

## Self-powered Tachometer

## H7ER

- Revolutions displayed up to five digits.
- Dual revolution display according to encoder resolution used;  $1000\text{ s}^{-1}/1000\text{ min}^{-1}$  or  $1000.0\text{ s}^{-1}/1000.0\text{ min}^{-1}$
- Switchable dual revolution display type available (-NV1 models); extended up to  $10000\text{ min}^{-1}$



## Ordering Information

### ■ Tachometers

Count input	Display	Max. revolutions displayed (applicable encoder resolution)			
		1000 $\text{s}^{-1}$ (1 pulse/rev.), 1000 $\text{min}^{-1}$ (60 pulse/rev.)		1000.0 $\text{s}^{-1}$ (10 pulse/rev.), 1000.0 $\text{min}^{-1}$ (600 pulse/rev.) $\leftrightarrow$ 10000 $\text{min}^{-1}$ (60 pulse/rev.) (switchable)	
		Light-gray body	Black body	Light-gray body	Black body
PNP/NPN universal DC voltage input	7-segment LCD with backlight	H7ER-NV-H	H7ER-NV-BH	H7ER-NV1-H	H7ER-NV1-BH
	7-segment LCD	H7ER-NV	H7ER-NV-B	H7ER-NV1	H7ER-NV1-B
No-voltage input	7-segment LCD	H7ER-N	H7ER-N-B	---	---

### ■ Model Number Legend

H7ER - N   -

1 2 3 4

#### 1. Count Input

None: No-voltage input  
V: PNP/NPN universal DC voltage input

#### 2. Number of Digits

None: 4 digits  
1: 5 digits

#### 3. Case Color

None: Light gray  
B: Black

#### 4. Display

None: 7-segment LCD without backlight  
H: 7-segment LCD with backlight

### ■ Accessories (Order Separately)

Lithium Battery	Y92S-36	
Wire-wrap Terminal (Set of two Terminals)	Y92S-37	
Flush Mounting Adapter	26 mm × 45 mm	Y92F-75
	24.8 mm × 48.8 mm	Y92F-77B

# Specifications

## ■ General

Item	H7ER-NV-□ H7ER-NV-□H	H7ER-N-□	H7ER-NV1-□ H7ER-NV1-□H
Operating mode	Up type		
Mounting method	Flush mounting		
External connections	Screw terminals, Wire-wrap Terminals (see note 3)		
Display	7-segment LCD with or without backlight (character height: 8.6 mm) (see note 4)		
Number of digits	4		5
Count input	PNP/NPN universal DC voltage input	No-voltage input	PNP/NPN universal DC voltage input
Max. counting speed	1 kHz		10 Hz
Max. revolutions displayed (see note 5)	1,000 s <sup>-1</sup> (When encoder resolution of 1 pulse/rev is used.) 1,000 min <sup>-1</sup> (When encoder resolution of 60 pulse/rev is used.)		1,000.0 s <sup>-1</sup> (When encoder resolution of 10 pulse/rev is used.) 1,000.0 min <sup>-1</sup> (When encoder resolution of 600 pulse/rev is used.) ↔ 10,000 min <sup>-1</sup> (When encoder resolution of 60 pulse/rev is used.) (Switchable with switch)
Attachment	Waterproof packing, flush mounting bracket, revolution unit labels (see note 5)		
Approved standard	UL508, CSA C22.2 No.14, Lloyds Conforms to EN61010-1/IEC61010-1 (Pollution degree2/overvoltage category III) Conforms to VDE0106/P100		

- Note:**
1. Reset is not available.
  2. When there is no input, the display will be 0.0 or 0.
  3. Separately ordered Wire-wrap Terminals (Y92S-37) are required.
  4. Only PNP/NPN Universal DC voltage input models have a backlight.
  5. "rpm", "rps", "s<sup>-1</sup>" and "min<sup>-1</sup>" labels are included.

