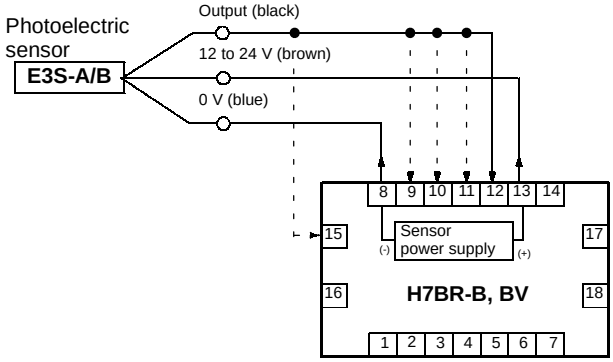


*H: Relay ON

Voltage Input Signal Levels

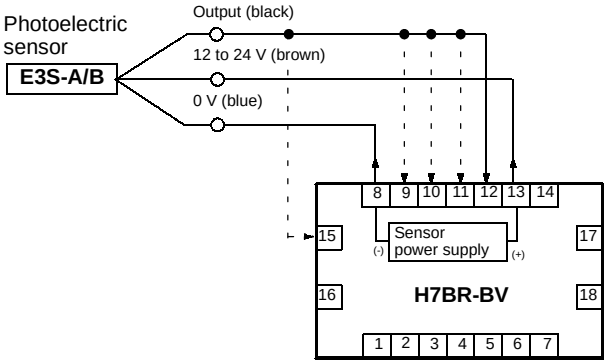
1. High level 4.5 to 30 VDC
2. Low level 0 to 2 VDC

3-wire DC type(NPN)

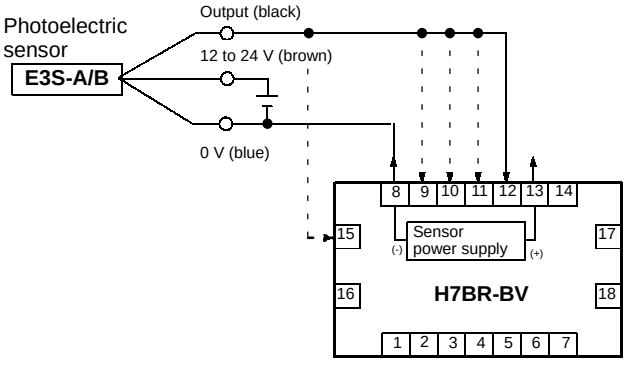


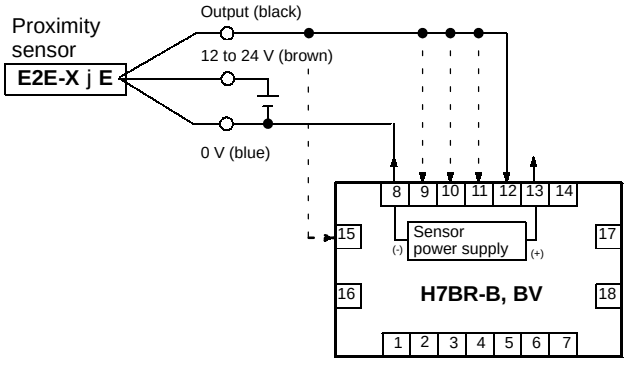
*Models ending in -BV have reversed logic.

3-wire DC type (PNP)



Using the external power supply





*Models ending in -BV have reversed logic.

Note: Refer to page 10, *Technical Information* for the applicable Sensors and Encoders.

■ Applicable OMRON Sensors

D: Direct connections possible
C: Connection possible (however either a resistive load or a separate power supply maybe necessary.
R: Connection not recommended.
N: Connection not possible.

Classification		Model	Specifications				H7BR-B H7BR-C	H7BR-BV H7BR-CV
			Power supply voltage	Load current	Residual voltage	Other		
3-wire DC	NPN	E3XR-CE4(T) E3XR-CGE4 E3XR-GM E3S-X j E3S- j E4 E3S-GS E3S-R E3S- j S E3S-VS E3R E3L E3HF E3HS E3HT E3HC	12 to 24 VDC ±10% 10% ripple max.	80 mA max.	10 mA, 0.75 V max.	---	D	D
		E3C-A E3C-C E3C-GE4 E3C-WE4						
		E3XR-CC4 E3V E3S- j G4 j E3S-LS5C4 E3S-LS20C4 E3H E3C-JC4(P)		100 mA max.	10 mA, 0.7 V max.			C
		E3C-WH4F						D
		E3N		200 mA max.	10 mA, 1 V max.			
		E3ML		80 mA max.				
		E3S-LS3C1D	5 to 12 VDC, 10% ripple max.	30 mA max.				C
	PNP	E3S- j B4 E3S-LS5B4 E3S-LS20B4	12 to 24 VDC ±10% 10% ripple max.	100 mA max.	10 mA, 0.8 V max.	---	R	D

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

Cat. No. M09-E1-1A

OMRON

Digital Counter

H7AN

A 72 x 72-mm (DIN) LED-display Counter with a Wide Range of Features

- Many variations, including models with 2-, 4-, 6-, or 8-digit displays, 1- and 2-stage models, and preset counter models that can be set for incrementing, decrementing, or reversible operation.
- Preset counter operation can be simultaneously read out on both contact and solid-state outputs.
- Totalizing counters with 4-, 6-, or 8-digit displays are also available.
- A draw-out construction enables maintenance without rewiring.
- A wide power supply range (100 to 240 VAC).
- DC models are also available.

Ordering Information

Each model is sold together with a mounting bracket.

Preset Counter

Incrementing (Up) or decrementing (Down) counter (not reversible)

One stage / Two stages

Without digital display / With digital display / With digital display

No. of digits	Backup function			
2	No	H7AN-2	H7AN-2D	---
	Yes	H7AN-2M	H7AN-2DM	---
4	No	H7AN-4	H7AN-4D	H7AN-W4D
	Yes	H7AN-4M	H7AN-4DM	H7AN-W4DM

Reversible counter (Up/Down)

One stage / Two stages

With digital display / With digital display

No. of digits	Backup function		
2	No	H7AN-E2D	---
	Yes	H7AN-E2DM	---
4	No	H7AN-E4D	H7AN-WE4D
	Yes	H7AN-E4DM	H7AN-WE4DM

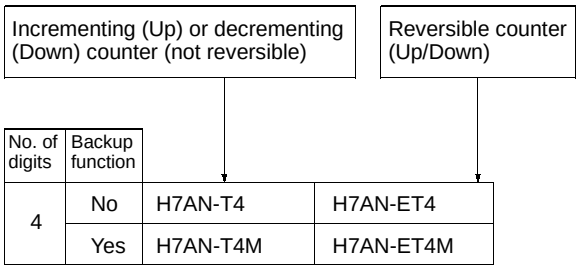
Incrementing (Up), decrementing (Down), or reversible (Up/Down) counter

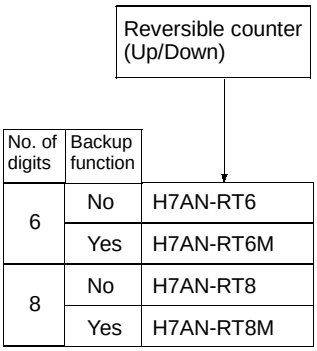
One stage / Two stages

With digital display / With digital display

No. of digits	Backup function		
6	No	H7AN-R6D	H7AN-RW6D
	Yes	H7AN-R6DM	H7AN-RW6DM
8	No	H7AN-R8D	---
	Yes	H7AN-R8DM	---

Totalizing Counter





Specifications

Preset Counters

Incrementing/Decrementing Counters

Operating method			Incrementing and decrementing (selectable with DIP switch)			
Mounting method			Flush mounting			
Operation modes			N, F, C, R, K, P, Q (selectable with rotary DIP switch)			
Input signal method (Count,reset input)			Contact and solid-state input voltage (H and L)			
Control output			1-stage counters: Contact (SPDT) and solid-state output (H and L output switchable) 2-stage counters: Contact (SPST-NO) and solid-state output (H and L output switchable)			
Set value read			Continuous mode			
Memory backup			No		Yes (Backup time for power interruption: approx. 10 years at 20°C)	
Display			No (IN and Up indicators only)	Yes (10-mm high 7-segment LED, Up indicator)	No (IN and Up indicators only)	Yes (10-mm high 7-segment LED, Up indicator)
Models	**2 digits**	**1 stage**	H7AN-2	H7AN-2D	H7AN-2M	H7AN-2DM
	4 digits	**1 stage**	H7AN-4	H7AN-4D	H7AN-4M	H7AN-4DM
		2 stages	---	H7AN-W4D	---	H7AN-W4DM

Reversible Counters

Operating method			Reversible (selectable with rotary DIP switch) between 0 and the set value Incrementing/decrementing A/D (command inputs) Incrementing/decrementing B/E (individual inputs) Incrementing/decrementing C/F (phase difference inputs)	
Mounting method			Flush mounting	
Operation modes			N, F, C, R, K, P, Q (selectable with rotary DIP switch)	
Input signal method (Count, reset input)			Contact and solid-state input voltage (H and L)	
Control output			1-stage counters: Contact (SPDT) and solid-state output (H and L output switchable) 2-stage counters: Contact (SPST-NO) and solid-state output (H and L output switchable)	
Set value read			Continuous mode	
Memory backup			No	Yes (Backup time for power interruption: approx. 10 years at 20°C)
Display			Yes (10-mm high 7-segment LED)	
Models	**2 digits**	**1 stage**	H7AN-E2D	H7AN-E2DM
	4 digits	**1 stage**	H7AN-E4D	H7AN-E4DM
		2 stages	H7AN-WE4D	H7AN-WE4DM

Incrementing, Decrementing, and Reversible Counters

Operating method			Incrementing, decrementing, and reversible (selectable with rotary DIP switch)	
Mounting method			Flush mounting	
Operation modes			N, F, C, R, K, P, Q (selectable with rotary DIP switch)	
Input signal method (Count, reset input)			Contact and solid-state input voltage (H and L)	
Control output			1-stage counters: Contact (SPDT) and solid-state output (H and L output switchable) 2-stage counters: Contact (SPST-NO) and solid-state output (H and L output switchable)	
Set value read			Continuous mode, Reset mode (selectable)	
Memory backup			No	Yes (Backup time for power interruption: approx. 10 years at 20°C)
Display			Yes (8-mm high 7-segment LED, Up indicator)	
Models	**6 digits**	**1 stage**	H7AN-R6D	H7AN-R6DM
		2 stage	H7AN-RW6D	H7AN-RW6DM
	8 digits	**1 stages**	H7AN-R8D	H7AN-R8DM

Totalizing Counters

Incrementing/Decrementing Counters

Operating method		Incrementing and decrementing (selectable with DIP switch)	
Mounting method		Flush mounting	
Input signal method (Count, reset input)		Contact and solid-state input voltage (H and L)	
Memory backup		No	Yes (Backup time for power interruption: approx. 10 years at 20°C)
Display		Yes (10-mm high 7-segment LED)	
Models	**4 digits**	H7AN-T4	H7AN-T4M

Reversible Counters

Operating method		Reversible (selectable with rotary DIP switch) between 0 and the full scale Incrementing/decrementing A/D (command inputs) Incrementing/decrementing B/E (individual inputs) Incrementing/decrementing C/F (phase difference inputs)	
Mounting method		Flush mounting	
Input signal method (Count, reset input)		Contact and solid-state input voltage (H and L)	
Memory backup		No	Yes (Backup time for power interruption: approx. 10 years at 20°C)
Display		Yes (10-mm high 7-segment LED)	
Models	**4 digits**	H7AN-ET4	H7AN-ET4M

Incrementing, Decrementing, and Reversible Counters

Operating method		Incrementing, decrementing, and reversible	
Mounting method		Flush mounting	
Input signal method (Count, reset input)		Contact and solid-state input voltage (H and L)	
Memory backup		No	Yes (Backup time for power interruption: approx. 10 years at 20°C)
Display		Yes (8-mm high 7-segment LED)	
Models	**6 digits**	H7AN-RT6	H7AN-RT6M
	8 digits	H7AN-RT8	H7AN-RT8M

■ Ratings

Rated supply voltage	100 to 240 VAC, 50/60 Hz (common use); 12 to 24, 48, 100 VDC*
Operating voltage range	85% to 110% of rated voltage
Power consumption	Approx. 10 VA (240 VAC at 50 Hz); Approx. 5 W (at 24 VDC)**
Max. counting speed of CP1 and CP2	2-digit counters: 30 cps 4-digit counters: 30 cps or 3 kcps (C or P mode or differential phase input) 30 cps or 5 kcps (except C or P mode or differential phase input) 6- or 8-digit counters: 30 cps, 3 kcps, or 5 kcps (except 8-digit counters with up/down inputs A through F) Minimum signal width (with ON/OFF ratio of 1:1): 30 cps: 16.7 ms, 3 kcps: 0.17 ms, 5 kcps: 0.1 ms H: 4.5 to 30 VDC, L: 0 to 2 VDC
Reset	Power supply reset (except for H7AN Counter with suffix “-M”): Signal time: 0.5 s with a reset time of 0.05 s after power on. External, manual, reset signal time: 0.02 s Reset time after completion of reset signal: 0.05 s Automatic reset***
Control output	Contacts: 3 A at 250 VAC, resistive load ($\cos\phi = 1$) No-contacts: 100 mA max. at 30 VDC max., open collector
Min. applicable load	10 mA at 5 VDC (p level reference value)
External power supply	80 mA, 12 VDC ±10% (contains 5% ripple max.)
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity	35% to 85%
Case	Light gray (Munsell 5Y7/1)

*The ripple is 20% max.
**There is an inrush current of 14 A at 240 VAC for approximately 0.6 ms, 15 A at 12 to 24 VDC for 2 ms, 5 A at 48 VDC for 3 ms, or 8 A at 100 VDC for 2 ms immediately after power on.
***Only preset counters can be automatically reset.

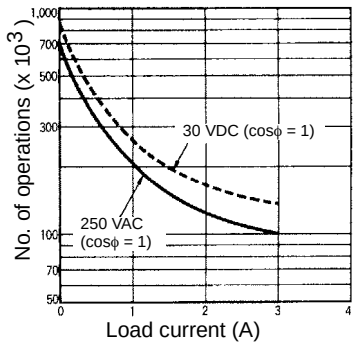
■ Characteristics

Insulation resistance	100 MΩ min. (at 500 VDC) (between current-carrying terminal and exposed non-current-carrying metal parts, and between non-continuous contacts)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min (between current-carrying terminal and exposed non-current carrying metal parts) 750 VAC, 50/60 Hz for 1 min (between non-continuous contacts)
Impulse withstand voltage	6 kV (between power terminals), 6 kV (between current-carrying terminal and exposed non-current-carrying metal parts)
Noise immunity	±2 kV (between power terminals) and ±500 V (between input terminals), square-wave noise by noise simulator
Vibration resistance	Destruction: 10 to 55 Hz, 0.75-mm double amplitude Malfunction: 10 to 55 Hz, 0.5-mm double amplitude
Shock resistance	Destruction: 300 m/s^2 (approx. 30G) Malfunction: 100 m/s^2 (approx. 10G)
Life expectancy	Mechanical: 10,000,000 operations min. Electrical: 100,000 operations min. (3 A at 250 VAC, resistive load)
Weight	Approx. 360 g

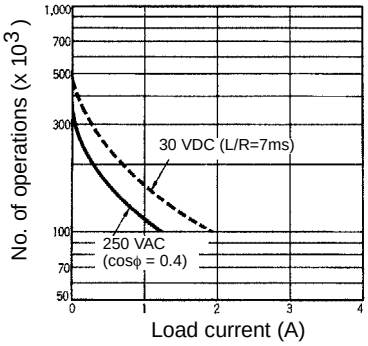
Engineering Data

Life of Contacts

Electric Life Expectancy (Resistive load)



Electric Life Expectancy (Inductive load)

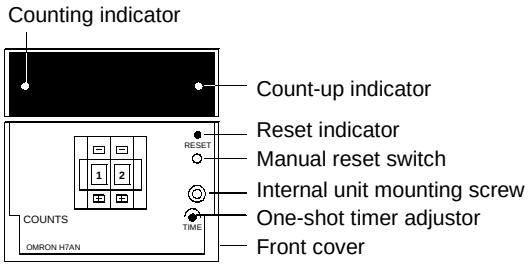


Reference: 0.15 A max. can be switched 100,000 times at 125 VDC (cosφ = 1).
0.1 A max. can be switched 100,000 times when L/R = 7 ms.

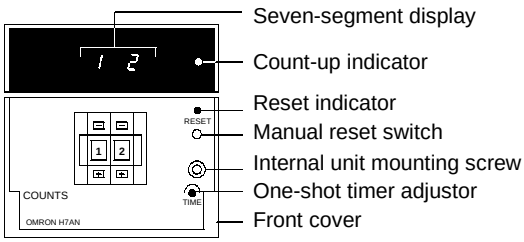
Nomenclature

■ Preset Counter

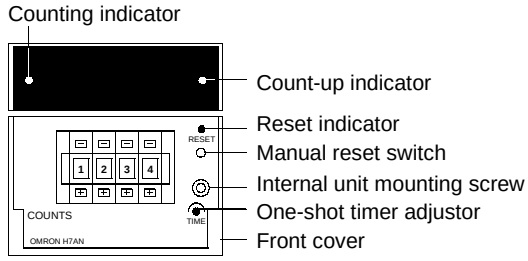
H7AN-2/2M



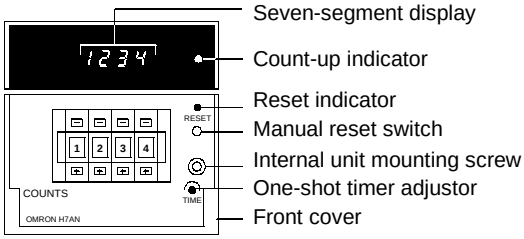
H7AN-2D/2DM
H7AN-E2D/E2DM



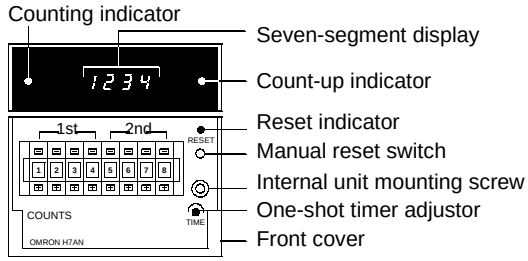
H7AN-4/4M



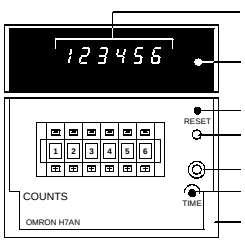
H7AN-4D/4DM
H7AN-E4D/E4DM



H7AN-W4D/W4DM
H7AN-WE4D/WE4DM

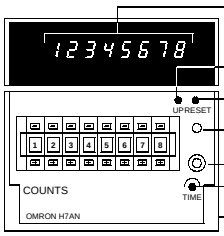


H7AN-R6D/R6DM



Seven-segment display
Count-up indicator
Reset indicator
Manual reset switch
Internal unit mounting screw
One-shot timer adjustor
Front cover

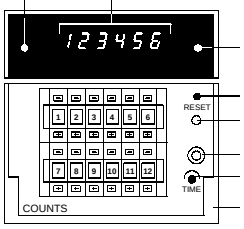
H7AN-R8D/R8DM



Seven-segment display
Count-up indicator
Reset indicator
Manual reset switch
Internal unit mounting screw
One-shot timer adjustor
Front cover

H7AN-RW6D/RW6DM

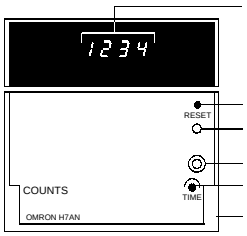
Counting indicator



Seven-segment display
Count-up indicator
Reset indicator
Manual reset switch
Internal unit mounting screw
One-shot timer adjustor
Front cover

■ Totalizing Counter

H7AN-T4/T4M/ET4/ET4M
H7AN-RT6/RT6M/RT8/RT8M

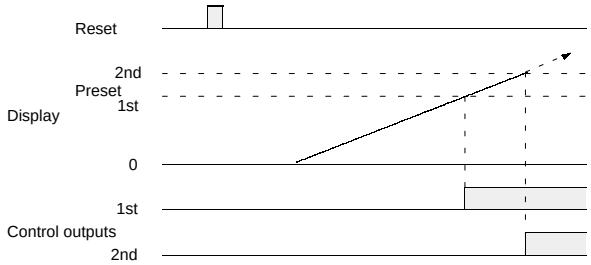
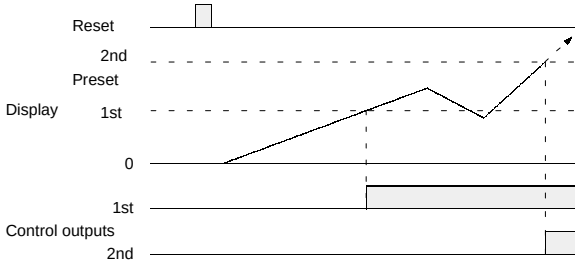
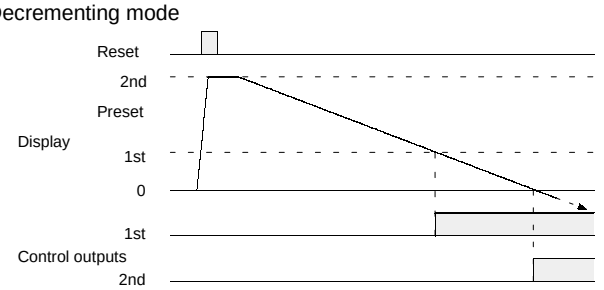
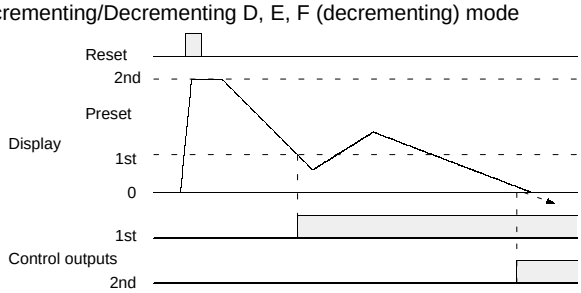


Seven-segment display
Reset indicator
Manual reset switch
Internal unit mounting screw
One-shot timer adjustor
Front cover

Operation

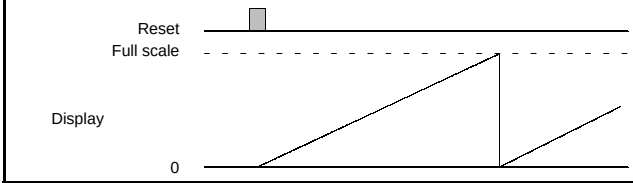
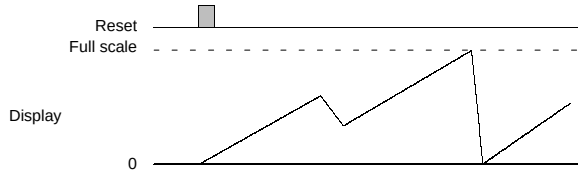
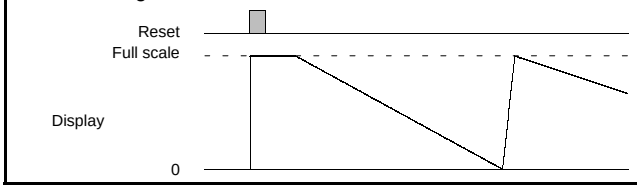
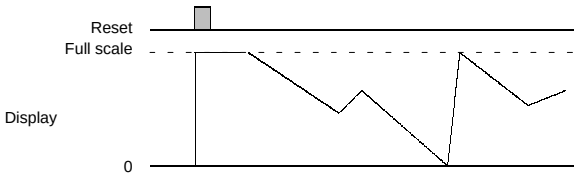
■ Count Operation

Preset Counters

Incrementing/Decrementing selectable mode	Reversible mode
Incrementing mode  	Incrementing/Decrementing A, B, C (incrementing) mode 
Decrementing mode  	Incrementing/Decrementing D, E, F (decrementing) mode 

Note: Two-stage counters, set the counters so that the interval between 1st and 2nd count up will be more than 5 ms. For Incrementing/Decrementing switchable counters, only the 2nd value will be effective if the 1st value is larger than the 2nd value.
The Incrementing/Decrementing Counters give outputs in the following order; 1st to 2nd to 1st to 2nd.

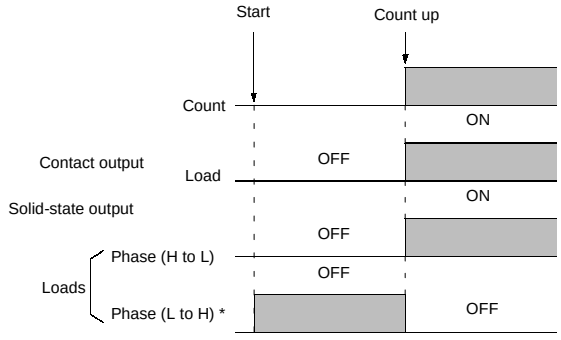
Totalizing Counters

Incrementing/Decrementing selectable mode	Reversible mode
Incrementing mode 	Incrementing/Decrementing A, B, C (decrementing) mode 
Decrementing mode 	Incrementing/Decrementing D, E, F (decrementing) mode 

The full scale value is 9999 for the 4-digit counters, 999999 for the 6-digit counters, and 99999999 for the 8-digit counters.

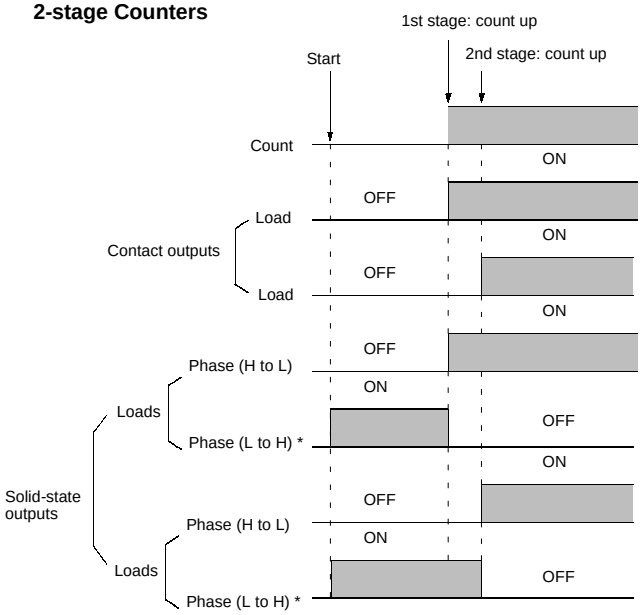
■ Output Timing Charts

1-stage Counters



*The operation of the load when the phase has been reversed.

2-stage Counters



*The operation of the load when the phase has been reversed.

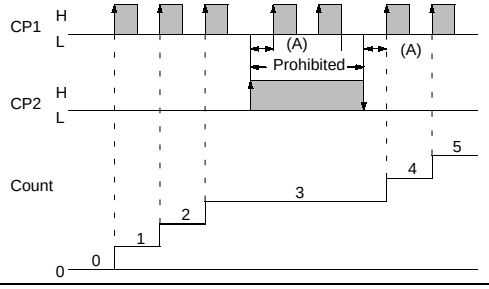
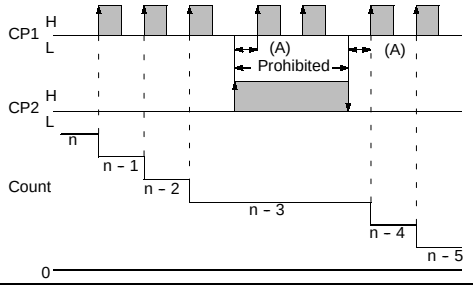
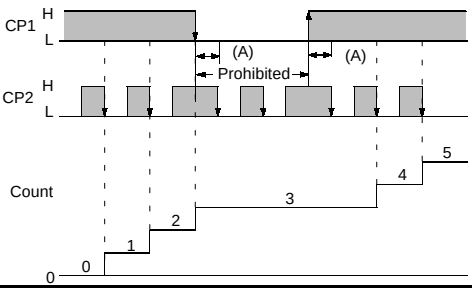
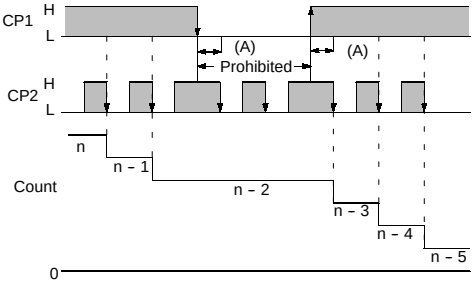
Output Delays

Control output	Max. counting speed	Output delay	
		2-, 4-digit counters	6-, 8-digit counters
Contact output	30 cps	14.0 to 16.0 ms	14.0 to 18.0 ms
	3 kcps	---	6.0 to 8.0 ms
	5 kcps	6.0 to 8.0 ms	6.0 to 8.0 ms
Solid-state output	30 cps	8.0 to 10.0 ms	9.5 to 12.0 ms
	3 kcps	---	0.4 to 0.6 ms
	5 kcps	0.4 to 0.6 ms	0.3 to 0.5 ms

Input Mode Setting

Incrementing/Decrementing Selectable Mode

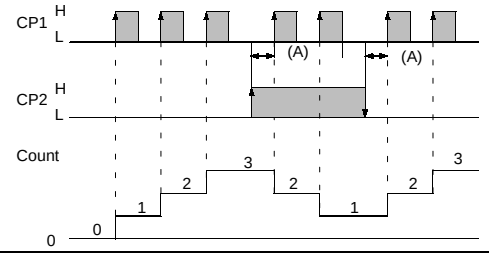
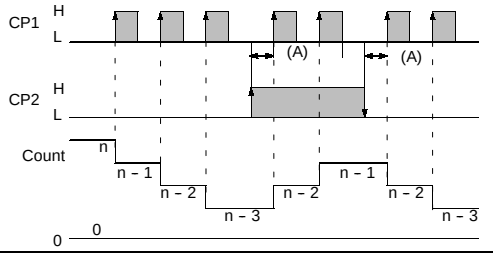
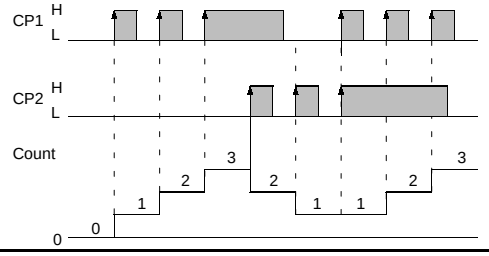
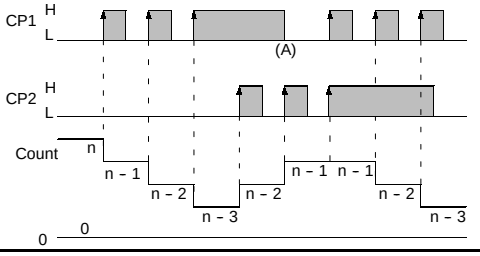
Note: The width of (A) must be the same as or lager than the minimum signal width, because an error of ±1 count may occur if the width of (A) is smaller than the minimum signal width.

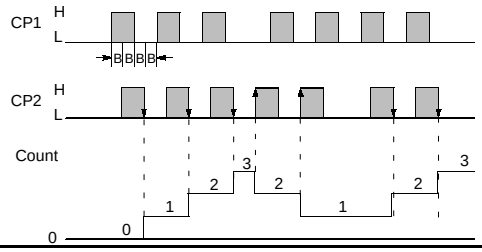
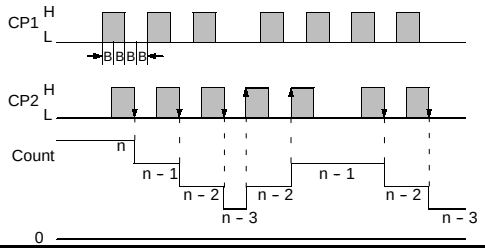
Incrementing mode	Decrementing mode
CP1: Count input; CP2: prohibit (gate) input	CP1: Count input; CP2: prohibit (gate) input
	
CP1: Prohibit (gate) input; CP2: count input	CP1: Prohibit (gate) input; CP2: count input
	

Reversible Mode

Note: 1. A: Minimum signal width; B: Must be at least 1/2 of minimum signal width. An error of ±1 count may occur if the width of (A) and (B) are smaller than the minimum signal width.

2. Set the same counting speed for CP1 and CP2 when in Up/Down C, or F mode.

Incrementing mode	Decrementing mode
Incrementing/Decrementing A command input mode	Incrementing/Decrementing D command input mode
	
Incrementing/Decrementing B individual input mode	Incrementing/Decrementing E individual input mode
	

Incrementing mode	Decrementing mode
Incrementing/Decrementing C phase difference input mode	Incrementing/Decrementing F phase difference input mode
	

Max. Counting Speed

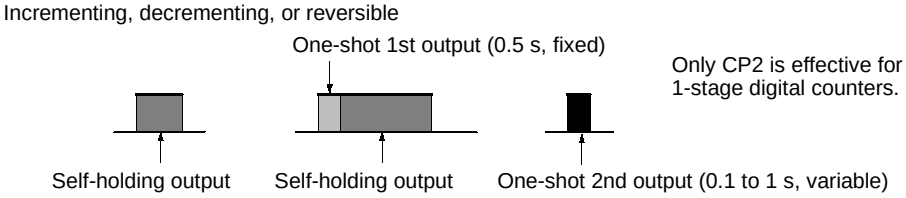
The maximum counting speed of each model varies with the counting mode and the number of digits as follows:

Input mode	4 digits		6 digits	8 digits
	N, F, R, K, Q	C, P		
Command input	5 kcps	3 kcps	5 kcps	3 kcps
Individual input	5 kcps	3 kcps	5 kcps	3 kcps
Phase difference input	3 kcps	3 kcps	5 kcps	3 kcps

Note: 1. To go to another mode from the present mode, select the mode with the internal selector and reset the counter with the external reset signal, power reset or manual reset switch. The counter can be also reset by turning power off. Mode selection is not possible with the automatic reset. The selected mode is effective only after the counter is reset.

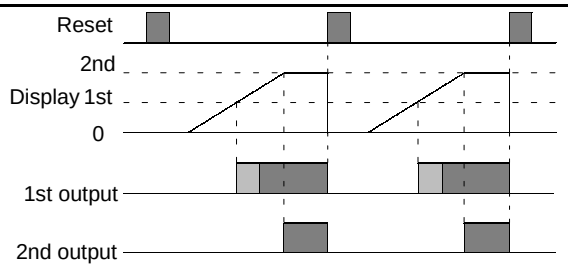
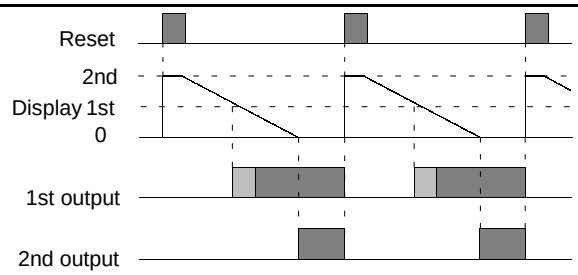
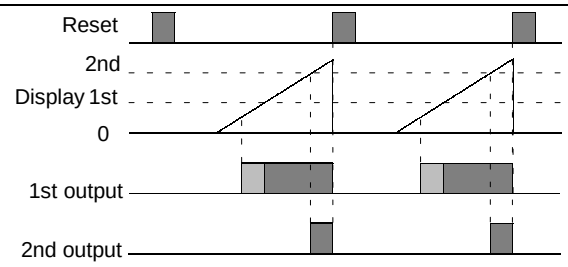
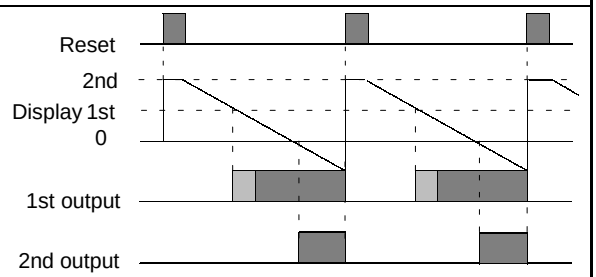
2. The maximum counting speed is 5 kcps except for Up/Down inputs A through F.

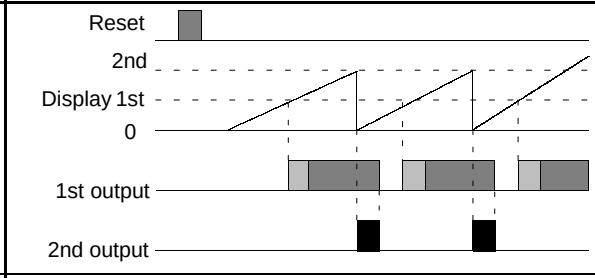
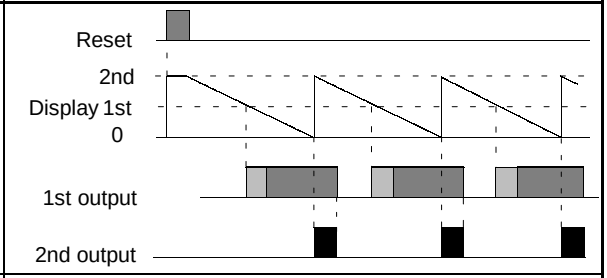
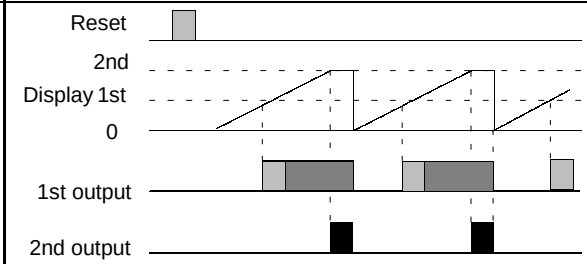
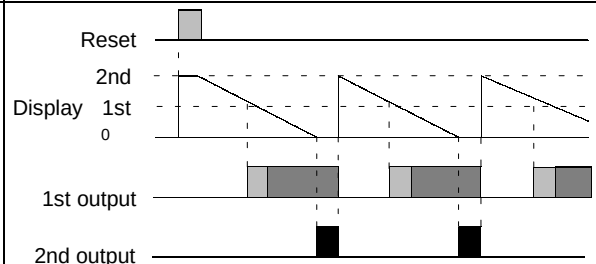
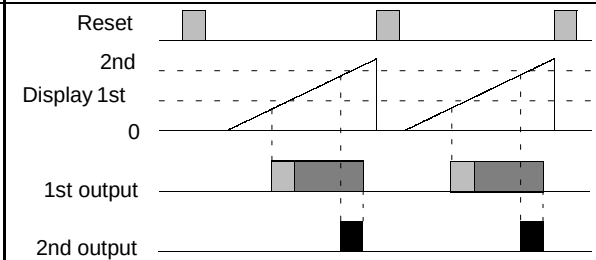
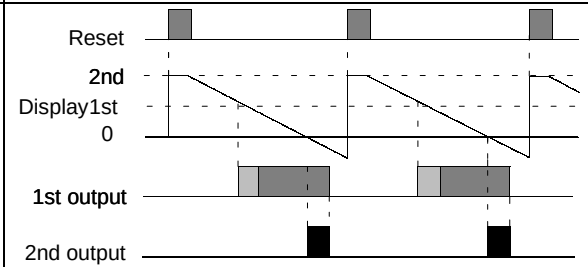
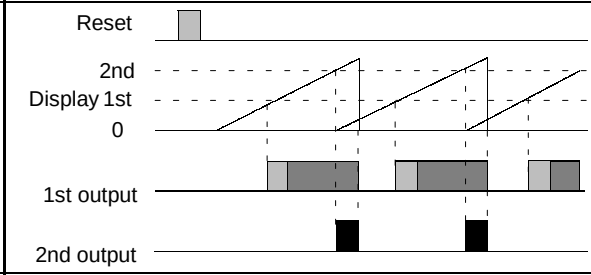
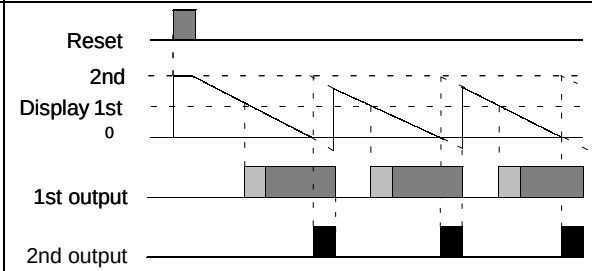
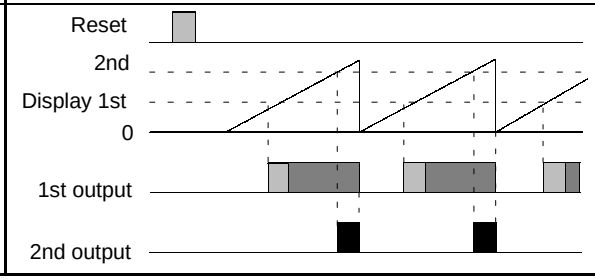
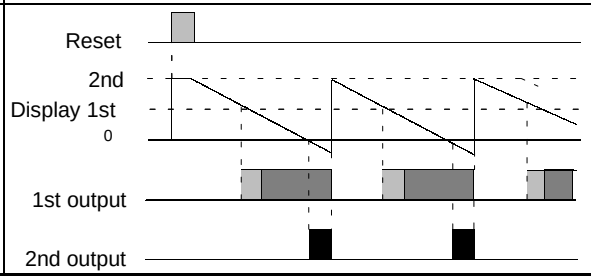
■ Output Modes



Note: 1. In the C, K, P, and Q modes, the counters must not count up again while the one-shot timer is working.

2. In the C mode, the present value is placed in reset start status as soon as the preset count is reached and the count-up status is not displayed.

Output mode	Incrementing, Incrementing/Decrementing A, B, C	Decrementing, Incrementing/Decrementing D, E, F
N		
F		

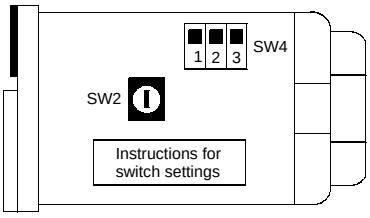
Output mode	Incrementing, Incrementing/Decrementing A, B, C	Decrementing, Incrementing/Decrementing D, E, F
C		
R		
K		
P		
Q		

■ Arrangement and Function of Selectors

Factory settings are shown in bold-face types.

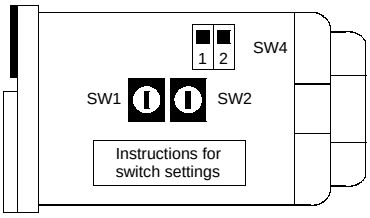
Preset Counter

H7AN-2/2M/2D/2DM



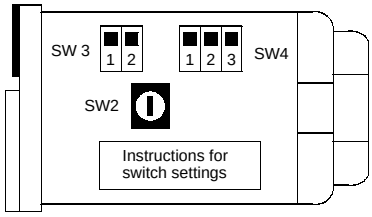
SW2 Counter mode selector
SW4-1 Solid-state output level selector
L to H (at count completed: LtoH)
H to L (at count completed: H to L)
SW4-2 Manual reset selector
Manual reset enabled
Manual reset disabled
SW4-3 UP/DOWN selector
UP (increment)
DOWN (decrement)

H7AN-E2D/E2DM



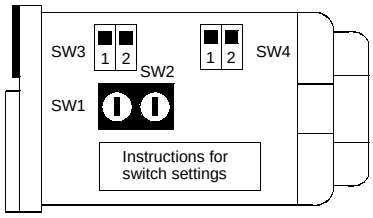
SW1 Counter function selector
SW2 Counter mode selector
SW4-1 Solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-2 Manual reset selector
Manual reset enabled
Manual reset disabled

H7AN-4/4M/4D/4DM



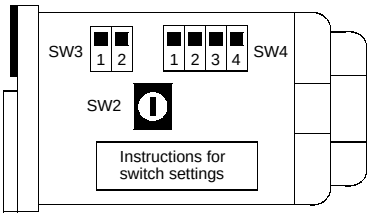
SW2 Counter mode selector
SW3-1 CP1's maximum counting speed selector
30cps
5kcps
SW3-2 CP2's maximum counting speed selector
30cps
5 kcps
SW4-1 Solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-2 Manual reset selector
Manual reset enabled
Manual reset disabled
SW4-3 UP/DOWN selector
UP (increment)
DOWN (decrement)

H7AN-E4D/E4DM



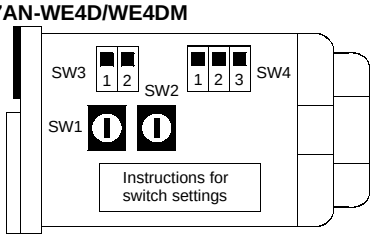
SW1 Counter function selector
SW2 Counter mode selector
SW3-1 CP1's maximum counting speed selector
30cps
5 kcps
SW3-2 CP2's maximum counting speed selector
30cps
5 kcps
SW4-1 Solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-2 Manual reset selector
Manual reset enabled
Manual reset disabled

H7AN-W4D/W4DM



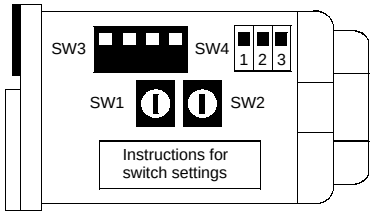
SW2 Counter mode selector
SW3-1 CP1's maximum counting speed selector
30cps
5kcps
SW3-2 CP2's maximum counting speed selector
30cps
5 kcps
SW4-1 1st solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-2 2nd solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed:H to L)
SW4-3 Manual reset selector
Manual reset enabled
Manual reset disabled
SW4-4 UP/DOWN selector
UP (increment)
DOWN (decrement)

H7AN-WE4D/WE4DM



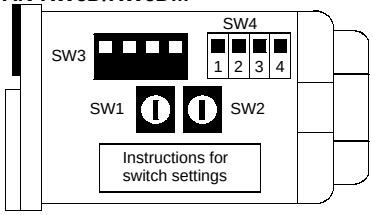
SW1 Counter function selector
SW2 Counter mode selector
SW3-1 CP1's maximum counting speed selector
30cps
5 kcps
SW3-2 CP2's maximum counting speed selector
30cps
5 kcps
SW4-1 1st soled-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-2 2nd solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-3 Manual reset selector
Manual reset enabled
Manual reset disabled

H7AN-R6D/R6DM
H7AN-R8D/R8DM



SW1 Counter function selector
SW2 Counter mode selector
SW3 Maximum counting speed selector
SW4-1 Solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-2 Set value read selector
Continuous read
Read when reset
SW4-3 Manual reset selector
Manual reset enabled
Manual reset disabled

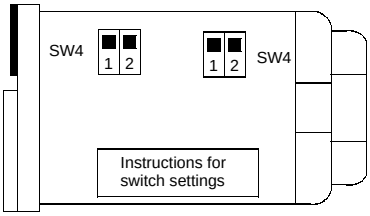
H7AN-RW6D/RW6DM



SW1 Counter function selector
SW2 Counter mode selector
SW3 Maximum counting speed selector
SW4-1 1st solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-2 2nd solid-state output level selector
L to H (at count completed: L to H)
H to L (at count completed: H to L)
SW4-3 Set value read selector
Continuous read
Read when reset
SW4-4 Manual reset selector
Manual reset enabled
Manual reset disabled

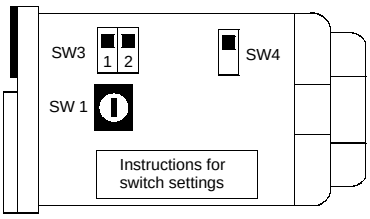
Totalizing Counter

H7AN-T4/T4M



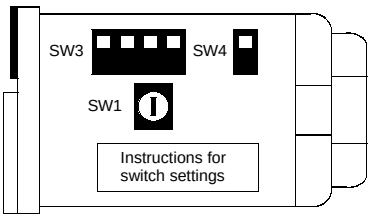
SW3-1 CP1's maximum counting speed selector
30cps
5 kcps
SW3-2 CP2's maximum counting speed selector
30cps
5 kcps
SW4-1 Manual reset selector
Manual reset enabled
Manual reset disabled
SW4-2 UP/DOWN selector
UP (increment)
DOWN (decrement)

H7AN-ET4/ET4M



SW1 Counter function selector
SW3-1 CP1's maximum counting speed selector
30cps
5 kcps
SW3-2 CP2's maximum counting speed selector
30cps
5 kcps
SW4 Manual reset selector
Manual reset enabled
Manual reset disabled

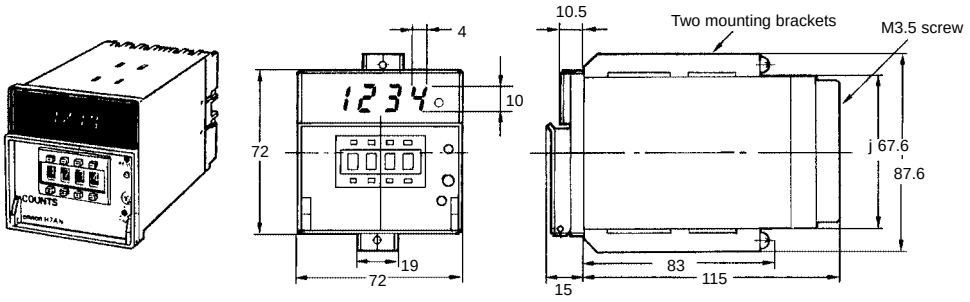
H7AN-RT6, RT6M/RT8/RT8M



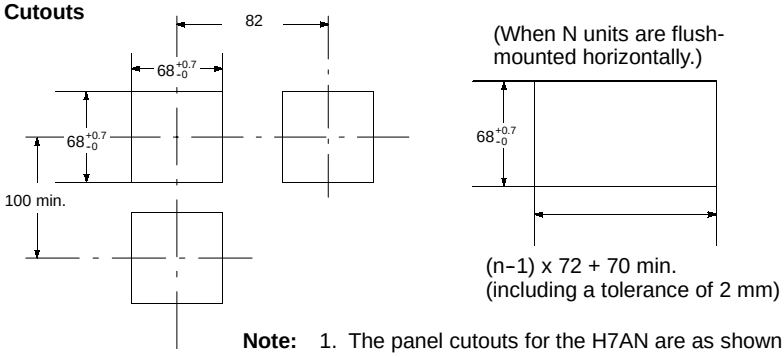
SW1 Counter function selector
SW3 Maximum counting speed selector
SW4 Manual reset selector
Manual reset enabled
Manual reset disabled

Dimensions

Note: All units are in millimeters unless otherwise indicated.



