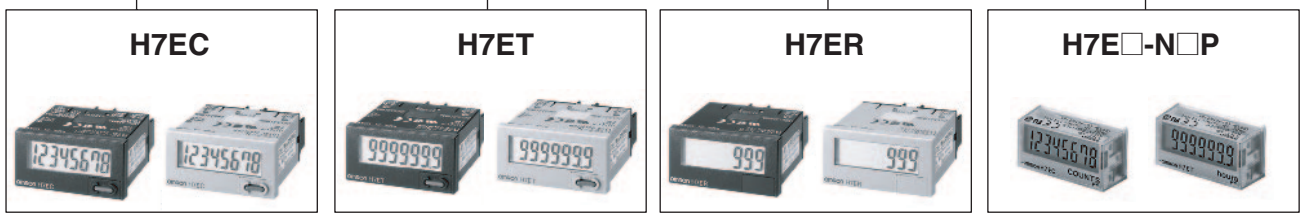
Self-powered Totalizer
H7E

Compact Economical Totalizer with High Visibility Available with Backlit LCD Display

- Large display with 8.6-mm character height.
- Includes new models with backlight for improved visibility in dimly lit places. (Requires 24-VDC power supply.)
- Black and light-gray cases now available.
- PNP/NPN universal DC voltage input types now available.
- Battery is replaceable for Totalizer reuse and conservation of the environment.
- Key-protect switch to prevent faulty reset key operation.
- Dual operation mode.
- Front face compatible with NEMA4/IP66.
- Short body, all models have a depth of 48.5 mm.
- Finger protection terminal block conforms to VDE0106 Part100.
- Conforms to UL, CSA, and CE marking.
  Conforms to EN61010-1 (pollution degree 2/overvoltage category III.)
- Conforms to EMC standards and EN61326, thus allowing use in residential, commercial and light- and heavy-industry environments.
- Six-language instruction manual provided.
- PCB-mounting models available. (Requires 3-V power supply.)

■ Broad Line-up of the H7E Series

H7E



Total Counter
- 8-digit

Time Counter
- 999999.9h/ 3999d23.9h
- 999h59min59s/ 9999h59.9min

Tachometer
- 1,000 s^{-1} with 1 pulse/rev. encoder
- 1,000.0 s^{-1} with 10 pulse/rev. encoder
- 1,000 min^{-1} with 60 pulse/rev. encoder
- 10,000 min^{-1} with 60 pulse/rev. encoder
- 1,000.0 min^{-1} with 600 pulse/rev. encoder

PCB-mounting Counter
- Total Counter (8-digit)
- Time Counter (999999.9h)

Contents

Self-powered Total Counter
H7EC

- Eight-digits, counting range 0 to 99999999.
- Dual input speed: 30 Hz ←→ 1 kHz (except for AC/DC multi-voltage input models)

Model Number Structure

■ Model Number Legend

H7EC - N □ - □ □
1 2 3

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

2. Case Color
None: Light gray
B: Black

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

Ordering Information

■ Total Counters

Count input	Max. counting speed	Display	Model	
			Light-gray body	Black body
PNP/NPN universal DC voltage input	30 Hz ←→ 1 kHz (switchable)	7-segment LCD with backlight	H7EC-NV-H	H7EC-NV-BH
		7-segment LCD	H7EC-NV	H7EC-NV-B
AC/DC multi-voltage input	20 Hz	7-segment LCD	H7EC-NFV	H7EC-NFV-B
No-voltage	30 Hz ←→ 1 kHz (switchable)	7-segment LCD	H7EC-N	H7EC-N-B

■ Accessories (Order Separately)

Lithium Battery	Y92S-36	
Wire-wrap Terminal (set of two Terminals)	Y92S-37	
Compact Flush Mounting Bracket (See note.)	Y92F-35	
Flush Mounting Adapter	26 mm × 45.3 mm	Y92F-75
	27.5 mm × 52.5 mm	Y92F-76
	24.8 mm × 48.8 mm	Y92F-77B

Note: The New H7E models are supplied with a Y92F-34 Mounting Bracket.

Specifications

■ General

Item	H7EC-NV-□ H7EC-NV-□H	H7EC-NFV-□	H7EC-N-□
Operating mode	Up type		
Mounting method	Flush mounting		
External connections	Screw terminals, optional Wire-wrap Terminals (see note 1)		
Reset	External/Manual reset		
Number of digits	8		
Count input	PNP/NPN universal DC voltage input	AC/DC multi-voltage input	No-voltage input
Display	7-segment LCD with or without backlight, zero suppression (character height: 8.6 mm) (see note 2)		
Max. counting speed	30 Hz/1 kHz	20 Hz	30 Hz/1 kHz
Case color	Light gray or black (-B models)		
Attachment	Waterproof packing, flush mounting bracket		
Approved standard	UL863, CSA C22.2 No.14, Lloyds Conforms to EN61010-1/IEC61010-1 (Pollution degree2/overvoltage category III) Conforms to VDE0106/P100		

Note: 1. Separately ordered Wire-wrap Terminals (Y92S-37) are required.

2. Only PNP/NPN universal DC voltage input models (-H models) have a backlight.

■ Ratings

Item	H7EC-NV-□ H7EC-NV-□H	H7EC-NFV-□	H7EC-N-□
Supply voltage	Backlight model: 24 VDC (0.3 W max.) (only for backlight) 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)	High (logic) level: 24 to 240 VAC/VDC, 50/60 Hz Low (logic) level: 0 to 2.4 VAC/VDC, 50/60 Hz	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		No voltage input Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 750 kΩ min.	
Max. counting speed (see note)	30 Hz or 1 KHz (Switchable with switch)	20 Hz	30 Hz or 1 KHz (Switchable with switch)
Minimum signal width	20 Hz: 25 ms 30 Hz: 16.7 ms 1 KHz: 0.5 ms		
Reset system	External reset and manual reset: Minimum signal width of 20 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%		

Note: ON/OFF ratio 1:1

■ Characteristics

Item	H7EC-NV-□ H7EC-NV-□H	H7EC-NFV-□	H7EC-N-□
Insulation resistance	100 MΩ min. (at 500 VDC) between current-carrying metal parts and exposed non-current-carrying metal parts, and between the backlight power supply terminal 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 and between count input terminals and reset terminals	100 MΩ min. (at 500 VDC) between current-carrying metal parts and exposed non-current-carrying metal parts
Dielectric strength	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 terminal and count input terminals/ reset terminals for backlight models	3,700 VAC, 50/60 Hz for 1 min between current-carrying metal parts and exposed non-current-carrying metal parts 2,200 VAC, 50/60 Hz for 1 min between reset terminals and exposed non-current-carrying metal parts and between count input terminals and reset terminals	1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and exposed non-current-carrying metal parts
Impulse withstand voltage	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts 3 kV between input terminals and reset terminals	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts
Noise immunity	Square-wave noise generated by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)		
	±600 V (Between count input terminals/ Between reset terminals) ±480 V (Between the backlight power supply terminals for backlight models)	±1.5 kV (Between count input terminals) ±500 V (Between reset terminals)	±500 V (Between count input terminals/ Between reset terminals)
Static immunity	±8 kV (malfunction)		
Vibration resistance	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		
Shock resistance	Malfunction: 200 m/s^2 3 times each in 6 directions Destruction: 300 m/s^2 3 times each in 6 directions		
EMC	(EMI) EN61326 Emission Enclosure: EN55011 Group 1 class B (EMS) EN61326 Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference from AM Radio Waves: EN61000-4-3: 10 V/m (80 MHz to 1 GHz) (level 3) Immunity RF-interference from Pulse-modulated Radio Waves: EN61000-4-3: 10 V/m (900 MHz ± 5 MHz) (level 3) Immunity Conducted Disturbance: EN61000-4-6: 10 V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2 kV power line (level 4) 2 kV I/O signal line (level 4)		
Degree of protection	Front panel: IP66, NEMA4 Terminal block: IP20		
Weight (see note)	No-backlight model: Approx. 60 g Backlight model: Approx. 65 g	Approx. 60 g	Approx. 60 g

Note: Weight includes waterproof packing and flush mounting bracket.

■ Reference Value

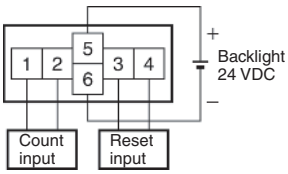
Item	Value	Note
Battery life	7 years min. with continuous input at 25°C (lithium battery)	The battery life is calculated according to the conditions in the left column and therefore is not a guaranteed value. Use these value as reference for maintenance or replacement.

Connections

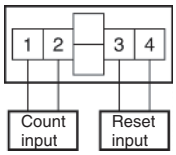
■ Terminal Arrangement

Bottom view: View of the Total Counter rotated horizontally 180°

Backlight Model



No-backlight Model

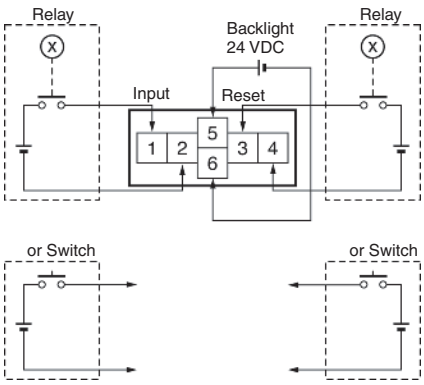


■ Connections

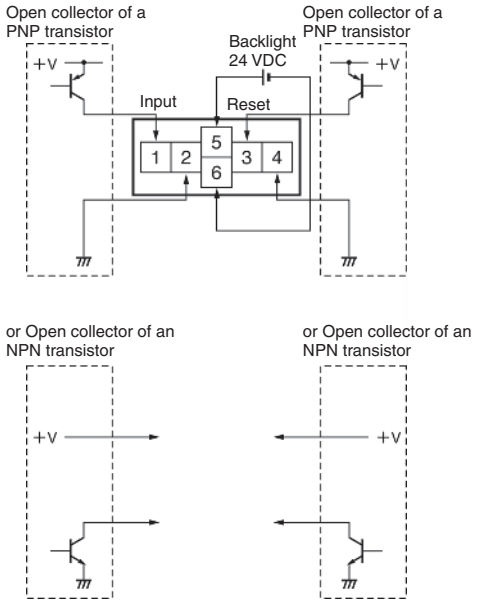
H7EC Total Counter

PNP/NPN Universal DC Voltage Input Model With Backlight

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



2. Solid-state Input

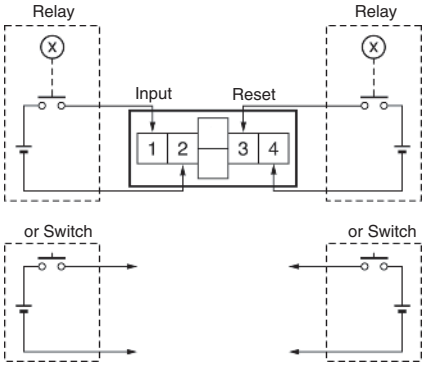


Note: 1. Terminals 2 and 4 (input circuit and reset circuit) are functionally isolated.

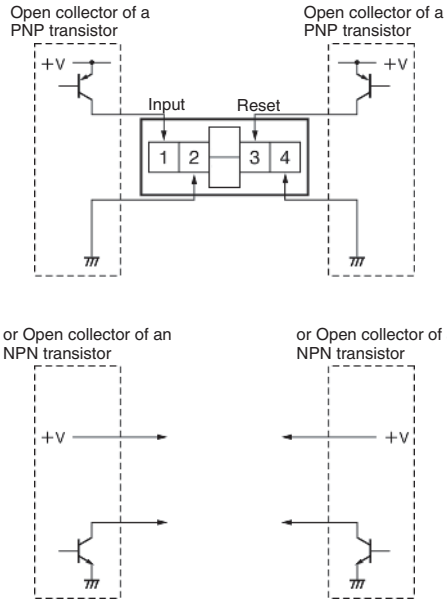
2. Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 100 μA

PNP/NPN Universal DC Voltage Input Model Without Backlight

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



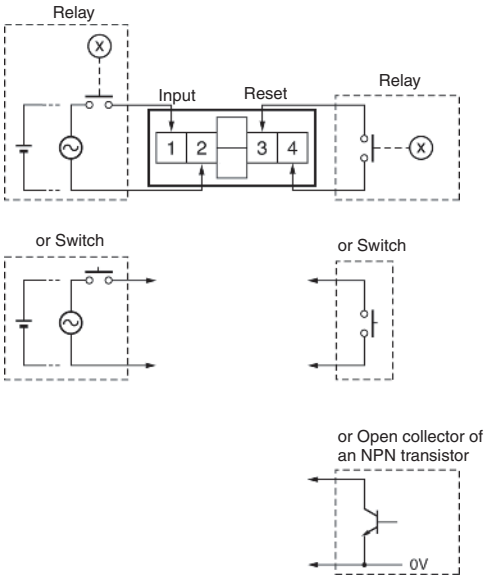
2. Solid-state Input



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 ≥ 50 V
Leakage current < 100 μA

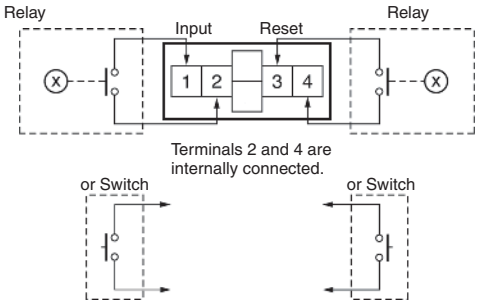
AC/DC Multi-voltage Input Model



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

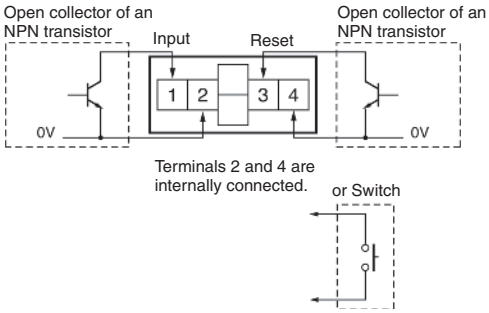
No-voltage Input Model

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



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

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



Note: 1. 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 small thus allowing easy connection.

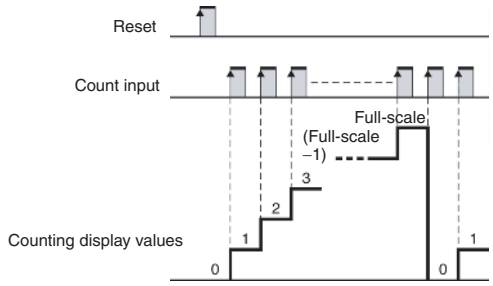
2. Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 1 μA

Operation

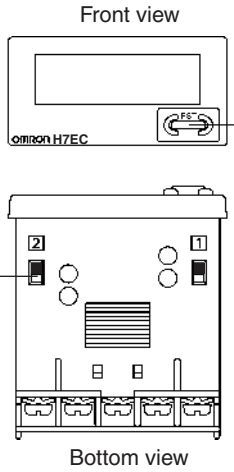
■ Operating Modes

H7EC Total Counter

Incrementing Operation (Up)



Nomenclature



Reset Key

Reset the count value. Not operable under key-protect.

Counting speed switch

For all models except for H7EC-NFV-□. If the counting speed setting is changed, the present value will not be held and so press the Reset Key on the front panel.

Setting (see note)	Counting speed
Front panel ↑ Concave side	30 Hz (default setting)
↓ Concave side Terminal block	1 kHz

Key-protect Switch

The Reset Key is not operable while the key-protect switch is set to ON.

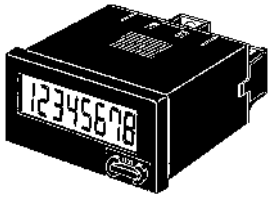
Setting (see note)	Key-protect
Front panel ↑ Concave side	OFF (default setting)
↓ Concave side Terminal block	ON

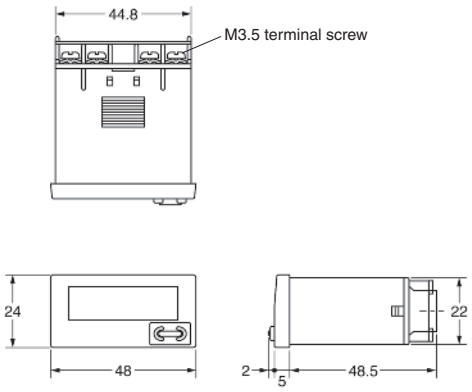
Note: Perform switch setting before mounting to a control panel.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

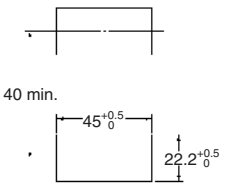
H7EC-N



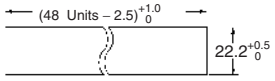


Panel Cutout

Separate mounting

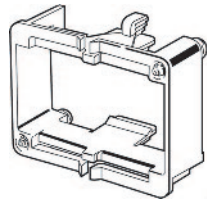


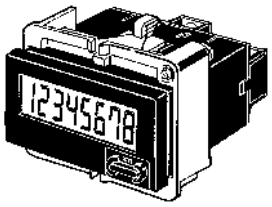
Dense mounting

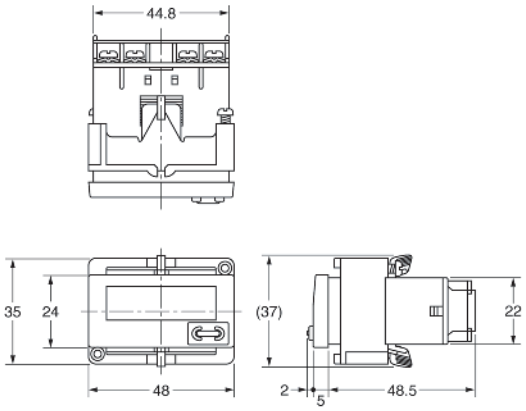


Waterproofing is not possible for dense mounting

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.

Note: A Compact Flush Mounting Bracket (Y92F-35) can also be used. Refer to *Accessories* for details.

Self-powered Time Counter
H7ET

- Seven digits, time range 0 to 3999d23.9h.
- Dual time range: 999999.9 ←→ 3999d23.9h or 999h59m59s ←→ 9999h59.9m

Model Number Structure

■ Model Number Legend

H7ET - N □ □ - □ □
1 2 3 4

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
None: Light gray
B: Black

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

Ordering Information

■ Time Counters

Timer input	Display	Time range			
		999999.9h ←→ 3999d23.9h (switchable)		999h59min59s ←→ 9999h59.9min (switchable)	
		Light-gray body	Black body	Light-gray body	Black body
PNP/NPN universal DC voltage input	7-segment LCD with backlight	H7ET-NV-H	H7ET-NV-BH	H7ET-NV1-H	H7ET-NV1-BH
	7-segment LCD	H7ET-NV	H7ET-NV-B	H7ET-NV1	H7ET-NV1-B
AC/DC multi-voltage input	7-segment LCD	H7ET-NFV	H7ET-NFV-B	H7ET-NFV1	H7ET-NFV1-B
No-voltage input	7-segment LCD	H7ET-N	H7ET-N-B	H7ET-N1	H7ET-N1-B

■ Accessories (Order Separately)

Lithium Battery	Y92S-36	
Wire-wrap Terminal (set of two terminals)	Y92S-37	
Compact Flush Mounting Bracket (See note.)	Y92F-35	
Flush Mounting Adapter	26 mm × 45.3 mm	Y92F-75
	27.5 mm × 52.5 mm	Y92F-76
	24.8 mm × 48.8 mm	Y92F-77B

Note: The New H7E models are supplied with a Y92F-34 Mounting Bracket.

Specifications

■ General

Item	H7ET-NV-□ H7ET-NV-□H	H7ET-NFV-□	H7ET-N-□	H7ET-NV1-□ H7ET-NV1-□H	H7ET-NFV1-□	H7ET-N1-□
Operating mode	Accumulating					
Mounting method	Flush mounting					
External connections	Screw terminals					
Reset	External/Manual reset					
Display	7-segment LCD with or without backlight, zero suppression (character height: 8.6 mm) (see note 1)					
Number of digits	7					
Time range	0.0h to 999999.9h ←→ 0.0h to 3999d23.9h (switchable with switch)			0s to 999h59min59s ←→ 0.0min to 9999h59.9min (switchable with switch)		
Timer input	PNP/NPN universal DC voltage input	AC/DC multi-voltage input	No-voltage input	PNP/NPN universal DC voltage input	AC/DC multi-voltage input	No-voltage input
Case color	Light gray or black (-B models)					
Attachment	Waterproof packing, flush mounting bracket, time unit labels (see note 2)					
Approved standard	UL863, CSA C22.2 No.14, Lloyds Conforms to EN61010-1/IEC61010-1 (pollution degree2/overvoltage category III) Conforms to VDE0106/P100					

Note: 1. Only PNP/NPN universal DC voltage input models (-H models) have a backlight.

2. “-hours”, “-d-h”, “-h-m”, and “-h-m-s” labels are included.

■ Ratings

Item	H7ET-NV□-□ H7ET-NV□-□H	H7ET-NFV□-□	H7ET-N□-□
Supply voltage	Backlight model: 24 VDC (0.3 W max.) (for backlight) No-backlight model: Not required (powered by built-in battery)	Not required (powered by built-in battery)	
Timer input	High (logic) level: 4.5 to 30 VDC Low (logic) level: 0 to 2 VDC (Input impedance: Approx. 4.7 kΩ)	High (logic) level: 24 to 240 VAC/VDC, 50/60 Hz Low (logic) level: 0 to 2.4 VAC/VDC, 50/60 Hz	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		No voltage input Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 750 kΩ min.	
Minimum pulse width	1 s		
Reset system	External reset and manual reset: Minimum signal width of 20 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	H7ET-NV□-□ H7ET-NV□-H□	H7ET-NFV□-□	H7ET-N□-□
Time accuracy	±100 ppm (25°C)		
Insulation resistance	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 timer 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 and between timer input terminals and reset terminals	100 MΩ min. (at 500 VDC) between current-carrying metal parts and exposed non-current-carrying metal parts
Dielectric strength	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 timer input terminals/reset terminals for backlight models	3,700 VAC, 50/60 Hz for 1 min between timer input terminals and exposed non-current-carrying metal parts 2,200 VAC, 50/60 Hz for 1 min between reset terminals and exposed non-current-carrying metal parts and between timer input terminals and reset terminals	1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and exposed non-current-carrying metal parts
Impulse withstand voltage	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts 3 kV between timer input terminals and reset terminals	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts
Noise immunity	Square-wave noise generated by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)		
	±600 V (Between timer input terminals/ Between reset terminals) ±480 V (Between the backlight power supply terminals for backlight models)	±1.5 kV (Between timer input terminals) ±500 V (Between reset terminals)	±500 V (Between timer input terminals/ Between reset terminals)
Static immunity	±8 kV (malfunction)		
Vibration resistance	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		
Shock resistance	Malfunction: 200 m/s² 3 times each in 6 directions Destruction: 300 m/s² 3 times each in 6 directions		
EMC	(EMI) EN61326 Emission Enclosure: EN55011 Group 1 class B (EMS) EN61326 Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference from AM Radio Waves: EN61000-4-3: 10 V/m (80 MHz to 1 GHz) (level 3) Immunity RF-interference from Pulse-modulated Radio Waves: EN61000-4-3: 10 V/m (900 MHz ± 5 MHz) (level 3) Immunity Conducted Disturbance: EN61000-4-6: 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)		
Degree of protection	Front panel: IP66, NEMA4 with waterproof packing Terminal block: IP20		
Weight (see note)	No-backlight model: Approx. 60 g Backlight model: Approx. 65 g	Approx. 60 g	Approx. 60 g

Note: Weight includes waterproof packing and flush mounting bracket.

■ Reference Value

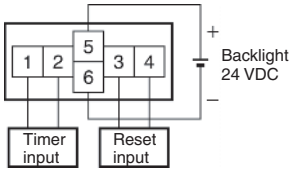
Item	Value	Note
Battery life	10 years min. with continuous input at 25°C (lithium battery)	The battery life is calculated according to the conditions in the left column and therefore is not a guaranteed value. Use these value as reference for maintenance or replacement.

Connections

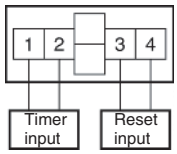
■ Terminal Arrangement

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

Backlight Model



No-backlight Model

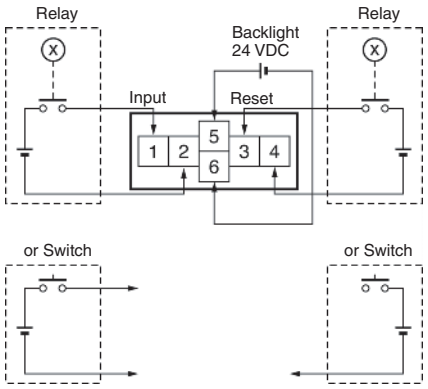


■ Connections

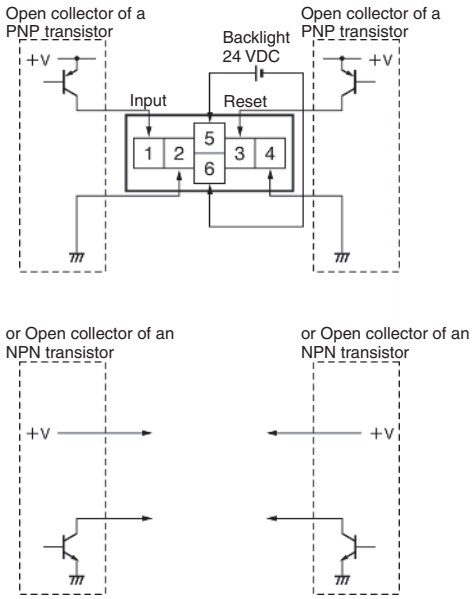
H7ET Time Counter

PNP/NPN Universal DC Voltage Input Model With Backlight

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



2. Solid-state Input

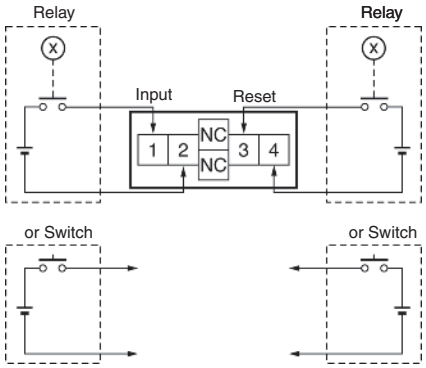


Note: 1. Terminals 2 and 4 (input circuit and reset circuit) are functionally isolated.

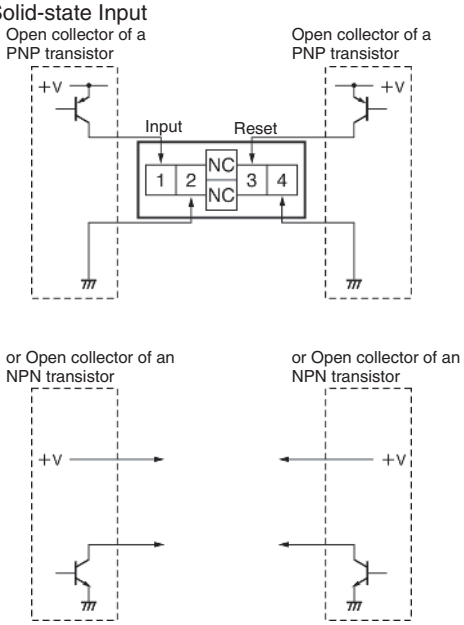
2. Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 1 μA

PNP/NPN Universal DC Voltage Input Model Without Backlight

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



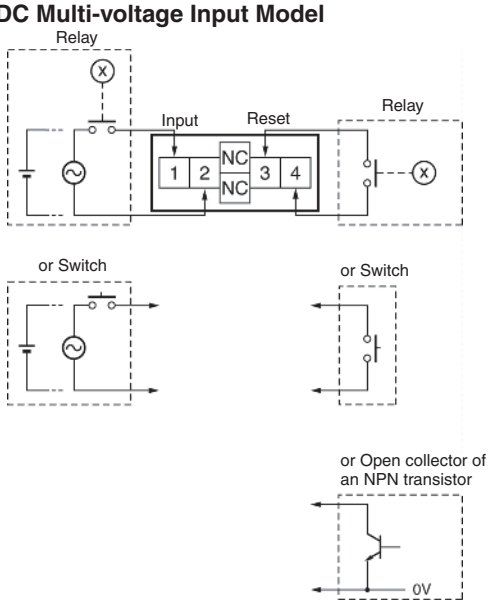
2. Solid-state Input



Note: 1. Terminals 2 and 4 (input circuit and reset circuit) are functionally isolated.

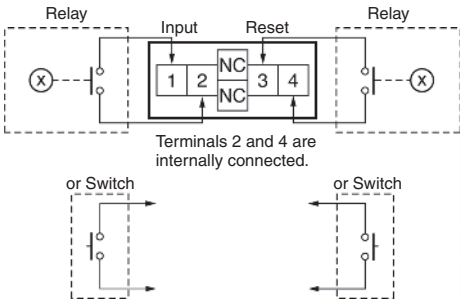
2. Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 1 μA

AC/DC Multi-voltage Input Model



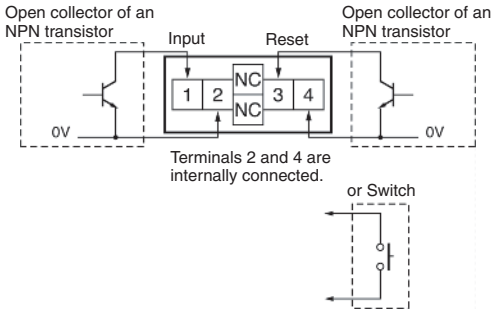
No-voltage Input Model

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



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 the SSR.

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



Note: 1. 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.

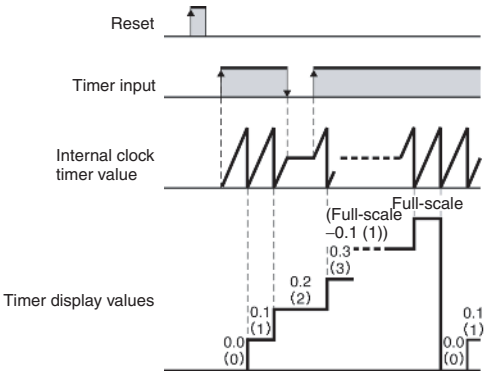
2. Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 1 μA

Operation

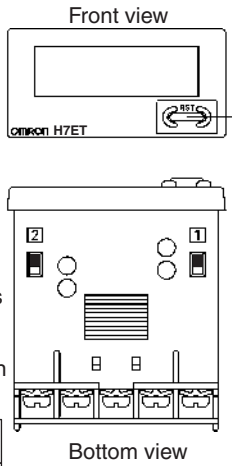
■ Operating Modes

H7ET Time Counter

Incrementing Operation (Up)



Nomenclature



Reset Key

Reset the count value. Not operable under key-protect.

Time-range switch

If the time-range setting is changed, the present value will not be held and so press the Reset Key on the front panel.

Key-protect Switch

The Reset Key is not operable while the key-protect switch is set to ON.

Setting (see note)	Key-protect
Front panel 	OFF (default setting)
 Terminal block	ON

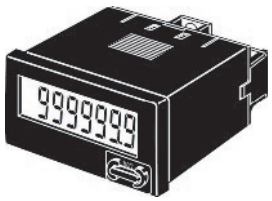
Setting (see note)	Time range	
	H7ET-N□□-□□	H7ET-N□□1-□□
Front panel 	0.0h to 3999d23.9h	0s to 999h59min59s (default setting)
 Terminal block	0.0h to 999999.9h (default setting)	0.0min to 9999h59.9min

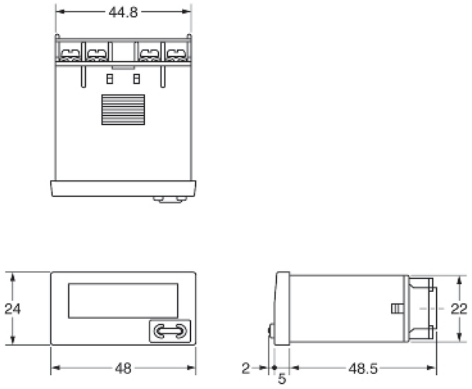
Note: Perform switch setting before mounting to a control panel.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

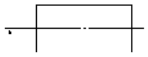
H7ET-N



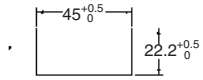


Panel Cutout

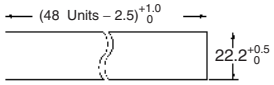
Separate mounting



40 min.

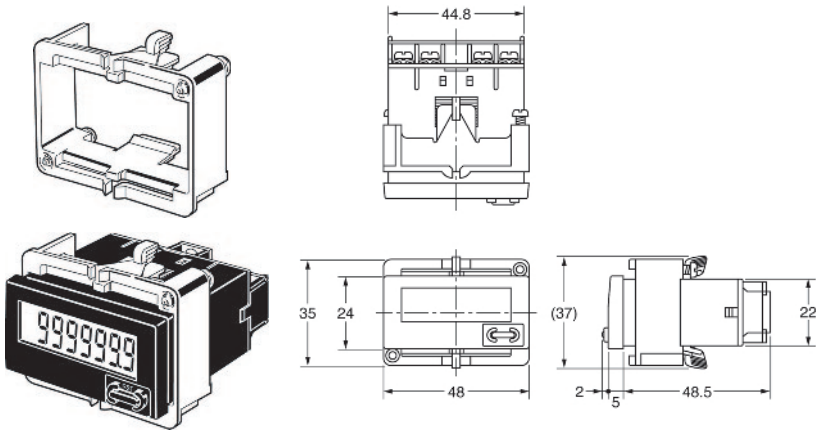


Dense mounting



Waterproofing is not possible for dense 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.

Note: A Compact Flush Mounting Bracket (Y92F-35) can also be used. Refer to *Accessories* for details.

Self-powered Tachometer
H7ER

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

Model Number Structure

■ 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

Ordering Information

■ Tachometers

Count input	Display	Max. revolutions displayed (applicable encoder resolution)			
		1000 s^{-1} (1 pulse/rev.), 1000 min^{-1} (60 pulse/rev.)		1000.0 s^{-1} (10 pulse/rev.), 1000.0 min^{-1} (600 pulse/rev.) ←→ 10000 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	---	---

■ Accessories (Order Separately)

Lithium Battery	Y92S-36	
Wire-wrap Terminal (Set of two Terminals)	Y92S-37	
Compact Flush Mounting Bracket (See note.)	Y92F-35	
Flush Mounting Adapter	26 mm × 45.3 mm	Y92F-75
	27.5 mm × 52.5 mm	Y92F-76
	24.8 mm × 48.8 mm	Y92F-77B

Note: The New H7E models are supplied with a Y92F-34 Mounting Bracket.

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, zero suppression (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 kHz
Max. revolutions displayed (see note 5)	1,000 s^{-1} (When encoder resolution of 1 pulse/rev is used.) 1,000 min^{-1} (When encoder resolution of 60 pulse/rev is used.)		1,000.0 s^{-1} (When encoder resolution of 10 pulse/rev is used.) 1,000.0 min^{-1} (When encoder resolution of 600 pulse/rev is used.) ←→ 10,000 min^{-1} (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	UL863, 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^{-1}" and "min^{-1}" 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.
Max. counting speed	4-digit models:1 kHz 5-digit models:10 kHz	1 kHz
Minimum signal width	10 kHz: 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-□
Insulation resistance	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
Dielectric strength	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
Impulse withstand voltage	4.5 kV between current-carrying terminal and exposed non-current-carrying metal parts	
Noise immunity	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)
Static immunity	±8 kV (malfunction)	
Vibration resistance	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	
Shock resistance	Malfunction: 200 m/s^2 3 times each in 6 directions Destruction: 300 m/s^2 3 times each in 6 directions	
EMC	(EMI) EN61326 Emission Enclosure: EN55011 Group 1 class B (EMS) EN61326 Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference from AM Radio Waves: EN61000-4-3: 10 V/m (80 MHz to 1 GHz) (level 3) Immunity RF-interference from Pulse-modulated Radio Waves: EN61000-4-3: 10 V/m (900 MHz ± 5 MHz) (level 3) Immunity Conducted Disturbance: EN61000-4-6: 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)	
Degree of protection	Front panel: IP66, NEMA4 with waterproof packing Terminal block: IP20	
Weight (see note)	No-backlight model: Approx. 60 g Backlight model: Approx. 65 g	

Note: Weight includes waterproof packing and flush mounting bracket.

■ Reference Value

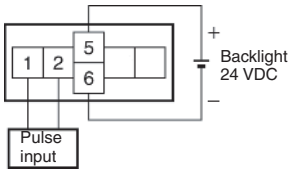
Item	Value	Note
Battery life	7 years min. with continuous input at 25°C (lithium battery)	The battery life is calculated according to the conditions in the left column and therefore is not a guaranteed value. Use these value as reference for maintenance or replacement.

Connections

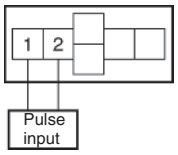
■ Terminal Arrangement

Bottom view: View of the Tachometer rotated horizontally 180°

Backlight Model



No-backlight Model

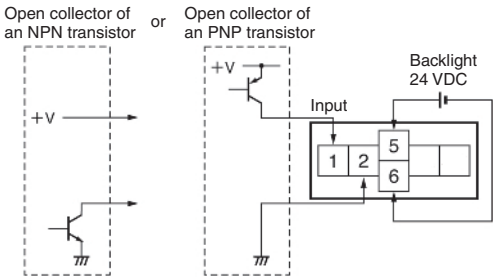


■ Connections

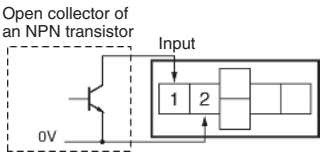
H7ER Tachometer

Note: Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 100 μA (1 μA for no-voltage input model)

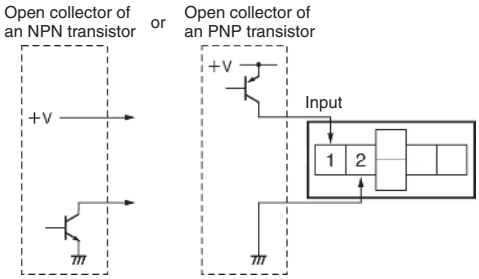
PNP/NPN Universal DC Voltage Input Models With Backlight
Transistor Input



No-voltage Input Model
Transistor Input (Open Collector of an NPN Transistor)



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

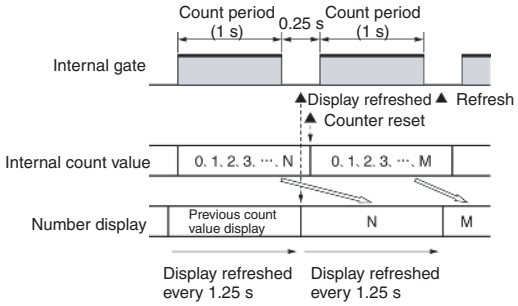


Operation

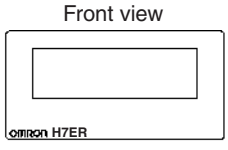
■ Operating Modes

H7ER Tachometer

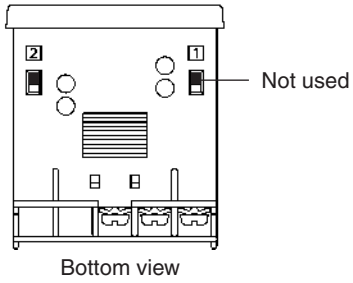
Incrementing Operation
Within Unit Time (Up)



Nomenclature



Counting speed switch
For H7ER-NV1-□□



Counting Speed Switch Settings and Unit Label Application

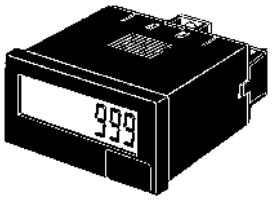
Model	Counting speed switch setting (see note)	Max. revolutions displayed	Applicable encoder resolution	Applicable unit label
H7ER-NV1-□□	Front panel Concave side	10000 min^{-1} (default setting)	60 pulse/rev.	"min^{-1}" or "rpm"
	Concave side Terminal block	1000.0 min^{-1}	600 pulse/rev.	"min^{-1}"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

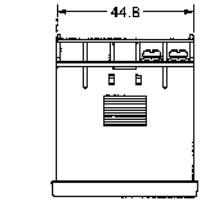
Note: Perform switch setting before mounting to a control panel.

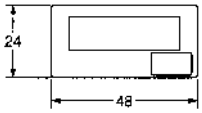
Dimensions

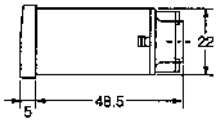
Note: All units are in millimeters unless otherwise indicated.

H7ER-N



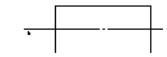




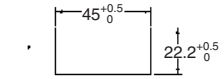


Panel Cutout

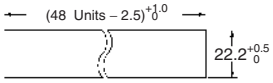
Separate mounting



40 min.

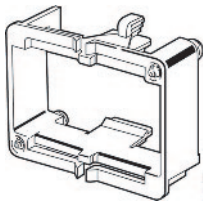


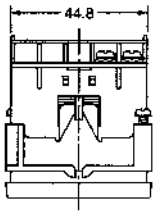
Dense mounting

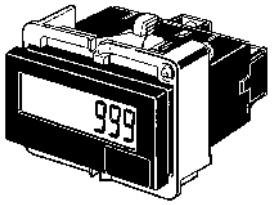


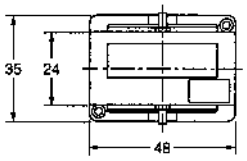
Waterproofing is not possible for dense mounting

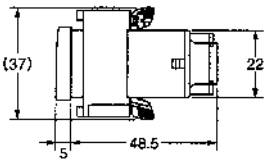
Dimensions with Flush Mounting Bracket









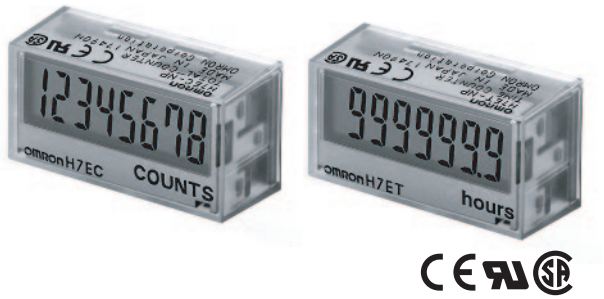


- When mounting, insert the Counter into the cutout, insert the adapter from the back and push in the Counter while making the gap between the front panel and the cutout panel as small as possible. Use screws to secure the Counter. If waterproofing is desired, insert the waterproof packing.
- When several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

Note: A Compact Flush Mounting Bracket (Y92F-35) can also be used. Refer to *Accessories* for details.

