

# NPS SERIES

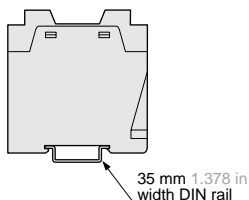
## ON / OFF Input Sensor Controller



Multi-functional slim sensor controller

### DIN rail mounting

Mountable on 35 mm 1.378 in DIN rail by one-push. It reduces mounting space and mounting operations.

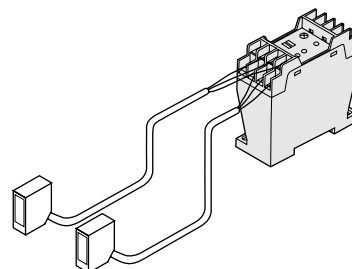


### Two outputs: contact and non-contact

Useful for various applications because the controller has two outputs, relay contact and NPN open-collector transistor output. (NPS-C7 and NPS-CT7 only)

### Connects two sensors **NPS-C7W**

Two sensors can be connected, and two independent outputs are generated.

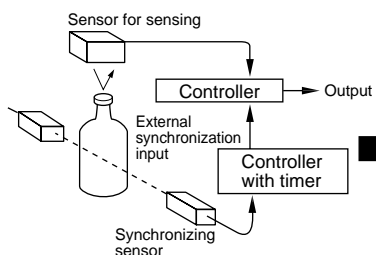


### Edge trigger **NPS-CT7**

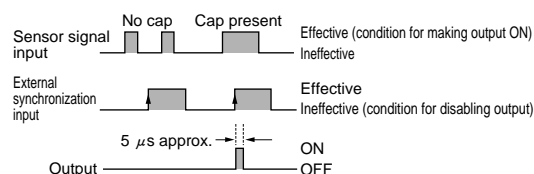
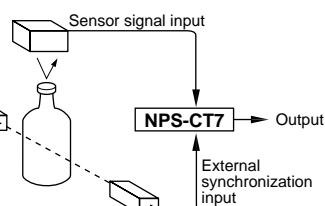
Synchronized input is possible at either the rising or the falling edge of the external synchronization signal. With this, now only one controller suffices where earlier two were required in applications, such as, detecting presence of bottle caps.

#### Example: Detecting presence of cap on bottle

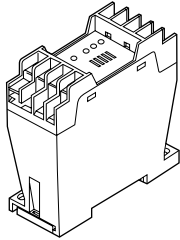
##### • Conventional method



##### • Using NPS-CT7

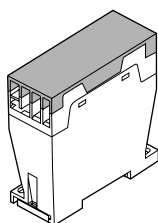


## ORDER GUIDE

| Type                  | Appearance  | Model No.      | Supply voltage                | Power supply for sensor           | Output  | External synchronization function | Timer function                  |
|-----------------------|---|----------------|-------------------------------|-----------------------------------|---|-----------------------------------|---------------------------------|
| General use           |  | <b>NPS-C7</b>  | 100 to 240 V AC<br>$\pm 10\%$ | 12 V DC $\pm 10\%$<br>150 mA max. | <ul style="list-style-type: none"> <li>Relay contact 1c</li> <li>NPN open-collector transistor</li> </ul> | Gate trigger                      | _____                           |
| High-performance      |   | <b>NPS-CT7</b> |                               | 12 V DC $\pm 10\%$<br>130 mA max. |   | Gate trigger and edge trigger     | Three function selectable timer |
| Two sensor connection |   | <b>NPS-C7W</b> |                               | 12 V DC $\pm 10\%$<br>120 mA max. | Relay contact 1c<br>two outputs   | _____                             | _____                           |

## Accessory

- **NPS-CV** (Protection cover)



| ON / OFF Input | NPS      |
|----------------|----------|
| Analog Input   | CA       |
| CA2            |          |
| Power Supply   | PS-18V-U |