Panel Cutouts

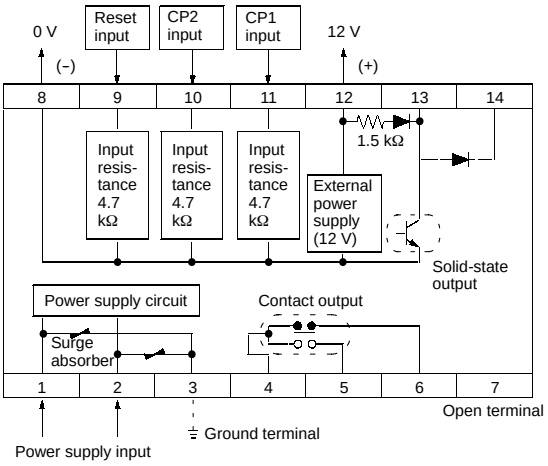


Note: 1. The panel cutouts for the H7AN are as shown (according to DIN437000).
2. The recommended mounting panel thickness is from 1 to 5 mm.
3. Use the mounting bracket (sold together) to mount the digital counter.

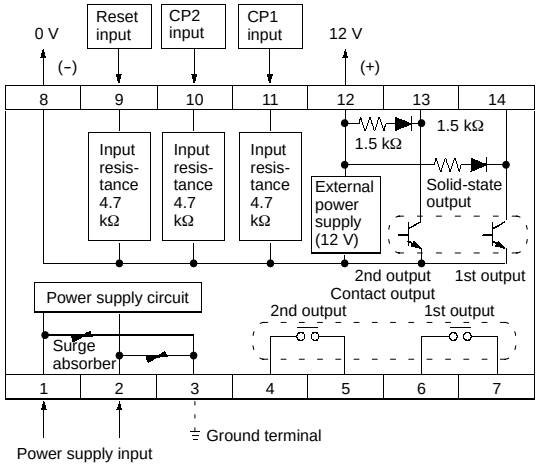
Installation

■ Terminal Arrangement

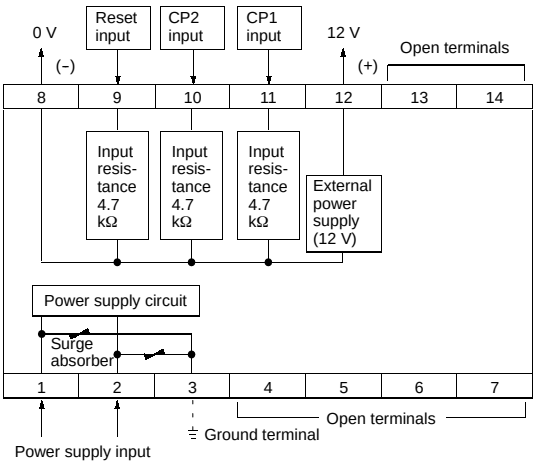
1-stage Preset Counters



2-stage Preset Counters



Total Counters



Note:
1. The polarities of the DC power supply terminals are as follows: Terminal 1: negative; terminal 2: positive
2. If there is excessive external noise, terminal 3 must be grounded to an appropriate place where the grounding resistance is 100 Ω max. There will be a current leakage of 0.2 mA each from terminals 1 and 2 to terminal 3.
3. The open terminals cannot be used as relay terminals.
4. Insert surge absorbers between each of the power supply terminals and the ground terminal. If the ground terminal is not used, insert the surge absorbers between terminal 1 and terminal 2.

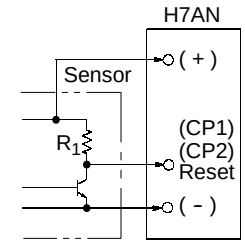
■ Connections

Solid-state Inputs (NPN Transistors)

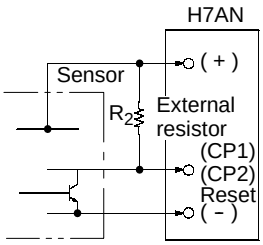
The CP1, CP2, and reset inputs of the H7AN must be voltage inputs.

Solid-state Contact Input Signal Levels

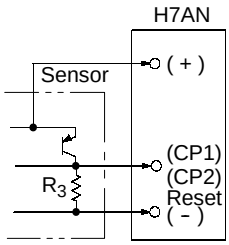
1. High level: 4.5 V min.
   4.7 kΩ x E/(4.7 kΩ + R1 or R2) must satisfy the above level.
   E: 30 VDC max. (12 VDC if power is supplied from the external power supply.)
2. Low level: 2 V max.



High level: Transistor: OFF



High level: Transistor: OFF



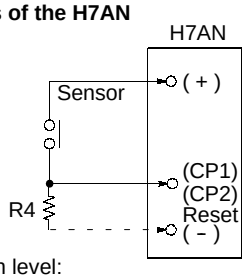
High level: PNP Transistor: ON;
R3 is optional.

Contact Inputs

For contact inputs, the contact must have a switching capacity of 2.5 mA min. at 12 V. If a 680-Ω resistor (1/2 W) is used for R4, reliability will be improved.

Input Conditions of the H7AN

H: 5 to 30 V
L: 0 to 2 V



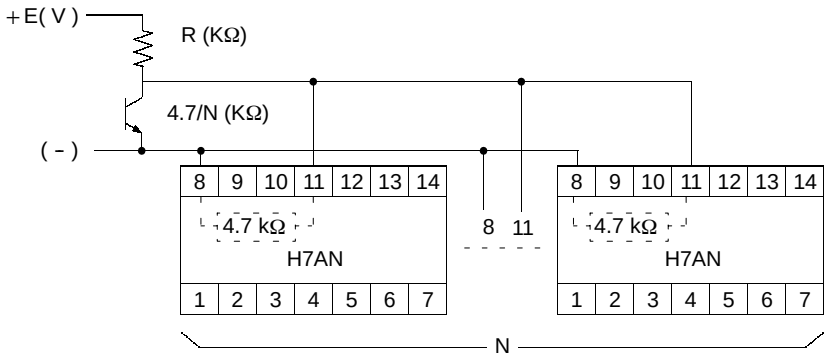
High level:
Contact: ON

Connections of Single Solid-state Inputs

The following illustrations show how to connect a single solid-state input to digital counters connected in parallel. The H7AN has an input resistance of 4.7 kΩ. If the number of counters is N, the total input resistance will be 4.7/N kΩ. In this case, the high level input signal voltage can be calculated as follows:

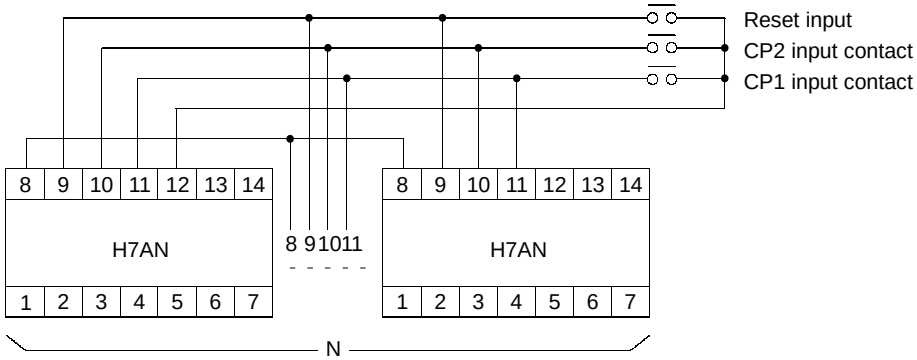
(4.7/N) x E/(4.7/N + R)

Determine the value of E (V) and R (kΩ) so that the high level input signal voltage will be 5 to 30 VDC.



Connections of Single Contact Inputs

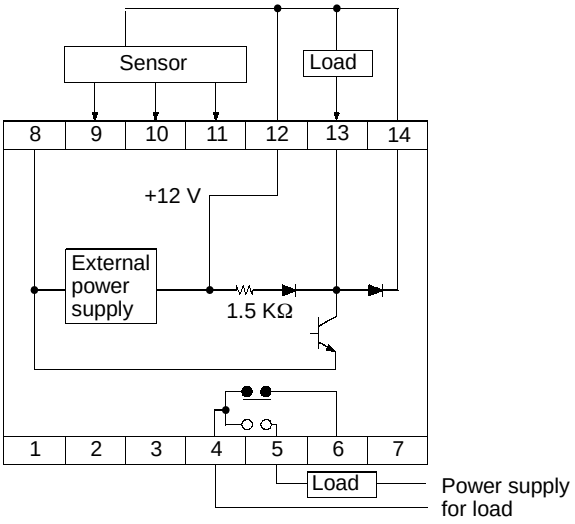
The following illustrations show how to connect a single contact input to digital counters connected in parallel. If the number of digital counters is N, the total contact input current will be 2.5 x N (mA) at 12 VDC.



Solid-state Outputs (One-stage Counters)

Load Operation when Transistor is ON

External power supply for Load

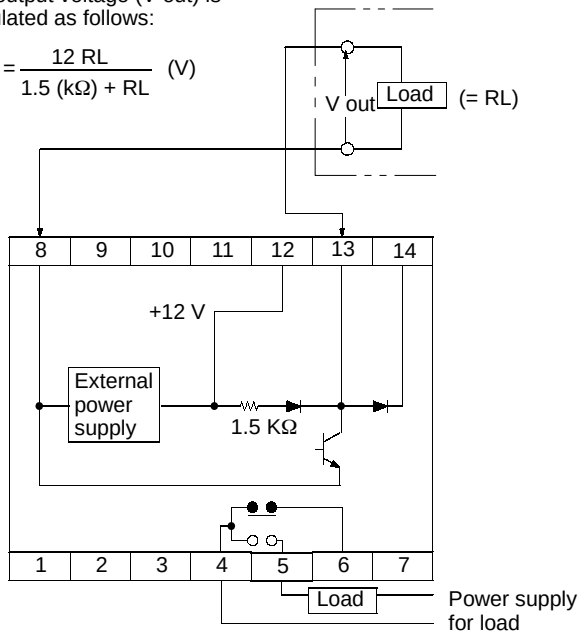


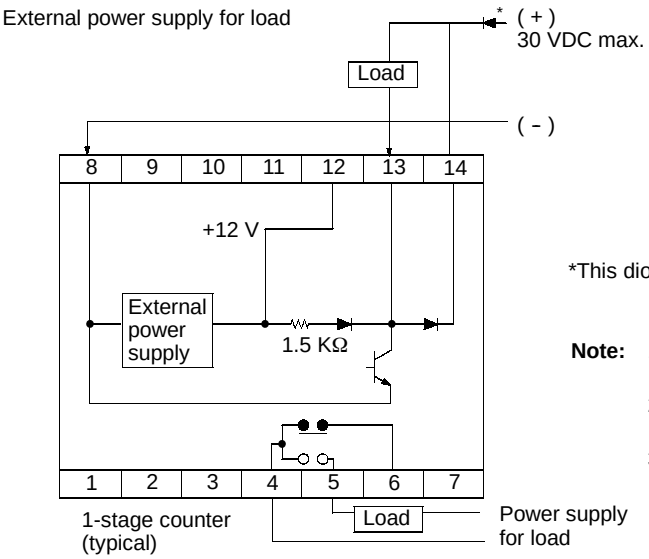
Load Operation when Transistor is OFF

Connected to the input terminals of other equipment

The output voltage (V out) is calculated as follows:

$$Vout = \frac{12\ RL}{1.5\ (k\Omega) + RL}\ (V)$$



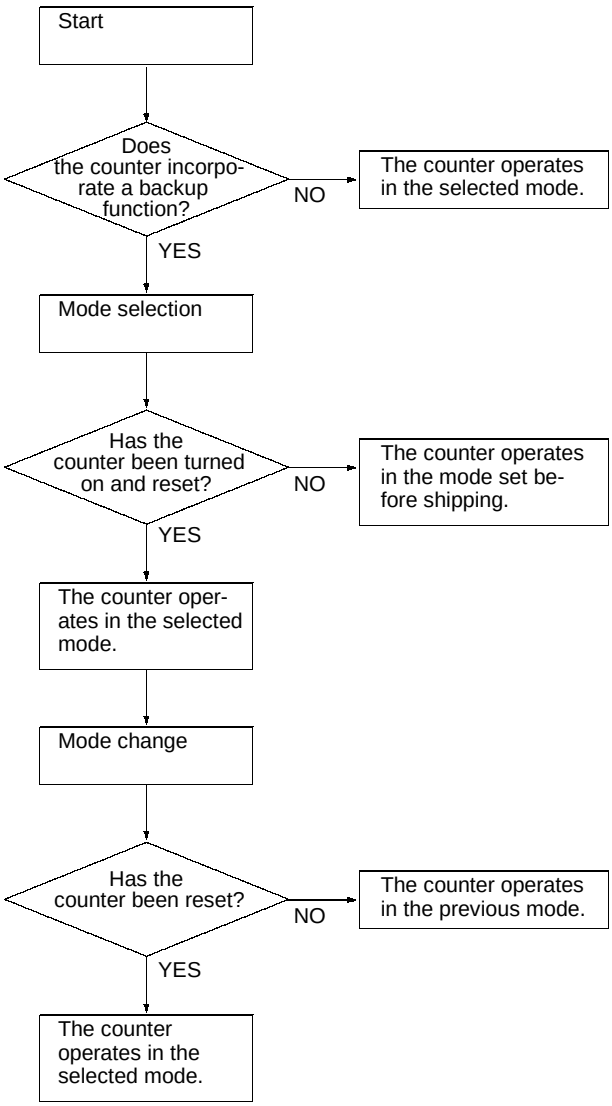


*This diode is necessary if the supply voltage is below 12 V.

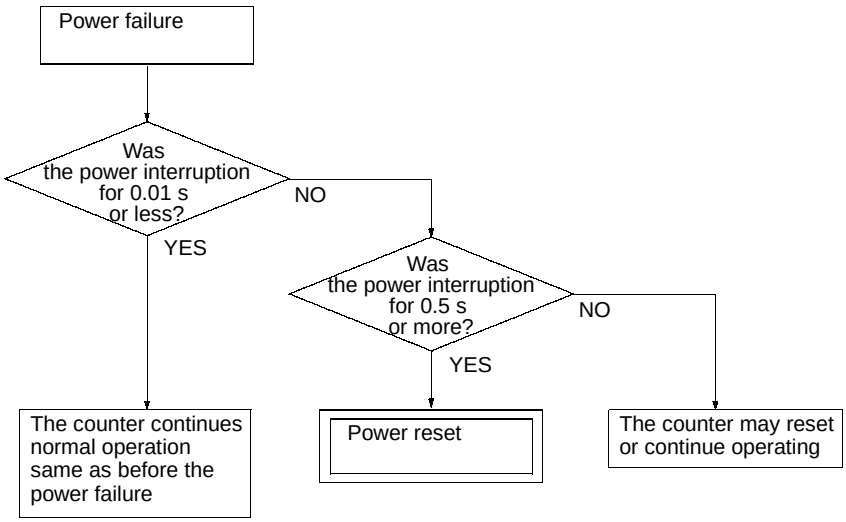
Note:
1. The total current consumption of the sensor and load must not exceed the capacity of the external power supply (80 mA).
2. The capacity of the load must not exceed the switching capacity of the transistor (100 mA).
3. The polarities of the power supply terminals are not reversible. Check connections before applying voltage to the power supply terminals to avoid damaging the Counter.

Precautions

Refer to the following flowchart before using the H7AN-M, which has a backup function.

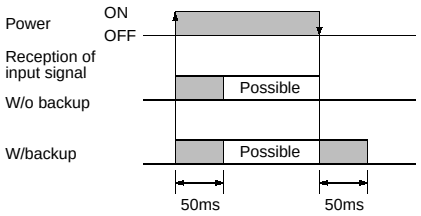


Refer to the following flowchart for the relationship between the settings of the H7AN and power interruptions.

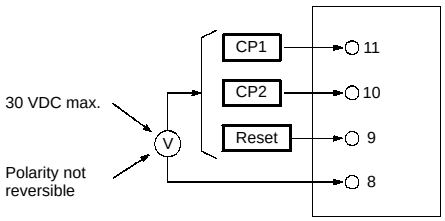


Power Supplies, Input, Output

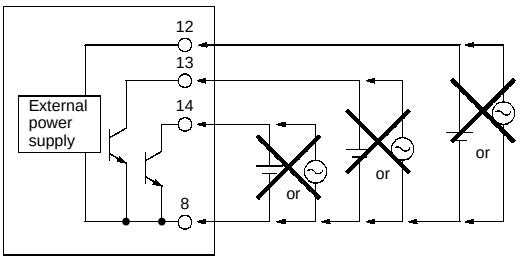
When turning on and off the power, input signal reception is possible, unstable, or impossible as shown in the diagram below. The unstable period will vary with power supply voltage and the load conditions on external power supplies.



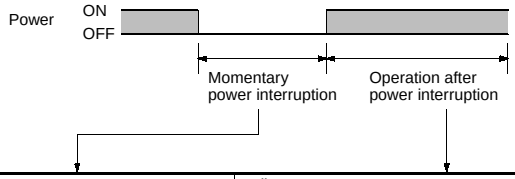
The following illustration shows how to apply voltage to the CP1, CP2, and reset input terminals.



Do not apply voltage to either the solid-state output terminals or external power supply terminals.



H7AN models without a backup function operate as follows:

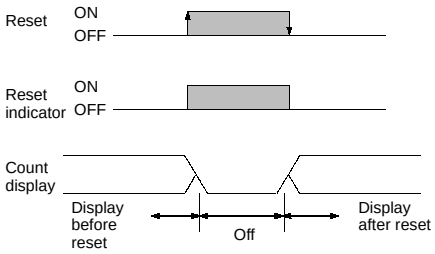


0.5 s or more	All reset
0.01 s or less	The counter continues normal operation same as before the power failure.
More than 0.01 and less than 0.5 s	The counter may reset or continue operating.

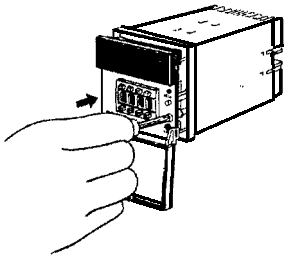
Note: Use the H7AN-M, which has a backup function, to maintain the settings without being cancelled by a power interruption.

Operation and Displays

The following timing chart shows how the H7AN indicates when there is an external or manual reset input.



To mount the casing on the digital counter, insert the digital counter body into the casing by hand as far as possible and then tighten the mounting screw. Press by the hand the front panel as indicated by the arrow so that the screw will tighten securely.



⚠ Caution

The H7AN-M has a built-in lithium battery. Do not throw the digital counter into fire; it may explode. Do not dispose of the digital counter with burnable waste products. The built-in lithium battery cannot be replaced.

It is possible to change the setting of the H7AN counters at any time. You can interrupt the counting operation by resetting the counter to a large value while the digital counter is in operation. To cut the counting operation short, the counter can be set to a small value. Attach the front cover to the counter so that the set value will not be accidentally reset during normal counting operations. It is possible to nullify this function on the H7AN 6-digit or 8-digit counters so that you can change the setting of the counters only after resetting the H7AN.

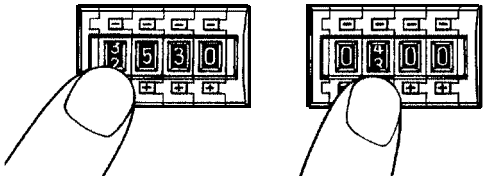
To test the digital counter, reset the counter to 0 so that the control output will turn ON instantaneously. Do not reset the counter to 0 during actual counting operations.

Do not set any digit incompletely or an error will occur.

Do not set the counter as shown below.

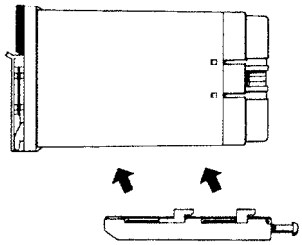
530: Accurate counting is not possible.

000: The counter will output instantaneously.



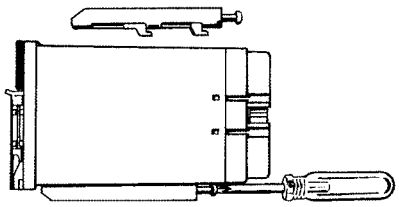
Mounting

The following illustrations show how to mount the H7AN with a mounting bracket (sold together).



Mount on the bottom of the digital counter after loosening the screw to the left.

Y92H-5



Mount on the top of the digital counter after loosening the screw to the right. Securely tighten the screw until it gives a clicking sound.

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

Cat. No. M01-E1-9A

OMRON

Solid-state Counter

H7CN

All Required Counter Functions Incorporated in a Compact DIN-sized (48 x 48) Housing

- In addition to Up and Down models, a reversible (Up-Down) counter is also available
- Maximum counting speed of 5,000 cps, never before attained by a small-size preset counter
- Power supply freely selectable within a range of 100 to 240 VAC. Also, power supply for the DC-operated models is selectable within a range of 12 to 48 V
- Models with memory backup function against power failure available

RC

Ordering Information

Classification		Preset Counter								Totalizing Counter
Input signal system (Count & reset inputs)		Contact, Solid-state								Contact/Solid-state
Mounting method		Flush mounting, surface mounting								
Display		7-segment LEDs (8 mm high), Up indicator								7-segment LEDs (8 mm high)
Number of digits		4 digits (0 to 9,999)								
Backup power for memory protection		No		Yes (100 to 240 VAC only) Backup time for power interruption: Approx. 5 years at 20°C (approx. 10 min without battery)		No				Yes Backup time for power interruption: Approx. 5 years at 20°C (approx. 10 min without battery)
Control output		Contact (SPST-NO)		Contact (SPDT)		Contact (SPST-NO)		Solid-state (open-collector)		---
Operating mode		Up counting	Down counting	Up counting	Down counting	Reversible counting, command input	Reversible counting, individual input	Up counting	Down counting	Up counting
Max. counting speed	**30 cps**	H7CN-XLN	H7CN-YLN	H7CN-XLNM	H7CN-YLNM	H7CN-ALN	H7CN-BLN	---	---	H7CN-TXL
	5 kcps (see note)	H7CN-XHN	H7CN-YHN	H7CN-XHNM	H7CN-YHNM	H7CN-AHN	H7CN-BHN	H7CN-XHNS	H7CN-YHNS	H7CN-TXH

Note: Only the solid-state input signal is available when the maximum counting speed is 5,000 cps

■ Accessories (Order Separately)

Protective Cover	**Hard**	Y92A-48B
Flush Mounting Adapter		Y92F-30
Backup Battery		Y92S-20

Sockets

Applicable Counter	Track Mounted Socket	Back Connecting Socket
H7CN- j j	P2CF-08	P3G-08
H7CN- j j M	P2CF-11	P3GA-11

Specifications

■ Ratings

Supply voltage	24, 100 to 240 VAC 50/60 Hz 12 to 48 VDC (contains 20% ripple max.) (see note 1)
Operating voltage range	85% to 110% of rated voltage
Power consumption (see note 2)	Approx. 12 VA/2.5 W (at 240 VAC, 50Hz) Approx. 2.5 W (at 48 VDC)
Count and reset input	Impedance by short-circuiting contacts: 1 kΩ max. Residual voltage: 2 V max. Impedance by opening contacts: 100 kΩ min.
Max. counting speeds of count input	30 cps (contact and solid-state inputs) Minimum pulse width: 16.7 ms (ON/OFF ratio: 1:1) 5.000 cps (solid-state inputs) Minimum pulse width: 0.1 ms (ON/OFF ratio: 1:1)
Reset system	Power-OFF reset Reset time: 0.5 s Reset time following power application 0.05 s External reset & manual reset Reset time: 0.02 s Reset time following signal application: 0.05 s
Control output	Contact (SPDT) output: 3 A, 250 VAC, cosφ = 1 (resistive load) Solid-state (open collector) output: 30 VDC MAX. 100 mA max.

Note: 1. The memory backup function is not available for this DC supply voltage range.

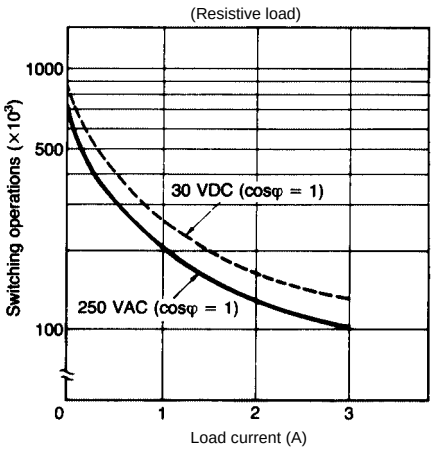
2. On power application, an inrush current of approximately 10 times the normal current flows through the Counter.

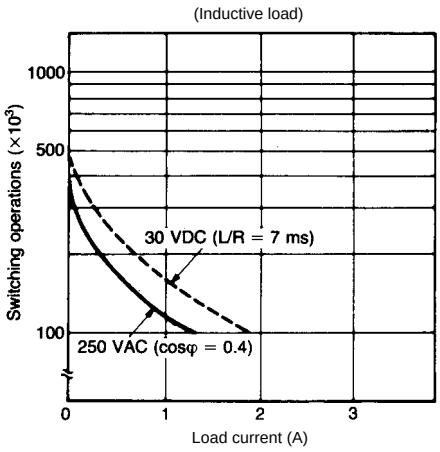
■ Characteristics

Item	Preset Counter	Totalizing Counter
Insulation resistance	100 MΩ min. (at 500 VDC) (between current-carrying terminal and exposed non-current-carrying metal parts, and between non-continuous contacts)	100 MΩ min. (at 500 VDC) (between current-carrying terminal and exposed non-current-carrying metal parts)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min (between current-carrying terminal and exposed non-current carrying metal parts and between non-continuous contacts)	2,000 VAC, 50/60 Hz for 1 min (between current-carrying terminal and exposed non-current carrying metal parts)
Impulse withstand voltage	6 kV (between power terminals) 6 kV (between current-carrying terminal and exposed non-current-carrying metal parts)	
Noise immunity	±2 kV (between power terminals), ±500 V (between input terminals), square-wave noise by noise simulator	
Static immunity	Malfunction: 8 kV	
Vibration resistance	Destruction: 10 to 55 Hz, 0.75-mm single amplitude Malfunction: 10 to 55 Hz, 0.5-mm single amplitude	
Shock resistance	Destruction: 300 m/s^2 (approx. 30G) Malfunction: 100 m/s^2 (approx. 10G)	
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)	
Ambient humidity	35% to 85%	
Life expectancy	Mechanical: 10 million operations min. Electrical: 100,000 operations min. (3 A at 250 VAC, resistive load)	---
Approved standards	UL (File No. E41515) CSA (File No. LR22310)	
Weight	Approx. 150 g	

Engineering Data

Electrical Life Expectancy



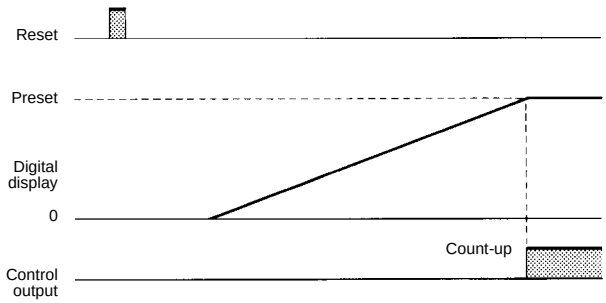


Operation

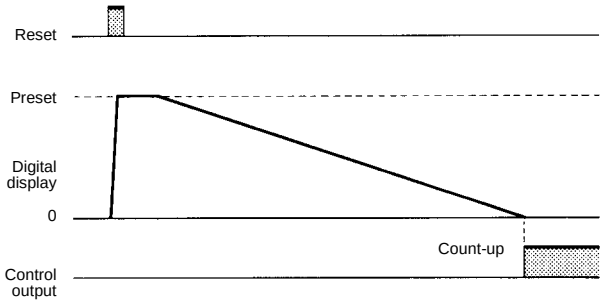
■ Timing Charts

Preset Counter

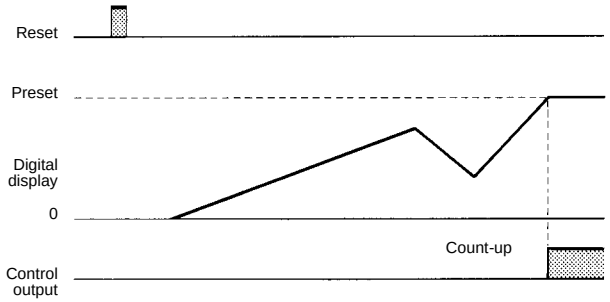
Up Type



Down Type

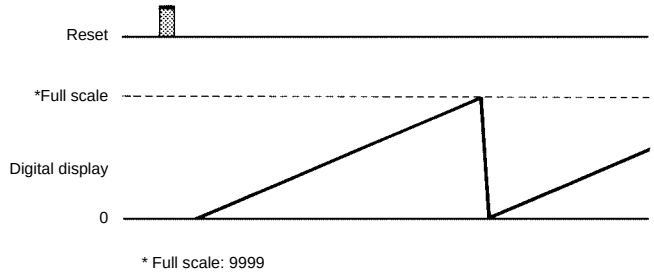


Up/Down A, B Types



Totalizing Counter

Up Type

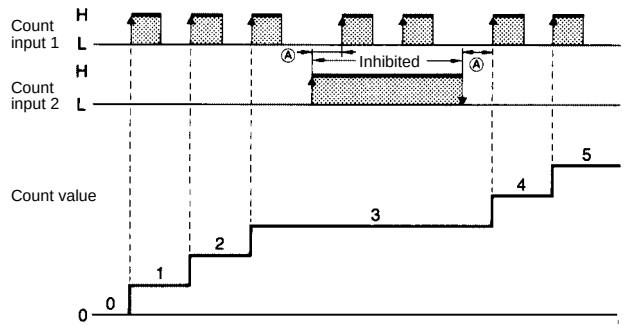
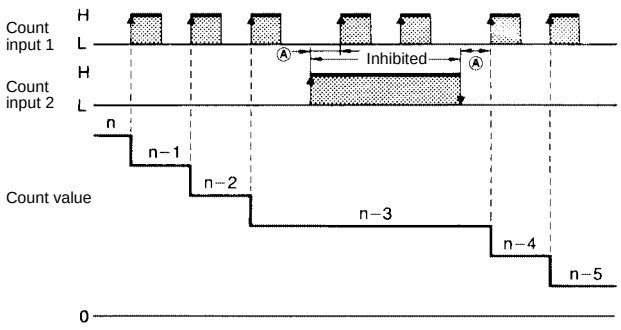
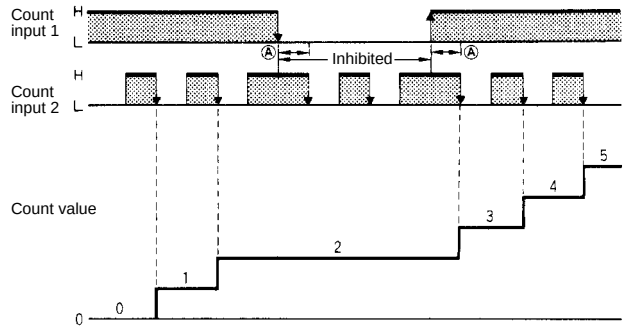
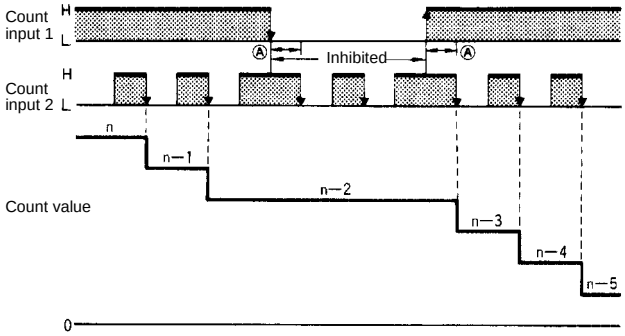


* Full scale: 9999

Input Mode

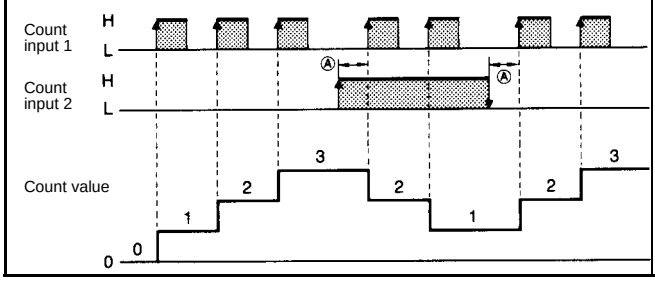
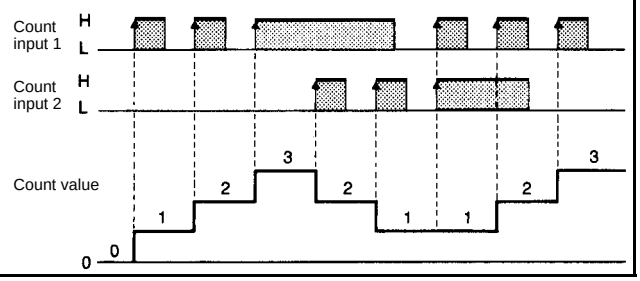
Up/Down Selectable Type

Note: (A) must be more than the minimum signal width. If (A) is set shorter than the minimum signal width, the error of count ±1 may occur.

Up mode	Down mode
Count input 1: Count input; Count input 2: Inhibit (gate) input  **Note:** Input to the CP2 while the CP1 is set to "L."	Count input 1: Count input; Count input 2: Inhibit (gate) input  **Note:** Input to the CP1 while the CP2 is set to "H."
Count input 1: Inhibit (gate) input; Count input 2: Count input  **Note:** Input to the CP2 while the CP1 is set to "L."	Count input 1: Inhibit (gate) input; Count input 2: Count input  **Note:** Input to the CP1 while the CP2 is set to "H."

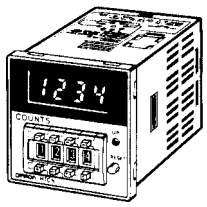
Up/Down Type

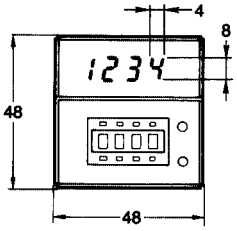
Note: (A) must be more than the minimum signal width. If (A) is set shorter than the minimum signal width, the error of count ±1 may occur.

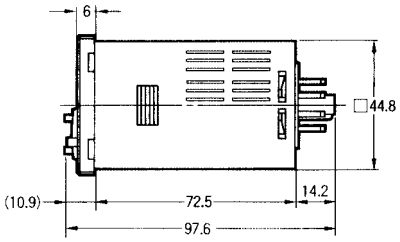
Up/Down A command input	Up/Down B individual input
	

H: Short-circuit ON-time impedance; 1 kΩ max. Residual voltage; 0.5 V max.
L: Open circuit OFF-time impedance; 100 kΩ min.

Dimensions



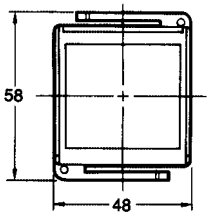


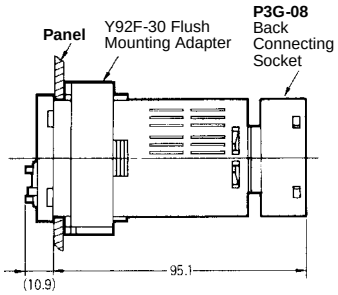


■ Accessories

Adapter for Flush Mounting

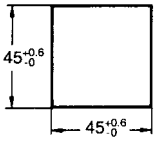
Y90F-30



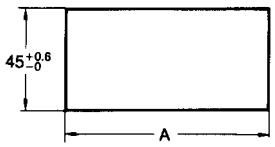


Panel Cutout

The standard panel cutout is as shown below. (Panel cutout conforms to DIN43700.)



Panel cutout for side-by-side mounting of two or more Units

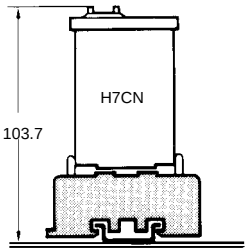


When mounting n Counters in a line, dimension A can be calculated from following formula.
A = (48n-2.5) $^{+1}_{0}$

Connecting Sockets

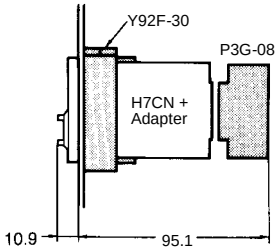
H7CN

Front Mounting



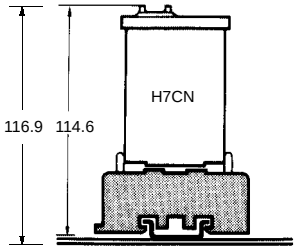
P2CF-08

Flush Mounting



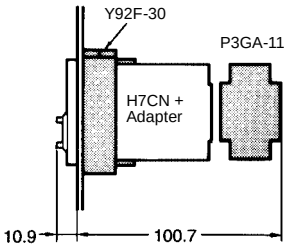
H7CN- j j NM

Front Mounting



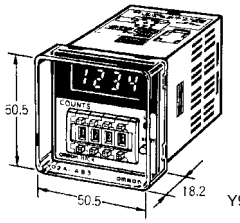
P2CF-11

Flush Mounting



■ Protective Cover

The Protective Cover shields the front panel, particularly the count value setting section from dust, dirt and water, and prevent malfunctioning of the Counter due to static electricity.

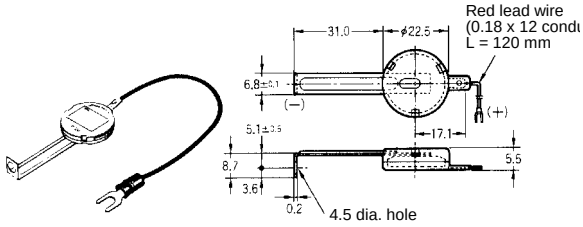


Y92A-48B* (Hard cover)

* The Hard Protective Cover prevents the set count value from being altered due to accidental contact with the push-type thumbwheel switch.

■ Backup Battery for Memory Protection

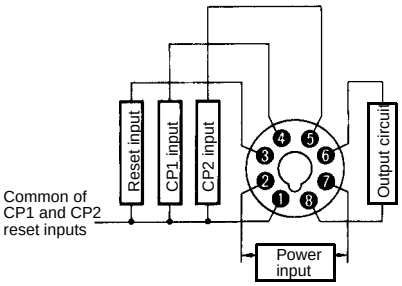
Y92S-20



Installation

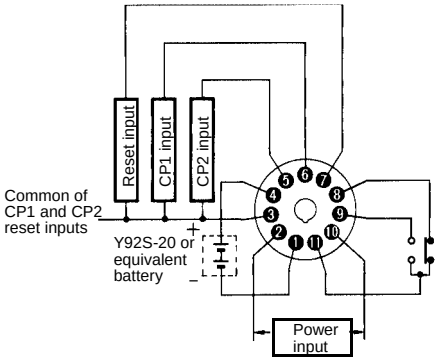
■ Terminal Arrangement

Presetting Model (with No Backup Function)



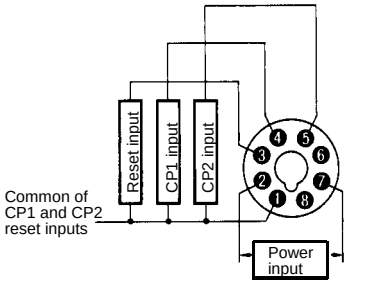
Note:
1. Terminal 2 is a negative terminal and terminal 7 is a positive terminal if DC power is supplied.
2. Common terminal 1 is internally connected to terminal 2 if the Counter is a model that operates with DC.

Presetting Model (with Backup Function)



Note:
1. If Y92S-201 is not used, make sure that the voltage of the battery is 3 V.
2. All data will be held for approximately 10 minutes if no battery is used.

Totalizing Model (with No Backup Function)



Note:
1. Terminal 2 is a negative terminal and terminal 7 is a positive terminal if DC power is supplied.
2. Common terminal 1 is internally connected to terminal 2 if the Counter is a model that operates with DC.

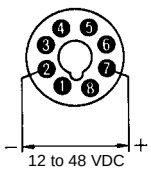
Connections

■ Power Supply Connection

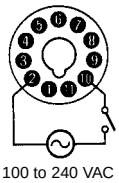
For Models with No Backup Function

AC Power Supply

DC Power Supply



For Models with Backup Function

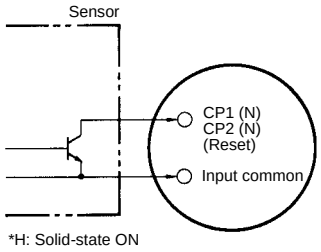


Note:
1. Make sure that the fluctuation of the supply voltage is within the permissible range.
2. Pay attention to the polarity of the DC power supply and do not make a wiring mistake.

■ Input Connection

The CP1 and CP2 reset inputs of the H7CN will be active when input to the H7CN is short-circuited.

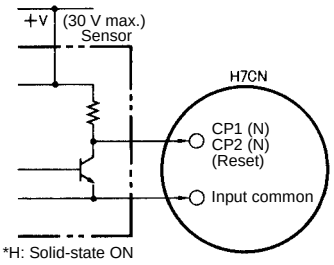
Solid-state Input (NPN)



*Refer to the following for the signal levels of the solid-state input.

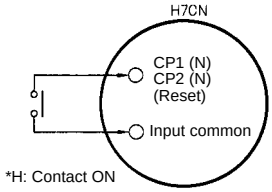
Note: 1. H level with solid-state ON.
Residual voltage: 0.5 V max.
ON impedance: 1 kΩ max.

2. L level with solid-state OFF.
OFF impedance: 100 kΩ min.



*Sensors with voltage output can be connected to the H7CN as shown in the above circuit diagram. When solid-state is OFF, make sure that the voltage between the input common and CP1 or CP2 terminals are 4 V min. for AC models and 6 V min. for DC models.

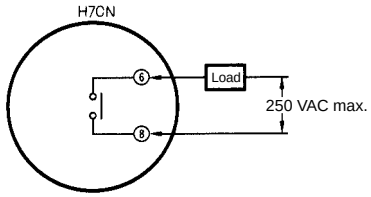
Contact Input



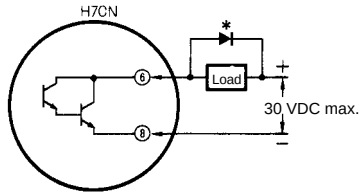
*Make sure that the contact can switch 0.5 mA at 5 V with ease.

■ Output (Load) Connection

Contact Output



Solid-state Output



*Diode to absorb counter-electromotive force

Delay Time

The delay time, which is the period between the moment a pulse input signal that coincides with the preset value is ON and the moment the corresponding control output signal is ON, varies with the counting speed and type of output as shown in the following table.

Control output	Max. counting speed	Delay time
Contact output	30 Hz (cps)	12 to 13.5 ms
	5 kHz (cps)	5.5 to 8 ms
Solid-state output	5 kHz (cps)	0.65 to 0.7 ms

Precautions

⚠ Caution

The Y92S-20, which is used for the H7CN- j j NM, is a battery for power failure backup. Do not short the positive and negative poles of the battery, recharge or disassemble it, deform it with pressure, or throw it into a fire, otherwise it may explode, burn, or leak liquid.

Correct Use

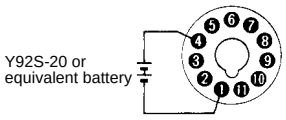
Battery for Power Failure Backup

Be sure to connect a battery to the Counter if it is a model with a backup function. A variety of 3-V batteries can be used. The data backup time of the Counter varies with the electric capacity of the battery.

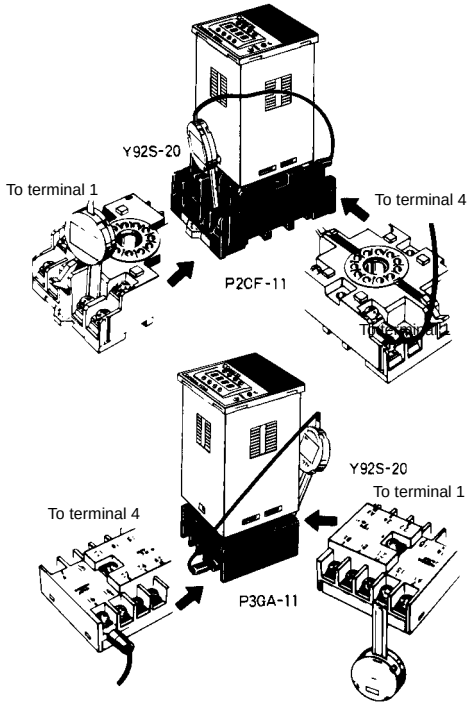
Before using the Counter for the first time, turn on the Counter and reset it. Since output may be sent out when the power is turned on, be sure to keep the output terminals open when turning on the power.

If a power failure to the Counter occurs for longer than 10 minutes with the battery disconnected, the Counter will have output errors or display errors when power is supplied to the Counter again, in which case reset the Counter before use. (The Counter can be used with or without the battery if it is reset.)

The life of the battery depends on the frequency of power failures. It is, however, recommended that the battery be replaced regularly (i.e., every four to five years).

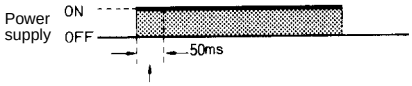


Connection



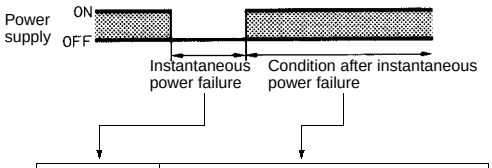
Power Supply, Input, and Output

The Counter requires 50 ms to be in stable operation after power is supplied. Do not input any signal before the Counter is in stable operation.



Do not input signals during this period, when the Counter is not in stable operation.

Refer to the following for the condition of the Counter after an instantaneous power failure if the Counter has no backup function.



0.5 s min.	The display and output are reset.
0.01 s max.	The previous condition is on hold.
0.01 to 0.5 s	Either the previous condition is on hold or the display and output are reset.

Note: If the previous condition must be on hold, use the H7CN-M, which has a backup function.