PCB-mounting Counters
H7E□-N□P

- Dedicated for use on PCB.
- Total Counters and Time Counter available.



Model Number Structure

■ Model Number Legend

H7E□- N□P
1 2

1. Function
C: Total Counter
T: Time Counter

2. Max. Counting Speed for H7EC Models
None: 1 kHz
L: 30 Hz

Ordering Information

■ PC Board-use Counters

Count input	Display	Total counter		Time counter
		Max. counting speed		
		1 kHz	30 Hz	
No-voltage input	7-segment LCD	H7EC-NP	H7EC-NLP	H7ET-NP

■ Accessory (Order Separately)

Connecting Socket (28-pin)	XR2A-2801-N

Specifications

■ General

Item	Total Counter		Time Counter
	H7EC-NP	H7EC-NLP	H7ET-NP
Operating mode	Up type		
Mounting method	Direct mounting on PC Board or mounting on 28-pin socket		
Reset	External reset, Power-OFF reset		
Number of digits	8		7
Time range	---		0.0h to 999999.9h
Max. counting speed	1 kHz	30 Hz	---
Count/Timer input	No-voltage input		
Display	7-segment LCD (character height: 8.6 mm)		
Case color	Transparent		
Approved standard	UL863, CSA C22.2 No.14		

■ Ratings

Item	H7EC-NP H7EC-NLP	H7ET-NP
Supply voltage	3 VDC (2.7 to 3.3 VDC)	
Count/Timer input **Reset input**	No voltage input Maximum short-circuit impedance: 10 kΩ max. Short-circuit residual voltage: 0.5 V max. Minimum open impedance: 750 kΩ min.	
Max. counting speed (see note)	1 kHz: Minimum signal width of 0.5 ms 30 Hz: Minimum signal width of 16.7 ms	---
Minimum signal input width	---	1 s
Reset system	External reset: Minimum signal width of 20 ms Power-OFF reset: Minimum power OFF time of 500 ms	
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%	

Note: ON/OFF ratio 1:1

■ Characteristics

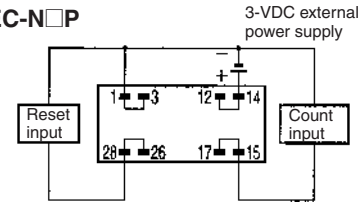
Item	H7EC-NP H7EC-NLP	H7ET-NP
Time accuracy	---	±100 ppm (25°C)
Noise immunity	Square-wave noise generated by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise) ±500 V (Between count or timer input terminals/Between reset terminals)	
Static immunity	±8 kV (malfunction)	
Vibration resistance	Malfunction:0.15-mm 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	
Shock resistance	Malfunction:200 m/s² 3 times each in 6 directions Destruction:300 m/s² 3 times each in 6 directions	
EMC	(EMI) EN61326 Emission Enclosure: EN55011 Group 1 class B (EMS) EN61326 Immunity ESD: EN61000-4-2: 4-kV contact discharge (level 2) 8-kV air discharge (level 3) Immunity RF-interference from AM Radio Waves: EN61000-4-3: 10 V/m (80 MHz to 1 GHz) (level 3) Immunity RF-interference from Pulse-modulated Radio Waves: EN61000-4-3: 10 V/m (900 MHz ± 5 MHz) (level 3) Immunity Conducted Disturbance (see note): EN61000-4-6: 10 V (0.15 to 80 MHz) (level 3) Immunity Burst (see note): EN61000-4-4: 2-kV I/O signal line (level 4)	
Weight	Approx. 20 g	

Note: The power supply terminals of the H7E□-N□P are considered as 3-VDC control terminals.

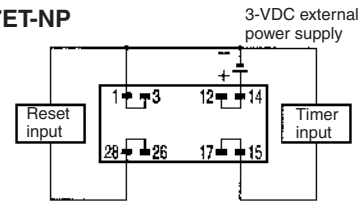
Connections

■ Terminal Arrangement

H7EC-N□P



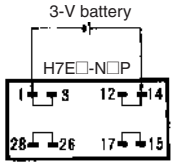
H7ET-NP



■ 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 supply can be calculated by the following formula:

$t = A/I_c$

Where,
t: Life expectancy of battery (h)
A: Battery capacity (mAh)
I_c: H7E□-N□P current consumption (mA)

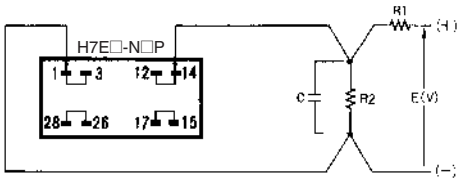
Example:
Battery life when using a 3-V lithium battery with a capacity of 1,200 mAh for the H7E□-N□P.

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

When necessary, the voltage from the battery may be divided by resistances:



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

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

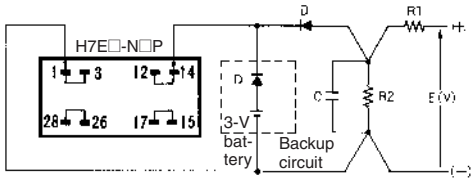
R	E		
	5 V	12 V	24 V
R_1	2 kΩ	9.1 kΩ	33 kΩ
R_2	3 kΩ	3 kΩ	4.7 kΩ

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

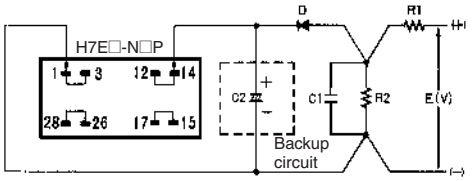
Backup Circuit for Protection Against Power Failure



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

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 power supplied to the H7E□-N□P has dropped to less than the voltage of the backup circuit, the battery will discharge.

To protect the circuit against a momentary power failure, an aluminum electrolyte capacitor can 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□-N□P (V)
I_c: H7E□-N□P current consumption (μA)

Example:
Backup time by an aluminum electrolytic capacitor of 100 μF. (Minimum operating voltage of H7E□-N□P is 2.6 V.)

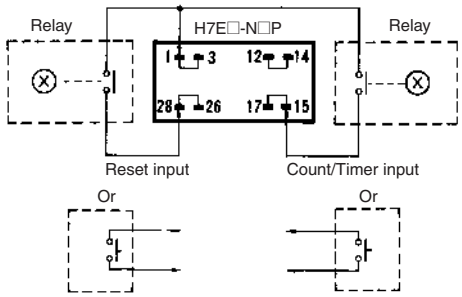
$t = 100\ \mu F \times (3\text{-}2.6\ V)/20\ \mu A = 100 \times 0.40/20 = 2.0$ seconds

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.

Keep the wiring between the H7E□-N□P and R_2 or C as short as possible (within 50 mm).

Input Connections

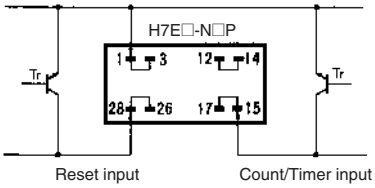
Input Connection Contact Input



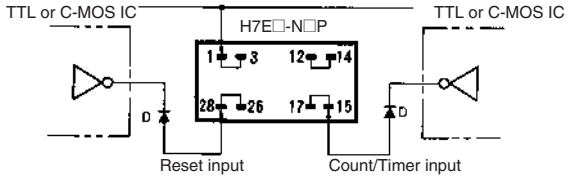
When the H7EC-NP is used, relay chattering may be counted. Use the H7EC-NLP, one of the low-speed input models.

Solid State Input

Open-collector Transistor Input



TTL or C-MOS IC Input



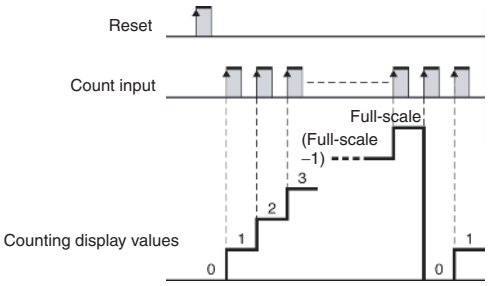
Use a transistor for input that satisfies the following conditions:
Collector breakdown voltage ≥ 50 V
Leakage current < 1 μA
Use a diode (D) having a forward voltage as small as possible (0.1 V max. at I_F of 20 μA).

Operation

■ Operating Modes

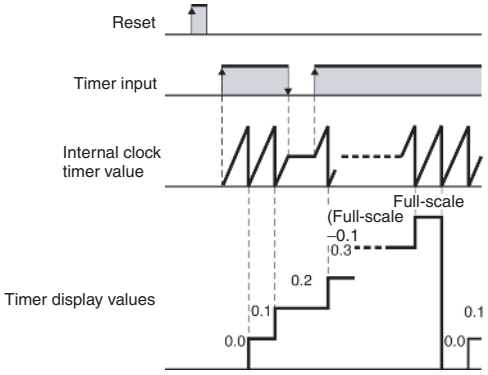
H7EC Total Counter

Incrementing Operation
(Up)



H7ET Time Counter

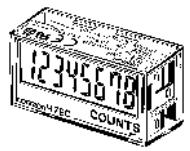
Incrementing Operation
(Up)



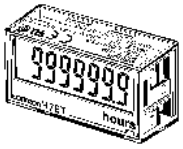
Dimensions

Note: All units are in millimeters unless otherwise indicated.

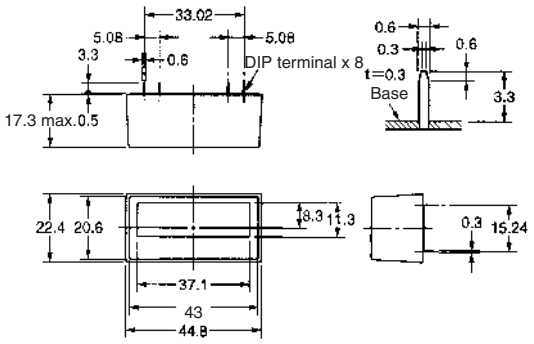
Flush Mounting
H7EC-N□P



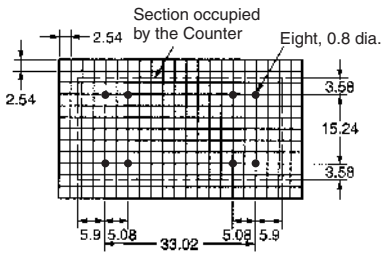
Flush Mounting
H7ET-NP



DIP Terminal



PCB Processing Dimensions (Soldering Surface)



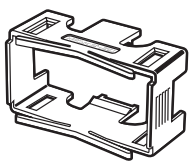
Note: Processing dimensions are for 28-pin IC socket.

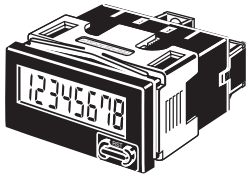
Accessories (Order Separately) (Common)

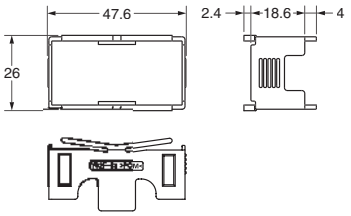
■ New H7E (Except for PCB-mounting Counter)

The New H7E models are supplied with a mounting bracket (Y92F-34) and nut. Additionally, the Y92F-75/-76/-77B Flush Mounting Adapters shown here allow the New H7E models to be fitted to existing panel cutouts.

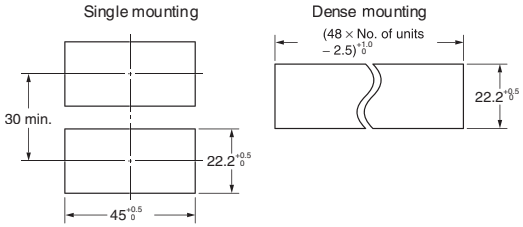
Y92F-35 Compact Flush Mounting Bracket







Panel Cutout

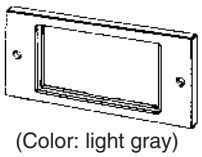


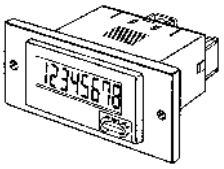
Degree of protection (front): IP40 (not waterproof)
The Y92F-76 adapter can be used. The DIP switch of the H7E□-N can be operated in mounted condition. Vibration resistance and shock resistant are the same level as the H7E□-N series.

- The minimum mounting interval is 30 mm.
  Note: An interval of 40 mm is recommended for easier wiring.
- Do not allow the ambient temperature of the H7E□-N to exceed the specifications (55°C).
- Mounting is possible onto panels with a thickness of 1 to 5 mm.

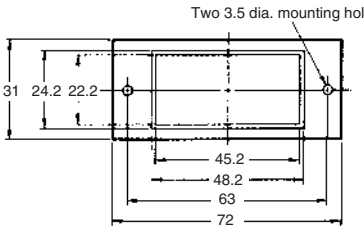
Y92F-75 Flush Mounting Adapter for 26 × 45.3 Rectangular Cutout

Use mounting bracket supplied with the Counter

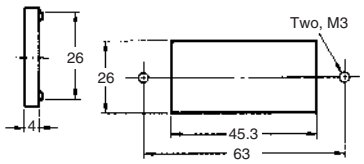




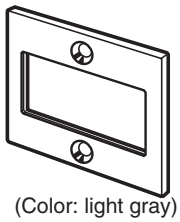
(Color: light gray)

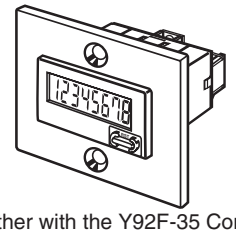


Panel Cutout

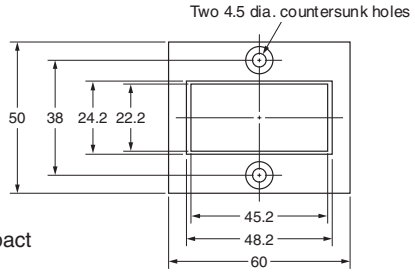


Y92F-76 Flush Mounting Adapter for 27.5 × 52.5 Rectangular Cutout

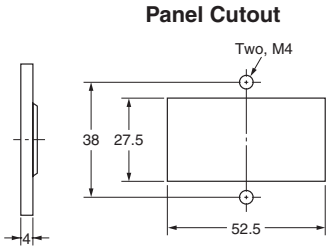




(Color: light gray)
Use the Y92F-76 together with the Y92F-35 Compact Flush Mounting Bracket.

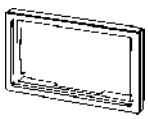


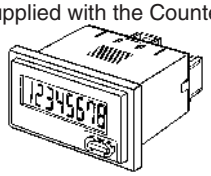
Panel Cutout



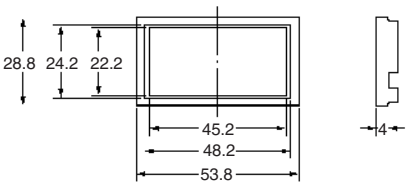
Y92F-77B Flush Mounting Adapter for 24.8 × 48.8 Rectangular Cutout

Use mounting bracket supplied with the Counter

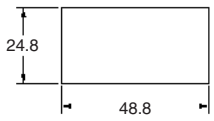




(Color: light gray)

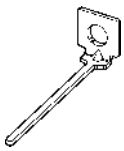


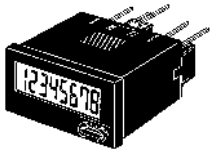
Panel cutout

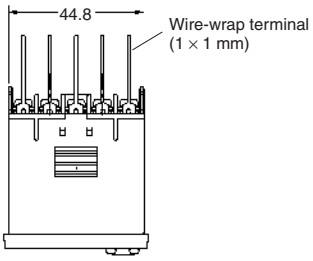


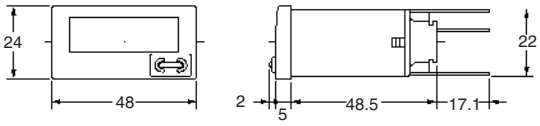
Note: The mounting panel thickness should be between 1 and 5 mm.

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





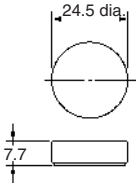




When using the Wire-wrap Terminal, be sure to use the correct wires and peripheral devices. (The correct wires, bits and sleeves are shown in the table on the right.)

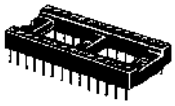
Wire	Bit	Sleeve	Wrapped state
AWG22	2-A	2-B	Normal
AWG24	1-A	1-B	Normal
AWG26	3-A	1-B	Normal

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 (Common)

■ 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.

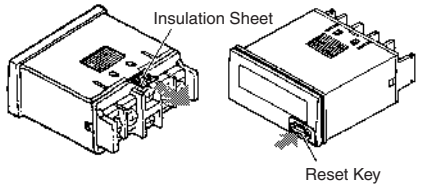
⚠ Caution

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.)

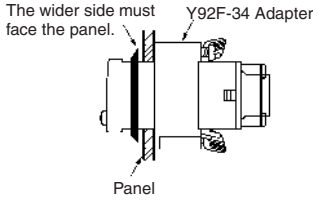


- Switch settings on the Counter must be performed before mounting it to a control panel.
- Do not use the Counter in the following locations:
  - Locations subject to severe changes in temperature.
  - Locations subject to condensation as the result of high humidity.

Mounting Precautions for Flush Mounting

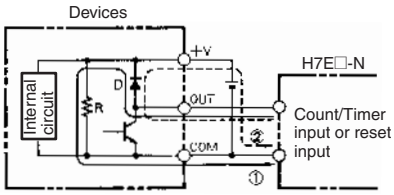
Although the operating section is watertight (conforming to NEMA4, IP66), rubber packing is provided to avoid water leakage through the gap between the Counter and panel cutout. Unless this rubber packing is tightly squeezed on, water may permeate inside the panel. Therefore, be sure to tighten the screws for fixing the Y92F-34 Flush Mounting Bracket. (Excessive tightening may also deform the rubber packing.)

Screw for the Flush Mounting Bracket



Reset Input and Count/Timer Input

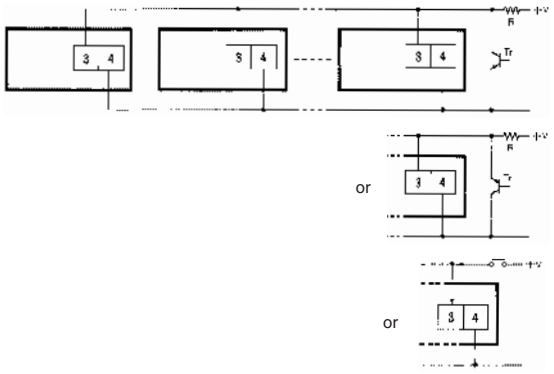
- The H7E operates using its built-in Battery. If the H7E is connected to a device that has +V and OUT terminals that are connected with a diode as shown in the circuit diagram, the circuit indicated by the arrow 1 or 2 will be formed when the device is turned OFF. As a result, the H7E may be reset or 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: No voltage can be applied. (No-voltage input)
  - No-voltage input model: No voltage can be applied.
- 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 Input, Timer Input or Reset Input to More than One H7E Counter at a Time

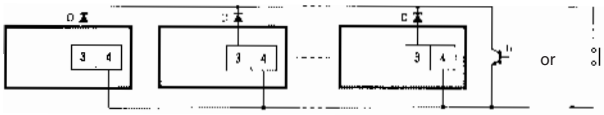
• PNP/NPN Universal DC Voltage Input



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

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

• No-voltage Input



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

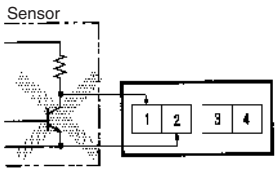
2. The forward voltage of the diode must be as low as possible (i.e., 0.1 V maximum with an I_F of 20 μA) so that the voltage between terminals 3 and 4 will be 0.5 V when the reset input is ON.

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.



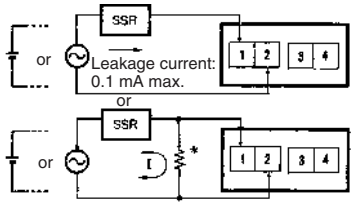
• When connecting an open collector input from a transistor to the Counter that operates with no-voltage input, make sure that the leakage current of the transistor is 1 μA maximum.

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

• The operation of the Counter may be affected if the capacitance of input lines 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

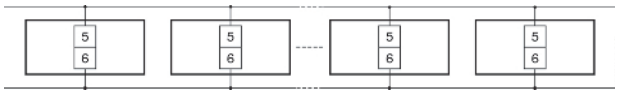
• When connecting count/timer input from an SSR to the Counter that operates with AC/DC voltage input, use OMRON's G3TA-IA/ID SSR (for DC) whose leakage current is 0.1 mA max. or connect a bleeder resistor in parallel to the input circuit of the Counter.



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

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.

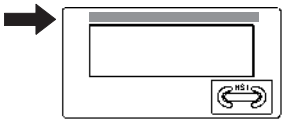
Input Verification with the H7ET Time Counter

(When the time range is not set to 0s to 999h59min59s)

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)

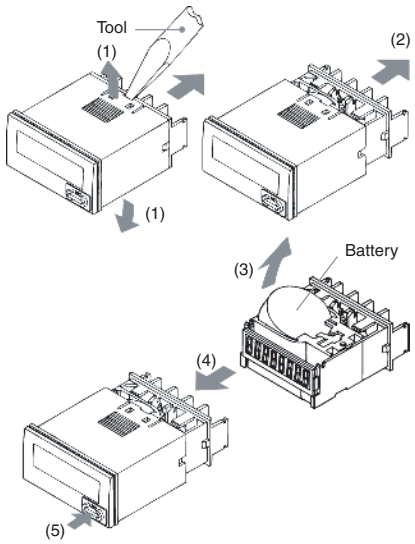
3. Lift the Battery up by the edge and remove it. (3)
When removing the Battery, do not come in contact with the display area or any internal parts.

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.

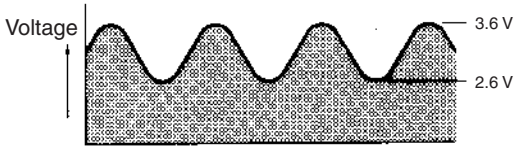
7. Press the Reset Key before use (not necessary for H7ER-N,-NV,-NV1). (5)



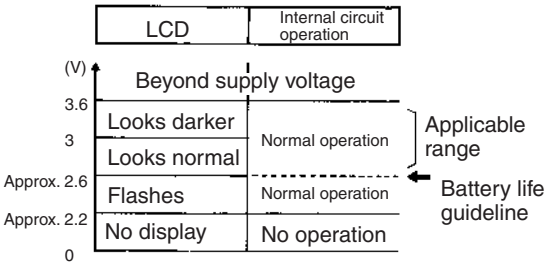
■ PCB-mounting Counter

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.



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.

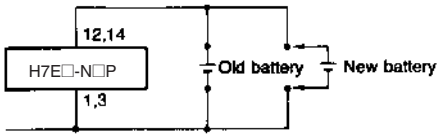
Others

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.

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.

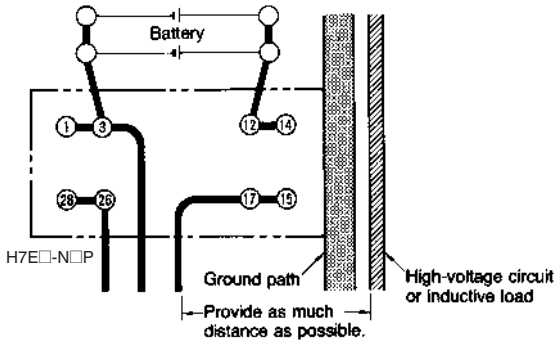
When designing the circuit board, providing two extra terminals for battery connection will make the switch must simpler. See the schematic diagram below:



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°C ± 10°.

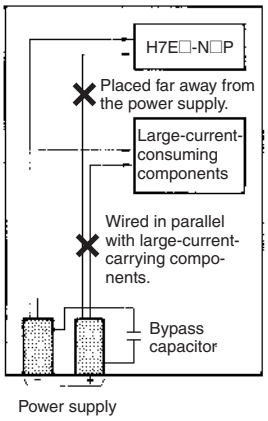
Since the Counter is not flux-tight, do not use flux when soldering.

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

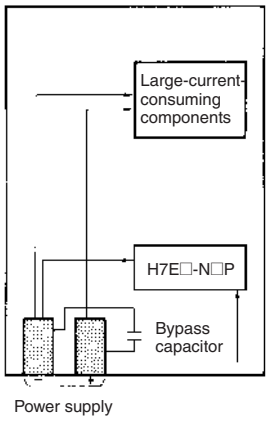
When mounting the Counter on a PC board with components which consume higher current than the H7E□-N□P, observe the following precautions.

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.

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. M064-E1-03

In the interest of product improvement, specifications are subject to change without notice.

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 (EN61326).
- Conforms to IEC standards, and approved by UL and CSA.
- Wide power supply range.
- Six-language instruction manual provided.

H7□P Series

H7GP

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

H7HP

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

Contents

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.

Model Number Structure

■ Model Number Legend

H7GP-□□□
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

Ordering Information

■ List of Models

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

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			
Degree of protection		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 or 5 kHz (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) 1,000 VAC, 50/60 Hz for 1 min between power terminals and control input terminals (DC 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, four cycles each in three directions (8 minutes per cycle) Malfunction: 10 to 55 Hz with 0.5-mm single amplitude, four cycles each in three directions (8 minutes per cycle)
Shock resistance	Destruction: 294 m/s^2 each in three directions Malfunction: 196 m/s^2 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	(EMI) EN61326 Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A (EMS) EN61326 Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3: 10 V/m (Amplitude-modulated, 80 MHz to 1 GHz) (level 3); 10 V/m (Pulse-modulated, 900 MHz ±5 MHz) (level 3) Immunity Conducted Disturbance: EN61000-4-6: 10 V (0.15 to 80 MHz) (according to EN61000-6-2) Immunity Burst: EN61000-4-4: 2 kV power-line (level 3); 2 kV I/O signal-line (level 4) Immunity Surge: EN61000-4-5: 1 kV line to lines (power and output lines) (level 2); 2 kV line to ground (power and output lines) (level 3) Immunity Voltage Dip/Interruption: EN61000-4-11: 0.5 cycle, 100% (rated voltage)
Approved standards	UL508, CSA22.2 No.14, conforms to EN61010-1, VDE0106/P100
Case color	Rear section: Gray smoke; Front section: 5Y7/1 (light gray) or N1.5 (black)
Weight	Approx. 76 g

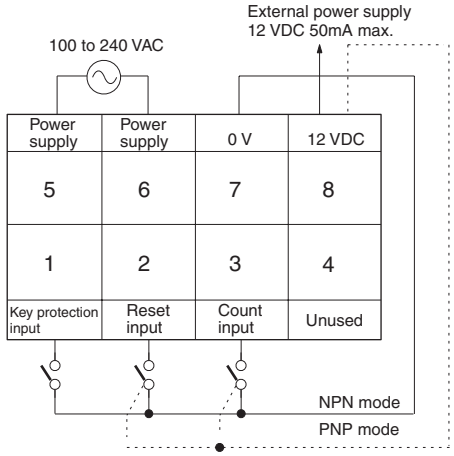
Connections

■ Terminal Arrangement

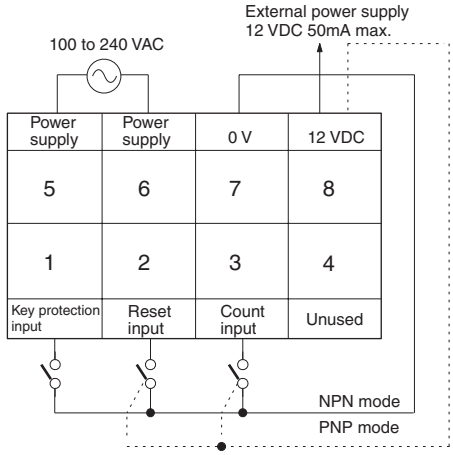
Note: Non-contact input is also available.

AC Models

H7GP-C

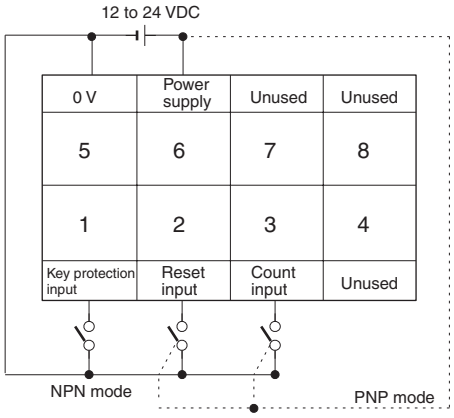


H7GP-T

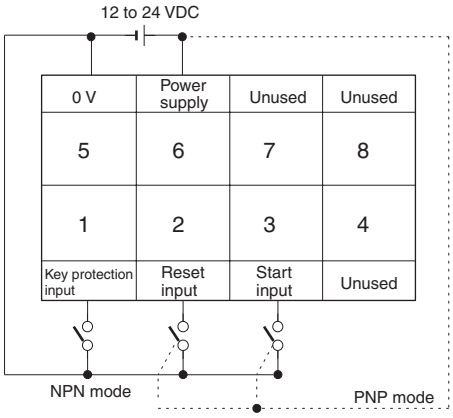


DC Models

H7GP-CD



H7GP-TD



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

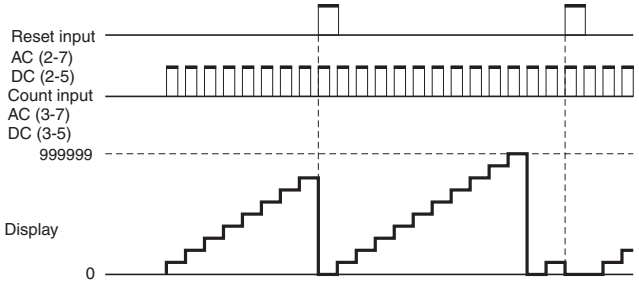
Switch	Item	Function	
3 (On right side from front)	Input mode (note 1)	Display side	NPN
		Terminal side	PNP
4 (On left side from front)	Time range (note 1)	Display side	99999.9h (note 2)
		Terminal side	99 h 59 min 59 s

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.

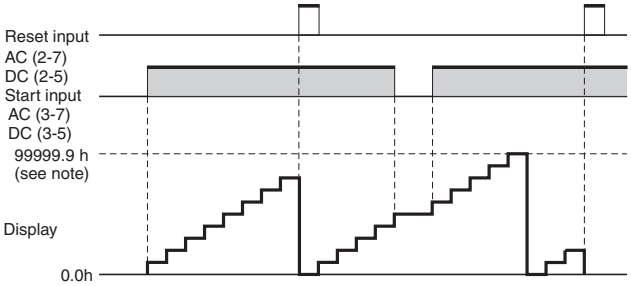
2. The decimal point will flash every second when “99999.9 h” is set.

■ Operating Modes

Total Counters

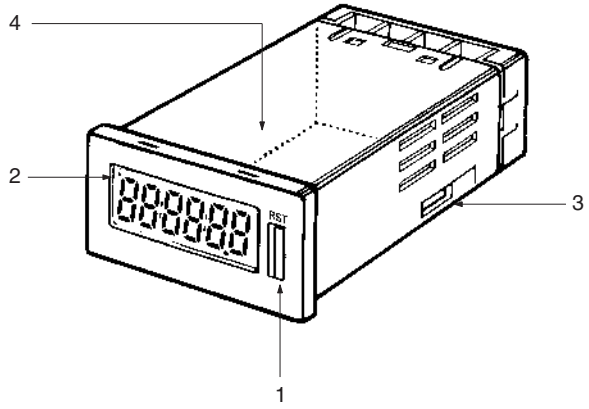


Time Counters



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

Nomenclature

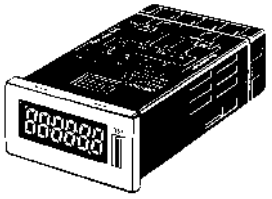


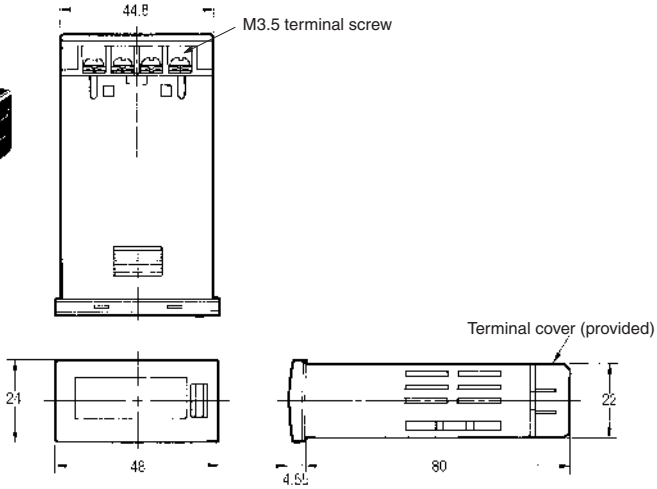
1. **Reset Key**
   Resets the count value, but will not operate while the keys are protected.
2. **Key Protection Indicator**
   Lit while the keys are protected. (Reset Key is disabled.).
3. **NPN/PNP DIP Switch**
   (Count or start with reset)
   When the setting has been changed, turned power off 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.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

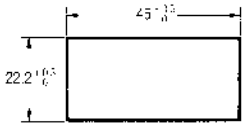
H7GP-C
H7GP-T





Panel Cutouts

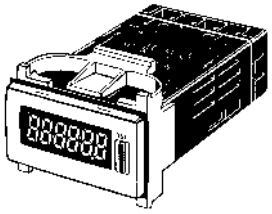
Panel cutouts are as shown below (according to DIN43700).

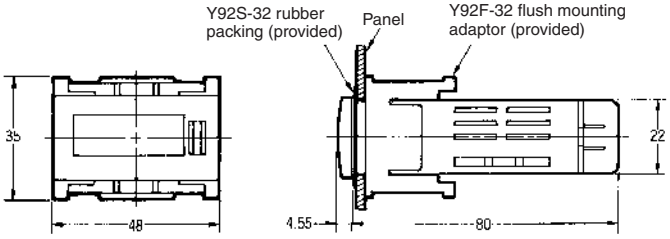


Note: 1. The mounting panel thickness should be 1 to 6 mm.

2. Water resistance will be lost if Counters are mounted side-by-side.

With Flush Mounting Bracket





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.

Model Number Structure

■ Model Number Legend

H7HP-□□□□
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

Ordering Information

■ List of Models

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

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			
Degree of protection		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 (individual) (total counter), or accumulative (time counter)		Up/down (individual)	
Max. counting speeds		30 Hz or 5 kHz (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 ms 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) 1,000 VAC, 50/60 Hz for 1 min between power terminals and control input terminals (DC 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, four cycles each in three directions (8 minutes per cycle) Malfunction: 10 to 55 Hz with 0.5-mm single amplitude, four cycles each in three directions (8 minutes per cycle)
Shock resistance	Destruction: 294 m/s^2 each in three directions Malfunction: 196 m/s^2 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	(EMI) E61326 Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A (EMS) EN61326 Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3: 10 V/m (Amplitude-modulated, 80 MHz to 1 GHz) (level 3); 10 V/m (Pulse-modulated, 900 MHz ±5 MHz) (level 3) Immunity Conducted Disturbance: EN61000-4-6: 10 V (0.15 to 80 MHz) (according to EN61000-6-2) Immunity Burst: EN61000-4-4: 2 kV power-line (level 3); 2 kV I/O signal-line (level 4) Immunity Surge: EN61000-4-5: 1 kV line to lines (power and output lines) (level 2); 2 kV line to ground (power and output lines) (level 3) Immunity Voltage Dip/Interruption: EN61000-4-11: 0.5 cycle, 100% (rated voltage)
Approved standards	UL508, CSA22.2 No.14, conforms to EN61010-1, VDE0106/P100
Case color	Rear section: Gray smoke; Front section: 5Y7/1 (light gray) or N1.5 (black)
Weight	Approx. 106 g

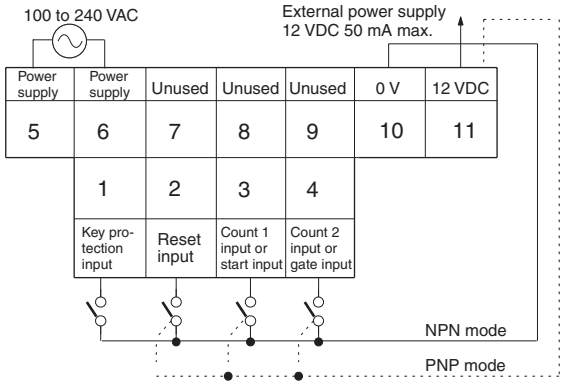
Connections

■ Terminal Arrangement

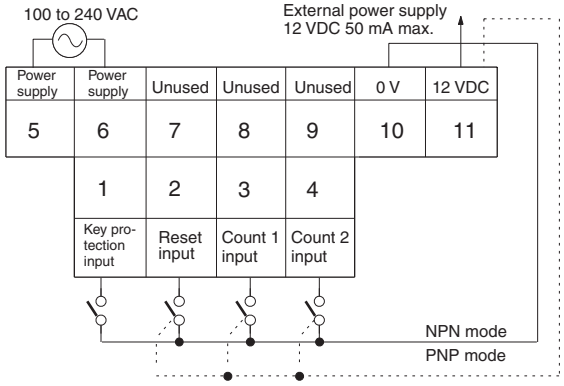
Note: 1. Incremented for count 1 (CP1) inputs; decremented for count 2 (CP2) inputs.
2. Non-contact input is also available.

AC Models

H7HP-A

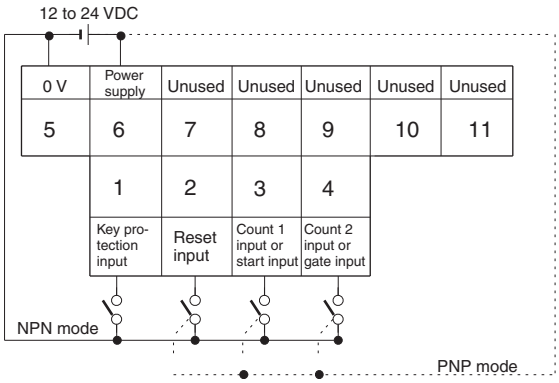


H7HP-C8

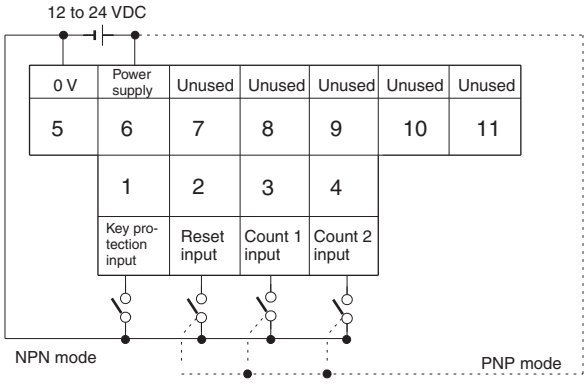


DC Models

H7HP-AD



H7HP-C8D



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 min 59 s
3	Input mode (note)	NPN	PNP
4	Unused	---	---

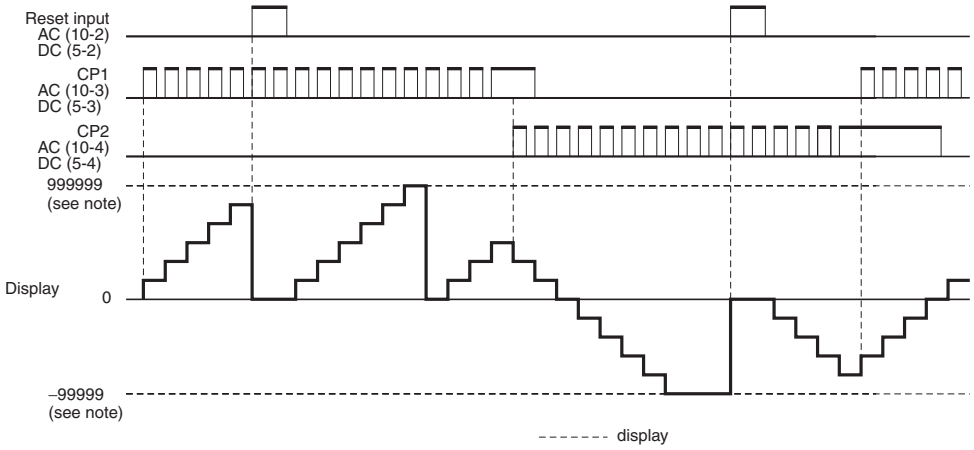
H7HP-C8/-C8D

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.

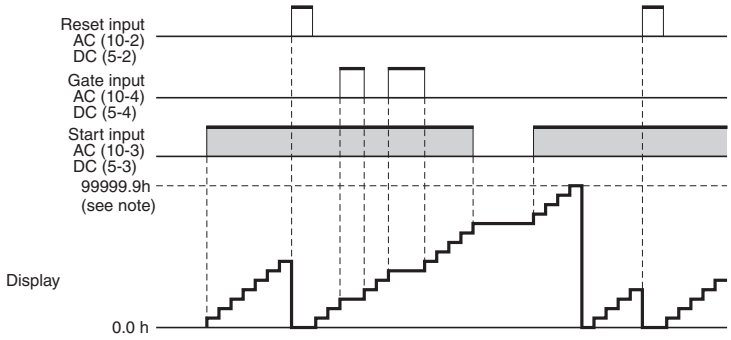
■ Operating Modes

Total Counters



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

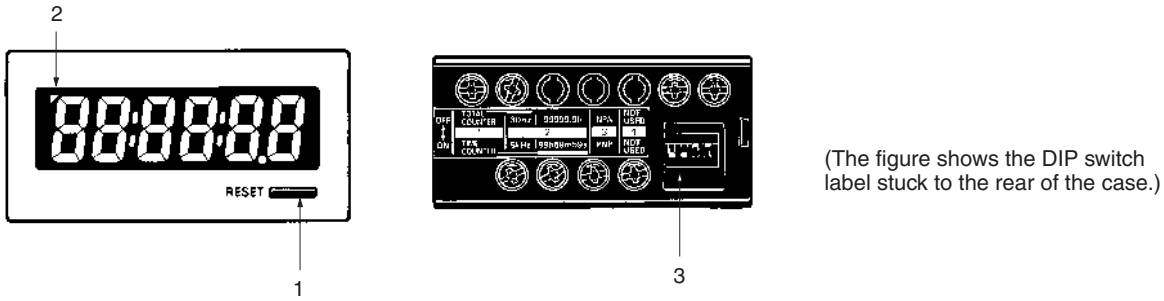
Time Counters



Note: 1. Display values are shown for full scale set to 99999.9 h.