## ■ Ratings

Item	H7ER-NV□-□ H7ER-NV□-□H	H7ER-N-□
Supply voltage	Backlight model: 24 VDC (0.3 W max.) (for backlight lit) No-backlight model: Not required (powered by built-in battery)	Not required (powered by built-in battery)
Count 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: 750 kΩ min.
Reset input		
Max. counting speed	4-digit models: 1 kHz 5-digit models: 10 kHz	1 kHz
Minimum signal width	10 Hz: 0.05 ms 1 kHz: 0.5 ms	
Terminal screw tightening torque	0.98 N • m max.	
Ambient temperature	Operating: -10°C to 55°C (with no condensation or icing) Storage: -25°C to 65°C (with no condensation or icing)	
Ambient humidity	Operating: 25% to 85%	

## ■ Characteristics

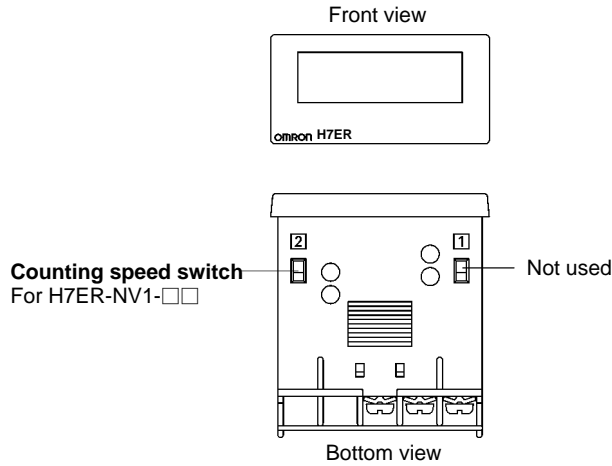
Item	H7ER-NV□-□ H7ER-NV□-□H	H7ER-N-□
<b>Insulation resistance</b>	100 MΩ min. (at 500 VDC) between current-carrying metal parts and exposed non-current-carrying metal parts, and between the backlight power supply and count input terminals/reset terminals for backlight models	100 MΩ min. (at 500 VDC) between current-carrying metal parts and exposed non-current-carrying metal parts
<b>Dielectric strength</b>	1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and exposed non-current-carrying metal parts and between the backlight power supply and count input terminals/reset terminals for backlight models	1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and exposed non-current-carrying metal parts
<b>Impulse withstand voltage</b>	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts	
<b>Noise immunity</b>	Square-wave noise generated by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)	
	±600 V (Between count input terminals) ±480 V (Between the backlight power supply terminals for backlight models)	±500 V (Between count input terminals)
<b>Static immunity</b>	±8 kV (malfunction)	
<b>Vibration resistance</b>	Malfunction: 0.15-mm single amplitude at 10 to 55 Hz for 10 min each in 3 directions Destruction: 0.375-mm single amplitude at 10 to 55 Hz for 2 hrs each in 3 directions	
<b>Shock resistance</b>	Malfunction: 200 m/s <sup>2</sup> 3 times each in 6 directions Destruction: 300 m/s <sup>2</sup> 3 times each in 6 directions	
<b>EMC</b>	(EMI) EN50081-1 Emission Enclosure: EN55022 class B (EMS) EN50082-2 Immunity ESD: EN61000-4-2: 4-kV contact discharge (level 2) 8-kV air discharge (level 3) Immunity RF-interference from AM Radio Waves: ENV50140: 10 V/m (80 MHz to 1 GHz) (level 3) Immunity RF-interference from Pulse-modulated Radio Waves: ENV50204: 10 V/m (900 MHz ± 5 MHz) (level 3) 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)	
<b>Enclosure rating</b>	Front panel: IP66, NEMA4 with waterproof packing Terminal block: IP20	
<b>Weight (see note)</b>	No-backlight model: Approx. 60 g Backlight model: Approx. 65 g	

**Note:** Weight includes waterproof packing and flush mounting bracket.

## ■ Reference Value

Item	Value	Note
Battery life	7 years min. with continuous input at 25°C (lithium battery)	The battery life is calculated according to the conditions in the left column and therefore is not a guaranteed value. Use these value as reference for maintenance or replacement.