Display and Output

- The display of the Counter will be turned off when the external reset or manual reset signal is input. The Counter will display the reset value when it has been reset.
- The Counter reads input signals anytime and it is possible to change the set value of the Counter while power is being supplied. Be aware that the Counter will have an output signal if the set value coincides with the count value while changing the set value.
  To prevent the set value from being changed by mistake while operating the Counter, use the Y92A-48B Protective Cover, which is sold separately.
- By setting all set values to 0, the Counter will have a control output signal instantly, which can be used for testing purposes.
- When changing the set value while power is being supplied, do not leave a set value set midway between numbers, otherwise the Counter will have a set value error.

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

Cat. No. M04-E1-7A

OMRON

Solid-state Counter

H8CA-S

DIN-sized (48 x 48 mm) Solid-state Counter with Timer Functions

- Easier operation due to improved front panel
- Counter and timer function modes switch-selectable
- Large easy-to-read 6-digit LCD
- Non-significant zeroes suppressible from the preset or count value display
- Power supply voltages freely selectable within a range of 24 to 240 V for the AC-operated models, and 12 to 120 V for the DC-operated models

RC

Ordering Information

Power supply	Output	No voltage input (short/open circuit)		Voltage input (high/low voltage)	
		30 cps	1 kcps	30 cps	1 kcps
AC (24 to 240 VAC)	**Contact**	H8CA-SAL	H8CA-SAH	H8CA-SALV	H8CA-SAHV
	Solid-state	H8CA-SALS	H8CA-SAHS	H8CA-SALVS	H8CA-SAHVS
DC (12 to 120 VDC)	**Contact**	H8CA-SDL	H8CA-SDH	H8CA-SDLV	H8CA-SDHV
	Solid-state	H8CA-SDLS	H8CA-SDHS	H8CA-SDLVS	H8CA-SDHVS

Mounting method	Surface/Flush mounting
Operating function	Preset counter/timer (selectable)
Operating system	Counter: select from three input modes (command input, individual input, phase difference input) Timer: time-limit operation, integrating operation
Operating mode	Select from four operating modes. (N, F, C, R)
Backup power supply for memory protection	Yes (approx. 10 years at 20°C)
Display	7-segment LCD, 8-mm high
No. of digits	6 (Counter: 0 to 999999, Timer: 0.00 to 9999.99 s/0.0 to 99999.9 min/0.0 to 99999.9 h)
External connection	Socket
Input signal	Counter function: count and reset inputs Timer function: start, reset and gate inputs

Accessories (Order Separately)

Flush Mounting Adapter	Y92F-30
Track-mounting Socket	P2CF-11
Back Connecting Socket	P3GA-11

Specifications

■ Ratings

Supply voltage	24 to 240 VAC, 50/60 Hz 12 to 120 VDC (Contains 20% ripple (p-p) max.)
Operating voltage range	90 to 110% of rated voltage
Power consumption	Approx. 2.2 VA (at 240 VAC, 50Hz) (see note 1); Approx. 1.4 VA (at 100 VAC); Approx. 1 W (at 120 VDC) (see note 1); Approx. 0.8 W (at 100 VDC); Approx. 0.7 W (at 12 VDC)
Max. counting speeds of count input (in counter function mode)	30 cps (contact and solid-state inputs) Minimum pulse width: 16.7 ms (ON/OFF ratio: 1:1) 1 kcps (solid-state input) Minimum pulse width: 0.5 ms (ON/OFF ratio: 1:1)
Reset system	External reset (common to contact and solid-state inputs) and manual reset Minimum reset signal width: 20 ms Reset time following signal application: 0.05 s
Start and gate response time (in timer function)	Start and gate response time (common to contact and solid-state inputs): L-model: 16.7 ms H-model: 0.5 ms
Count and reset inputs for counter function/Start and gate inputs for timer function	No-voltage input (see note 2) Maximum short-circuit impedance: 1 kΩ max. Short-circuit residual voltage: 0.5 V max. (1.3 V max.) Minimum open impedance: 100 kΩ min. Voltage input: 5 to 30 VDC at “High” level 0 to 2 VDC at “Low” level INPUT impedance: Approx. 4.7 kΩ
Control output	Contact output type: SPDT 3 A 250 VAC $\cos\varphi = 1$ (resistive load) Solid-state output type: Open collector 100 mA max. 30 VDC max.

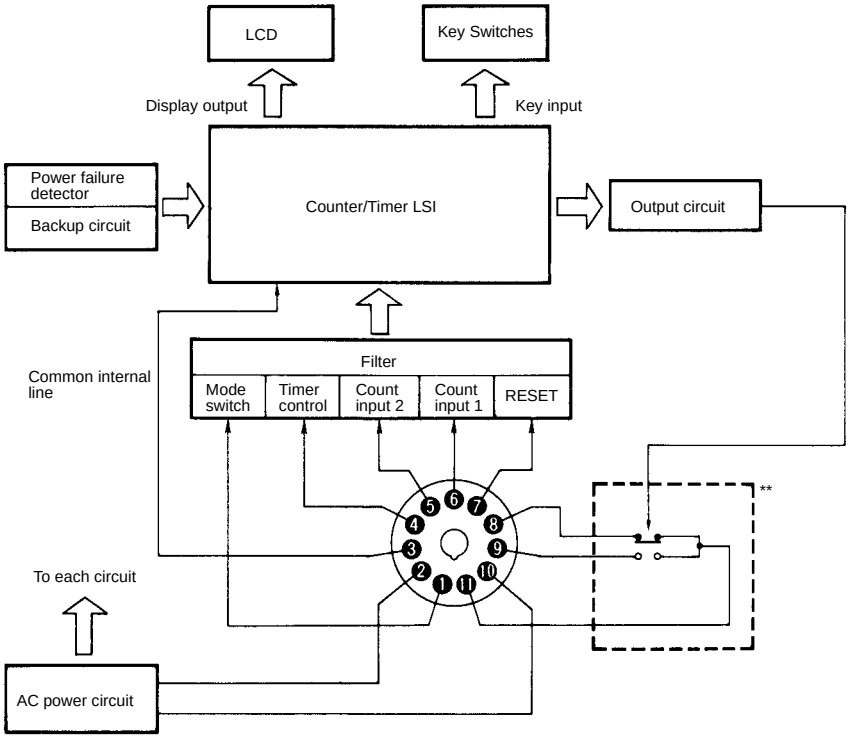
Note: 1. When power is applied, there is an inrush current of 3.7 A at 240 VAC, and 2.3 A at 120 VDC, for approx. 0.5 ms.

2. When using no-voltage input the source current output from each input terminals is 2 mA max.

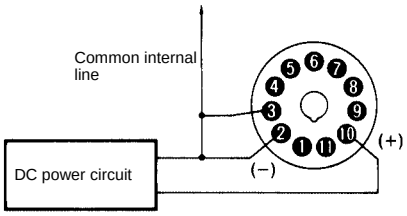
■ Characteristics

In timer function mode	**Repeat accuracy**	±0.05%±0.05 s max.
	Setting error	±0.1%±0.05 s max.
	Variation due to voltage change	±0.05%±0.05 s max.
	Variation due to temperature change	
Insulation resistance		100 MΩ min. at 500 VDC
Dielectric strength		1,500 VAC 50/60 Hz for 1 minute
Impulse withstand voltage		3 kV (between power terminals) 4.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts)
Noise immunity		±1.2 kV (between power terminals), ±500 V (between input terminals), square-wave noise by noise simulator
Static immunity		Malfunction: 8 kV
Vibration resistance		Destruction: 10 to 55 Hz, 0.75 mm total amplitude Malfunction: 10 to 55 Hz, 0.3 mm total amplitude
Shock resistance		Destruction: 300 m/s^2 (approx. 30 G) Malfunction: 100 m/s^2 (approx. 10 G)
Ambient temperature		Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity		35% to 85%
Life expectancy		Mechanical: 10 million operations min. Electrical: 100,000 operations min. (250 VAC 3 A resistive load)
Approved standards		UL (File No. E41515) CSA (File No. LR22310)
Case color		Light grey (Munsell 5Y 7/1)
Weight		Approx. 130 g

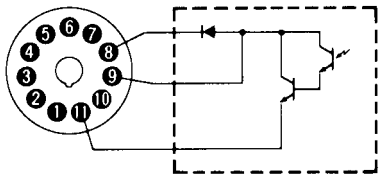
Block Diagram



With DC Power Supply



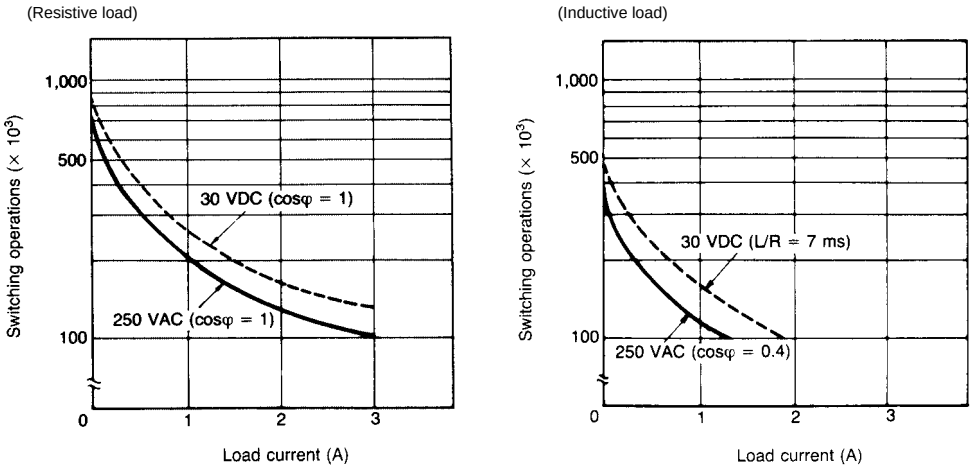
With Solid-state Output



The power source and input circuits for the AC power models are not insulated.

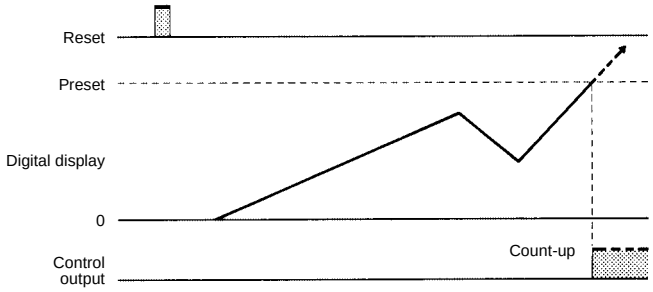
Engineering Data

Electrical Life Expectancy

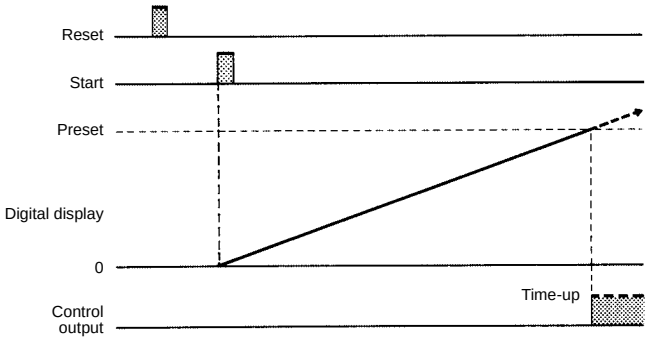


Timing Charts/Operation Mode

Operations in Counter Mode



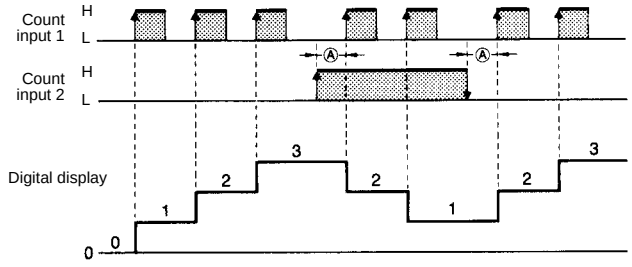
Operations in Timer Mode



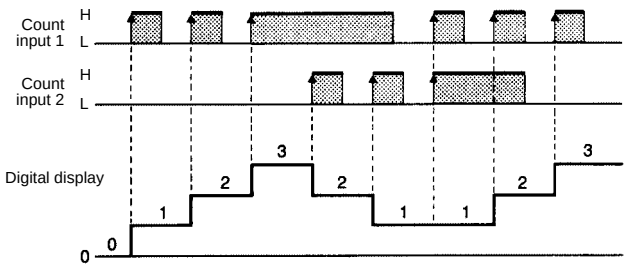
Input Mode

In the chart below, (A) is the minimum signal width, and (B) must be more than half of (A); with (B) set to less than half the minimum signal width, a count error of ±1 count may occur.

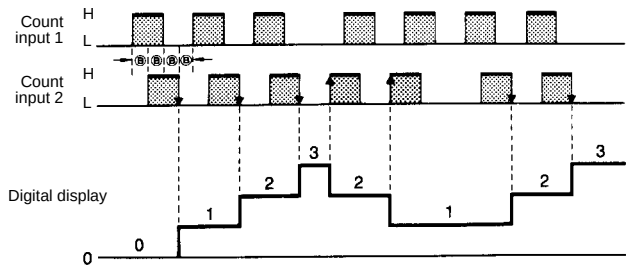
Up/Down A Command Input



Up/Down B Individual Input



Up/Down C Phase Difference Input



Note: 1. No-voltage input type

H: If the Counter is a contact input model, the contact turns ON.
If the Counter is a solid-state input model, the open-collector transistor is in the ON state.

L: If the Counter is a contact input model, the contact turns OFF.
If the Counter is a solid-state input model, the open-collector transistor is in the OFF state.

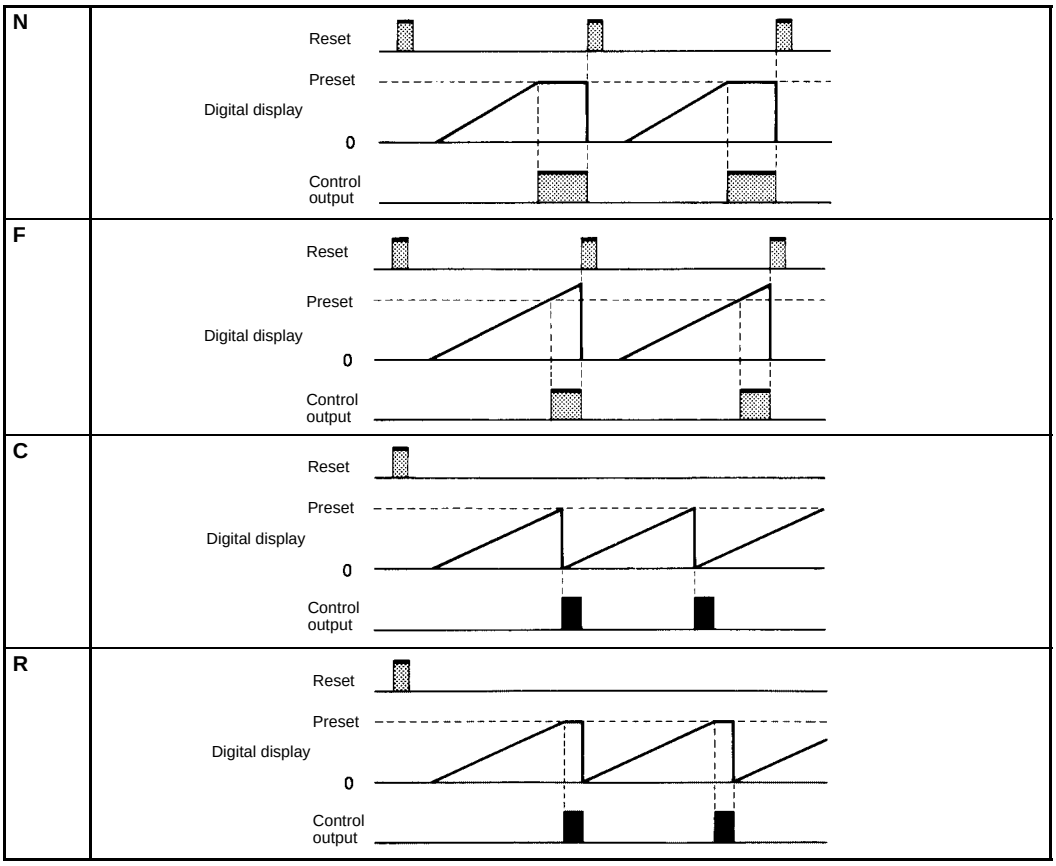
2. Voltage input type
Input signal voltage at "High" level is 5 to 30 V, while at "Low" level, 0 to 2 V.

Functions of Count Inputs

Input	Counter A mode	Counter B mode	Counter C mode	Timer
Count input 1	Count input: The count value is incremented by one when CP2 becomes "LOW" level. The count value is decremented by one when CP2 becomes "HIGH" level.	Incrementing count input	Phase difference input: The count value is incremented by one when phase of CP2 is delayed with respect to phase of CP1. The count value is decremented by one when phase of CP2 is advanced with respect to phase of CP1.	Start input
Count input 2	Incrementing/decrementing control	Decrementing count input		Gate input

Operations in Both Counter and Timer Modes

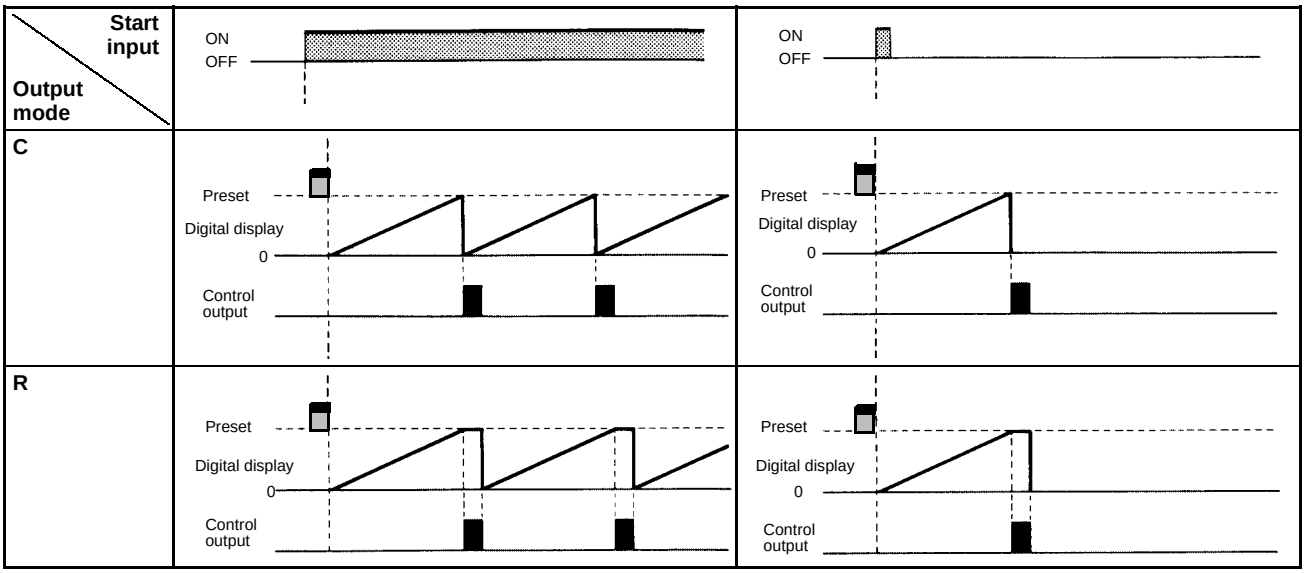
Note: In the C mode, the final total is not displayed because internal count circuit is reset as soon as counting is finished.



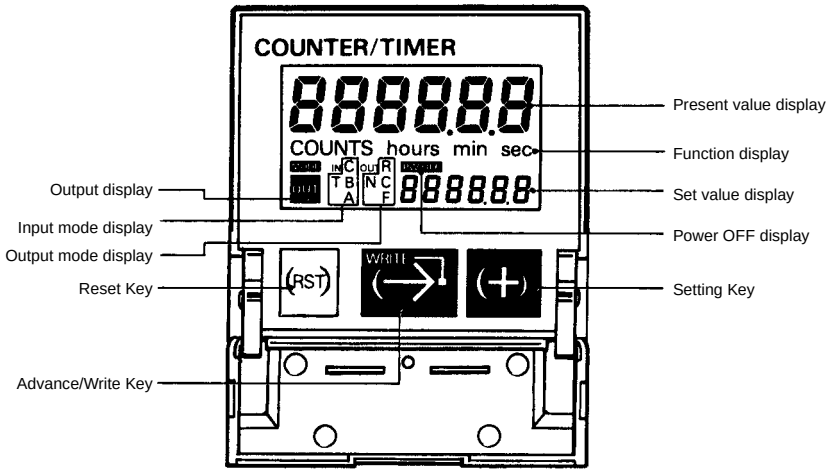
Note: 1. The displayed numeric value is incremented by the start input in the timer mode.

2. In the C mode, the final total is not displayed because the internal count circuit is reset as soon as counting is finished.

3. The operation in the timer mode differs due to the difference of the start input. (The operations in the N and F modes are the same.)



Nomenclature



Key Functions:

RST

Reset Key:
Resets the Present value display and the output.

Setting Key:
Sets the set value. Selects timer or counter function, and input and output modes.

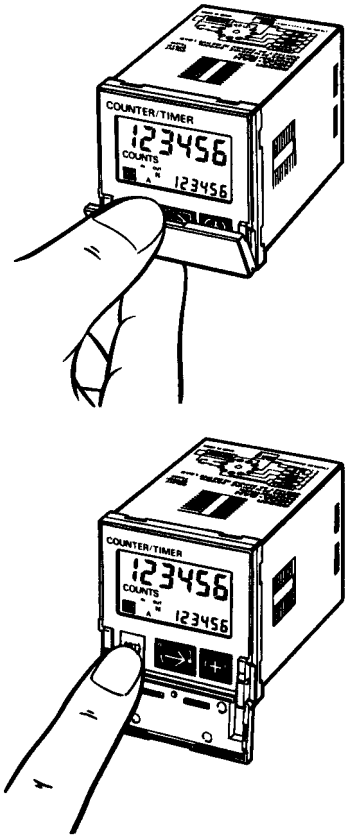
WRITE

Write Key:
Selects the function and mode, and writes. Normally used to write, or advance one column when setting the set value.

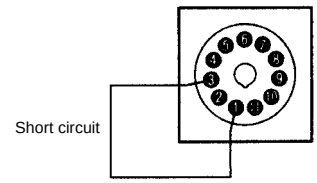
Programming

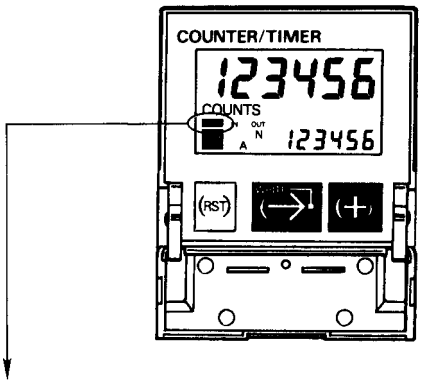
Function Selection

Select timer or counter function in advance. It is not necessary for power to be ON to set this function. When the H8CA-S is shipped, it is set to counter function, input mode "A," output mode "N," and preset value 1.



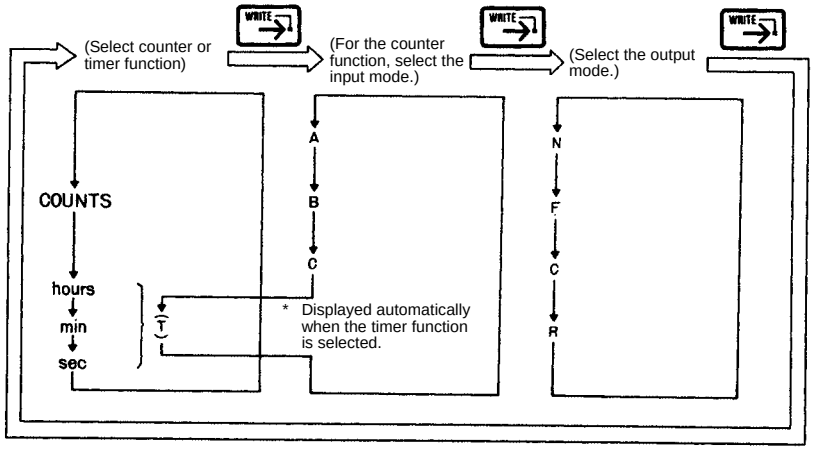
1. Terminals 1 and 3 are connected. (It is only necessary to connect these terminals when selecting the function.)





MODE is lit. The function, input mode, or output mode display will be blinking. (The Power OFF display will stop blinking when power comes ON.)

2. Press the Setting Key to select counter or timer function, input mode, and output mode. The characters below will flash when the Setting Key is pressed.



- Press the Setting Key until the desired function appears.
- Press the Write Key to write the desired input mode.

- Press the Setting Key until the desired input mode appears.
- Press the Write Key to write the desired input mode.

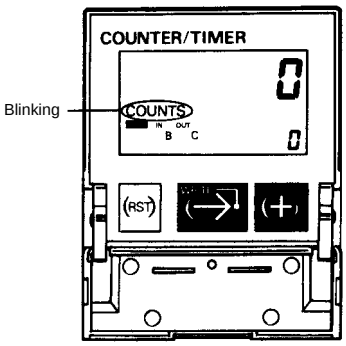
- Press the Setting Key until the desired output mode appears.
- Press the Write Key to write the desired output mode.

Examples

1. Selecting the Counter Function with Input Mode "A" and Output Mode "N" (Terminals 1 and 3 Connected)

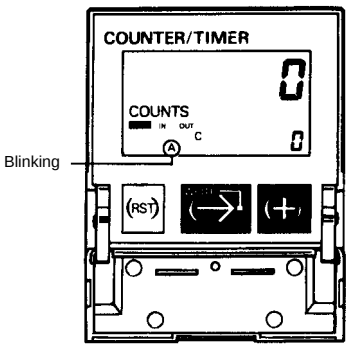
"MODE" lights on the display

"COUNTS" will begin blinking when the Setting Key is pressed. (Press the Keys until the desired place is reached.)



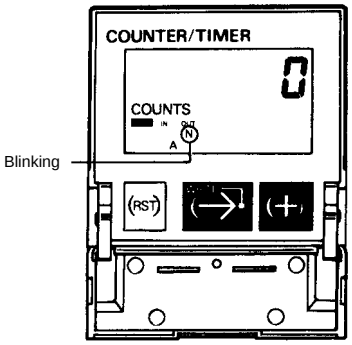
Press the Write Key. "COUNTS" will stop blinking and one of the input modes will begin blinking.

Press the Setting Key until input mode "A" begins blinking.



Press the Write Key. "A" will stop blinking an one of the output modes will begin blinking.

Press the Setting Key until output mode "N" begins blinking.

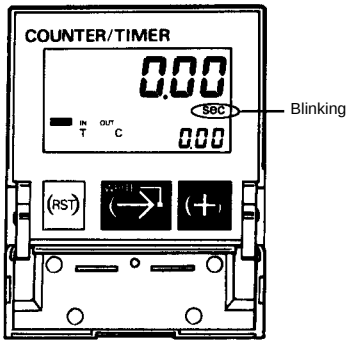


Disconnect terminals 1 and 3 before setting values. When terminals 1 and 3 are disconnected, the "MODE" display will turn OFF and output mod "N" will stop blinking.

Always disconnect terminals 1 and 3 when finished selecting the function. Values cannot be preset if terminals 1 and 3 are connected.

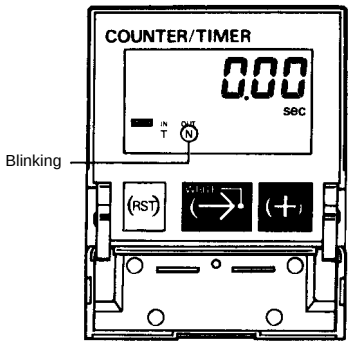
2. Selecting the Timer Function with "sec" and Output Mode "N" (Terminals 1 and 3 Connected)

If set for timer, "sec" will begin blinking when the Setting Key is pressed. (Press the Keys until the desired place is reached.)



Press the Write Key. "sec" will stop blinking and one of the output modes will begin blinking. The INPUT MODE will automatically enter "T."

Press the Setting Key until input mode "N" begins blinking.

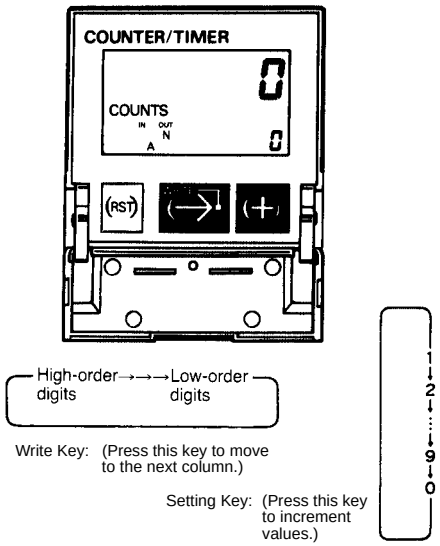


Disconnect terminals 1 and 3 before setting values. When terminals 1 and 3 are disconnected, the "MODE" display will turn OFF and output mode "N" will stop blinking.

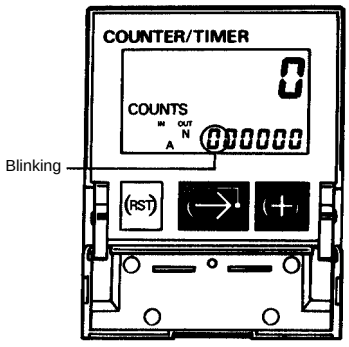
Always disconnect terminals 1 and 3 when finished selecting the function. Values cannot be preset if terminals 1 and 3 are connected.

Presetting Values

Preset values after selecting the function. Values can be preset whether the power supply is ON or OFF.

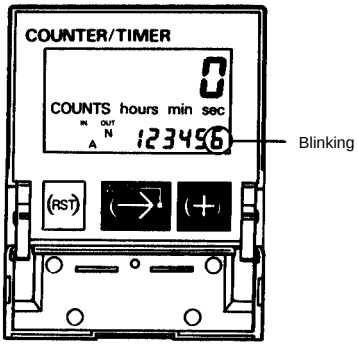


Press the Write Key until the desired digit begins blinking.



Press the Setting Key to set the desired value.

Continue pressing the Write and Setting Keys until the smallest digit has been set.

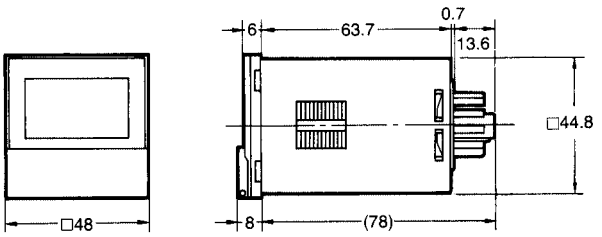


To complete presetting, press the Write Key so that no place on the display is blinking.

*Preset unnecessary higher digits at 0. (i.e. 000015)

Note: The output will go ON if the set value is 0 (0.0 or 0.00) and the displayed count is also 0 (0.0 or 0.00). In this case, press reset after presetting, and the output will go OFF.

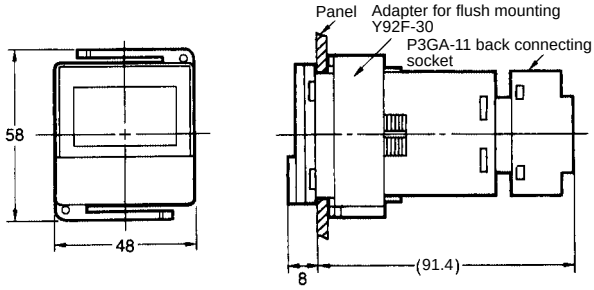
Dimensions



■ Accessories (Order Separately)

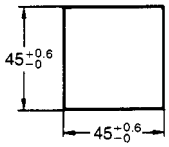
Adapter for Flush Mounting

Y92F-30

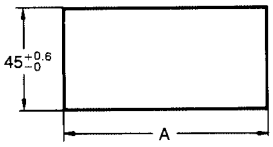


Panel Cutout

The standard panel cutout is as below.
(Panel cutout conforms to DIN43700)



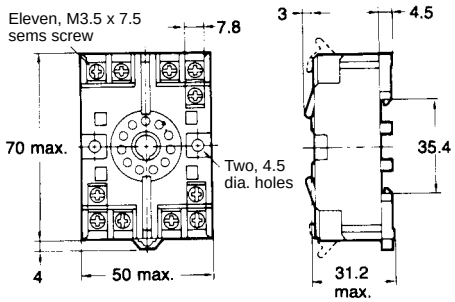
Panel cutout for side-by-side mounting of two or more units



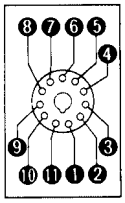
When mounting n Counters in line, dimension A can be calculated from following formula.
A = (48n – 2.5) +1 -0

Connecting Sockets

P2CF-11 Front Connecting Socket

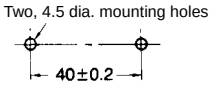


Terminal Arrangement/ Internal Connections

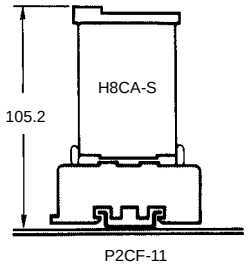


(Top view)

Mounting Holes

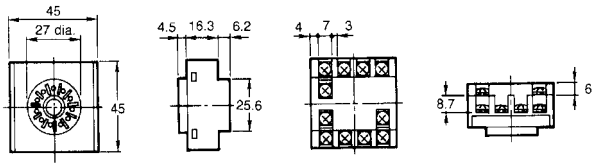


Mounting Height of Counter with Socket

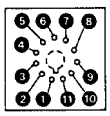


Note: Track mounting is also possible.

P3GA-11 Back Connecting Socket

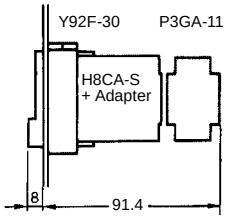


Terminal Arrangement



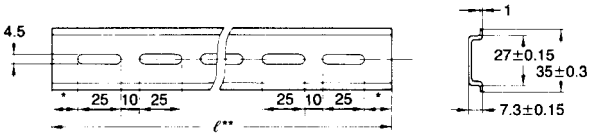
(Bottom view)

Mounting Depth of Counter with Socket

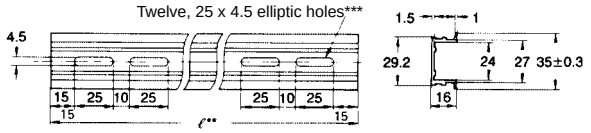


Mounting Track/End Plate/Spacer

PFP-100N/PFP-50N Mounting Track



PFP-100N2 Mounting Track



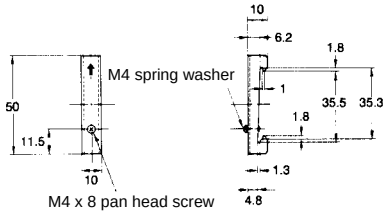
* This dimension is 15 mm on both ends in the case of PFP-100N but on one end in the case of PFP-50N.

** The length ℓ of each mounting track is shown in this table.

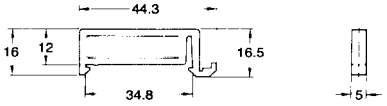
PFP-100N	1 m
PFP-50N	50 cm
PFP-100N2	1 m

*** A total of 12-25 x 4.5 elliptic holes are provided with 6 holes cut from each end of the track at a pitch of 10 mm between holes.

PFP-M End Plate

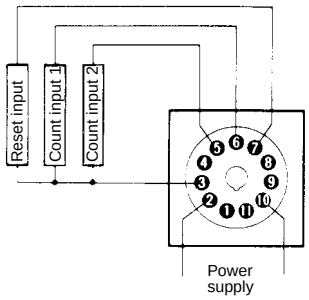


PFP-S Spacer



Connections

Counter Function Mode

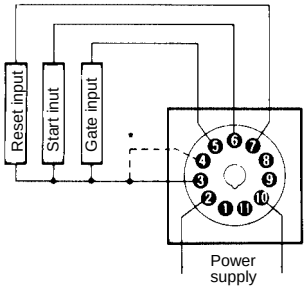


Note: When the control power supply is DC, terminals (2) and (3) are internally connected.

Mode Switch Terminals ((1) & (3))

When these terminals are shot-circuited, set the input and output modes with the Reset Key, not the Setting Key.

Timer Function Mode



Note: When the control power supply is DC, terminals (2) and (3) are internally connected.

* Check the operating status of terminals (3) and (4) (see table below) before connecting or disconnecting them.

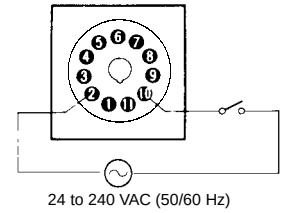
Timer Control Terminals [(4) & (3)]

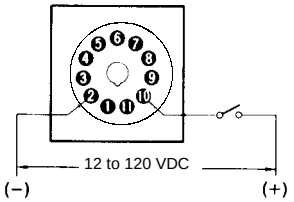
Be sure these terminals are not connected when using H8CA-S as a Counter. These terminals are used as shown below only when H8CA-S functions as a timer.

Terminals (4) & (3)	Operation
Short-circuited	Timer operation temporarily interrupted when power failure occurs in control power supply
Open	Timer operation continues even when power failure occurs in control power supply

Power Supply Connection

Connect power supply across terminals (2) and (10) and apply one of the specified voltages. (Pay special attention to the polarity when using a DC-operated model.)



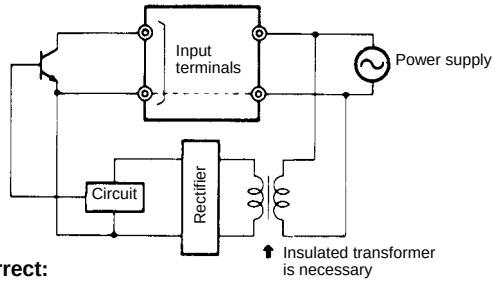


⚠ Caution

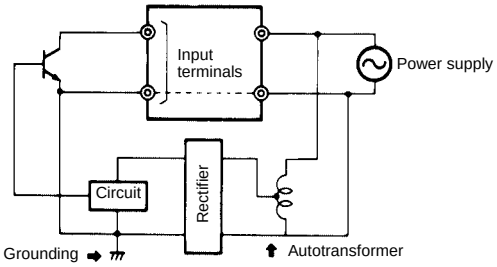
Do not touch the input terminals while power is supplied to the H8CA-S; otherwise you will feel electric shock because the Counter does not have any power transformer built in. Use of a model rated at a low DC voltage is recommended when the Counter is to be installed at a location where the input terminals are easily accessible.

Note: When connecting external signal input contacts and transistors, use a power supply having a power transformer whose primary and secondary circuits are isolated from each other with the secondary circuit not grounded, for the input devices, to prevent current feedback and short-circuiting.

Correct:



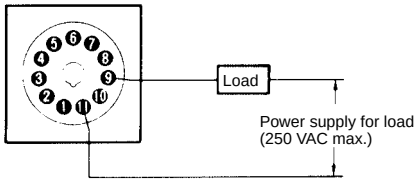
Incorrect:



Note: Do not arrange the peripheral circuits of the Counter in either way, as the internal circuit may be destroyed, rendering the Counter non-operable.
To input a signal from a single input contact to several H8CA-Ss at the same time, be sure to connect the terminals of the same numbers in parallel.

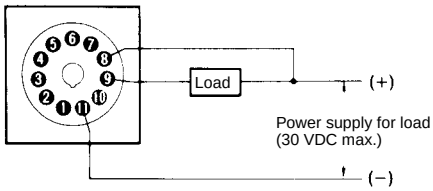
Load Circuit (Control Output) Connection

Contact Output Type



Note: The load is turned on when the set count or time is up.

Solid-state Output Type



Note: 1. The load is turned on when the set count or time is up.
2. Be sure to connect terminal (8) when an inductive load is connected.

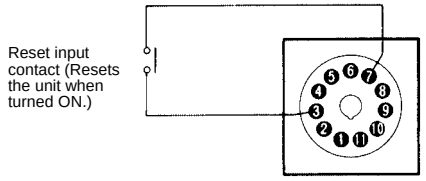
Output Delay Time

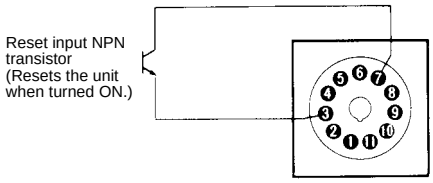
The output delay time is the time from the application of the count input signal of the preset value until the generation of control output. The delay time differs depending on counting speed and model of control output used, as shown in the table below.

Type of control output	Max. counting speed or rated time		Output delay time
Contact output	30 cps	Common to hours, minutes and seconds	30 ms max.
	1 kcps		10 ms max.
Solid-state output	30 cps		20 ms max.
	1 kcps		2 ms max.

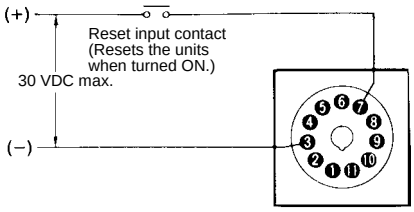
Reset Input Connection

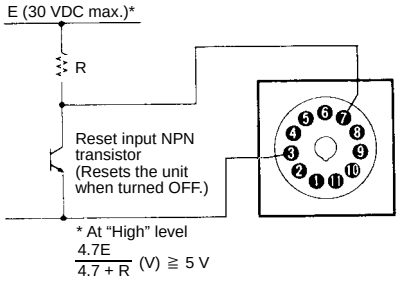
No-voltage Input Type

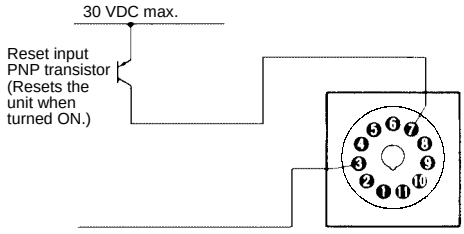


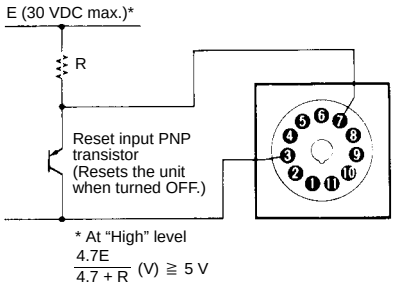


Voltage Input Type



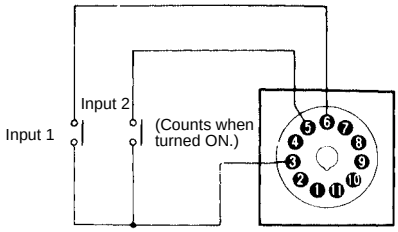


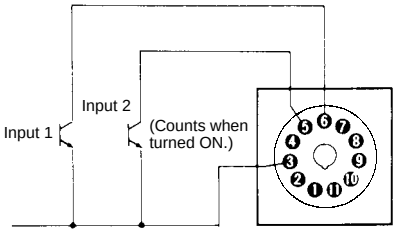




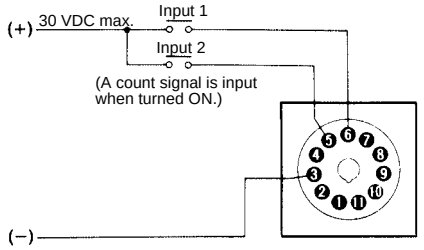
Count Input Connection

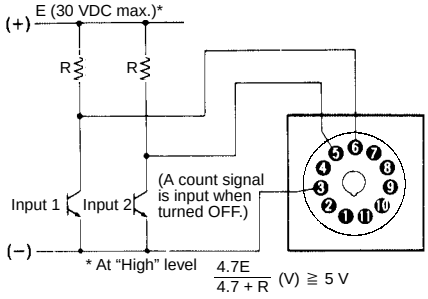
No-voltage Input Type

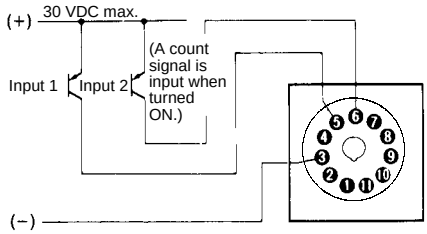


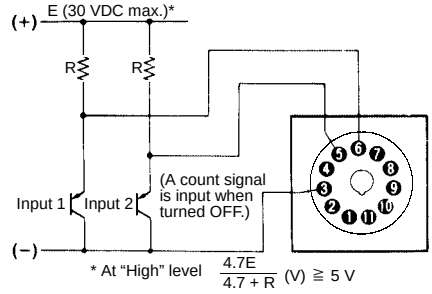


Voltage Input Type







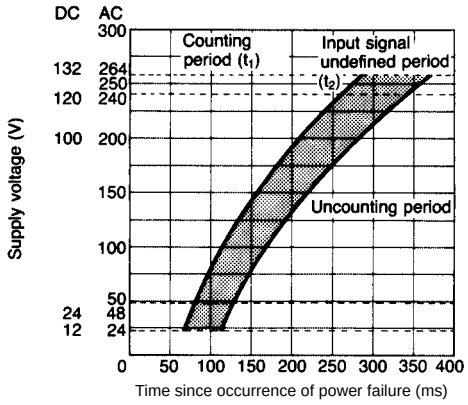


Precautions

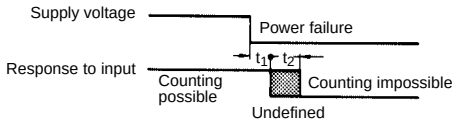
Power Failure Detection

The H8CA-S is capable of detecting and indicating a power failure on the display. Before power application or when a power failure occurs, the "PW OFF" display flickers indicating that the control power supply is off.

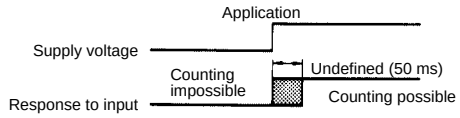
Relation Among t_1, t_2, and Supply Voltage



When a power failure occurs, there is a period during which the Counter does not respond to the input signal, as shown below, because of lag in the rise in the internal circuit voltage.



Likewise, on power application, there is a period during which the Counter does not respond to the input signal, as shown below because of a lag in the rise in the internal circuit voltage.



Operation and Display

"OUT" is displayed when counting or timing is completed.

When "MODE" lights on display, terminals 1 and 3 are connected. In this case, it is not possible to preset values. Be sure to disconnect the terminals.

The H8CA-S used "regular read format," so the preset values can be changed whether power is ON or OFF.

When changing the preset value during timer or Counter operation, a signal will be output when the new value is the same as the displayed value.

The front panel keys operate at a touch. Do not press the keys with excessive force or tools such as a screwdriver. Press only with fingers.

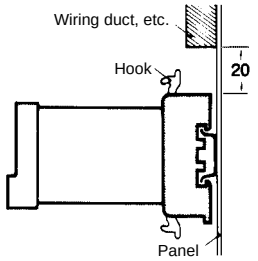
After presetting values, part of the display might be blinking. The H8CA-S will operate normally in this condition, but press the Write Key so that characters do not blink.

Mounting

There is no limitation in mounting direction. However, avoid mounting the unit at an angle.

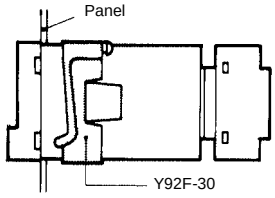
Surface Mounting
P2CF-11 Front Connecting Socket

When a number of the H8CA-S are mounted in a vertical line or when an H8CA-S is mounted close to an obstacle such as a wiring duct, be sure to provide a separation of approx. 20 mm between adjacent units or between the unit and the obstacle to allow room for engagement and disengagement of hooks as shown below.



Flush Mounting
Y92F-30 Adapter for Flush Mounting

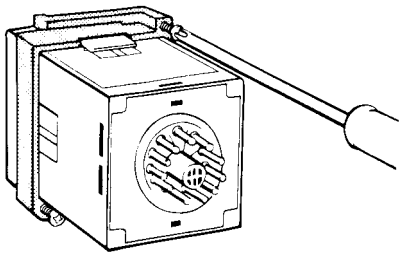
Insert the H8CA-S into a square-cut hole from the front of the mounting panel; insert the adapter from the rear of the H8CA-S until the clearance between the panel surface and the adapter is minimized. Then secure the H8CA-S with two screws onto the panel.