2. Gate input is available only when H7HP-A settings are made.

Nomenclature



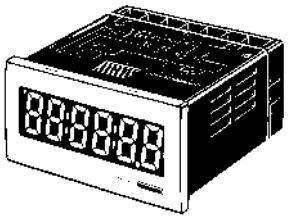
(The figure shows the DIP switch label stuck to the rear of the case.)

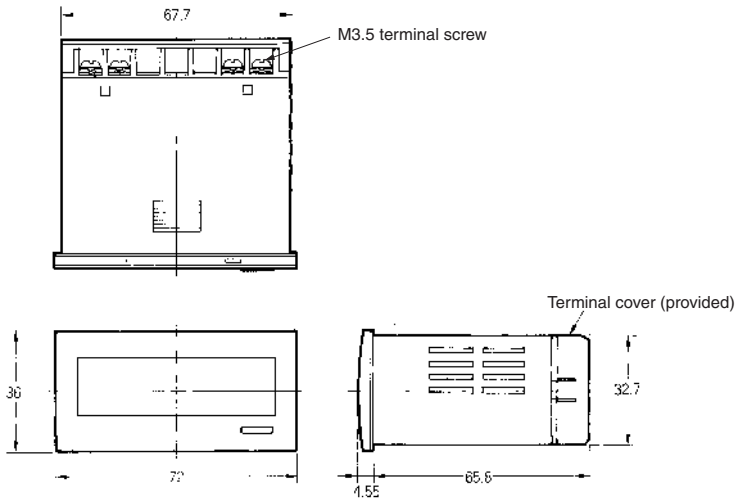
1. **Reset Key**
   Resets the count value, but will not operate while the keys are protected.
2. **Key Protection Indicator**
   Lit while the keys are protected (Reset Key is disabled.).
3. **DIP Switch**
   Use to change a setting. Refer to *DIP Switch Settings* for details.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

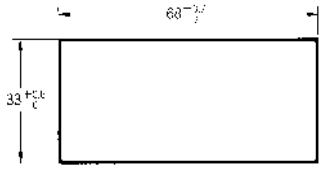
H7HP-A
H7HP-C8





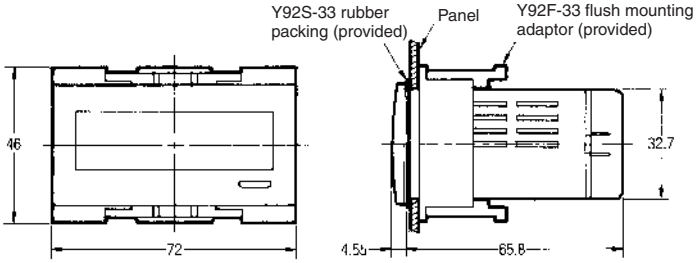
Panel Cutouts

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 Bracket



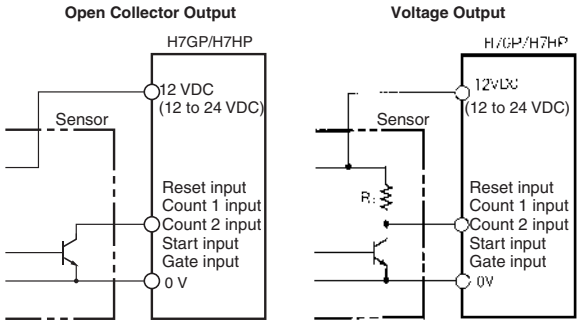
Connections (Common)

■ Input Connections

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

No-voltage Input (NPN Input Mode)

Reset, Count 1, Count 2, Start, and Gate Inputs

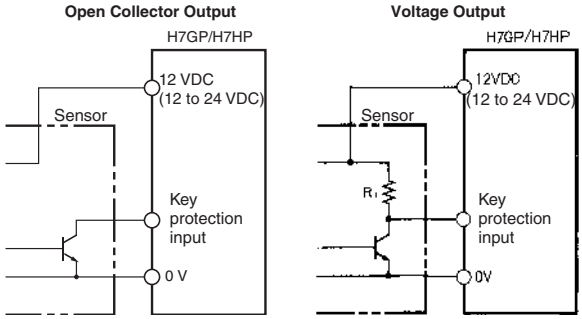


Reset, Count 1, Count 2, Start, and Gate Inputs Specification

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-wired sensors cannot be used.

Key Protection Input



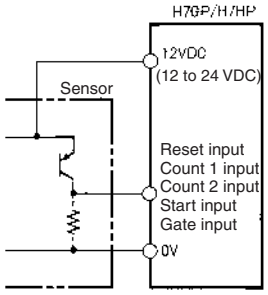
Key Protection Inputs Specification

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-wired sensors cannot be used.

Voltage Input (PNP Input Mode)

Reset, Count 1, Count 2, Start, and Gate Inputs



Reset, Count 1, Count 2, Start, and Gate 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-wired sensors cannot be used.

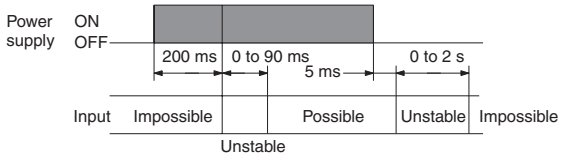
Precautions (Common)

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

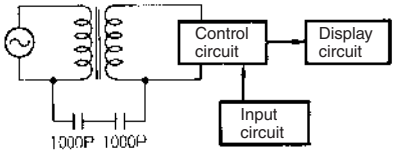
Power Supplies

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

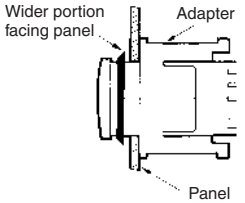
The following displays will appear if an error occurs.

Display	Error	Correction
----	-99999 max. (H7HP, 6-digit model) -99999999 max. (H7HP, 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□ 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.

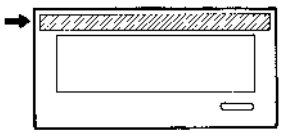
Labels

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

Degree of Protection

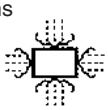
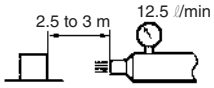
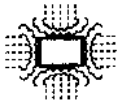
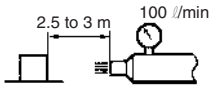
IP - 6 6 G

- 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 m2 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 ship-decks; limited ingress permitted.	Spray water from all directions for one minute per m2 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. M049-E1-03

Preset Counter/Timer
H8GN

World's Smallest Compact Preset Counter/ Timer

1/32-mm DIN with Communications

- Only 48 x 24 x 83 mm (W x H x D)
- Switch between 4-digit preset counter and 4-digit timer operation.
- While using the preset counter, it is possible to switch the display to monitor the totalizing count value (8 digits).
- Built-in prescaling for counter operation.
- ON/OFF-duty adjustable flicker mode that can be used to perform cyclic control is available for timer operation.
- Four preset values that can be changed by the front panel key (SV-bank).
- Finger protection terminal block to meet VDE0106/P100.
- Panel surface compatible with NEMA4X/IP66.
- Conforms to UL, CSA, and IEC safety standards as well as CE Marking.
- Six-language instruction manual provided.

Model Number Structure

■ Model Number Legend

H8GN-AD-□
1 2

1. Supply Voltage
D: 24 VDC

2. Communications Output Type
None: Communications not supported
FLK: RS-485

Ordering Information

■ List of Models

Supply voltage	Output	Communications	
		No communications	RS-485
24 VDC	Contact output (SPDT)	H8GN-AD	H8GN-AD-FLK

Specifications

■ Ratings

Rated supply voltage		24 VDC
Operating voltage range		85% to 110% of rated supply voltage
Power consumption		1.5 W max. (for max. DC load) (Inrush current: 15 A max.)
Mounting method		Flush mounting
External connections		Screw terminals (M3 screws)
Terminal screw tightening torque		0.5 N·m max.
Attachment		Waterproof packing, flush mounting bracket
Display		7-segment, negative transmissive LCD; time display (h, min, s); CMW, OUT, RST, TOTAL Present value (red, 7-mm-high characters); Set value (green, 3.4-mm-high characters)
Digits		PV: 4 digits SV: 4 digits When total count value is displayed: 8 digits (Zeros suppressed)
Memory backup		EEPROM (non-volatile memory) (number of writes: 100,000 times)
Counter	**Maximum counting speed**	30 Hz or 5 kHz (See note.)
	Counting range	−999 to 9,999
	Input modes	Increment, decrement, individual, quadrature inputs
	Output modes	N, F, C, or K
Timer	**Time ranges**	0.000 to 9.999 s, 0.00 to 99.99 s, 0.0 to 999.9 s, 0 to 9999 s, 0 min 00 s to 99 min 59 s, 0.0 to 999.9 min, 0 h 00 min to 99 h 59 min, 0.0 h to 999.9 h, 0 h to 9999 h
	Timer modes	Elapsed time (Up), remaining time (Down)
	Output modes	A, B, D, E, F, or Z
Inputs	**Input signals**	For Counter: CP1, CP2, and reset For Timer: Start, gate, and reset
	Input method	No-voltage input (contact short-circuit and open input) Short-circuit (ON) impedance: 1 KΩ max. (Approx. 2 mA runoff current at 0 Ω) Short-circuit (ON) residual voltage: 2 VDC max. Open (OFF) impedance: 100 kΩ min. Applied voltage: 30 VDC max.
	Start, reset, gate	Minimum input signal width: 1 or 20 ms (selectable)
	Power reset	Minimum power-opening time: 0.5 s
Control output		SPDT contact output: 3 A at 250 VAC/30 VDC, resistive load (cos ϕ = 1)
Minimum applied load		10 mA at 5 VDC (failure level: P, reference value)
Reset system		External, manual, and power supply resets (for timer in A, B, D, E, or Z modes)
Sensor waiting time		260 ms max. (Inputs cannot be received during sensor wait time if control outputs are turned OFF.)

Note: The figures given for maximum counting speed are for incrementing or decrementing operation with a prescale value of ×1. If prescaling is used and 5 kHz is set, the maximum counting speed will be reduced to about half. The maximum counting speed will also be reduced to about half when the up/down mode is selected.

■ Characteristics

Timer function	**Accuracy of operating time and setting error (including temperature and voltage effects)**	Signal start: ± 0.03% ± 30 ms max. Power-ON start: ± 0.03% ± 50 ms max.
Insulation resistance		100 MΩ min. (at 500 VDC)
Dielectric strength		1,500 VAC, 50/60 Hz for 1 min between output terminals and non-current-carrying metal parts 510 VAC, 50/60 Hz for 1 min between current-carrying terminals (except output terminals) and non-current-carrying metal parts 1,500 VAC, 50/60 Hz for 1 min between output terminals and current-carrying terminals (except output terminals) 500 VAC, 50/60 Hz for 1 min between communications terminals and current-carrying terminals (except output terminals) 1,000 VAC, 50/60 Hz for 1 min between contacts not located next to each other
Noise immunity		Square-wave noise by noise simulator; ±480 V (between power terminals), ± 600 V (between input terminals)
Static immunity		± 8 kV (malfunction), ± 15 kV (destruction)
Vibration resistance	**Malfunction**	10 to 55 Hz with 0.35-mm single amplitude each in three directions for 10 min
	Destruction	10 to 55 Hz with 0.75-mm single amplitude each in three directions for 2 h
Shock resistance	**Malfunction**	100 m/s^2, 3 times each in six directions
	Destruction	300 m/s^2, 3 times each in six directions
Life expectancy	**Mechanical**	10 million operations
	Electrical	100,000 operations min. (3 A at 250 VAC, resistive load) (See note.)
Ambient temperature	**Operating**	−10°C to 55°C (with no icing or condensation)
	Storage	−25°C to 65°C (with no icing or condensation)
Ambient humidity		25% to 85%
EMC		(EMI): EN61326 Emission Enclosure: EN55011 Group 1 Class A (EMS): EN61326 Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2), 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3: 10 V/m (Amplitude-modulated, 80 MHz to 1 GHz) (level 3); 10 V/m (Pulse-modulated, 900 MHz ± 5 MHz) (level 3) Immunity Conducted Disturbance: EN61000-4-6: 3 V (0.15 to 80 MHz) (level 2) Immunity Burst: EN61000-4-4: 2 kV power-line (level 3); 1 kV I/O signal-line (level 4); 1 kV communications-line (level 3) Immunity Surge: EN61000-4-5: 1 kV between lines (power and output lines) (level 3); 2 kV between grounds (power and output lines) (level 3)
Approved standards		UL508, CSA C22.2 No.14 Conforms to EN61010-1/IEC61010-1 (Pollution degree 2/overvoltage category II) Conforms to VDE0106/P 100 (Finger Protection)
Case color		Rear section: Gray smoke; Front section: N1.5 (black)
Degree of protection		Panel surface: IP66 and NEMA Type 4X (indoors) Rear case: IP20 Terminal block: IP20
Weight		Approx. 80 g

Note: Refer to the *Life-test Curve*.

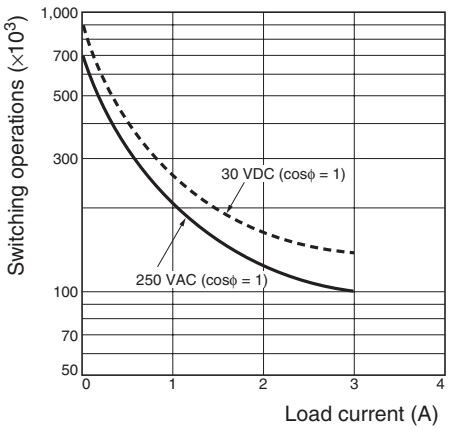
■ Communications Specifications

Transmission path connections	Multidrop
Communications method	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Baud rate (See note.)	1,200/2,400/4,800/9,600 bit/s
Transmission code	ASCII
Data bit length (See note.)	7 or 8 bits
Stop bit length (See note.)	1 or 2 bits
Error detection (See note.)	Vertical parity (none, even, or odd) (See note.) Block check character (BCC)
Flow control	Not supported.
Interface	RS-485
Retry function	Not supported.
Communications buffer	40 bytes
Reading and writing from H8GN	Reading present value and totalizing count value; reading/writing preset and set values; switching between SV-banks; switching between communications write-enabled/write-prohibited; reading/writing other initial and advanced function setting parameters

Note: The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the communications setting level.

■ Life-test Curve (Reference Values)

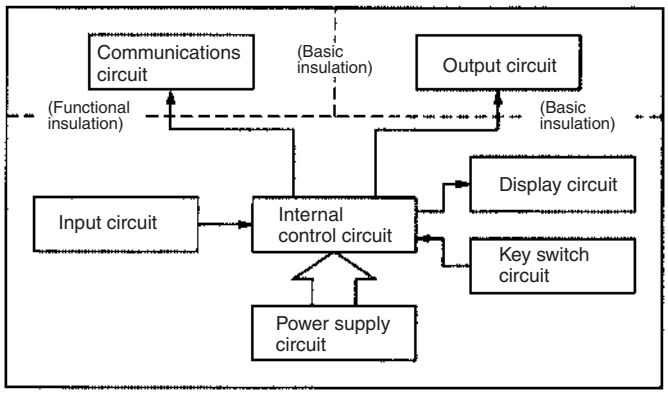
Resistive Load



Reference: A maximum current of 0.15 A can be switched at 125 VDC (cosϕ = 1) and a maximum current of 0.1 A can be switched if L/R is 7 ms. In both cases, a life of 100,000 operations can be expected. The minimum applicable load is 10 mA at 5 VDC (failure level: P).

Connections

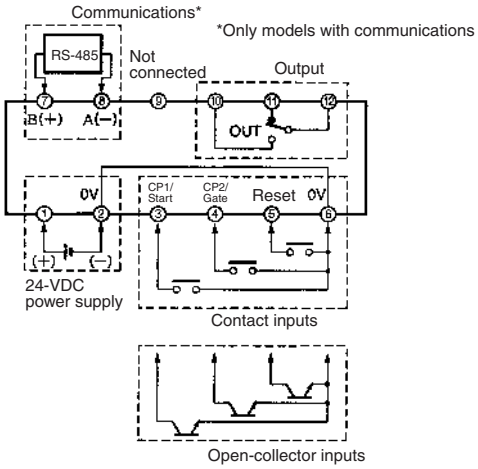
■ Block Diagram



■ I/O Functions

Inputs	**Counter inputs**	**CP1/CP2**	• Receive count signals. • Receive increment, decrement, individual, and quadrature inputs. • In increment mode and decrement mode, CP1 is used for the count input and CP2 is used for count prohibit input.
		Reset	• Resets the present value. (Totalizing count value is not reset.) (In increment mode or increment/decrement mode, the present value returns to 0; in Decrement Mode the present value returns to the set value.) • The count input is not received during resetting. • The RST indicator is lit during resetting.
	Timer inputs	**Start**	• Starts timing.
		Reset	• Resets the timer. (In elapsed time mode the time returns to 0; in remaining time mode, the time returns to the set value.) • During resetting, timing stops and the control output turns OFF. • The RST indicator is lit during resetting.
		Gate	• Prohibits timing operation.
Outputs		**OUT**	• Output made according to the output mode setting when the set value is reached.

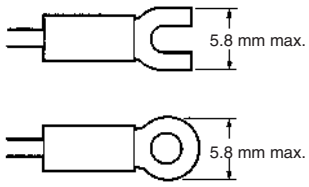
■ Terminal Arrangement



Note: (2) and (6) are connected internally.
Do not use unused terminals as relay terminals.

■ Wiring

Use the following type of crimp terminals for M3 screw.



Nomenclature

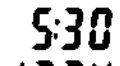
No. 1 Display
Displays the present value or parameter type. When totalizing count is displayed, the leftmost 4 digits of the 8-digit totalizing count will be displayed. (Zeros suppressed)

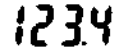
Operation display 2

Indicator	Meaning
CMW	Lit when communications writing is enabled.
RST	Lit during reset using reset input or Reset Key.
OUT	Lit when control output is ON.
TOTAL	Lit when totalizing count value is displayed.

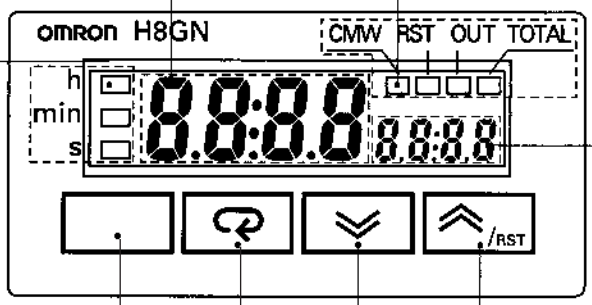
Operation display 1
Displays the time unit when the timer function has been selected.

Example

5 h 30 min 

123.4 s 

Flashes while timer is on 0.0 min, 0 h 00 min, 0.0 h, or 0 h.



No. 2 Display
Displays set value or set value of the parameter. Displays the rightmost 4 digits of the count value (8 digits) when the H8GN is used as a totalizing counter. (Zeros suppressed)

Level Key
Press this key to select the setup level. The setup level is selected in order "operation level" ←→ "adjustment level", "initial setting level" ←→ "communications setting level".

Mode Key
Press this key to select parameters within each level.

Down Key
Each press of this key decreases values displayed on the No. 2 display. Hold down this key continuously to decrease values quickly. Also returns setting items.

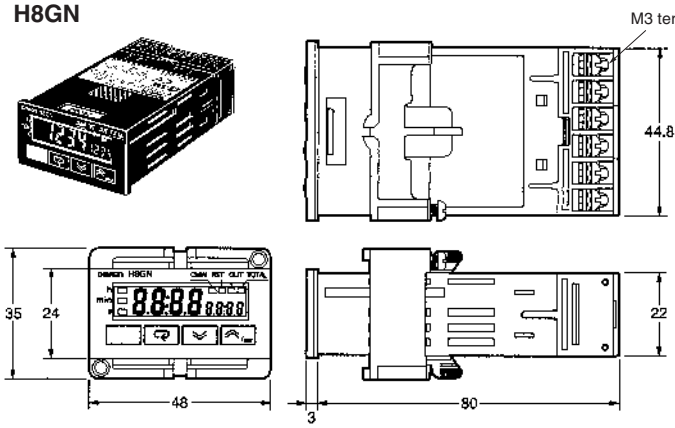
Up/Reset Key
Each press of this key increases values displayed on the No. 2 display. Hold down this key continuously to increase values quickly. Also advances setting items.

Reset Function
To reset the present value, press this key while the present value is displayed.
If this key is pressed while the totalizing count value is displayed, the totalizing count value and the present value will be reset.

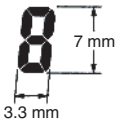
Dimensions

Note: All units are in millimeters unless otherwise indicated.

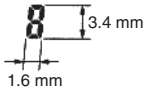
H8GN



No. 1 display digit size



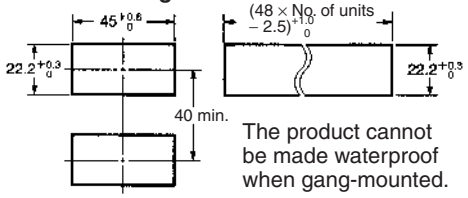
No. 2 display digit size



Panel cutout

Separate mounting

Gang mounting



The product cannot be made waterproof when gang-mounted.

- Insert the H8GN in the square cutout, insert the adapter from the back, and push the H8GN into the cutout as far as possible. Use screws to secure the H8GN. To make the H8GN waterproof, insert waterproof packing and tighten the screws.
- When mounting two or more products in a cutout, be sure that the ambient temperature does not exceed the specifications.

Precautions

⚠ Caution

Do not use the product in locations subject to flammable or explosive gases. Doing so may result in explosion.

⚠ Caution

The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life. Using the product beyond its service life may result in contact deposition or burning.

⚠ Caution

Do not disassemble, repair, or modify the product. Doing so may result in electric shock, fire, or malfunction.

⚠ Caution

Do not allow metal objects or conductive wires to enter the product. Doing so may result in electric shock, fire, or malfunction.

Other Precautions

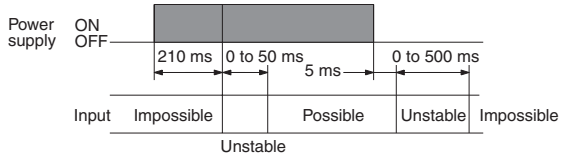
- Store at the specified temperature. If the H8GN has been stored at a temperature of less than −10°C, allow the H8GN to stand at room temperature for at least 3 hours before use.
- Use the product within the ratings specified for vibration, shock, submerging in water, and exposure to oil.
- Do not use the product in locations subject to dust, corrosive gases, or direct sunlight.
- Use the product within the ratings specified for temperature and humidity.
- The product is designed for 24 VDC. Applying voltages other than the rated one such as 100 to 240 VAC may damage the internal elements.
- Separate the input signal devices, input signal cables, and the product from the source of noise or high-tension cables producing noise.
- Separate the product from the source of static electricity when using the product in an environment where a large amount of static electricity is produced (e.g., forming compounds, powders, or fluid materials being transported by pipe).
- Do not expose the product to organic solvent such as thinner or benzine, strong alkali materials, or strong acid materials. Doing so may damage the product surface.

Application Precautions

1. Do not use the product in locations where condensation may occur due to high humidity or where temperature changes are severe.
2. Be sure to wire terminals correctly, with the correct polarity.
3. Maintain the power supply voltage within the allowable ranges.
4. Connect the power supply through a relay or switch so that the voltage reaches a fixed value immediately. If the voltage increases gradually the power supply may be reset or outputs may turn ON.
5. When the power is turned ON, an inrush current (approx. 15 A) will flow momentarily. Depending on power supply capacities, the product may not start due to this leakage current. The power supply must be of a sufficiently large capacity.
6. For the main power supply or the power supply for input devices, use a power supply transformer whose primary side is insulated from the secondary side and whose secondary side is not grounded.
7. Leaving the H8GN with outputs ON at a high temperature for a long time may hasten the degradation of internal parts (such as electrolytic capacitors). Therefore, use the product in combination with relays and avoid leaving the product as long as more than 1 month with the output turned ON.

Power Supplies

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



Turn the power ON and OFF using a relay with a rated capacity of 15 A minimum to prevent contact deterioration due to inrush current caused by turning the power ON and OFF.

When power is turned ON, a starting current flows momentarily. Therefore, pay attention to the overcurrent detection level of the power supply used.

Timer Control with Power Start

To allow for the startup time of peripheral devices (sensors, etc.), the H8GN starts timing operation between 210 to 260 ms after power is turned ON (see diagram above). For this reason, in operations where timing starts from power ON, the time display will actually start from 258 ms. If the set value is 258 ms or less, the time until output turns ON will be a fixed value between 210 and 260. (Normal operation is possible for set value of 259 ms or more.) In applications where a set value of 258 ms or less is required, use start timing with signal input.

When the H8GN is used with power start in F mode (i.e., accumulative operation with output on hold), there will be a timer error (approximately 100 ms each time the H8GN is turned ON) due to the characteristics of the internal circuitry. Use the H8GN with signal start if timer accuracy is required.

Changing the Set Value

In Counter Operation

When changing the set value during operation, the output will turn ON if the set value equals the present value.

In Timer Operation

When changing the set value during operation, if the set value is changed in so that the conditions below are satisfied, the Timer operates in the same way as when the present value reaches the set value because a constant read-in system is in use. Depending on the output mode, this may result in output turning ON.

Timer mode UP: Present value ≥ set value
Timer mode DOWN: Elapsed time ≥ set value
(Present value = 0)

Note: When in DOWN mode, the amount set value is changed is added to or subtracted from the present value.

Operation with a Set value of 0

In Counter Operation

The output will turn ON if the set value (0) equals the present value. The output will be OFF while the Reset Key is pressed or the reset input is ON.

In Timer Operation

a) When the output mode is set to A, B (one-shot output), D, or F, output will turn ON when the start signal is input.

b) When the output mode is set to B (hold output), E, or Z, output will remain OFF even when the start signal is input.

Response Delay Time When Resetting

The following table shows the delay from when the reset signal is input until the output is turned OFF.

Minimum reset signal width	Output delay time
1 ms	3.7 to 6.0 ms
20 ms	19 to 21 ms

Output Delay Time

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

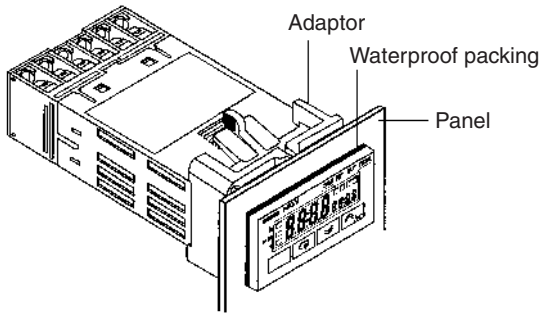
Actual Measurements in N or K Mode

Control output	Max. counting speed	Output delay time*
Contact output	30 Hz	17.3 to 18.9 ms
	5 kHz	3.5 to 5.2 ms

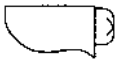
*The variation in delays is due to different modes and conditions.

Mounting

Tighten the two mounting screws on the Adaptor. Tighten them alternately, a little at a time, so as to keep them at an equal tightness.

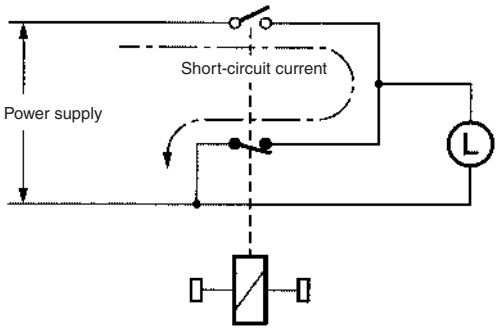


The H8GN's panel surface is water-resistive (conforming to NEMA 4X (indoors) and IP66). In order to prevent the internal circuit from water penetration through the space between the Counter and operating panel, attach a rubber packing (provided with the H8GN) between the Counter and operating panel and secure the rubber packing with the Y92F-34 Flush-mounting Adaptor.



Output

The SPDT (single-pole, double-throw) consists of an SPST-NO contact and an SPST-NC contact. Do not form a circuit with 3-point short-circuit (power short-circuiting with arc).



Reference

For details about communications functions, refer to H8GN Preset Counter/Timer User's Manual (Catalog No. M066).

Operating Procedures

■ Initial Setup

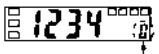
The [O] and [R] Keys are used to switch between setup menus, and the amount of time that you hold the keys down for determines which setup menu you move to. This section describes two typical examples.

Note: In the following sections, "PV" is used to indicate a present value and "SV" to indicate a set value.

1. Using the H8GN as a Counter

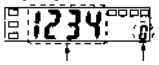
Typical Application Examples

1. Changing Set Values



Set value and selections in each display can be changed by pressing the [▲] and [▼] Keys.

2. Displays

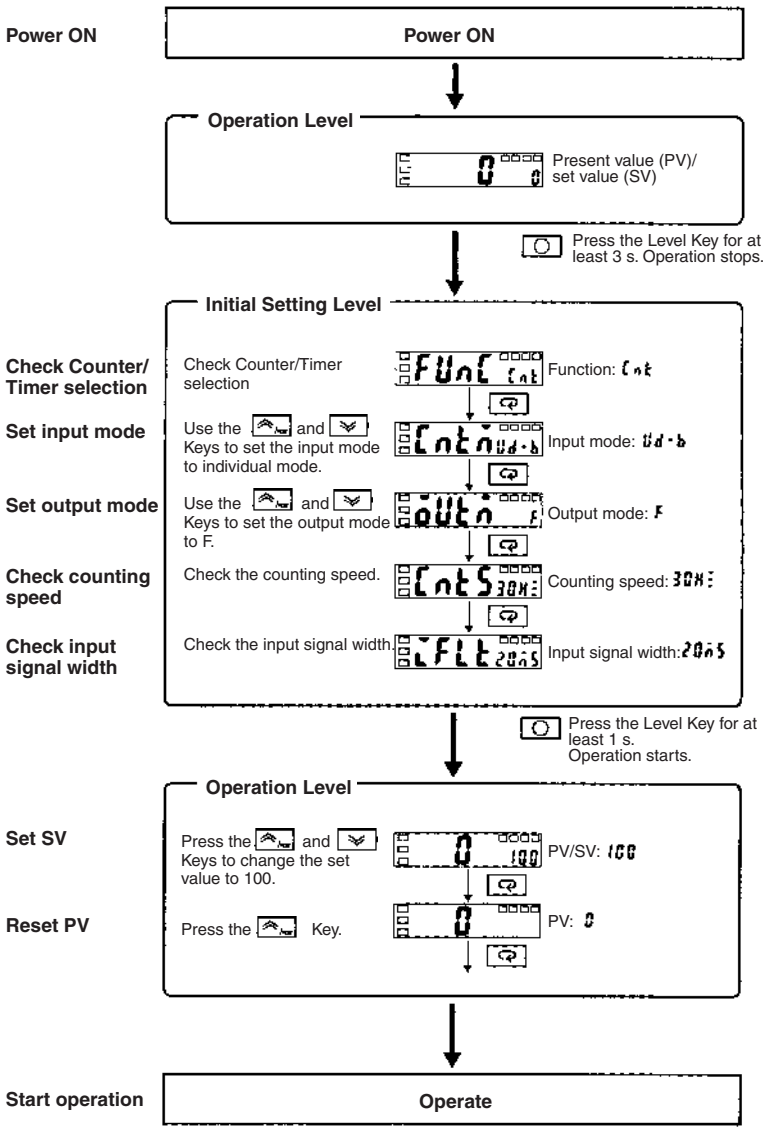


No. 1 display No. 2 display

Typical Application

Input mode	Individual input
Output mode	F (overcount)
Counting speed	30 Hz
Input signal width	20 ms
Decimal point	None
Prescale	None

• **Setup Procedure**



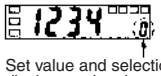
• **Confirming Set Values**

Set values are effective two seconds after key operation is stopped or when the [O] or [R] Key is pressed.

2. Using the H8GN as a Timer

Typical Application Examples

1. Changing Set Values



Set value and selections in each display can be changed by pressing the ▲ and ▼ Keys.

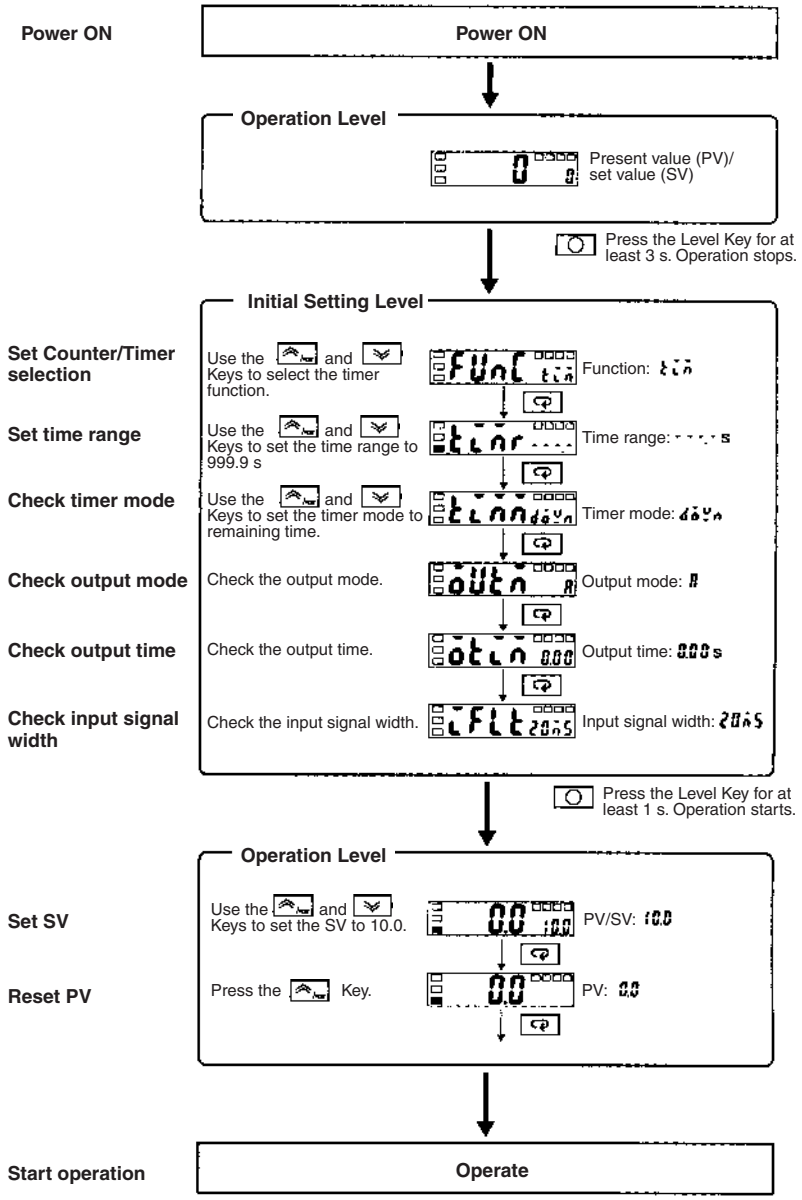
2. Display

No. 1 Display No. 2 Display

Typical Application Examples

Time range	0.0 to 999.9 s
Timer mode	DOWN (remaining time)
Output mode	A mode
Output time	Hold
Input signal width	20 ms

- **Setup Procedure**



- **Confirming Set Values**

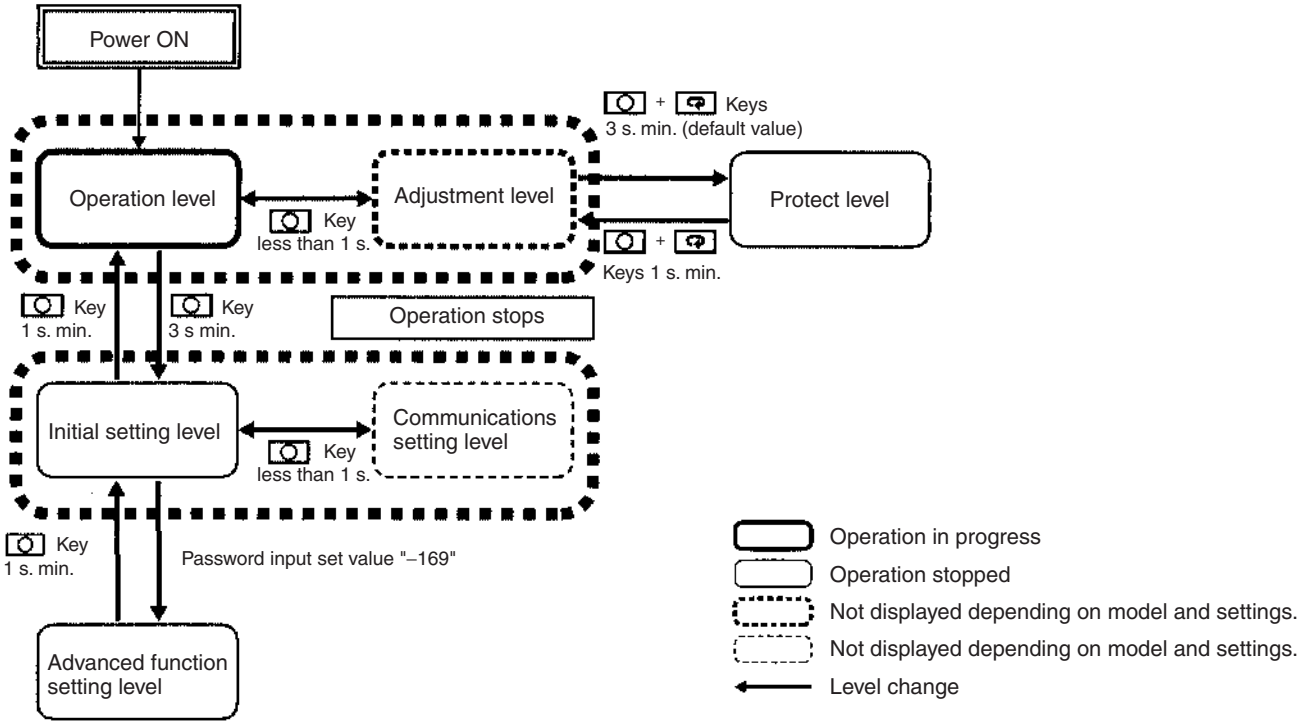
Set values are effective two seconds after key operation is stopped or when the ◎ or ↩ Key is pressed.

■ Setting Specifications after Turning ON Power

Outline of Operation Procedure

Key Operation

In the following descriptions, all the parameters are introduced in the display sequence. Some parameters may not be displayed depending on the protection settings and operating conditions.



Note: Of these levels, the initial setting level, communications setting level, and advanced function setting level can be used only when operation has stopped. Control output is stopped when these three levels are selected. When switched back to the operation level from one of these levels, operation will start.

Description of Each Level

Operation Level

- This level is displayed when you turn the power ON. You can move to the protect level, initial setting level, and adjustment level from this level.
- Normally, select this level during operation.
- During operation, the present value, set value, totalizing count value, and setting number of SV-bank can be monitored using the Key.

Adjustment Level

- To select this level, press the Key once for less than one second.
- This level is for entering set value (SV 0 to 3) for operation. This level contains parameters for communications writing enable/disable, set value of SV-bank, and cycle time (timer Z mode).
- You can move to the top parameter of the operation level, protect level, or initial setting level from here.

Initial Setting Level

- To select this level, press the Key for at least three seconds in the operation level or adjustment level.
- This level is for selecting the function, input mode, time range, timer mode, output mode, output time, counting speed, input signal width, decimal point position, prescale value, and rising/falling edge for input signal.
- You can move to the advanced function setting level or communications setting level from this initial setting level. To return to the operation level, press the Key for at least one second. To move to the communications setting level, press the key once for less than one second.

Protect Level

- To select this level, simultaneously press the and Keys for at least three seconds (default value). This level is to prevent unwanted or accidental modification of parameters. Protected levels will not be displayed, and so the parameters in that level cannot be modified.

Communications Setting Level

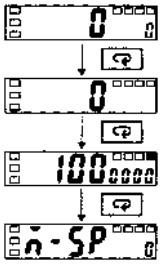
- To select this level, press the Key once for less than one second in the initial setting level. When the communications function is used, set the communications conditions in this level. Communicating with a personal computer (host computer) allows set values to be read and written.

Advanced Function Setting Level

- To select this level, you must change the initial settings/communications protection setting in the protect level to “0” and then enter the password (“–169”) in the initial setting level.
- This level is for initializing settings, enabling SV-bank and totalizing counter use, setting display auto-return time, and move- to-protect-level time.
- You can move to the initial setting level from this level.

Parameters

Operation Level



(1) PV/SV

(2) PV

(3) Totalizing count value

(4) SV-bank

1. PV/SV

This display appears when the power is turned ON. No. 1 display shows the present value and No. 2 display shows the set value. The values displayed will be determined by the settings for Counter/Timer selection, time range, timer mode, and decimal point position made in the initial setting level.

Use the [R/S] and [▼] Keys to change the settings.

2. PV

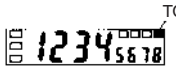
No. 1 display will show the present value and No. 2 display will remain blank. The values displayed will be determined by the settings for Counter/Timer selection, time range, timer mode, and decimal point position made in the initial setting level.

Press the [R/S] Key to reset the present value.

3. Totalizing Count Value

The totalizing count value is displayed only if "totalizing counter used" in the advanced function setting level has been set to ON.

The leftmost four digits of the 8-digit totalizing count value will be shown in No. 1 display and the rightmost four digits will be shown in No. 2 display.



=Totalizing count value: 12,345,687

Press the [R/S] Key to simultaneously reset the totalizing count value and the present value.

[R/S] Key during PV display

[R/S] Key during totalizing count value display

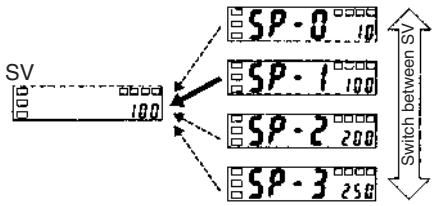
PV	0→1→2→3→0→1→2→0→1→2
Totalizing count value	0→1→2→3→3→4→5→0→1→2

Refer to ***Input/Output Mode Settings*** on page page 81 for information on totalizing counter operation.

