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

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-□P & H7ER-□□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

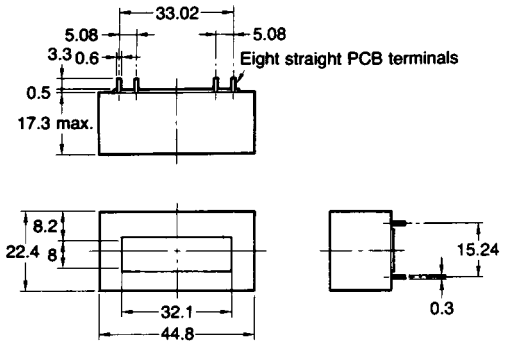
Note: 1. The maximum voltages allowed on the input, or gate terminals are as follows:
No-voltage models: 3 VDC
DC voltage models: 30 VDC

2. ON/OFF ratio 1:1

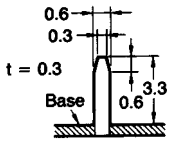
■ Characteristics

Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute between current-carrying terminal and exposed non-current-carrying metal parts.
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

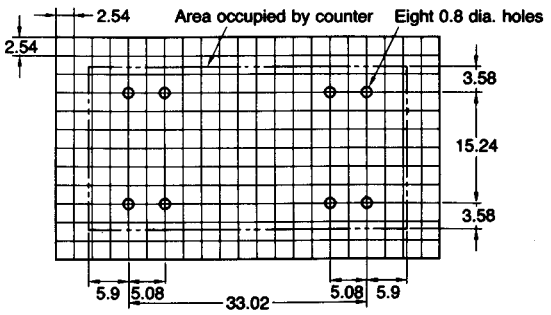
Dimensions



Detailed Drawing of Straight PCB Terminal



PCB Mounting Holes



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

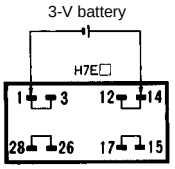
Note: When machine inserting the H7E PC-board Use Counters, these holes must be 1.2 mm diameter.

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:

$t = A/I_c$

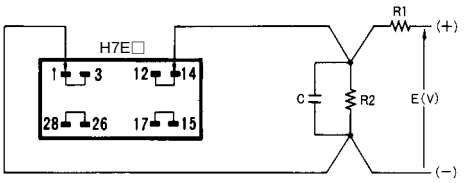
Where,
t: life expectancy of battery (h)
A: battery capacity (mAh)
I_c: current consumed by H7E□-□P (mA)

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

$t = 1{,}200\ [mAh]/20 \times 10^{-3}\ [mA] = 60{,}000$ 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:

$E\ (V) \times R_2 / (R_1 + R_2) = 3\ V$

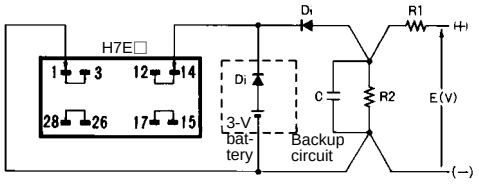
R	E		
	5 V	12 V	24 V
R_1	2 kΩ	9.1 kΩ	33 kΩ
R_2	3 kΩ	3 kΩ	4.7 kΩ

Allow a current high enough to flow through R_1 so that the H7E□-□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□-□P and R_2 as short as possible (within 50 mm).

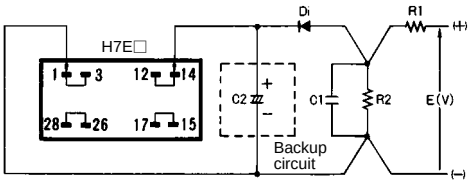
Backup Circuit for Protection Against Power Failure



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□-□P (V)
I_c: H7E□-□P current consumption (μA)

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

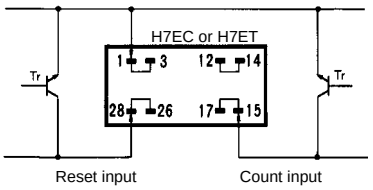
$t = 100\ \mu F \times (3 - 2.55\ V)/20\ \mu A = 100 \times 0.45/20 = 2.25$ seconds

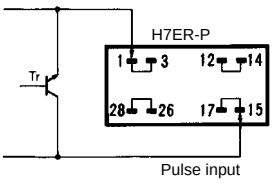
Note that the above calculation provides an approximate value, which varies depending on the environment under which the Counter is used and also on the type of capacitors used. Provide some allowance in selecting capacitors.

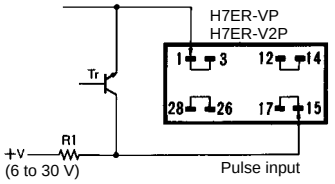
Minimize the wiring distance between the H7E□-P and the ends of the R_2.