SPECIFICATIONS

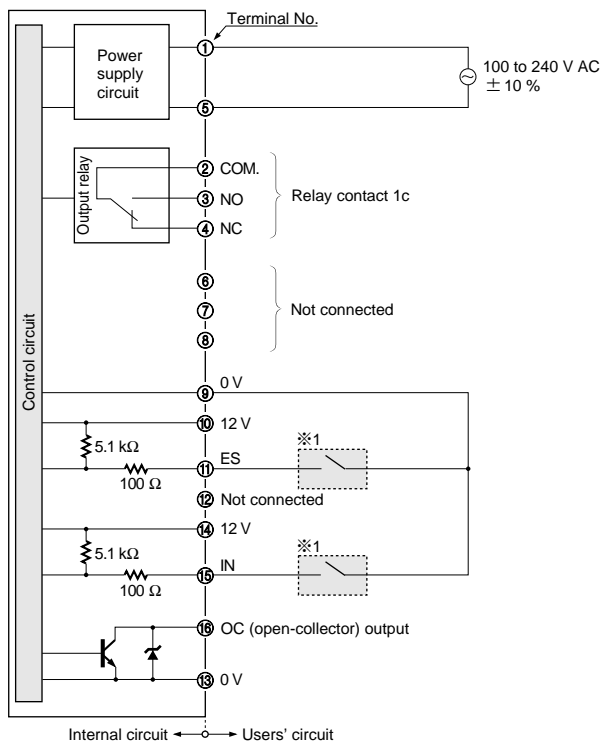
| Type                              |   | DIN rail mounting  |  |                       |
|-----------------------------------|---|--|--|-----------------------|
|                                   |   | General use  | High-performance   | Two sensor connection |
| Item                              | Model No.   | NPS-C7   | NPS-CT7  | NPS-C7W               |
| Applicable sensors                |   | Photoelectric sensor, inductive proximity sensor, etc., with NPN transistor output or relay output   |  |                       |
| Supply voltage                    |   | 100 to 240 V AC $\pm$ 10 %   |  |                       |
| Power consumption                 |   | 6 VA or less   |  |                       |
| Power supply for sensor           | Voltage   | 12 V DC $\pm$ 10 % (incorporated with short-circuit protection)  |  |                       |
|                                   | Current   | 150 mA   | 130 mA   | 120 mA                |
| Output                            | <div> <div>Relay contact 1c</div> <ul style="list-style-type: none"> <li>Switching capacity: 250 V 3 A AC (resistive load)</li> <li>Electrical life: 100,000 switching operations or more (rated load)(at 1,800 operations/hour)</li> <li>Mechanical life: 10 million switching operations or more (at 36,000 operations/hour)</li> </ul> </div> <div> <div>NPN open-collector transistor</div> <ul style="list-style-type: none"> <li>Maximum sink current: 100 mA or less</li> <li>Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>Residual voltage: 1 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)</li> </ul> </div> <div> <div>Relay contact 1c</div> <ul style="list-style-type: none"> <li>Switching capacity: 250 V 3 A AC (resistive load)</li> <li>Electrical life: 100,000 switching operations or more (rated load)(at 1,800 operations/hour)</li> <li>Mechanical life: 10 million switching operations or more (at 36,000 operations/hour)</li> </ul> </div> |  |  |                       |
|                                   | Output operation  | Switchable normal operation or inverse operation   |  |                       |
| Response time                     |   | Relay contact: 10 ms approx., NPN open-collector transistor: 5 $\mu$ s or less   |  | 10 ms approx.         |
| Indicators                        | Power   | Red LED (lights up when the power is ON)   |  |                       |