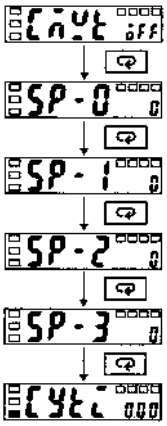
4. SV-bank (n-SP)

SV-bank is displayed only when "SV-bank used" in the advanced function setting level has been set to ON.

Select the SV-bank (SV 0 to 3). To use the SV-bank function, the four set values (SV 0 to 3) can be set beforehand in the adjustment level. The keys on the front of the Unit can then be used during operation to switch between the set values. For models with built-in communications, communications can be used to switch between the set values.



Adjustment Level



(1) Communications writing control

(2) SV 0

(2) SV 1

(2) SV 2

(2) SV 3

(3) Cycle time

1. Communications Writing Control (CMWT)

Communications writing control is displayed only for models with communications.

Allows or prohibits communications to write data from a personal computer (host computer). Communications can be used to read data regardless of this setting.

2. SV 0 to 3 (SP-0, SP-1, SP-2, SP-3)

SV 0 to 3 is displayed only when "SV-bank used" in the advanced function setting level has been set to ON.

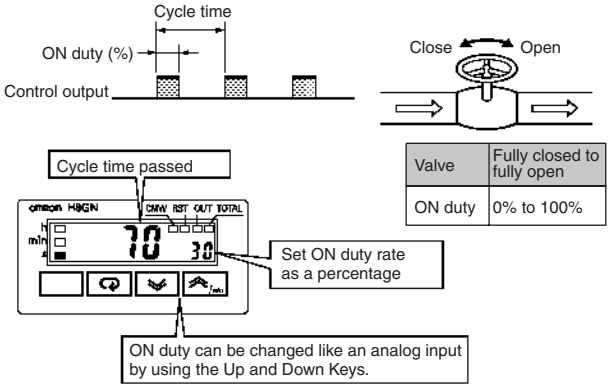
Used to set the set value when the SV-bank function is used. The operator can use the keys on the front to switch between the set values (SV 0 to 3). When the set value is changed in operation mode, the set value (SV 0 to 3) set in the adjustment level for SV-bank will also change.

3. Cycle Time (CYCT)

Cycle time is displayed only when the "output mode for timer function" in the initial setting level has been set to "Z."

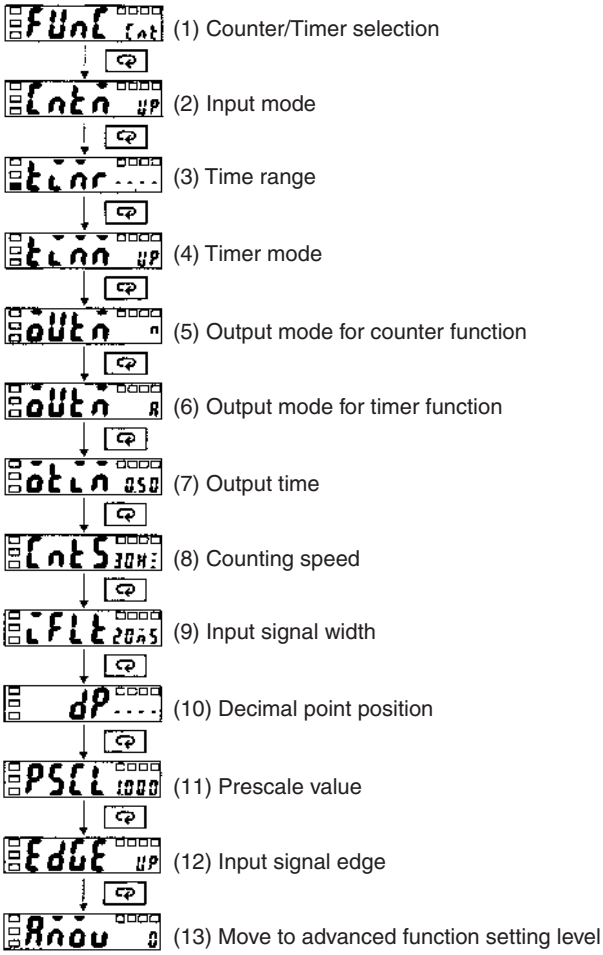
Sets the cycle time used for ON/OFF-duty adjustable flicker mode (Z). Cyclic control can be performed easily in ON/OFF-duty adjustable flicker mode by first setting the cycle time in the adjustment level and by using the set value in operation level to change the ON-duty ratio.

Controlling the flowrate by opening and closing the electromagnetic valve by pulse control.



Refer to ***Input/Output Mode Settings*** on page 82 for information on ON/OFF-duty adjustable flicker mode operation.

Initial Setting Level



1. Counter/Timer Selection (FUnC)

Select to use the H8GN as either a counter or a timer.

2. Input Mode (CntM)

The input mode is displayed only when "Counter/Timer selection" in the initial setting level has been set to counter.

When the H8GN is to be used as a counter, select increment, decrement, individual, or quadrature for the input mode. If increment or decrement is selected, the input signal edge for CP1 (count input) can be switched using the input signal edge setting.

Refer to ***Input/Output Modes and Count Values*** on page 80 for information on input mode operations.

3. Time Range (tRNG)

The time range is displayed only when "Counter/Timer selection" in the initial setting level has been set to timer.

When the H8GN is to be used as a timer, set the time range to be timed.

4. Timer Mode (tMOD)

The timer mode is displayed only when "Counter/Timer selection" in the initial setting level has been set to timer.

When the H8GN is to be used as a timer, set the elapsed or remaining time mode.

5. Output Mode for Counter Function (OUTC)

The output mode is displayed only when "Counter/Timer selection" in the initial setting level has been set to counter.

When the H8GN is to be used as a counter, set the output mode.

Refer to ***Input/Output Mode Settings*** on page 81 for information on output mode operations.

6. Output Mode for Timer Function (OUTM)

The output mode is displayed only when "Counter/Timer selection" in the initial setting level has been set to counter.

When the H8GN is to be used as a timer, set the output mode.

Refer to ***Input/Output Mode Settings*** on page 81 for information on output mode operations.

7. Output Time (OTIM)

The output time is displayed only when "output mode for counter function" in the initial setting level has been set to C or K or when "output mode for timer function" in the initial setting level has been set to A or B.

When using one-shot output in the H8GN, set the output time for the one-shot output (0.01 to 99.99 s).

One-shot output can be used only when the C or K output mode is selected for counter function or A or B output mode is selected for timer function.

If the output time is set to "0" when selecting timer function, the output will be held. The output time cannot be set to "0" for counter function.

8. Counting Speed (CntS)

The counting speed is displayed only when "Counter/Timer selection" in the initial setting level has been set to counter.

When the H8GN is used as a counter, the operator can switch between maximum counting speeds (30 Hz/5 kHz) for CP1 and CP2.

Set to 30 Hz when using a contact for the input signal. When the counting speed is set to 30 Hz, input signal chattering is removed.

9. Input Signal Width (CFLT)

Switches between minimum input signal widths (20 ms/1 ms) for start, reset and gate inputs. All input signal widths are set together via external input.

When the counter function is selected, only the reset input is set, but when the timer function is selected the start, gate, and reset inputs are all set together.

Set to 20 ms when using a contact for the input signal. When the input signal width is set to 20 ms, input signal chattering is removed.

10. Decimal Point Position (dP)

The decimal point position is displayed only when "Counter/Timer selection" in the initial setting level has been set to counter.

This determines the decimal point position for PV, SV, SV-bank (SV 0 to 3), and totalizing count values. Press the Key to move the decimal point to the left and press the Key to move it to the right.

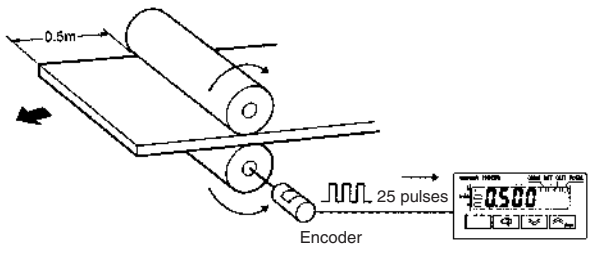
11. Prescale Value (PSCL)

The prescale value is displayed only when "Counter/Timer selection" in the initial setting level has been set to counter.

Converts the counter input pulse to any value within the setting range (0.001 to 9.999).

Example: To have a display of □□.□□ m for a system that outputs 25 pulses when the object has been moved forward 0.5 m, perform the following steps.

1. Set the decimal point position to before the second-last digit.
2. Set the prescale value to 0.02 (0.5 ÷ 25).



12.Input Signal Edge (EdGE)

The input signal edge will be displayed only when the "input mode" at the initial setting level has been set to increment or decrement.

Switches the CP1 input edge when the H8GN is used as an incrementing or decrementing counter. In the counter increment or decrement modes, CP2 will function as the gate input and CP1 counting will be prohibited while CP2 is ON.

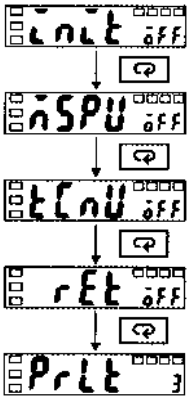
Refer to ***Input/Output Modes and Count Values*** on page 80 for information on input mode operations.

13.Move to Advanced Function Setting Level (AMOV)

This will be displayed only when the "initial setting/communications protection" in protect level is set to 0.

This setting enables the advanced function settings to utilize the counter/timer functions to the maximum. To move to the advanced function setting level, enter the password (–169) from the initial setting level.

Advanced Function Setting Level



(1) Parameter initialization

(2) SV-bank used

(3) Totalizing counter used

(4) Display auto-return time

(5) Move-to-protect-level time

1. Parameter Initialization (*InIt*)

Used to return all settings to default values.

Turn ON parameter initialization and shift to another display to return all settings to default values.

2. SV-bank Used (*nSPU*)

Set "SV-bank used" to ON and operate the keys from the panel to switch between SV 0 to 3.

To use the SV-bank function, the set value (SV 0 to 3) must be set beforehand in the adjustment level. These set value are then used during operation by operating the keys on the front of the Unit.

3. Totalizing Counter Used (*tCnU*)

Set totalizing counter use to ON to display and enable use of the totalizing counter in the operation level.

The totalizing counter displays the leftmost four digits of the 8-digit totalizing count on No. 1 display and the rightmost four digits on No. 2 display to enable 8-digit counting.

4. Display Auto-return Time (*rEt*)

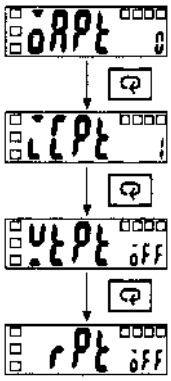
If this function is used, the display in the operation and adjustment levels will automatically return to the PV/SV display if no key operations have been made for the set period. (setting range: 1 to 99 s.)

The time before auto-return of the display can be set here. If this setting is set to OFF, the auto-return function will not operate.

5. Move-to-protect-level Time (*PrLt*)

If the [O] and [R] Keys are pressed for more than 3 seconds in the operation level, the display will move to the protect level. Use this setting to change the time that the key must be pressed to any time within the setting range (3 to 30 s).

Protect Level



(1) Operation/Adjustment Protection

Restricts menu display and writing in the operation and adjustment levels.

(2) Initial Setting/Communications Protection

Restricts menu display and moving to the initial setting level/communications setting level/advanced function setting level.

(3) Setting Change Protection

Restricts setting changes using front panel keys.

(4) Reset Key Protection

Restricts use of the Reset Key.

1. Operation/Adjustment Protection (*oAPt*)

The following table shows the protection given for each setting level.

Setting level	Operation level		Adjustment level
	PV/SV	Other	
0	Not protected	Not protected	Not protected
1	Not protected	Not protected	No display, no level shift
2	Not protected	No display, no level shift	No display, no level shift
3	Display only	No display, no level shift	No display, no level shift

Not protected: Display and setting changes are possible.
Display only: Display is possible.
No display, no level shift: Display and level shifts are not possible.

The initial setting level is 0 and no protection is given at this setting level.

2. Initial Setting/Communications Protection (*ICPt*)

Moving to initial setting, communications setting, or advanced function setting levels is restricted.

Setting	Initial setting level	Communications setting level	Advanced function setting level
0	OK	OK	OK
1	OK	OK	NO
2	NO	NO	NO

OK: Move to other levels possible
NO: Move to other levels not possible

The default setting is 1.

3. Setting Change Protection (*WtPt*)

Restricts setting changes using front panel keys.

Setting	Meaning
OFF	Settings can be changed by key operation.
ON	Settings cannot be changed by key operation. (Only protect level settings can be changed.)

The default setting is OFF.

4. Reset Key Protect (*rPt*)

Prohibits the use of the Reset Key.

Setting	Meaning
OFF	PV and totalizing count values can be reset by the Reset Key.
ON	PV and totalizing count values cannot be reset by the Reset Key.

The default setting is OFF.

Communications Setting Level

The communications specifications are set in the communications setting level. Make the individual communications settings from the front panel.

The communications parameters and their settings are listed in the following table.

Parameter	Display	Settings	Set value
Communications unit number	U-no	0 to 99	0 / **1** to 99
Baud rate	bPS	1.2, 2.4, 4.8, or 9.6 (kbps)	1.2 / 2.4 / 4.8 / **9.6**
Communications data length	LEn	7/8 (bits)	**7** / 8
Stop bits	Sbit	1/2	1 / **2**
Parity	Prty	None, even, or odd	nonE / **EVEn** / odd

Note: 1. The settings shown in reverse video are the default settings.

2. Settings made in the communications setting level are enabled when the power is turned ON again.

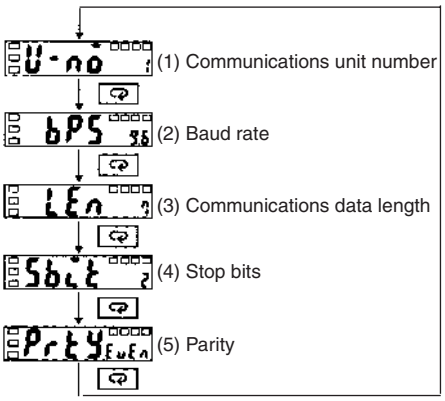
Before performing communications, perform the following procedure with the front panel keys to set the communications unit number, baud rate, and other settings. Refer to the communications manual for operation methods for other communications settings.

1.Press the [O] Key for at least 3 seconds and move from the operation level to the initial setting level.

2.Press the [O] Key and move from the initial setting level to the communications setting level.

3.Press the [↺] Key to change the settings items as shown below.

4.Use the [▲] and [▼] Keys to change the settings data.



Align each communications setting with the settings on the personal computer or other communications device.

1. Communications Unit Number (U-no)

When communicating with a host computer, set a unit number to enable the host computer to identify each unit. The number can be set in a range from 0 to 99 in increments of 1. The default unit number is 1. When using multiple units, the units will not function normally if the same unit number is set for more than one unit.

2. Baud Rate (bPS)

Set the baud rate for communications with the host computer. The settings correspond to the following baud rates.

1.2 (1,200 bps), 2.4 (2,400 bps), 4.8 (4,800 bps), and 9.6 (9,600 bps).

3. Communications Data Length (LEn)

The communications data length can be changed to either 7 or 8 bits.

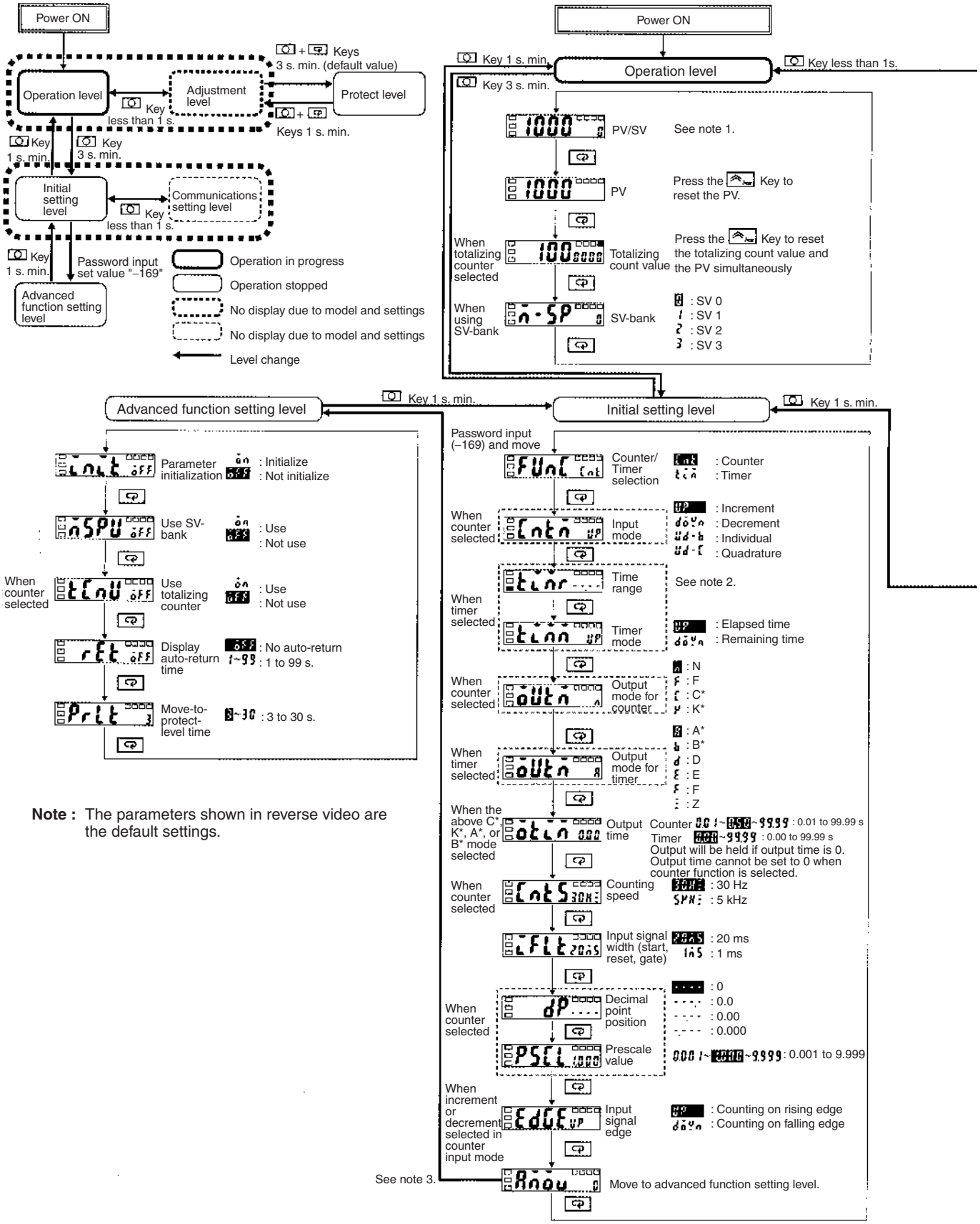
4. Stop Bits (Sbit)

The stop bits can be set to either 1 or 2.

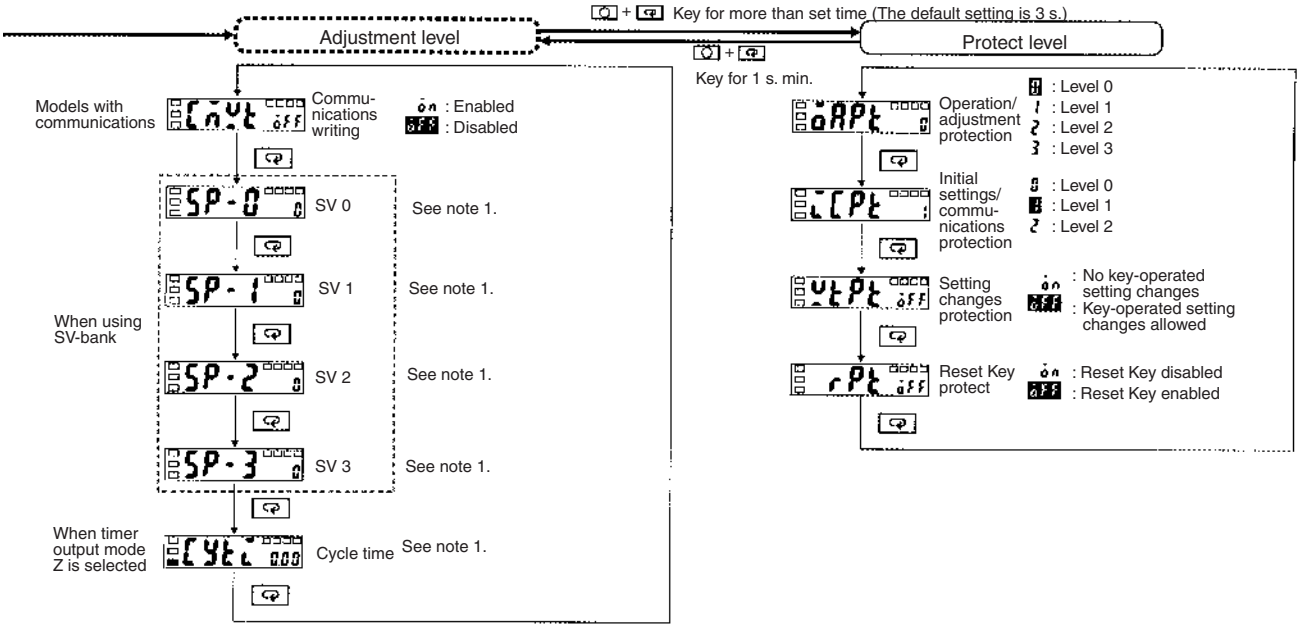
5. Parity (Prty)

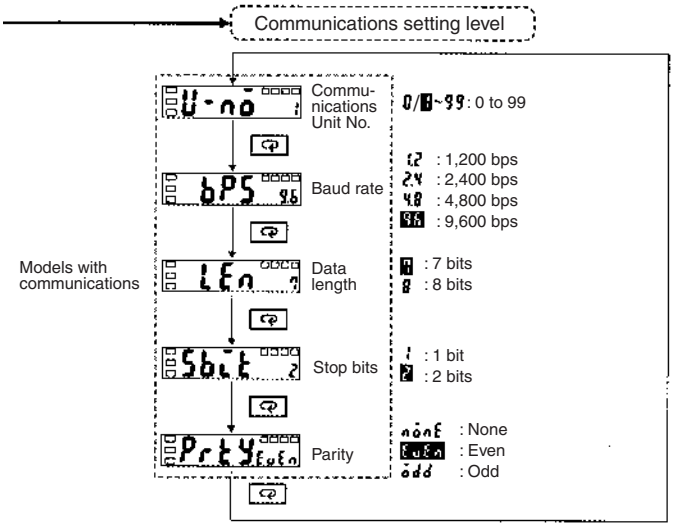
The parity can be set to none, even, or odd.

■ Parameters



Note : The parameters shown in reverse video are the default settings.





Note : Settings made in the communications setting level are enabled when the power is turned ON again.

Note: 1. Counter (increment or decrement)

: 0 to 9999

Counter (individual or quadrature)

: –999 to 9999

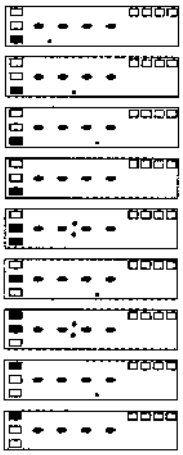
Timer (cycle time or mode other than output mode Z)

: 0.000 to 9.999 s
: 0.00 to 99.99 s
: 0.0 to 999.9s, min, h
: 0 to 9999 s, h
: 0 min 00 s to 99 min 59 s
: 0 h 00 min to 99 h 59 min

Timer (output mode Z)

: 0% to 100% (ON duty)

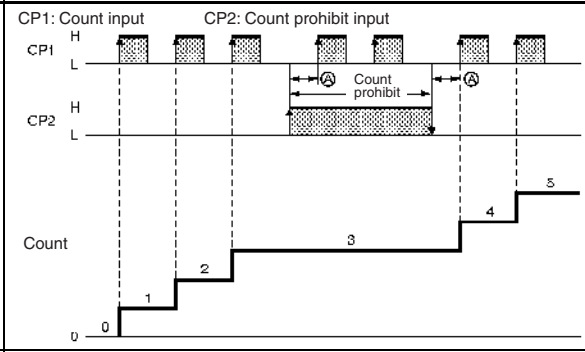
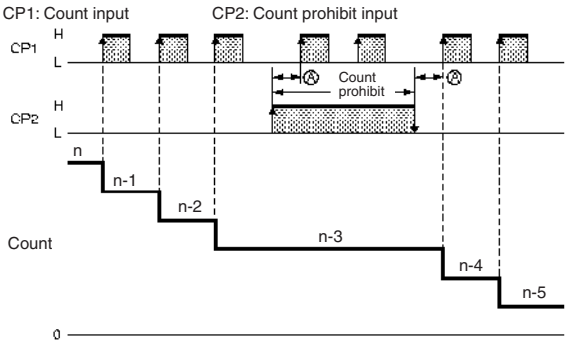
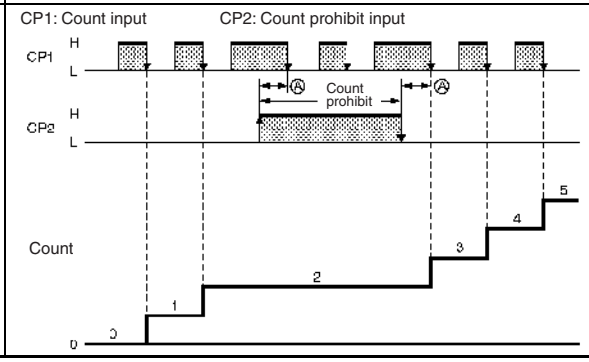
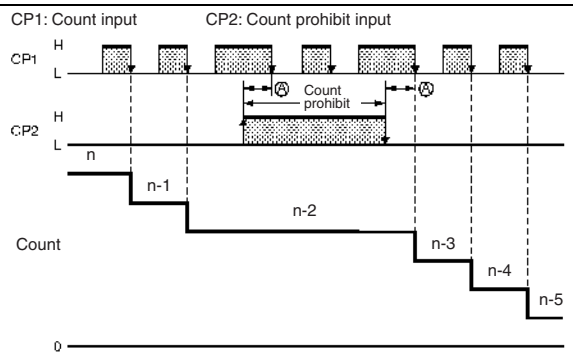
2. Time range



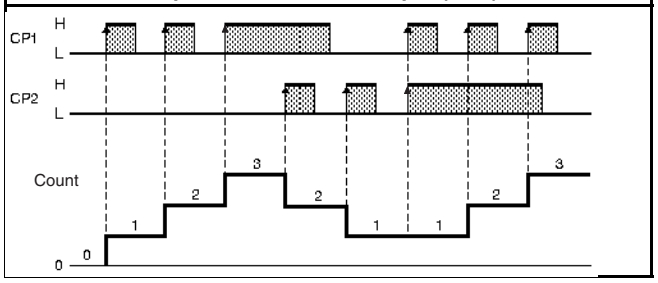
3. Displayed when level 0 is selected for initial setting/ communications protection in the protect level.

■ Operating Mode

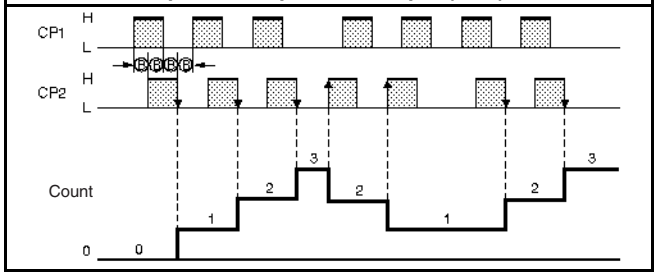
Input/Output Modes and Count Values

<table>
<tr><th colspan="2"></th><th>Up (Increment) mode (UP)</th><th>Down (Decrement) mode (dOWn)</th></tr>
<tr><td rowspan="2">Input edge</td><td>UP</td><td> 
</td><td> 
</td></tr>
<tr><td>DOWN</td><td> 
</td><td> 
</td></tr>
</table>

Up/Down B Individual input (Ud-b)



Up/Down C quadrature input (Ud-C)



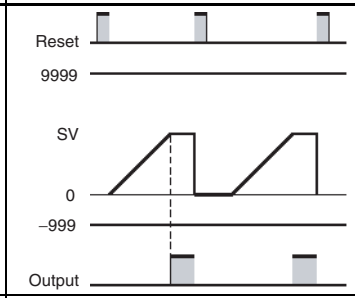
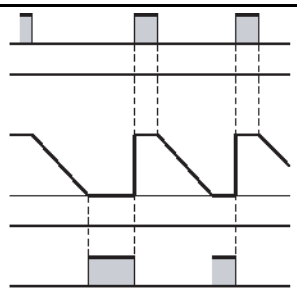
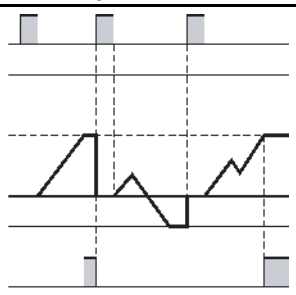
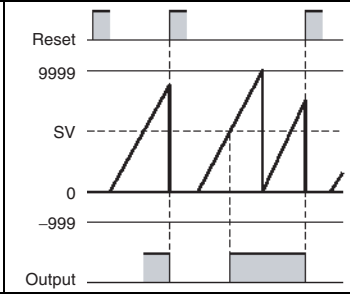
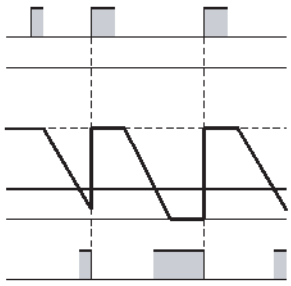
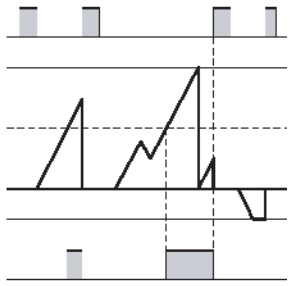
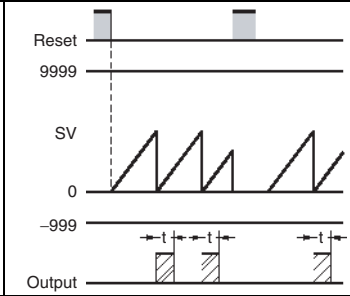
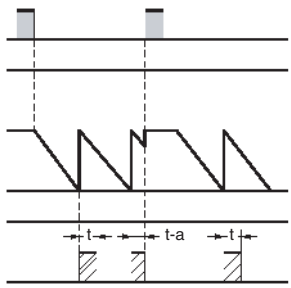
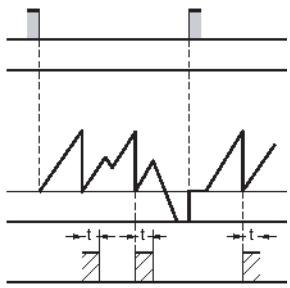
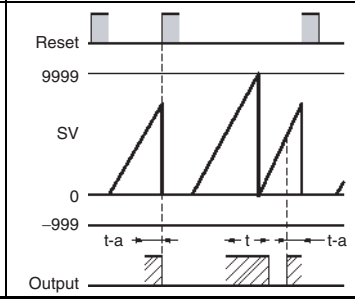
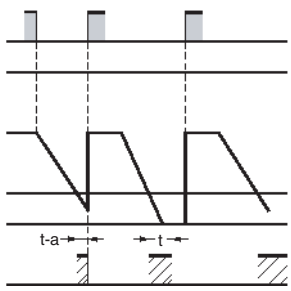
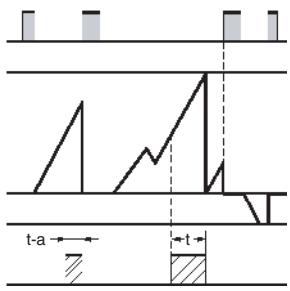
Note: 1. (A) indicates the minimum signal width and (B) requires at least 1/2 the minimum signal width. If these conditions are not met, a counting error (+1 or −1) may occur.

2. The following table explains the L and H symbols in the above graphics.

Symbol	Input
H	Short-circuited
L	Open

Input/Output Mode Settings

Counter Function

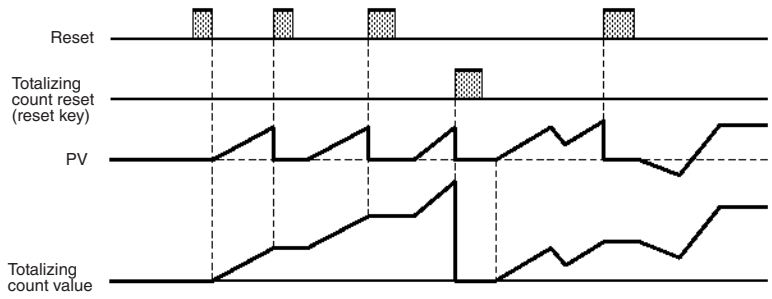
		Input mode		
		Up	Down	Up/Down B.C
Output mode	N			
	F			
	C			
	K			

Note: 1. t: output time. t – a < t : Less than the output time.

2. If there is a power failure during output ON, output will turn ON again when the power supply has recovered. For one-shot output, an output will be made again for the duration of the output time setting once the power supply has resumed.

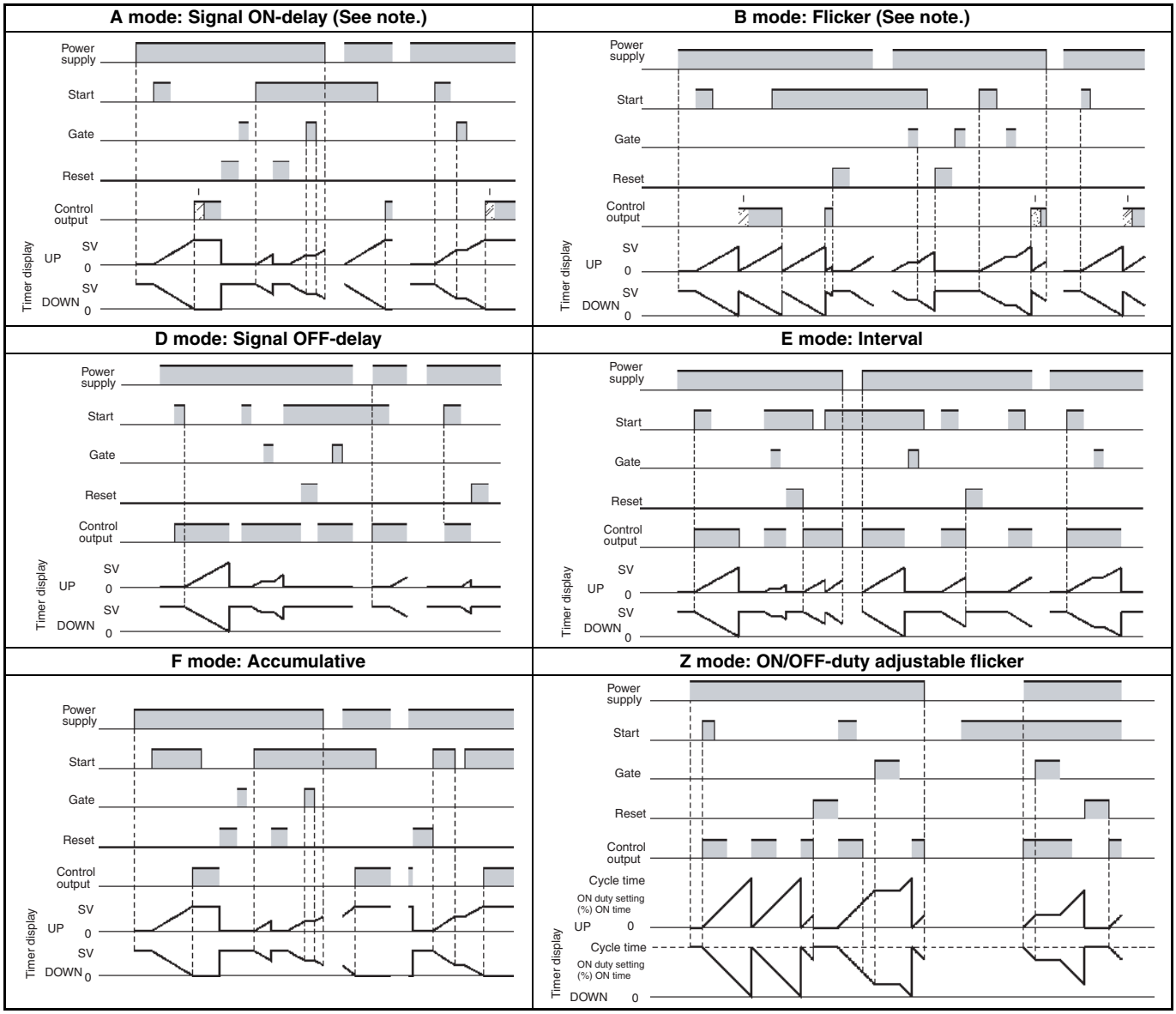
3. Output timing restarted during one-shot outputs is ignored.

Totalizing Counter Operation



- Totalizing counter continues to count the present value, regardless of whether an reset input (by the reset key) has been made to reset the PV.
- When totalizing count value is reset, the PV is reset at the same time.
- The totalizing count range is 0 to 99,999,999. If the totalizing count exceeds 99,999,999, the count returns to 0. If the count drops below 0, it becomes 99,999,999.

Timer Function

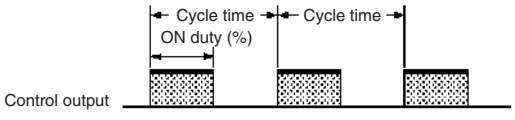


Note: One-shot output or HOLD output can be selected for output: 

Z Mode

Output quantity can be adjusted by changing the cycle time set in the adjustment level to 1 and by changing the ON duty (%) set value.

The set value shows the ON duty (%) and can be set to a value between 0 and 100 (%). When the cycle time is 0, the output will always be OFF. When the cycle time is not 0 and when ON duty has been set to 0 (%), the output will always be OFF. When ON duty has been set to 100 (%), the output will always be ON.



■ Troubleshooting

When an error occurs, the error code is displayed on the main display. Take countermeasures according to the code.

No. 1 display	No. 2 display	Error contents	Countermeasure
E111	No display	Memory error (RAM)	Turn the power OFF and ON again. If normal operation is still not restored, it may be necessary to repair or replace the H8GN. If normal operation is restored by turning the power supply OFF and ON, it is possible that there is noise interference. Check that there is nothing in the vicinity that may be the source of noise.
E111	SUM	Memory error (EEP)	
E1	No display	CPU error	
- - - - Flashes	Set value displayed or no display	Present value under-flow	This is not an actual error. This display indicates that the present value has dropped to a value less than –999. Reset using reset input or pressing the Up Key when "- - - -" is displayed.

Note: Error codes are displayed only if PV/SV or PV is being displayed.

Additional Information

■ Parameters List

Fill in your set values in the *Set value* column of the following tables and utilize the tables for quick reference.

Protect Level

Parameter name	Parameter	Setting range	Default value	Unit	Set value
Operation/Adjustment Protection	oAPt	0 to 3	0		
Initial Setting/Communications Protection	CCPt	0 to 2	1		
Setting Change Protection	ytPt	on/oFF	oFF		
Reset Key Protection	rPt	on/oFF	oFF		

Operation Level

Parameter name			Parameter	Setting (display) range	Default value	Unit	Set value
Present value (PV)/ Set Value (SV)	PV	Counter		-999 to 9999/---- (PV<-999)	0		
		Timer		0.000 to 9.999 (Time range=-.---s)	0.000	Second	
				0.00 to 99.99 (Time range=--.--s)	0.00	Second	
				0.0 to 999.9 (Time range=---.-s)	0.0	Second	
				0 to 9999 (Time range=----s)	0	Second	
				0:00 to 99:59 (Time range=--min--s)	0:00	Minute: Second	
				0.0 to 999.9 (Time range=---.-min)	0.0	Minute	
				0:00 to 99:59 (Time range=--h--min)	0:00	Hour: Minute	
				0.0 to 999.9 (Time range=---.-h)	0.0	Hour	
				0 to 9999 (Time range=----h)	0	Hour	
	SV	Counter		0 to 9999 (Input mode=Up or Down)	0		
				-999 to 9999 (Input mode=Individual or quadrature)	0		
		Timer (Output mode: A, B, D, E, F)		0.000 to 9.999 (Time range=-.---s)	0.000	Second	
				0.00 to 99.99 (Time range=--.--s)	0.00	Second	
				0.0 to 999.9 (Time range=---.-s)	0.0	Second	
				0 to 9999 (Time range=----s)	0	Second	
				0:00 to 99:59 (Time range=--min--s)	0:00	Minute: Second	
				0.00 to 999.9 (Time range=---.-min)	0.0	Minute	
				0:00 to 99:59 (Time range=--h--min)	0:00	Hour: Minute	
				0.00 to 999.9 (Time range=---.-h)	0.0	Hour	
				0 to 9999 (Time range=----h)	0	Hour	
		Timer (Output mode: Z)		0 to 100	0	%	
PV				Same as for PV in the above PV/SV column.			
Totalizing count value				0 to 99999999	0		
SV-bank			n-SP	0/ 1/2/3	0		

Adjustment Level

Parameter name		Parameter	Setting range	Default value	Unit	Set value
Communications writing control		CMWT	on/oFF	oFF		
SV 0		SP-0	Same as for PV in the above PV/SV column.			
SV 1		SP-1	Same as for PV in the above PV/SV column.			
SV 2		SP-2	Same as for PV in the above PV/SV column.			
SV 3		SP-3	Same as for PV in the above PV/SV column.			
Cycle time	Timer (Output mode=Z)	CYTC	0.000 to 9.999 (Time range=-.---s)	0.000	Second	
			0.00 to 99.99 (Time range=--.--s)	0.00	Second	
			0.0 to 999.9 (Time range=---.-s)	0.0	Second	
			0 to 9999 (Time range=----s)	0	Second	
			0:00 to 99:59 (Time range=--min--s)	0:00	Minute: Second	
			0.0 to 999.9 (Time range=---.-min)	0.0	Minute	
			0:00 to 99:59 (Time range=--h--min)	0:00	Hour: Minute	
			0.0 to 999.9 (Time range=---.-h)	0.0	Hour	
			0 to 9999 (Time range=----h)	0	Hour	

Initial Setting Level

Parameter name		Parameter	Setting range	Default value	Unit	Set value
Counter/Timer selection		FUNC	CNT/TIMR	CNT		
Input mode		CNTM	UP/DOWN/UD-B/UD-C	UP		
Time range		TIMR	-.---S/--.--S/---.-S/----S/ --MIN--S/---.-MIN/--H--MIN/ ---.-H ----H	--.--	Second	
Timer mode		TIMM	UP/DOWN	UP		
Output mode for counter function		OUTM	N/F/C/P	N		
Output mode for timer function		OUTM	A/B/D/E/F/J	A		
Output time	Counter	OTIM	0.01 to 99.99	0.50	Second	
	Timer		0.00 to 99.99	0.00	Second	
Counting speed		CNTS	30HZ/5KHZ	30HZ		
Input signal width		IFLT	20MS/ 1MS	20MS		
Decimal point position		DP	----/---.-/--.--/-.---	----		
Prescale value		PSCL	0.001 to 9.999	1.000		
Input signal edge		EDGE	UP/DOWN	UP		
Move to function setting level		MOVE	-999 to 9999	0		

Communications Setting Level

Parameter name	Parameter	Setting range	Default value	Unit	Set value
Communications unit number	U-NO	0 to 99	1		
Baud rate	BPS	1.2/2.4/4.8/9.6	9.6	kbps	
Communications data length	LEN	7/8	7	bit	
Stop bits	SBIT	1/2	2	bit	
Parity	PRTY	NONE/EVEN/ODD	EVEN		

Advanced Function Setting Level

Parameter name	Parameter	Setting range	Default value	Unit	Set value
Parameter initialization	InIt	on/oFF	oFF		
SV-bank used	bSPU	on/oFF	oFF		
Totalizing counter used	tCnU	on/oFF	oFF		
Display auto-return time	rEt	oFF/1 to 99	oFF	Second	
Move-to-protect-level time	PrLt	3 to 30	3	Second	

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. M065-E1-02

Multifunction Preset Counter
H7CX

- Highly visible display with backlit negative transmissive LCD.
- Programmable PV color to visually alert when output status changes (screw terminal block models).
- Intuitive setting enabled using ergonomic up/down digit keys (4-digit models) and DIP switch.
- Configurable as 1-stage counter, 2-stage counter, total and preset counter, batch counter, dual counter, or tachometer. (Configurability varies with model.)
- PNP/NPN switchable input.
- Finger-safe terminals (screw terminal block models).
- Meets a variety of mounting requirements:
  Screw terminal block models, and pin-style terminal models.
- NEMA4/IP66 compliance.
- Six-language instruction manual.