By attaching the P3GA-11 back connecting socket to a flush mounted H8CA-S, wiring can be performed in the same manner as the front connecting socket.

Dismounting

To dismount an H8CA-S flush mounted with a Y92F-30 adapter, loosen the two screws of the adapter, pry up the top and bottom hooks of the adapter and pull the H8CA-S out from the front of the panel.



⚠ Caution

The H8CA-S has a built-in lithium battery. Be sure to dispose of the old H8CA-S properly, as lithium batteries are likely to explode if incinerated.

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

Cat. No. M08-E1-1A

OMRON

Multi-maintenance Counter | H8BM

Nine Built-in Counters/Timers to Measure Equipment Utilization

- Up to nine Counters can be used as counters or accumulative timers.
- Can be used as a multi-stage preset counter.
- Individual outputs to indicate maintenance timing.
- Pre-forecast/Forecast and machine stoppage output provided.
- IP54F enclosure rating for resistance to oil and water.
- Compact, short-body: 72 x 72 x 79 mm (DIN).
- Directly connectable to 2-wire DC sensors.

RC

Ordering Information

Number of stages	Output	Model
3-stage setting	NPN	H8BM-B
	PNP	H8BM-BP
1-stage setting	NPN	H8BM-BD
	PNP	H8BD-BDP

■ Accessories (Order Separately)

Replacement Parts

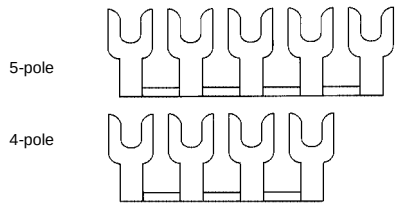
Name	Model
Hard Protective Cover	Y92A-72C
Rubber Packing	Y92S-25

A Hard Protective Cover and Rubber Packing are supplied with the Counter.

Short Bar

Short Bar	Y92S-26

When the Counter is used as a multi-stage preset counter, wiring will be facilitated if Counter inputs 1 through 9 are short-circuited with the following Short Bar.



Both the 5-pole and 4-pole Short Bars are used to short-circuit the 9 Counter inputs.

Specifications

Item	H8BM-B, H8BM-BP	H8BM-BD, H8BM-BDP
Classification	3-stage setting	1-stage setting
Mounting method	Flush mounting	
External connections	Screw terminals	
Enclosure ratings	IP54F (panel surface)	
Display mode	Up display	
Output mode	F mode	
Reset system	External, manual resets	
Timing function	Yes	
Input signal method	Voltage inputs: High and low signal voltages (count, reset, re-monitor, counter select, I/O inhibit)	
Control output	No-contact outputs: NPN outputs (RUN, forecast, machine stoppage) (PNP outputs for -BP)	No-contact outputs: NPN outputs (RUN, forecast) (PNP outputs for -BDP)
Display	Count, preset value, counter number, and error codes displayed on 7-segment LCD Power-ON, mode, reset, I/O inhibit, and re-monitor modes displayed on LCD characters Output indication on LCD characters and LEDs	
LCD with backlight	Yes	
Built-in counter number	9 (counters 1 to 9) (see Note 1)	
Number of stages	3 stages (see Note 2)	1 stage (see Note 5)
Digits	Forecast value: 6 digits (999999) Pre-forecast value: −5 digits (see Note 3) Machine stoppage: +5 digits (see Note 4)	6 digits (999999)
Max. time settings	Forecast value: 99999.9 hr (0.1 hr or more) Pre-forecast value: −9999.9 hr (see Note 3) Machine stoppage: +9999.9 hr (see Note 4)	99999.9 hr (0.1 hr or more)
Memory backup	Backup time for power interruption: Approx. 10 years at 25°C	
Approved standards	UL, CSA	

Note: 1. Each channel operates on an separate I/O.

2. Pre-forecast: Displayed only on LCD (No external output is provided.)
   Forecast: Displayed on LCD and LED and output (Output for each Counter)
   Machine stoppage: Displayed on LCD and LED and output
   (Output when the count value of one or more of Counters 1 to 9 has reached its machine stoppage value.)
3. The pre-forecast value is set as a negative offset in respect to the forecast value.
4. The machine stoppage value is set as a positive offset in respect to the forecast value.
5. This model operates on the forecast value only.

■ Ratings

Rated voltage	24 VDC
Operating voltage range	85% to 110% of rated voltage (see Note 1)
Power consumption	Approx. 1.8 W (at 24 VDC) (see Note 2)
Max. counting speed	30 cps (ON:OFF = 1:1)
Min. input signal width	Counter No. selection input: 16.7 ms max. Reset input: 100 ms max. Re-monitor input: 30 ms max. Output number request input: 30 ms max. I/O inhibit input: 16.7 ms max.
One-shot output time	20 ms (see Note 3)
Count, reset, re-monitor, output number request, and I/O inhibit input	Voltage input (see Note 4) (input resistance: approx. 2.2 kΩ) High level: 16 to 30 VDC Low level: 0 to 3 VDC
Control output	Open-collector output: 100 mA max. at 30 VDC max.
Case color	Light gray (Munsell 5Y3/1)

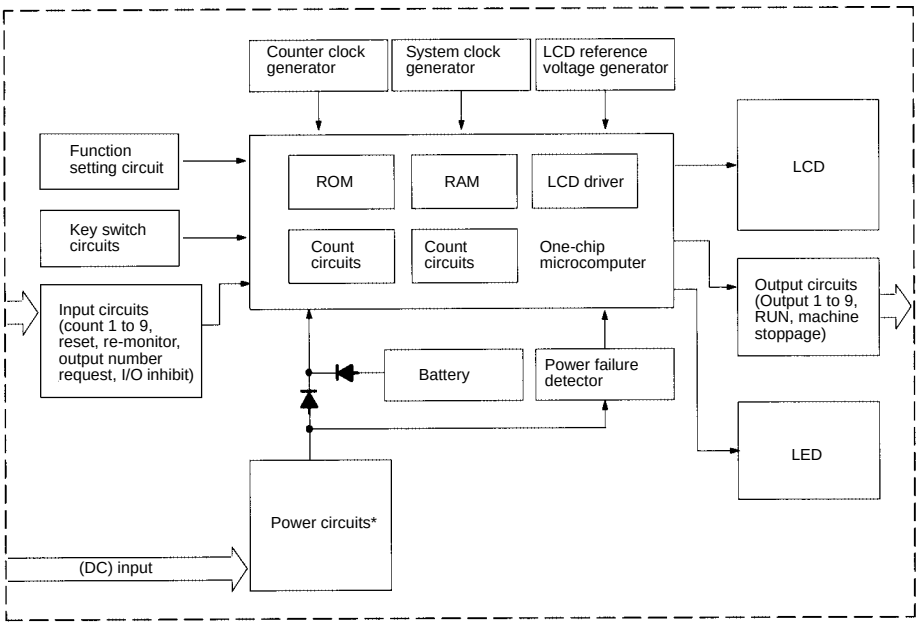
Note: 1. Ripple content: 20% max.

2. On power application, an inrush current of approx. 1.2 A flows into the Counter.
3. This signal is output as a carry signal when the Counter is used as a totalizing counter.
4. This signal can also be used as a no-voltage input signal depending on the wiring (refer to Input Connections).

■ Characteristics

Insulation resistance	100 MΩ min. (at 250 VDC) (between current-carrying terminals and exposed non-current-carrying metal parts)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min (between current-carrying terminals and exposed non-current-carrying metal parts)
Impulse withstand voltage	1 kV (between power terminals) 1.5 kV (between current-carrying terminals and exposed non-current-carrying metal parts)
Noise immunity	±1 kV (between power terminals) and ±600 V (between input terminals), square-wave noise via noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)
Static immunity	Malfunction: 8 kV; destruction: 15 kV
Vibration resistance	Destruction:10 to 55 Hz with 0.75 mm single amplitude in three directions Malfunction:10 to 55 Hz with 0.5 mm single amplitude in three directions
Shock resistance	Destruction:294 m/s^2 (approx. 30G) Malfunction:196 m/s^2 (approx. 20G)
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85%
Weight	Approx. 290 g

■ Block Diagram



Although the input terminals are electrically insulated from the internal circuit, do not conduct an insulation resistance test on these terminals.

■ I/O Functions

Inputs

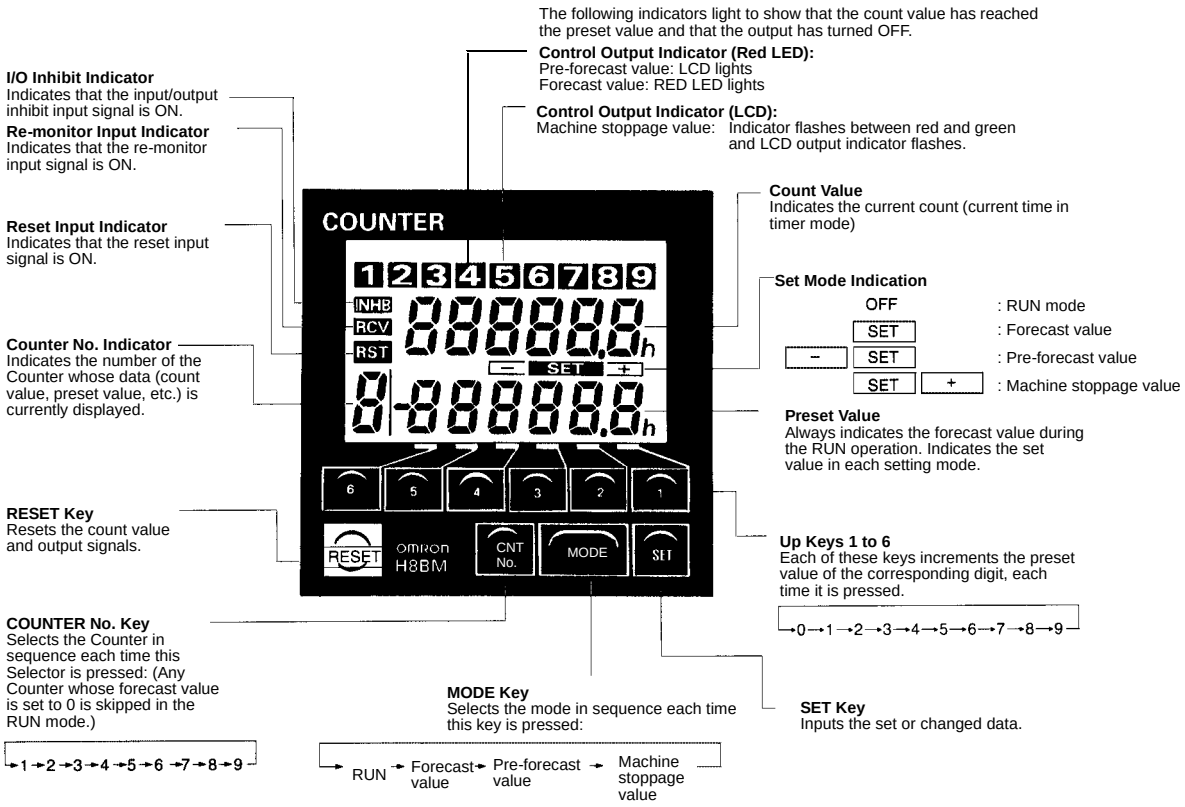
Count (1 to 9)	Input count values. Used as time count input signals when Counter is used as timer. Maximum counting speed: 30 cps (minimum signal width: 16.7 ms)
Reset	Resets displayed count (timing) value of a specified Counter. Counter under reset does not operate ad its output is turned OFF. Reset signal input during re-monitor input restores reset count (timing) value of the specified Counter. While reset signal is ON, RST indicator lights.
Re-monitor	Reset count (timing) value of specified Counter can be re-monitored, and restored by reset input. While re-monitor signal is ON, RCV indicator lights.
Counter No. select	Specifies Counter whose count (timing) value is to be displayed.
I/O inhibit	Inhibits count inputs of all Counters. Turns OFF all forecast outputs, RUN outputs, and machine stoppage outputs. While I/O inhibit signal is ON, INHB indicator lights.

Outputs

Forecast (1 to 9)	Each of these outputs turns ON when its forecast value has been reached. When Counter is used as totalizing counter, output one-shot signals as carry signals. Retain outputs until count values are reset.
RUN	Turns ON when Counter is operating normally.
Machine stoppage	Turns ON when count value of one Counter has reached set machine set machine stoppage value. Retains output until count value is reset.

Note: The input and output signals are enabled when power is applied to the Counter. During a power failure, the input signals are disabled, and the output signals are turned OFF.

Nomenclature



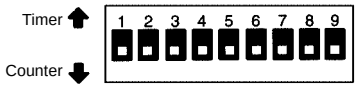
Note: Models with only 1-stage setting (H8BM- j D j) are not provided with pre-forecast and machine stoppage output function; only the forecast output function is provided.

Operation

■ Operation

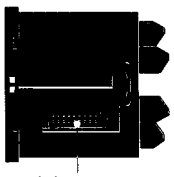
1. Selecting Counter/Timer Operation

Whether each Counter operates as a counter or a timer can be specified on a DIP switch provided on the side panel of the Counter. Open the lid of the switch compartment on the side of the Counter. Set each DIP switch pin as necessary by referring to the following figure:



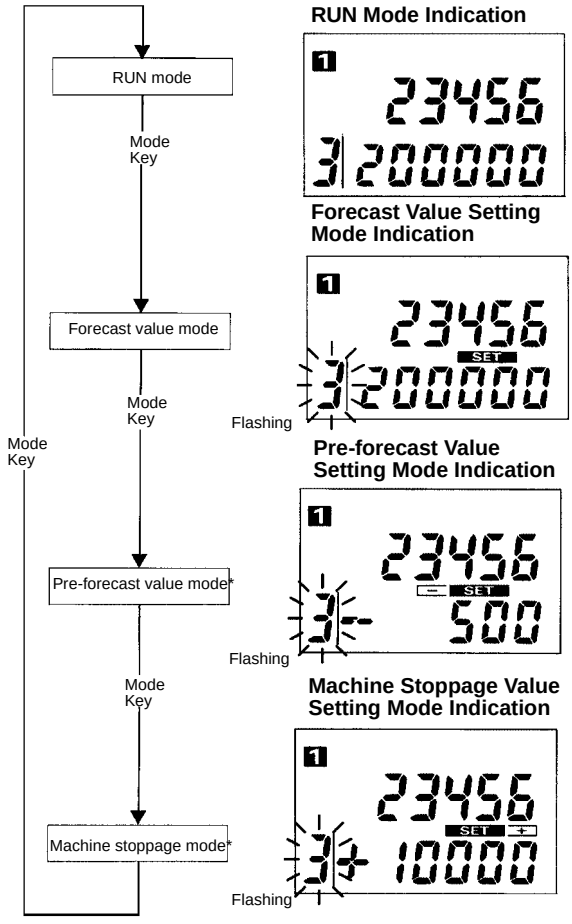
The setting of the DIP switch is read on power application.

Note: The setting of the DIP switch that is used to select the counter or timer operation of each Counter is read on power application. Setting change of this DIP switch while the Counter is operating will be ignored. Power must be turned off then back on again after changing settings.



2. Changing Mode

Each time the MODE Key is pressed, the mode changes as follows:

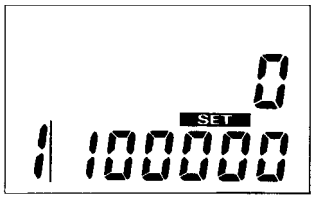


Note:
1. The modes marked * are not provided on the 1-stage type Counter.
2. I/O operations are always performed regardless of the mode.
3. If no key is pressed for 1 minute in each mode, the RUN mode is automatically restored.

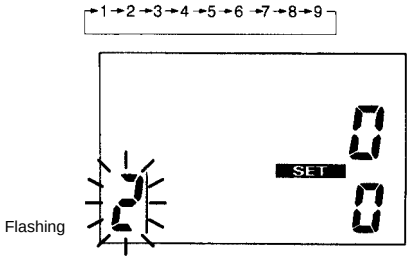
3. Setting/Changing Data (3-stage Type)

Setting/Changing Forecast Value

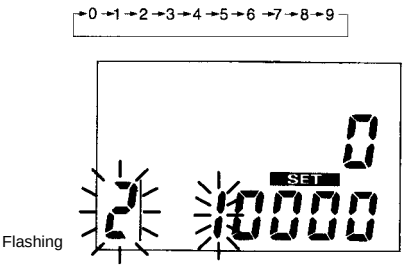
1. Press the MODE Key to enter the forecast value setting mode. The same Counter number as in the RUN mode is displayed.



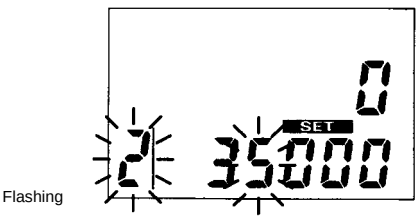
2. Press the COUNTER No. Key to select the Counter whose data is to be set or changed. The Counters are selected in sequence each time the COUNTER No. Key is pressed. A Counter can also be selected by inputting the Counter No. selection.



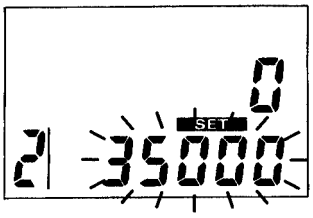
3. Use the Up Keys (1 to 6) to change the values of the digits. When an Up Key is pressed, the corresponding digit starts flashing. The preset value is zero-suppressed. Each time the Up Key is pressed, the specified value increment as:



In the following example, the forecast value of Counter 2 is set to 35000.

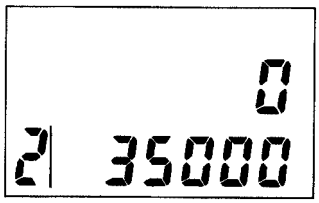


4. Press the SET Key to determine the set value. If o Key is pressed within 5 seconds after the SET Key has been pressed, the RUN mode is automatically restored. Key inputs made during the 5 seconds are valid.



After the set forecast value has flashed, the display is changed automatically as below.

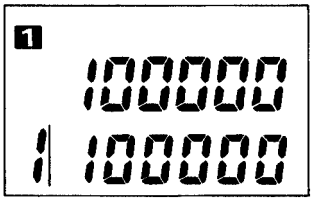
RUN Mode Indication



4. Resetting Count Value

Resetting Value for Each Counter

1. Select the Counter whose count value is to be reset by either pressing the COUNTER No Key or inputting the Counter No. select. The count value can be reset in any mode.

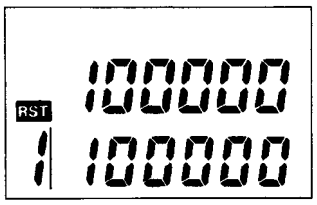


2. Either press the RESET Key or input the reset signal. The count value of the selected Counter will be reset to 0.

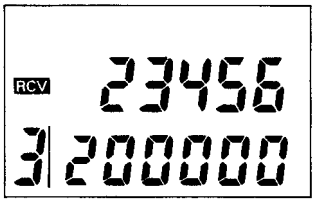
5. Re-monitoring Count Value

A count value that has been reset by mistake can e recovered. (ex. Recover previously reset count value “23456” of Counter No. 3)

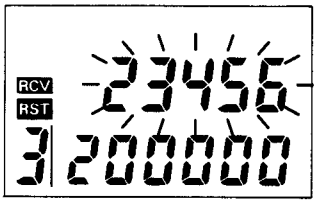
1. Turn ON the re-monitor input. The count value which was reset will be displayed. At this time, the count value is only displayed and not recovered internally. The Counter whose count value is displayed remains in the RUN mode.



2. Press the COUNTER No. Key (or apply the Counter No. select input) to access the Counter whose count value is to be recovered. If the count value does not need to be recovered, the following operations are not necessary.



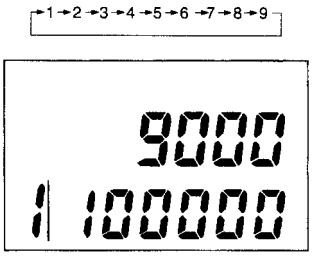
3. Press the RESET Key (or apply the reset input). The recovered value will flash 3 times, and the count value that was reset will be recovered for the designated Counter only. While the recovery input is ON, the recovered count value will remain displayed. However, the internal mechanism of the Counter will continue operating from the count value before resetting.



4. Turn OFF the re-monitor input to restore normal operation.

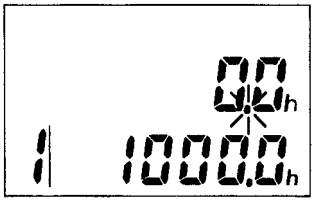
6. Checking Count Values (RUN Mode)

Select the Counter whose count value is to be checked by pressing the COUNTER No. Key in the RUN mode, or by inputting the Counter No. select. The Counter number changes in sequence each time the COUNTER No. Key is pressed. However, any Counter not used (whose forecast value is set to 0) will be skipped.



7. Count Value Display

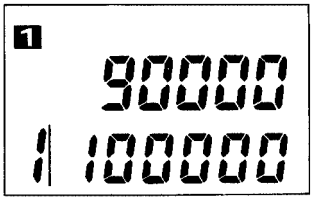
While the count input is ON, the period on the count value display flashes. The timer operation measures time by totaling the ON time of the count input.



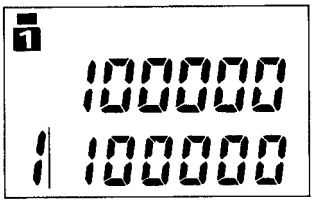
8. Output Indicator

The status of the pre-forecast, forecast, and machine stoppage outputs is displayed as follows:

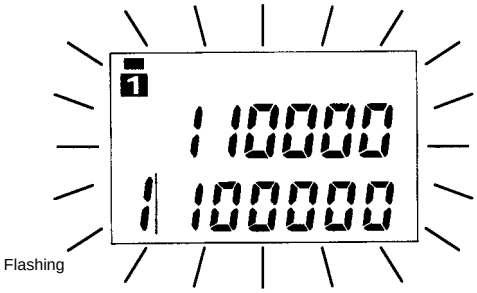
1. **Pre-forecast:** The number of the Counter whose count value has reached the pre-forecast value is displayed on the LCD. The pre-forecast is only displayed on LCD as a message and no actual output is issued.



2. **Forecast Output:** A red indicator lights above the number of the Counter whose count value is displayed on the LCD.



3. **Machine Stoppage Output:** The background alternately lights in red and green, and the number of the Counter whose machine stoppage output is issued is flashed on the LCD.



Note: When any of the pre-forecast, forecast, and machine stoppage outputs of a Counter has turned ON, the Counter number of that Counter is automatically displayed. When an attempt to reset the count value is made at this time, the count value of only the Counter whose count value is currently displayed is reset (in RUN mode only).

9. Clearing Settings

- The count values of all the Counters can be cleared by simultaneously holding down the RESET Key and COUNTER No. Key for 3 seconds.

  The same function is effected if the Counter number select input and reset input are simultaneously applied for 3 seconds.

- The count value, pre-forecast value, forecast value, and machine stoppage value of all the Counters can be cleared by simultaneously holding down the RESET and SET Keys for 3 seconds.

10. When Used as Totalizing Counter/Timer Counter

By setting the forecast value of a Counter to 999999 (99999.9 hr), the Counter can be used as a totalizing counter/timer. The machine stoppage output of this Counter is not issued. When used as a totalizing counter, the forecast output of this Counter issues a one-shot output for 20 ms as a carry signal when the count value changes from 999999 to 0.

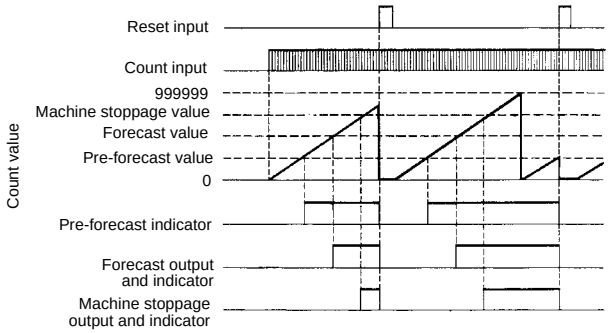
11. Self-diagnostic Function

The following displays will appear if an error occurs.

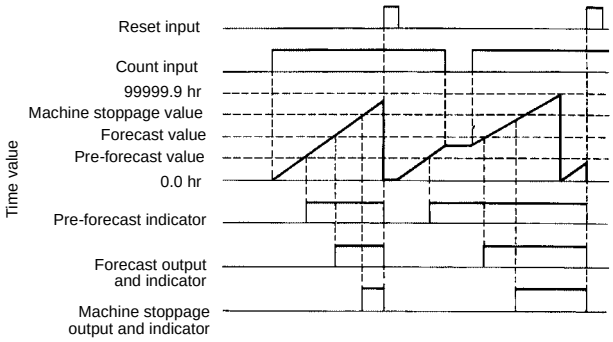
Display	Meaning	Output status	Recovery	Setting after recovery
E1	CPU Error	OFF	Press RESET Key	Normal counter operation is recovered using count and set values from before the error.
E2	Memory Error			Factory setting

■ Timing Charts

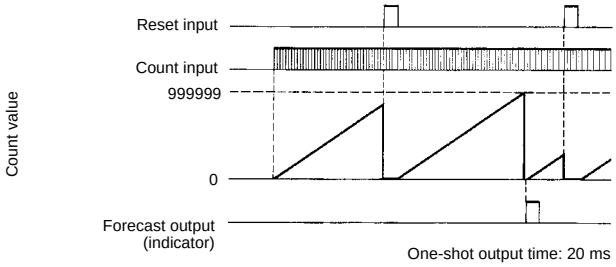
Counter (3-stage Preset Operation)



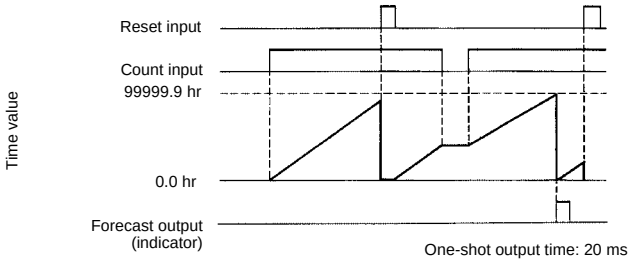
Timer (3-stage Preset Operation)



Totalizing Counter Operation

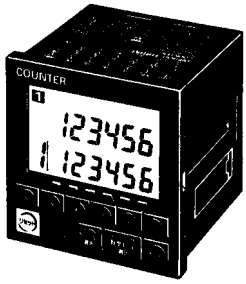


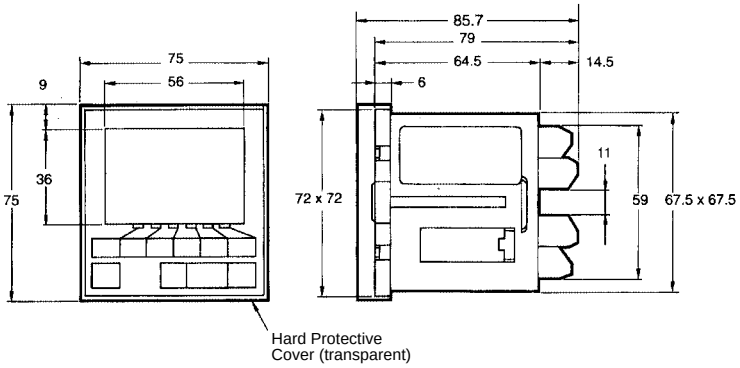
Totalizing Timer Operation



Dimensions

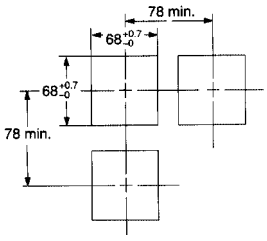
Note: All units are in millimeters unless otherwise indicated.





Panel Cutouts

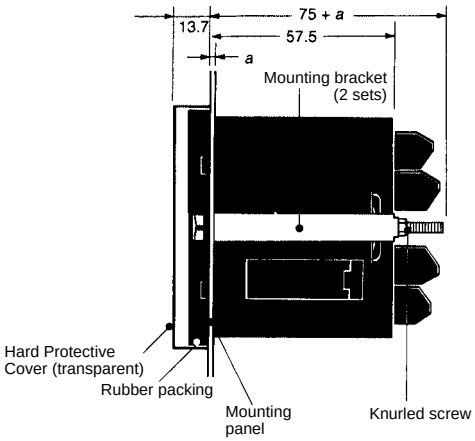
Panel cutout is as shown below (according to DIN43700). The mounting panel thickness should be 1 to 5 mm.



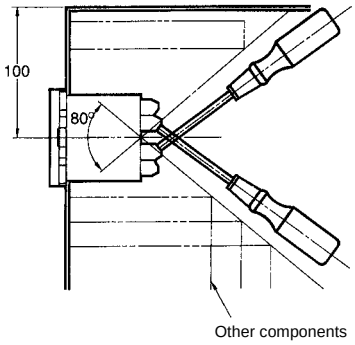
Installation

■ Mounting

To mount the Counter, attach the two fixtures supplied as accessories to the left and right sides of the Counter, and securely tighten the knurled screws on the brackets. If any other screws are used to attach the brackets, or if the knurled screws are excessively tightened with a tool, damage may result.



Provide enough space around the Counter when mounting it to ensure a proper working space.



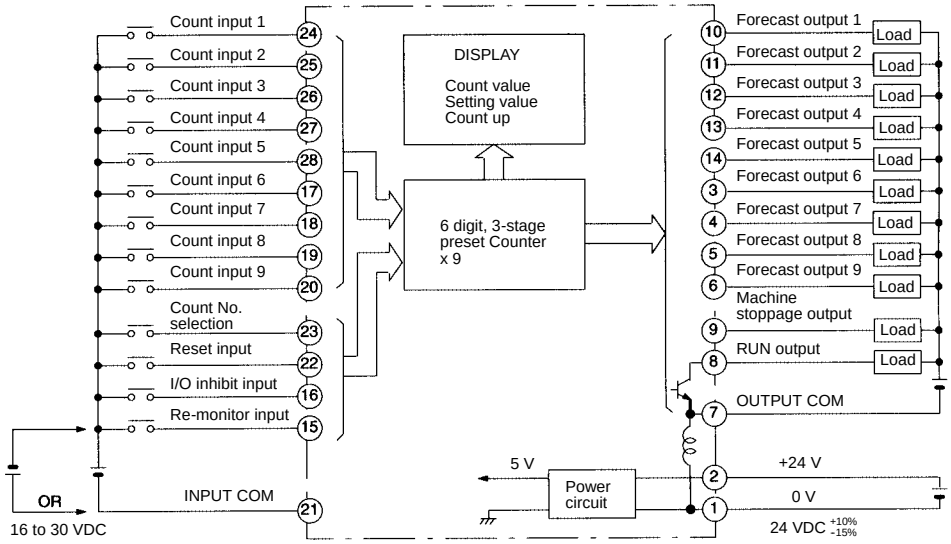
■ Terminal Arrangement

22	23	24	25	26	27	28
15	16	17	18	19	20	21
8	9	10	11	12	13	14
1	2	3	4	5	6	7

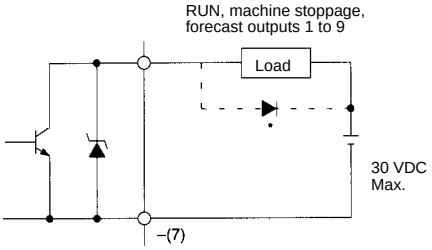
22	23	24	25	26	27	28
Reset input	Count No. selection	Count input 1	Count input 2	Count input 3	Count input 4	Count input 5
15	16	17	18	19	20	21
Re-monitor input	I/O inhibit input	Count input 6	Count input 7	Count input 8	Count input 9	Input COM
8	9	10	11	12	13	14
RUN output	Machine stoppage output	Forecast output 1	Forecast output 2	Forecast output 3	Forecast output 4	Forecast output 5
1	2	3	4	5	6	7
Power supply: 0 V	Power supply: 24 V	Forecast output 6	Forecast output 7	Forecast output 8	Forecast output 9	Output COM

■ Connections

NPN Output



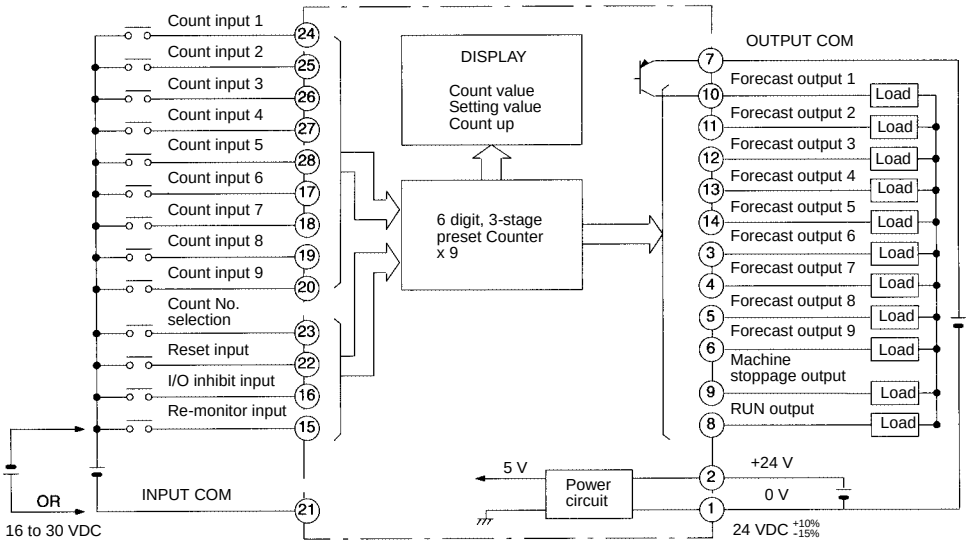
Note: Short-circuit terminals 1 and 7 when the power source of the Counter is shared.
H8BM-BD/-BDP outputs the forecast and machine stoppage values simultaneously.



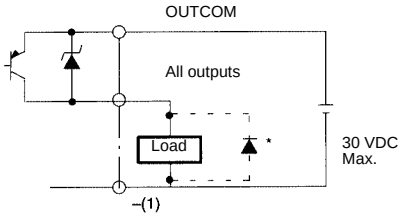
* Connect a diode to suppress Counter surge when an inductive load is connected.

Note: When the load is short-circuited, the internal circuits may be damaged.

PNP Output



Note: H8BM-BD/-BDP outputs the forecast and machine stoppage values simultaneously.



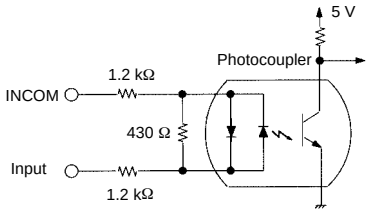
* Connect a diode to suppress Counter surge when an inductive load is connected.

Note: When the load is short-circuited, the internal circuits may be damaged.

Output	RUN, machine stoppage, forecast 1 to 9
Output method	Open collector
Applicable voltage	30 V max.
Rated current	100 mA
Residual voltage	2 V max.
Leakage current	100 μA max.

■ I/O Connections

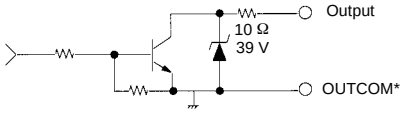
Input Circuits



The input terminals are electrically insulated from the internal circuits.

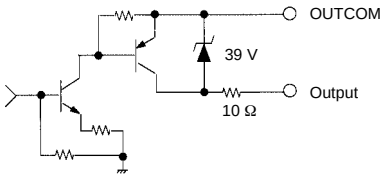
Output Circuits

NPN Type



The OUT COM and 0 V terminals are internally connected.

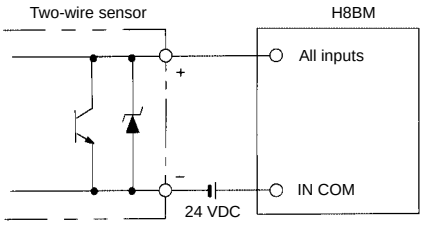
PNP Type

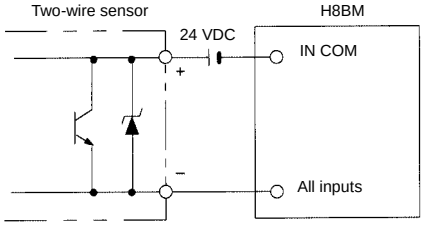


Example of Input Connections (Solid-state Switches)

Two-wire Sensors

The count input, counter No. select input, reset input, I/O inhibit input, and re-monitor input signals are enabled when voltage is applied.





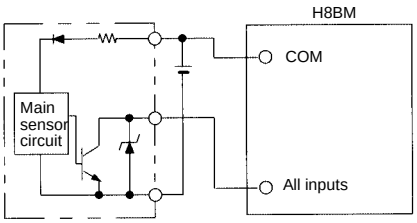
Note: Use the following two-wire sensors:

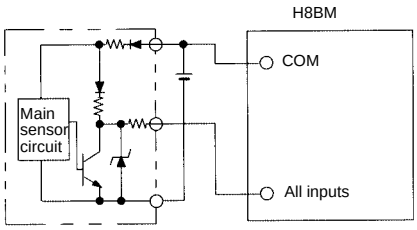
1. High-level; transistor ON
   Min. switching capacity: 5 mA max.
   Residual voltage: 4 V max.
2. Low-level: transistor OFF
   Leakage current: 1.5 mA max.
3. Power voltage range: 20.4 to 30 VDC

Use of the OMRON TL-XD or E2E-XD-N Sensors is recommended.

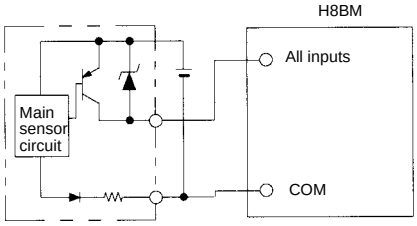
Three-wire Sensors

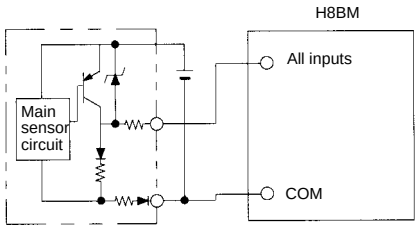
NPN Type



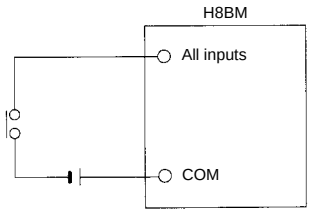


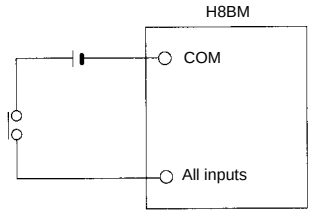
PNP Type





Contact Switch Connection



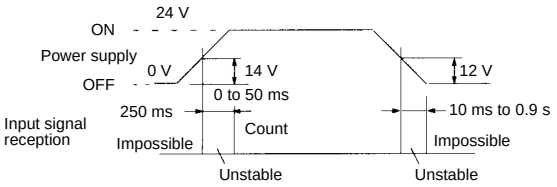


*H: Contact ON.
*Use contact that can break 13 mA, 30 V

Precautions

■ Power Supply

- The power supply and input circuits are electrically insulated inside the Counter.
- When turning the power on and off, input signal reception is sometimes not possible as shown in the diagram below. The unstable period will vary with power supply voltage and the load conditions on external power supplies.



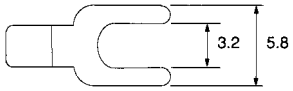
- Turn on or off the operating power source all at once by using switch or relay contact.

■ Operating Environment

- The front panel of the Counter is dust-proof and oil-proof. However, if the Counter is exposed to a large quantity of water or oil for a long time, the internal components may be affected.
- When using the Counter in a location where excessive noise is generated keep the Counter, input devices, and input wiring as far away as possible from the noise source and power lines. Use of shielded cable as input signal lines is recommended.
- Organic solvents (such as paint thinner), as well as strong acids or strong alkalies can damage the housing of the Counter.

■ Others

- To conduct a dielectric strength test between the electric circuits and non-current-carrying metal parts with the Counter installed in the control panel, either disconnect the Counter from the circuit, or short-circuit all the terminals of the Counter (this is to prevent the test voltage from sneaking into the Counter and prevent the internal circuitry of the Counter from being damaged in case the insulation of some device in the control panel ruptures.
- The terminal screw is M3 x 5. Use the solderless terminal as shown in the following illustration.



⚠ Caution

This product contains a lithium battery. Lithium batteries explode if incinerated. Dispose of the Counter as a non-combustible item.

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

Cat. No. M42-E1-1B

OMRON

Cam Positioner

H8PS

Cam Positioner

Economical Electronic Cam Switch with High-performance Eight-cam Control

- Easy replacement of mechanical cam switches.
- Easy setting with single-function keys (each key has one function).
- Accepts 330-rpm input for compatibility with a variety of automatic units for operation timing control.
- Equipped with useful functions for switching encoder rotation direction, designating the encoder origin, etc.
- Bright LCD backlight display.
- Up to 16-cam control possible using parallel input adapter and two H8PSs.
- Conforms to EMC standards.
- Approved by UL and CSA.
- Six-language instruction manual provided.

CE RC

Rotary Encoder

- This encoder works in combination with the H8PS Cam Positioner to detect the operation timing of various automatic machines at high precision.
- The E6CP is a low-cost money-saving encoder.
- The E6F is compatible with high shaft-tolerance applications as well as environments subjected to water and oil.

Ordering Information

■ Cam Positioner

Mounting method	Output configuration	Model
Flush	NPN transistor output	H8PS-8B
	PNP transistor output	H8PS-8BP
Surface/Track	NPN transistor output	H8PS-8BF
	PNP transistor output	H8PS-8BFP

■ Rotary Encoder

Type	Cable length	Model
Economy	2 m	E6CP-AG5C-C
Rigid		E6F-AG5C-C

■ Accessories (Order Separately)

Item	Specification	Model
Protective Cover	---	Y92A-96B
Shaft Coupling for E6CP	Axis dia.: 6 mm	E69-C06B
Shaft Coupling for E6F	Axis dia.: 10 mm	E69-C10B
Extension Cable (see note)	5 m (same for E6CP and E6F)	E69-DF5
Parallel Input Adapter	---	Y92C-30
Mounting Base	For H8PS-8BF j	Y92F-91
DIN Track	Length: 50 cm	PFP-50N
	Length: 100 cm	PFP-100N(2)
Spacer	---	PFP-S
End Plate	---	PFP-M

Note: Please inquire about the availability of non-standard lengths.

Specifications

■ Ratings/Characteristics

Cam Positioner

Mounting method	H8PS-8B(P): Flush mounting H8PS-8PF(P): Surface/Track mounting
Rated supply voltage	24 VDC
Operating voltage range	85% to 110% of rated voltage
Power consumption	Approx. 4 W
Setting unit	1° Increments (cam control precision, however, is within 2°: 256° rotational increments) Up to 2 output signals can be set per cam
Inputs	Encoder input: connections to a special absolute encoder (OMRON E6CP/E6F) Response rotation speed: Run mode: 330 rpm max. Switchable between high speed (60 to 330 rpm) and low speed (60 rpm max.) Test mode: 60 rpm max. Includes malfunction data detection
Outputs	Open-collector transistor output NPN: H8PS-8B(F) PNP: H8PS-8B(F)P Cam outputs: 8 lines (Output No.1 to 8) 30 VDC max., 100 mA max. (residual voltage: 2 V max.) RUN OUT: Turns ON in Run and Test modes, OFF in Program mode in case of error 30 VDC max., 100 mA max. (residual voltage: 2 V max.) TACHOMETER: 60-ppr signal output for rpm meter 30 VDC max., 30 mA max. (residual voltage: 0.5 V max. for NPN models, 2 V max. for PNP models)
Encoder cable extension distance	100 m max.
Output response time	Run mode: 0.5 ms max. under high speed designation 2.5 ms max. under low speed designation Test mode: 5 ms max.
Life expectancy of memory back-up battery	10 years (at 25°C)
Insulation resistance	100 MΩ min. (at 500 VDC) between current-carrying terminal and exposed, non-current-carrying metal part
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between current-carrying terminal and exposed, non-current-carrying metal part
Impulse withstand voltage	1 kV between power terminals, 1.5 kV between current-carrying terminal and non-current-carrying metal part
Noise immunity	±480 V between power terminals for square-wave noise from noise simulator (pulse width: 100 ns/1 μs, 1 ns at startup)
Static immunity	Destruction: 15 kV Malfunction: 8 kV
Vibration resistance	Destruction: 10 to 55 Hz 0.75-mm single amplitude each in X, Y, and Z directions Malfunction: 10 to 55 Hz 0.5-mm single amplitude each in X, Y, and Z directions
Shock resistance	Destruction: 300 m/s^2 (approx. 30 G) Malfunction: 200 m/s^2 (approx. 20 G)

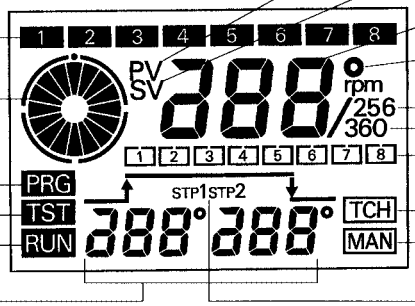
Display method	LCD with back light
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge 8 kV air discharge Immunity RF-interference: ENV50140: 10 V/m (10 k to 1 GHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV power-line 2 kV I/O signal-line
Approved standards	UL (File No. E41515), CSA (File No. LR22310)
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85%
Weight	Approx. 300 g

Rotary Encoder

Item		E6CP-AG5C-C	F6F-AG5C-C
Rated supply voltage		12 VDC −10% to 24 VDC +15%, ripple (p-p) 5% max.	
Current consumption		70 mA max.	
Resolution (per revolution)		256 (8-bit)	
Output code		Grey binary	
Output method		Open collector output	
Output capacity		Applied voltage: 28 VDC max. Sink current: 16 mA max. Residual voltage: 0.4 V max. (sink current at 16 mA)	Applied voltage: 30 VDC max. Sink current: 35 mA max. Residual voltage: 0.4 V max. (sink current at 35 mA)
Logic		Negative logic (H = 0, L = 1)	
Precision		Within ±1°	
Rotation direction		Clockwise (viewing from the shaft) for output code increment	
Rise and fall times of output		1 μs max. (control output voltage: 16 V; load resistance: 1 kΩ; output cord: 2 m max.)	1 μs max. (control output voltage: 5 V; load resistance: 470 Ω; output cord: 2 m max.) 2 μs max. (control output voltage: 5 V; load resistance: 1 kΩ; output cord: 2 m max.)
Startup torque		10 gf-cm max.	100 gf-cm max.
Moment of inertia		10 gf-cm^2 max.	15 g-cm^2 max.
Shaft-load tolerance	**Radial**	3 kgf	10 kgf
	Thrust	2 kgf	3 kgf
Max. rpm threshold		1,000 rpm	5,000 rpm
Ambient temperature		Operating: −10°C to 55°C (with no icing) Storage: −25°C to 85°C (with no icing)	Operating: −10°C to 60°C (with no icing) Storage: −25°C to 80°C (with no icing)
Ambient humidity		35% to 85% (with no condensation)	
Enclosure ratings		IEC standard IP50	IEC standard IP52F
Insulation resistance		10 MΩ max. (at 500 VDC) between charged parts and the case	
Dielectric strength		500 VAC, 50/60 Hz for 1 min between charged parts and the case	
Vibration resistance		Malfunction: 10 to 55 Hz, 1.5-mm double amplitude each in X, Y, and Z directions	
Shock resistance		Malfunction: 100 G for 3 times each in X, Y, and Z directions	
Weight		Approx. 200 g (with 2-m cord)	Approx. 500 g (with 2-m cord)

Nomenclature

Display



Output Cam Indicators
Indicate the cam outputs that are currently ON.

Rotation Display Monitor
Displays rotational angle position, direction, and speed.

Mode Indicators
PRG: Programming Mode
TST: Test Mode
RUN: Run Mode

Angle Chart Display
Displays the ON-angle and OFF-angle values when the settings are confirmed, and displays the settings for confirmation and display.

Set Value Indicator
Lights in the Programming Mode or Test Mode.

Process Value Indicator
Lights in the Run Mode.

Angle Display

"Degree" Display
Lights when 360° display is selected.

Display angle as absolute 256 or 360 degrees.