Input Connections

Solid-state Input of Open-collector Transistor



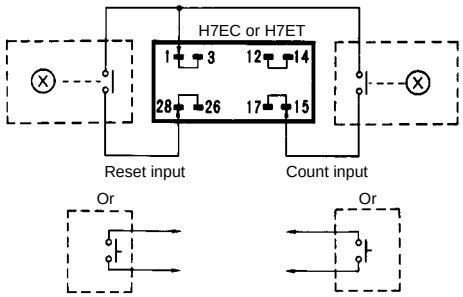




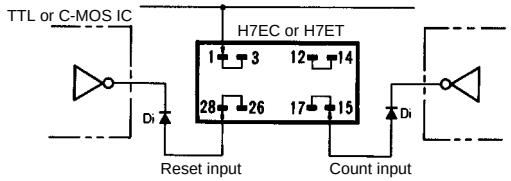
Use a transistor for input that satisfies the following conditions:
Collector breakdown voltage ≧ 50 V
Leakage current < 1 μA

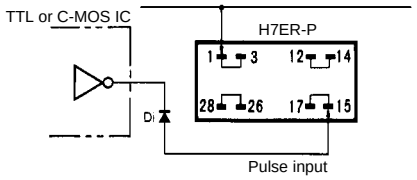
Use a diode (Di) having a forward voltage as small as possible (0.1 V max. at I_F of 20 μA).

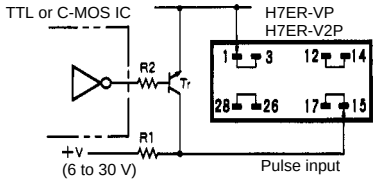
Input Connection Contact Input



By TTL or C-MOS IC







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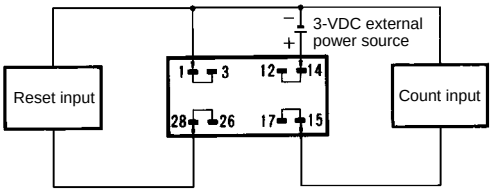
Use a diode (Di) having a forward voltage as small as possible (0.1 V max. at I_F of 20 μA).

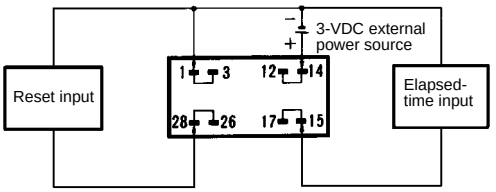
■ Terminal Arrangement

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

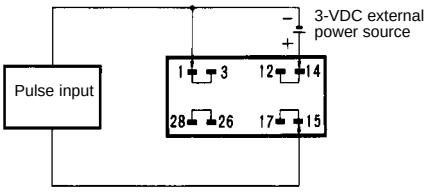
H7EC-□P



H7ET-P



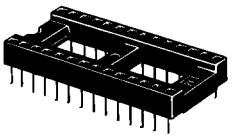
H7ER-□□P



Accessories (Order Separately)

■ Connecting Socket

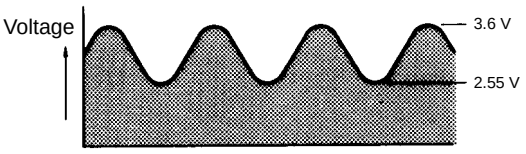
Description	Part number
28-pin (standard quality)	XR2A-2801
28-pin (premium quality)	XR3A-2801



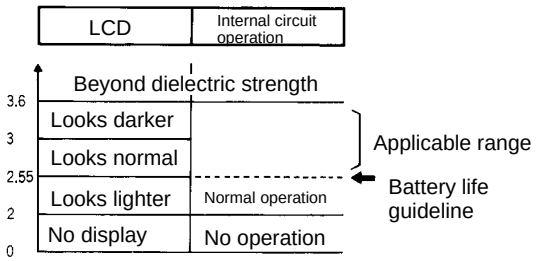
Precautions

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.



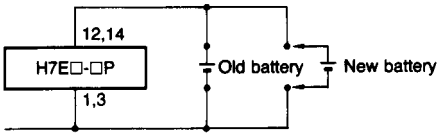
- The H7E□-P changes its mode as shown below depending on the applied supply voltage.



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.

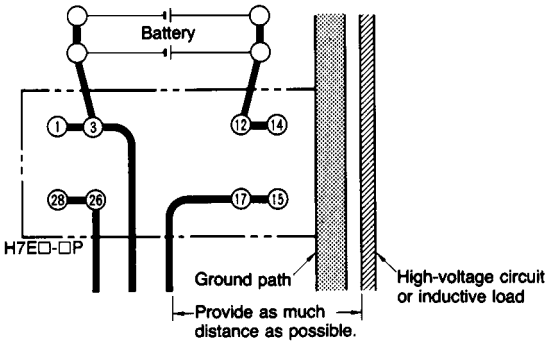
When designing the circuit board, providing two extra terminals for battery connection will make the switch must simpler. See the schematic diagram below:



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

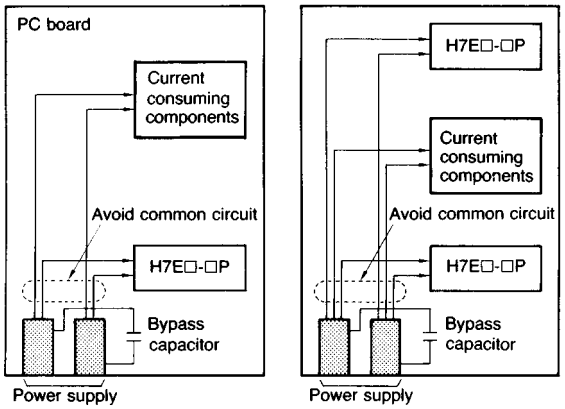
General Information

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. M063-E1-1 **In the interest of product improvement, specifications are subject to change without notice.**

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Industrial Automation Company

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