Contents

Model Number Structure

■ Model Number Legend

H7CX-A□□□□□□
1 2 3 4 5 6

1. External connection
None: Screw terminals
11: 11-pin socket

2. No. of digits
None: 6 digits
4: 4 digits

3. Stage setting
None: 1-stage setting
U: Factory-set to 1-stage setting
W: Factory-set to 2-stage setting

4. Output type
None: Contact output or contact and transistor in combination
S: Transistor output

5. Supply voltage/external power supply
None: 100 to 240 VAC at 50/60 Hz with 12 VDC power supply
D: 12 to 24 VDC without external power supply
D1: 12 to 24 VDC or 24 VAC at 50/60 Hz with 12 VDC power supply

6. Case color
None: Black
G: Light gray (Munsell 5Y7/1): Produced upon request.

Ordering Information

■ List of Models

Supported configurations			• 1-stage counter • 1-stage counter with total counter				• 1-stage counter • 2-stage counter • 1-stage counter with total counter • 1-stage counter with batch counter • Dual counter (addition/subtraction) • Tachometer		• 1-stage counter • 2-stage counter • 1-stage counter with total counter • 1-stage counter with batch counter • Dual counter (addition only)
Sensor power supply	**Output type**	**Supply voltage**	**11-pin socket**		**Screw terminal**				
			1-stage				**1-stage (See note.)**	**2-stage**	
			6 digits	**4 digits**	**6 digits**	**4 digits**	**6 digits**	**6 digits**	**4 digits**
			H7CX-A11□	**H7CX-A114□**	**H7CX-A□**	**H7CX-A4□**	**H7CX-AU□**	**H7CX-AW□**	**H7CX-A4W□**
12 VDC	Contact output	100 to 240 VAC	H7CX-A11	H7CX-A114	H7CX-A	H7CX-A4	---	H7CX-AW	H7CX-A4W
		12 to 24 VDC/ 24 VAC	H7CX-A11D1	H7CX-A114D1	---	---	---	H7CX-AWD1	---
	Contact and transistor output	100 to 240 VAC	---	---	---	---	H7CX-AU	---	---
		12 to 24 VDC/ 24 VAC	---	---	---	---	H7CX-AUD1	---	---
	Transistor output	100 to 240 VAC	H7CX-A11S	H7CX-A114S	H7CX-AS	H7CX-A4S	---	H7CX-AWS	---
		12 to 24 VDC/ 24 VAC	H7CX-A11SD1	---	---	---	H7CX-AUSD1	H7CX-AWSD1	---
None	Contact output	12 to 24 VDC	---	---	H7CX-AD	H7CX-A4D	---	---	---
	Transistor output		---	---	H7CX-ASD	H7CX-A4SD	---	H7CX-AWSD	H7CX-A4WSD

Note: Can be used as a 2-stage counter. In this case, each output can be flexibly allocated to either stage 1 or 2.

■ Accessories (Order Separately)

Name		**Models**
Flush Mounting Adapter (See note 1.)		Y92F-30
Waterproof Packing (See note 1.)		Y92S-29
Track Mounting/Front Connecting Socket	11-pin	P2CF-11
	11-pin, finger-safe type	P2CF-11-E
Back Connecting Socket	11-pin	P3GA-11
	11-pin, finger-safe type	P3GA-11 with Y92A-48G (See note 2.)
Hard Cover		Y92A-48
Soft Cover		Y92A-48F1
Mounting Track	50 cm (l) × 7.3 mm (t)	PFP-50N
	1 m (l) × 7.3 mm (t)	PFP-100N
	1 m (l) × 16 mm (t)	PFP-100N2
End Plate		PFP-M
Spacer		PFP-S

Note: 1. Supplied with screw-terminal models (i.e., excluding H7CX-A11□/-A114□ models).
2. Y92A-48G is a finger-safe terminal cover attached to the P3GA-11 Socket.

Specifications

■ Ratings

Item		H7CX-A4□	H7CX-A□	H7CX-A114□	H7CX-A11□
Classification		Preset counter			
Supported configurations		1-stage counter, 1-stage counter with total counter (selectable)			
Rated supply voltage (See note 1.)		100 to 240 VAC (50/60 Hz), 12 to 24 VDC		100 to 240 VAC (50/60 Hz) 24 VAC (50/60 Hz)/12 to 24 VDC	
Operating voltage range		85% to 110% of rated supply voltage (90% to 110% at 12 VDC)			
Power consumption		Approx. 9.2 VA at 264 VAC Approx. 7.2 VA at 26.4 VAC Approx. 3.7 W at 12 VDC			
Mounting method		Flush mounting		Flush mounting, surface mounting, or DIN track mounting	
External connections		Screw terminals		11-pin socket	
Terminal screw tightening torque		0.5 N·m max.		---	
Display		7-segment, negative transmissive LCD;			
	PV	11.5-mm-high characters, red or green (programmable)	9-mm-high characters, red or green (programmable)	11.5-mm-high characters, red	9-mm-high characters, red
	SV	6-mm-high characters, green			
Digits		4 digits (–999 to 9,999) SV range: 0 to 9,999	6 digits (–99,999 to 999,999) SV range: –99,999 to 999,999 (See note 2.) or 0 to 999,999	4 digits (–999 to 9,999) SV range: 0 to 9,999	6 digits (–99,999 to 999,999) SV range: –99,999 to 999,999 (See note 2.) or 0 to 999,999
Max. counting speed		30 Hz or 5 kHz (selectable, ON/OFF ratio 1:1), common setting for CP1 and CP2			
Input modes		Increment, decrement, command, individual, and quadrature			
Input signals		CP1, CP2, reset, and total reset			
Input method		No-voltage input/voltage input (switchable) No-voltage input ON impedance: 1 kΩ max. (Leakage current: 5 to 20 mA at 0 Ω) ON residual voltage: 3 V max. OFF impedance: 100 kΩ min. Voltage input High (logic) level: 4.5 to 30 VDC Low (logic) level: 0 to 2 VDC (Input resistance: approx. 4.7 kΩ)			
Reset input		Minimum reset input signal width: 1 or 20 ms (selectable), common setting for all inputs			
Reset system		External, manual, and automatic reset (internal according to C, R, P, and Q mode operation)			
Output modes		N, F, C, R, K-1, P, Q, A	N, F, C, R, K-1, P, Q, A, K-2, D, L	N, F, C, R, K-1, P, Q, A	N, F, C, R, K-1, P, Q, A, K-2, D, L
One-shot output time		0.01 to 99.99 s			
Output type		Contact type: SPDT Transistor type: 1 transistor			
Control output		Contact output: 3 A at 250 VAC/30 VDC, resistive load ($\cos\phi$=1) Minimum applied load: 10 mA at 5 VDC (failure level: P, reference value) Transistor output: NPN open collector, 100 mA at 30 VDC Residual voltage: 1.5 VDC max. (approx. 1 V) Leakage current: 0.1 mA max.			
		NEMA B300 Pilot Duty, 1/4 HP 3-A resistive load at 120 VAC, 1/3 HP 3-A resistive load at 240 VAC			
External power supply		12 VDC (±10%), 100 mA (except for H7CX-A□D models) Refer to *Precautions* for details.			
Key protection		Yes			
Prescaling function		Yes (0.001 to 9.999)	Yes (0.001 to 99.999)	Yes (0.001 to 9.999)	Yes (0.001 to 99.999)
Decimal point adjustment		Yes (rightmost 3 digits)			
Sensor waiting time		250 ms max. (Control output is turned OFF and no input is accepted during sensor waiting time.)			
Memory backup		EEPROM (overwrites: 100,000 times min.) that can store data for 10 years min.			
Ambient temperature		Operating: –10 to 55°C (–10 to 50°C if counters are mounted side by side) (with no icing or condensation) Storage: –25 to 65°C (with no icing or condensation)			
Ambient humidity		25% to 85%			
Case color		Black (N1.5), light gray (Munsell 5Y7/1, produced upon request)			
Attachments		Waterproof packing, flush mounting adapter		None	

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

2. Only when the following modes are selected.
Input mode: command, individual, or quadrature; output mode: K-2, D, or L

■ Ratings (contd.)

Item			H7CX-A4W□	H7CX-AW□	H7CX-AU□
Classification			Preset counter	Preset counter/tachometer	
Supported configurations			1-stage counter, 2-stage counter, 1-stage counter with total counter, 1-stage counter with batch counter, dual counter (addition only) (selectable)	1-stage counter, 2-stage counter, 1-stage counter with total counter, 1-stage counter with batch counter, dual counter (addition/subtraction), tachometer (selectable)	
Rated supply voltage (See note 1.)			100 to 240 VAC (50/60 Hz), 12 to 24 VDC	100 to 240 VAC (50/60 Hz), 24 VAC (50/60 Hz)/12 to 24 VDC, 12 to 24 VDC	100 to 240 VAC (50/60 Hz), 24 VAC (50/60 Hz)/12 to 24 VDC
Operating voltage range			85% to 110% of rated supply voltage (90% to 110% at 12 VDC)		
Power consumption			Approx. 9.2 VA at 264 VAC Approx. 7.2 VA at 26.4 VAC Approx. 3.7 W at 12 VDC		
Mounting method			Flush mounting		
External connections			Screw terminals		
Terminal screw tightening torque			0.5 N·m max.		
Display			7-segment, negative transmissive LCD		
		PV	11.5-mm-high characters, red or green (programmable)	9-mm-high characters, red or green (programmable)	
		SV	6-mm-high characters, green		
Digits			4 digits (–999 to 9,999) SV range: 0 to 9,999	6 digits (–99,999 to 999,999 or 0 to 999,999 when using as Tachometer) SV range: –99,999 to 999,999 (See note 2.) or 0 to 999,999	
Input signals			CP1, CP2, reset 1, and reset 2		
Input method			No-voltage input/voltage input (switchable) No-voltage input ON impedance: 1 kΩ max. (Leakage current: 5 to 20 mA at 0 Ω) ON residual voltage: 3 V max. OFF impedance: 100 kΩ min. Voltage input High (logic) level: 4.5 to 30 VDC Low (logic) level: 0 to 2 VDC (Input resistance: approx. 4.7 kΩ)		
Counter	Max. counting speed		30 Hz or 5 kHz (selectable, ON/OFF ratio 1:1), common setting for CP1 and CP2		
	Input mode		Increment, decrement, command, individual, and quadrature		
	Reset input		Minimum reset input signal width: 1 or 20 ms (selectable), common setting for all inputs		
	Reset system		External, manual, and automatic reset (internal according to C, R, P, and Q mode operation)		
	Output modes		N, F, C, R, K-1, P, Q, A	N, F, C, R, K-1, P, Q, A, K-2, D, L, H	
	One-shot output time		0.01 to 99.99 s		
Tachometer	Pulse measurement method		---	Periodic measurement (Sampling period: 200 ms)	
	Max. counting speed		---	30 Hz or 10 kHz (selectable)	
	Measuring ranges		---	30 Hz: 0.01 to 30.00 Hz 10 kHz: 0.01 Hz to 10 kHz	
	Measuring accuracy		---	±0.1% FS ±1 digit max. (at 23 ±5°C)	
	Output modes		---	HI-LO, AREA, HI-HI, LO-LO	
	Auto-zero time		---	0.1 to 99.9 s	
	Startup time		---	0.0 to 99.9 s	
	Average processing		---	OFF/2/4/8 times	
Output type			H7CX-A4W/-AW/-AWD1: SPDT (OUT2) and SPST-NO (OUT1) H7CX-A4WSD/-AWS/-AWSD/-AWSD1: 2 transistors		H7CX-AU/-AUD1: SPDT and 1 transistor H7CX-AUSD1: 2 transistors (Output allocation possible)
Control output			Contact output: 3 A at 250 VAC/30 VDC, resistive load (cosϕ=1) Minimum applied load: 10 mA at 5 VDC (failure level: P, reference value) Transistor output: NPN open collector, 100 mA at 30 VDC Residual voltage: 1.5 VDC max. (approx. 1 V) Leakage current: 0.1 mA max.		
			NEMA B300 Pilot Duty, 1/4 HP 3-A resistive load at 120 VAC, 1/3 HP 3-A resistive load at 240 VAC		
External power supply			12 VDC (±10%) 100 mA (except for H7CX-A□D models) Refer to *Precautions* for details.		
Key protection			Yes		
Prescaling function			Yes (0.001 to 9.999)	Yes (0.001 to 99.999)	
Decimal point adjustment			Yes (rightmost 3 digits)		
Sensor waiting time			250 ms max. (Control output is turned OFF and no input is accepted during sensor waiting time.)		
Memory backup			EEPROM (overwrites: 100,000 times min.) that can store data for 10 years min.		
Ambient temperature			Operating: –10 to 55°C (–10 to 50°C if counters are mounted side by side) (with no icing or condensation) Storage: –25 to 65°C (with no icing or condensation)		
Ambient humidity			25% to 85%		
Case color			Black (N1.5), light gray (Munsell 5Y7/1, produced upon request)		
Attachments			Waterproof packing, flush mounting adapter	Waterproof packing, flush mounting adapter, labels for counter/tachometer DIP switch settings	

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

2. Only when the following modes are selected.
- Input mode: command, individual, or quadrature; output mode: K-2, D, L, or H
- Dual count calculating mode: SUB; output mode: K-2, D, L, or H in dual counter operation

■ Characteristics

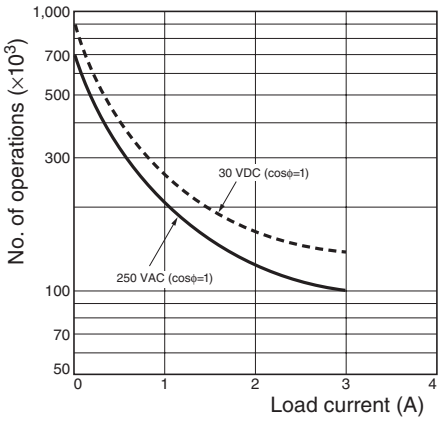
item	H7CX
Insulation resistance	100 MΩ min. (at 500 VDC) between current-carrying terminal and exposed non-current-carrying metal parts, and between non-continuous contacts
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and non-current-carrying metal parts 2,000 VAC (for 100 to 240 VAC), 50/60 Hz for 1 min between power supply and input circuit (1,000 VAC for 24 VAC/12 to 24 VDC) 1,000 VAC (for H7CX-□SD/-□SD1), 50/60 Hz for 1 min between control output, power supply, and input circuit (2,000 VAC for models other than H7CX-□SD/-□SD1) 1,000 VAC, 50/60 Hz for 1 min between non-continuous contacts
Impulse withstand voltage	3 kV (between power terminals) for 100 to 240 VAC, 1 kV for 24 VAC/12 to 24 VDC and 12 to 24 VDC 4.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts) for 100 to 240 VAC, 1.5 kV for 24 VAC/12 to 24 VDC and 12 to 24 VDC
Noise immunity	±1.5 kV (between power terminals) for 100 to 240 VAC and 24 VAC/12 to 24 VDC, ±480 V for 12 to 24 VDC ±600 V (between input terminals) Square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)
Static immunity	Destruction: 15 kV Malfunction: 8 kV
Vibration resistance	Destruction: 10 to 55 Hz with 0.75-mm single amplitude, four cycles each in three directions (8 minutes per cycle) Malfunction: 10 to 55 Hz with 0.35-mm single amplitude, four cycles each in three directions (8 minutes per cycle)
Shock resistance	Destruction: 294 m/s^2 each in three directions Malfunction: 98 m/s^2 each in three directions
Life expectancy	Mechanical: 10,000,000 operations min. Electrical: 100,000 operations min. (3 A at 250 VAC, resistive load) See *Life-test Curve* on page 92.
Approved safety standards (See note 1.)	UL508/Listing, CSA C22.2 No. 14, conforms to EN61010-1 (Pollution degree 2/overvoltage category II) Conforms to VDE0106/P100 (finger protection).
EMC	(EMI) EN61326 Emission Enclosure: EN55011 Group 1 class A Emission AC mains: EN55011 Group 1 class A (EMS) EN61326 Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2), 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3: 10 V/m (Amplitude-modulated, 80 MHz to 1 GHz) (level 3); 10 V/m (Pulse-modulated, 900 MHz ±5 MHz) (level 3) Immunity Conducted Disturbance: EN61000-4-6: 10 V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2 kV power-line (level 3); 1 kV I/O signal-line (level 4) Immunity Surge: EN61000-4-5: 1 kV line to lines (power and output lines) (level 2); 2 kV line to ground (power and output lines) (level 3) Immunity Voltage Dip/Interruption EN61000-4-11: 0.5 cycle, 100% (rated voltage)
Degree of protection	Panel surface: IP66 and NEMA Type 4 (indoors) (See note 2.)
Weight	Approx. 140 g

Note: 1. To meet UL listing requirements with the H7CX-A11□ models, an OMRON P2CF-11-□ or P3GA-11 Socket must be mounted on the H7CX. Otherwise, H7CX-A11□ models are considered to meet UL508 recognition requirements.

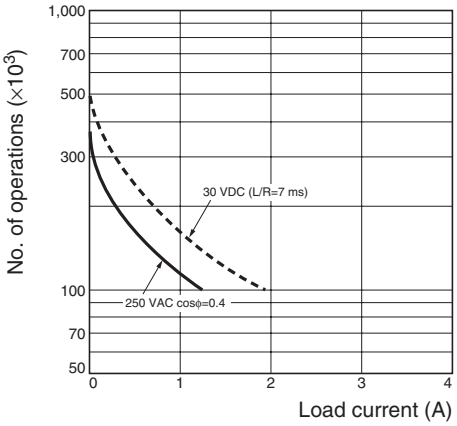
2. A waterproof packing is necessary to ensure IP66 waterproofing between the H7CX and installation panel.

■ Life-test Curve (Reference Values)

Resistive Load



Inductive Load



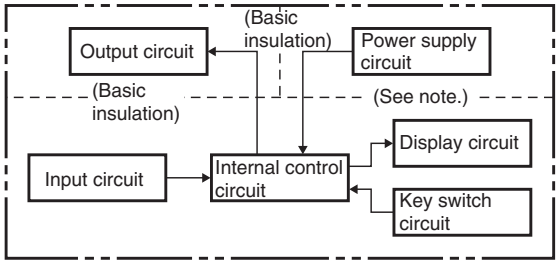
Reference: A current of 0.15 A max. can be switched at 125 VDC (cosϕ=1) and current of 0.1 A max. can be switched if L/R=7 ms. In both cases, a life of 100,000 operations can be expected. The minimum applicable load is 10 mA at 5 VDC (failure level: P).

■ Inrush Current (Reference Values)

Model	Voltage	Applied voltage	Inrush current (peak value)	Time
H7CX-A11/-AW	100 to 240 VAC	264 VAC	5.8 A	0.7 ms
H7CX-A11D1/-AWD1	24 VAC/12 to 24 VDC	26.4 VAC	10.4 A	1.2 ms
H7CX-AD	12 to 24 VDC	26.4 VDC	6.0 A	1.2 ms

Connections

■ Block Diagram



Note: All models except for H7CX-□D (models with 12 to 24-VDC power supplies) have basic insulation.

■ I/O Functions

Using as a Counter

Inputs	**CP1, CP2**	• In general (except for dual counter mode) Reads counting signals Increment, decrement, command, individual, and quadrature inputs accepted. • When used as a dual counter Reads CP1 count signals with CP1 input and CP2 count signals with CP2 input. Increment signals can be input.
	Reset or Reset 1	• In general (except for dual counter mode) Resets present value and outputs (OUT2 when using the batch counter). (See note 1.) Counting cannot be performed during reset/reset 1 input. The reset indicator is lit during reset input. • When used as a dual counter Resets the CP1 present value (to 0). Counting for CP1 input cannot be performed during reset 1 input. The reset indicator is lit during reset 1 input.
	Total Reset or Reset 2 (See note 2.)	• When used as a 1-stage/2-stage counter Does not operate (Not used). • When used as a total and preset counter Resets the total count value. Holds the total count value at 0 during total reset input. • When used as a batch counter Resets the batch count value and batch output (OUT1). Holds the batch count value at 0 during reset 2 input. • When used as a dual counter Resets the CP2 present value. Counting for CP2 input cannot be performed during reset 2 input.
Outputs	**OUT1, OUT2**	Outputs take place according to designated output mode when corresponding preset is reached.

Note: 1. In increment mode or increment/decrement mode, the present value returns to 0; in decrement mode, the present value returns to the set value with 1-stage models, and returns to set value 2 with 2-stage models.

2. The reset indicator will not be lit when the total reset or reset 2 input is ON.

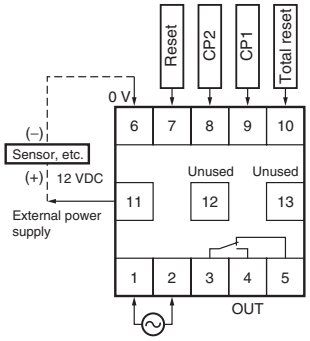
Using as a Tachometer

Inputs	**CP1, CP2**	Reads counting signals. (CP2 input is not used.)
	Reset 1, Reset 2	Holds the measurement value and outputs. (Reset 2 input is not used.) The reset indicator is lit during hold.
Outputs	**OUT1, OUT2**	Outputs signals according to the specified output mode when a set value is reached.

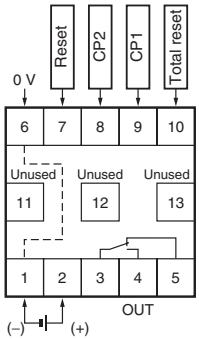
■ Terminal Arrangement

Confirm that the power supply meets specifications before use.

H7CX-A/-A4
1-stage Contact Output

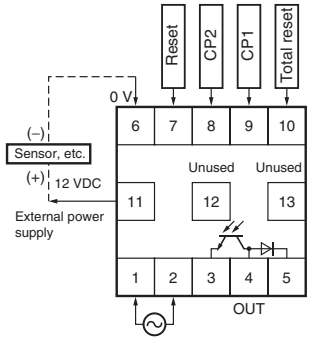


H7CX-AD/-A4D
1-stage Contact Output

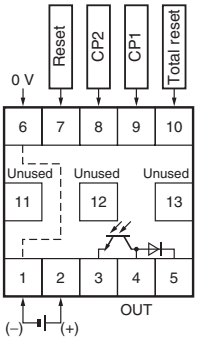


Note: Terminals 1 and 6 are connected internally.

H7CX-AS/-A4S
1-stage Transistor Output

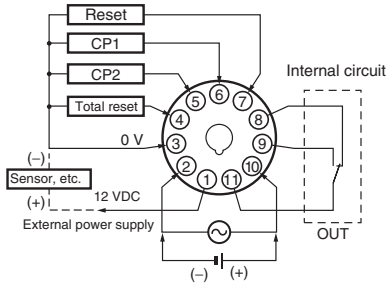


H7CX-ASD/-A4SD
1-stage Transistor Output



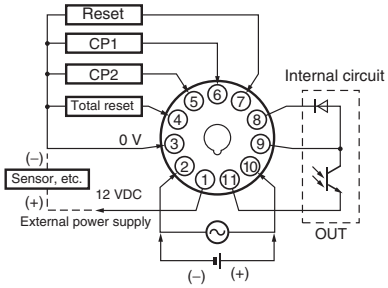
Note: Terminals 1 and 6 are connected internally.

H7CX-A11/-A114/-A11D1/-A114D1
1-stage Contact Output

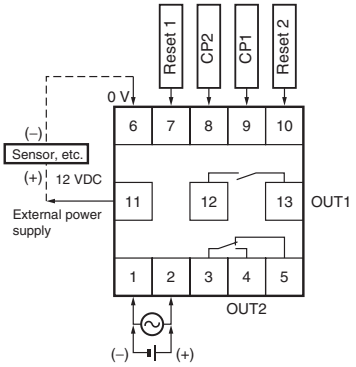


Note: Do not connect unused terminals as relay terminals.

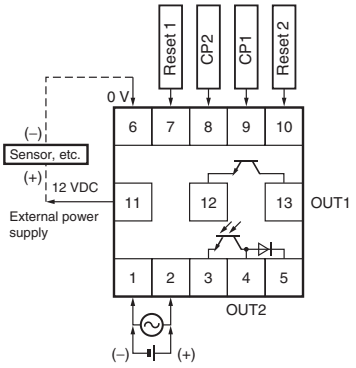
H7CX-A11S/-A114S/-A11SD1
1-stage Transistor Output



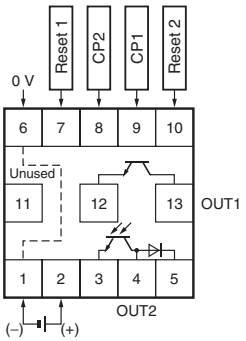
H7CX-AW/-A4W/-AWD1
2-stage Contact Output



H7CX-AWS/-AWSD1
2-stage Transistor Output

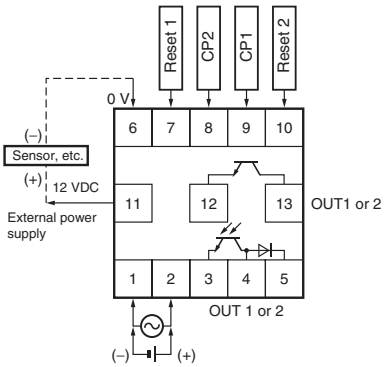


H7CX-AWSD/-A4WSD
2-stage Transistor Output



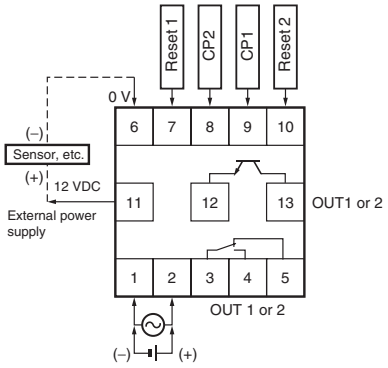
Note: 1. Terminals 1 and 6 are connected internally.
2. Do not connect unused terminals as relay terminals.

H7CX-AUSD1
1 or 2-stage Transistor Output



Note: Each output can be flexibly allocated to either stage 1 or 2 in function selection mode.

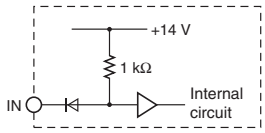
H7CX-AU/-AUD1
1-stage Contact, 1-stage Transistor Output



Note: Each output can be flexibly allocated to either stage 1 or 2 by setting in function selection mode.

■ Input Circuits

CP1, CP2, Reset/Reset 1, and Total Reset/Reset 2 Input



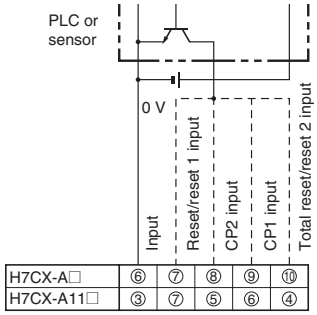
Note: The circuit shown above is for no-voltage input (NPN input).

■ Input Connections

The inputs of the H7CX are no-voltage (short-circuit or open) inputs or voltage inputs.

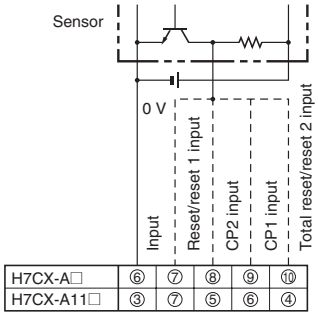
No-voltage Inputs (NPN Inputs)

Open Collector



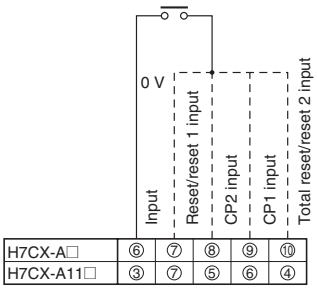
Operates when the transistor turns ON.

Voltage Output



Operates when the transistor turns ON.

Contact Input

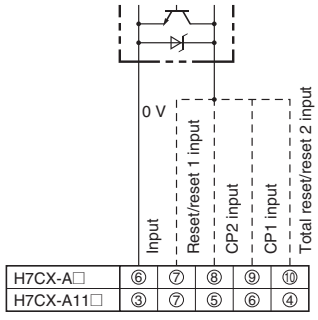


Operates when the contact turns ON.

No-voltage Input Signal Levels

No-contact input	Short-circuit level Transistor ON Residual voltage: 3 V max. Impedance when ON: 1 KΩ max. (The leakage current is 5 to 20 mA when the impedance is 0 Ω.)
	Open level Transistor OFF Impedance when OFF: 100 KΩ min.
Contact input	Use contact which can adequately switch 5 mA at 10 V. Maximum applicable voltage: 30 VDC max.

DC Two-wire Sensor



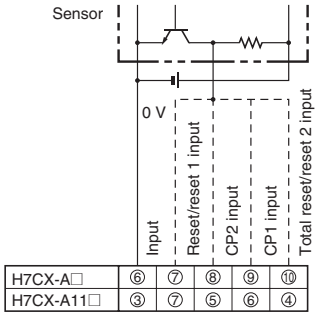
Operates when the transistor turns ON.

Applicable Two-wire Sensor

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

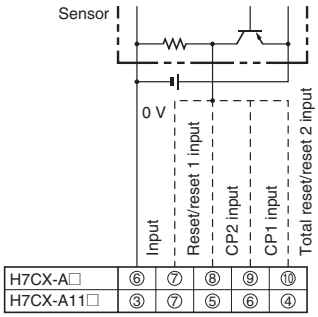
Voltage Inputs (PNP Inputs)

No-contact Input (NPN Transistor)



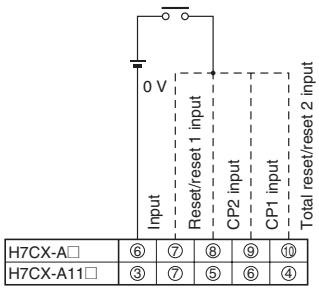
Operates when the transistor turns OFF.

No-contact Input (PNP Transistor)



Operates when the transistor turns ON.

Contact Input



Operates when the contact turns ON.

Voltage Input Signal Levels

High level (Input ON):	4.5 to 30 VDC
Low level (Input OFF):	0 to 2 VDC
Maximum applicable voltage:	30 VDC max.
Input resistance:	Approx. 4.7 kΩ

Nomenclature

Indicators

① Reset Indicator (Orange)
Lit when the reset input (1) or reset key is ON.

② Key Protection Indicator (Orange)

③ Control Output Indicator (Orange)
OUT: One stage
OUT1, OUT2: Two stages

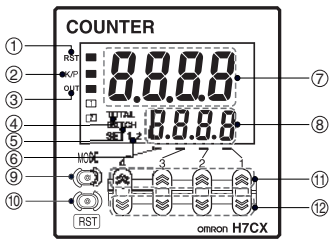
④ Total Count Indicator
Lit when the total count value is displayed.

⑤ Batch Indicator
Lit when the batch count value is displayed.

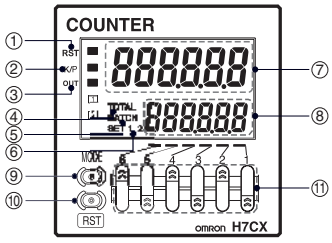
⑥ Set Value 1, 2 Stage Indicator

⑦ Present Value (Main Display)
Character height: 11.5 mm (6-digit: 9mm)

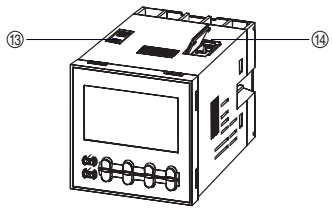
⑧ Set Value (Sub-display)
Character height: 6 mm



Front view of 4-digit model



Front view of 6-digit model



Operation Keys

⑨ Mode Key
Used to switch mode and setting items.

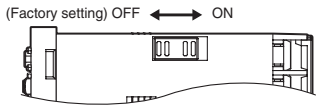
⑩ Reset Key
The operation of the reset function depends on the configuration selected as shown in the table below.

⑪ Up Keys: 1 to 4
(6-digit models: 1 to 6)

⑫ Down Keys: 1 to 4

Switches

⑬ Key Protect Switch



⑭ DIP Switch

Reset Operation by Reset Key

Configuration	Reset operation
1-stage/2-stage counter	Resets the present value and outputs.
Total and preset counter	• Resets the present value and outputs. • When the total count value is displayed, resets the present value, the total count value, and outputs.
Batch counter	• Resets the present value and OUT2. • When the batch count value is displayed, resets the present value, the batch count value, and outputs.
Dual counter	Resets the CP1 present value, CP2 present value, dual count value, and outputs.
Tachometer	Maintains the measured value and outputs (hold function).

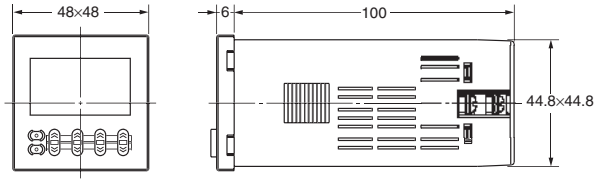
Dimensions

Note: All units are in millimeters unless otherwise indicated.

■ Counter (without Flush Mounting Adapter)

Screw-terminal Models with External Power Supplies (Flush Mounting)

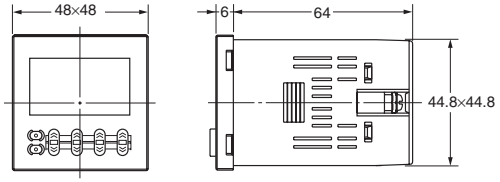
- H7CX-A
- H7CX-AS
- H7CX-A4
- H7CX-A4S
- H7CX-AW
- H7CX-AWS
- H7CX-A4W
- H7CX-AWD1
- H7CX-AWSD1
- H7CX-AU
- H7CX-AUD1
- H7CX-AUSD1



Note: M3.5 terminal screw (effective length: 6 mm)

Screw-terminal Models without External Power Supplies (Flush Mounting)

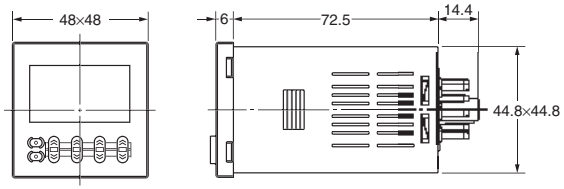
- H7CX-AD
- H7CX-ASD
- H7CX-A4D
- H7CX-A4SD
- H7CX-AWSD
- H7CX-AWSD



Note: M3.5 terminal screw (effective length: 6 mm)

11-pin Socket Models (Flush Mounting/Surface Mounting)

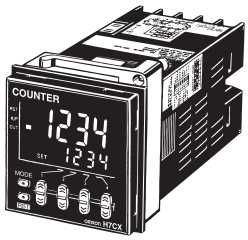
- H7CX-A11
- H7CX-A11S
- H7CX-A11D1
- H7CX-A11SD1
- H7CX-A114
- H7CX-A114S
- H7CX-A114D1

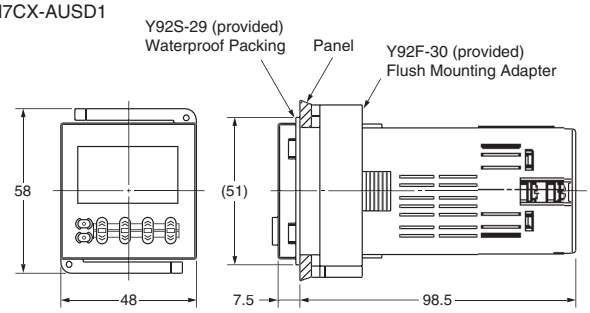


■ Dimensions with Flush Mounting Adapter

Screw-terminal Models with External Power Supplies
(Provided with Adapter and Waterproof Packing)

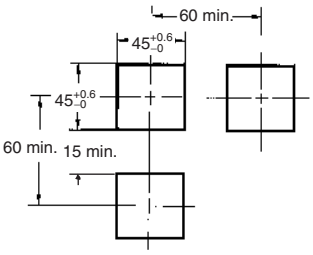
- H7CX-A
- H7CX-AS
- H7CX-A4
- H7CX-A4S
- H7CX-AW
- H7CX-AWS
- H7CX-A4W
- H7CX-AWD1
- H7CX-AWSD1
- H7CX-AU
- H7CX-AUD1
- H7CX-AUSD1





Panel Cutouts

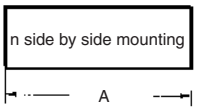
Panel cutouts are as shown below.
(according to DIN43700).



Note: 1. The mounting panel thickness should be 1 to 5 mm.

2. To allow easier operability, it is recommended that Adapters are mounted so that the gap between sides with hooks is at least 15 mm (i.e., so that the panel cutout interval is at least 60 mm).

3. It is possible to mount counters side by side, but only in the direction without the hooks. If they are mounted side-by-side, water-resistant specifications cannot be ensured.



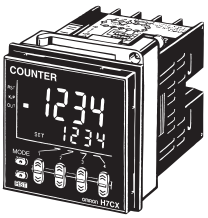
$A = (48n - 2.5)^{+1}_{0}$

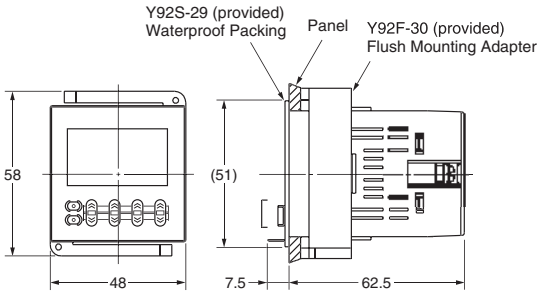
With Y92A-48F1 attached.
$A = \{48n - 2.5 + (n-1) \times 4\}^{+1}_{0}$

With Y92A-48 attached.
$A = (51n - 5.5)^{+1}_{0}$

Screw-terminal Models without External Power Supplies
(Provided with Adapter and Waterproof Packing)

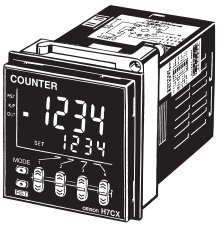
- H7CX-AD
- H7CX-ASD
- H7CX-A4D
- H7CX-A4SD
- H7CX-AWSD
- H7CX-A4WSD

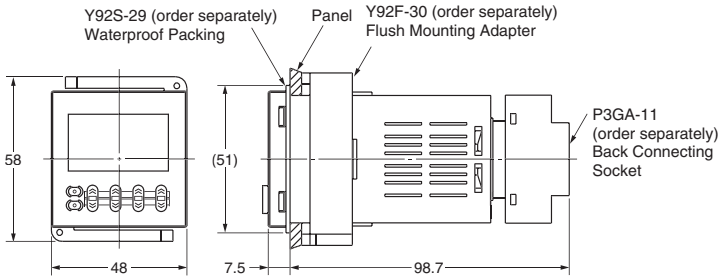




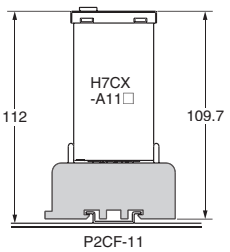
11-pin Socket Models
(Adapter and Waterproof Packing Ordered Separately)

- H7CX-A11
- H7CX-A11S
- H7CX-A11D1
- H7CX-A11SD1
- H7CX-A114
- H7CX-A114S
- H7CX-A114D1





■ Dimensions with Front Connecting Socket

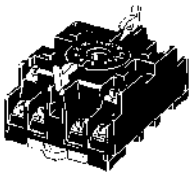


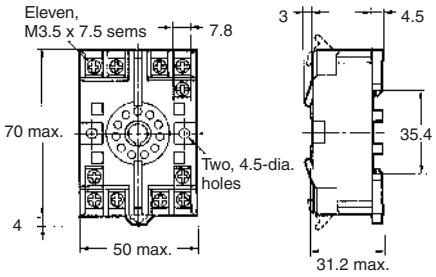
Note: These dimensions vary with the kind of DIN track (reference value).

■ Accessories (Order Separately)

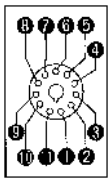
Note: All units are in millimeters unless otherwise indicated.