# Nomenclature



## Counting Speed Switch Settings and Unit Label Application

Model	Counting speed switch setting (see note)	Max. revolutions displayed	Applicable encoder resolution	Applicable unit label
H7ER-NV1-□□	Front panel ↑	10000 min <sup>-1</sup> (default setting)	60 pulse/rev.	"min <sup>-1</sup> " or "rpm"
	Terminal block ↓	1000.0 min <sup>-1</sup>	600 pulse/rev.	"min <sup>-1</sup> " or "rpm"
		1000.0 s <sup>-1</sup>	10 pulse/rev.	"s <sup>-1</sup> " or "rps"
H7ER-N-□ H7ER-NV-□□	No setting is required	1000 min <sup>-1</sup>	60 pulse/rev.	"min <sup>-1</sup> " or "rpm"
		1000 s <sup>-1</sup>	1 pulse/rev.	"s <sup>-1</sup> " or "rps"

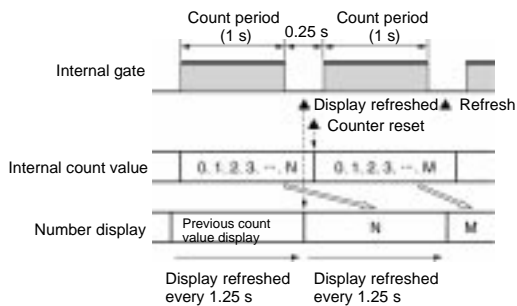
**Note:** Perform switch setting before mounting to a control panel.

# Operation

## ■ Operating Modes

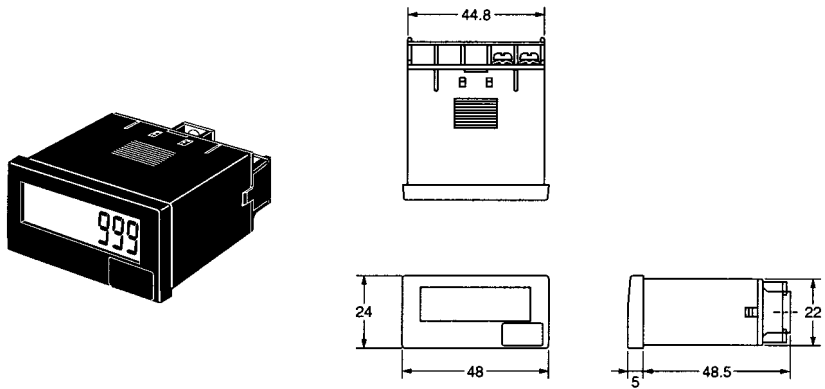
### H7ER Tachometer

Incrementing Operation  
Within Unit Time (Up)



