Self-Powered Time Counter

H7ET

Subminiature Time Counters With Enhanced Appearance and Features

- Large display with 8.6 mm (0.338 in) height
- Available with backlight LCD
- PNP/NPN DC voltage input available
- Seven digits, time range 0 to 3999d23.9h
- Key-protect switch to prevent front resetting
- Selectable time range: 999999.9h or 3999d23.9h and 999h59m59s or 9999h59.9m
- NEMA 4/IP66 front
- Replaceable battery
- New black case

Ordering Information

### TIME COUNTERS

<table>
<thead>
<tr>
<th>Count input</th>
<th>Display</th>
<th>Time range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNP/NPN universal DC voltage input</td>
<td>7-segment LCD with backlight</td>
<td>H7ET-NV-BH</td>
</tr>
<tr>
<td>AC/DC multi-voltage input</td>
<td>7-segment LCD</td>
<td>H7ET-NFV-B</td>
</tr>
<tr>
<td>No-voltage input</td>
<td>7-segment LCD</td>
<td>H7ET-N-B</td>
</tr>
</tbody>
</table>

| MODEL NUMBER LEGEND          |

H7ET - N 1 2 3 4 5 6

1. Count Input
   - None: No-voltage input
   - V: PNP/NPN universal DC voltage input
   - FV: AC/DC multi-voltage input

2. Time Range
   - None: 999999.9h/3999d23.9h
   - 1: 999h59m59s/9999h59.9m

3. Case Color
   - B: Black

4. Display
   - None: 7-segment LCD without backlight
   - H: 7-segment LCD with backlight

### ACCESSORIES (ORDER SEPARATELY)

<table>
<thead>
<tr>
<th>Item</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement battery</td>
<td>Y92S-36</td>
</tr>
<tr>
<td>Wire-wrap terminal (set of two terminals)</td>
<td>Y92S-37</td>
</tr>
<tr>
<td>Panel-mounting adapter</td>
<td>Y92F-75</td>
</tr>
<tr>
<td></td>
<td>Y92F-77B</td>
</tr>
</tbody>
</table>
## Specifications

### GENERAL

<table>
<thead>
<tr>
<th>Item</th>
<th>H7ET-NV-B, H7ET-NV-BH</th>
<th>H7ET-NFV-B</th>
<th>H7ET-N-B, H7ET-N-BH</th>
<th>H7ET-NV1-B, H7ET-NV1-BH</th>
<th>H7ET-NFV1-B</th>
<th>H7ET-N1-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating mode</td>
<td>UP type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting method</td>
<td>Panel mounting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External connections</td>
<td>Screw terminals, optional wire-wrap terminals (See Note 3.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reset</td>
<td>External/Manual reset</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>7-segment LCD with or without backlight (character height: 8.6 mm) (See Note 1.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of digits</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time range</td>
<td>0.0h to 999999.99h or 0.0h to 3999d23.9h (switchable with switch)</td>
<td>0s to 999h59m59s or 0.0m to 9999h59.9m (switchable with switch)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count input</td>
<td>PNP/NPN universal DC voltage input</td>
<td>AC/DC multi-voltage input</td>
<td>No-voltage input</td>
<td>PNP/NPN universal DC voltage input</td>
<td>AC/DC multi-voltage input</td>
<td>No-voltage input</td>
</tr>
<tr>
<td>Case color</td>
<td>Black</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attachment</td>
<td>Waterproof gasket, panel-mounting bracket, time unit labels (See Note 2.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approved standard</td>
<td>UL508, CSA C22.2 No.14, Lloyds Conforms to EN61010-1/IEC61010-1 (pollution degree2/overvoltage category III)</td>
<td>Conforms to VDE0106/P100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. Only PNP/NPN universal DC voltage input models (-H models) are available with a backlight.
2. “-hours,” “-d-h,” “-h-m,” and “-h-m-s” labels are included.
3. Wire-wrap terminals (Y92S-37) can be ordered separately.