Track Mounting/Front Connecting Socket
P2CF-11

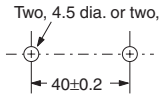




Terminal Arrangement/ Internal Connections (Top View)

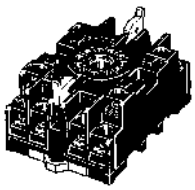


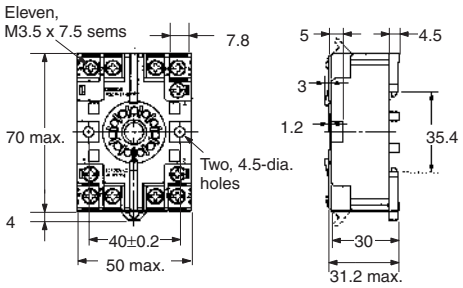
Surface Mounting Holes



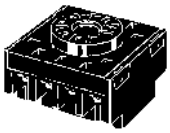
Note: Track mounting is also possible.

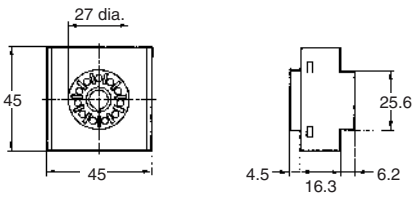
P2CF-11-E (Finger Safe Terminal Type) Conforming to VDE0106/P100



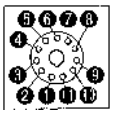


Back Connecting Socket
P3GA-11





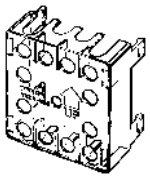
Terminal Arrangement/ Internal Connections (Bottom View)

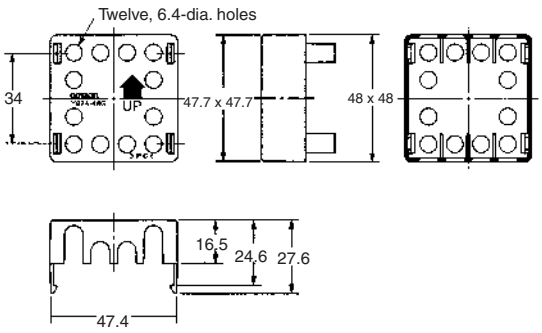


Note: Finger protection can be ensured by using in combination with the Y92A-48G Terminal Cover.

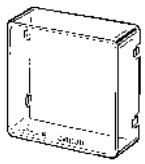
Finger Safe Terminal Cover Conforming to VDE0106/P100

Y92A-48G (Attachment for P3GA-11 Socket)

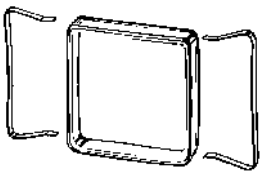




Hard Cover
Y92A-48



Soft Cover
Y92A-48F1

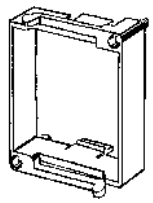


Note: 1. Depending on the operating environment, the condition of the Soft Cover may deteriorate, and it may shrink or become harder. Therefore, it is recommended that the Soft Cover is replaced regularly.

2. The H7CX's panel surface is water-resistive (conforming to IP66) and so even if drops of water penetrate the gaps between the keys, there will be no adverse effect on internal circuits. If, however, there is a possibility of oil being present on the operator's hands, use the Soft Cover. The Soft Cover ensures protection equivalent to IP54F against oil. Do not, however, use the H7CX in locations where it would come in direct contact with oil.

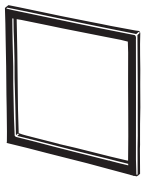
Flush Mounting Adapter
(provided with screw-terminal models)

Y92F-30

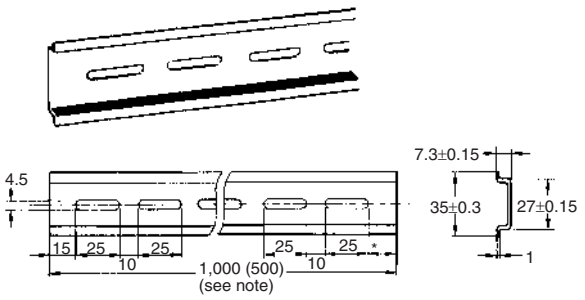


Waterproof Packing
(provided with screw-terminal models)

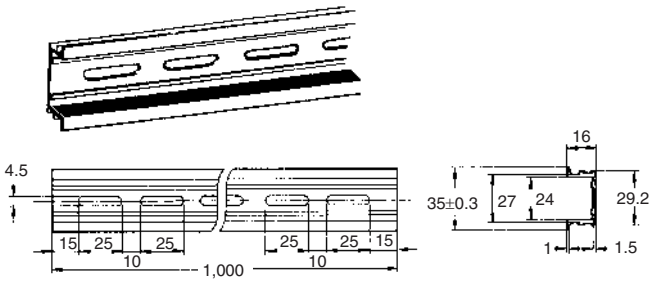
Y92S-29



Mounting Track
PFP-100N, PFP-50N

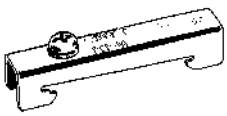


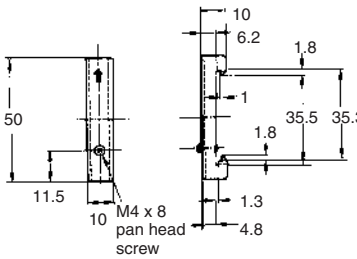
PFP-100N2



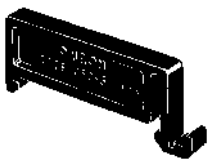
Note: The values shown in parentheses are for the PFP-50N.

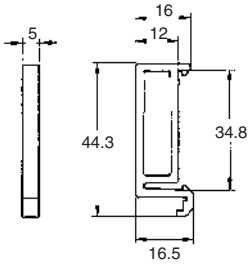
End Plate
PFP-M





Spacer
PFP-S





Precautions

⚠ Caution

Do not use the product in locations subject to flammable or explosive gases. Doing so may result in explosion.

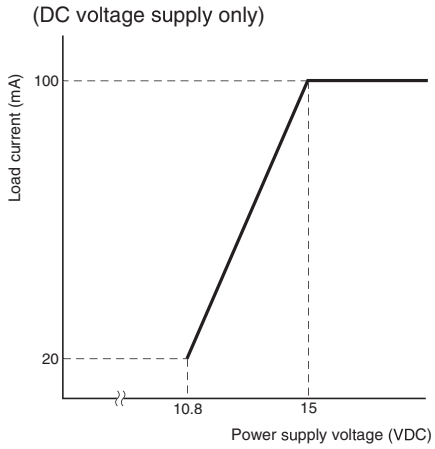
The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life. Using the product beyond its service life may result in contact deposition or burning.

Do not disassemble, repair, or modify the product. Doing so may result in electric shock, fire, or malfunction.

Do not allow metal objects or conductive wires to enter the product. Doing so may result in electric shock, fire, or malfunction.

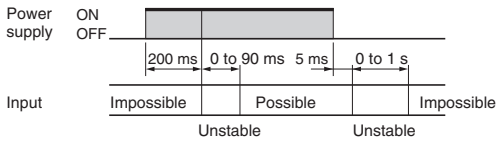
■ External Power Supply

The capacity of the external power supply is 100 mA at 12 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.



Turn the power ON and OFF using a 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.

Apply the power supply voltage through a relay or switch in such a way that the voltage reaches a fixed value immediately, otherwise they may not be reset or a counter error may result.

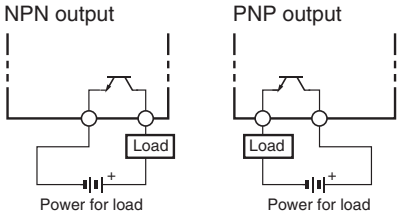
Be sure that the capacity of the power supply is large enough, otherwise the counter may not start due to inrush current (reference value: approx. 10 A, 1.2 ms at 26.4 VAC) that may flow for an instant when the counter is turned ON.

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

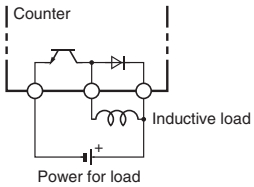
Make sure that the voltage applied is within the specified range, otherwise the internal elements of the counter may be damaged.

■ Transistor Output

The transistor output of the H7CX is isolated from the internal circuitry by a photocoupler, so the transistor output can be used as both NPN and PNP output.



The diode connected to the collector of the output transistor is used to absorb inverted voltage that is generated when an inductive load is connected to the H7CX.



■ Changing the Set Values

When changing the set value during operation, because the H7CX uses a constant read-in system, output will turn ON if the set value is equal to the present value.

■ Operation with a Set Value and Present Value of 0

If the set value and present value are both 0, output will turn ON. Output will turn OFF during reset.

■ Using the Prescaling Function

Observe the following points when setting a prescale value.

- Set the set value to a value less than {Maximum countable value − Prescale value}.

  Example: If the prescale value is 1.25 and the counting range is 0.000 to 999.999, set the set value to a value less than 998.749 (= 999.999 − 1.25).

- If the set value is set to a value greater than this, output will not turn ON.

Note: Output will turn ON, however, if a present value overflow occurs (FFFFFF or FFFF).

- Setting the prescale value incorrectly may result in incorrect counting operation. Be sure to set the prescale value correctly.

■ DIP Switch Setting

Ensure that the power is turned OFF before changing DIP switch settings. Changing DIP switch settings with the power turned ON may result in electric shock due to contact with terminals subject to high voltages.

■ Power Failure Backup

All data is stored in the EEPROM when there is power failure. The EEPROM can be overwritten more than 100,000 times. EEPROM is overwritten when the power is turned OFF or when settings are changed.

■ Self-diagnostic Function

The following displays will appear if an error occurs.

Main display	Sub-display	Error	Output status	Correction method	Set value after reset
------ (----) (See notes 1 and 2.)	No change	Present value underflow (See note 3.)	No change	Either press the reset key or turn ON reset input.	No change
FFFFFF (FFFF) (See notes 1 and 2.)	No change	Present value overflow (See note 4.)	No change	Either press the reset key or turn ON reset input. (See note 5.)	No change
E1	Not lit	CPU	OFF	Either press the reset key or reset the power supply.	No change
E2	Not lit	Memory error (RAM)	OFF	Reset the power supply.	No change
E2	SUM	Memory error (EEP) (See note 6.)	OFF	Reset to the factory settings using the reset key.	0

Note: 1. The display for 4-digit models is given in parentheses.

2. Display flashes (1-second cycles).

3. Occurs when the present value or the total count value goes below –99,999 (–999 with 4-digit models).

4. Occurs when the present value (or measurement value) reaches 999,999 (9,999 with 4-digit models) under the following conditions:

- The output mode is K-2, D, L, or H.
- The H7CX is set for dual counter or tachometer operation.

5. Except when the H7CX is set for tachometer operation.

6. Includes the case where the EEPROM has reached its overwrite lifetime.

■ Response Delay Time When Resetting (Transistor Output)

The following table shows the delay from when the reset signal is input until the output is turned OFF.

(Reference values)

Minimum reset signal width	Output delay time
1 ms	0.8 to 1.2 ms
20 ms	15 to 25 ms

■ Output Delay Time

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-2 modes. (Reference values)

Control output type	Maximum counting speed	Output delay time
Contact output	30 Hz	16.5 to 24.0 ms
	5 kHz	3.7 to 5.6 ms
Transistor output	30 Hz	12.0 to 20.0 ms
	5 kHz	0.2 to 0.55 ms

Note: The above times may vary slightly depending on the mode or operating conditions.

■ Maximum Counting Speed for Batch Counter

The maximum counting speed for batch counter operation is 5 kHz. The batch counter counts the number of times the count reaches the set value.

■ Wiring

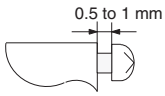
Wiring input lines in the same conduit as power lines or other high-voltage lines may result in malfunction due to noise. Wire the input lines separately, away from lines carrying high-voltages. In addition, make the input wiring as short as possible and use shield lines or metal wiring conduits.

Pay attention to terminal polarity to ensure correct wiring.

■ Mounting

Tighten the two mounting screws on the Adaptor. Tighten them alternately, a little at a time, so as to keep them at an equal tightness.

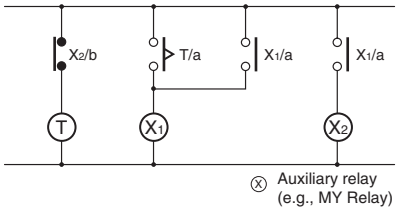
The H7CX's panel surface is water-resistive (conforming to NEMA 4 and IP66). In order to prevent the internal circuit from water penetration through the space between the timer and operating panel, attach a waterproof packing between the timer and installation panel and secure the waterproof packing with the Y92F-30 Flush-mounting Adapter.



It is recommended that the space between the screw head and the adapter should be 0.5 to 1 mm.

■ Operating Environment

- Use the product within the ratings specified for submerging in water and exposure to oil.
- Do not use the product in locations subject to vibrations or shocks. Using the product in such locations over a long period may result in damage due to stress.
- Do not use the product in locations subject to dust, corrosive gases, or direct sunlight.
- Separate the input signal devices, input signal cables, and the product from the source of noise or high-tension cables producing noise.
- Separate the product from the source of static electricity when using the product in an environment where a large amount of static electricity is produced (e.g., forming compounds, powders, or fluid materials being transported by pipe).
- Organic solvents (such as paint thinner), as well as very acidic or basic solutions might damage the outer casing of the H7CX.
- Use the product within the ratings specified for temperature and humidity.
- Do not use the product in locations where condensation may occur due to high humidity or where temperature changes are severe.
- Store at the specified temperature. If the H7CX has been stored at a temperature of less than -10°C, allow the H7CX to stand at room temperature for at least 3 hours before use.
- Leaving the H7CX with outputs ON at a high temperature for a long time may hasten the degradation of internal parts (such as electrolytic capacitors). Therefore, use the product in combination with relays and avoid leaving the product as long as more than 1 month with the output turned ON.



- The load current must be within the rated current.

■ Insulation

- Specifications call for basic insulation between the power supply and input terminals, between the power supply and output terminals, and between the input and output terminals. (The H7CX-A□D is not insulated between the power supply and input terminals.)
- Input and output terminals are connected to devices without exposed charged parts.
- Input and output terminals are connected to devices with basic insulation that is suitable for the maximum operating voltage.

Operating Procedures

■ Setting Procedure Guide

Setting for Counter Operation (1-stage/2-stage Counter, Total and Preset Counter, Batch Counter, Dual Counter)

When Using Basic Settings Only

Basic Settings

- Counting speed (30 Hz, 5 kHz)
- Input mode (UP, DOWN)
- Output mode (N, F, C, K-1)
- One-shot output time (0.5 s, 0.05 s)(See note 2.)
- Reset input signal width (20 ms, 1 ms)
- NPN/PNP input mode (NPN, PNP)

The settings can be performed easily with the DIP switch.
➡ For details on the setting methods, refer to page 21.

When Using Settings Other than the Above

All the functions can be set with the operation keys.
➡ For details on the setting methods, refer to page 22.

Other Settings

- Input mode (UP/DOWN A, UP/DOWN B, UP/DOWN C)
- Output mode (R, P, Q, A, K-2, D, L, H)
- One-shot output time (except for 0.5 s and 0.05 s) (See note 2.)

When Using Advanced Functions

Settings for advanced functions other than the basic settings above can be performed with the operation keys.
➡ For details on the setting methods, refer to page 22.

Advanced Functions

- Dual count calculating mode
- Output 1 time (for 2-stage counter)
- Decimal point position
- Prescale value
- Display color
- Output allocation
- Key protect level

Note: 1. At the time of delivery, the H7CX is set to the 1-stage counter (2-stage counter for H7CX-AW□/-A4W□ models) configuration.
2. Set to output 2 time when using as a 2-stage counter or batch counter.

Setting for Tachometer Operation

When Using Basic Settings Only

Basic Settings

- Counting speed (30 Hz, 10 kHz)
- Output mode (HI-LO, AREA, HI-HI, LO-LO)
- Average processing (OFF, 2, 4, 8 times)
- NPN/PNP input mode (NPN, PNP)

The settings can be performed easily with the DIP switch.
➡ For details on the setting methods, refer to page 33.

When Using Advanced Functions

Settings for advanced functions other than the basic settings above can be performed with the operation keys.
➡ For details on the setting methods, refer to page 34.

Advanced Functions

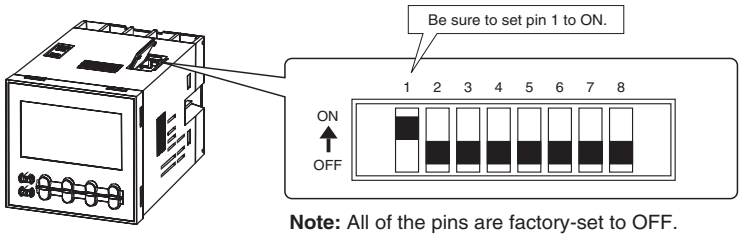
- Decimal point position
- Prescale value
- Auto-zero time
- Startup time
- Display color
- Output allocation
- Key protect level

Note: At the time of delivery, the H7CX is set to the 2-stage counter (1-stage counter for H7CX-AU□ models) configuration.

■ Operating Procedures (Counter Function)

Settings for Basic Operations

Settings for basic functions can be performed with just the DIP switch.



Note: All of the pins are factory-set to OFF.

	Item	OFF	ON
1	DIP switch settings enable/disable	Disabled	Enabled
2	Counting speed	30 Hz	5 kHz
3	Input mode	UP (increment)	DOWN (decrement)
4	Output mode	Refer to the table on the right.	
5			
6	One-shot output time (See note.)	0.5 s	0.05 s
7	Reset input signal width	20 ms	1 ms
8	NPN/PNP input mode	NPN	PNP

Pin 4	Pin 5	Output mode
OFF	OFF	N
ON	OFF	F
OFF	ON	C
ON	ON	K-1

Note: Set to one-shot output 2 time when using as a 2-stage counter or batch counter.

Easy Confirmation of Switch Settings Using Indicators

The ON/OFF status of the DIP switch pins can be confirmed using the front display. For details, refer to page 124.

Note: 1. Be sure to set pin 1 of the DIP switch to ON. If it is set to OFF, the DIP switch settings will not be enabled.

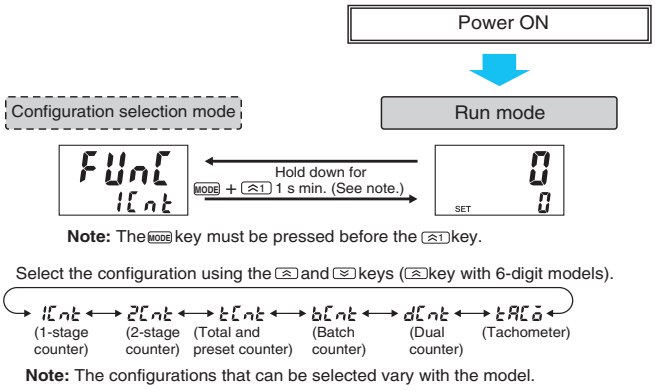
2. Changes to DIP switch settings are enabled when the power is turned ON.

3. When setting input modes, output modes, or output times that cannot be set with the DIP switch, all of the settings have to be made using the operation keys. For details on the setting methods, refer to page 108. When making settings using the operation keys, be sure to set pin 1 of the DIP switch to OFF.

Switching to Total and Preset Counter, Batch Counter, and Dual Counter Operation (See note.)

The H7CX is factory-set to the 1-stage counter (2-stage counter for H7CX-AW□/-A4W□ models) configuration. To change to a different configuration, use the procedure shown on the right. For details, refer to page 39.

Note: This includes changing to the 2-stage counter (or 1-stage counter) configuration.



Advanced-Function Settings

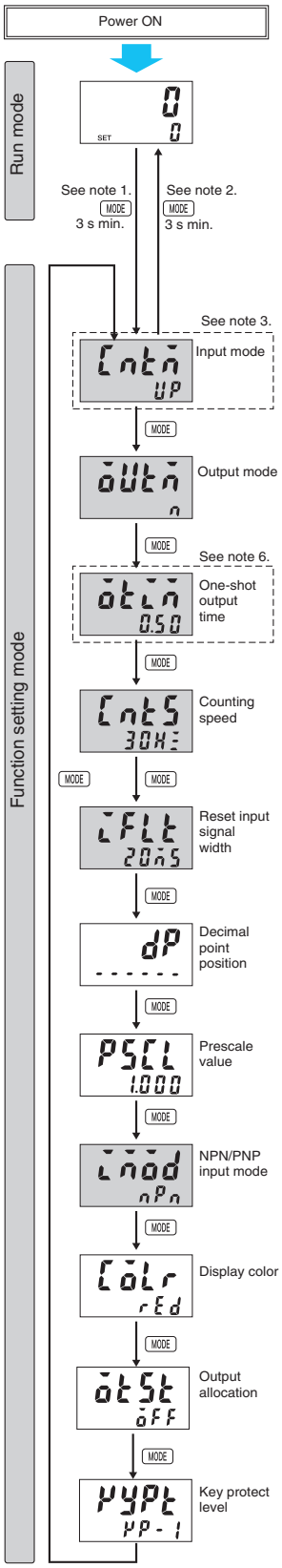
After making DIP switch settings for basic operations, advanced functions (see note) can be added using the operation keys.
For details, refer to page 22.

Note: Advanced functions consist of the dual count calculating mode, output 1 time (for 2-stage counter), decimal point position,prescale value, display color, output allocation, and key protect level.

Settings for All Functions

Note: At the time of delivery, the H7CX is set to the 1-stage counter (2-stage counter for H7CX-AW□/-A4W□ models) configuration. When using as a 2-stage (or 1-stage) counter, total and preset counter, batch counter, or dual counter, switch to the configuration using the procedure given on page 124.

Settings that cannot be performed with the DIP switch are performed with the operation keys.



For details on operations in run mode, refer to page 25.

Note: 1. If the mode is switched to the function setting mode during operation, operation will continue.

2. Changes made to settings in function setting mode are enabled for the first time when the mode is changed to run mode. Also, when settings are changed, the counter is reset (present value initialized and output turned OFF) on returning to run mode.

The characters displayed in reverse video are the default settings.

When performing settings with operation keys only, set pin1 of the DIP switch to OFF (factory setting). If pin 1 of the DIP switch is set to ON, the setting items indicated by ▭ will not be displayed.

Set each setting item using the ▲ ▼ keys. (▲ key only for 6-digit models)

See note 4. See note 4.
UP ↔ dUn ↔ Ud-A ↔ Ud-b ↔ Ud-C ↔
(UP) (DOWN) (UP/DOWN A) (UP/DOWN B) (UP/DOWN C)

Note 4: Displayed for output modes other than K-2, D, L, and H only.

See note 5. See note 5. See note 5. See note 5.
n ↔ F ↔ C ↔ r ↔ Y-1 ↔ P ↔ Q ↔ A ↔ Y-2 ↔ d ↔ L ↔ H ↔
(N) (F) (C) (R) (K-1) (P) (Q) (A) (K-2) (D) (L) (H)

Note: 5. Display only when the input mode is UP/DOWN A, B, or C with 6-digit models (with H7CX-AU□/-AW□ models only for H).

0.01 ~ 0.50 ~ 99.99
(0.01s) (0.50s) (99.99s)

Note: Displayed only when the output mode is C, R, K-1, P, Q, A, or K-2.

30HZ ↔ 5KHZ
(30Hz) (5kHz)

20ms ↔ 1ms
(20ms) (1ms)

See note 7.
------[----] ↔ -----.-[---.-] ↔ ----.--[--.--] ↔ ---.---[-.---] ↔
No decimal point / One digit after decimal point / Two digits after decimal point / Three digits after decimal point

See note 7.
0.001 ~ 1.000 ~ 99.999 [9.999]
(0.001) (1.000) (99.999) [9.999]

Note 7: The displays for 4-digit models are shown inside parentheses.

nPn ↔ PnP ↔
(NPN input) (PNP input)

rEd ↔ Grn ↔ r-G ↔ G-r ↔
(Red) (Green) (Red-green) (Green-red)

Note: Displayed for terminal-block models (except H7CX-A11□) only.

oFF ↔ on ↔

Note: Displayed for H7CX-AU□ models only.

KP-1 ↔ KP-2 ↔ KP-3 ↔ KP-4 ↔ KP-5 ↔
(KP-1) (KP-2) (KP-3) (KP-4) (KP-5)

Note 3:

When using as a dual counter:

CALn Add — Dual count calculating mode

Add ↔ Sub ↔
(Addition) (Subtraction)

See note.

Note: Displayed for output modes other than K-2, D, L, and H only.

Note 6:

When using as a 2-stage counter:

otn2 0.50 — One-shot output 2 time

0.01 ~ 0.50 ~ 99.99
(0.01s) (0.50s) (99.99s)

Note: Displayed only when the output mode is C, R, K-1, P, Q, A, or K-2.

otn1 Hold — One-shot output 1 time

HOLd/0.01 ~ 99.99
(Outputs held) (0.01s) (99.99s)

If the output time is 0.00, HOLd is displayed.

Note 1: Displayed for output modes other than D, L, and H.

Note 2: HOLD cannot be set when the output mode is K-2.

When using as a batch counter:

otn2 0.50 — One-shot output 2 time

0.01 ~ 0.50 ~ 99.99
(0.01s) (0.50s) (99.99s)

Note: Displayed only when the output mode is C, R, K-1, P, Q, A, or K-2.

Explanation of Functions

Input Mode (InP) (Setting possible using DIP switch.)

Set increment mode (UP), decrement mode (DOWN), or one of the increment/decrement modes (UP/DOWN A, UP/DOWN B, or UP/DOWN C) as the input mode. Input modes other than UP or DOWN modes cannot be set using the DIP switch and so use the operation keys if other modes are required. (For details on the operation of the input modes, refer to Input Modes and Present Value on page 112.)

Dual Count Calculating Mode (CALC)

When using as a dual counter, select either ADD (addition) or SUB (subtraction) as the calculation method for the dual count value. SUB mode can be used only when K-2, D, L, or H is selected as the output mode with 6-digit models.

ADD: Dual count value = CP1 PV + CP2 PV

SUB: Dual count value = CP1 PV – CP2 PV

Output Mode (OUTP) (Setting possible using DIP switch.)

Set the way that control output for the present value is output. The possible settings are N, F, C, R, K-1, P, Q, A, K-2, D, L, and H. Output modes other than N, F, C, or K-1 cannot be set using the DIP switch and so use the operation keys if other modes are required. The output modes that can be set vary with the model. (For details on the operation of the output modes, refer to Input/Output Mode Settings on page 113.)

One-shot Output Time (OTIM) (Setting possible using DIP switch.)

Set the one-shot output time (0.01 to 99.99 s) for control output. One-shot output can be used only when C, R, K-1, P, Q, A, or K-2 is selected as the output mode. Output times other than 0.5 s or 0.05 s cannot be set with the DIP switch and so use the operation keys if other settings are required.

One-shot Output 2 Time (OTM2) (Setting possible using DIP switch.)

When using as a 2-stage counter or batch counter, set the one-shot output time (0.01 to 99.99 s) for control output (OUT2). One-shot output can be used only when C, R, K-1, P, Q, A, or K-2 is selected as the output mode. Output times other than 0.5 s or 0.05 s cannot be set with the DIP switch and so use the operation keys if other settings are required.

One-shot Output 1 Time (OTM1)

When using as a 2-stage counter, set the one-shot output time (0.01 to 99.99 s) for control output (OUT1). One-shot output can be used only when D, L, or H is selected as the output mode. If the output time is set to 0.00, HOLd is displayed, and outputs are held. HOLD cannot be set when the output mode is K-2.

Counting Speed (InT5) (Setting possible using DIP switch.)

Set the maximum counting speed (30 Hz/5 kHz) for CP1 and CP2 inputs together. If contacts are used for input signals, set the counting speed to 30 Hz. Processing to eliminate chattering is performed for this setting.

Reset Input Signal Width (CFLT) (Setting possible using DIP switch.)

Set the reset input signal width (20 ms/1 ms) for reset/reset 1 and total reset/reset 2 inputs together. If contacts are used for input signals, set the counting speed to 20 ms. Processing to eliminate chattering is performed for this setting.

Decimal Point Position (dP)

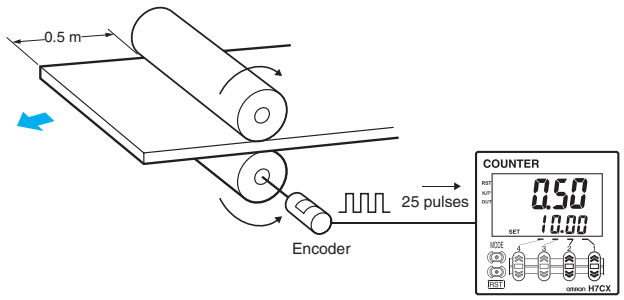
Decide the decimal point position for the present value, CP1/CP2 present values, set value (SV1, SV2), total count value, and dual count set value.

Prescale Value (PSCL)

Pulses input to the counter are converted according to the specified prescale value. (Setting range: 0.001 to 99.999 for 6-digit models and 0.001 to 9.999 for 4-digit models.)

Example: To display the feed distance for systems that output 25 pulses for a feed length of 0.5 m in the form □□.□□ m:

1. Set the decimal point position to 2 decimal places.
2. Set the prescale value to 0.02 (0.5÷25).



NPN/PNP Input Mode (InOd)

Select either NPN input (no-voltage input) or PNP input (voltage input) as the input format. The same setting is used for all external inputs. For details on input connections, refer to *Input Connection* on page 96.

Display Color (CoLr)

Set the color used for the present value.

	Output OFF (See note.)	Output ON (See note.)
rEd	Red (fixed)	
Grn	Green (fixed)	
r-G	Red	Green
G-r	Green	Red

Note: When using as a 2-stage counter, this is the status of output 2.

Output Allocation (OtSt)

When using H7CX-AU□ models as a 2-stage counter, the output can be flexibly allocated to either stage 1 or 2.
Transistor output can be allocated to SV1 and contact output for SV2 or vice verse, as in the following table.

H7CX-AU/-AUD1

	OUT1	OUT2
oFF	Transistor (12-13)	Contact (3, 4, 5)
on	Contact (3, 4, 5)	Transistor (12-13)

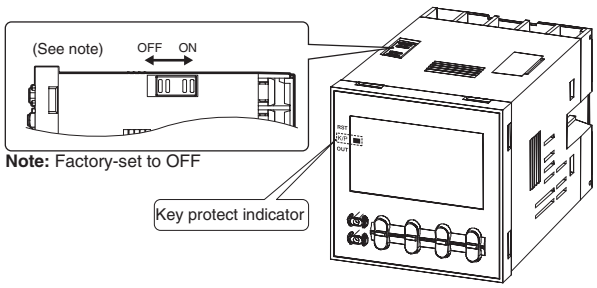
H7CX-AUSD1

	OUT1	OUT2
oFF	Transistor (12-13)	Transistor with diode (3, 4, 5)
on	Transistor with diode (3, 4, 5)	Transistor (12-13)

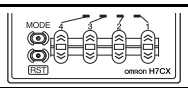
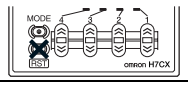
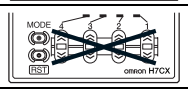
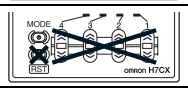
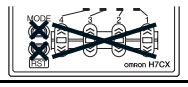
Key Protect Level (KYPt)

Set the key protect level.

When the key-protect switch in set to ON, it is possible to prevent setting errors by prohibiting the use of certain operation keys by specifying the key protect level (KP-1 to KP-5). The key protect indicator is lit while the key-protect switch is set to ON. Confirm the ON/OFF status of the key-protect switch after the H7CX is mounted to the panel.



Note: Factory-set to OFF

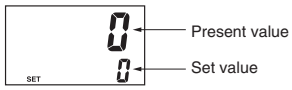
Level	Meaning	Details			
		Changing mode (See note.)	Switching display in run mode	Reset key	Up/down key (Up key for 6-digit models)
KP-1 (default setting)		No	Yes	Yes	Yes
KP-2		No	Yes	No	Yes
KP-3		No	Yes	Yes	No
KP-4		No	Yes	No	No
KP-5		No	No	No	No

Note: Changing mode to configuration selection mode (MODE + ≪1 1 s min.) or function setting mode (MODE 3 s min.).

Operation in Run Mode

Set values for each digit as required using the ⌃ and ⌄ keys. (⌃ key only for 6-digit models.)

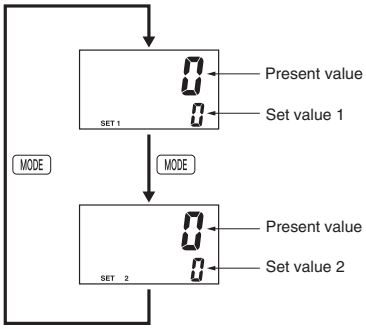
1-stage Counter



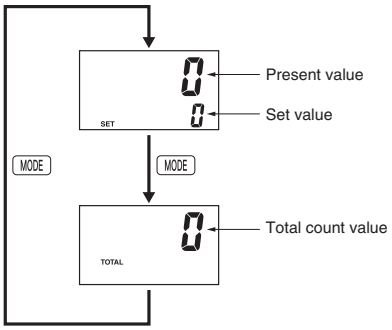
Present Value
Shows the present count value.

Set Value (Set Value 1, Set Value 2)
Set the set value. When the present value reaches the set value, signals are output according to the specified output mode.

2-stage Counter



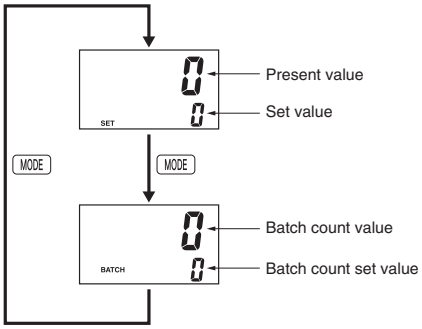
Total and Preset Counter



Present Value/Set Value
Same as 1-stage counter.

Total Count Value
Shows the present total count value.

Batch Counter

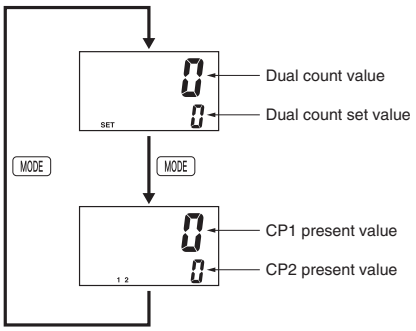


Present Value/Set Value
Same as 1-stage counter.

Batch Count Value
Shows the number of times the count has been completed for the present value.

Batch Count Set Value
Set the batch count set value. When the batch count value reaches the batch count set value, batch output (OUT1) turns ON.

Dual Counter



Dual Count Value
Shows the sum of the CP1 present value and CP2 present value when the dual count calculating mode is ADD and shows the value obtained by subtracting the CP2 present value from the CP1 present value when the dual count calculating mode is SUB.

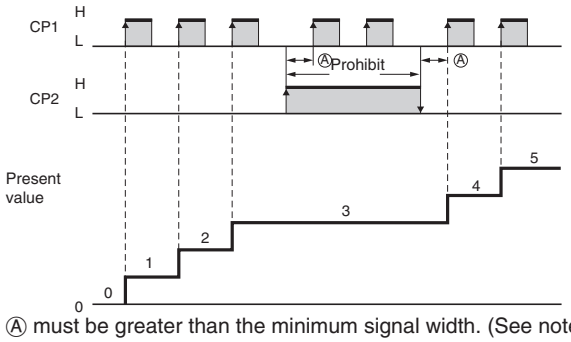
Dual Count Set Value
Set the dual count set value. When the dual count value reaches the dual count set value, signals are output according to the specified output mode.

CP1/CP2 Present Value
Show the present count values for CP1 and CP2 present values respectively.

Input Modes and Present Value

UP (Increment) Mode

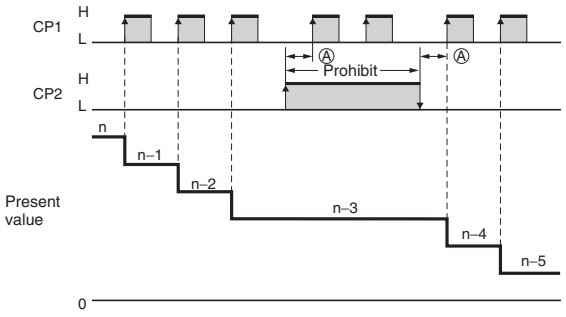
CP1: Count input; CP2: Prohibit (gate) input



Ⓐ must be greater than the minimum signal width. (See note 2.)

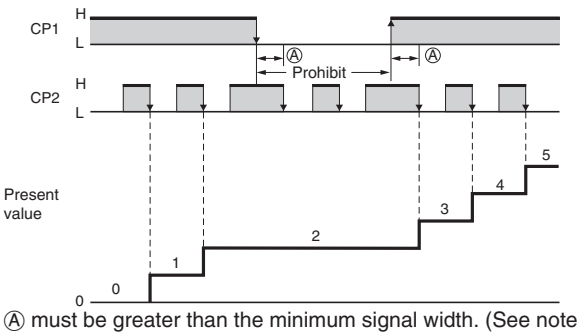
DOWN (Decrement) Mode

CP1: Count input; CP2: Prohibit (gate) input



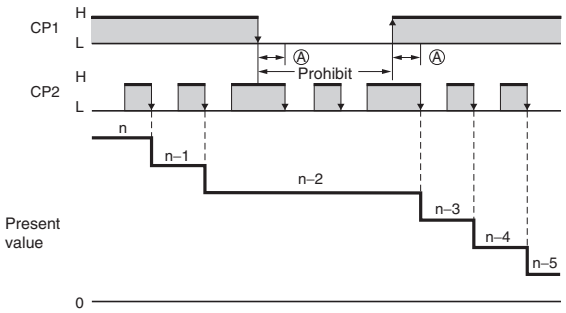
Ⓐ must be greater than the minimum signal width. (See note 2.)

CP1: Prohibit (gate) input; CP2: Count input



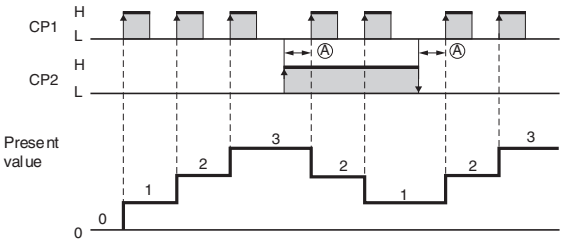
Ⓐ must be greater than the minimum signal width. (See note 2.)

CP1: Prohibit (gate) input; CP2: Present value



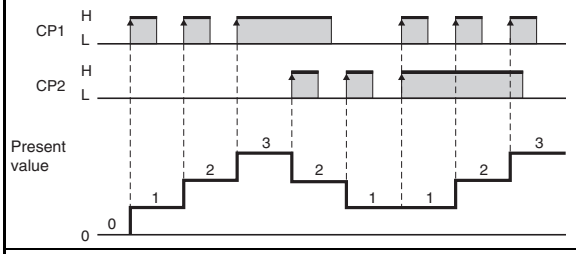
Ⓐ must be greater than the minimum signal width. (See note 2.)

UP/DOWN A Command Input Mode

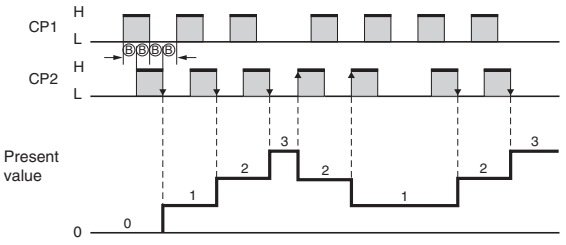


Ⓐ must be greater than the minimum signal width. (See note 2.)

UP/DOWN B Individual Input Mode



UP/DOWN C Quadrature Input Mode



Ⓑ must be at least 1/2 the minimum signal width. (See note 2.)

Note: 1. If the configuration selection is set to dual counter, CP1 and CP2 input will operate in the same way as the count input (CP1) of UP (increment) mode.

2. Ⓐ must be greater than the minimum signal width and Ⓑ must be at least 1/2 the minimum signal width. If they are less, a count error of ±1 may occur.
Minimum signal width: 16.7 ms (when maximum counting speed = 30 Hz)
100 µs (when maximum counting speed = 5 kHz)

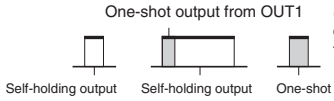
3. The meaning of the H and L symbols in the tables is explained below.

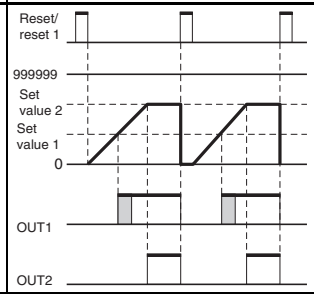
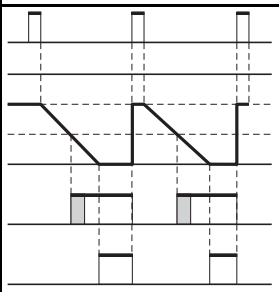
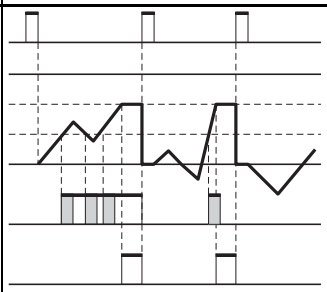
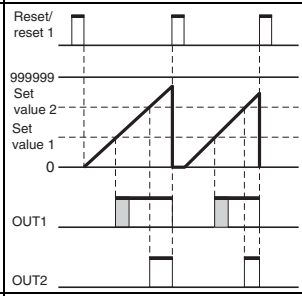
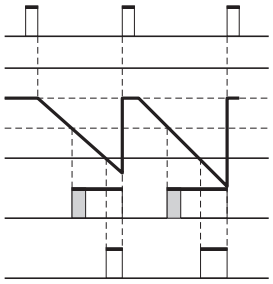
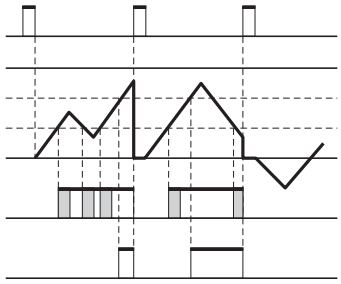
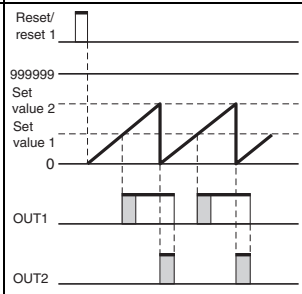
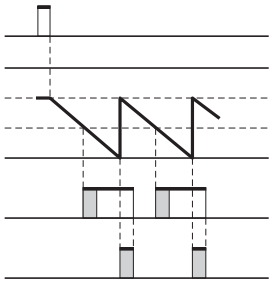
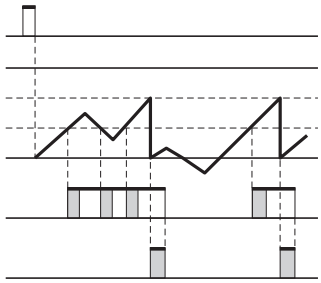
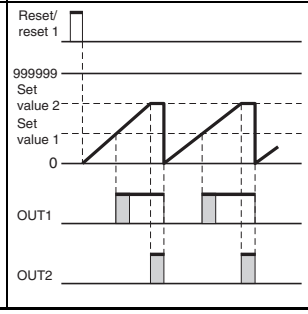
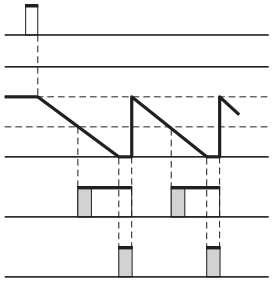
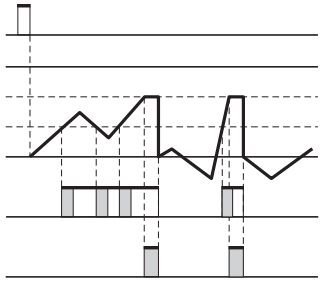
Input method Symbol	No-voltage input (NPN input)	Voltage input (PNP input)
H	Short-circuit	4.5 to 30 VDC
L	Open	0 to 2 VDC

Input/Output Mode Settings

Operation for 1-stage models is the same as that for OUT2.