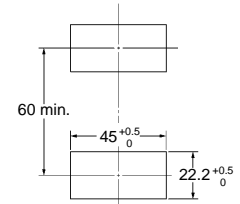
# Dimensions

**Note:** All units are in millimeters unless otherwise indicated.  
**H7ER-N**

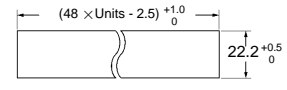


### Panel Cutout

Separate mounting

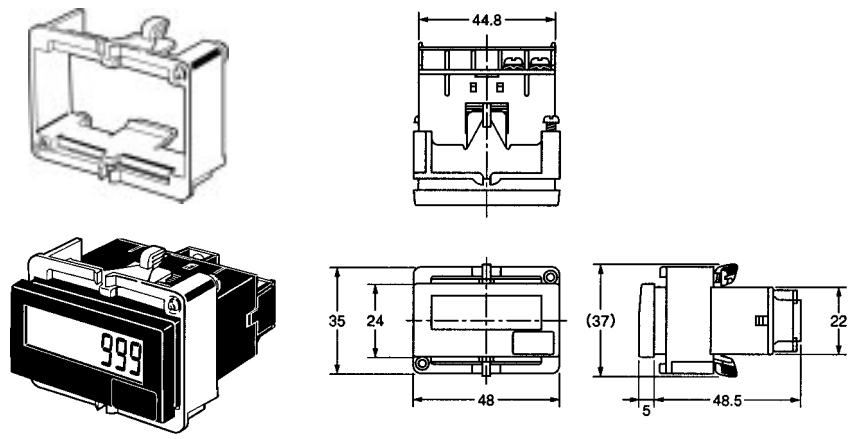


### Joint mounting



Waterproofing is not possible for joint mounting

### Dimensions with Flush Mounting Bracket



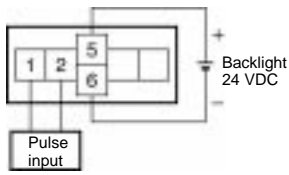
- When mounting, insert the Counter into the cutout, insert the adapter from the back and push in the Counter while making the gap between the front panel and the cutout panel as small as possible. Use screws to secure the Counter. If waterproofing is desired, insert the waterproof packing.
- When several Counters are installed, ensure that the ambient temperature will not exceed specifications.
- The appropriate thickness of the panel is 1 to 5 mm.

# Installation

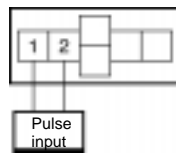
## Terminal Arrangement

Bottom view: View of the Tachometer rotated horizontally 180°

### Backlight Model



### No-backlight Model



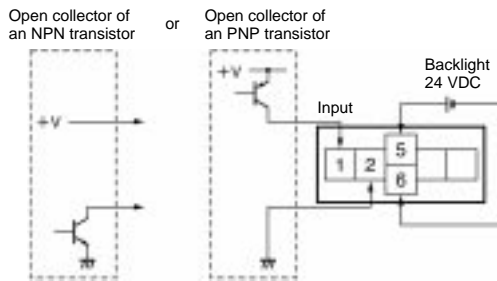
## Connections

### H7ER Tachometer

**Note:** Select input transistors according to the following:  
 Dielectric strength of the collector  $\geq 50$  V  
 Leakage current  $< 100 \mu\text{A}$  ( $1 \mu\text{A}$  for no-voltage input model)

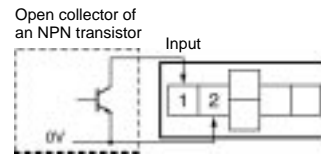
#### PNP/NPN Universal DC Voltage Input Models With Backlight

Transistor Input



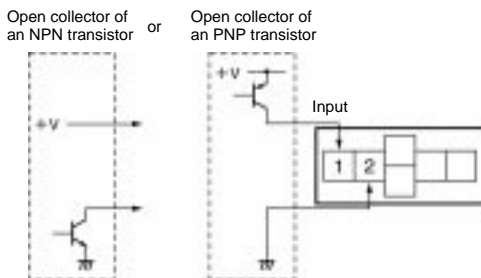
#### No-voltage Input Model

Transistor Input (Open Collector of an NPN Transistor)



#### PNP/NPN Universal DC Voltage Input Models Without Backlight

Transistor Input



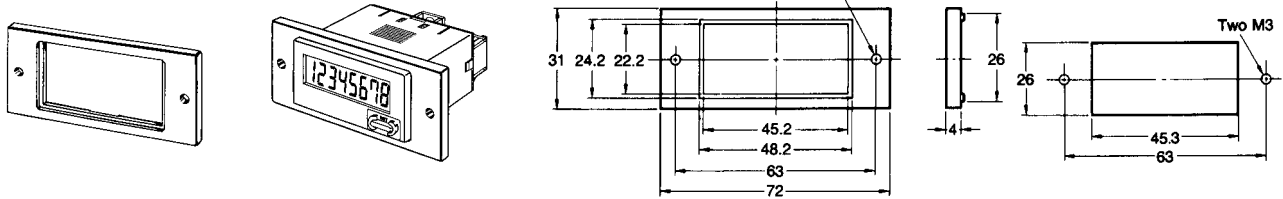
# Accessories (Order Separately)

## ■ New H7E (Except for PCB-mounting Counter)

The New H7E models are supplied with a mounting bracket and nut. Additionally, the Flush Mounting Adapters shown here allow the New H7E models to be fitted to existing panel cutouts.