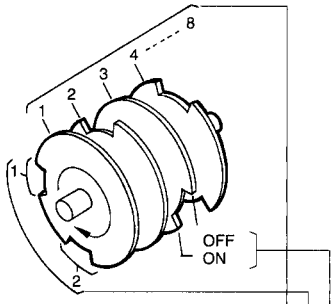
Cam Indicators
Indicates the cam number during programming.

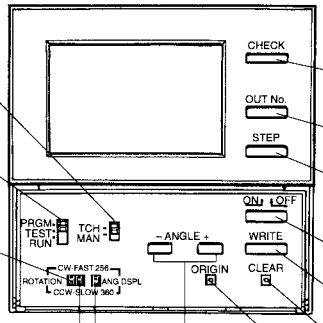
Programming Mode Indicators
TCH: Lights when teaching is selected.
MAN: Lights when manual setting is selected.

Step Indicators
The current step of the cams is displayed.

Operations

Note: Correspondence to mechanical cams.





Programming Mode Switch
TCH: The unit can set through actual operation of the machine.
MAN: Angles can be set using the angle keys.

Mode Switch
PRGM: Programming Mode
TEST: Test Mode
RUN: Run Mode

Rotation Direction Switch
The rotational direction on the rotation display can be changed.

Rotation Speed Selector
FAST: 60 to 330 rpm
SLOW: 60 rpm or less

256/360 Switch
256: Sets display to 0° to 255° absolute positions per rotation.
360: Sets display to 0° to 359° per rotation.

ANGLE Keys
+: Increases the angle value.
–: Decreases the angle value.

CHECK Key
Accesses settings.

OUT NO. Key
Selects or designates the cam number.

STEP Key
Selects or designates the operation steps of the current cam number.

ON/OFF Key
Selects or designates the ON or OFF angle.

WRITE Key
Sets the programmed settings.

CLEAR Key
Deletes the contents of the settings.

ORIGIN Key
Takes the current angle of the machine as the origin "0" angle.

Operation

■ Functions

Classifications	Functions
Encoder rotational direction switch	Encoder data revolutions can be set to clockwise or counterclockwise.
Encoder origin designation	The process display angle can be set to the origin as 0° at the press of a button.
Angle display switch	The unit can convert the display of absolute encoder values 256 divisions/revolution to 360°/revolution.
Rotation display monitor	Graphic display of encoder rotational angle position.
Teaching	The unit can set the ON/OFF angle from actual operation of the machine.
Monitor contents	Process value display (character height: 11 mm), output display, settings display, set cam number display, mode display, revolution display, operation step display, and error message display.

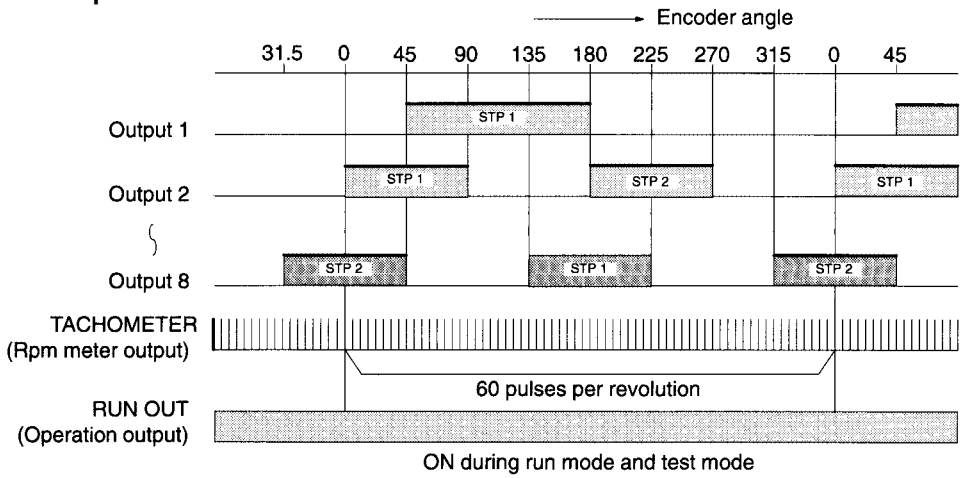
■ Operation

The H8PS Cam Positioner receives angle signal inputs from the Encoder, and outputs the preset ON/OFF angles as control signals (cams number 1 to 8).

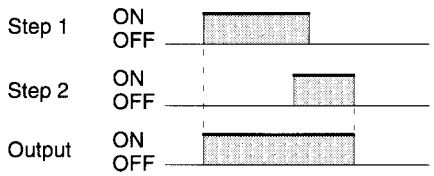
Program Example

Control output (cam number)	STEP 1		STEP 2	
	ON angle	OFF angle	ON angle	OFF angle
1	45°	180°	---	---
2	0°	90°	180°	270°
. . .	. . .	. . .	. . .	. . .
8	135°	225°	315°	45°

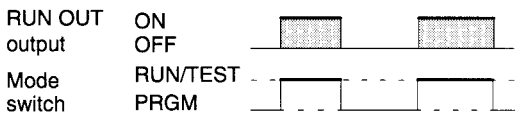
Operation Example



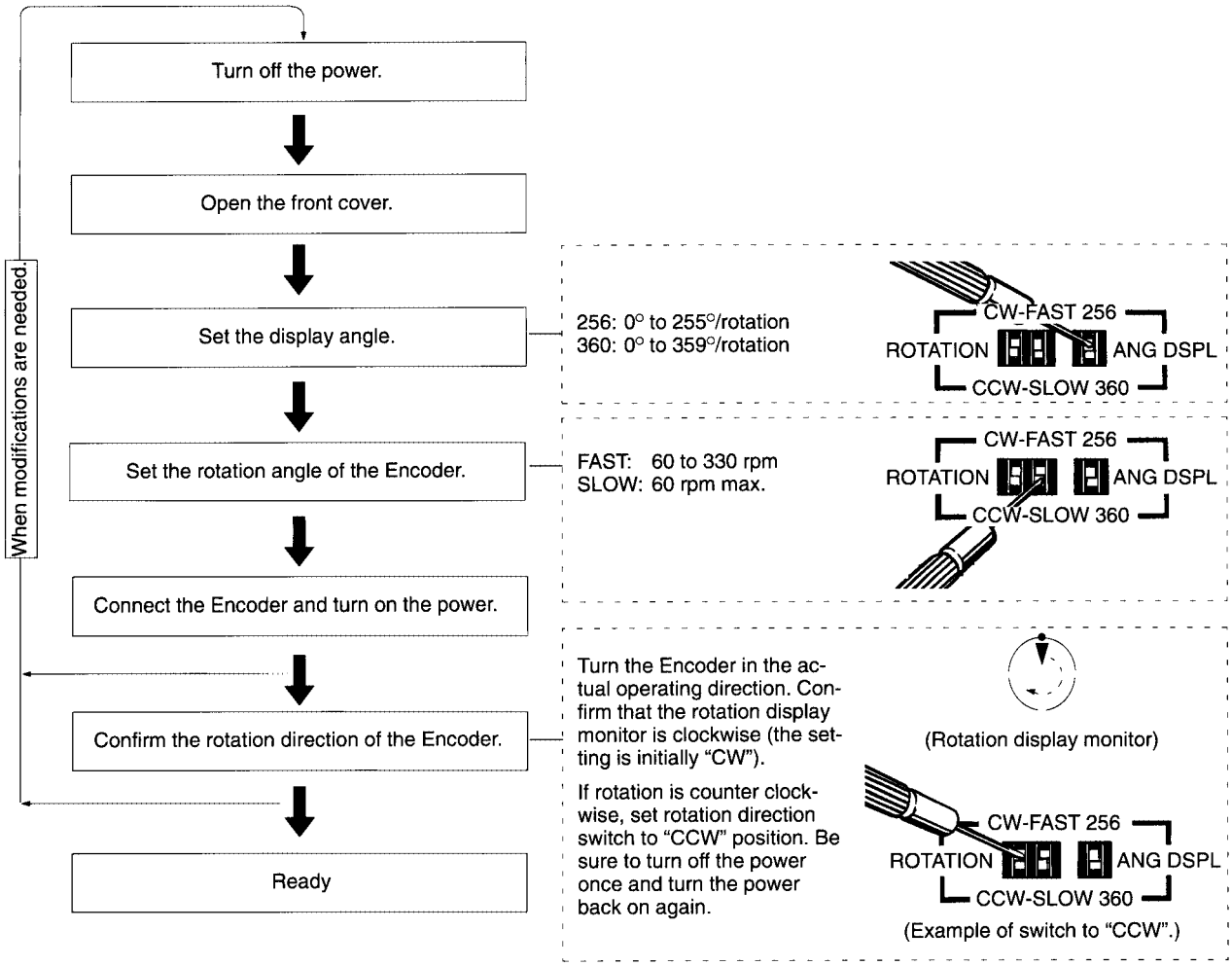
Note: 1. When the setting angles for STEP 1 and STEP 2 of same output are overlapped, the operation is as follows:



2. The operating output "RUN OUT" does not turn ON during programming. The operation output turns ON with the timing shown in the diagram, but it remains OFF when an error occurs. Thus, you can use the output as a timing signal during operation, including test runs.



■ Initializing



■ Actual Setting Example

1. Setting the Origin

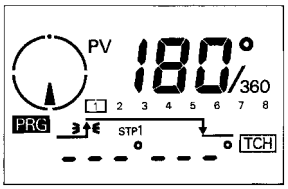
Any mode can be used to set the origin except for the Run Mode.
Ex. Set the process value of 180° to 0°.

a. Set the mode switch to PRGM.

b. Set the programming mode switch to TCH.

Mode	Programming Mode
PAGM TEST RUN	TCH MAN

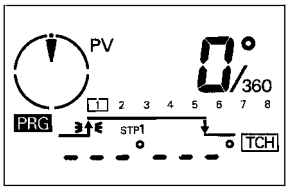
Initial Display



c. Adjust the machine (Encoder) to the position of the desired origin (180° in the example).

d. Press the ORIGIN Key.

Go back to the initial display.



2. Setting of Modifying the ON or OFF Angle

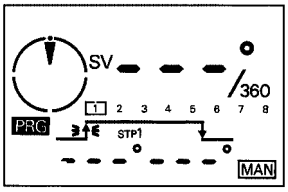
Set or modify with the Angle Keys.
Ex. Set cam number 2 step 2 to turn ON at 30° and turn OFF at 41°.

a. Set the mode switch to PRGM.

b. Set the programming mode switch to MAN.

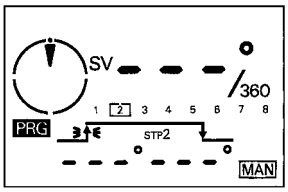
Mode	Programming Mode
PAGM TEST RUN	TCH MAN

Initial Display



c. Press the OUT NO. Key and select “2” for cam number 2. Keep pressing the key for automatic increment or decrement.

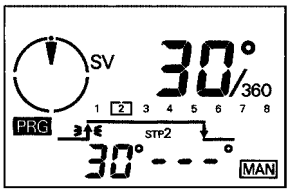
d. Press the STEP Key and select “STP2” for step 2.



e. Press the ON/OFF Key to set the ON angle.

f. Press the + or – Keys to set to “30.”

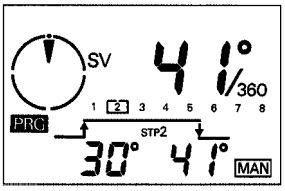
g. Press the WRITE Key.



h. Press the ON/OFF Key to set the OFF angle.

i. Press the + or – Keys to set to “41.”

j. Press the WRITE Key.



Note: Pressing the + or – Key continually will automatically increment or decrement the value. Pressing the other key during automatic increment or decrement will increase the speed.

3. Setting or Modifying the ON/OFF Angle Set or Modify by Teaching

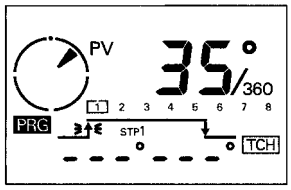
Ex. Set the ON/OFF angle by teaching step 1 of cam number 3.

a. Set the mode switch to PRGM.

b. Set the programming mode switch to TCH.

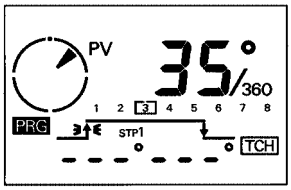
Mode	Programming Mode
PAGM TEST RUN	TCH MAN

Initial Display



c. Press the OUT NO. Key and select “3” for cam number 3.

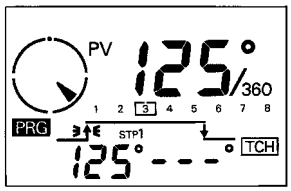
d. Press the STEP Key and select “STP1” for step 1.



e. Press the ON/OFF Key to set the ON angle.

f. Adjust the machine (Encoder) and set it at the output ON position (125° in the example).

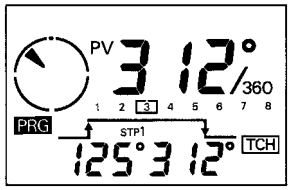
g. Press the WRITE Key.



h. Press the ON/OFF Key to set the OFF angle.

i Adjust the machine (Encoder) and set it at the output OFF position (312° in the example).

j. Press the WRITE Key.



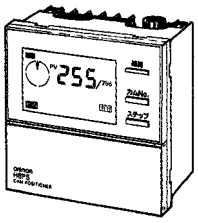
Note: If the machine (Encoder) is operated at a speed greater than permitted, an “E2” error will occur.

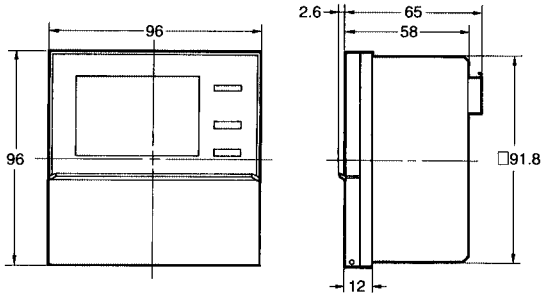
Dimensions

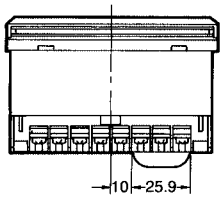
Note: 1. All units are in millimeters unless otherwise indicated.
2. j denotes square dimensions.

■ Cam Positioner

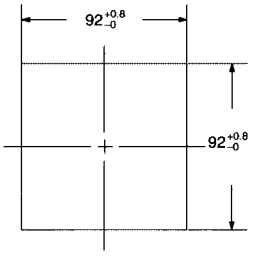
Flush Mounting Models
H8PS-8B
H8PS-8BP



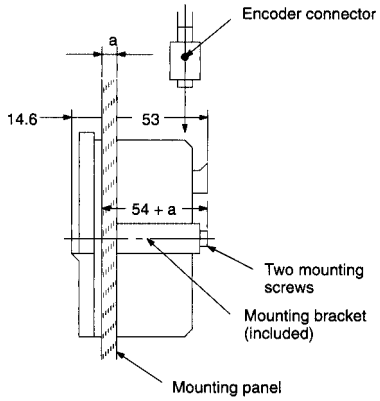




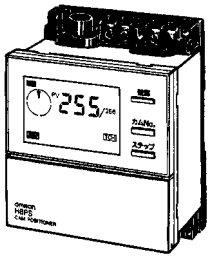
Panel Cutout

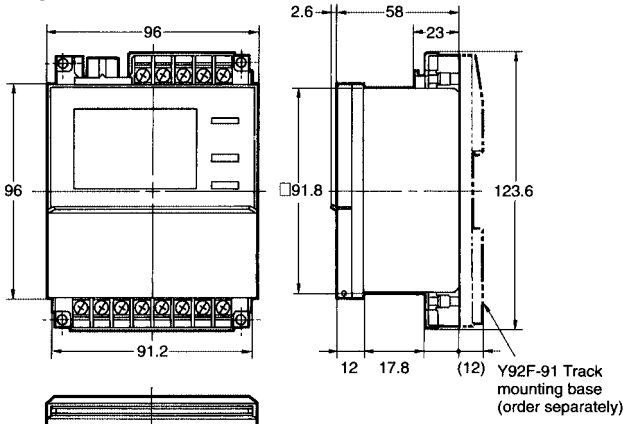


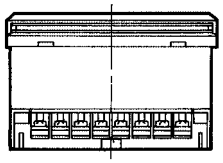
Flush Mount



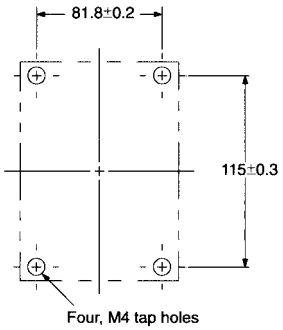
Surface-mounting/Track-mounting Models
H8PS-8BF
H8PS-8BFP



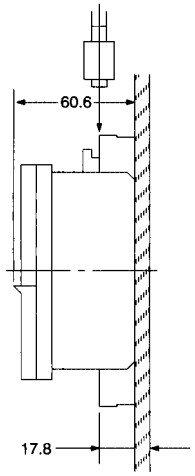




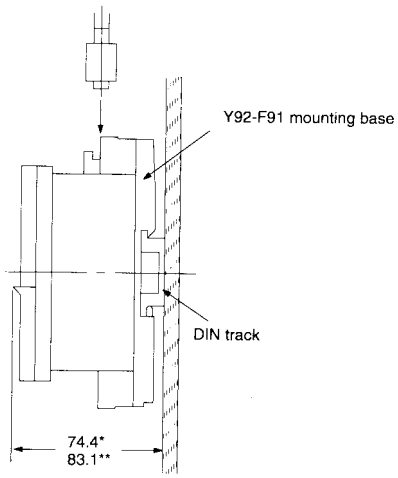
Mounting Holes



Surface Mount



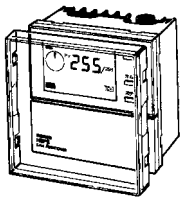
Track Mount
H8PS-8BF/-8BFP with Y92F-91



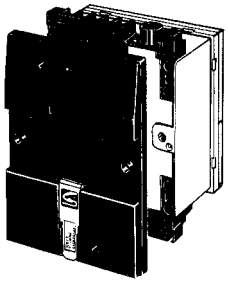
*for PFP-100N or PFP-50N.
**for PFP-100N2.

■ Accessaries (Other Separately)

Protective Cover
Y92A-96B



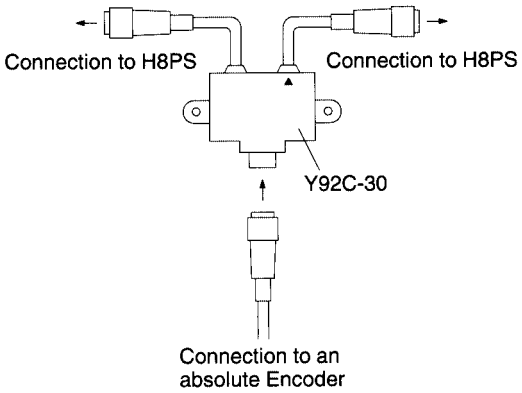
Track Mounting Base
Y92F-91



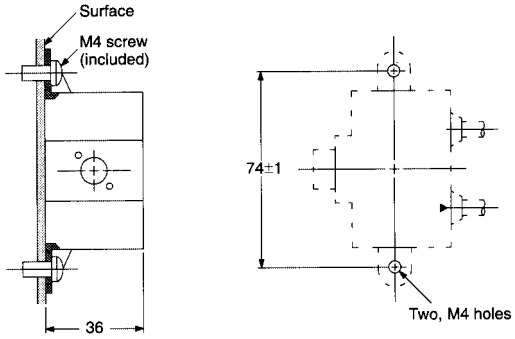
Adapter for Parallel Operation

This Adapter enables two H8PS Cam Positioners to share a signal from an Encoder.

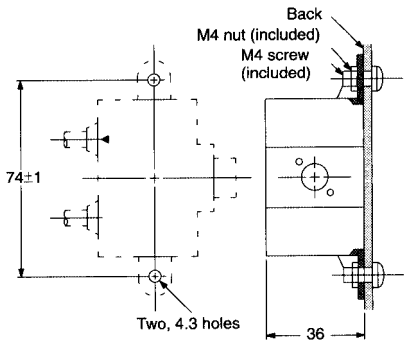
Use the cable marked with triangle mark when connecting only one H8PS Cam Positioner to the adapter.



Panel Surface Mounting

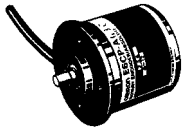


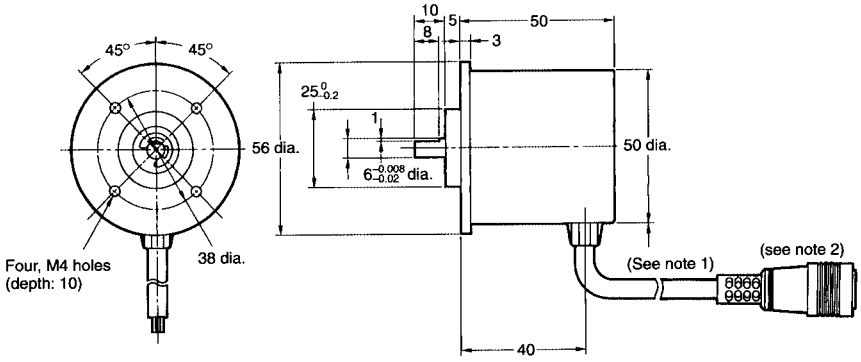
Panel Back Mounting



■ Rotary Encoder

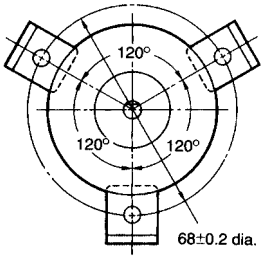
E6CP-AG5C-C

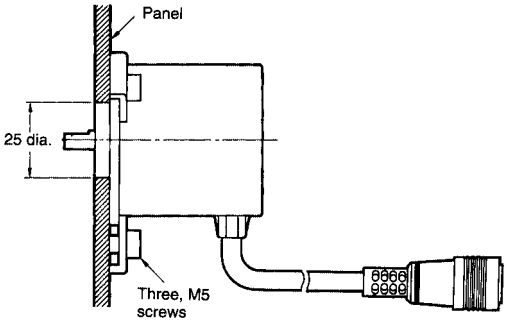




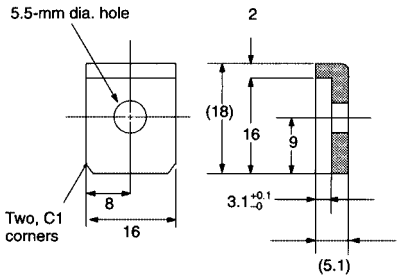
Note: 1. Round, vinyl-insulated cord. External dia.: 6 mm; 10/7/0.18-mm dia.; standard: 2 m.
2. Connector to H8PS (Hirose Electric: RP13A-12PD-13SC)

With Mounting Bracket

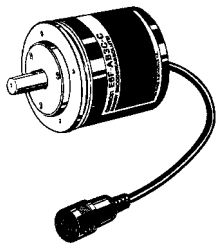


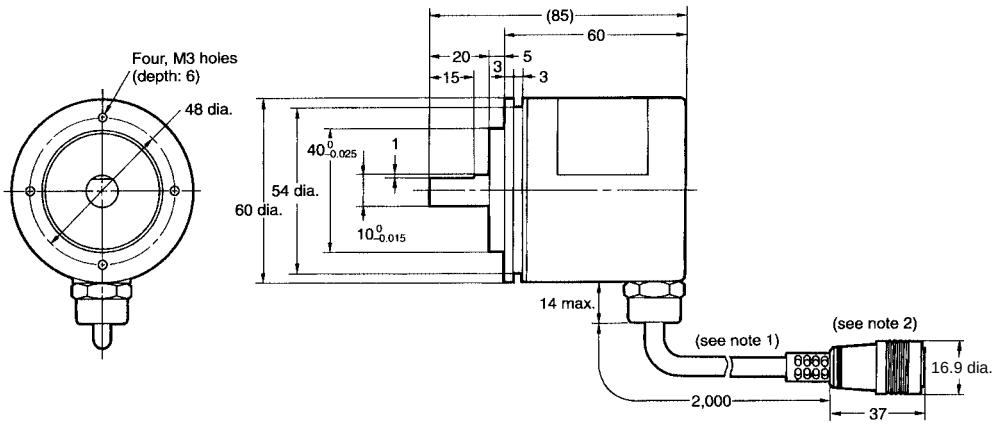


Mounting Bracket (included)



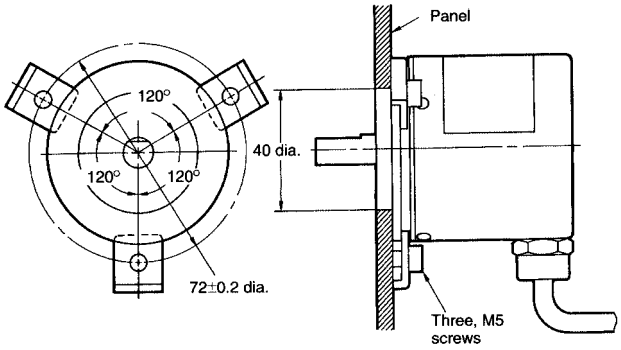
E6F-AG5C-C



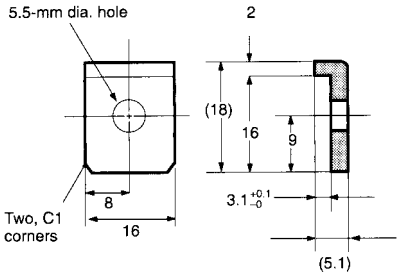


Note: 1. Round, vinyl-insulated and shielded cord (oil resistant). External dia.: 6 mm; 12/7/0.18-mm dia.; standard: 2 m.
2. Connector to H8PS (Hirose Electric: RP13A-12PD-13SC)

With Mounting Bracket

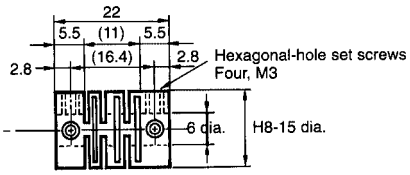


Mounting Bracket (included)

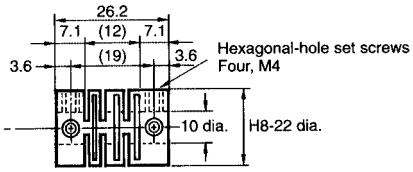


■ Accessories for Rotary Encoder

Shaft Coupling (for E6CP)
E69-C06B

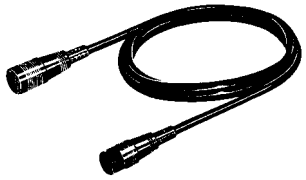


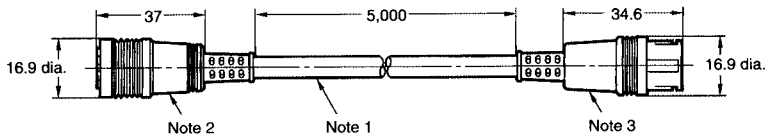
Shaft Coupling (for E6F)
E69-C10B



Note: The material is polyacetal resin with glass fibers (GC-25).

Extension Cable
E69-DF5





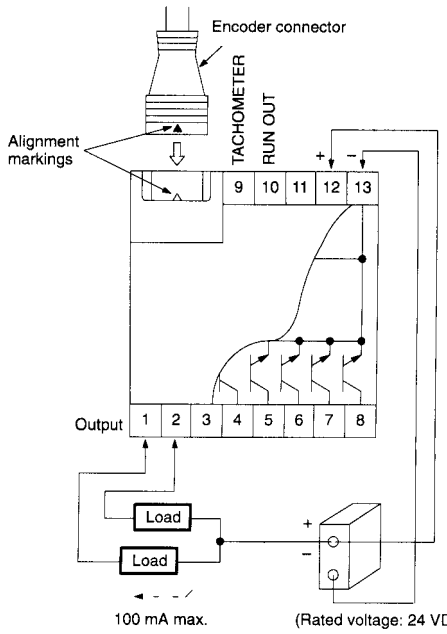
Note: 1. Round, vinyl-insulated and shielded cord (oil resistant). External dia.: 6 mm; 12/7/0.18-mm dia.; 5 m.

2. Connector for H8PS (E6F-AB3C-C, E6F-AG5C-C)

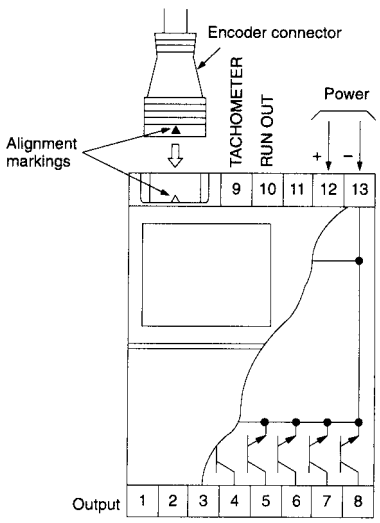
Installation

■ Terminal Arrangement

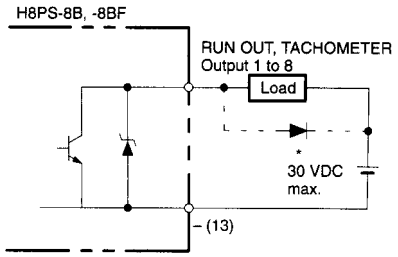
H8PS-8B



H8PS-8BF

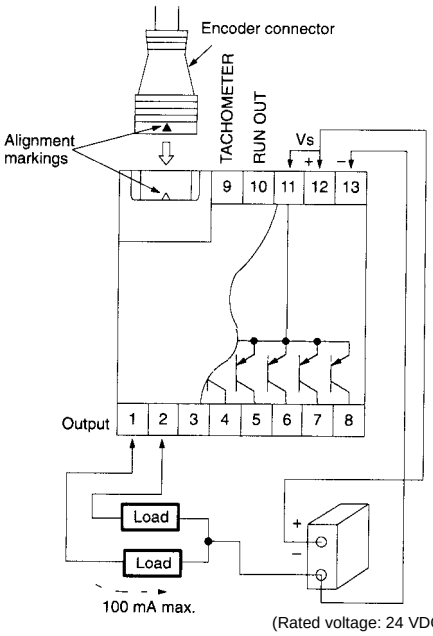


Output Circuit

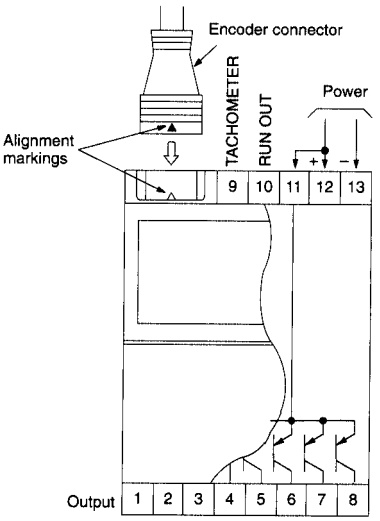


*When using an inductive load, connect a reverse surge-absorbing diode.

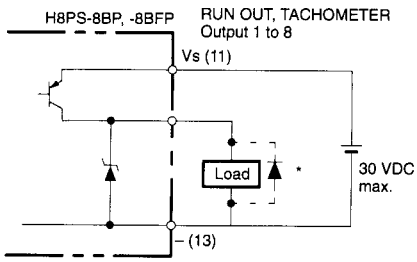
H8PS-8BP



H8PS-8BFP



Output Circuit



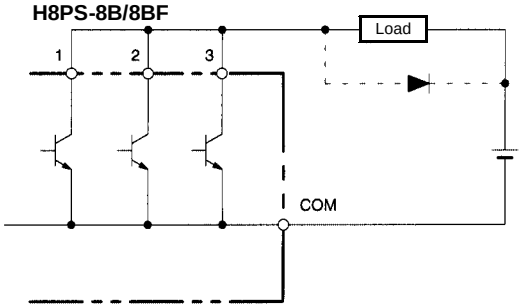
* When using an inductive load, connect a reverse surge-absorbing diode.

Item	H8PS-8B/-8BF		H8PS-8BP/-8BFP	
	RUN OUT Output 1 to 8	TACHOMETER	RUN OUT Output 1 to 8	TACHOMETER
Output method	NPN open collector		PNP open collector	
Dielectric strength	30 V		30 V	
Rated current	100 mA	30 mA	100 mA	30 mA
Residual voltage	2 V max.	0.5 V max	2 V max.	
Leak current	100 μA max.	5 μA max.	100 μA max.	

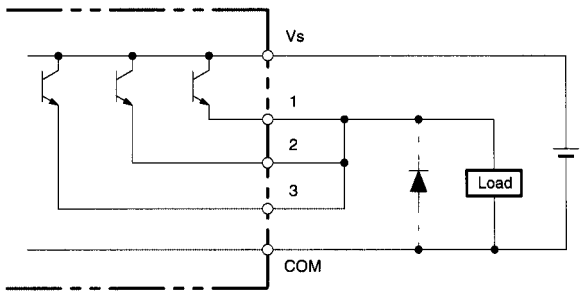
Note: Internal circuit damage can result from a short circuit in the load.

Multiple outputs (OUTPUT 1 to 8) can be connected to operate a load as shown below.

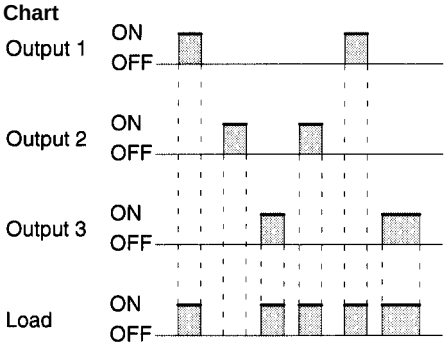
H8PS-8B/8BF



H8PS-8BP/8BFP



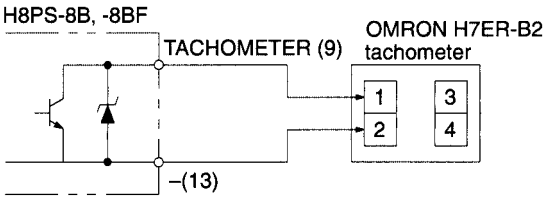
Timing Chart



Connection Examples

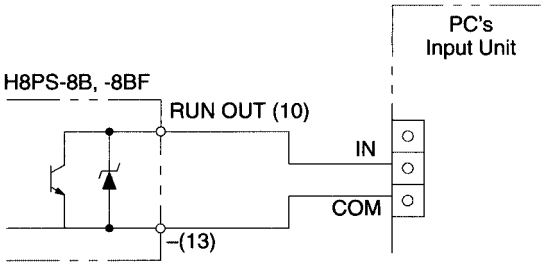
TACHOMETER Connection

Since the rotational output consists of 60 pulses per revolution, select an appropriate rpm meter.



RUN OUT Connection

The output is ON during run and test modes and can be used as a status signal by connecting to the Input Unit of a Programmable Controller (SYSMAC) or similar device.



Precautions

■ Cam Positioner

Error Displays and Cancelling

When an error occurs, perform the following cancellation operation. (When the following errors occur, all outputs turn OFF except for the TACHOMETER output.)

Display	Description	Cancellation method
E0	Set origin data error	Reset the origin in the Programming Mode and return to the previous mode.
E1	Memory error, when settings have been modified	Switch to the Programming Mode and confirm all settings. After correcting the settings, return to the previous mode.
E2	Encoder input data error 1. The Encoder is malfunctioning or a connector is disconnected. 2. The Encoder rotation speed exceeds the response limit. 3. The Encoder output data became scrambled because of noise. 4. A line to the Encoder is cut.	Switch to the Programming Mode and check the following items. Return to the previous mode after corrections. 1. Encoder abnormality 2. Faulty Encoder connector contacts 3. Encoder rotation speed and response speed settings 4. Noise and surge protection

After turning on the power, it takes approximately two seconds until normal operation,

When the ON angle and OFF angle are the same value, no output will occur.

Handling

Turn the operation power on or off instantaneously via a contact such as a switch or relay.

Avoid operation in the following environments:

1. An ambient temperature below −10°C or above 55°C.
2. Very dusty locations.
3. Very humid locations.
4. Locations where corrosive gasses are generated.
5. Locations with heavy vibrations or shock.
6. Locations prone to water or oil.
7. Locations with direct sunlight.

For operation in environments with excessive electrical noise generation, separate the Encoder cords and the main unit of the H8PS from high-power cables that have noise or noise-generating sources.

The external finish of the main unit is prone to organic solvents (thinner, benzene, etc.), strong alkali (ammonia, sodium hydroxide), and strong acid. Please avoid contact with theses chemicals.

Store the devices between −25°C and 65°C. For storage below −10°C, power the unit up after letting it stand at room temperature for three hours.

To perform dielectric testing, impulse-voltage testing, and insulation-resistance measuring between the electrical circuitry and the uncharged metal parts when the unit is mounted in a control panel, first disconnect the wiring of the unit from the circuitry. (This prevents degradation of damage of internal circuitry in the event that part of the control-panel equipment has faulty voltage resistance or faulty insulation. The test voltage might go to the power-supply terminals of the main unit.)

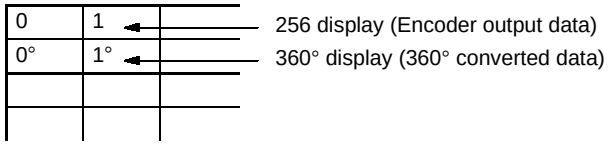
The Encoder consists of precision parts. Exercise care in handling, and make sure no excessive shock or pressure is applied to the Encoder. Especially make sure that the Encoder's rotating shaft is not subjected to excessive force.

The connections for the main unit connectors should have no undue stress applied. Wire cables accordingly.

Angle Data Table

The H8PS uses an absolute Encoder with 256 divisions per revolution. To assist with programming, displays and settings may be done by conversion to 360 degrees by a switch on the front panel. The following table shows the conversions.

How to Use the Table



0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0°	1°	3°	4°	6°	7°	8°	10°	11°	13°	14°	15°	17°	18°	20°	21°
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
23°	24°	25°	27°	28°	30°	31°	32°	34°	35°	37°	38°	39°	41°	42°	44°
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
45°	46°	48°	49°	51°	52°	53°	55°	56°	58°	59°	60°	62°	63°	65°	66°
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
293°	294°	295°	297°	298°	300°	301°	302°	304°	305°	307°	308°	309°	311°	312°	314°
224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
315°	316°	318°	319°	321°	322°	323°	325°	326°	328°	329°	330°	332°	333°	335°	336°
240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
338°	339°	340°	342°	343°	345°	346°	347°	349°	350°	352°	353°	354°	356°	357°	359°

WARNING

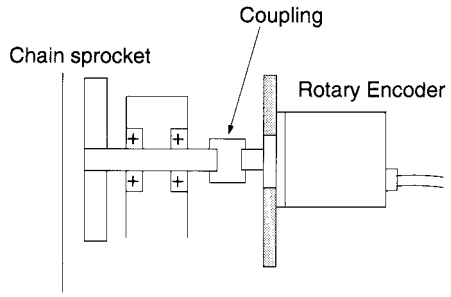
1. The H8PS has a built-in lithium battery. Be sure to dispose of the old H8PS properly, as lithium batteries are likely to explode if incinerated.
2. Electrical shock hazard
   Never touch the input terminals of any H8PS Cam Positioner when power is being applied to the Cam Positioner.

■ Rotary Encoder

Make sure that the E6CP Encoder is not subjected to oil or water. If oil or water enters the interior, malfunctions may occur. For use in environments subject to water drops or oil, use the E6F.

Rotary Encoders consist of precision parts. Their operation may be damaged if the Encoder is dropped. Be very careful with handling.

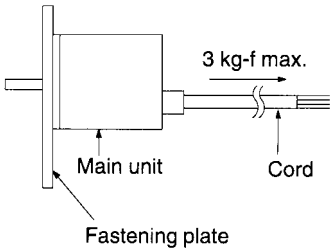
When joining to a chain, timing belt, or gears, interpose a coupling and bearings before the Encoder.



Large mounting deviations (eccentric centers or angles) may cause an excessive load on the Encoder's shaft, resulting in damage or drastically reduced life expectancy. Take care not to place excessive loads on the shaft.

Keep the tightening torque around 5 kg S cm when fastening the rotary Encoder.

Do not pull the wiring at a force greater than 3 kg when the main unit is fastened and wired.



If you insert a coupling on the shaft, do not hammer on the coupling or otherwise subject it to shock.

Mounting Procedure

1. Place a coupling on the shaft.
   Do not screw the coupling and shaft tight.
2. Fasten the Encoder.
   Do not insert the shaft to the coupling more than the length shown below.

Shaft coupling	Length of insertion
E69-C06B	5.5 mm
E69-C10B	7.1 mm

3. Fasten the coupling.

Shaft coupling	Tightening torque
E69-C06B	2.5 kgf S cm
E69-C10B	4.5 kgf S cm

4. Connect power supply and input/output lines.
   Make sure you turn off the power supply when wiring.
5. Turn on the power and check outputs.

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

Cat. No. M41-E1-3B

OMRON

Cam Positioner

H8PR

Low-Cost, High-Performance Electronic Cam Switch for Use with OMRON E6F Rotary Encoder

- Control outputs can be programmed to turn ON/OFF in 1° units of rotary encoder shaft rotation
- Handles input from the dedicated E6F-AB3C-C Absolute Rotary Encoder
- A single control output can be programmed to turn ON/OFF up to 10 times
- Quick response of 0.2 ms (5 kHz) max.
- The encoder shaft rotation direction can be changed and the point of origin automatically corrected
- Built-in battery backs up program memory

RC

Ordering Information

Cam Positioner

Programmable control outputs	8 points		16 points		24 points	
Output configuration	**NPN**	**PNP**	**NPN**	**PNP**	**NPN**	**PNP**
Model	H8PR-8	H8PR-8P	H8PR-16	H8PR-16P	H8PR-24	H8PR-24P

Absolute Encoder

Model	E6F-AB3C-C
Cable length	2 m

Encoder Shaft Connector

Model	E69-C10B

Note: 1. An optional 5-m Extension Cable, E69-DF5, is available.
2. The cable can be extended up to 30 m.
3. The *H8PR Operation Manual* is also available.

Specifications

■ Ratings

Supply voltage		100 to 240 VAC, 50/60 Hz
Operating voltage range		90 to 110% of rated supply voltage
Power consumption		Approx. 10 W (240 VAC, 50 Hz)
Input	**Encoder input**	Accepts input from E6F-AB3C-C Rotary Encoder Response time: 5 kHz (0.2 ms) at 833 rpm of encoder shaft. Adjustable to 0.5, 1, 2, 3, 4, and 5 kHz With built-in error detection function
	INHIBIT	Input via contacts or transistor (selectable) and turns OFF all control outputs Contact input: 20 ms response time Solid-state input: 5 ms response time
	FORCED RUN	Input when FORCED RUN and 0 V (or-COM) terminals are short-circuited and protects program from being modified.
Output		Open-collector transistor output 30 VDC, 100 mA max. NPN: H8PR-8/16/24 PNP: H8PR-8P/16P/24P
	Control outputs	No. of points: 8 (OUT 1 to OUT 8) for H8PR-8(P) 16 (OUT 1 to OUT 16) for H8PR-16(P) 24 (OUT 1 to OUT 24) for H8PR-24(P)
	RUN	Turns ON in RUN mode and OFF in case of error

Standards Approval

UL (File No. E41515)
CSA (File No. LR22310)

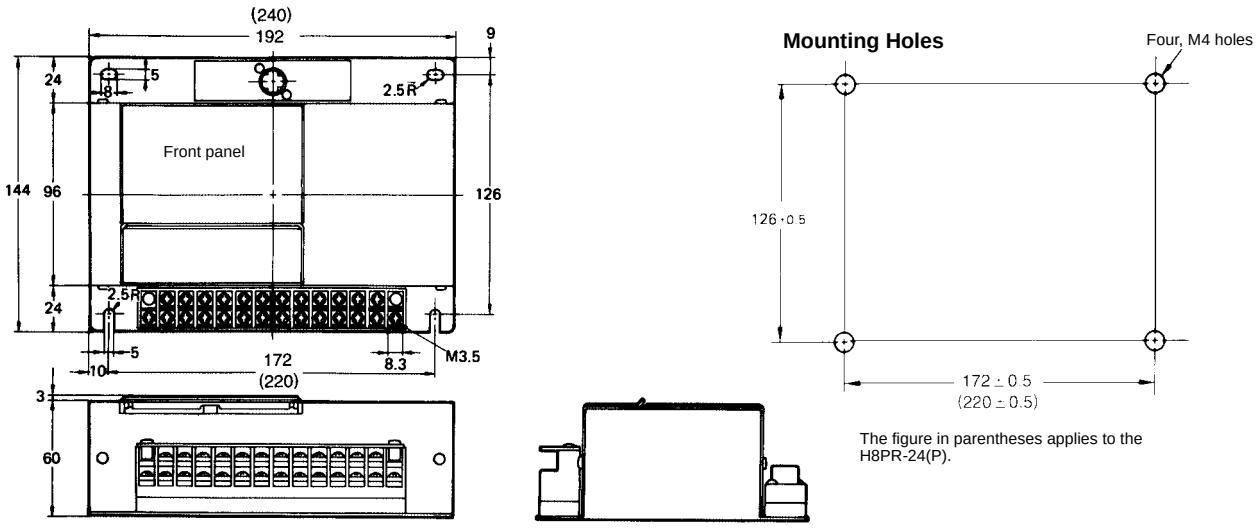
■ Characteristics

Controllable Encoder shaft rotation angle	Can be set in units of 1°. One control output can be programmed to turn ON/OFF up to 10 times.
Encoder rotation	Clockwise/counterclockwise (selectable)
Encoder origin compensation	−179° to +180°
Teaching function	Angles at which control outputs are to be turned ON/OFF and point of origin can be registered in memory directly from Encoder
Output starting angle	0° to 359°
Memory protection function against power failure	0.01 s
Memory protection	10 years min. (at 25°C)
Insulation resistance	100 MΩ min. at 500 VDC between current-carrying terminals and non-current-carrying exposed metal parts, and between power circuit and control output circuit
Dielectric strength	1,500 VAC, 50/60 kHz for 1 minute between current-carrying terminals and non-current-carrying exposed metal parts, and between power circuit and control output circuit.
Vibration resistance	Destruction: 10 to 55 Hz, 0.75 mm double amplitude Malfunction: 10 to 55 Hz, 0.5 mm double amplitude
Shock resistance	Destruction: 300 m/s^2 (approx. 30 G) Malfunction: 100 m/s^2 (approx. 10 G)
Ambient operating temperature	−10°C to 55°C
Ambient humidity	35% to 85%
Weight	Approx. 1.3 kg

Output Response Time

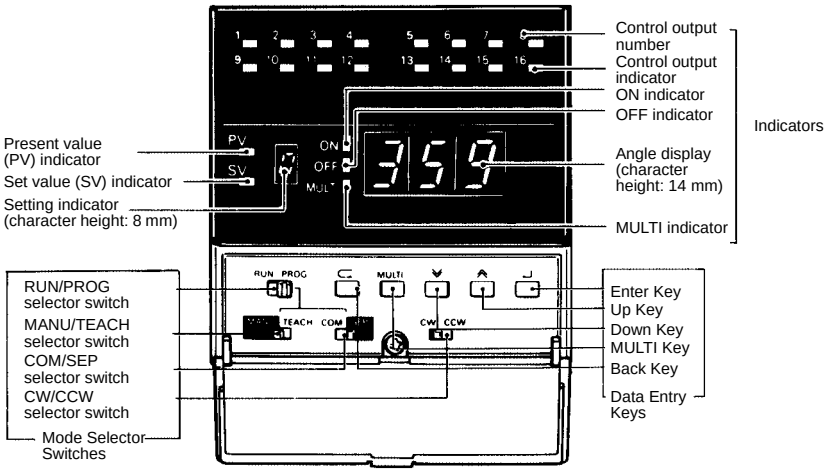
Response frequency of Encoder	Output response time
5 kHz, 4 kHz	0.3 ms max.
3 kHz	0.35 ms max.
2 kHz	0.5 ms max.
1 kHz	1.1 ms max.
0.5 kHz	1.5 ms max.

Dimensions



The figure in parentheses applies to the H8PR-24(P).