### RATINGS

<table>
<thead>
<tr>
<th>Item</th>
<th>H7ET-NV□-B, H7ET-NV□-BH</th>
<th>H7ET-NFV□-B</th>
<th>H7ET-N□-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>Backlight model: 24 VDC (for backlight)</td>
<td>Not required (powered by battery)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No-backlight model: Not required (powered by battery)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count input</td>
<td>High (logic) level: 4.5 to 30 VDC Low (logic) level: 0 to 2 VDC (Input impedance: Approx. 4.7 kΩ)</td>
<td>High (logic) level: 24 to 240 VAC/ VDC, 50/60 Hz Low (logic) level: 0 to 2.4 VAC/ VDC, 50/60 Hz</td>
<td>No voltage input Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 750 kΩ min.</td>
</tr>
<tr>
<td>Reset input</td>
<td>No voltage input Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 750 kΩ min.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum pulse width</td>
<td>1 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reset system</td>
<td>External reset and manual reset: minimum signal width of 20 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal screw</td>
<td>0.98 N • m max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tightening torque</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating: -10°C to 55°C (14°F to 131°F) with no condensation or icing Storage: -25°C to 65°C (-13°F to 149°F) with no condensation or icing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>Operating: 25% to 85%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHARACTERISTICS

<table>
<thead>
<tr>
<th>Item</th>
<th>H7ET-NV□□□□</th>
<th>H7ET-NVF□□□□</th>
<th>H7ET-N□□□□</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time accuracy</td>
<td>±100 ppm (25°C)</td>
<td>100 MΩ min. (at 500 VDC)</td>
<td>100 MΩ min. (at 500 VDC)</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>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</td>
<td>100 MΩ min. (at 500 VDC) between current-carrying metal parts and exposed non-current-carrying metal parts, and between count input terminals and reset terminals</td>
<td>100 MΩ min. (at 500 VDC) between current-carrying metal parts and exposed non-current-carrying metal parts</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>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</td>
<td>3,700 VAC, 50/60 Hz for 1 min between count input terminals and exposed non-current-carrying metal parts</td>
<td>1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and exposed non-current-carrying metal parts</td>
</tr>
<tr>
<td>Impulse withstand voltage</td>
<td>4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts</td>
<td>4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts</td>
<td>4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts</td>
</tr>
<tr>
<td>Noise immunity</td>
<td>Between input terminals: ±600 V in normal mode, ±1.5 kV in command mode</td>
<td>Between count input terminals: ±1.5 kV in normal mode, ±1.5 kV in command mode</td>
<td>±500 V in normal mode, ±1.5 kV in command mode</td>
</tr>
<tr>
<td>Static immunity</td>
<td>±8 kV (malfunction)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Malfunction: 0.15-mm single amplitude at 10 to 55 Hz for 10 min each in 3 directions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td>Malfunction: 200 m/s² (approx. 20G) 3 times each in 6 directions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery life</td>
<td>10 years min. with continuous input at 25°C (lithium battery)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMC</td>
<td>EN50081-1</td>
<td>EN55022 class B</td>
<td>EN61000-4-2: 4-kV contact discharge (level 2) 8-kV air discharge (level 3)</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>Front panel: IP66, NEMA4 with waterproof packing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (see note)</td>
<td>Non-backlight model: Approx. 60 g</td>
<td>Approx. 60 g</td>
<td>Approx. 60 g</td>
</tr>
</tbody>
</table>

Note: Weight includes waterproof gasket and panel-mounting bracket.
Nomenclature

TIME COUNTER

- **Reset Key**: Reset the count value. Not operable under key-protect.
- **Key-protect Switch**: Time-range switch. If the switch setting is changed, press the Reset Key on the front panel.
- **Setting** (see note) **Key-protect**
  - Front panel: OFF (default setting)
  - Terminal block: ON