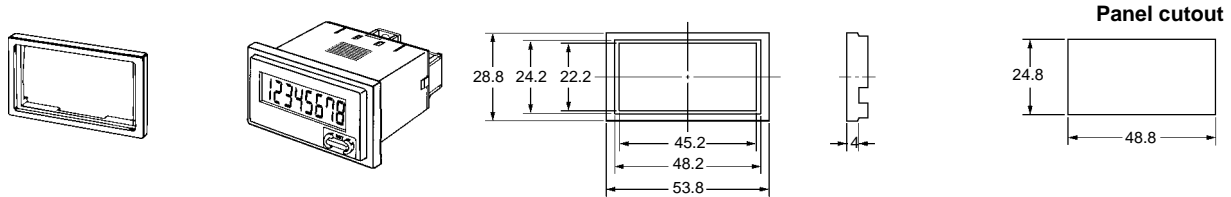
### Y92F-75 Flush Mounting Adapter for 26 × 45.3 Rectangular Cutout

Use mounting bracket supplied with the Counter

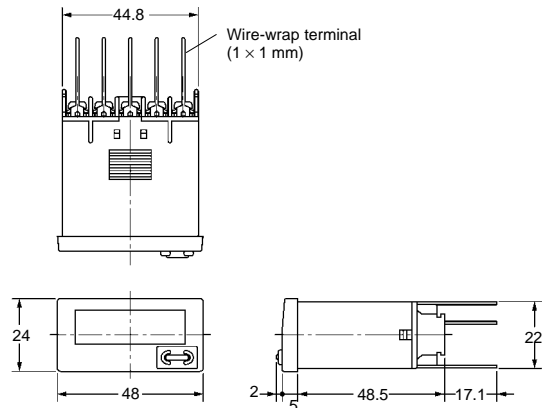
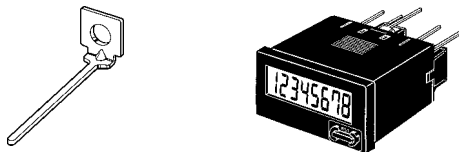


### Y92F-77B Flush Mounting Adapter for 24.8 × 48.8 Rectangular Cutout

Use mounting bracket supplied with the Counter



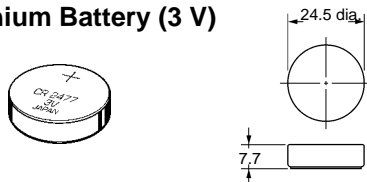
### Y92S-37 Wire-wrap Terminal (Set of Two Terminals)



When using the Wire-wrap Terminal, be sure to use the correct wires and peripheral devices. (The correct wires, bits and sleeves are shown in the table on the right.)

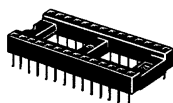
Wire	Bit	Sleeve	Wrapped state
AWG22	2-A	2-B	Normal
AWG24	1-A	1-B	Normal
AWG26	3-A	1-B	Normal

### Y92S-36 Lithium Battery (3 V)



## ■ PCB-mounting Counters

### XR2A-2801-N 28-pin Socket



**Note:** When using the Socket, use the PCB processing dimensions previously provided.

## Precautions

### ■ New H7E (Except for PCB-mounting Counter)

#### ! WARNING

This product has a built-in lithium battery. Do not short-circuit the + and – terminals, charge, disassemble, deform, or expose the battery to fire. The battery may explode (break), catch fire, or cause liquid leakage.

#### ! Caution

Do not use any battery other than the specified one (Y92S-36). Using another battery may cause liquid leakage or breakage, resulting in malfunction or injury.

#### ! Caution

If a voltage other than the rated one is applied, internal elements may be damaged.