Nomenclature



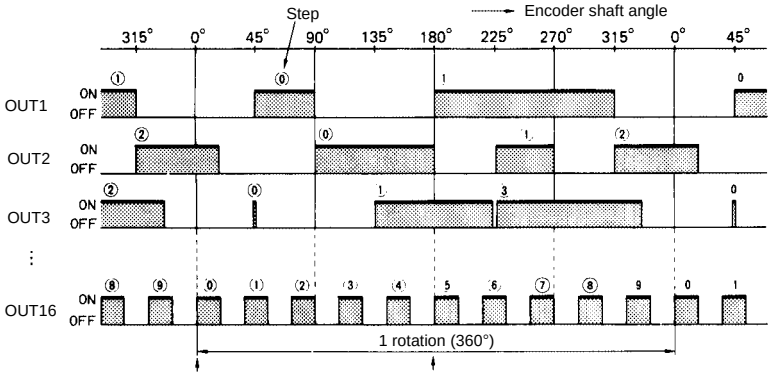
Operation

The H8PR Cam Positioner accepts rotation angle signal input from the OMRON E6F-AB3C-C Absolute Rotary Encoder which indicates the rotation angle of the Encoder shaft. Each control output of the Cam Positioner can be programmed to turn ON or OFF at fixed angle of the Encoder shaft.

Program Example

Step	0		1		2		to	9	
ON/OFF output	ON	OFF	ON	OFF	ON	OFF	...	ON	OFF
1	45°	90°	180°	315°	---	---	...	---	---
2	90°	180°	225°	270°	315°	18°	...	---	---
3	44°	45°	135°	220°	225°	340°	...	---	---
to	...	...	...	...	...	...	...	...	...
16	0°	18°	36°	54°	72°	90°	...	324°	342°

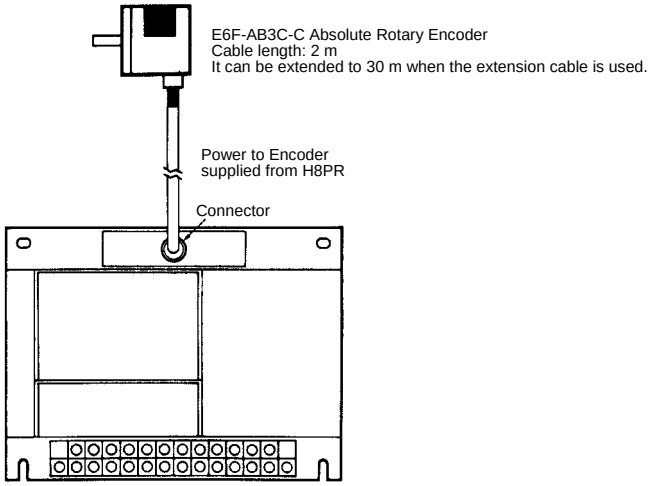
Operation Example



Can be programmed from 0°. One control output can be programmed to turn ON/OFF up to 10 times.

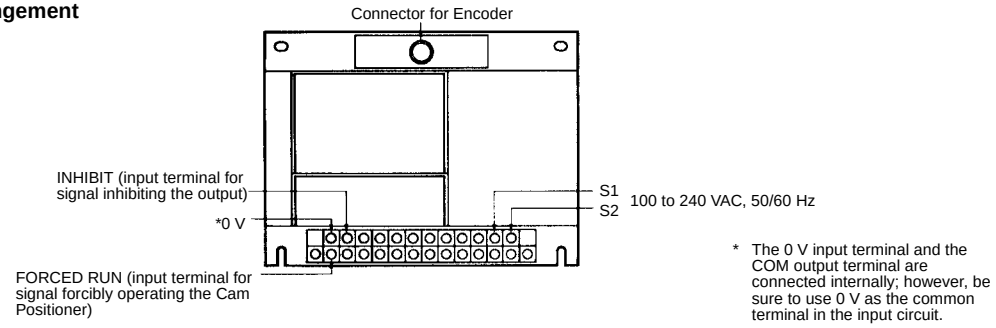
Connections

Encoder Input Connection

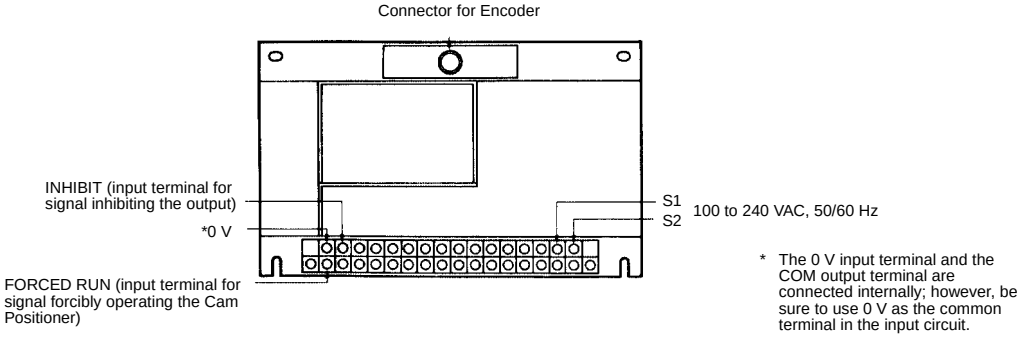


Input Terminal Arrangement

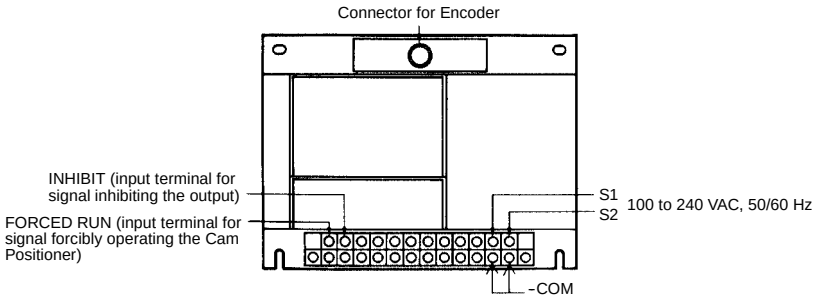
H8PR-8/16



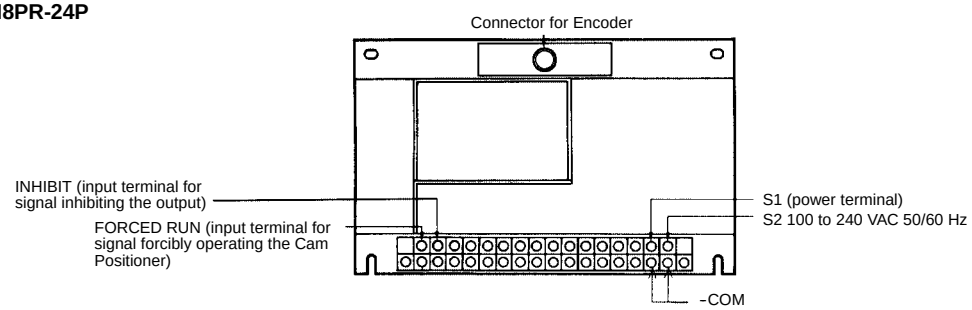
H8PR-24



H8PR-8P/16P

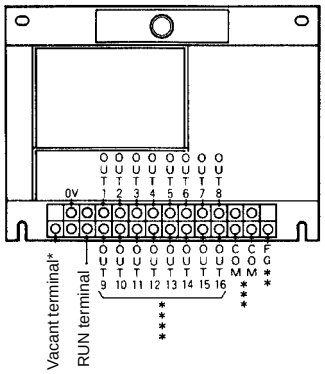


H8PR-24P

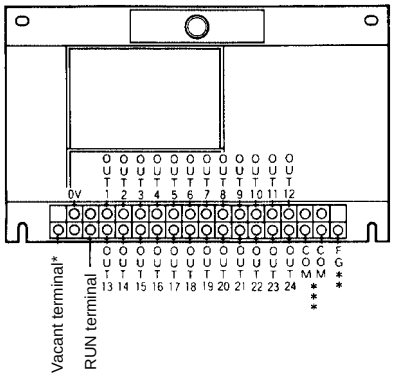


Output Terminal Arrangement

H8PR-8/16



H8PR-8/16



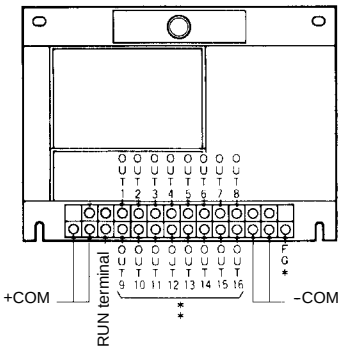
* Do not use the vacant terminal as a repeating terminal.

** Be sure to ground this terminal to prevent electric shock.

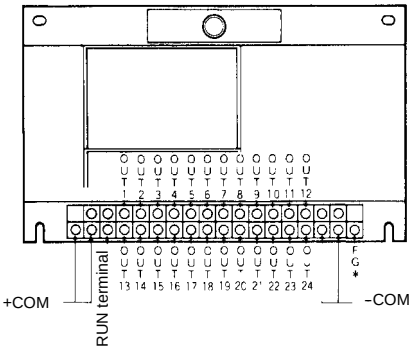
*** The COM output terminal and the 0 V input terminal are internally connected; however, be sure to use COM terminal as the common terminal for output circuits.

**** Terminals OUT9 to OUT16 are not provided on the H8PR-8.

H8PR-8P/16P



H8PR-24P

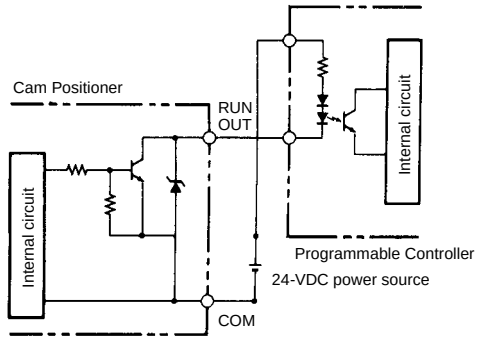


* Be sure to ground this terminal to prevent electric shock.

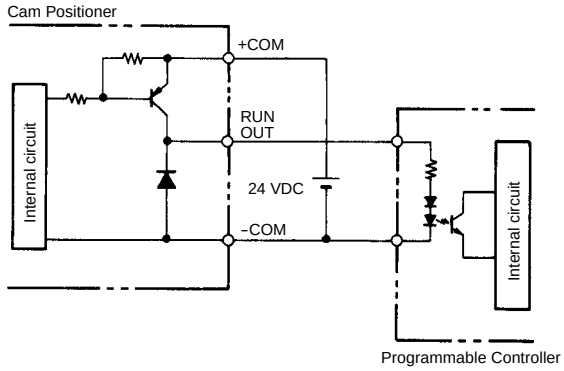
** Terminals OUT9 to OUT16 are not provided on the H8PR-8.

Connecting to Programmable Controller

H8-PR-8/16/24

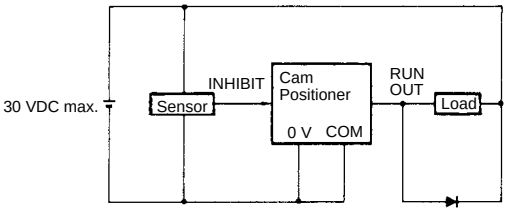


H8PR-8P/16P/24P

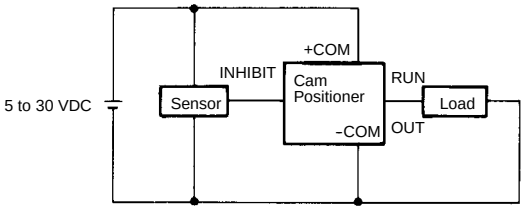


Note: Supply the power to the sensor for INHIBIT signal input and output circuit from the same power source.

H8-PR-8/16/24



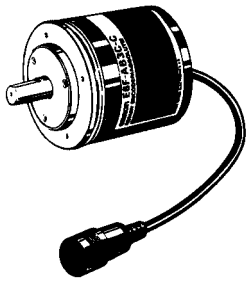
H8PR-8P/16P/24P



E6F Rotary Encoder (Absolute Type)

- Resolution of 360 allows detection in units of 1°
- 10 mm dia. rigid shaft withstands loads of up to 10 kg (radial) and 3 kg (axial)
- Drip-proof, oil-proof construction (meets IP52F) permits versatile use in adverse environments

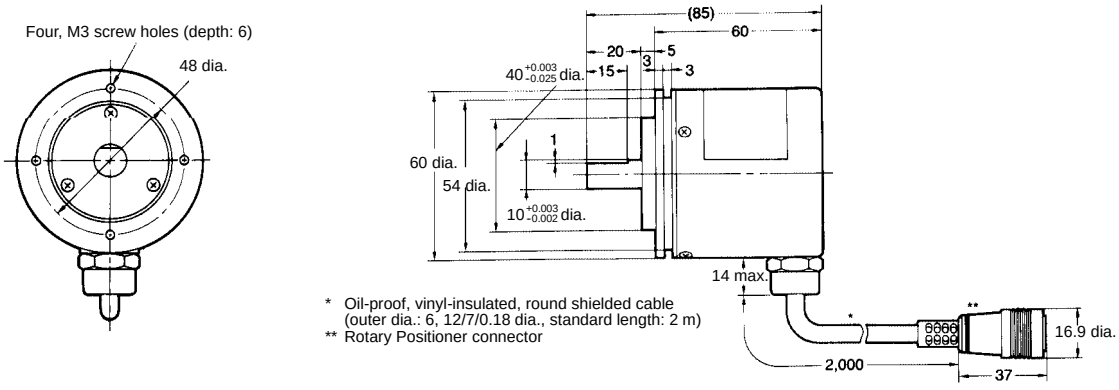
E6F-AB3C-C



■ Specifications

Supply voltage	5 to 12 VDC, −5%, +10%, contains 5% ripple (p-p) max.
Current consumption	100 mA max.
Sensing method	Absolute type
Resolution (pulse/revolution)	360 (10 bits)
Output code	BCD
Output configuration	Open-collector transistor output
Output capacity	Applied voltage: 30 VDC max. Sink current: 35 mA max. Residual voltage: 0.4 V max. (at 35 mA sink current)
Maximum response frequency	10 kHz
Logic	Negative (H level: 0, L level: 1)
Accuracy	±0.5° max.
Revolution direction	Output code increased in clockwise direction (when viewed from shaft)
Output rise and fall times	1.0 μs max. (control output voltage: 5 V, load resistance: 470 Ω, output cable: 2 m) 2.0 μs max. (control output voltage: 5 V, load resistance: 1 kΩ, output cable: 2 m)
Starting torque	100 gf-cm max.
Moment of inertia	15 g-cm^2 max.
Shaft loading	Radial: 10 kgf, Axial: 3 kgf
Maximum rpm	5,000 rpm
Ambient temperature	Operating: −10°C to 70°C Storage: −25°C to 80°C
Ambient humidity	35% to 85% (without condensation)
Vibration resistance	Destruction: 10 to 55 Hz, 1.5 mm double amplitude (in X, Y, and Z directions, respectively for 2 hours)
Shock resistance	Destruction: 100 G (in X, Y, Z directions, respectively 3 times)
Degree of protection	IEC IP52F (dust-proof, drop-proof)
Weight	Approx. 500 g (including 2 m cable)

■ Dimensions



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

Cat. No. M40-E1-3A

OMRON

Intelligent Signal Processor | K3TC

An Ideal Interface for High-speed Up/Down Counting for an Input Range of 50 kHz (kcps)

- 50-kHz input range for high-speed signal processing.
- A wide selection of outputs: relay, transistor, BCD, linear, or communications.
- Prescale function available, which displays in units of actual physical parameters (length, volume, etc.).
- Built-in sensor power supply (12 VDC, 80 mA).
- Banks with four set values and four prescale values.
- Five-stage comparative outputs available.
- Safety structure with input, output, and power terminals completely insulated from one another ensuring a dielectric withstand strength of 2,000 V.
- Compact 1/8 DIN size.
- Conforms to EMC standards, EN61010-1 (IEC101-1).
- UL/CSA approved.
- Six-language instruction manual provided.

CE uC

Ordering Information

Base Unit

Input type	NPN		PNP	
Supply voltage	100 to 240 VAC	12 to 24 VDC	100 to 240 VAC	12 to 24 VDC
Basic Models These models provide a present value LED and front-panel control keys. Can be connected to any Output Board, or can be used for display only without an Output Board. 	K3TC-NB11A	K3TC-NB12A	K3TC-PB11A	K3TC-PB12A

Available Output Board Combinations

Output type	Output configuration	Output Boards	Base Units
			Basic
Relay contact	5 outputs: OUT 1, 2, 4, 5 (SPST-NO), and OUT 3 (SPDT)	K31-C2	Yes
	5 outputs: OUT 1, 2, 4, 5 (SPST-NC), and OUT 3 (SPDT)	K31-C5	Yes
Transistor	5 outputs (NPN open collector)	K31-T1	Yes
	5 outputs (PNP open collector)	K31-T2	Yes
Communication boards*	RS-232C	K31-S1	Yes
Combination output and communication boards*	BCD output + 5 transistor outputs (NPN open collector)	K31-B4	Yes
	4 to 20 mA + 5 transistor outputs (NPN open collector)	K31-L4	Yes
	1 to 5 V + 5 transistor outputs (NPN open collector)	K31-L5	Yes
	RS-485 + 5 transistor outputs (NPN open collector)	K31-S5	Yes
	RS-422 + 5 transistor outputs (NPN open collector)	K31-S6	Yes

*For details, refer to *K3TC/K3TH/K3TR/K3TX Communication Output-type Intelligent Signal Processor Operation Manual*.

Model Number Legend:

Base Units and Output Boards can be ordered individually or as sets.

Base Units

K3TC - □ □ □ □ □
1 2 3 4 5

Output Boards

K31 - □ □
6 7

Base Units with Output Boards

K3TC - □ □ □ □ □ - □ □
1 2 3 4 5 6 7

1, 2. Input Sensors Codes

NB: NPN inputs
PB: PNP inputs

3. Series No.

1: Current series

4. Supply Voltage

1: 100 to 240 VAC
2: 12 to 24 VDC

5. Display

A: Basic

6, 7. Output Type Codes

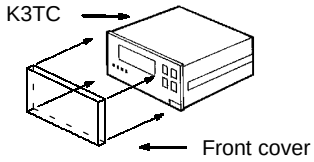
C2: 5 comparative relay contact outputs (OUT 1, 2, 4, 5: SPST-NO; OUT 3: SPDT)
C5: 5 comparative relay contact outputs (OUT 1, 2, 4, 5: SPST-NC; OUT 3: SPDT)
T1: 5 comparative transistor outputs (NPN open collector)
T2: 5 comparative transistor outputs (PNP open collector)
B4: BCD output + 5 transistor outputs (NPN open collector)
L4: Linear output, 4 to 20 mA + 5 transistor outputs (NPN open collector)
L5: Linear output, 1 to 5 V + 5 transistor outputs (NPN open collector)
S1: Communication RS-232C
S5: RS-485 + 5 transistor outputs (NPN open collector)
S6: RS-422 + 5 transistor outputs (NPN open collector)

Note: Refer to the *Output Board Combinations* table on page 198.

■ Accessories (Order Separately)

Transparent Front Cover Model K32-49SC

The K32-49SC Soft Front Cover protects the front panel of the Processor (the Basic Models) from oil and water. All keys on the front panel can be operated with the cover on.



Specifications

■ Ratings

Supply voltage	100 to 240 VAC (50/60 Hz); 12 to 24 VDC
Operating voltage range	85% to 110% of supply voltage
Power consumption (see note)	15 VA max. (max. AC load with all indicators lit) 10 W max. (max. DC load with all indicators lit)
Built-in sensor power supply	80 mA at 12 VDC±10%
Insulation resistance	10 MΩ min. (at 500 VDC) between external terminal and case. Insulation provided between inputs, outputs, and power supply.
Dielectric withstand voltage	2,000 VAC for 1 min between external terminal and case. Insulation provided between inputs, outputs, and power supply.
Noise immunity	±1,500 V on power supply terminals in normal or common mode ±1 μs, 100 ns for square-wave noise with 1 ns
Vibration resistance	Malfunction: 10 to 55 Hz, 0.5-mm for 10 min each in X, Y, and Z directions Destruction: 10 to 55 Hz, 0.75-mm for 2 hrs each in X, Y, and Z directions
Shock resistance	Malfunction: 98 m/s^2 (10G) for 3 times each in X, Y, and Z directions Destruction: 294 m/s^2 (30G) for 3 times each in X, Y, and Z directions
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −20°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85% (with no condensation)
Ambient atmosphere	Must be free of corrosive gas
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity-RF-interference: ENV50140: 10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2 kV power-line (level 3) 2 kV I/O signal-line (level 4)
Approved standards	UL (File No. E4151), CSA (File No. LR67027): conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1).
Weight	Approx. 450 g

Note: An Intelligent Signal Processor requires a control power supply current of approximately 1 A the moment the Intelligent Signal Processor is turned on. Do not forget to take this into consideration when using several Intelligent Signal Processors.

Input/Output Ratings

Relay Contact Output

(Incorporating a G6B Relay)

Item	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4, L/R = 7 ms)
Rated load	5 A at 250 VAC; 5 A at 30 VDC	1.5 A at 250 VAC, 1.5 A at 30 VDC
Rated carry current	5 A max. (at COM terminal)	
Max. contact voltage	380 VAC, 125 VDC	
Max. contact current	5 A max. (at COM terminal)	
Max. switching capacity	1,250 VA, 150 W	375 VA, 80 W
Min. permissible load	10 mA at 5 VDC	

Transistor Output

Rated load voltage	12 to 24 VDC $^{+10\%}/_{-15\%}$
Max. load current	50 mA
Leakage current	100 μA max.

BCD Output

I/O signal name		Item	Rating
Inputs	REQUEST, COMPENSATION, RESET	Input voltage	No-voltage contact input
		Input current	10 mA
		Operating voltage	ON: 1.5 V max. OFF: 3 V min.
Outputs	DATA, POLARITY, OVERFLOW, DATA VALID, RUN	Rated load voltage	12 to 24 VDC $^{+10\%}/_{-15\%}$
		Max. load current	10 mA
		Leakage current	100 μA max.

Note: Logic method: negative logic

Linear Output

Item	4 to 20 mA	1 to 5 V
Resolution	4,096	
Output error	±0.5% FS	
Permissible load resistance	600 Ω max.	500 Ω min.

■ Communications

Item		RS-232C, RS-422	RS-485
Transmission method		4-wire, half-duplex	2-wire, half-duplex
Synchronization method		Start-stop synchronization	
Baud rate		150/300/600/1,200/2,400/4,800/9,600/19,200	
Transmission code		ASCII (7-bit)	
Communications	**Write to K3TC**	Set values, reset control	
	Read from K3TC	Set values, process value, model data, error code, etc.	

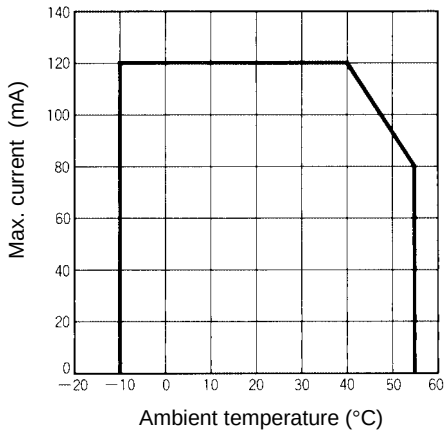
For details, refer to *K3TC/K3TH/K3TR/K3TX Communication Output-type Intelligent Signal Processor Operation Manual.*

■ Characteristics

Input signal	Non-voltage contact (30 Hz (cps) max., ON/OFF pulse width: 15ms min.) Open collector (50 kHz (kcps) max., ON/OFF pulse width: 9 μs min.) Output delay time: 1 ms max. when NPN transistor output is ON **Connectable Sensors** ON residual voltage: 3 V max. OFF leakage current: 1.5 mA max. Load current: Must have switching capacity of 20 mA min. Must be able to dependably switch a load current of 5 mA max.
Input mode	Up/Down B (individual inputs), Up/Down C (phase difference inputs)
Output mode	ALL-H/ALL-L
Max. displayed digits	5 digits (−9999 to 99999)
Display	7-segment LED
Polarity display	"−" is displayed automatically with a negative input signal.
Zero display	Leading zeros are not displayed.
Prescale function	Programming via front-panel key inputs. (0.0001×10^{-9} to 9.9999×10^{9}, decimal: 10^{-1} to 10^{-3}) Can be set using prescale value teaching.
External control	RESET: 16 ms max. (external reset signal only) COMPENSATION: 16 ms max. (external compensation signal only) BANK 1, 2: 100 ms max. (bank switching time) Up to 4 set value or prescale value banks available
Other functions	Set value teaching Set value write-protection Linear output range teaching Variable linear output range
Output configuration	Relay contact output (5 outputs), transistor output (NPN and PNP open collector), parallel BCD (NPN open collector) + transistor output (NPN open collector), linear output (4 to 20 mA, 1 to 5 V) + transistor output (NPN open collector), communication functions (RS-232C), communication functions (RS-485, RS-422) + transistor output (NPN open collector)
Delay in comparative outputs	1 ms max. (at transistor output), 10 ms max. (at relay output)
Linear output response time	20 ms max.
Enclosure rating	Front panel: Refer to IEC standard IP50 Rear case: Refer to IEC standard IP20 Terminals: Refer to IEC standard IP00
Memory protection	Non-volatile memory (EEPROM)

Engineering Data

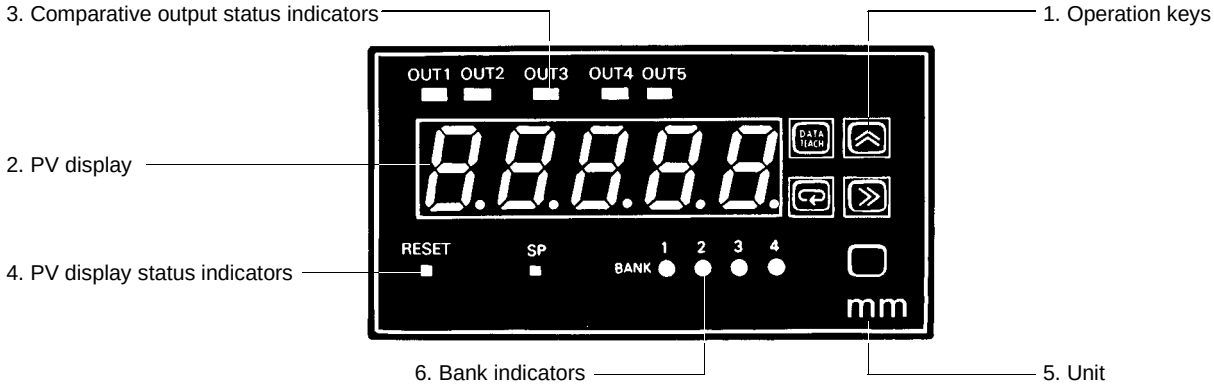
Derating Curve for Sensor Power Supply



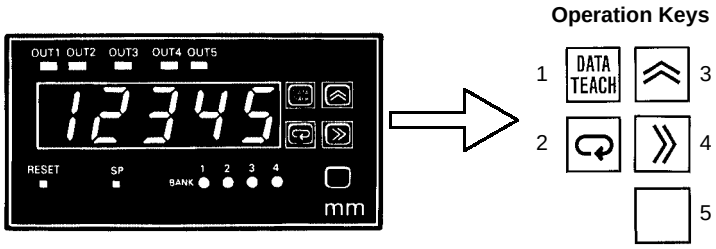
Note: The derating curve shown is for standard installation.
The derating curve depends on the mounting direction.

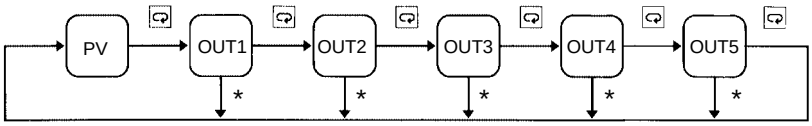
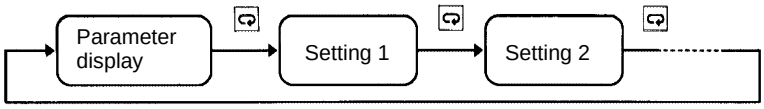
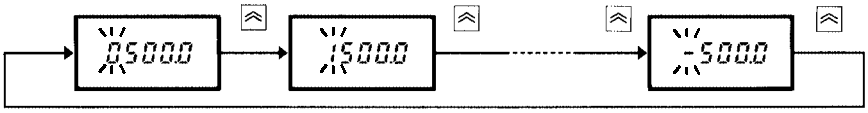
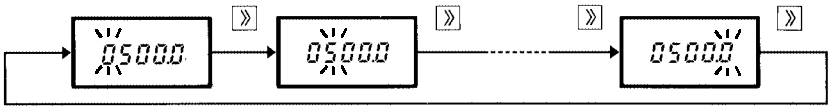
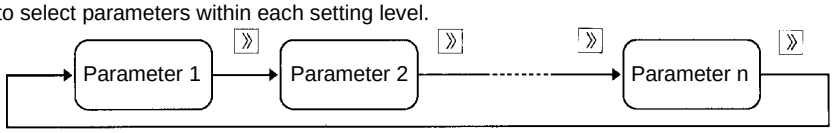
Nomenclature

K3TC-NB1 j A



Name	Functions
1. Operation keys	See next page for details.
2. PV display	Displays the process value, operations/parameters when setting, and error messages.
3. Comparative output status indicators	Indicate the status of the comparative output when comparative output board is installed.
4. PV display status indicators	Indicate the ON/OFF status of the reset input and set value is on the PV display.
5. Unit name	Location for attaching the unit sticker (enclosed).
6. Bank indicators	Indicate which bank of set values or prescale values is currently selected.



No.	Name	Functions
1	DATA/TEACH Key	In the setting mode, effects the teaching function. With this function, the set values, prescale values, and linear output range are set by means of actual input.
2	Display Key	The set values are displayed on the PV display. This function is provided only for Processors with comparative outputs. (*If a key is not pressed for 5 s, the process value will automatically return.)  In the setting mode, this key is used to enable setting or to write set values into memory after selecting the parameter with the Shift Key. 
3	Up Key	Used to increment the current digit in the set value by one. 
4	Shift Key	Used to shift the digit being set.  Used to select parameters within each setting level. 
5	Level Key	Used to enter the setting mode. Used within the setting mode to change setting levels.

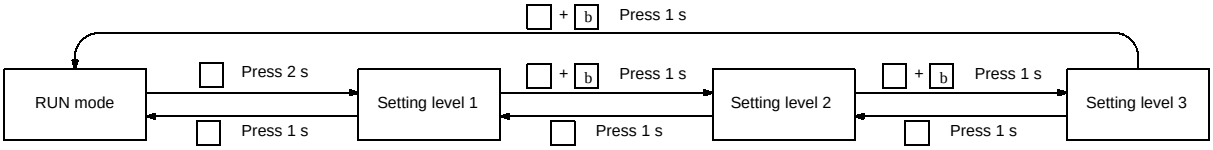
Operation

■ Setting Mode Levels and Parameters

The Processor has two main modes: run mode for normal operations and setting mode for initial parameter input. The setting mode is divided into three levels based on frequency of use. Within both of these levels are various parameters that can be set.
Initial setting of parameters thus entails entering the setting mode, shifting to the levels that contain parameters that must be set, selecting the parameters and writing in the desired set values.

■ Setting Procedures

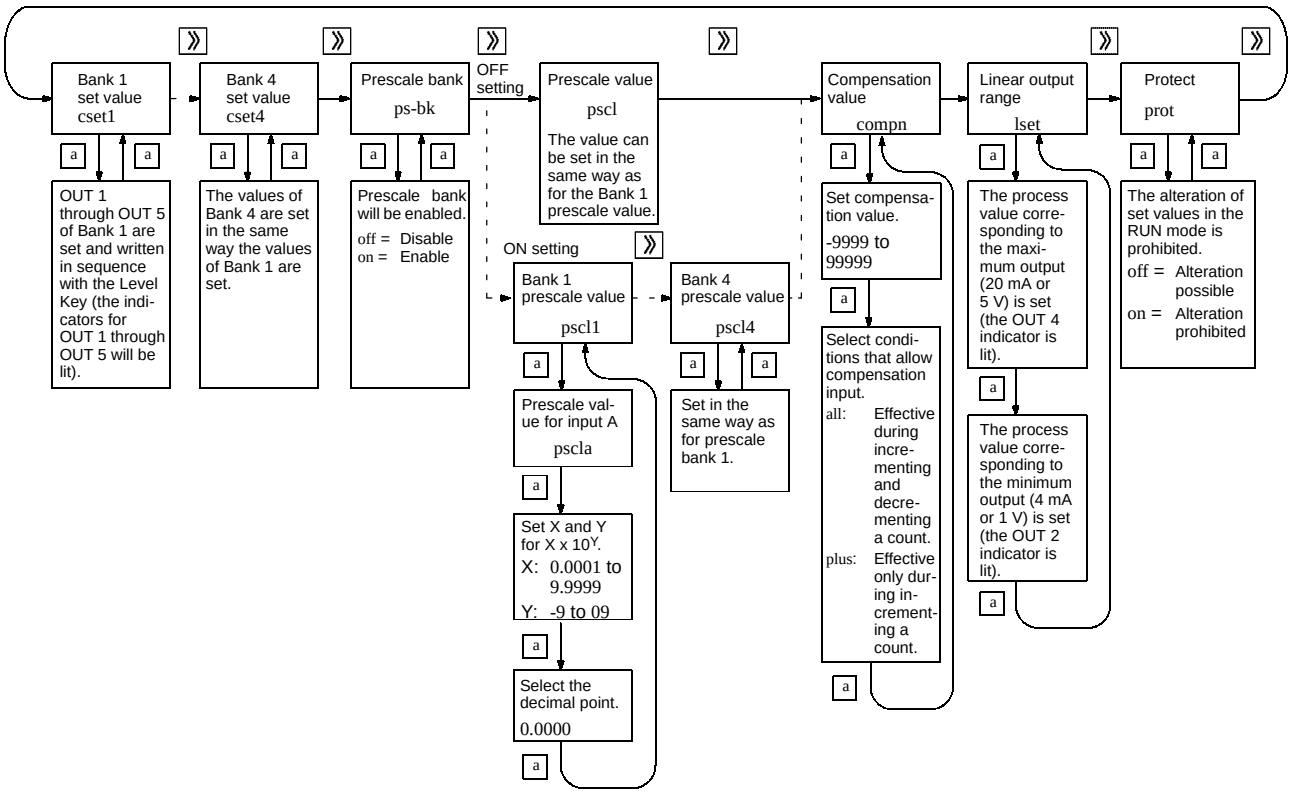
Shifting Levels



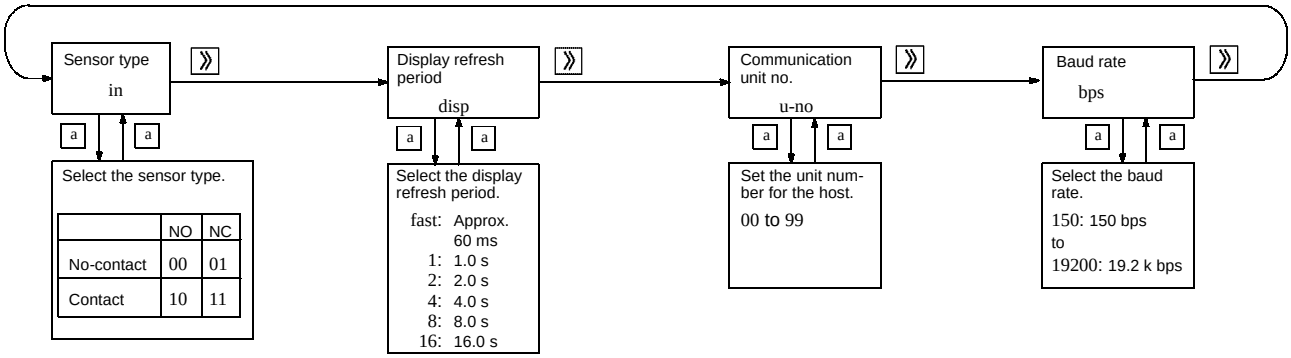
During operation, if you are unsure of the present status (such as the level or parameter with which the setting has been made), press the Level Key for one second to go one level lower. Be sure to write the set value again on that level.

Normal Processor operation is stopped when setting mode is entered.
The parameters that are accessible on any individual unit will vary depending on the output board installed.

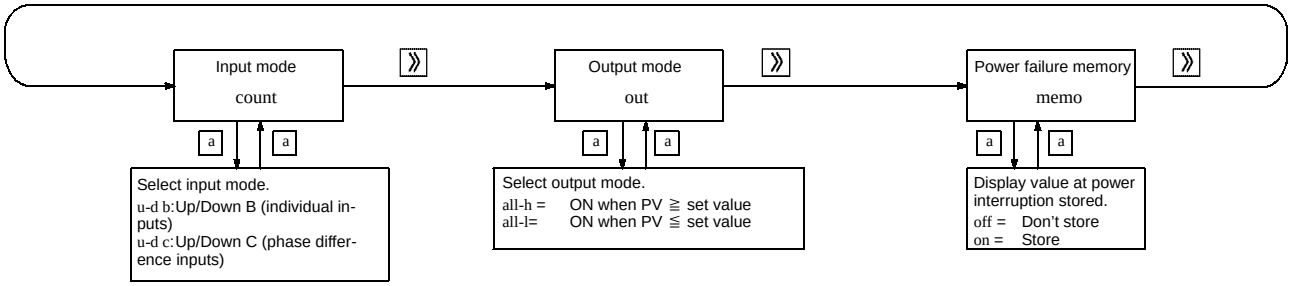
Setting Level 1



Setting Level 2



Setting Level 3



■ Parameters

Setting Level 1

cset 1 to 4

Set values for each bank can be set with the Up and Shift Keys.
Setting range: -9999 to 99999.
Factory settings: 00000.

ps-bk

Enable or disable prescale bank with Up Key.
on: Bank enabled; off: Bank disabled (fixed prescale value used)
Factory settings: off

pscl

The prescale value ($X \times 10^Y$; X = mantissa, y = exponent) used when the prescale bank is disabled is set with the Up and Shift Keys.
Setting range: X = 0.0001 to 9.9999; Y = -9 to 09 (10^{-9} to 10^9). The decimal point can also be set.
Factory settings: X = 1.0000, Y= 00 (1.0000×10^0);
Decimal: %%%%% (no decimal)

pscl 1 to 4

Prescale values for each bank can be set with the Up and Shift Keys after setting the enabled prescale bank parameter. Prescale bank 1 corresponds to set value bank 1, Prescale bank 2 corresponds to set value bank 2, etc.

compn

Compensation values can be set with Up and Shift Keys.
Setting range: -9999 to 99999
Factory settings: 00000
Compensation input effective condition can be selected with the Up Key.
all = Effective during incrementing and decrementing a count.
plus = Effective only during incrementing a count.
(The present value will be forcibly reset to the compensation value that has been preset between -9999 to 99999 when a compensation input is ON.)
Factory settings: all

lset (Linear Output Models only)

A linear output range can be set as required. A display value corresponding to the L_H maximum output value (20 mA or 5 V) and that corresponding to the L_L minimum output value (4 mA or 1 V) can be set with the Up and Shift Keys.
Setting range: -9999 to 99999
Factory settings: L_H = 99999; L_L = 00000

prot

The set value protect can be ON or OFF with the Up Key when the K3TC is in the RUN mode.
on: Enabled; off: Disabled
Factory settings: off

Note: cset 1 to 4 and pscl 1 to 4 correspond to banks 1 to 4.

Setting Level 2

in

The sensor type is set with the Up Key. No-contact NO = 00; No-contact NC = 01; Contact NO = 10; and Contact NC = 11
Factory settings: 00

In the case of contact input, proper measurement may not be possible unless 10 or 11 selected.

disp

The display refresh period is set among six levels with the Up Key.
Settings: fast = Approx. 60 ms; 1 = 1 s; 2 = 2 s; 4 = 4 s; 8 = 8 s; 16 = 16 s
Factory settings: fast

u-no (Communication Output type only)

A unit number, an identification number by which the host computer identifies each K3TC Intelligent Signal Processor, can be selected with Up and Shift Keys.
Setting range: 00 to 99
Factory settings: 00

bps (Communication Output type only)

A baud rate up to 19,200 bps can be selected with the Up Key.
Settings: 150 to 19200
Factory settings: 9600

Setting Level 3

count

The input mode can be set with the Up Key.
u-d b = Up/Down B (individual inputs)
u-d c = Up/Down C (phase difference inputs)
Factory settings: u-d c

out

The output mode can be set with the Up Key.
all-h: The output is ON when the present value is the same as or larger than the set value.
all-l: The output is ON when the present value is the same as or smaller than the set value.
Factory settings: all-h

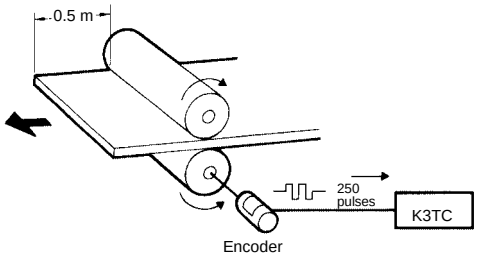
memo

The display value when the power is interrupted is stored in memory.
on: Stored; off: Not stored
Factory settings: off

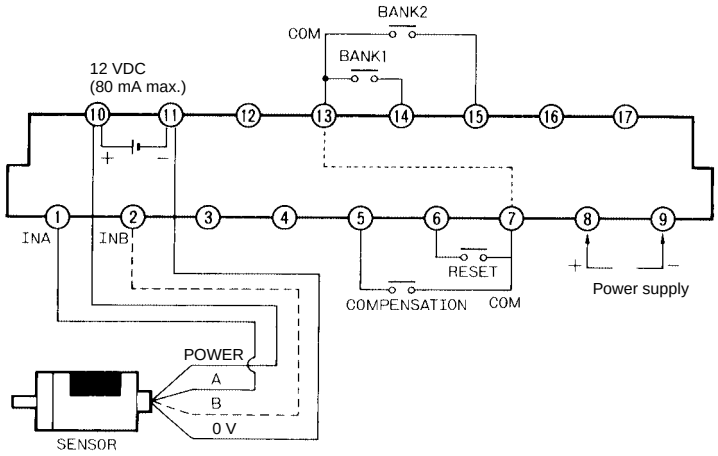
Prescaling

The prescale function makes it possible to convert the counting value of the K3TC into an appropriate value.
For example, the system shown in the illustration outputs 250 pulses when the object is advanced 0.5 m. To enable the K3TC to display j j j j . j (mm), obtain the advanced length of the object per pulse from the following formula.
500 mm (0.5 m)/250 = 2

1. The prescale value is set by the mantissa X multiplied by the exponent Y as follows:
   Prescale value = 2.0000×10^{0}
   X = 2.000, Y = 00
2. Set the decimal point to the left of the rightmost digit.



■ Input Board



Note: Terminals 7 and 13 are insulated from each other.

INA/INB	Counts input signals. Accepts Up/Down (individual or phase difference) inputs.
RESET	Resets the present value to zero. No counting inputs are accepted when a RESET input is ON. RESET is lit when a reset input is ON. **Note:** External reset minimum signal width: 16 ms
COMPENSATION	Resets the present counting value to the compensation value at the rising edge of a compensation input. In the compensation value setting parameter, it is possible to set to “Effective during incrementing and decrementing a count” or to “Effective only during incrementing a count.” **Note:** External compensation input minimum signal width: 16 ms
BANK 1, 2	Selects one of the four banks.

Bank no.	Control input	
	Bank 1	Bank 2
1	OFF	OFF
2	ON	OFF
3	OFF	ON
4	ON	ON

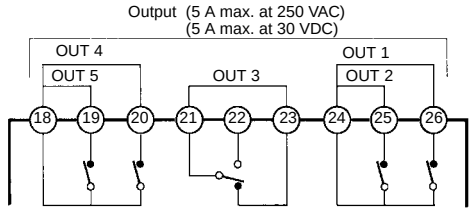
Note: Bank switching minimum signal width: 100 ms max.

Connectable Non-voltage Sensor Input Signal Levels

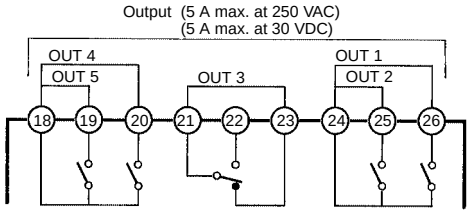
Transistor inputs:
ON: Residual voltage must be 3 V max.
OFF: Leakage current must be 1.5 mA max.
The switching capacity must be 20 mA or greater.

■ Output Board

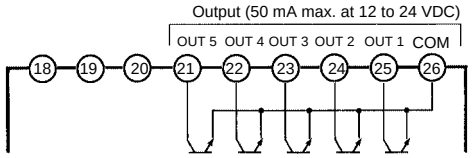
K31-C5: Relay (5 Outputs)



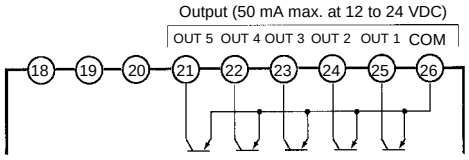
K31-C2: Relay (5 Outputs)



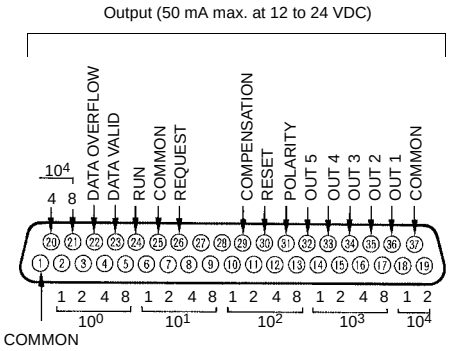
K31-T1: Transistor (NPN Open Collector)



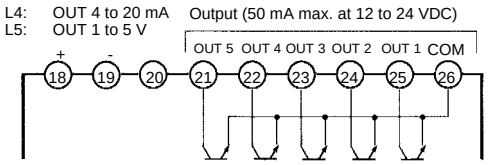
K31-T2: Transistor (PNP Open Collector)



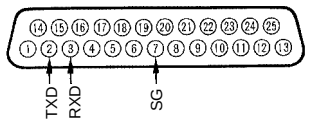
K31-B4: BCD + Transistor (NPN Open Collector)



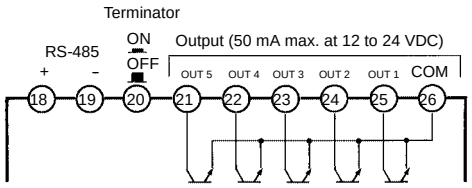
K31-L4, -L5: Linear + Transistor (NPN Open Collector)



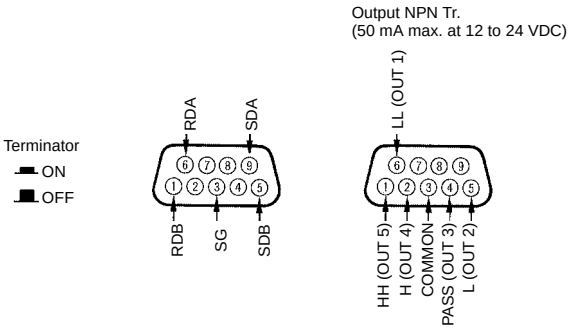
K31-S1: RS-232C



K31-S5: RS-485 + Transistor (NPN Open Collector)

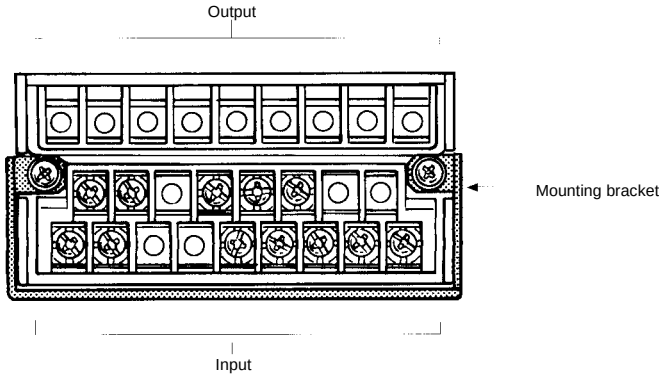


K31-S6: RS-422 + Transistor (NPN Open Collector)



- D 37P Connectors for BCD output type (attachment)
  Plug: XM2A-3701
  Hood: XM2S-3711
- D 25P connectors for RS-232C type (order separately)
  Plug: XM2A-2501
  Hood: XM2S-2511
- D 9P connectors for RS-422 type (order separately)
  Plug: XM2A-0901
  Hood: XM2S-0911

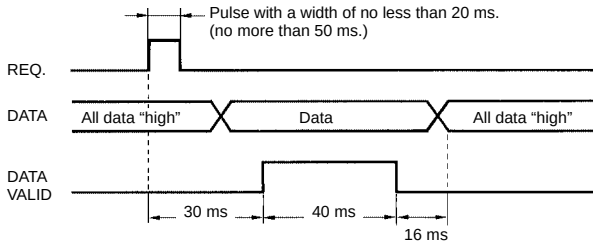
■ Terminal Arrangement



■ BCD Output Timing Chart

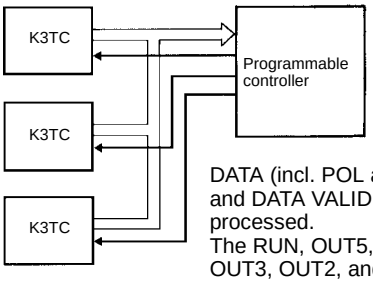
A request signal from an external device (such as a PC) is required to read BCD data.