When using a 2-stage model as a 1-stage counter, total and preset counter, or dual counter, OUT1 and OUT2 turn ON and OFF simultaneously.



		Input mode			Operation after count completion
		UP	DOWN	UP/DOWN A, B, C	
Output mode setting	N				The outputs and present value display are held until reset/reset 1 is input.
	F				The present value display continues to increase/decrease. The outputs are held until reset/reset 1 is input.
	C				As soon as the count reaches SV, the present value display returns to the reset start status. The present value display does not show the present value upon count-up. The outputs repeat one-shot operation. OUT1 self-holding output turns OFF after the OUT2 one-shot output time.The OUT1 one-shot output time is independent of OUT2.
	R				The present value display returns to the reset start status after the one-shot output time. The outputs repeat one-shot operation. OUT1 self-holding output turns OFF after the OUT2 one-shot output time.The OUT1 one-shot output time is independent of OUT2.

Note: 1. The full scale (FS) for H7CX 4-digit models is 9999.

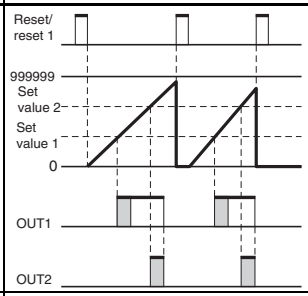
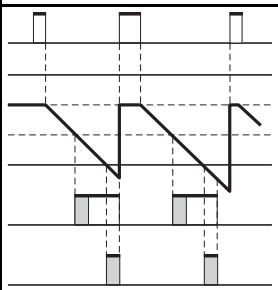
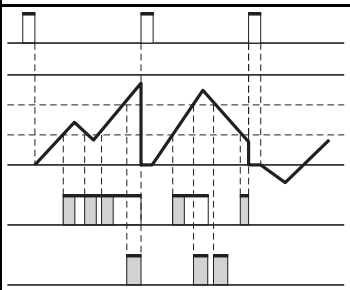
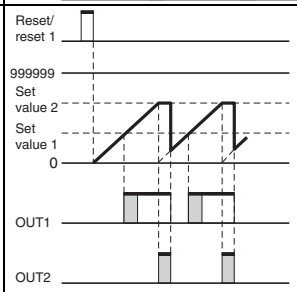
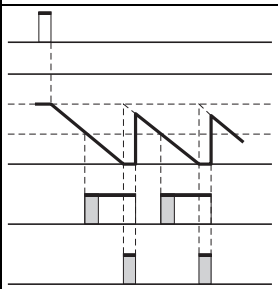
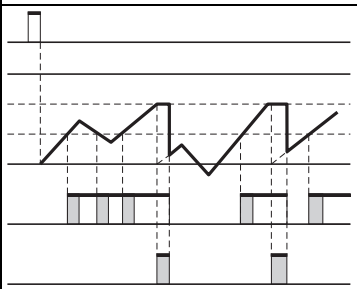
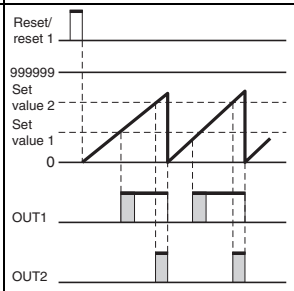
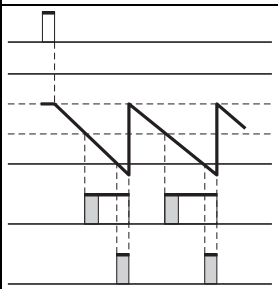
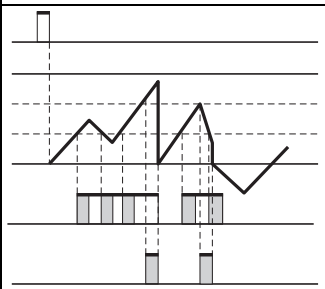
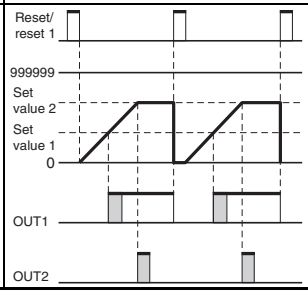
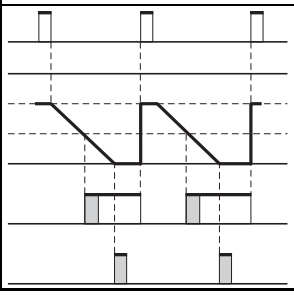
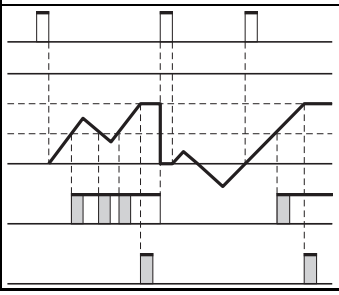
2. When the present value reaches 999999, it returns to 0.

3. Counting cannot be performed during reset/reset 1 input.

4. If reset/reset 1 is input while one-shot output is ON, one-shot output turns OFF.

5. If there is power failure while output is ON, output will turn ON again when the power supply has recovered. For one-shot output, output will turn ON again for the duration of the output time setting once the power supply has recovered.

6. Do not use the counter function in applications where the count may be completed (again) while one-shot output is ON.

		Input mode			Operation after count completion
		UP	DOWN	UP/DOWN A, B, C	
Output mode setting	K-1				The present value display continues to increase/decrease. OUT1 self-holding output turns OFF after the OUT2 one-shot output time.The OUT1 one-shot output time is independent of OUT2.
	P				The present value display does not change during the one-shot output time period, but the actual count returns to the reset start status. The outputs return to the one-shot start state and repeat one-shot operation. OUT1 self-holding output turns OFF after the OUT2 one-shot output time. The OUT1 one-shot output time is independent of OUT2.
	Q				The present value continues to increase/decrease for the one-shot output time, but returns to the reset start status after the one-shot output time has elapsed. The outputs repeat one-shot operation. OUT1 self-holding output turns OFF after the OUT2 one-shot output time. The OUT1 one-shot output time is independent of OUT2.
	A				The present value display and OUT1 self-holding output is held until reset/reset 1 is input. OUT1 and OUT2 are independent.

Note: 1. The full scale (FS) for H7CX 4-digit models is 9999.

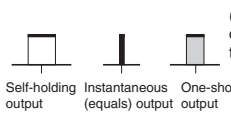
2. When the present value reaches 999999, it returns to 0.

3. Counting cannot be performed during reset/reset 1 input.

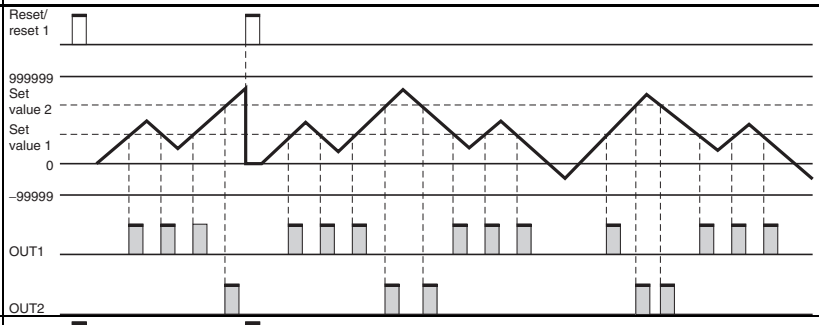
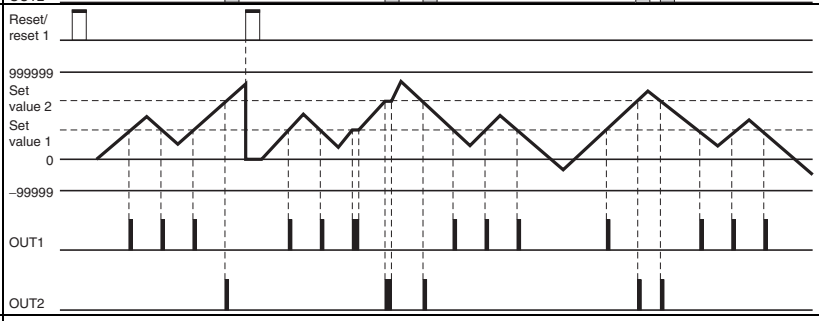
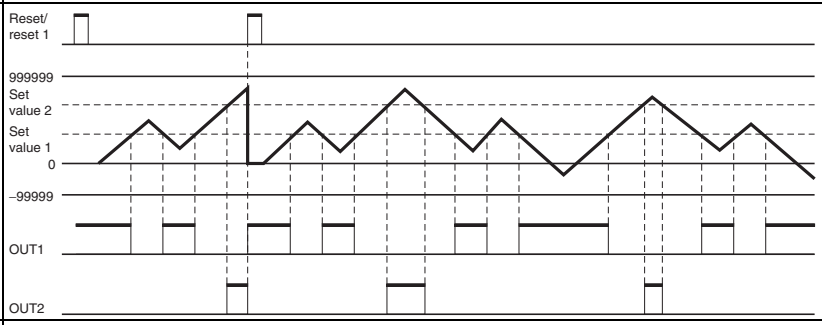
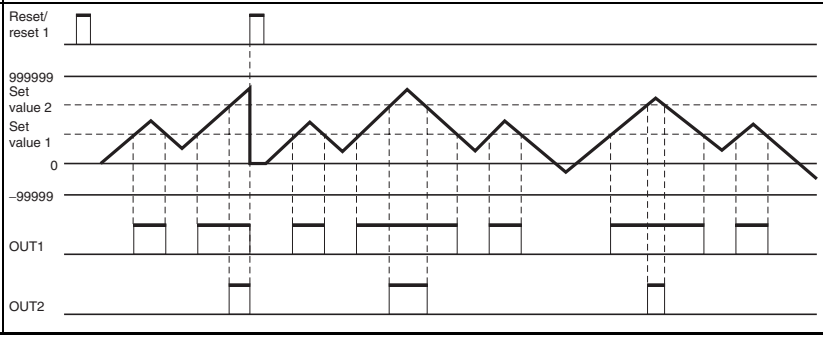
4. If reset/reset 1 is input while one-shot output is ON, one-shot output turns OFF.

5. If there is power failure while output is ON, output will turn ON again when the power supply has recovered. For one-shot output, output will turn ON again for the duration of the output time setting once the power supply has recovered.

6. Do not use the counter function in applications where the count may be completed (again) while one-shot output is ON.



(The one-shot output time can be set in the range 0.01 to 99.99s.)

		Input mode UP/DOWN A, B, C	Operation after count completion
Output mode setting	**K-2**		The display continues to increase/decrease until the overflow or underflow value is reached. One-shot output only.
	D		The display continues to increase/decrease until the overflow or underflow value is reached. The outputs are ON while the count is equal.
	L		The display continues to increase/decrease until the overflow or underflow value is reached. OUT1 is held while the present value is less than or equal to set value 1. OUT2 is held while the present value is greater than or equal to set value 2.
	H		The display continues to increase/decrease until the overflow or underflow value is reached. OUT1 is held while the present value is greater than or equal to set value 1. OUT2 is held while the present value is greater than or equal to set value 2. **Note:** H mode is available only when using a 6-digit model as a 2-stage counter.

Note: 1. Counting cannot be performed during reset/reset 1 input.

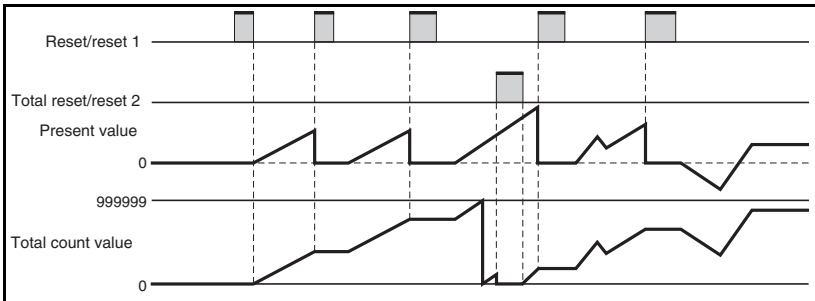
2. If reset/reset 1 is input while one-shot output is ON, one-shot output turns OFF.

3. If there is power failure while output is ON, output will turn ON again when the power supply has recovered. For one-shot output, output will turn ON again for the duration of the output time setting once the power supply has recovered.

4. Do not use the counter function in applications where the count may be completed (again) while one-shot output is ON.

Total and Preset Counter Operation

The H7CX has a total counter, separate from the 1-stage preset counter, for counting the total accumulated value.

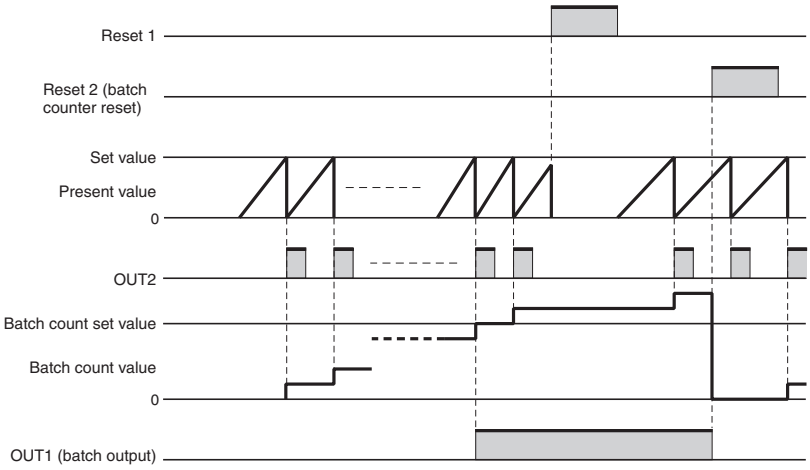


Note: The full scale (FS) for H7CX 4-digit models is 9999.

- The total counter continues to count the total accumulated value when the present value is reset using reset/reset 1 input (reset key).
- The total count value is reset when the total reset/reset 2 input is turned ON. If the reset key is pressed while the total count value is displayed, the total count value is reset. The present value is also reset at this time.
- The counting range of the total counter is −99,999 to 999,999 (−999 to 9,999). The total count value returns to 0 when it reaches the full scale limit.

Batch Counter Operation

The H7CX has a batch counter, separate from the 1-stage preset counter, for counting the number of times the count has been completed.



Note: The above is for when the output mode is C.

- The batch counter continues after count completion.
- Batch output is held until batch counter reset is input.
- When the batch counter reset input is turned ON, the batch count value is reset, and batch output turns OFF.
- If the reset key is pressed while the batch count value is displayed, the batch count value is reset and batch output turns OFF. The present value is also reset at this time.

Note: 1. The batch count value is held at 0 during batch counter reset input.

2. If the batch count set value is 0, batch count will be performed but there will be no batch output.

3. The batch count value returns to 0 when it reaches 999,999 (9,999 for 4-digit models).

4. Once batch input has been turned ON, it will return to the ON state after power interruptions.

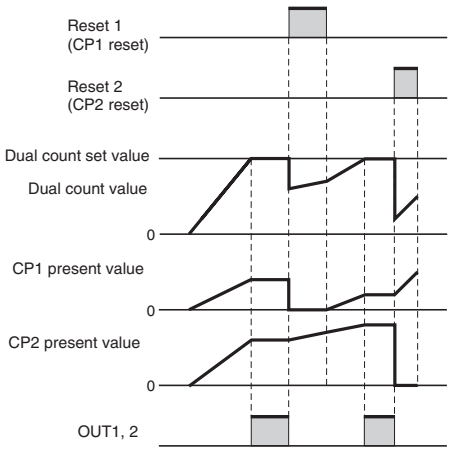
5. If the batch count set value is changed from a value that is greater than the batch count value to one that is less, batch output will turn ON.

6. After batch output turns ON, the ON state will be held even if the batch count set value is changed to a value greater than the batch count value.

Dual Counter Operation

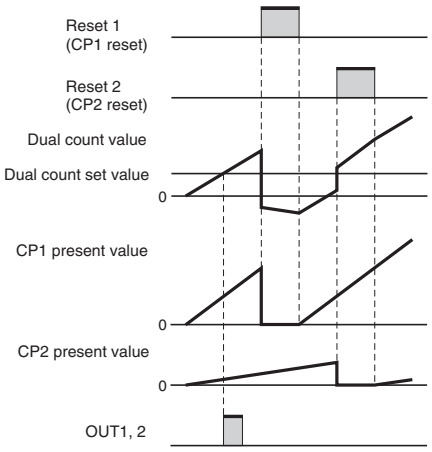
Using the dual counter allows the count from 2 inputs to be added or subtracted and the result displayed. It is possible to specify a set value for which output turns ON when the set value matches the added or subtracted result.
OUT1 and OUT2 turn ON and OFF simultaneously.

Dual Count Calculating Mode = ADD
Dual count value = CP1 PV + CP2 PV



Note: The above is for when the output mode is N.

Dual Count Calculating Mode = SUB
Dual count value = CP1 PV − CP2 PV



Note: The above is for when the output mode is K-2. SUB mode can be used only when K-2, D, L, or H is selected as the output mode with 6-digit models.

- The operation after count completion for the dual counter value is determined by the output mode.
- The CP1 present value is reset when reset 1 input is turned ON and the CP2 present value is reset when reset 2 input is turned ON.
- If the reset key is pressed while the dual count value, CP1 present value, or CP2 present value is displayed, all of the present values are reset and outputs turn OFF. At this time, counting is not possible for CP1 or CP2 inputs.

Note: 1. Counting is not possible for CP1 during reset 1 input. CP2 will not be affected. The dual count value will be calculated based on a CP1 present value of 0.

2. Counting is not possible for CP2 during reset 2 input. CP1 will not be affected. The dual count value will be calculated based on a CP2 present value of 0.

3. The counting range for the dual count value is −99,999 to 999,999 (−999 to 9,999 for 4-digit models). The counting ranges for the CP1 present value and CP2 present value are 0 to 999,999 (0 to 9,999 for 4-digit models). If a present value exceeds 999,999 (9,999 for 4-digit models), FFFFFF (FFFF for 4-digit models) will be displayed to indicate an overflow, and all counting will stop.

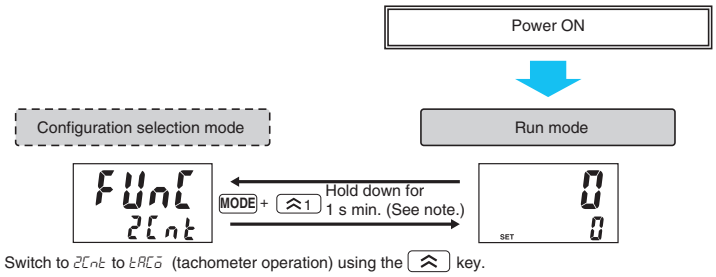
Reset Function List

Function	1-stage/2-stage counter	Total and preset counter		Batch counter		Dual counter	
Screen displayed in run mode	**Present value/ set value (1, 2)**	**Present value/ set value**	**Total count value**	**Present value/ set value**	**Batch count value/batch count set value**	**Dual count value/dual count set value**	**CP1 present value/CP2 present value**
Reset/reset 1	Present value and output reset.	Present value and output reset.		Present value and output reset.		Only the CP1 present value is reset.	
Total reset/reset 2	No effect.	Only the total count value is reset.		Batch count value and batch output reset.		Only the CP2 present value is reset.	
Reset key	Present value and output reset.	Present value and output reset.	Present value, total count value, and output reset.	Present value and output reset.	Present value, batch count value, output and batch output reset.	CP1 present value, CP2 present value, dual count value, and output reset.	

■ Operating Procedures (Tachometer Function)

Switching from Counter to Tachometer

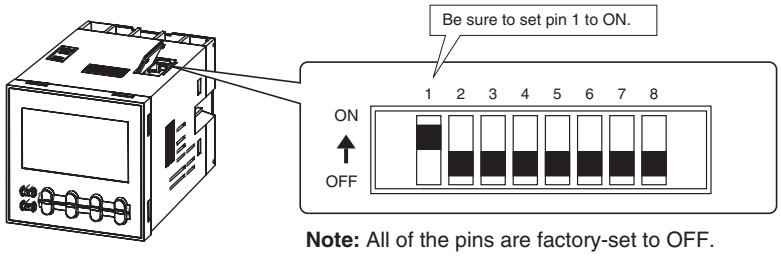
The H7CX is factory-set to the 2-stage counter (1-stage counter for H7CX-AU□ models) configuration. To switch to the tachometer configuration, use the procedure shown on the right. For details, refer to page 39.



Note: The MODE key must be pressed before the ≪1 key.

Settings for Basic Operations

Settings for basic functions can be performed with just the DIP switch.



Note: All of the pins are factory-set to OFF.

	Item	OFF	ON
1	DIP switch settings enable/disable	Disabled	Enabled
2	Counting speed	30 Hz	10 kHz
3	Tachometer output mode	Refer to the table on the right.	
4			
5	Average processing	Refer to the table on the right.	
6			
7	---	---	---
8	NPN/PNP input mode	NPN	PNP

Pin 3	Pin 4	Tachometer output mode
OFF	OFF	Upper and lower limit
ON	OFF	Area
OFF	ON	Upper limit
ON	ON	Lower limit

Pin 5	Pin 6	Average processing
OFF	OFF	OFF (no average processing)
ON	OFF	2 times
OFF	ON	4 times
ON	ON	8 times

Easy Confirmation of Switch Settings Using Indicators

The ON/OFF status of the DIP switch pins can be confirmed using the front display. For details, refer to page 124.

Note: 1. Be sure to set pin 1 of the DIP switch to ON. If it is set to OFF, the DIP switch settings will not be enabled.

2. Changes to DIP switch settings are enabled when the power is turned ON.

Advanced-Function Settings

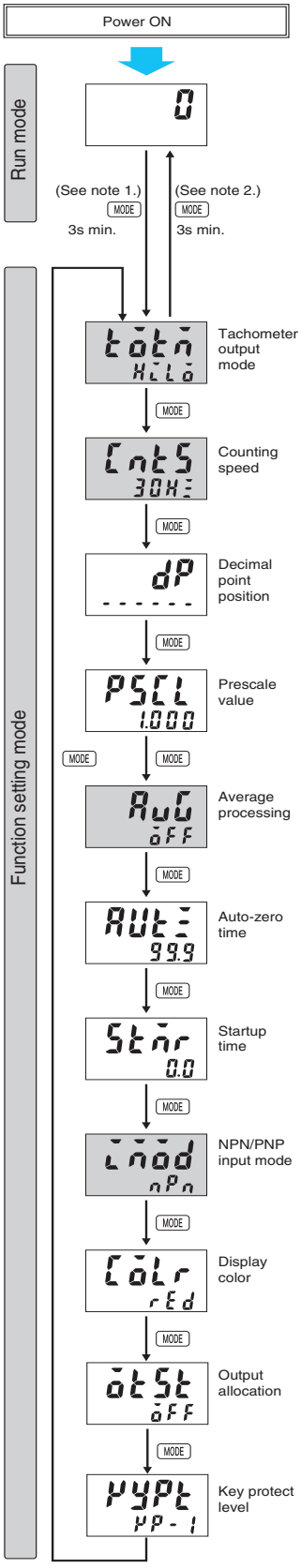
After making DIP switch settings for basic operations, advanced-functions (see note) can be added using the operation keys. For details, refer to page 34.

Note: Advanced functions consist of decimal point position, prescale value, auto-zero time, startup time, display color, output allocation, and key protect level.

Settings for Advanced Functions

Note: When using as a tachometer, switch to the tachometer configuration using the procedure given on page 124.

Settings that cannot be performed with the DIP switch are performed with the operation keys.



Note: 1. If the mode is switched to the function setting mode during operation, operation will continue.tion, operation will continue.
2. Changes made to settings in function setting mode are enabled for the first time when the mode is changed to run mode. Also, whensettings are changed, the counter is reset (measured values initial-ized and output turned OFF) on returning to run mode.

For details on operations in run mode, refer to page 37.

The characters displayed in reverse video are the initial values.

When performing settings with operation keys only, set pin1 of the DIP switch to OFF (factory setting).
If pin 1 of the DIP switch is set to ON, the setting items indicated by ▭ will not be displayed.

Set each setting item using the ≪ keys.

HLLo → ArEA → HcHc → LoLo
(HI-LO) (AREA) (HI-HI) (LO-LO)

30Hz → 10kHz
(30Hz) (10kHz)

------ → ------.- → ----.-- → ---.---
(No decimal point) (One digit after decimal point) (Two digits after decimal point) (Three digits after decimal point)

0.001 ～ 1.000 ～ 99.999
(0.001) (1.000) (99.999)

oFF → 2 → 4 → 8
(No average processing) (Average of 2 measurements) (Average of 4 measurements) (Average of 8 measurements)

0.1 ～ 99.9
(0.1s) (99.9s)

0.0 ～ 99.9
(0.0s) (99.9s)

nPn → PnP
(NPN input) (PNP input)

rEd → Grn → r-G → G-r
(Red) (Green) (Red-green) (Green-red)

oFF ↔ on

Note: Displayed for H7CX-AU□ models

PP-1 → PP-2 → PP-3 → PP-4 → PP-5
(KP-1) (KP-2) (KP-3) (KP-4) (KP-5)

Explanation of Functions

Tachometer Output Mode (tōtn) (Setting possible using DIP switch.)

Set the output method for control output based on the OUT1/OUT2 set value. Upper and lower limit (HI-LO), area (AREA), upper limit (HI-HI), and lower limit (LO-LO) can be set. (For details on the operation of the output modes, refer to Output Mode Settings on page 123.)

Counting Speed (CntS) (Setting possible using DIP switch.)

Set the maximum counting speed (30 Hz/10 kHz) for CP1 input. If contacts are used for input signals, set the counting speed to 30 Hz. Processing to eliminate chattering is performed for this setting.

Decimal Point Position (dP)

Decide the decimal point position for the measurement value, OUT1 set value, and OUT2 set value.

Prescale Value (PSCL)

It is possible to display the rate of rotation or the speed of a device or machine to which the H7CX is mounted by converting input pulses to a desired unit. If this prescaling function is not used, the input frequency (Hz) will be displayed.

The relationship between display and input is determined by the following equation. Set the prescale value according to the unit to be displayed.

Displayed value = f × a
f: Input pulse frequency (number of pulses in 1 second)
a: Prescale value

1. Displaying Rotation Rate

Display unit	Prescale value (a)
rpm	1/N × 60
rps	1/N

N: Number of pulses per revolution

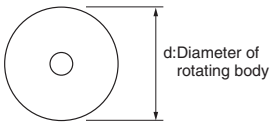
Example: In order to display the rate of rotation for a machine that outputs 5 pulses per revolution in the form □□.□ rpm:

1. Set the decimal point position to 1 decimal place.
2. Using the formula, set the prescale value to 1/N × 60 = 60/5 = 12.

2. Displaying Speed

Display unit	Prescale value (a)
m/min	πd × 1/N × 60
m/s	πd × 1/N

N: Number of pulses per revolution
d: Diameter of rotating body (m)
πd: Circumference (m)



Average Processing (AVG) (Setting possible using DIP switch.)

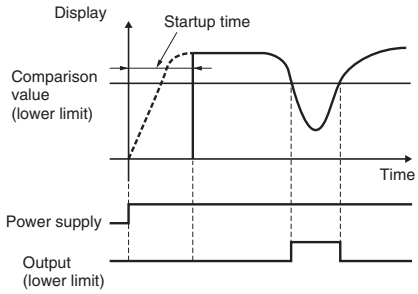
Flickering display and output chattering can be prevented using average processing (simple averaging). Average processing can be set to one of four levels: no average processing, 2 times (i.e., the average of 2 measurement values), 4 times, or 8 times. The measurement cycle will be equal to the sampling cycle (200 ms) multiplied by the average processing setting (i.e., the number of times). Average processing enables fluctuating input signals to be displayed stably. Set the optimum number of times for the application.

Auto-zero Time (AUtZ)

It is possible to set the H7CX so that if there is no pulse for a certain time the display is force-set to 0. This time is called the auto-zero time. Set the auto-zero time to a time slightly longer than the estimated interval between input pulses and within the setting range (0.1 to 99.9 s). It will not be possible to make accurate measurements if the auto-zero time is set to a time shorter than the input pulse cycle. Setting a time that is too long may also result in problems, such as a time-lag between rotation stopping and the alarm turning ON.

Startup Time (Stār)

In order to prevent undesired output resulting from unstable input immediately after the power supply is turned ON, it is possible to prohibit measurement for a set time (0.0 to 99.9 s), the startup time. It can also be used to stop measurement and disable output until the rotating body reaches the normal rate of rotation, after the power supply to the H7CX and rotating body are turned ON at the same time.



NPN/PNP Input Mode (Cnād)

Select either NPN input (no-voltage input) or PNP input (voltage input) as the input format. The same setting is used for all external inputs. For details on input connections, refer to *The circuit shown above is for no-voltage input (NPN input).* on page 96.

Display Color (CōLr)

Set the color used for the measurement value.

Setting	Control output OFF	Control output ON
rEd	Red (fixed)	
Grn	Green (fixed)	
r-G (See note 1.)	Measured value displayed in red when both control outputs 1 and 2 are OFF.	Measured value displayed in green when either control output 1 or control output 2 is ON.
G-r (See note 2.)	Measured value displayed in green when both control outputs 1 and 2 are OFF.	Measured value displayed in red when either control output 1 or control output 2 is ON.

Note: 1. If the tachometer output mode is set to AREA, however, the measured value is displayed in red when control output 1 is OFF and in green when control output 1 is ON.

2. If the tachometer output mode is set to AREA, however, the measured value is displayed in green when control output 1 is OFF and in red when control output 1 is ON.

Output Allocation (oLSt)

When using H7CX-AU□ models as 2-stage counter, each output can be flexibly allocated to either stage 1 or 2.
Transistor output placed for SV1 and contact output for SV2 or vice verse, as in the following table.

H7CX-AU/-AUD1

	OUT1	OUT2
oFF	Transistor (12-13)	Contact (3, 4, 5)
on	Contact (3, 4, 5)	Transistor (12-13)

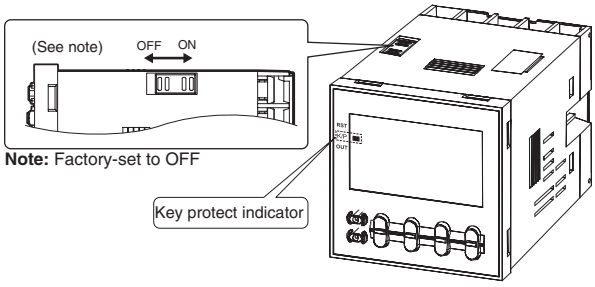
H7CX-AUSD1

	OUT1	OUT2
oFF	Transistor (12-13)	Transistor with diode (3, 4, 5)
on	Transistor with diode (3, 4, 5)	Transistor (12-13)

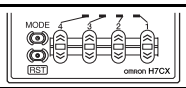
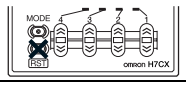
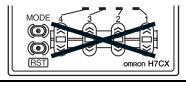
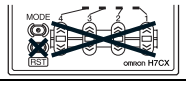
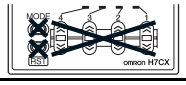
Key Protect Level (KYPt)

Set the key protect level.

When the key-protect switch in set to ON, it is possible to prevent setting errors by prohibiting the use of certain operation keys by specifying the key protect level (KP-1 to KP-5). The key protect indicator is lit while the key-protect switch is set to ON. Confirm the ON/OFF status of the key-protect switch after the H7CX is mounted to the panel.



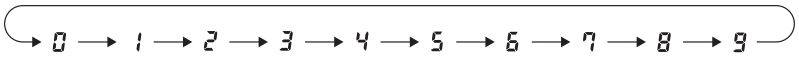
Note: Factory-set to OFF

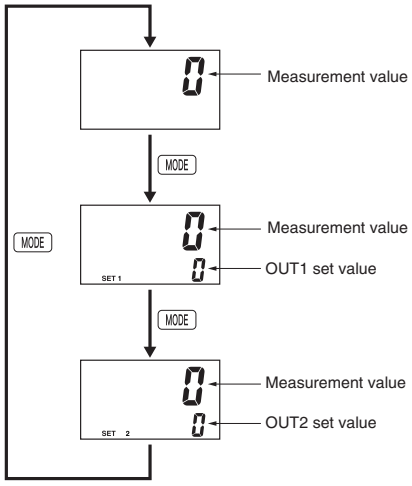
Level	Meaning	Details			
		Changing mode (See note.)	Switching display during operation	Reset key	Up/down key (Up key for 6-digit models)
KP-1 (default setting)		No	Yes	Yes	Yes
KP-2		No	Yes	No	Yes
KP-3		No	Yes	Yes	No
KP-4		No	Yes	No	No
KP-5		No	No	No	No

Note: Changing mode to configuration selection mode (MODE + ≪1 1 s min.) or function setting mode (MODE 3 s min.).

Operation in Run Mode

Set values for each digit as required using the ⌃ key.

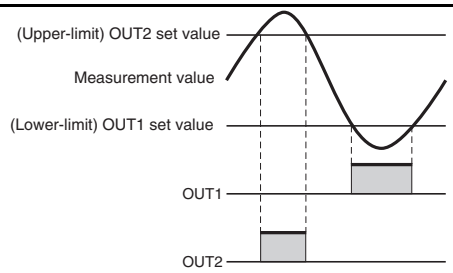


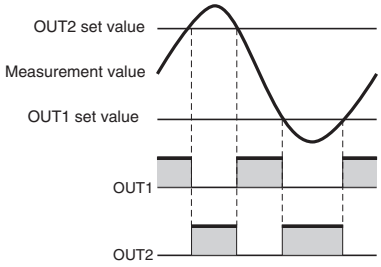


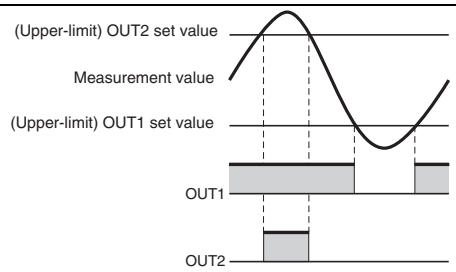
Measurement Value
Displays the currently measured value.

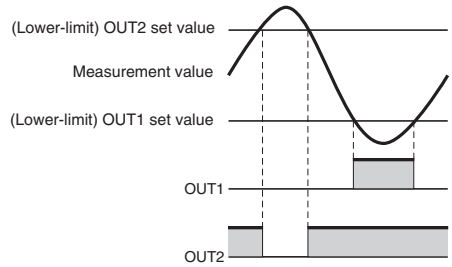
OUT1/OUT2 Set Value
Set OUT1 set value and OUT2 set value. The measurement value is compared to OUT1 set value and OUT2 set value and output is made according to the selected output mode.

Output Mode Settings

<table>
<tr><td rowspan="4">Output mode setting</td><td>Upper and lower limit (HI-LO)</td><td> 

ON condition for OUT1: measurement value ≤ OUT1 set value
ON condition for OUT2: measurement value ≥ OUT2 set value</td></tr>
<tr><td>Area (AREA)</td><td> 

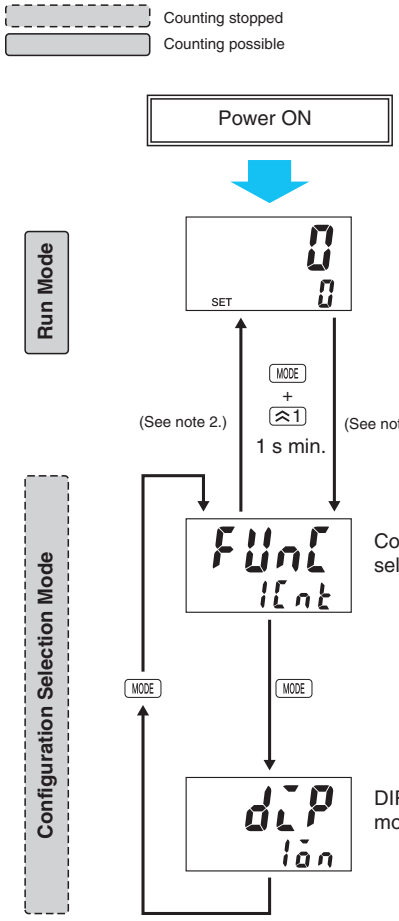
<table>
<tr><th>Condition</th><th>OUT1 set value ≤ OUT2 set value</th><th>OUT1 set value > OUT2 set value</th></tr>
<tr><td>ON condition for OUT1</td><td>OUT1 set value ≤ measurement value ≤ OUT2 set value</td><td>OUT2 set value ≤ measurement value ≤ OUT1 set value</td></tr>
<tr><td>ON condition for OUT2</td><td>measurement value < OUT1 set value
or
measurement value > OUT2 set value</td><td>measurement value < OUT2 set value
or
measurement value > OUT1 set value</td></tr>
</table></td></tr>
<tr><td>Upper limit (HI-HI)</td><td> 

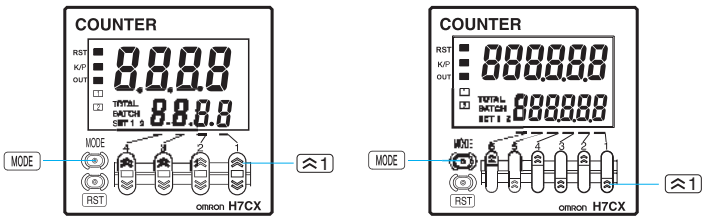
ON condition for OUT1: Measurement value ≥ OUT1 set value
ON condition for OUT2: Measurement value ≥ OUT2 set value</td></tr>
<tr><td>Lower limit (LO-LO)</td><td> 

ON condition for OUT1: Measurement value ≤ OUT1 set value
ON condition for OUT2: Measurement value ≤ OUT2 set value</td></tr>
</table>

■ Operation in Configuration Selection Mode

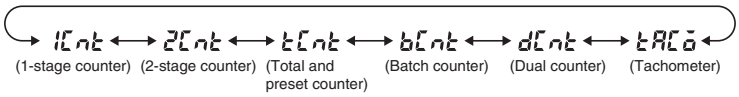
Select which H7CX configuration is used (i.e., 1-stage counter, 2-stage counter, total and preset counter, batch counter, dual counter, or tachometer) in configuration selection mode. The H7CX is also equipped with a DIP switch monitor function, a convenient function that enables the settings of the DIP switch pins to be confirmed using the front display.





To change the mode to configuration selection mode, press the ↑1 Key for 1 s min. with the MODE key held down. The mode will not change if the ↑1 key is pressed first.

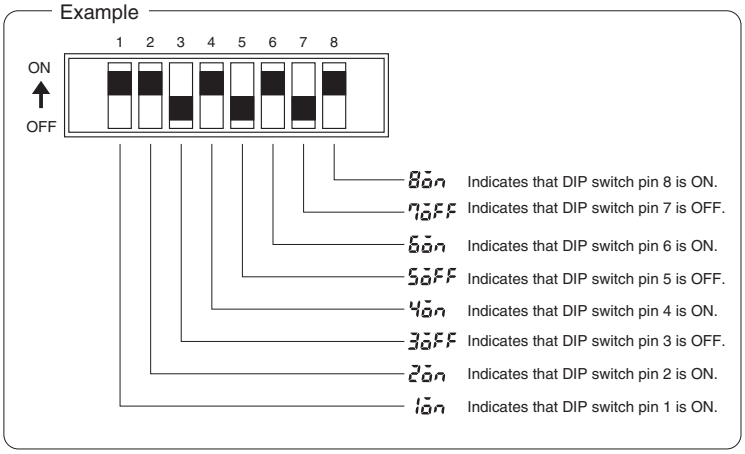
Select the configuration using the ↑↓ keys. (↑ key only for 6-digit models)
The H7CX is factory-set to the 1-stage counter configuration (2-stage counter configuration with H7CX-AW□/-A4W□ models).



The configuration that can be selected depend on the model.

The status of the DIP switch pins (1 to 8) can be confirmed using the ↑↓ keys.

Note: This display is possible only if DIP switch pin 1 (DIP switch settings) is set to ON (i.e., enabled).