|                                   | Output (Note)   | Red LED (lights up when the output is ON)  |  |                       |
|                                   | Sensor signal input   | _____  | Red LED ( lights up when the sensor signal input is effective )  | _____                 |
|                                   | External synchronization input  | _____  | Red LED ( lights up when the external synchronization input is effective )                             | _____                 |
| External synchronization function |   | Gate trigger   | Gate trigger and edge trigger  | _____                 |
| Timer function                    |   | _____  | Three function selectable timer (Delay time: switchable either 40 ms to 1 sec. or 0.4 sec. to 10 sec.) | _____                 |
| Environmental resistance          | Ambient temperature   | - 10 to + 50 $^{\circ}$ C + 14 to + 122 $^{\circ}$ F (No dew condensation or icing allowed), Storage: - 30 to + 70 $^{\circ}$ C - 22 to + 158 $^{\circ}$ F |  |                       |
|                                   | Ambient humidity  | 35 to 85 % RH, Storage: 35 to 85 % RH  |  |                       |
|                                   | Noise immunity  | Power line: 1,500 Vp, and 0.5 $\mu$ s pulse width (with noise simulator)   |  |                       |
|                                   | Voltage withstandability  | 1,500 V AC for one min. between the power and the output terminals   |  |                       |
|                                   | Insulation resistance   | 10 M $\Omega$ , or more, with 500 V DC megger between the power and the output terminals   |  |                       |
|                                   | Vibration resistance  | 10 to 55 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each  |  |                       |
|                                   | Shock resistance  | 100 m/s <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions for two times each   |  |                       |
| Material                          |   | Enclosure: ABS, Terminal block: PBT (Glass fiber reinforced)   |  |                       |
| Connecting method                 |   | Terminal block   |  |                       |
| Weight                            |   | 160 g approx.  |  |                       |
| Accessories                       |   | Short bar: 1 pc., <b>NPS-CV</b> (Protection cover): 1 pc., Short-circuit protection plate: 1 pc. Adjusting screwdriver: 1 pc. ( <b>NPS-CT7</b> only)       |  |                       |