Single Sampling Data Output

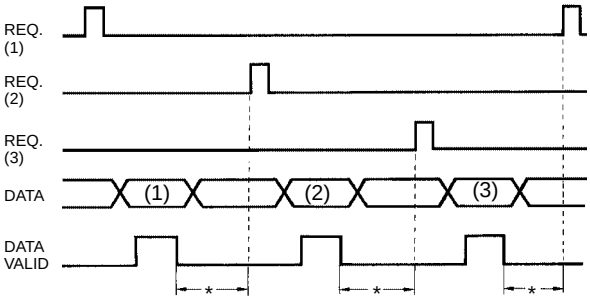


Approximately 30 ms after the REQ signal rises, a sample is taken and the DATA VALID signal is output. Read the data when the DATA VALID signal is ON.
The DATA VALID signal will turn OFF in 40 ms, and then in 16 ms, the data will go OFF.

Models with a BCD output have an open collector output configuration so that wired-OR connection is possible.

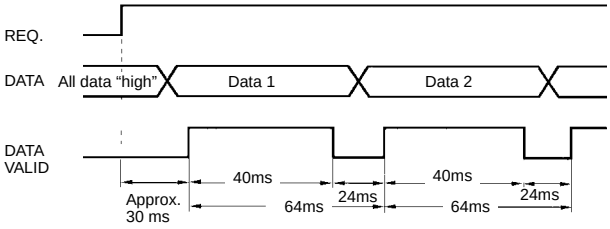


DATA (incl. POL and OVER) and DATA VALID are wired-OR processed.
The RUN, OUT5, OUT4, OUT3, OUT2, and OUT1 signals are always output regardless of the status of the REQ signal. Do not OR-wire these signals.



*The period between the DATA VALID signal and the REQ signal should be no less than 20 ms max..

Continuous Data Output



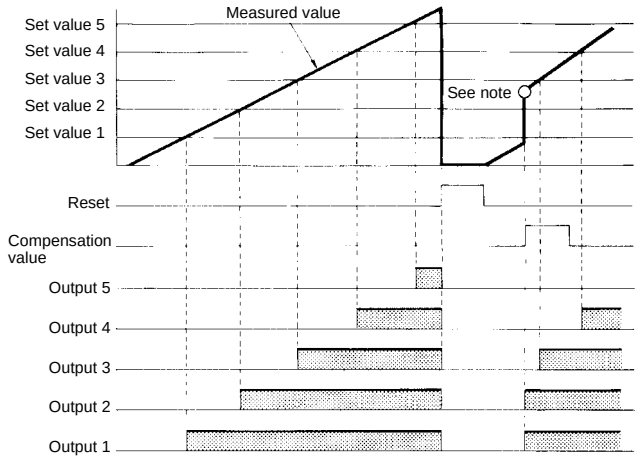
The K3TC outputs each measurement at an interval of 64 ms when a REQ signal is ON continuously.

■ Output Operation Timing in RUN Mode (Relay and Transistor Outputs)

The K3TC can output the results of Up/Down counting as comparative outputs.
The output mode can be set to the ALL−H mode or the ALL−L mode.

ALL-H

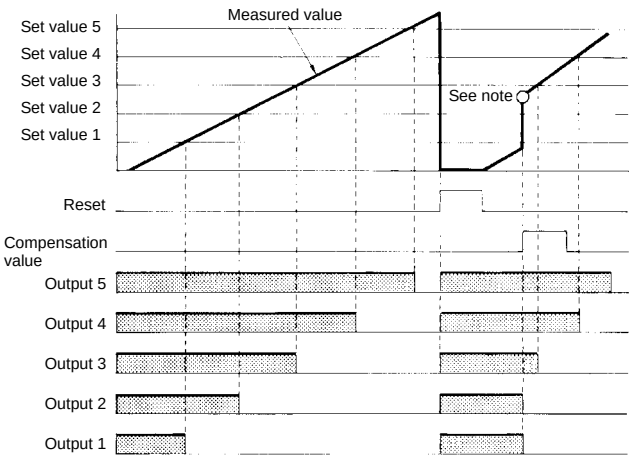
If the ALL-H output mode is selected, outputs 1 to 5 will be ON when the measured value exceeds set values 1 to 5.



Note: Set value 2 < compensation value < set value 3

ALL-L

If the ALL-L output mode is selected, outputs 1 to 5 will be ON when the measured value is less than set values 1 to 5.



Note: Set value 2 < compensation value < set value 3

While the reset signal is ON, the counting value will return to zero.

When the compensation signal is ON, the K3TC will be in counting operation starting with the preset compensation value. By selecting plus in compensation value parameter, the compensation value will be effective only for the adding operation.

■ Self-diagnosis Functions

The following table shows possible errors during the K3TC operation and the corrective actions to be taken.

Item	Condition	Error message	Output status				Corrective action
			Comparative outputs	BCD output	Linear output	Communications	
Device failure	Memory data error, EEPROM error	error	OFF	OFF (All outputs are H.)	OFF (Minimum value)	OFF (An error response will be returned.)	Turn the power OFF and then ON again once. If the error persists, repairs are necessary.
	Corrupted data	err-s	OFF	OFF (All outputs are H.)	OFF (Minimum value)	OFF (An error response will be returned.)	Turn the power OFF and then ON again once. If the error persists, press the Display Key and set all parameters again.
Overflow, underflow	Input value or display value outside range	: : : : : Blinks	Continues	Continues OVER ON	Continues	Continues OVER ON	Keep the input value and display value within the range.
Output type change	When output type has changed.	chg-o	OFF	OFF (All outputs are H.)	OFF (Minimum value)	OFF (An error response will be returned.)	Check the output board. If correct, press the Display Key. At this time, the parameters are initialized; therefore, set the parameters again.
Output type error	Output type other than specified	err-o	OFF	OFF (All outputs are H.)	OFF (Minimum value)	OFF (An error response will be returned.)	Turn the power OFF and then ON again once. If the error persists, repairs are necessary.

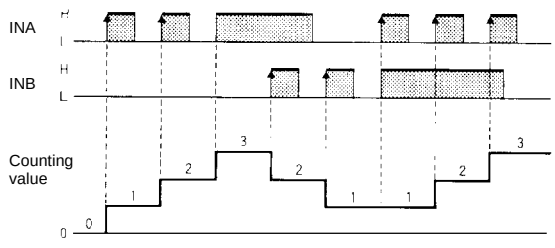
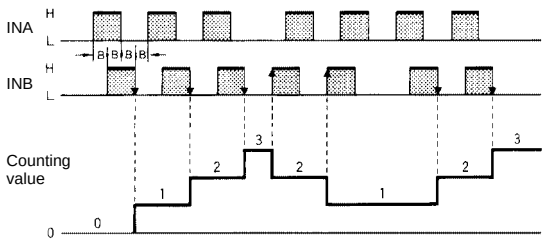
■ Output Delay (Reference Value)

The following table shows the time required for a K3TC in a system to go into reverse output operation after the counting value reaches the value preset with the K3TC, and is due to the output processing time of the K3TC, signal transmission time of the system, and the relay connected to the K3TC.

Control I/O	Output or response delay time
Relay contact output	3.0 to 10.0 ms
NPN/PNP transistor output	0.1 to 0.6 ms
Reset input	12.0 to 16.0 ms
Compensation input	12.0 to 16.0 ms
Bank switch	60.0 to 100.0 ms

Note: Output delay time varies with the operating environment. If the output delay time will possibly have a serious influence on your system, check the actual output delay time before applying the K3TC to the system.

■ Input Mode and Counting Values

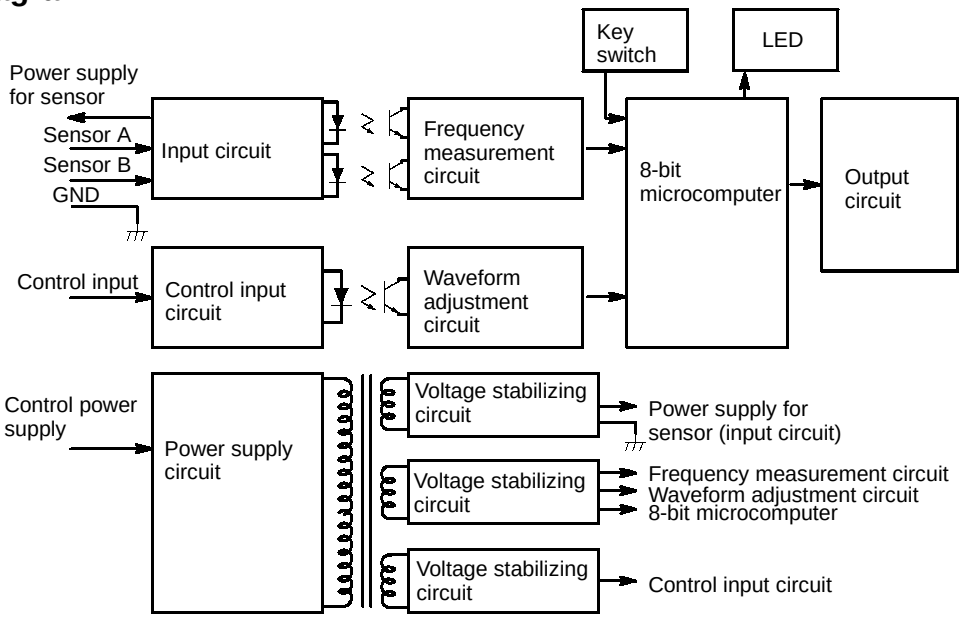
u-d b **: Up/Down B individual input**	u-d c **: Up/Down C phase difference input**
	

Note: 1. "B" must be larger than half the minimum signal width. If it is smaller, an error of ±1 count may occur.

2. Refer to the following for the meanings of the H and L characters in the above timing charts.

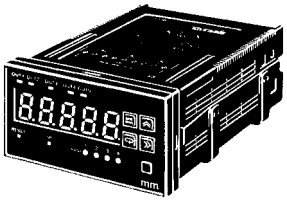
Signal	No-voltage input
H	Short-circuit
L	Open

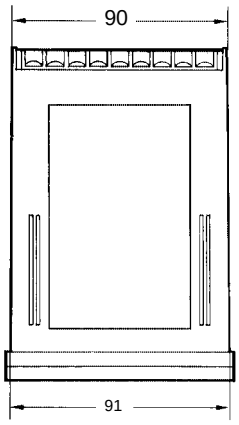
■ Block Diagram

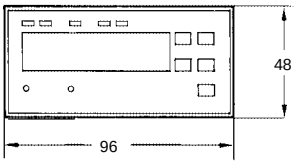


Dimensions

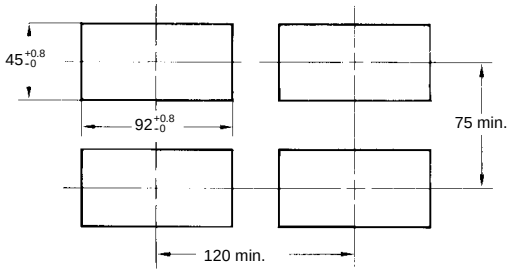
Note: All units are in millimeters unless otherwise indicated.



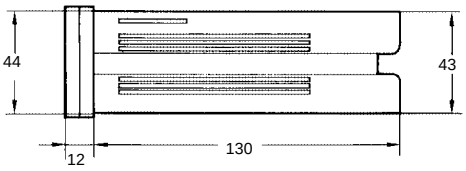




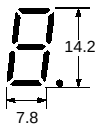
Panel Cutouts



Note: The above values are recommended values. Be careful not to mount the Processors too close to each other, i.e., not at any distance smaller than the recommended values.

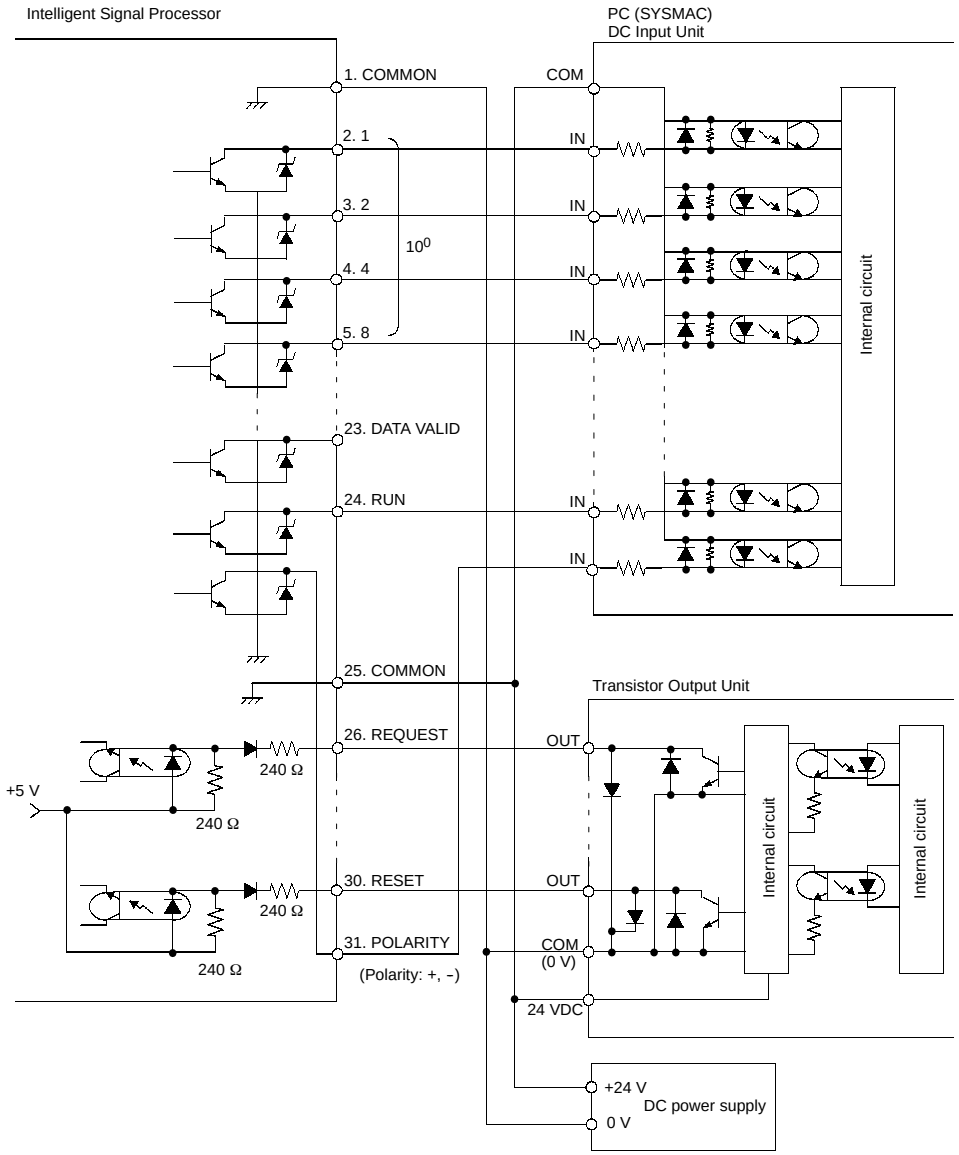


PV Display



Installation

■ Example of Connection to PC



■ Applicable Sensors

The following list provides some typical examples of connectable OMRON Sensors. For further details, please refer to the OMRON Sensor catalog.

Photoelectric Sensors

D: Directly connectable to up to two inputs.
S: Directly connectable to one input, but a separate power supply is necessary for two inputs.
C: Connectable, but a separate power supply is needed.
N: Not connectable.

Classification		Model	NPN inputs K3TC-NB1 j j - j j	PNP inputs K3TC-PB1 j j - j j
3-wire DC	NPN	E3X-A/F/VG/H	D	N
		E3S-A/B		
		E3S-CL		
		E3S-LS j C4		
		E3S-LS3C1D		
		E3S-GS/VS		
		E3S-R		
		E3HQ		
		E3HF/HS/HT/HC		
		E3V (see note)		
		E3S-C (see note)		
		E3R (see note)		
		E3L (see note)		
		E3S-X3 (see note)		
		E3X-NT	S	
		E3X-NV/NVG		
		E3C-GE4		
		E3C-WE4		
		E3C-WH4F		
		E3C-JC4P		
		E3S-5E4S-45		
		E3X-NM	N	
	PNP	E3X-A/F	N	D
		E3X-NM/NT		
		E3S-A/B		
		E3S-CL		
		E3S-LS5B4/LS20B4		
		E3S-C (see note)		
		E3V3 (see note)		

Note: A separate power supply is required for two inputs depending on the model.

Proximity Sensors

D: Directly connectable to up to two inputs.
S: Directly connectable to one input, but a separate power supply is necessary for two inputs.
C: Connectable, but a separate power supply is needed.
N: Not connectable.

Classification		Model	NPN inputs K3TC-NB1 j j - j j	PNP inputs K3TC-PB1 j j - j j
3-wire DC	NPN	E2E-X j E(-P)	D	N
		E2E- j C		
		E2C-GE4		
		E2C-WH4A		
		E2C-JC4A	S	
		E2C-AM4A		
		E2EC	D	
		TL-G3D-3		
		TL-W5E		
		TL-W j MC		
		TL-N j E		
		E2K-F j C		
		E2K-X j E		
		E2EV		
	PNP	E2E- j B	N	D
		E2E-X j F		
		E2F-X j F		
		TL-W j F		
	Amplifier	E2C-GF4	D	D
		E2C-WH4A		
		E2C-AM4A	S	S
2-wire DC	NPN	E2E-XD	N	D
		E2EC-D		

Rotary Encoder (Incremental Type)

D: Directly connectable to up to two inputs.
S: Directly connectable to one input, but a separate power supply is necessary for two inputs.
C: Connectable, but a separate power supply is needed.
N: Not connectable.

Classification		Model	NPN inputs K3TC-NB1 j j - j j	PNP inputs K3TC-PB1 j j - j j
3-wire DC	NPN	E6H-CWZ1C	C	N
		E6H-CWZ1E		
		E6H-CWZ2C		
		E6A2-CS3C	D	
		E6A2-CW3C		
		E6A2-CWZ3C		
		E6A2-CS5C		
		E6A2-CW5C		
		E6A2-CS3E		
		E6A2-CW3E		
		E6A2-CWZ3E	S	
		E6B2-CWZ6C		
		E6B2-CWZ3E	C	
		E6C-CWZ5C	S	
		E6C-CWZ3E		
		E6D-CWZ2C	C	
		E6D-CWZ1E		

Precautions

⚠ WARNING

Be careful not to touch any terminals, otherwise you may receive an electric shock.

Please do not disassemble the product nor touch the internal components of the product, otherwise you may receive an electric shock.

⚠ Caution

Operating Environment

Use the K3TC within the operating ambient temperature, operating ambient humidity, and storage temperature ranges specified for the K3TC.

Make sure to use the K3TC without ignoring the vibration resistance, shock resistance, or enclosure ratings specified for the K3TC.

Never use the Processor in locations where corrosive gas (particularly sulfureted or ammonia gas) is generated.

Separate the K3TC from machines generating strong high-frequency noise, such as high-frequency welding machines and high-frequency sewing machines.

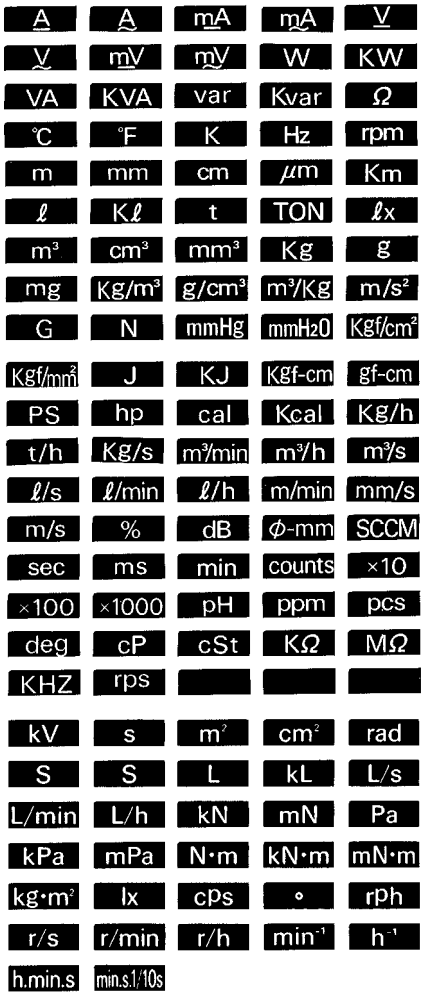
Operation

A K3TC model with a relay contact or transistor output board may not output any alarm signal normally if the model has an error. It is recommended that an independent alarm device be connected to the model.

The parameters are factory-set so that the K3TC will operate normally. The settings of the parameters may be changed according to the application.

Unit Label (Attached)

No product is shipped with the unit attached. Select a unit label from the sheet provided, and attach it to the product.

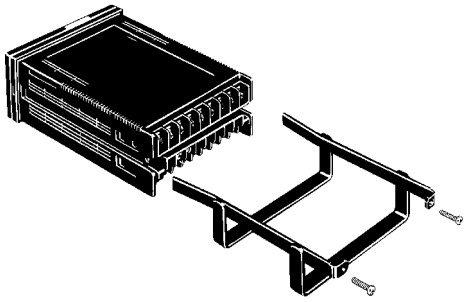


Mounting

Recommended panel thickness is 1 to 3.2 mm.

Mount the Processor by attaching the mounting bracket supplied as an accessory from the rear of the Unit. Turn each mounting screw clockwise and tighten it to a torque of about 5 kgf S cm (0.49 N S m).

Always attach the Mounting Bracket before wiring the terminals. Also, always remove the wiring from the terminals before removing the Mounting Bracket.



Mount the Processor as horizontally as possible.

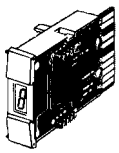
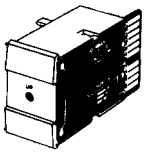
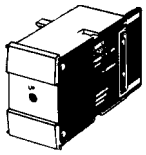
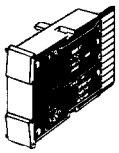
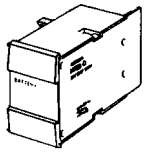
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N83-E1-1A

Choice of Functional Modules for an Arbitrary Counter System Configuration

- Compact (same size as thumbwheel switch modules)
- Capability to both read in and read out BCD data
- Building-block type modules permit easy assembly of a counter system with up to eight digits plus inputs and outputs
- Simple multi-stage preset/totalizing counter configuration up to eight stages
- Number system selectable (6, 24, 60, any other base may be used)
- Initial set mode to allow counting from an arbitrary value

Ordering Information

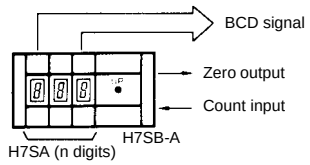
Model	Function
Counter Unit **H7SA** 	• Serves as a single-digit element of a multi-digit Counter. • Reads in and out BCD data. • Displays a digit by backlighted LCD. • May be combined with up to seven other Counter elements to form an 8-digit Counter (maximum). • Specifies a selectable number system.
Input-Output Unit **H7SB-A** 	• Specifies the input-output mode of the Counter. • Specifies the counting speed of the Counter. • Selects either Initial Set or Preset mode. • Communicates with up to eight H7SA Counters. • Generates output when the count value of the Counter coincides with the preset value. • Provides open collector output for loads.
Preset Output Unit **H7SB-B** 	• Generates coincidence output in multistage Counter system configuration. • Communicates with up to eight decimal-coded thumbwheel switch modules. • Provides open collector output for loads.
Fan-out Unit **H7SB-C** 	• Amplifies signals from the H7SA Counters. • Converts BCD signals into decimal or BCD/BCD (Signal Distributor) (real/complementary code) data. • Distributes signals to respective stages in multistage Counter system configuration.
Battery Unit **H7SB-D** 	• Serves for battery backup to retain the contents of memory (i.e. count data) in the event of a power failure. • The life expectancy of the battery is five years at 20°C with the 8-digit model of model H7SA.

■ Accessories (Order Separately)

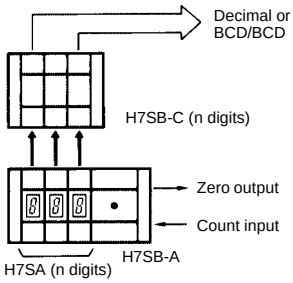
Card-edge Connector	P7S-22P
End Caps (pair)	A7P-M

■ Combination Examples

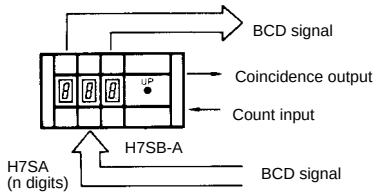
Read-out Counter (A)



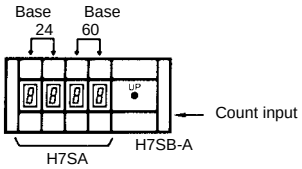
Read-out Counter (B)



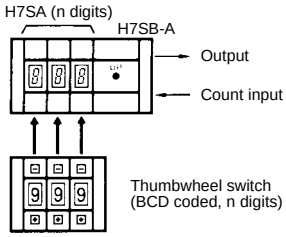
Read-in/Read-out Counter



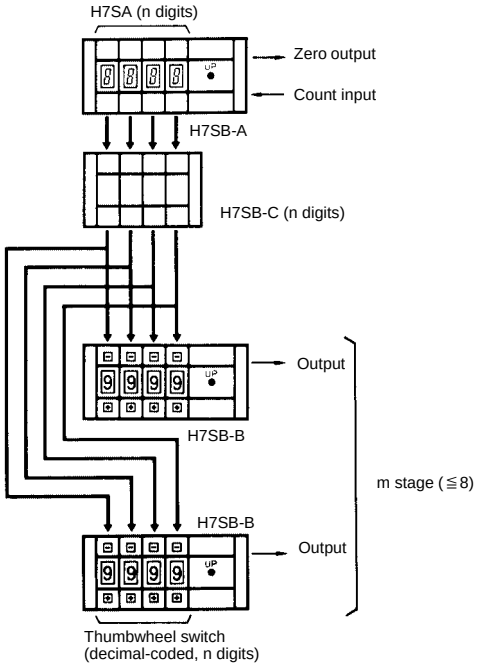
Counter with Selectable Number System



Preset Counter



Multistage Counter



Specifications

■ Ratings

Supply voltage	5 VDC ±10% (contains 10% ripple)
Power consumption	H7SA: 75 mW per Unit H7SB-A: 75 mW per Unit H7SB-B: 75 mW per Unit H7SB-C: 50 mW per Unit
Max. counting speed	30 cps/1,000 cps (wire-selectable)
Count input	No voltage input Short-circuit impedance: 1 kΩ max. Short-circuit residual voltage: 1.0 V max. (current flow through count input terminal when shorted: 0.5 mA) Open-circuit impedance: 100 kΩ min. Voltage input: HIGH level: 4 to 30 V LOW level: 0 to 2 V (Input resistance: 27 kΩ)
Reset system	External reset (reset signal time: 0.02 s)
Control output	Open collector: 30 VDC max., 100 mA max., ON residual voltage: 0.5 V max.
BCD input (to H7SA)	Short-circuit impedance: 1 kΩ max. Short-circuit residual voltage: 1.0 V max. (breakdown voltage: 5 V) Open-circuit impedance: 100 kΩ min.
BCD output (from H7SA)	Open drain: 5 V 1 mA (breakdown voltage: 5 V)
Decimal or BCD/BCD output (from H7SB-C) (see note)	Open collector: 30 VDC 20 mA, ON residual voltage: 0.5 V max.

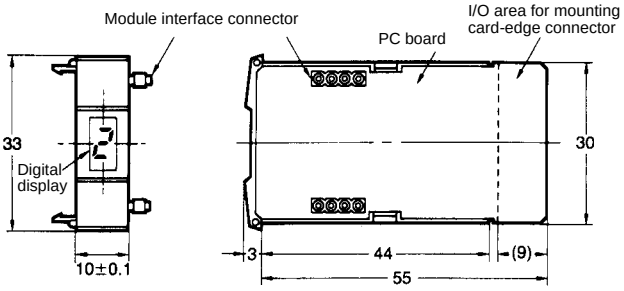
Note: BCD: BCD complementary code

■ Characteristics

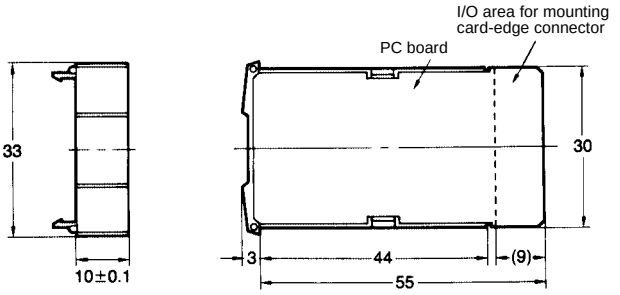
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	1,000 VAC 50/60 Hz for 1 minute
Vibration resistance	Destruction: 10 to 55 Hz; 0.75 mm double amplitude Malfunction: 10 to 55 Hz; 0.3 mm double amplitude
Shock resistance	Destruction: 300 m/s^2 (approx. 30 G) Malfunction: 100 m/s^2 (approx. 10 G)
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)
Ambient humidity	35% to 85%

Dimensions

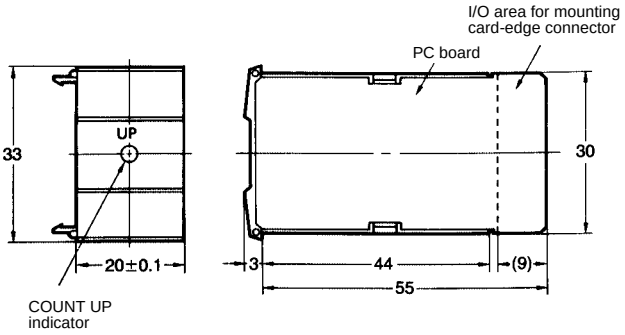
H7SA



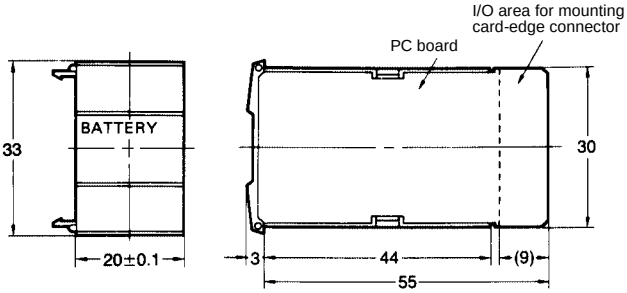
H7SB-C



H7SB-A/B

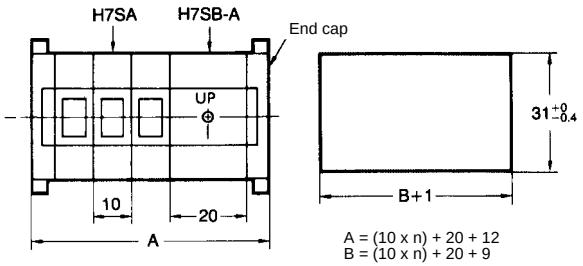


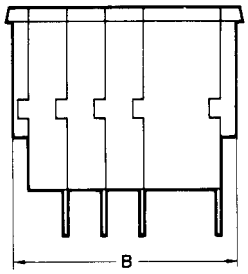
H7SB-D



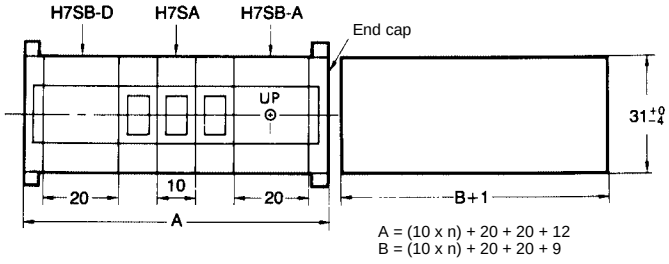
Panel Cutouts for Flush Mounting

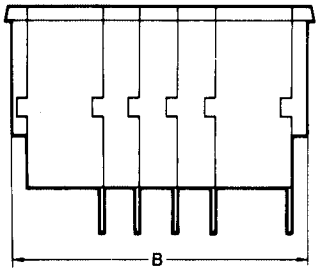
When Multiple H7SAs (n Digits) are Combined with One H7SB-A



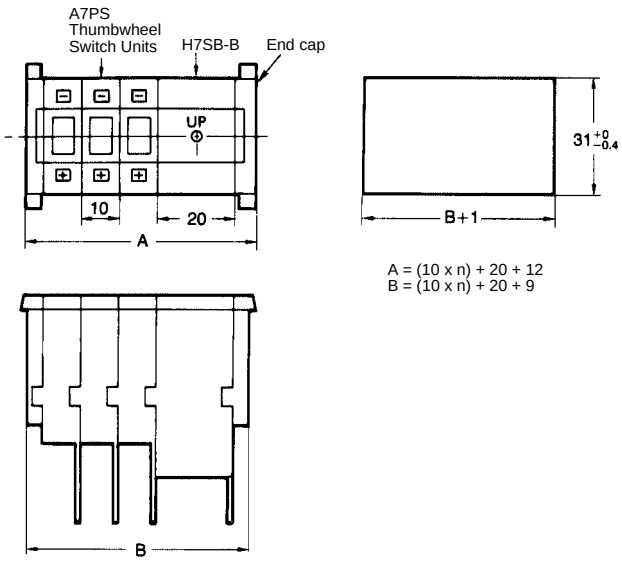


When Multiple H7SAs (n Digits) are Combined with One H7SB-A and One H7SB-D



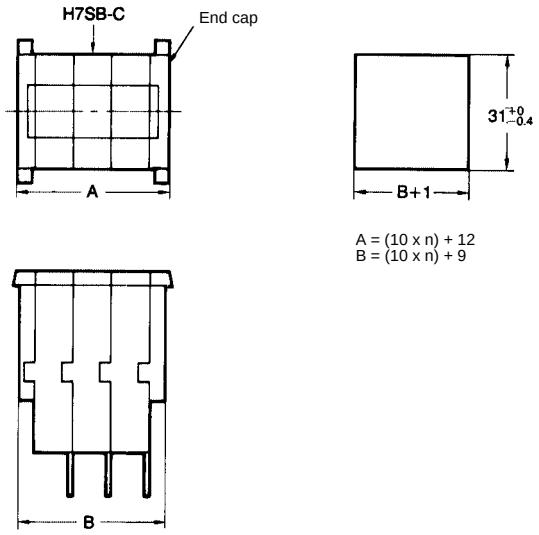


When Multiple A7PSs (n Digits) are Combined with One H7SB-B in Multistage Counter Configuration



A = (10 x n) + 20 + 12
B = (10 x n) + 20 + 9

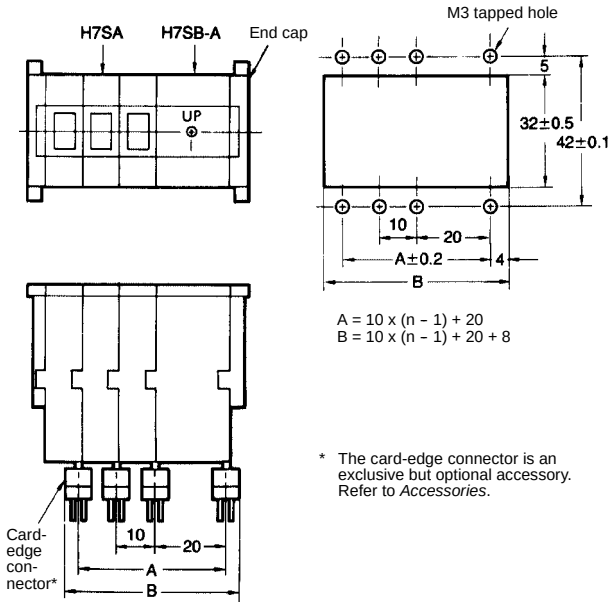
When Multiple H7SB-Cs (n Digits) are Used



A = (10 x n) + 12
B = (10 x n) + 9

Connector Mounting Holes for Front Mounting

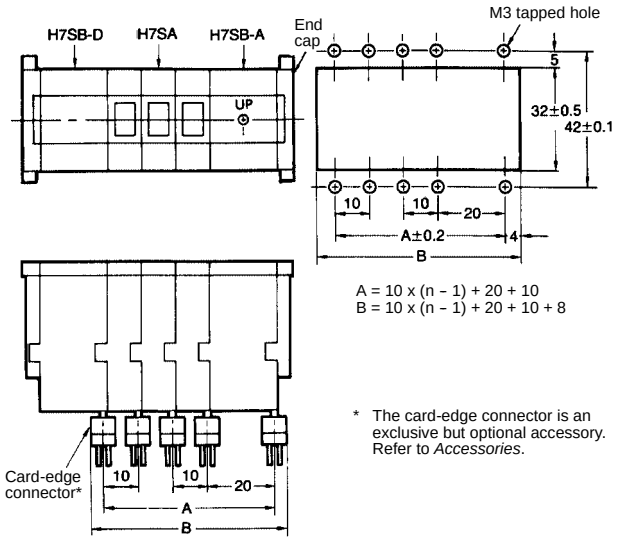
When Multiple H7SAs (n Digits) are Combined with One H7SB-A



A = 10 x (n – 1) + 20
B = 10 x (n – 1) + 20 + 8

* The card-edge connector is an exclusive but optional accessory. Refer to *Accessories*.

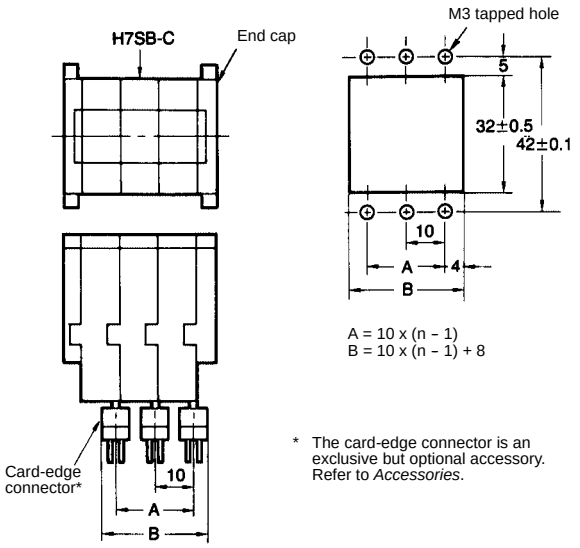
When Multiple H7SAs (n Digits) are Combined with One H7SB-A and One H7SB-D



A = 10 x (n – 1) + 20 + 10
B = 10 x (n – 1) + 20 + 10 + 8

* The card-edge connector is an exclusive but optional accessory. Refer to *Accessories*.

When Multiple H7SB-Cs (n Digits) are Used

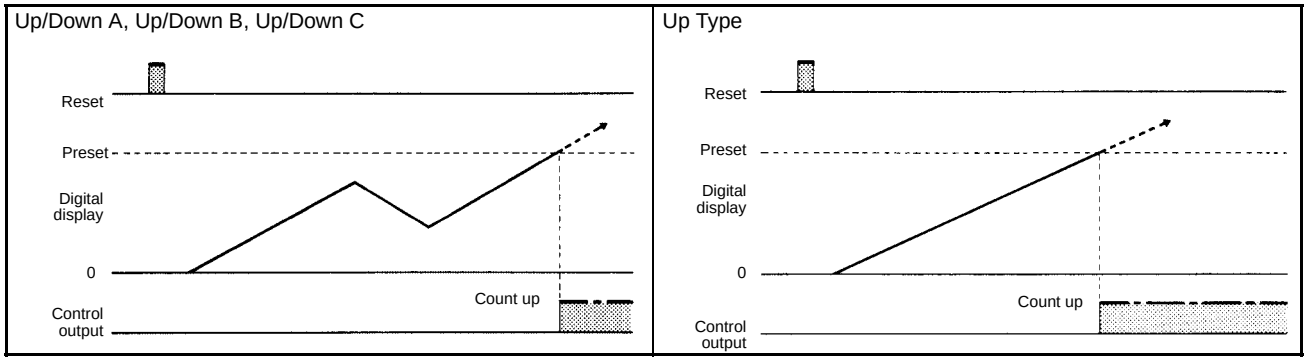


* The card-edge connector is an exclusive but optional accessory. Refer to *Accessories*.

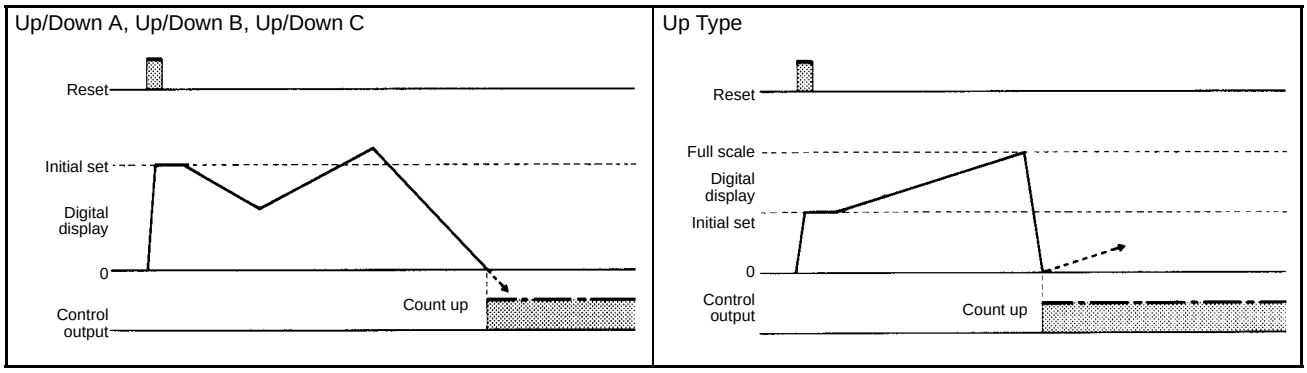
Timing Charts/Operation Modes

Operations (Basic Combination of H7SA with H7SB-A)

Preset Mode



Initial Set Mode



Input Mode

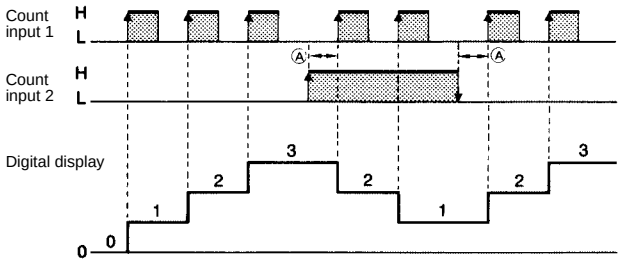
Note: 1. No-voltage input type
H: 1 kΩ max. of impedance when the contact turns ON
1 V max. of residual voltage when the contact turns ON
L: 100 kΩ min. of impedance when the contact turns OFF
Voltage input type
H: Input signal voltage +4 to +30 V
L: Input signal voltage 0 to 2 V

2. Up/Down A Counter (Command input)
The duration of A must be more than the minimum signal width (30 cps: 16.7 ms; 1 kcps: 0.5 ms).

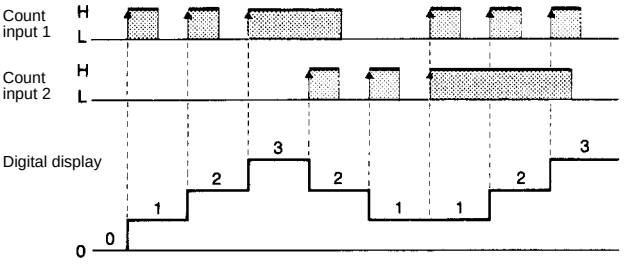
3. Up/Down B Counter (Separate input)
There is no limitation on the phase relationship between Count input 1 and Count input 2.

4. Up/Down C Counter (Phase differential input)
The duration of B must be more than half the minimum signal width. Count input 1 and Count input 2 must be of the same counting speed.

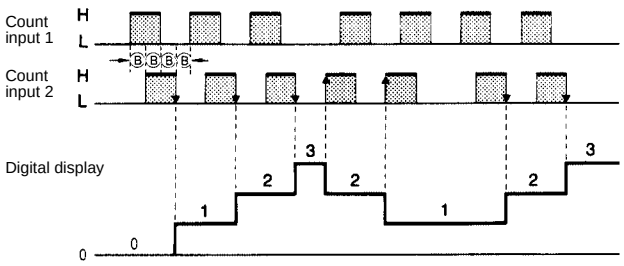
Up/Down A Command Input



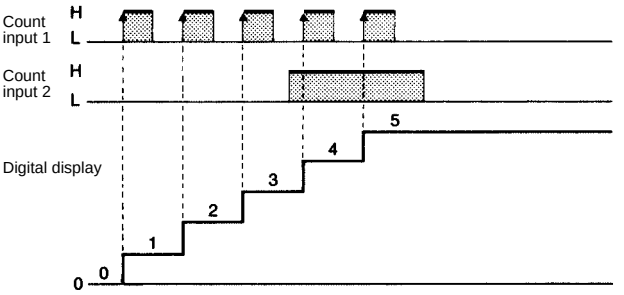
Up/Down B Individual Input



Up/Down C Phase Difference Input



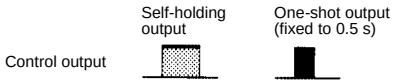
Up Type



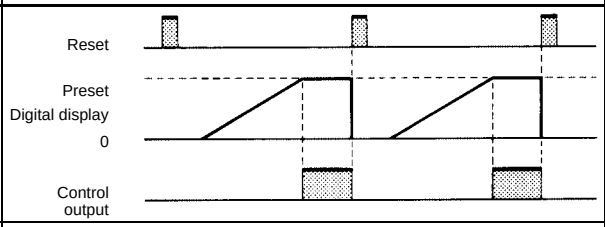
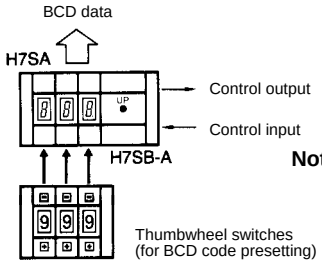
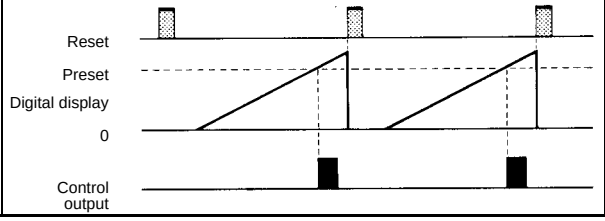
* Gate input is not triggered by Count input 2.