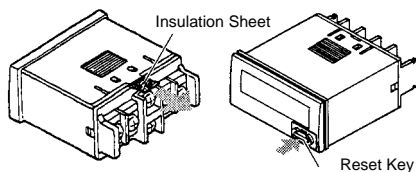
Do not use the Counter in the following places:

- Locations subject to direct sunlight.
- Locations subject to corrosive gases.
- Locations subject to dust.

### Before Use

- An insulation sheet has been inserted to maintain the quality of the Totalizer in the event of a long period without use. Be sure to remove this sheet before attempting to use the product.

Remove the insulation sheet and press the Reset Key on the front panel of the Counter. (With the H7ER-N, -NV(-H), -NV1(-H) models, "0" or "0.0" will be displayed after 1 s.)

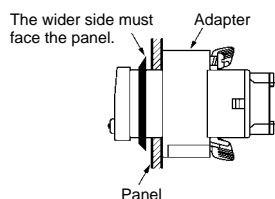


- Switch settings on the Counter must be performed before mounting it to a control panel.
- Do not use the Counter in the following locations:
  - Locations subject to severe changes in temperature.
  - Locations subject to condensation as the result of high humidity.

### Mounting Precautions for Flush Mounting

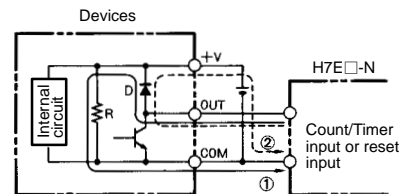
Although the operating section is watertight (conforming to NEMA4, IP66), rubber packing is provided to avoid water leakage through the gap between the Counter and panel cutout. Unless this rubber packing is tightly squeezed on, water may permeate inside the panel. Therefore, be sure to tighten the screws for fixing the Flush Mounting Bracket. (Excessive tightening may also deform the rubber packing.)

#### Screw for the Flush Mounting Bracket



### Reset Input and Count/Timer 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 the 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.

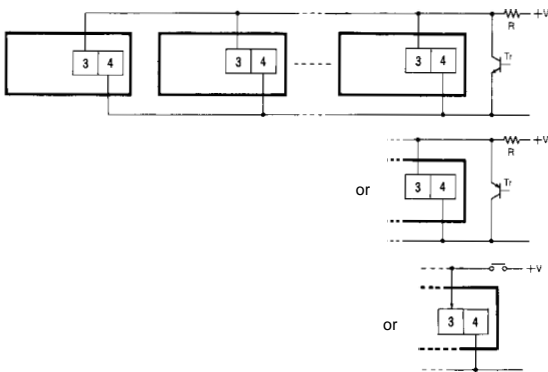


- If an excessive voltage is applied to the count/timer input or reset input terminals, the internal elements may be damaged. Ensure that the following voltages are not exceeded:
  - PNP/NPN universal voltage input model: 30 VDC
  - AC/DC voltage input model:
    - At count/timer input: 240 VAC (peak voltage: 338V)
    - 240 VDC
    - At reset input: 3 VDC (no-voltage input)
  - No-voltage input model: 3 VDC
  - Avoid wiring close to high-tension or large-current lines.
- Do not remove the outer case when voltage is being applied to the power supply terminals or the input terminals.
- The input for the H7E□-NFV□ is a high-impedance circuit and so influence from an induced voltage may result in malfunction. Therefore, when the input signal wiring is longer than 10 m (line capacitance of 120 pF/m, at room temperature), it is recommended that a CR filter or a bleeder resistor is connected.



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

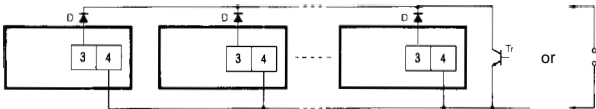
- PNP/NPN Universal DC Voltage Input



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

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

- No-voltage Input

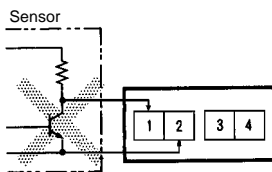


- Note:**
1. The leakage current of the transistor used for input must be less than 1  $\mu$ A.
  2. The forward voltage of the diode must be as low as possible (i.e., 0.1 V maximum with an  $I_F$  of 20  $\mu$ A) so that the voltage between terminals 3 and 4 will be 0.5 V when the reset input is ON.