Note: In **NPS-C7W**, two output indicators, Sensor 1 output indicator and Sensor 2 output indicator, have been incorporated.

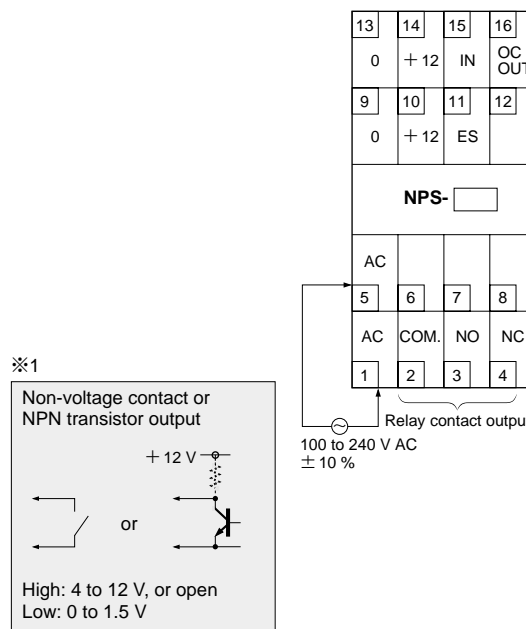
## I/O CIRCUIT AND WIRING DIAGRAMS

### NPS-C7 NPS-CT7

#### I/O circuit diagram

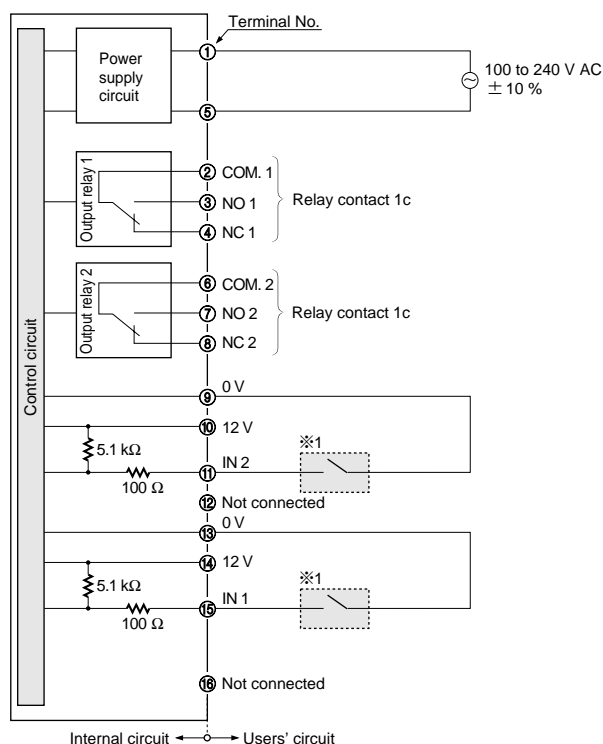


#### Terminal arrangement diagram

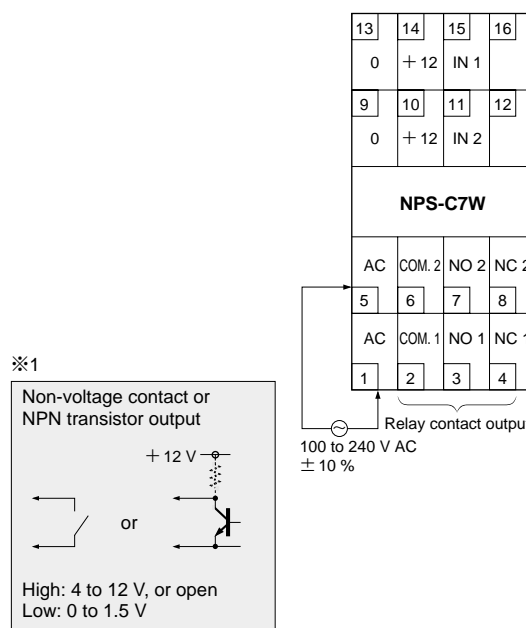


### NPS-C7W

#### I/O circuit diagram



#### Terminal arrangement diagram



| ON / OFF Input | NPS      |
|----------------|----------|
| Analog Input   | CA       |
| Power Supply   | PS-18V-U |

# NPS

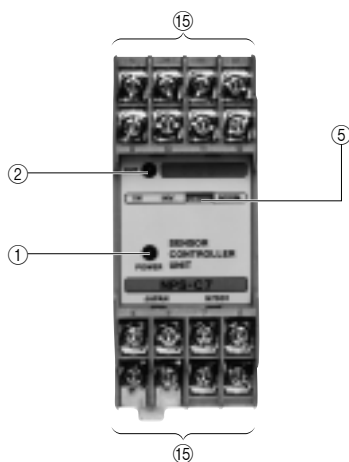
## PRECAUTIONS FOR PROPER USE



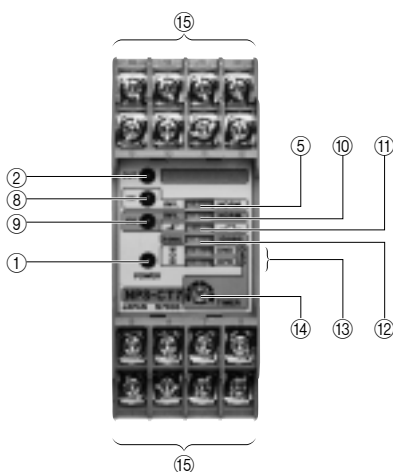
This product is not a safety controller. It does not possess control functions needed for accident prevention or safety maintenance.