<table>
<thead>
<tr>
<th>Setting (see note)</th>
<th>Time range</th>
</tr>
</thead>
<tbody>
<tr>
<td>H7ET-N□□□□□□□□□</td>
<td>0.0h to 3999d23.9h (default setting)</td>
</tr>
<tr>
<td>H7ET-N□□□□1-□□□□□</td>
<td>0s to 999h59m59s (default setting)</td>
</tr>
<tr>
<td>Front panel</td>
<td>0.0h to 999999.9h</td>
</tr>
<tr>
<td>Terminal block</td>
<td>0.0m to 9999h59.9m</td>
</tr>
</tbody>
</table>

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

Operation

- **OPERATING MODES**

  **H7ET Time Counter**

  **Incrementing Operation** (Up)
Dimensions

Unit: mm (inch)

■ H7ET-N

Dimensions with Panel-Mounting Bracket

Panel Cutout

Separate mounting

Joint mounting

Waterproofing is not possible for joint mounting

- 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 gasket.

- 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 Time Counter rotated horizontally 180°

<table>
<thead>
<tr>
<th>Backlight Model</th>
<th>Non-backlight Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timer input</td>
<td>Timer input</td>
</tr>
<tr>
<td>Reset input</td>
<td>Reset input</td>
</tr>
<tr>
<td>+ Backlight 24 VDC</td>
<td></td>
</tr>
</tbody>
</table>

Backlight Model

Non-backlight Model
Connections

**PNP/NPN UNIVERSAL DC VOLTAGE INPUT MODEL WITH BACKLIGHT**

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

![Contact Input Diagram]

- Relay
- Input Reset
- Open collector of an NPN transistor
- Open collector of a PNP transistor

2. Solid-state Input

![Solid-state Input Diagram]

- Input Reset
- Backlight 24 VDC
- Open collector of a PNP transistor
- Open collector of an NPN transistor

**Note:**
1. Terminals 2 and 4 (input circuit and reset circuit) are functionally isolated.
2. Select input transistors according to the following:
   - Dielectric strength of the collector \( \geq 50 \text{ V} \)
   - Leakage current < 1 \( \mu \text{A} \)
**NO-VOLTAGE INPUT MODEL**

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

   ![Diagram of NO-VOLTAGE INPUT MODEL](image)

   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. OMRON's G3TA-IA/ID is recommended as the SSR.

2. Solid-state Input

   ![Diagram of NO-VOLTAGE INPUT MODEL](image)

   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, allowing easy connection.

3. Select input transistors according to the following:
   - Dielectric strength of the collector ≥ 50 V
   - Leakage current < 1 µA

**AC/DC MULTI-VOLTAGE INPUT MODEL**

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

   ![Diagram of AC/DC MULTI-VOLTAGE INPUT MODEL](image)

2. Solid-state Input

   ![Diagram of AC/DC MULTI-VOLTAGE INPUT MODEL](image)

   Note: Terminals 2 and 4 (input circuit and reset circuit) are functionally isolated.

3. Select input transistors according to the following:
   - Dielectric strength of the collector ≥ 50 V
   - Leakage current < 1 µA

**PNP/NPN UNIVERSAL DC VOLTAGE INPUT MODEL WITHOUT BACKLIGHT**

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

   ![Diagram of PNP/NPN UNIVERSAL DC VOLTAGE INPUT MODEL WITHOUT BACKLIGHT](image)

   2. Solid-state Input

      ![Diagram of PNP/NPN UNIVERSAL DC VOLTAGE INPUT MODEL WITHOUT BACKLIGHT](image)

      or Open collector of an NPN transistor

      or Open collector of a PNP transistor

      Note: 1. Terminals 2 and 4 are internally connected.
          2. 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, allowing easy connection.

   2. Select input transistors according to the following:
      - Dielectric strength of the collector ≥ 50 V
      - Leakage current < 1 µA
Accessories (Order Separately)

An H7ET is supplied with a mounting bracket and nut. In addition, the panel-mounting adapters shown here allow the H7ET to be fitted to existing panel cutouts.