### Input and Power Supply

#### No-voltage Input Models

- 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 no-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.



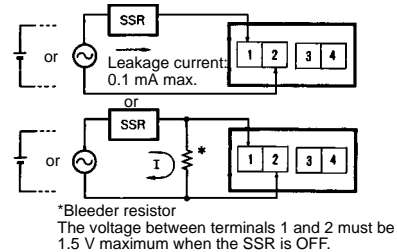
- When connecting an open collector input from a transistor to the Counter that operates with no-voltage input, make sure that the leakage current of the transistor is 1  $\mu$ A maximum.

### No-voltage Input and PNP/NPN Universal DC Voltage Input Models

- The operation of the Counter may be affected if the line voltage of the power supply exceeds 500 pF (about 10 m, with parallel wires of 2 x 2 mm). Keep all wires as short as possible. When using shielded wire, line capacitance may occur.

#### AC/DC Multi-voltage Input Models

- When connecting count/timer input from an SSR to the Counter that operates with AC/DC voltage input, use OMRON's G3TA-1A/1D SSR (for DC) whose leakage current is 0.1 mA max. or connect a bleeder resistor in parallel to the input circuit of the Counter.



### Backlight Power Supply

- To reduce variation in the brightness of the backlight when using more than one H7E with a backlight, use the same power supply for all the backlights.



- When connecting the DC power supply for the backlights, be sure to connect the polarities correctly.

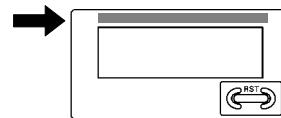
### Input Verification with the H7ET Time Counter

(When the time range is not set to 0s to 999h59m59s)

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.

### Unit Label for Time Counter and Tachometer

A unit label has been packed with the Counter. Use in accordance with the application.



### Battery Replacement

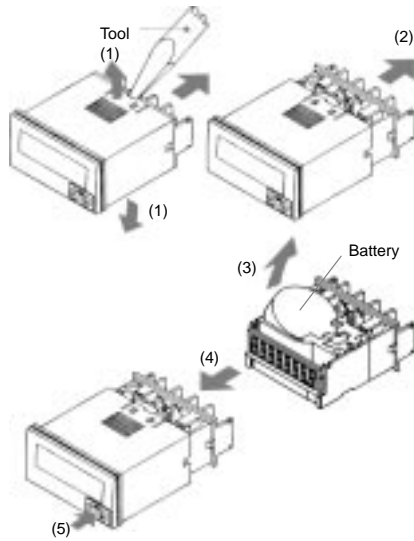
Remove the wiring when replacing the Battery. Do not come in contact with any item to which high voltage is being applied. Doing so may result in electric shock.

Before changing the Battery, the person should ensure that they are not carrying any static electric charge.

Procedure for replacing the Battery (refer to the diagrams below):

1. Using the tool, pry open the lift-tab on the case. (1)
2. Pull the body out of its outer case. (2)
3. Lift the Battery up by the edge and remove it. (3)  
When removing the Battery, do not come in contact with the display area or any internal parts.

4. Wipe the back of the new Battery before inserting it.
5. Ensure that the + and – terminals are correctly oriented.
6. After replacing the Battery, re-insert the body into its case. (4) Check that the case is securely held in by the lift-tab.
7. Press the Reset Key before use (not necessary for H7ER-N,-NV,-NV1). (5)



**EN/IEC Standards**

The count or timer input, reset input, and backlight power supply terminals of the no-voltage input or PNP/NPN universal DC voltage input models (H7E□-N,-N1, H7E□-NV(-H),-NV1(-H)) are not isolated.

A SELV power supply conforming to Appendix H of IEC61010-1 should be used for the count or timer input, reset input and backlight power supply terminals. A SELV power supply is a power supply for which the input and output have double or reinforced insulation, and for which the output voltage is 30 Vrms with 42.4 V peak or 60 VDC max. (Only the H7E□-NV□-H has a backlight.)