### Functional description

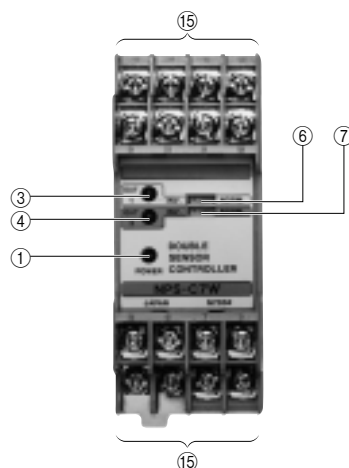
#### NPS-C7



#### NPS-CT7



#### NPS-C7W

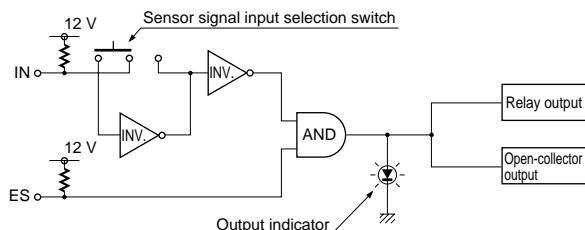


|   | Description  | Function   |
|---|--|--|
| ① | Power indicator (Red LED)                          | Lights up when the power is ON   |
| ② | Output indicator (Red LED)                         | Lights up when the output is ON.   |
| ③ | Sensor 1 output indicator (Red LED)                |  |
| ④ | Sensor 2 output indicator (Red LED)                |  |
| ⑤ | Sensor signal input selection switch               | <p>Selects the output operation.</p> <p>INV. <input type="checkbox"/> NORM.</p> <p>INV.: The output is ON when the sensor signal input is High.</p> <p>NORM.: The output is ON when the sensor signal input is Low.</p>  |
| ⑥ | Sensor 1 output operation mode switch              | <p>Selects the output operation.</p> <p>INV. <input type="checkbox"/> NORM.</p> <p>INV.: The output is ON when the sensor signal input is High.</p> <p>NORM.: The output is ON when the sensor signal input is Low.</p>  |
| ⑦ | Sensor 2 output operation mode switch              |  |
| ⑧ | Sensor signal input indicator (Red LED)            | <p>Indicates the state of the sensor signal input. The operation differs according to the mode set with ⑤ Sensor signal input selection switch.</p> <p>INV.: Lights up when the sensor signal input is High.</p> <p>NORM.: Lights up when the sensor signal input is Low.</p>  |
| ⑨ | External synchronization input indicator (Red LED) | <p>Indicates the state of the external synchronization input.</p> <p>Lights up when the external synchronization input does not disable the output.</p>  |
| ⑩ | External synchronization operation mode switch     | <p>Selects the operation of external synchronization.</p> <p>INV. <input type="checkbox"/> NORM.</p> <p>INV.: The output is neglected when the external synchronization input is High.</p> <p>NORM.: The output is neglected when the external synchronization input is Low.</p>   |
| ⑪ | Gate / Edge trigger operation mode switch          | <p>Selects Gate trigger or Edge trigger.</p> <p><input type="checkbox"/> <input type="checkbox"/></p> <p><input type="checkbox"/> : Effective at the instant the external synchronization input is applied.</p> <p><input type="checkbox"/> : Effective over the period for which the external synchronization input is applied.</p> |
| ⑫ | Delay time selection switch                        | <p>Selects the delay time.</p> <p>1 sec. <input type="checkbox"/> 10 sec.</p> <p>1 sec.: Variable from 40 ms approx. to 1 sec. approx.</p> <p>10 sec.: Variable from 0.4 sec. approx. to 10 sec. approx.</p>   |
| ⑬ | Timer operation mode switch                        | <p>Selects the timer operation.</p> <p>① ② ③ ④</p> <p>Ineffective ON-delay OFF-delay ONE SHOT</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>              |
| ⑭ | Timer adjuster                                     | Set the delay time.  |
| ⑮ | Terminal block                                     |  |

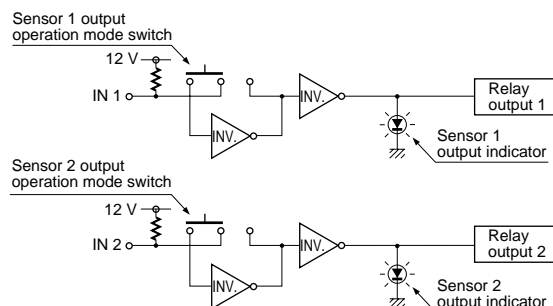
## PRECAUTIONS FOR PROPER USE

**Block diagrams** (The diagrams below explain NPS's operation in a simple manner. The actual circuits may differ slightly.)