**Y92F-75 PANEL-MOUNTING ADAPTER FOR 26 × 45 RECTANGULAR CUTOUT**

Must be used with mounting bracket supplied with the Counter

![Diagram of Y92F-75 adapter]

**Y92F-77B PANEL-MOUNTING ADAPTER FOR 24.8 × 48.8 RECTANGULAR CUTOUT**

Must be used with mounting bracket supplied with the Counter

![Diagram of Y92F-77B adapter]

**Y92S-37 Wire-Wrap Terminal (Set of Two Terminals)**

The wire-wrap terminals have a cross sectional dimension of 1x1 mm. Select one of three guages of wire from the table at right. Also listed in the table is the appropriate wiring hardware.

<table>
<thead>
<tr>
<th>Wire</th>
<th>Bit</th>
<th>Sleeve</th>
<th>Wrapped state</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG22</td>
<td>2-A</td>
<td>2-B</td>
<td>Normal</td>
</tr>
<tr>
<td>AWG24</td>
<td>1-A</td>
<td>1-B</td>
<td>Normal</td>
</tr>
<tr>
<td>AWG26</td>
<td>1-B</td>
<td>1-B</td>
<td>Normal</td>
</tr>
</tbody>
</table>
H7ET

Y92S-36 REPLACEMENT (LITHIUM) BATTERY (3 V)

Precautions

**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 H7ET-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 locations subject to:
- Severe changes in temperature.
- Condensation as the result of high temperatures.

**MOUNTING PRECAUTIONS FOR PANEL-MOUNTING**
Although the operating section is watertight (conforming to NEMA 4, IP66), a rubber gasket is provided to avoid water leakage through the gap between the Counter and panel cutout. Unless this rubber gasket is tightly squeezed on, water may permeate inside the panel. For this reason, be sure to tighten the screws for fixing the panel-mounting bracket.

**Screw for the Panel-Mounting Bracket**

- The wider side must face the panel.
- Adapter screw section 0.5 to 1 mm
- Tighten the screw until the distance is within the range shown above.
**RESET INPUT AND COUNT INPUT**

The H7ET operates using a Battery. If the H7ET 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 H7ET may be reset or count by one. Such devices should not be connected to the H7ER.

If an excessive voltage is applied to the count 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 input: 240 VAC (peak voltage: 338 V)
  - At reset input: 3 VDC (no-voltage input)

No-voltage input model: 3 VDC

Do not remove the outer case when voltage is being applied to the power supply terminals or to the input terminals.

The input for the H7E□-NF□-□ is a high-impedance circuit so influence from an induced voltage may result in malfunction.

When the input signal wiring is longer than 10 m (stray capacitance of 120 pF/m, at room temperature), a CR filter or a bleeder resistor should be connected.

**COUNT INPUT OR RESET INPUT TO MORE THAN ONE H7ET COUNTER AT A TIME**

PNP/NPN Universal DC Voltage Input

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

\[ H = \frac{4.7 \text{ (kΩ)}}{N} + V \]

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

**INPUT AND POWER SUPPLY**

Do not apply voltage on the Counter if the Counter is a model that operates with no-voltage input, or 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, to avoid malfunction.

When connecting a sensor to the Counter that operates with no-voltage input, make sure that the sensor has open collector output.

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, stray capacitance may occur.

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 AC/DC 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.

**BACKLIGHT POWER SUPPLY**

To reduce variation in the brightness of the backlight when using more than one H7ET 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**

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, be sure that you 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 H7ET-N,-NV,-NV1). (5)

When the internal Battery nears expiration, the display may flicker.

EN/IEC STANDARDS

The counter input, reset input, and backlight power supply terminals of the no-voltage input or PNP/NPN universal DC voltage input models (H7ET-N,-N1, H7ET-NV(-H),-NV1(-H)) are not isolated.

A SELV power supply conforming to Appendix H of IEC61010-1 should be used for the counter 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 Vrems with 42.4 V peak or 60 VDC max. (Only the H7ET-NV-H has a backlight.)

The terminals for counter 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.