The terminals for count or timer input and reset input for AC/DC multi-voltage input models have basic insulation.

Connect the reset input terminals to a device that does not have exposed current-carrying parts and has basic insulation for 240 VAC.

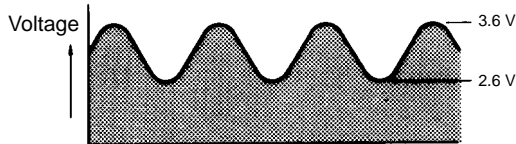
**Others**

If the indicator keeps flickering or is OFF, the internal battery may be close to the end of its service life. In such a case, it is suggested that the battery be replaced.

**Precautions**

**■ PCB-mounting Counter 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.



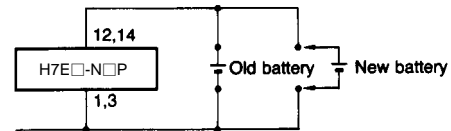
- The H7E□-N□P changes its mode as shown below depending on the applied supply voltage.

LCD		Internal circuit operation	
Beyond supply voltage			
3.6	Looks darker	Normal operation	Applicable range
3	Looks normal		
Approx. 2.6	Looks lighter		
Approx. 2.2	No display	No operation	Battery life guideline
0			

**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.

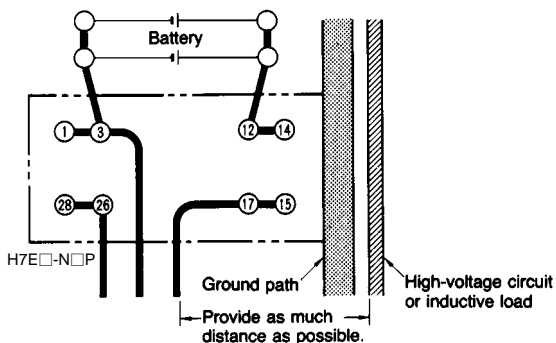
When designing the circuit board, providing two extra terminals for battery connection will make the switch must simpler. See the schematic diagram below:



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, timer, 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, timer, or reset terminals, otherwise the internal circuit may be damaged.

No-voltage input: 3 VDC

## General Information

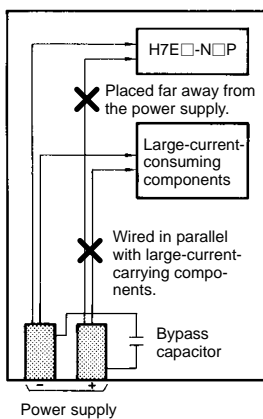
The terminals are solder-plated. Finish soldering the terminals within 5 seconds, at a solder iron tip temperature of  $250^{\circ}\text{C} \pm 10^{\circ}$ .

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.

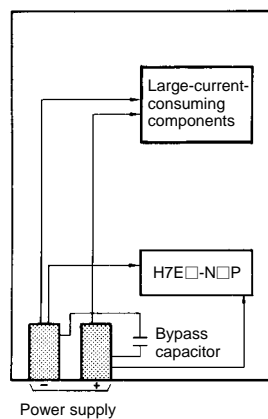
When mounting the Counter on a PC board with components which consume higher current than the H7E□-N□P, observe the following precautions.

1. Minimize the wiring (less than 50 mm) from the H7E□-N□P to the power supply section.
2. Avoid placing the H7E□-N□P power, timer, counter, or reset input circuit in parallel with circuits that consume large currents, particularly on the positive side.

PC Board (Bad Example)



PC Board (Good Example)



When using the Counter in an environment where the Counter is subject to frequent occurrences of vibration or shock, or when mounting the Counter facing downwards or sideways, it is suggested that the Counter be directly soldered to a PCB instead of using sockets.

## To Conform to EN/IEC Standards

Input terminals have no insulation from power supply terminals. The power supply terminals must be supplied from a SELV source in accordance with IEC61010-1 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 rms 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.