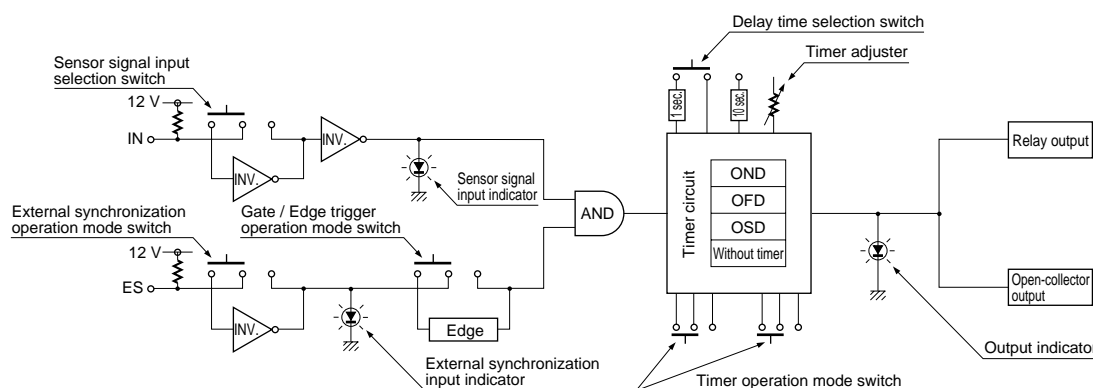
### NPS-C7



### NPS-C7W



### NPS-CT7



## Timer functions (NPS-CT7 only)

- **NPS-CT7** has three types of convenient built-in timer functions.

### ON-delay (OND)

<Function>: Neglects short output signals.

<Application>: As only long signals are extracted, this function is useful for detecting if a line is choked or for sensing only objects taking a long time to travel.

### OFF-delay (OFD)

<Function>: Extends the output signal for a fixed period of time.

<Application>: This function is useful if the output signal is so short that the connected device cannot respond.

### ONE SHOT (OSD)

<Function>: Outputs a fixed width signal upon sensing.

<Application>: This function is useful when the input specifications of the connected device require a signal of fixed width. Of course, it is also useful for extending a short width signal to a desired width.

## Selection switch and timer operation

| Switch setting                |                           | Sensor signal input                 | Output operation |      |
|-------------------------------|---------------------------|-------------------------------------|------------------|------|
| Sensor signal input selection | Timer operation selection |                                     |                  |      |
| NORM.                         | OND                       | Input not inverted normal operation | ON               | High |
|                               | OFD                       | Input not inverted normal operation | OFF              | Low  |
|                               | OSD                       | Input not inverted normal operation | ON               | High |
|                               | OND                       | Input not inverted ON-delay         | ON               | High |
|                               | OFD                       | Input not inverted OFF-delay        | OFF              | Low  |
|                               | OSD                       | Input not inverted ONE SHOT         | ON               | High |
| INV.                          | OND                       | Input inverted normal operation     | ON               | High |
|                               | OFD                       | Input inverted normal operation     | OFF              | Low  |
|                               | OSD                       | Input inverted ON-delay             | ON               | High |
|                               | OFD                       | Input inverted OFF-delay            | OFF              | Low  |
|                               | OSD                       | Input inverted ONE SHOT             | ON               | High |
|                               | Without timer             | Input inverted normal operation     | ON               | High |

Timer period: T = Switchable, either 40 ms approx. to 1 sec. approx., or 0.4 sec. approx. to 10 sec. approx.

Various other applications are possible.