■ Basic Operation Mode (H7SA + H7SB-A)

(Basic Combination of H7S with H7SB-A)

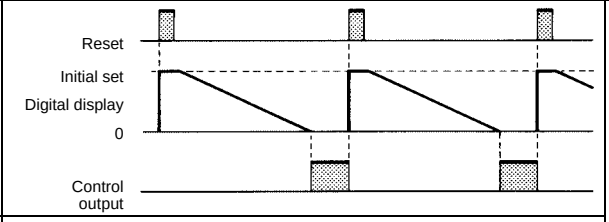
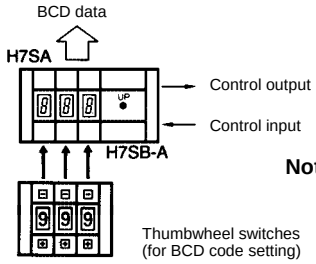
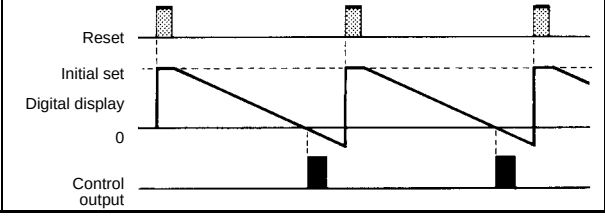


Preset Mode (Up/Down A, B, C, and Up Type)

	Timing chart	Configuration
N		
K		

Note: As soon as the preset value is changed to 0 in N mode, the output is produced.

Initial Set Mode (Up/Down A, B, C)

	Timing chart	Configuration
N		
K		

Note: The initial set value must be other than 0 in N mode.

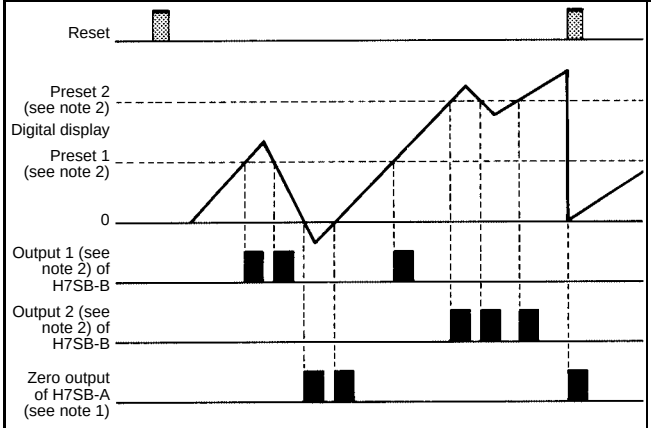
■ Applied Operation Mode (H7SA + H7SB-A + H7SB-C + H7SB-B)

(In the case of multiple stages and digits)
Set the H7SA in K mode.

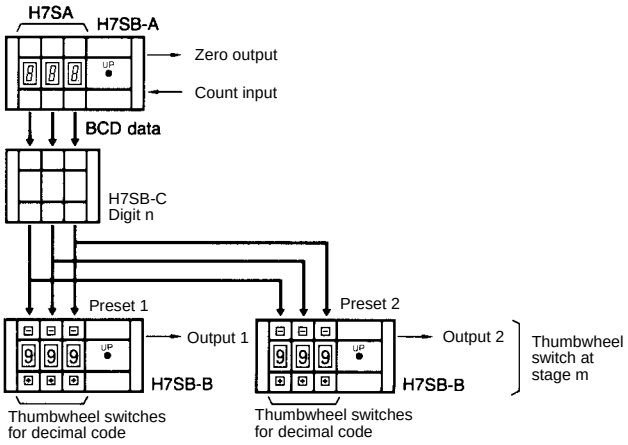
Preset Mode (Up/Down A, B, C)

(See note 1.)

Timing chart



Configuration



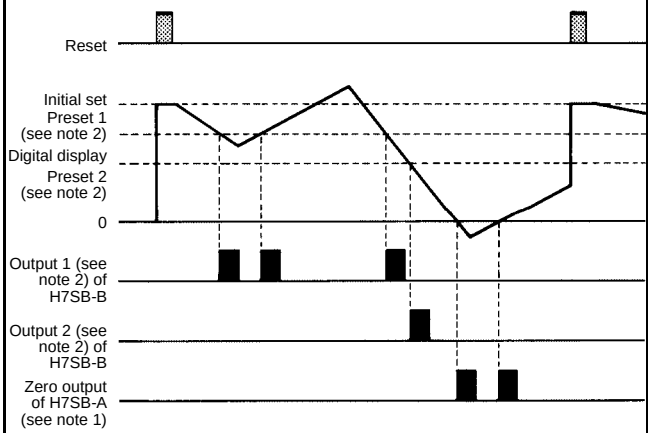
Note: H7SB-C: decimal code mode

Note: 1. The above timing chart applies to the H7SB-A in preset without presetting thumbwheel switches connected.

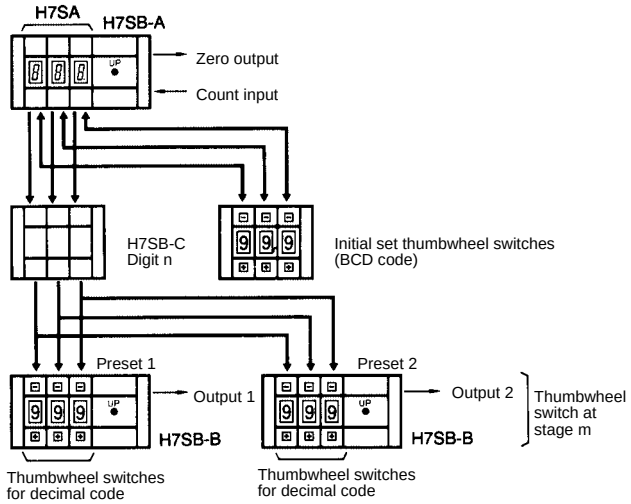
2. "Preset" means a value preset by the thumbwheel switches combined with the H7SB-B. Control outputs 1 and 2 respectively indicate the outputs to be produced by the H7SB-B when present value coincides with presets 1 and 2.

Initial Set Mode (Up/Down A, B, C)

Timing chart



Configuration



Note: H7SB-C: decimal code mode

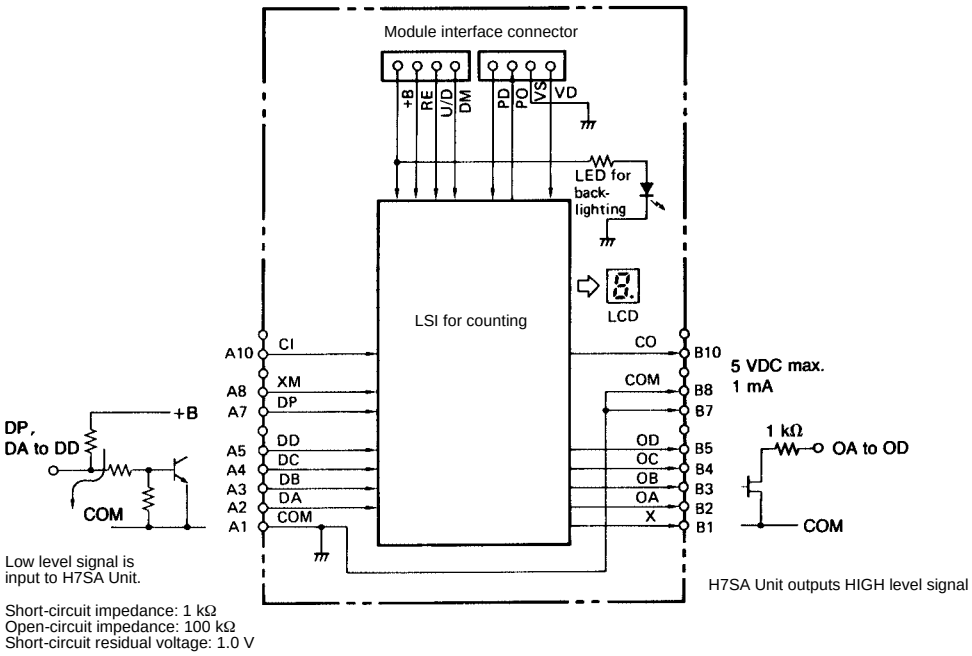
Note: 1. The H7SB-A produces its output when the present count value is 0 in initial set mode.

2. "Preset" means a value preset by the thumbwheel switches combined with the H7SB-B. Control outputs 1 and 2 respectively indicate the outputs to be produced by the H7SB-B when present value coincides with presets 1 and 2.

Functions of I/O Terminals

■ H7SA

Block Diagram



I/O Signals

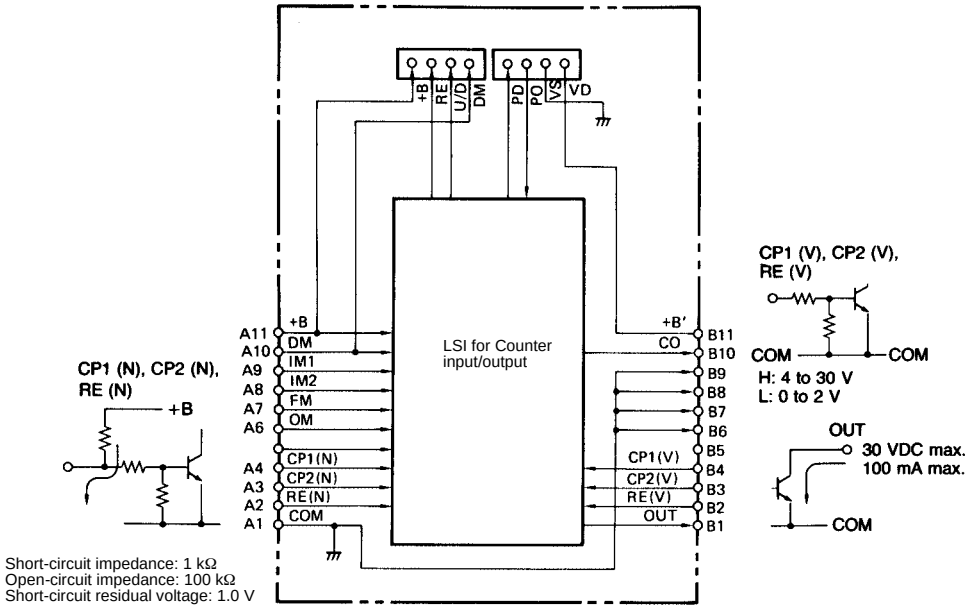
Terminal No.	Signal	Function
A1	COM	0 V terminal
A2	DA	Terminals for BCD data input from external devices such as thumbwheel switch and PC. Each terminal represents the following place value: DA DB DC DD 1 2 4 8
A3	DB	
A4	DC	
A5	DD	
A6	Vacant	---
A7	DP	Terminal for specifying the decimal point lighting on LCD. The decimal point illuminates when this terminal is connected to any of the COM terminals.
A8	XM	Terminal for setting the arbitrary number system function. When this terminal is connected to any of the COM terminals, any number system may be specified.
A9	Vacant	---
A10	CI	Terminal for count pulse input from the low-order digit. (The 1st digit is for pulse input from the H7SB-A.)
A11	Vacant	---
B1	X	Terminal for setting any base when the arbitrary number system function is in effect. This terminal is connected to terminals B2 (OA) through B5 (OD).
B2	OA	Terminals for BCD data output to external devices such as PC and display. Each terminal represents the following place value. OA OB OC OD 1 2 4 8
B3	OB	
B4	OC	
B5	OD	
B6	Vacant	---
B7	COM	0 V terminal
B8	COM	0 V terminal
B9	Vacant	---
B10	CO	Terminal for count pulse output (carry) to the high-order digit.
B11	Vacant	---

Output Status of OA to OD

Count value	OA	OB	OC	OD
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
ON: 0, OFF: 1				

■ H7SB-A

Block Diagram



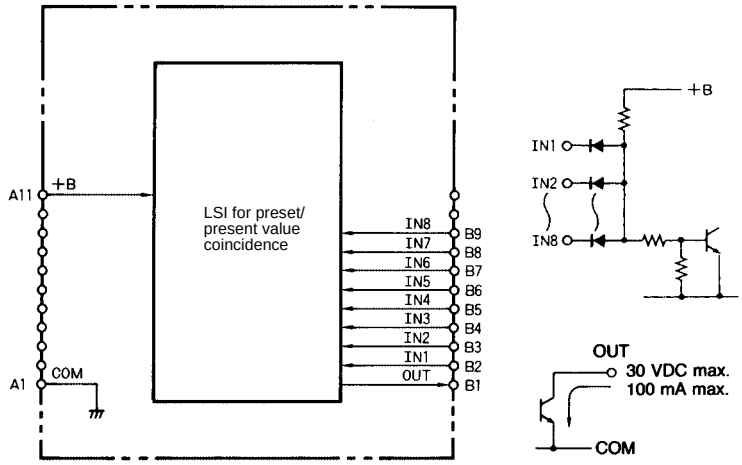
I/O Signals

Terminal No.	Signal	Function
A1	COM	0 V terminal
A2	RE (N)	Reset input terminal (No voltage input: Reset input signal is applied when this terminal is short-circuited or opened.)
A3	CP2 (N)	Count input terminals (No voltage input: CP2 and CP1 are applied when these terminals are short-circuited or opened.)
A4	CP1 (N)	
A5	Vacant	---
A6	OM	Terminal for specifying the operation mode of control output. The operation mode is set to “N” mode when this terminal is connected to any of the COM terminals and to “K” mode when left open.
A7	FM	Terminal for specifying the maximum counting speed of the Counter. The counting speed is set to 30 cps when this terminal is connected to any of the COM terminals and to 1,000 cps when left open.

Terminal No.	Signal	Function
A8	IM2	Terminals for input mode specification. IM1 / IM2 / Mode selected H / H / Up/Down A H / L / Up/Down B L / H / Up/Down C L / L / Up only **Note:** "L" refers to IM1 or IM2 connected to any of the COM terminals, while "H" refers to IM1 or IM2 left open.
A9	IM1	
A10	DM	Terminal for data mode specification. The data mode is set to "Initial Set" mode when this terminal is connected to terminal COM and to "Preset" mode when left open.
A11	+B	Terminal for control power supply application
B1	OUT	Terminal for control output when the count value of H7SA coincides with its preset value with respect to all digits.
B2	RE (V)	Reset input terminal (Voltage input)
B3	CP2 (V)	Count input terminals (Voltage input)
B4	CP1 (V)	
B5	Vacant	---
B6	COM	0 V terminal
B7	COM	0 V terminal
B8	COM	0 V terminal
B9	COM	0 V terminal
B10	CO	Terminal for count pulse output to H7SA
B11	+B'	Power terminal for battery backup

■ H7SB-B

Block Diagram

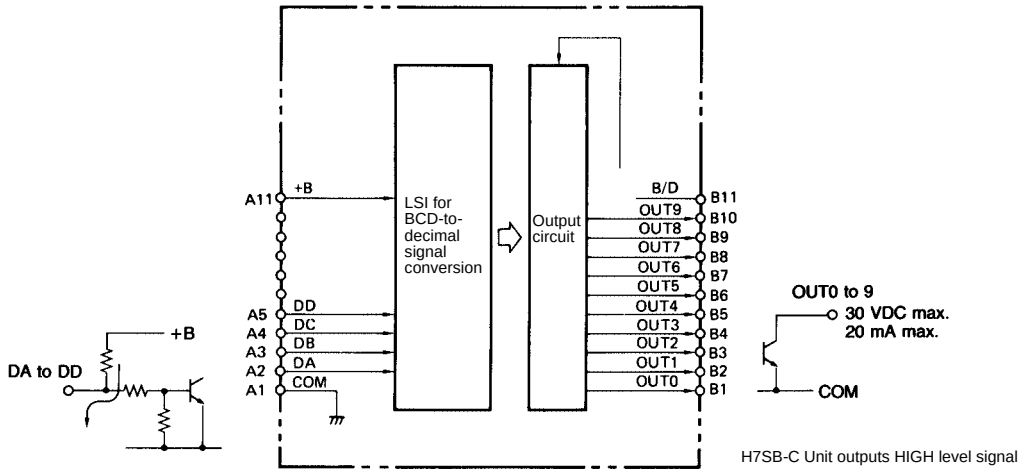


I/O Signals

Terminal No.	Signal	Function
A1	COM	0 V terminal
A11	+B	Terminal for control power supply application
B1	OUT	Terminal for control output when the input value of H7SB-C coincides with its preset value with respect to all digits
B2	IN1	Terminals for coincidence signal input from thumbwheel switches (decimal-coded).
B3	IN2	
B4	IN3	
B5	IN4	
B6	IN5	
B7	IN6	
B8	IN7	
B9	IN8	

■ H7SB-C

Block Diagram



Low level signal is input to H7SB-C.

Short-circuit impedance: 1 kΩ
Open-circuit impedance: 100 kΩ
Short-circuit residual voltage: 1.0 V

H7SB-C Unit outputs HIGH level signal

I/O Signals

Terminal No.	Signal	Function
A1	COM	0 V terminal
A2 A3 A4 A5	DA DB DC DD	Terminals for BDC data input from H7SA. Each terminal represents the following place value: DA/1 DB/2 DC/4 DD/8
A11	+B	Terminal for control power supply application
B1 B2 B3 B4 B5 B6 B7 B8 B9 B10	OUT0 OUT1 OUT2 OUT3 OUT4 OUT5 OUT6 OUT7 OUT8 OUT9	Terminals for decimal or BCD data output as specified by B/D (No. B11).
B11	B/D	Terminal for specifying the contents of data on output terminals. When this terminal is connected to COM, decimal codes are output from OUT0 through OUT9. When left open, BCD codes are output from OUT0 through OUT3 and OUT5 through OUT8.

Signal	Output	
	BCD code	Decimal code
OUT0	$\overline{A}$	0
OUT1	$\overline{B}$	1
OUT2	$\overline{C}$	2
OUT3	$\overline{D}$	3
OUT4	---	4
OUT5	A	5
OUT6	B	6
OUT7	C	7
OUT8	D	8
OUT9	---	9

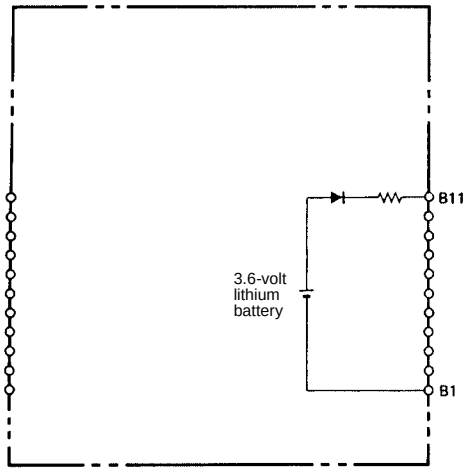
In the above table, A, B, C, and D indicate place values 1, 2, 4, and 8, respectively.
Do not use OUT 4 and 9 when using BCD codes.

Output Status of OUT 0 to 9

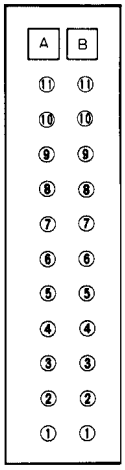
Input				Decimal code										BCD code									
				OUT										OUT									
DA	DB	DC	DD	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0
0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	0	0
1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0
0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	1	0	0	1	0	0
1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0	1	0	0
0	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	1	0	0
1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	1	0	0
0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	1	0
1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	0	1	1
ON: 0, OFF: 1																							

■ H7SB-D

Block Diagram



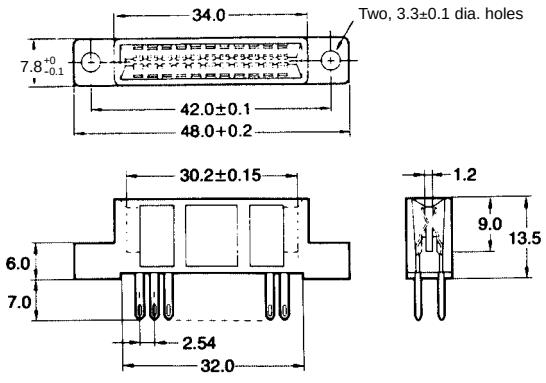
Terminal Arrangement when Connector is Mounted



(REAR VIEW)

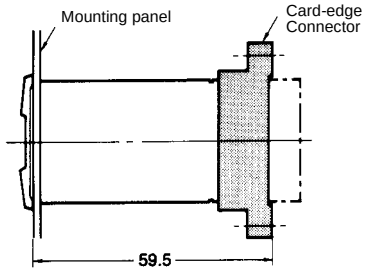
Accessories (Order Separately)

P7S-22P Card-edge Connector

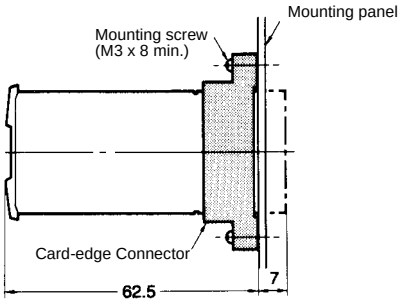


Mounting Height with Connector

Flush Mounting



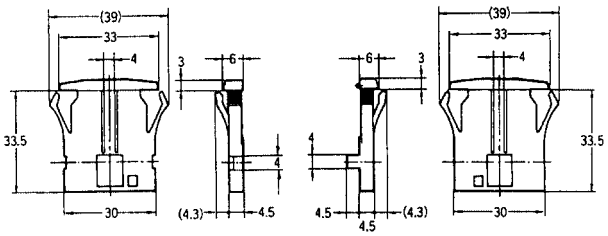
Front Mounting



A7P-M End Caps

End Caps are attached to each end of the assembled Counter system components and are used to secure the Counter system to a mounting panel.

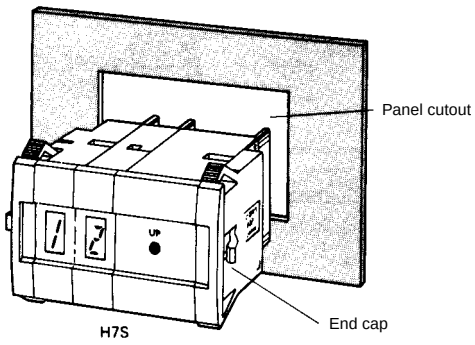
(Left) **(Right)**



Precautions

Flush Mounting

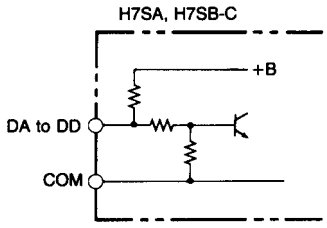
After assembling the component units with end caps at both ends, push the assembly into the panel cutout and make sure that it is secured and flush with the surface of the mounting panel.



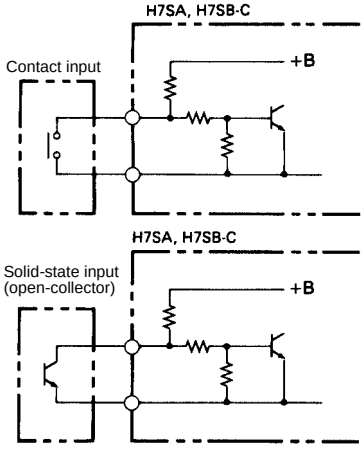
Connections

Data Input Terminals

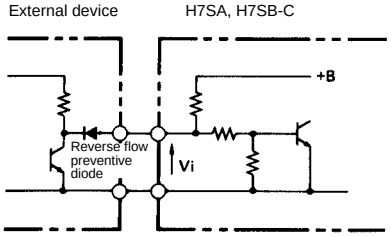
The data input terminal circuits of both the H7SA Counter Unit and H7SB-C Fan-out Unit are as shown below.



(No Voltage Input)
For no voltage input, either of the following methods of connection is recommended for the data input terminals (DA through DD) of both the H7SA and H7SB-C Units.



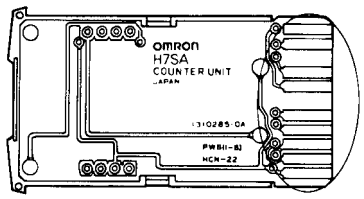
(Voltage Input)
If it is likely that a voltage of 5 V or more will be applied to the data input terminals of the H7SA and H7SB-C Units, be sure to insert a diode as shown in the diagram below.



Note: When the external device is in the ON state, Vi must be 1 V or less.

Card-edge Connector

Each component unit is externally connected through a Card-edge Connector. Leave intact the edge of the PC board except when mounting the Card-edge Connector (P7S-22P) supplied as an exclusive but optional accessory.
Do not solder any leads to the I/O terminals on the board edge.



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

Cat. No. M15-E1-3B

OMRON

Electromagnetic Counter | CSK

Miniature, Electromagnetic Totalizing Counter

- High-speed response (up to 35 cps)
- Locking mechanism for errorless operation
- Unique mechanism eliminates digit displacement during resets
- UL listed model also available (File No. E67871)

R

Ordering Information

Numbering of digits	Mounting method / Terminal / Resetting system / Locking mechanism		Surface mounting		Flush mounting	
			Wire-wrap terminals	Lead wires	Wire-wrap terminals	Lead wires
4 digits	Manual reset	No	CSK4	CSK4-W	CSK4-Y	CSK4-YW
		Yes	CSK4-K	CSK4-KW	CSK4-YK	CSK4-YKW
	Non-resetting	No	---	CSK4-LW	CSK4-YL	CSK4-YLW
6 digits	Manual reset	No	CSK6	CSK6-W	CSK6-Y	CSK6-YW
		Yes	CSK6-K	CSK6-KW	CSK6-YK	CSK6-YKW
	Non-resetting	No	---	CSK6-LW	CSK6-YL	CSK6-YLW

Note: 1. When placing your order, specify the desired supply voltage listed in *Specifications* and a UL listed model if required, in addition to the model number.

2. If a UL listed model is required, specify this in your order in addition to the desired model number.

Specifications

■ Ratings

Supply voltage	100, 200, VAC, 50/60 Hz 6, 12, 24, 48, 100 VDC
Operating voltage range	85% to 110% of rated voltage
Power consumption	AC: approx. 3 VA DC: approx. 3.5 W
ON time rating	Continuous rating
Counting speed	AC input: 15 cps (contact) (ON/OFF ratio: 1:1) DC input: 20 cps (contact) (ON/OFF ratio: 1:1)

Standards Approval

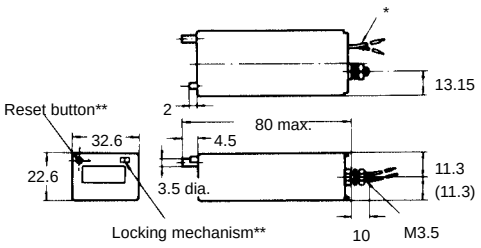
UL (File No. E67871)
(The above UL listing applies to the -US models only.)

■ Characteristics

Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	1,500 VAC, 50/60 Hz for 1 minute
Vibration resistance	Destruction: 16.7 Hz, 4 mm double amplitude Malfunction: 10 to 55 Hz, 0.5 mm double amplitude
Shock resistance	Destruction: 300 m/sec^2 (approx. 30G) Malfunction: 50 m/sec^2 (approx. 5G)
Ambient temperature	Operating: −10°C to 45°C Storage: −25°C to 65°C
Ambient humidity	45% to 85%
Life expectancy	50,000,000 counts
Weight	4-digit model: approx. 100 g 6-digit model: approx. 110 g

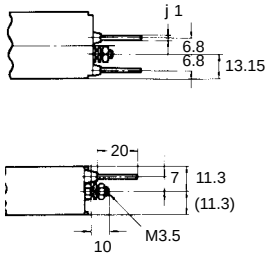
Dimensions

CSK4-W/KW/LW

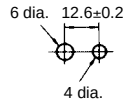


* Lead wire length: approx. 250
** CSK4-L and CSK4-LW are not provided with reset button nor locking mechanism.
CSK4 and CSK4-W are not provided with locking mechanism.

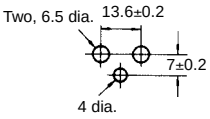
CSK4/K



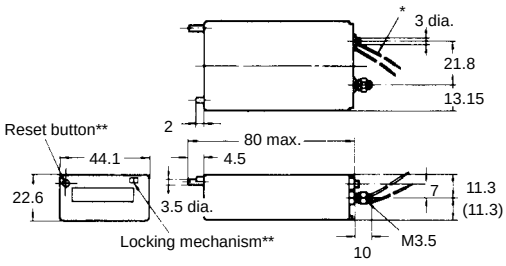
Mounting Holes CSK4-W/KW/LW



CSK4/K

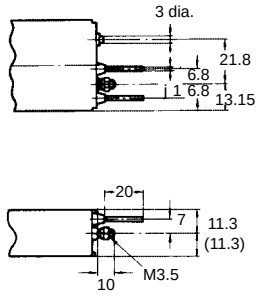


CSK6-W/KW/LW

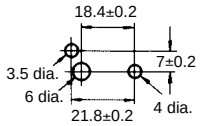


* Lead wire length: approx. 250
** CSK6-L and CSK6-LW are not provided with reset button nor locking mechanism.
CSK6 and CSK6-W are not provided with locking mechanism.

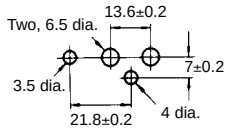
CSK6/K



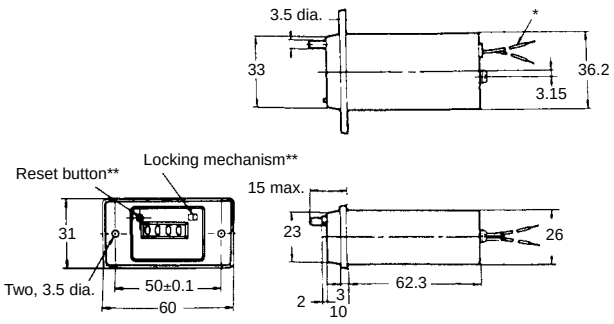
CSK6-W/KW/LW



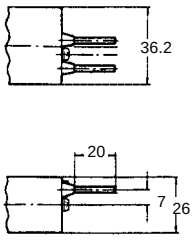
CSK6/K



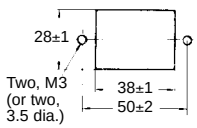
CSK4-YW/YKW/YLW



CSK4-Y/YK/YL

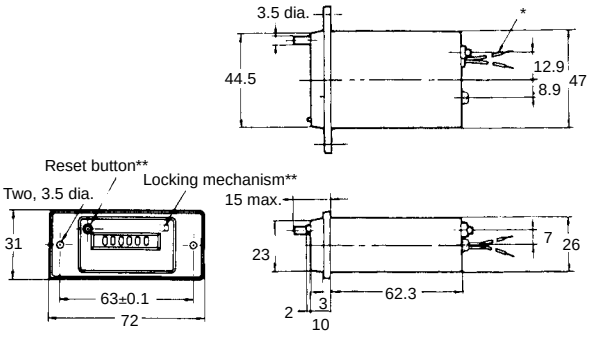


CSK4-YW/YKW/YLW CSK4-Y/YK/YL

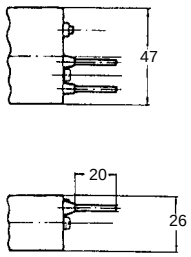


* Lead wire length: approx. 250
** CSK4-YL and CSK4-YLW are not provided with reset button nor locking mechanism
CSK4-Y and CSK4-YW are not provided with locking mechanism.

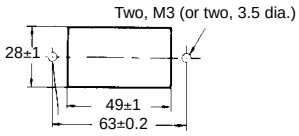
CSK6-YW/YKW/YLW



CSK6-Y/YK/YL



CSK6-YW/YKW/YLW
CSK6-Y/YK/YL



* Lead wire length: approx. 250
** CSK6-YL and CSK6-YLW are not provided with reset button nor locking mechanism.
CSK6-Y and CSK6-YW are not provided with locking mechanism.

Precautions

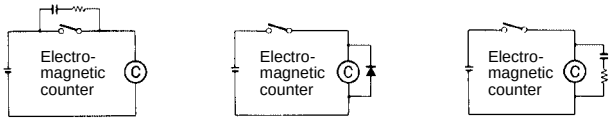
■ Operating

Never attempt to reset the Counter when in operation. It may cause malfunction

Count Signal

(1) Contact Count Input

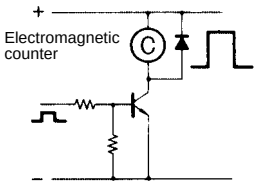
To absorb possible surges and extend the contact life, it is highly recommend that a contact protective circuit be inserted between the contact, or that a surge suppressor be attached across the Counter coil terminals.



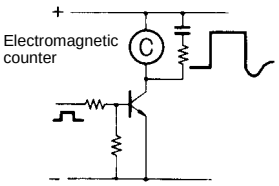
(2) Solid-state Count Input

It is necessary to employ a surge suppressor circuit to prevent noise generation and to protect the Counter drive transistor. The diode surge suppressor, if used, will extend the Counter resetting time resulting in response characteristic deterioration. The RC surge suppressor provides a slightly shorter reset time and therefore a better response characteristic; however, it cannot reduce the counterelectromotive force to zero.

Surge suppression by diode



Surge suppression by RC network



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

Cat. No. M22-E1-5A

OMRON

Electromagnetic Counter | CSKE

Compact and Economical Totalizing Counter

- Four mounting methods
- Three supply voltages for AC models and five for DC models
- DC models can be driven be a single-phase, full-wave rectified power source
- Six-digit and seven-digit models available

RC

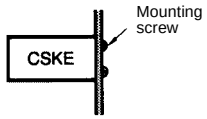
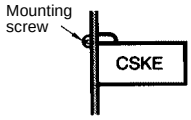
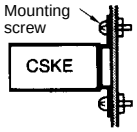
Ordering Information

Mounting method*		Surface mounting I	Flush mounting I	Surface mounting II	Flush mounting II
Operating mode		Up counting			
External connection		BY lead wires			
Count input		Contact (voltage) input			
Digit drive system		Half-digit drive system			
Number of digits and model	**6**	CSKE-6R	CSKE-6F	CSKE-6RL	CSKE-6Y
	7	CSKE-7R	CSKE-7F	CSKE-7RL	CSKE-7Y

Note: 1. When placing your order, specify the desired supply voltage listed in *Specifications* and a UL listed model if required, in addition to the model number.

2. If a UL listed model is required, specify this in your order in addition to the desired model number.

*** Mounting Method**

Surface mounting I (-R models)	Flush mounting I (-F models)	Surface mounting II (-RL models)	Flush mounting II (-Y models)
			

Specifications

■ Ratings

Supply voltage	24, 48, 100 VAC, 50/60 Hz 6, 12, 24, 48, 100 VDC (Can be used with a single-phase, full-wave rectified power source. Contains 48% ripple max.)
Operating voltage range	85 to 110% of rated supply voltage
Power consumption	AC: approx. 2 VA DC: approx. 2 W
Maximum counting speed	10 cps (contact input) Minimum signal width: 50 ms min. (Duty factor: 1:1)

Standards Approval

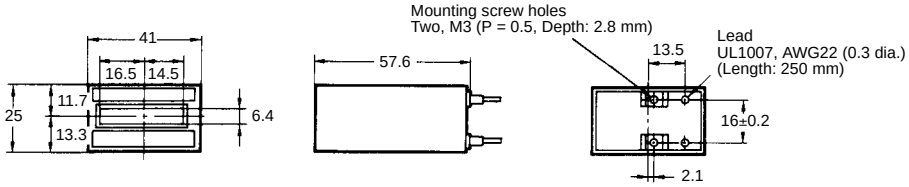
UL (File No. E67871)
CSA (File No. LR55129)
(The above UL listing applies to the -US models only.)

■ Characteristics

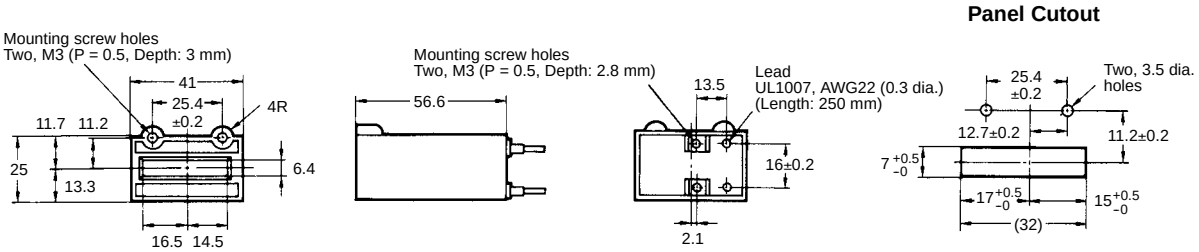
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	1,500 VAC, 50/60 Hz for 1 minute
Vibration resistance	Destruction: 10 to 25 Hz, 2 mm double amplitude Malfunction: 10 to 55 Hz, 0.5 mm double amplitude
Shock resistance	Destruction: 300 m/s^2 (approx. 30 G) Malfunction: 50 m/s^2 (approx. 5 G)
Ambient temperature	Operating: −10°C to 40°C
Ambient humidity	45% to 85%
Life expectancy	10,000,000 counts
Weight	Approx. 100 g

Dimensions

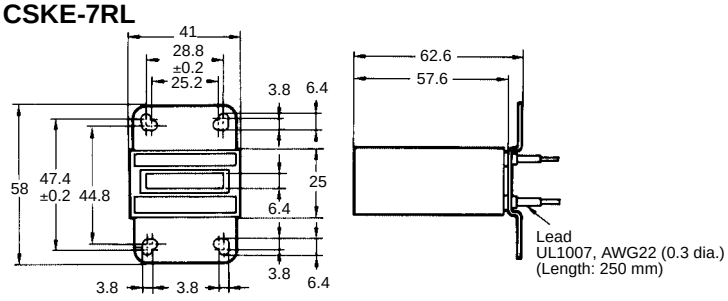
CSKE-6R
CSKE-7R



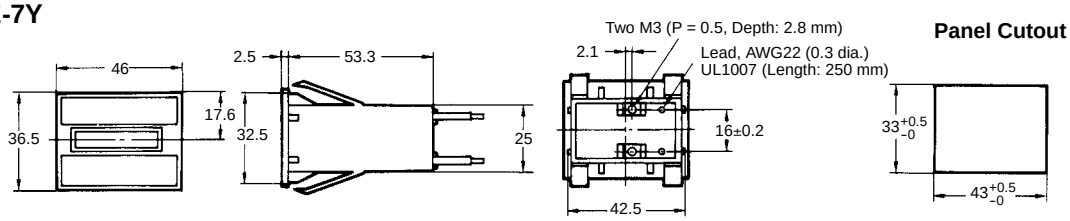
CSKE-6F
CSKE-7F



CSKE-6RL
CSKE-7RL



CSKE-6Y
CSKE-7Y



Precautions

Mounting/Connection

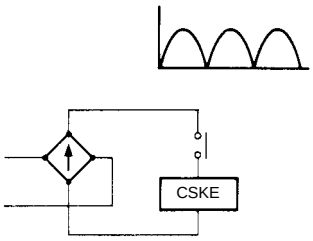
Whenever possible, install the Counter at an environment where it is not subject to heavy vibration, dust, and corrosive gases. When mounting the Counter on a panel with screws, do not apply excessive force on the screws when tightening, but be sure to tighten the screws securely. To flush-mount the Counter (a -Y model), insert it into the cutout on the mounting panel, until its class catch securely.

Use lead wires approximately 250 mm long. Do not stretch the leads with excessive force. Insulate the leads with insulation tape, etc.

When mounting the Counter using its screw holes, use screws that fit the holes properly. Also when determining the length of the screws, take the thickness of the mounting panel into consideration.

Supply Voltage

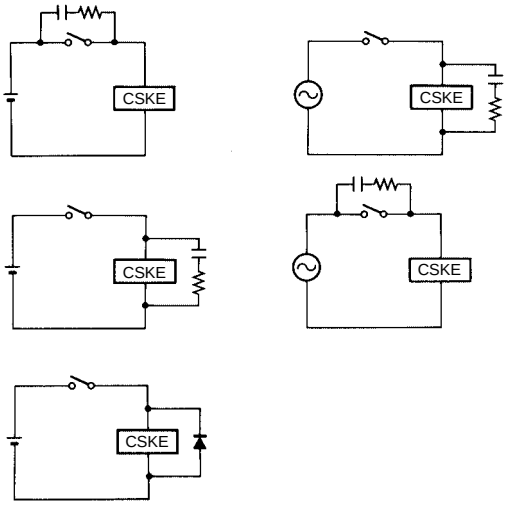
The Counter operates on a voltage 85% to 110% of the rated supply voltage. If the supply voltage exceeds or drops below this range, the Counter may malfunction. The DC models can operate with a ripple factor of 48% or less; so, they can be driven by a single-phase, full-wave rectified power source, whose waveform is shown below.



Count Signal

(1) Contact Input

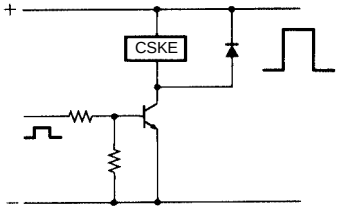
When using a contact input device to input the count signal, carefully select the input device. Use the current capacity and life of the contact of the input device as criteria for the selection. It is recommended to connect a protective circuit across the contacts of the input device, or a surge absorber across the Counter's coil, so that surges are absorbed and the life of the contacts are extended.



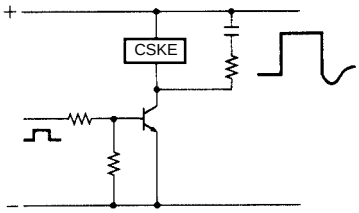
(2) Solid-state Input

When a solid-state input device is used, a surge absorber is necessary to protect the Counter drive transistor from being adversely affected by noises. If a diode is used as the surge absorber, the reset time of the Counter will be prolonged and, as a result, the Counter's response speed will be slowed down. If an RC network is used, the response characteristics of the Counter will be better as compared when a diode is used, but the counterelectromotive force cannot be completely reduced to zero.

Diode



RC network



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

Cat. No. M24-E1-1A

OMRON

Watertight Cover

Y92A- j j N

Ideal for Food Processing Machines or Other Applications that Require Watertightness

- Four sizes (96 x 96, 72 x 72, 48 x 96, 48 x 48) are available.
- Conforms to IP66 or NEMA4 (indoors).

Ordering Information

Model	Y92A-96N	Y92A-72N	Y92A-49N	Y92A-48N
Size	96 x 96 mm	72 x 72 mm	48 x 96 mm	48 x 48 mm

■ Materials

Front cover	94V-2 polycarbonate
Packing	Chloroprene rubber
Panel	SUS304

■ Applicable OMRON Products

Temperature Controller

ES100, E5AF, E5EF, Thermac X, W, S, E5T, E5P, E5KN, E5C2, E5C4

Timer

H3CR, H3B Series, H3CA, H5CR, H2C, H5CN, H5BR, H5AN

Counter

H8CA-S, H7CR, H8PS, H7BR, H8BM, H7CL, H7AN, H7CN

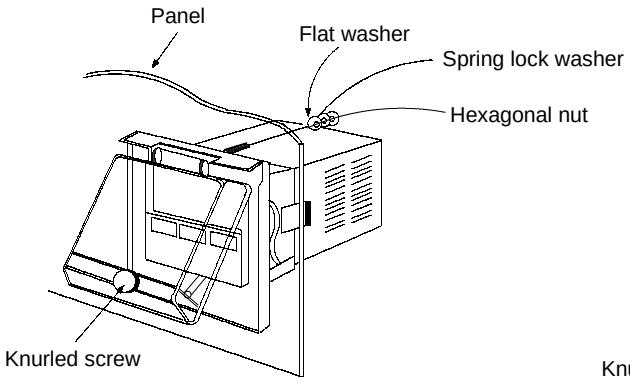
Intelligent Signal Processor/Digital Panel Meter

K3TX, K3TH, K3TR, K3TS, K3TE (see note), K3TF, K3TL

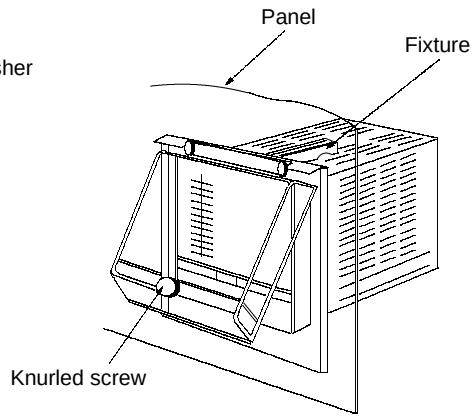
Note: Use the K32-L49MB (sold separately) for mounting.

Nomenclature

48 x 48 mm



96 x 96/72 x 72/48 x 96 mm

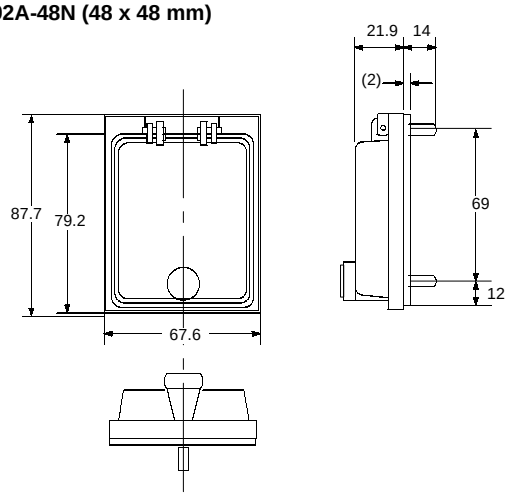


Note: Tighten the knurled screw to a torque of 0.03 N S m (3 kgf S cm) and the hexagonal nut to a torque of 0.05 N S m (5 kgf S cm).

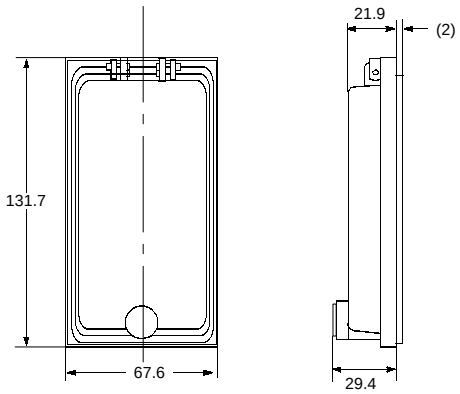
Dimensions

Note: All units are in millimeters unless otherwise indicated.

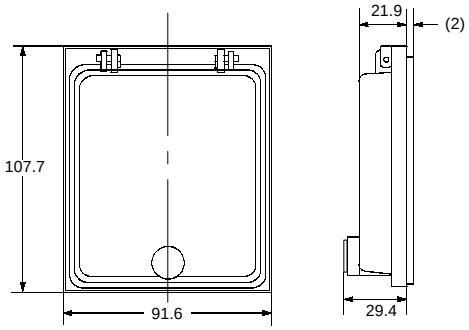
Y92A-48N (48 x 48 mm)



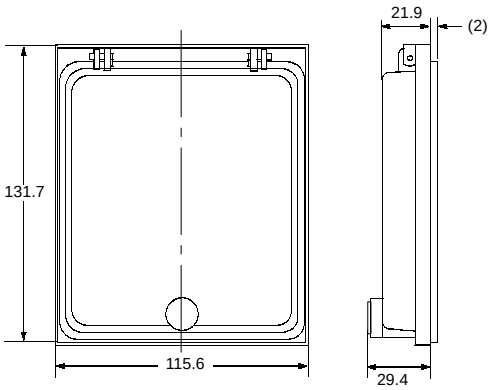
Y92A-49N (48 x 96 mm)



Y92A-72N (72 x 72 mm)

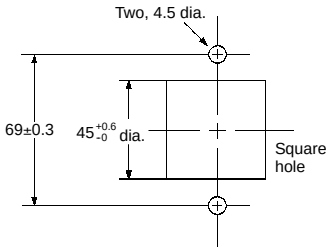


Y92A-96N (96 x 96 mm)



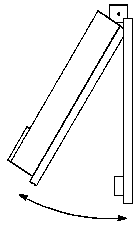
Panel Cutout

Y92A-48N (48 x 48 mm)



Precautions

It is possible to open or close the front cover by untightening or tightening the knurled screw.



Be sure to take the space required for the opening and closing of the front cover into consideration when installing the Watertight Cover.

The front cover is made of polycarbonbate, which can be cleaned using water, methanol, or ethanol.

Regularly check the packing, the quality of which will deteriorate over the process of time.

The front cover can be mounted in any direction.

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

Cat. No. Q88-E1-1A

9 pt.: Cat. No. X13-E1-10

10 pt.: Cat. No. X13-E1-10

11 pt.: Cat. No. X13-E1-10

8 pt.: Cat. No. X13-E1-10

9 pt.: Cat. No. X13-E1-10

10 pt.: Cat. No. X13-E1-10

11 pt.: Cat. No. X13-E1-10

8 pt.: Cat. No. X13-E1-10

9 pt.: Cat. No. X13-E1-10

10 pt.: Cat. No. X13-E1-10

11 pt.: Cat. No. X13-E1-10

8 pt.: Cat. No. X13-E1-10

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Cat. No. X013-E1-10

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