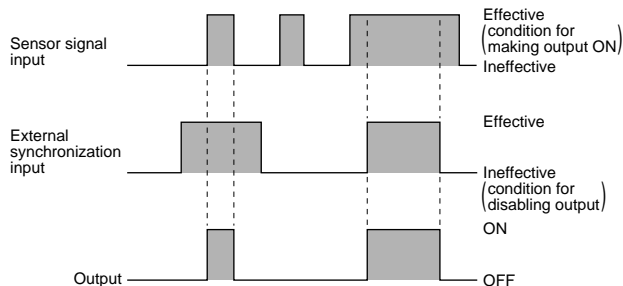
# NPS

## PRECAUTIONS FOR PROPER USE

### External synchronization function (NPS-C7, NPS-CT7 only)

#### • Gate trigger

The output is disabled when the external synchronization input is Low [mode selection switch on NORM. (Note)] or is High [mode selection switch on INV. (Note)] .



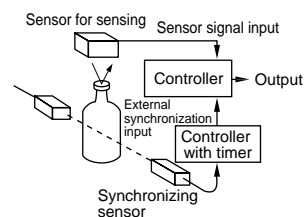
Note: Since **NPS-C7** is not incorporated with the selection switch, the output is disabled only when the external synchronization input is Low.

#### • Edge trigger (NPS-CT7 only)

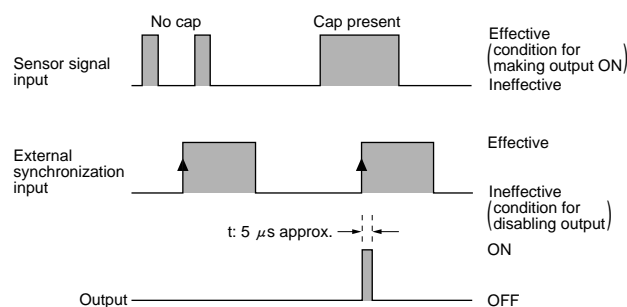
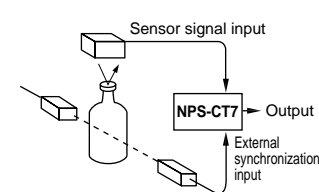
The sensor signal is judged at the instant the external synchronization input rises up or falls down. This sensor is ideal for cap presence detection that would have required two controllers in the past.

**Example: Detecting presence of cap on bottle**

#### <Conventional>



#### <NPS-CT7>



Note: As the output time 't' is only 5  $\mu$ s approx., extend it by using the OFF-delay timer or the ONE SHOT timer.

### Mounting

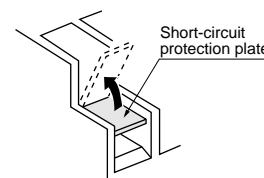
- To mount **NPS** with screws, use M4 screws. The tightening torque should be 0.78 N·m or less.

### Wiring

- Make sure that the power supply is off while wiring.
- Verify that the supply voltage variation is within the rating.

#### • Short-circuit protection plate

The short-circuit protection plate is attached to terminal No. 1 to prevent AC short-circuit. Flip the plate up, connect the wire to terminal No. 1, and then flip it down.

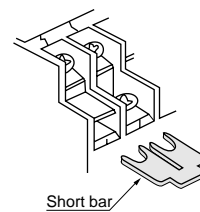
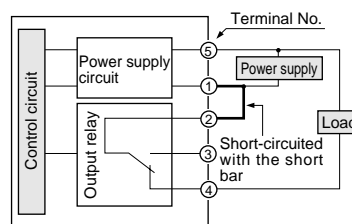


#### • Short bar

The short bar saves wiring when a common power supply is used for the AC supply terminal and the load supply of the relay contact output.

The short bar is attached between the terminal Nos. 1 and 2 at the time of shipment from our factory. To use a separate power supply for the output relay, make sure to remove it.

#### Typical wiring diagram



### • Dimensions of suitable crimp terminals

Unit: mm in

| Y-shaped type   | Round type  |
|---|---|
| <p>3.2 0.126 or more<br/>10 0.394 or less<br/>6 0.236 or less<br/>19 0.748 or less<br/>(When crimped)</p> | <p><math>\phi</math>3.2 <math>\phi</math>0.126 or more<br/>10 0.394 or less<br/>6 0.236 or less<br/>19 0.748 or less<br/>(When crimped)</p> |

Note: Use crimp terminals having insulation sleeves.

Recommended crimp terminal: Nominal size 1.25-3

- NPS-C7** and **NPS-CT7** do not incorporate a short-circuit protection at the NPN open-collector transistor output. Do not connect them directly to a power supply or a capacitive load.
- The response time of the NPN open-collector transistor output of **NPS-C7** or **NPS-CT7** is 5  $\mu$ s. If a relay or a micro-switch (mechanical contact) is connected, take care since its bounce may result in output chattering.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.

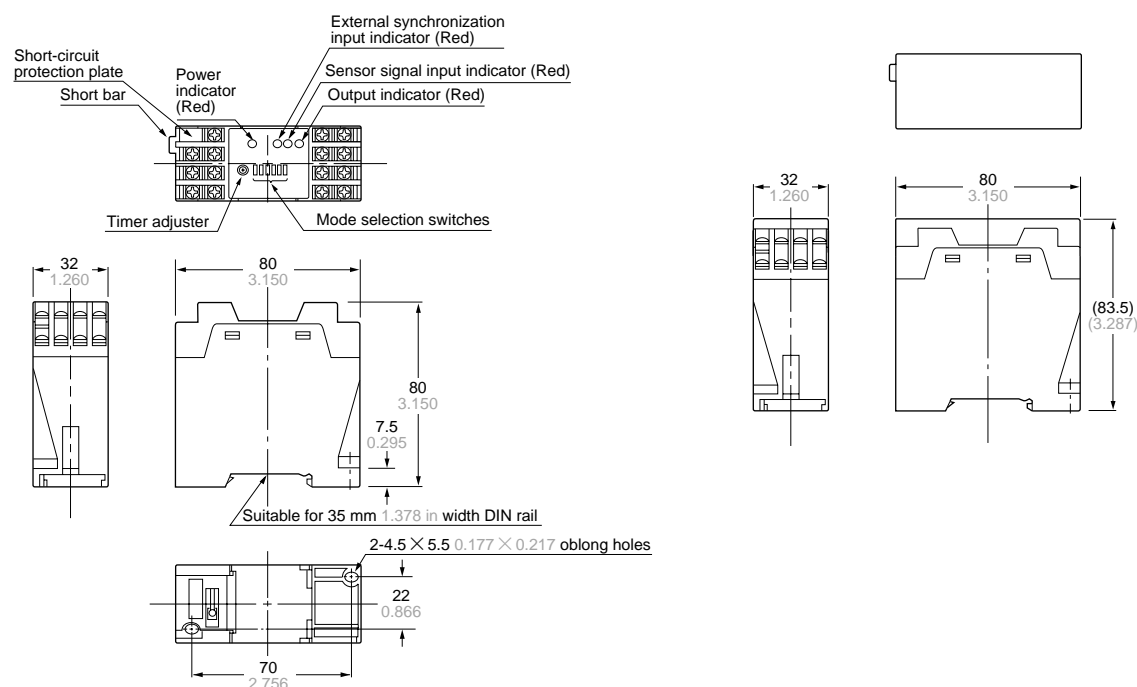
### Others

- Do not use during the initial transient time (0.5 sec.) after the power supply is switched on.
- Avoid dust, dirt, and steam.
- Take care that the controller does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.

**DIMENSIONS (Unit: mm in)** The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>

**NPS-□**

## Assembly dimensions with attached protection cover



- Notes: 1) The above drawing illustrates the dimensions of **NPS-CT7**.  
The dimensions of **NPS-C7** and **NPS-C7W** are identical to those given above.  
2) The front panel of each model is different.  
Refer to p.850 for more details of the front panels.

| ON / OFF Input | NPS      |
|----------------|----------|
|                |          |
| Analog Input   | CA       |
|                |          |
| Power Supply   | PS-18V-U |
|                |          |