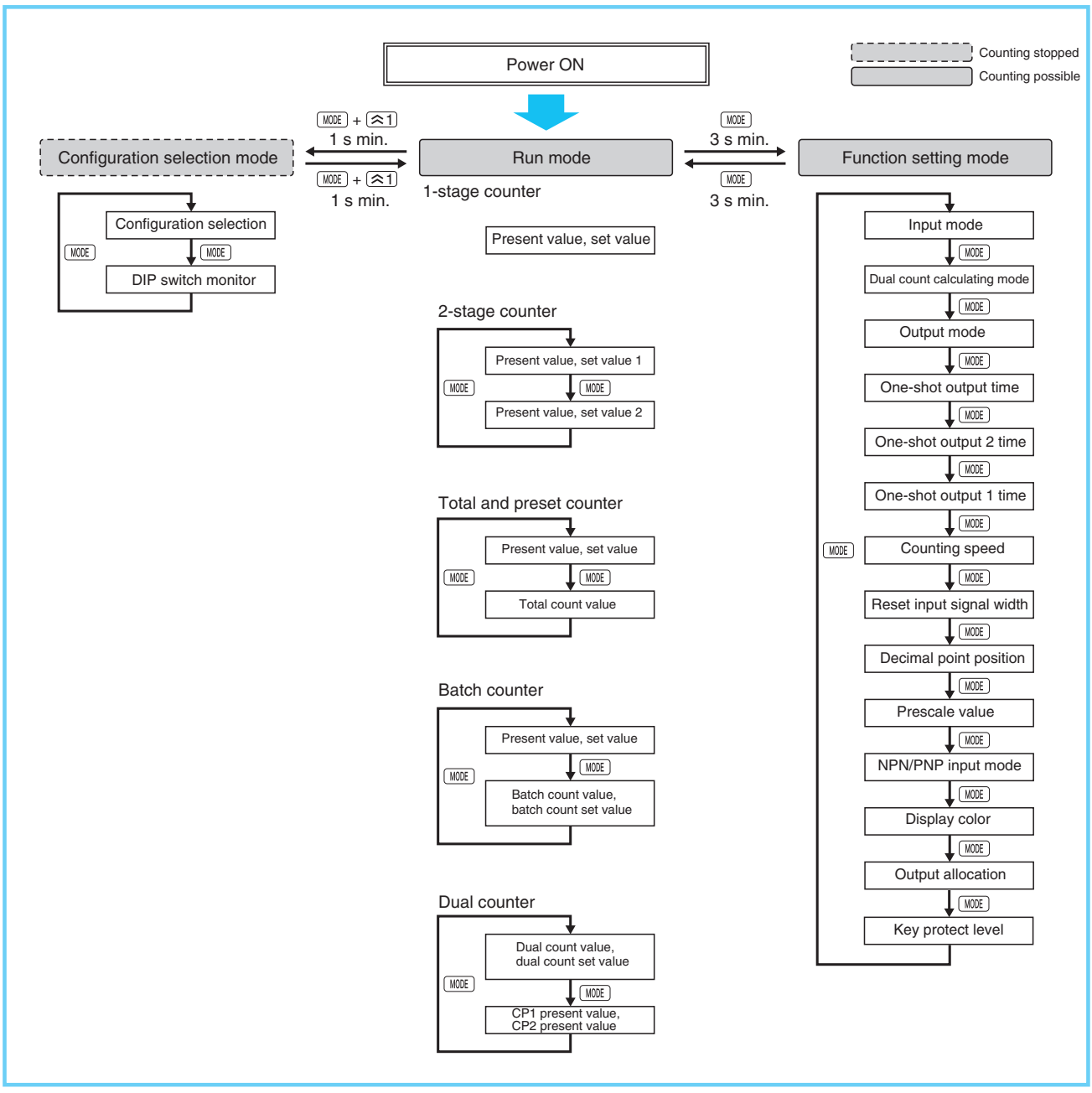
Note: 1. When the mode is changed to configuration selection mode, the present value is reset, outputs turns OFF, and counting (measuring) stops.

2. Setting changes made in configuration selection mode are enabled when the mode is changed to run mode. If the configuration is changed, the set value (or set value 1 and set value 2), OUT1 set value or OUT2 set value are initialized.

Additional Information

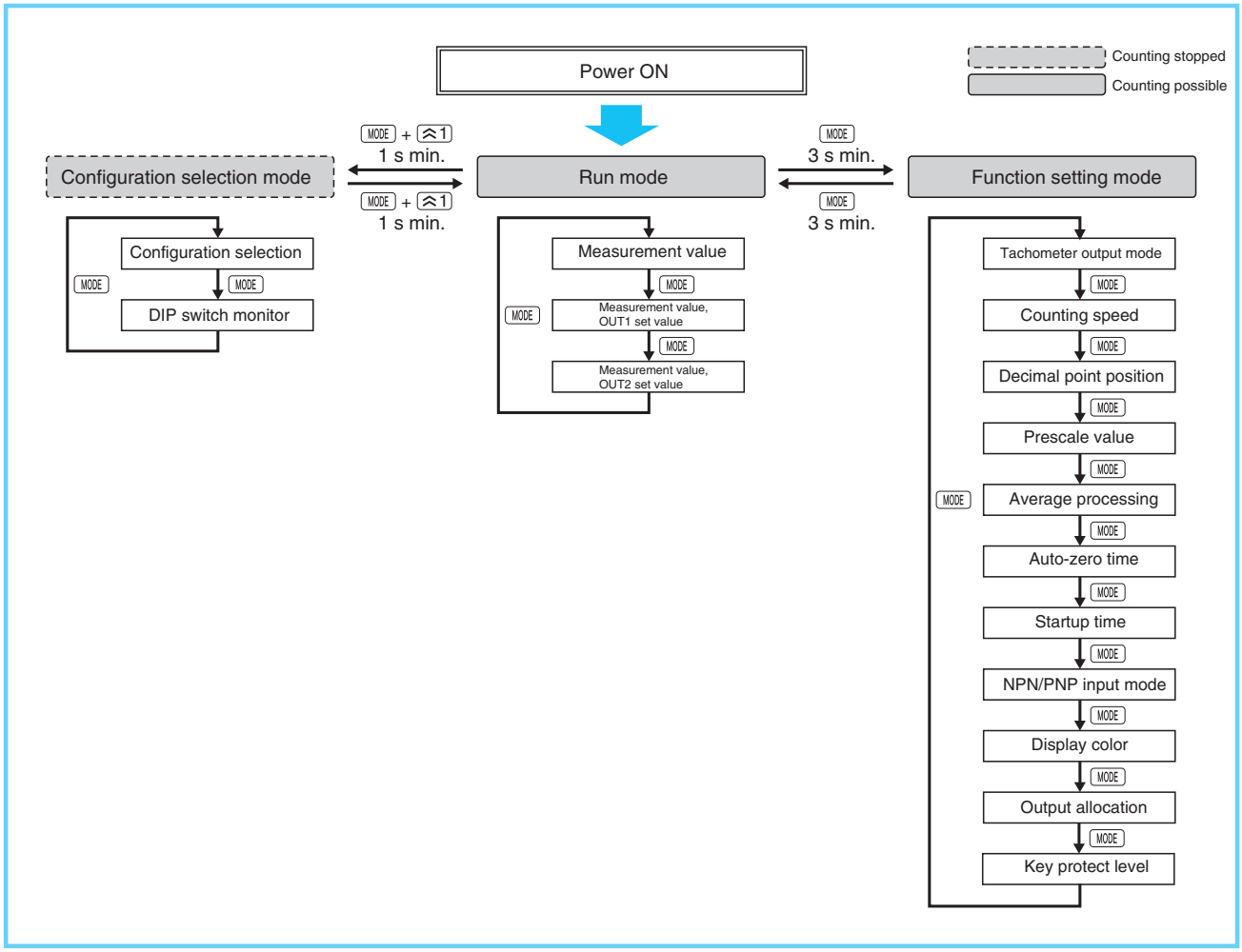
■ Using the Operation Keys

Counter Operation



Note: 1. Perform settings using the ↑ and ↓ keys (↑ key only with 6-digit models).
2. The above flowcharts outline the procedures for all models. For more details on each model, refer to page 107.

Tachometer Operation



Note: 1. All setting changes are performed using the ≪ key.
2. For details, refer to page 118.

■ Lists of Settings

Fill in your set values in the set value column of the following tables and utilize the tables for quick reference.

Configuration Selection Mode

Parameter name	Parameter	Setting range	Default value	Unit	Set value
Configuration selection	FUnC	1Cnt/2Cnt/tCnt/bCnt/dCnt/tRCo (See note 1.)	1Cnt (See note 2.)	---	
DIP switch monitor	dIP	on/oFF	oFF	---	---

Note: 1. The setting range varies with the model.
2. The default value for H7CX-AW□/-A4W□ models is 2Cnt.

Settings for Counter Operation

Run Mode

• 1-stage Counter

Parameter name		Parameter	Setting range	Default value	Unit	Set value
Present value, set value	Present value	---	-99999 to 999999 (-999 to 9999)	0	--	---
	Set value	---	0 to 999999 (0 to 9999) (For conditions other than those described in note 1.)	0	---	
			-99999 to 999999 (-999 to 9999) (See note 1.)			

• 2-stage Counter

Parameter name		Parameter	Setting range	Default value	Unit	Set value
Present value, set value 1	Present value	---	-99999 to 999999 (-999 to 9999)	0	---	---
	Set value 1	---	0 to 999999 (0 to 9999) (For conditions other than those described in note 1.)	0	---	
			-99999 to 999999 (-999 to 9999) (See note 1.)	0		
Present value, set value 2	Present value	---	-99999 to 999999 (-999 to 9999)	0	---	---
	Set value 2	---	0 to 999999 (0 to 9999) (For conditions other than those described in note 1.)	0	---	
			-99999 to 999999 (-999 to 9999) (See note 1.)	0		

• Total and Preset Counter

Parameter name		Parameter	Setting range	Default value	Unit	Set value
Present value, set value	Present value	---	-99999 to 999999 (-999 to 9999)	0	---	---
	Set value	---	0 to 999999 (0 to 9999) (For conditions other than those described in note 1.)	0	---	
			-99999 to 999999 (-999 to 9999) (See note 1.)			
Total count value		---	-99999 to 999999 (-999 to 9999)	0	---	---

• Batch Counter

Parameter name		Parameter	Setting range	Default value	Unit	Set value
Present value, set value	Present value	---	-99999 to 999999 (-999 to 9999)	0	---	---
	Set value	---	0 to 999999 (0 to 9999) (For conditions other than those described in note 1.)	0	---	
			-99999 to 999999 (-999 to 9999) (See note 1.)			
Batch count value, batch count set value	Batch count value	---	0 to 999999 (0 to 9999)	0	---	---
	Batch count set value	---	0 to 999999 (0 to 9999)	0	---	

• Dual Counter

Parameter name		Parameter	Setting range	Default value	Unit	Set value
Dual count value, dual count set value	Dual count value	---	-99999 to 999999 (-999 to 9999)	0	---	---
	Dual count set value	---	0 to 999999 (0 to 9999) (For conditions other than those described in note 2.)	0	---	
			-99999 to 999999 (-999 to 9999) (See note 2.)			
CP1 present value, CP2 present value	CP1 present value	---	0 to 999999 (0 to 9999)	0	---	---
	CP2 present value	---	0 to 999999 (0 to 9999)	0	---	---

Note: 1. The input mode is increment/decrement mode and the output mode is K-2, D, L, or H.

2. The dual count calculating mode is subtraction mode and the output mode is K-2, D, L, or H.

Function Setting Mode

Parameter name	Parameter	Setting range	Default value	Unit	Set value
Input mode	InPt	UP/dOWn/Ud-A/Ud-b/Ud-C (See note 1.)	UP	---	
Dual count calculating mode	CALn	Add/SUb (See note 1.)	Add	---	
Output mode	oUtP	n/F/C/r/M-1/P/9/A/M-2/d/L/H (See note 2.)	n	---	
One-shot output time	otIn	0.01 to 99.99	0.50	s	
One-shot output 2 time	otn2	0.01 to 99.99	0.50	s	
One-shot output 1 time	otn1	HoLd/0.01 to 99.99 (See note 3.)	HoLd	s	
Counting speed	CntS	30HZ/5MHZ	30HZ	---	
Reset input signal width	IFLt	20mS/1mS	20mS	---	
Decimal point position	dP	------/-----.-/----.--/---.--- (----/---.-/--.--/-.---)	------ (----)		
Prescale value	PSCL	0.001 to 99.999 (0.001 to 9.999)	1.000	---	
NPN/PNP input mode	InPd	nPn/PnP	nPn	---	
Display color	ColR	rEd/Grn/r-G/G-r	rEd	---	
Output allocation	otSt	oFF/on	oFF	---	
Key protect level	MyPt	MP-1/MP-2/MP-3/MP-4/MP-5	MP-1	---	

Note: 1. The setting range varies with the output mode.

2. The setting range varies with the model and the input mode.

3. HOLD cannot be set when the output mode is K-2.

Settings for Tachometer Operation

Run Mode

Parameter name		Parameter	Setting range	Default value	Unit	Set value
Measurement value		---	0 to 999999	0	---	---
Measurement value, OUT1 set value	Measurement value	---	0 to 999999	0	---	---
	OUT1 set value	---	0 to 999999	0	---	
Measurement value, OUT2 set value	Measurement value	---	0 to 999999	0	---	---
	OUT2 set value	---	0 to 999999	0	---	

Function Setting Mode

Parameter name	Parameter	Setting range	Default value	Unit	Set value
Tachometer output mode	tAtA	HoLd/ArEA/HCHC/LoLo	HCLo	---	
Counting speed	CntS	30HZ/ 10KHZ	30HZ	---	
Decimal point position	dP	------/-----.-/----.--/---.---	------	---	
Prescale value	PSCL	0.001 to 99.999	1.000	---	
Average processing	Ruo	oFF/2/4/8	oFF	---	
Auto-zero time	RUtZ	0.1 to 99.9	99.9	---	
Startup time	Stnr	0.0 to 99.9	0.0	s	
NPN/PNP input mode	Cnod	nPn/PnP	nPn	s	
Display color	CoLr	rEd/Grn/r-G/G-r	rEd	---	
Output allocation	otSt	oFF/on	oFF	---	
Key protect level	KyPt	KP-1/KP-2/KP-3/KP-4/KP-5	KP-1	---	

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. M070-E1-03

Up/Down Counting Meter
K3NC

An Ideal Interface for High-speed Up/Down Counting and Serial Communications

- 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.
- Compact 1/8 DIN size.
- Conforms to EMC standards, EN61010-1 (IEC1010-1).
- UL/CSA approved.

Model Number Structure

■ Model Number Legend

Base Units and Output Boards can be ordered individually or as sets. Refer to the *Output Board Combinations* table on page 132.

Base Units
K3NC - □ □ □ □
1 2 3 4

Output Boards
K31 - □ □ □ □
5 6 7 8

Base Units with Output Boards
K3NC - □ □ □ □ - □ □ □ □
1 2 3 4 5 6 7 8

1, 2. Input Sensors Codes
- NB: NPN inputs/Voltage pulse inputs
- PB: PNP inputs

3. Supply Voltage
- 1: 100 to 240 VAC
- 2: 12 to 24 VDC

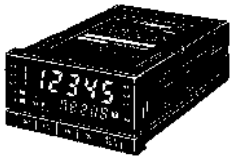
4. Display
- A: Basic
- C: Set Value LED Display

5, 6, 7, 8. Output Type Codes
- C2: 5 comparative relay contact outputs (OUT1, 2, 4, 5: SPST-NO; OUT3: SPDT)
- C5: 5 comparative relay contact outputs (OUT1, 2, 4, 5: SPST-NC; OUT3: SPDT)
- T1: 5 comparative transistor outputs (NPN open collector)
- T2: 5 comparative transistor outputs (PNP open collector)
- B2: BCD output (NPN open collector) (see note)
- B4: BCD output + 5 transistor outputs (NPN open collector)
- L1: Linear output (4 to 20 mA) (see note)
- L2: Linear output (1 to 5 VDC) (see note)
- L3: Linear output (1 mV/10 digits) (see note)
- 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)
- L6: Linear output, 1 mV/10 digits+ 5 transistor outputs (NPN open collector)
- L7: Linear output, 0 to 5 VDC (see note)
- L8: Linear output, 0 to 10 VDC (see note)
- L9: Linear output, 0 to 5 VDC + 5 transistor outputs (NPN open collector)
- L10: Linear output, 0 to 10 VDC + 5 transistor outputs (NPN open collector)
- FLK1: Communication RS-232C (see note)
- FLK2: Communication RS-485 (see note)
- FLK3: Communication RS-422 (see note)
- FLK4: RS-232C + 5 transistor outputs (NPN open collector)
- FLK5: RS-485 + 5 transistor outputs (NPN open collector)
- FLK6: RS-422 + 5 transistor outputs (NPN open collector)

Note: These output types are available on Basic Models only.

Ordering Information

■ Base Unit

Input type		NPN/Voltage pulse		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.		K3NC-NB1A	K3NC-NB2A	K3NC-PB1A	K3NC-PB2A
Set Value LED Models These models provide a present value LED, set value LED, and front-panel control keys. Can be connected to Relay, Transistor, or Combination Output Boards.		K3NC-NB1C	K3NC-NB2C	K3NC-PB1C	K3NC-PB2C

■ Available Output Board Combinations

Output type	Output configuration	Output boards	Base units	
			Basic	Set Value LED Display
Relay contact	5 outputs: OUT1, 2, 4, 5 (SPST-NO), and OUT3 (SPDT)	K31-C2	Yes	Yes
	5 outputs: OUT1, 2, 4, 5 (SPST-NC), and OUT3 (SPDT)	K31-C5	Yes	Yes
Transistor	5 outputs (NPN open collector)	K31-T1	Yes	Yes
	5 outputs (PNP open collector)	K31-T2	Yes	Yes
BCD (see note)	5-digit output (NPN open collector)	K31-B2	Yes	---
Linear	4 to 20 mA DC	K31-L1	Yes	---
	1 to 5 VDC	K31-L2	Yes	---
	1 mV/10 digits	K31-L3	Yes	---
	0 to 5 VDC	K31-L7	Yes	---
	0 to 10 VDC	K31-L8	Yes	---
Communication boards (see note)	RS-232C	K31-FLK1	Yes	---
	RS-485	K31-FLK2	Yes	---
	RS-422	K31-FLK3	Yes	---
Combination output and communication boards	BCD output + 5 transistor outputs (NPN open collector)	K31-B4	Yes	Yes
	4 to 20 mA + 5 transistor outputs (NPN open collector)	K31-L4	Yes	Yes
	1 to 5 V + 5 transistor outputs (NPN open collector)	K31-L5	Yes	Yes
	1 mV/10 digits + 5 transistor outputs (NPN open collector)	K31-L6	Yes	Yes
	0 to 5 VDC + 5 transistor outputs (NPN open collector)	K31-L9	Yes	Yes
	0 to 10 VDC + 5 transistor outputs (NPN open collector)	K31-L10	Yes	Yes
	RS-232C + 5 transistor outputs (NPN open collector)	K31-FLK4	Yes	Yes
	RS-485 + 5 transistor outputs (NPN open collector)	K31-FLK5	Yes	Yes
	RS-422 + 5 transistor outputs (NPN open collector)	K31-FLK6	Yes	Yes

Note: For details, refer to the *Communication Operation Manual.*

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)
Sensor power supply	80 mA at 12 VDC±10%
Insulation resistance	20 MΩ min. (at 500 VDC) between external terminal and case. Insulation provided between inputs, outputs, and power supply.
Dielectric strength	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 for 3 times each in X, Y, and Z directions Destruction: 294 m/s^2 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: 25% to 85% (with no condensation)
EMC	(EMI) EN61326+A1 Industry Emission Enclosure: CISPR 11 Group 1 class A: CISRP16-1/-2 Emission AC Mains: CISPR 11 Group 1 class A: CISRP16-1/-2 (EMS) EN61326+A1 Industry Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3: 10 V/m (amplitude-modulated, 80 MHz to 1 GHz) (level 3) Immunity Fast Transient Noise: EN61000-4-4: 2 kV (power line) (level 3) Immunity Burst Noise: 1 kV line to line (I/O signal line) Immunity Surge: EN61000-4-5: 1 kV line to line 2 kV line to ground (power line) Immunity Conducted Disturbance EN61000-4-6: 3 V (0.15 to 80 MHz) (level 2) Immunity Voltage Dip/Interrupting EN61000-4-11: 0.5 cycles, 0, 180°, 100% (rated voltage)
Approved standards	UL508, CSA22.2; Conforms to EN61326+A1, EN61010-1 (IEC61010-1) Conforms to VDE0106/P100 (finger protection) when the terminal cover is mounted.
Weight	Approx. 400 g

Note: A K3NC with DC supply voltage requires approximately 1 A DC as control power supply current the moment the K3NC is turned ON. Do not forget to take this into consideration when using several K3NC units. When the K3NC is not in measuring operation (e.g., the K3NC has been just turned ON or is operating for startup compensation time), the display will read "□□□□□" and all outputs will be OFF.

■ Characteristics

Input signal	No-voltage contact (30 Hz max., ON/OFF pulse width: 15 ms min.) Voltage pulse (50 kHz max., ON/OFF pulse width: 9 μs min., ON voltage: 4.5 to 30 V/OFF voltage: −30 to 2 V) Open collector (50 kHz max., ON/OFF pulse width: 9 μs min.) **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 (−19999 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 point can be set freely) Can be set using prescale value teaching.
External control	RESET: 16 ms max. (external reset signal) COMPENSATION: 16 ms max. (external compensation signal) BANK 1, 2: 100 ms max. (bank switching time) Up to 4 set value or prescale value banks available
Other functions	Variable linear output range (for models with linear outputs only) Remote/Local processing (available for communications output models only) Counting value reset with front panel keys Security Memory power failure
Output configuration	Relay contact output (5 outputs) Transistor output (NPN and PNP open collector), BCD (NPN 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, RS-485, RS-422) Communication functions (RS-232C, 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.
Degree of protection	Front panel: NEMA4 for indoor use (equivalent to IP66) Rear case: IEC standard IP20 Terminals: IEC standard IP00
Memory protection	Non-volatile memory (EEPROM) (possible to rewrite 100,000 times)

■ 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 (P level, reference value)	10 mA at 5 VDC	
Mechanical life	50,000,000 times min. (at a switching frequency of 18,000 times/hr)	
Electrical life (at an ambient temperature of 23°C)	100,000 times min. (at a rated load switching frequency of 1,800 times/hr)	

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 signal	No-voltage contact input
		Input current with no-voltage input	10 mA
		Signal level	ON voltage: 1.5 V max. OFF voltage: 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	1 mV/10 digits (see note)
Resolution	4,096		
Output error	±0.5% FS		±1.5% FS
Permissible load resistance	600 Ω max.	500 Ω min.	1 KΩ min.

Note: For the 1 mV/10-digit output, the output voltage changes for every 40 to 50 increment in the display value.

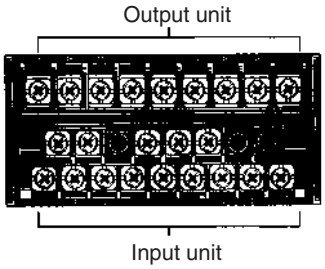
■ Communications Specifications

Item		RS-232C, RS-422	RS-485
Transmission method		4-wire, half-duplex	2-wire, half-duplex
Synchronization method		Start-stop synchronization	
Baud rate		1,200/2,400/4,800/9,600/19,200/38,400 bps	
Transmission code		ASCII (7-bit)	
Communications	**Write**	Comparative set value, prescaling value, remote/local programming, reset control, and other setting mode items excluding communications conditions.	
	Read	Process value, comparative set value, model data, error code, and others	

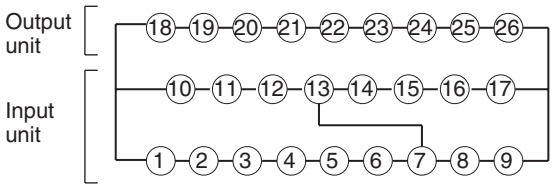
For details, refer to *Communication Operation Manual.*

Connections

■ Terminal Arrangement



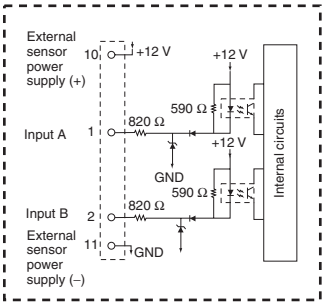
Terminal Numbers



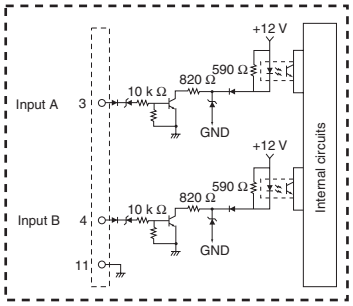
Note: Terminals 7 to 13 are connected internally.
Terminals 7 and 11 are mutually isolated.

Input Unit

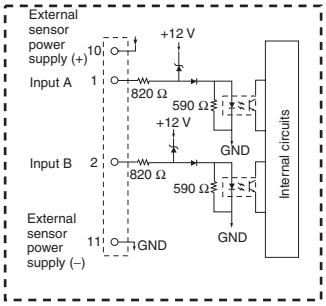
NPN Inputs



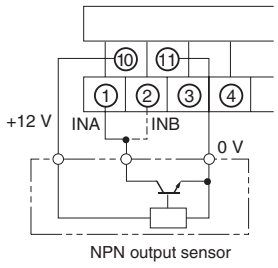
Voltage Pulse Inputs



PNP-input Models

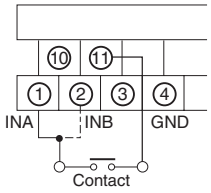


NPN Open Collector Output (NPN Linear 2-wire Output)



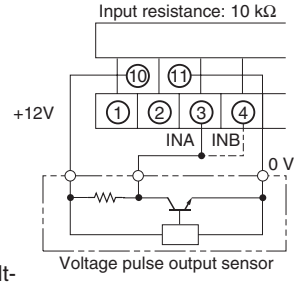
Note: Connect the + side of the NPN linear 2-wire input to terminal 1 and the – side to terminal 11.

Contact Output



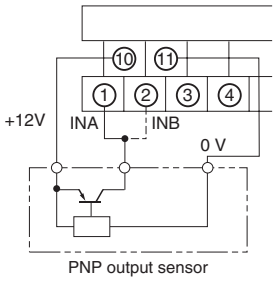
Note: When the contact is short-circuited, a current of approximately 13 mA will flow at a voltage of approximately 12 V.

Voltage Output



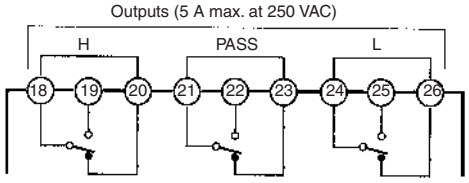
Note: With voltage pulse input not from a 3-wire sensor, connect the + side to terminal 3 and the – side to terminal 11.

PNP Open Collector Output

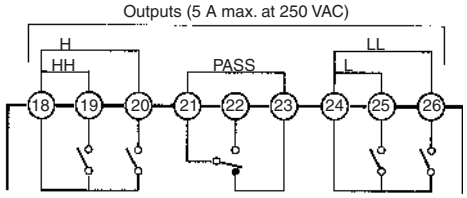


Output Unit

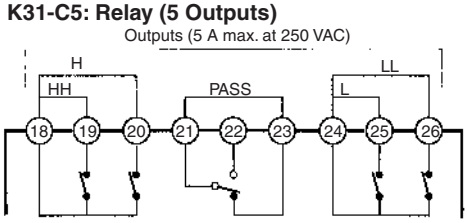
K31-C1: Relay (3 Outputs)



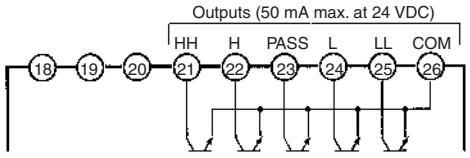
K31-C2: Relay (5 Outputs)



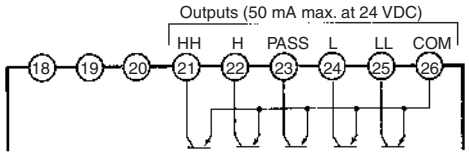
K31-C5: Relay (5 Outputs)



K31-T1: Transistor (NPN Open Collector)

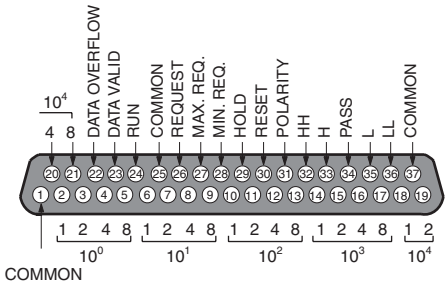


K31-T2: Transistor (PNP Open Collector)



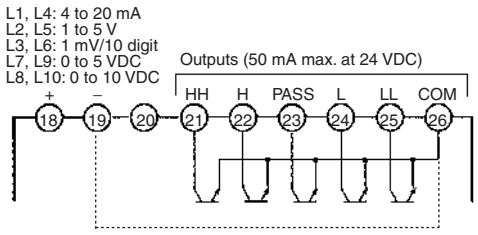
K31-B2, -B4: BCD (NPN Open Collector)

(Terminals 32 to 36 are provided only on K31-B4.



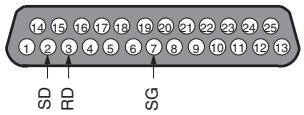
K31-L1, L2, L3,-L4, -L5, -L6, -L7, -L8, -L9, -L10: Linear

(Terminals 21 to 26 are provided only on K31-L4, -L5, -L6, -L9, -L10.)



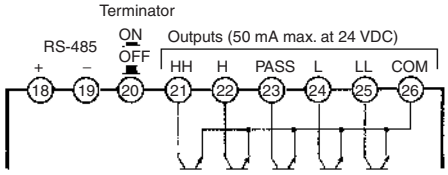
Note: With K31-L4/-L5/-L6/-L9/-L10 models, terminals 19 and 26 are connected internally.

K31-FLK1: RS-232C



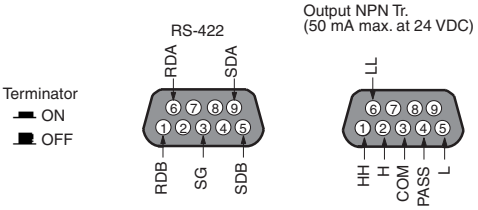
K31-FLK2, -FLK5: RS-485

(Terminals 21 to 26 are provided only on K31-FLK5.)



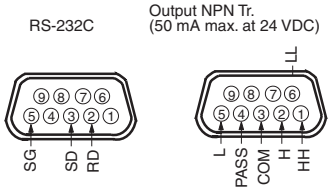
K31-FLK3, -FLK6: RS-422

(The right connector is provided only on K31-FLK6)

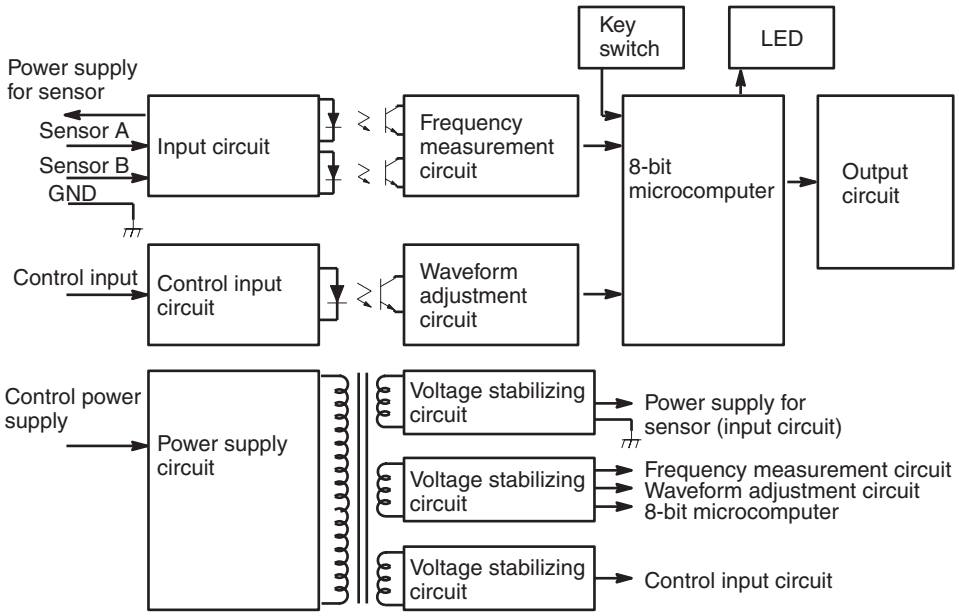


- D-sub 37P Connectors for BCD output (attachment)
  Plug: XM2A-3701
  Hood: XM2S-3711
- D-sub 25P connectors for RS-232C output (K31-FLK1) (order separately)
  Plug: XM2A-2501
  Hood: XM2S-2511
- D-sub 9P connectors for RS-422 output (K31-FLK3 and K31-FLK6) (order separately)
  Plug: XM2A-0901
  Hood: XM2S-0911
- D-sub 9P connectors for RS-232C output (K31-FLK4) (order separately)
  Plug: XM2D-0901
  Hood: XM2D-0911

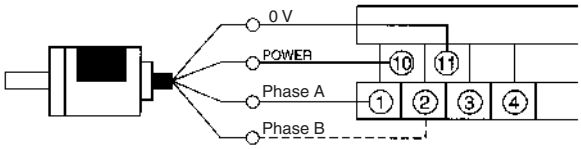
K31-FLK4: RS-232C + Transistor (NPN Open Collector)



■ Block Diagram



■ Rotary Encoder Connection Example



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

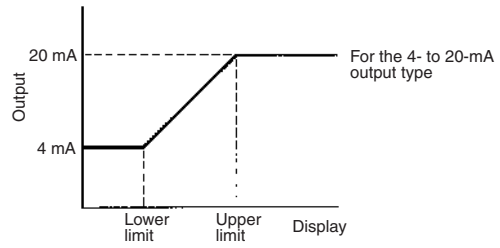
Note: Bank switching minimum signal width: 100 ms max.

Operation

■ Main Functions

Linear Output Range L5Eb

A linear output range can be set as required. A value corresponding to the maximum output value and that corresponding to the minimum output value can be set.



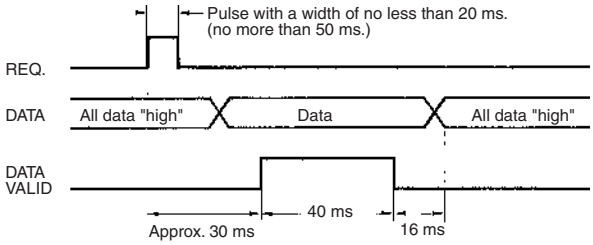
Remote/Local Selection r-L

Select remote programming when performing all settings through the host devices and select local programming when performing settings through key operation.

■ BCD Output Timing Chart

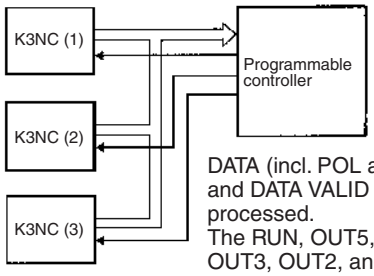
A request signal from an external device (such as a Programmable Controller) is required to read BCD data.

Single Sampling Data Output

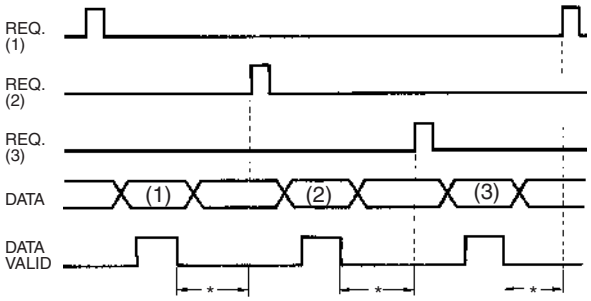


Approximately 30 ms after the REQ signal rises, a sample is taken and the DATA VALID signal is output. Read the data when the DATA VALID signal is ON.
The DATA VALID signal will turn OFF in 40 ms, and then in 16 ms, the data will go OFF.

Models with a BCD output have an open collector output configuration so that wired-OR connection is possible.

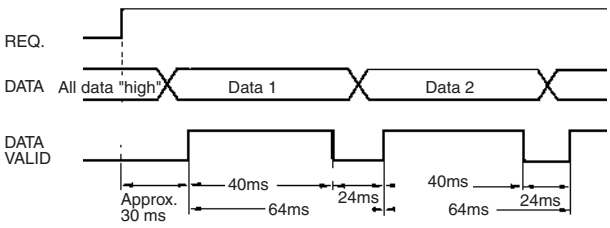


DATA (incl. POL and OVER) and DATA VALID are wired-OR processed.
The RUN, OUT5, OUT4, OUT3, OUT2, and OUT1 signals are always output regardless of the status of the REQ signal. Do not OR-wire these signals.



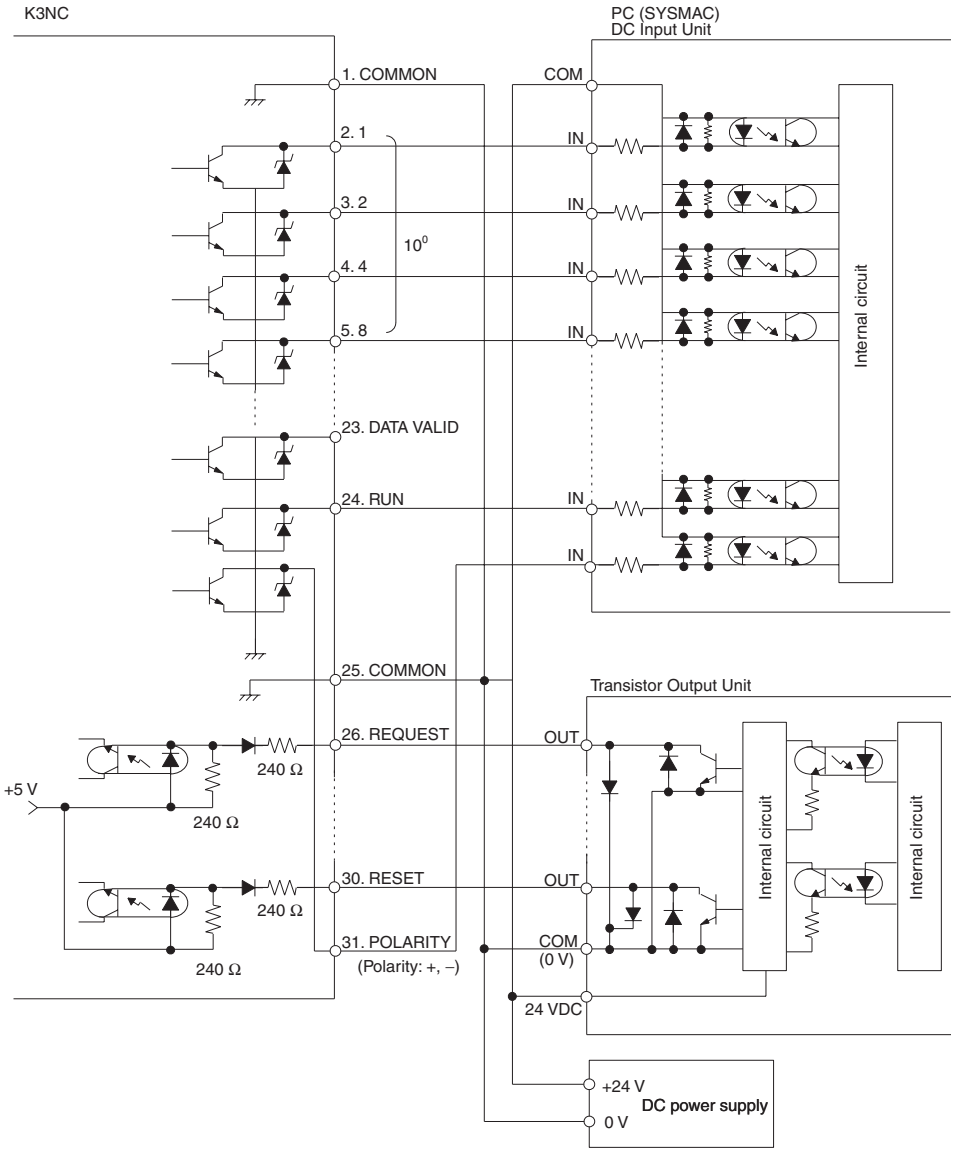
*The period between the DATA VALID signal and the REQ signal should be no less than 20 ms max.

Continuous Data Output

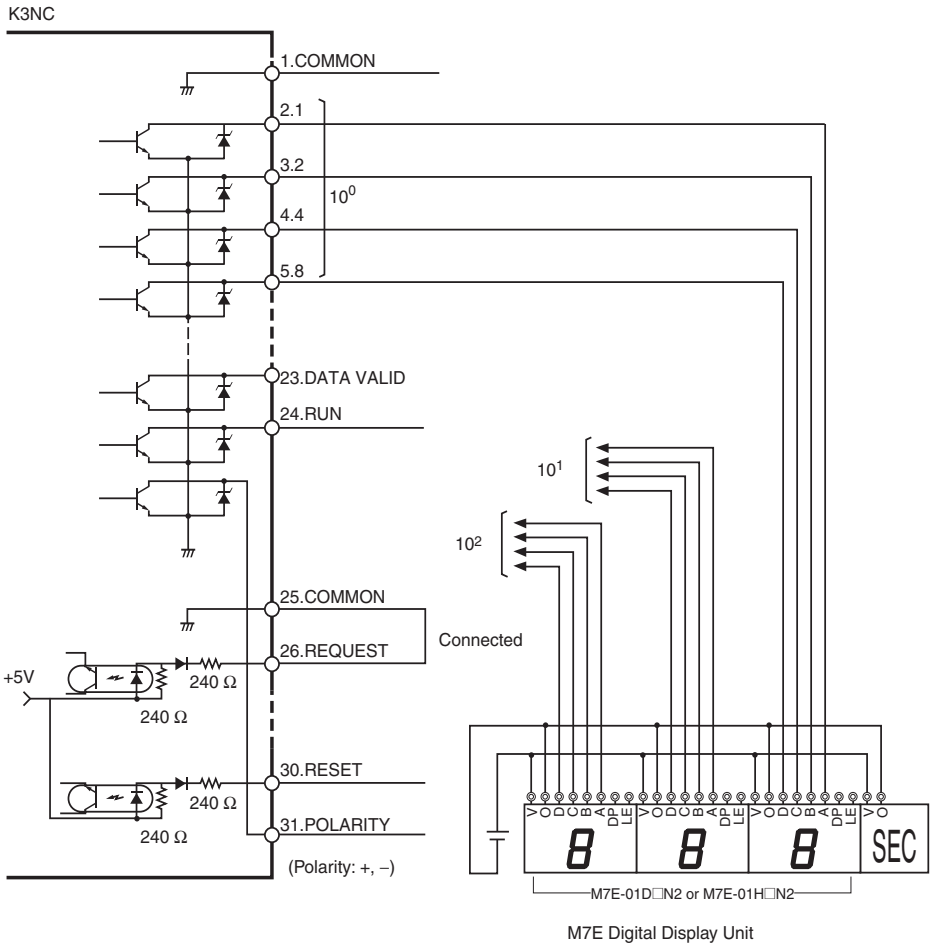


The K3NC outputs each measurement at an interval of 64 ms when a REQ signal is ON continuously.

Example of Connection to Programmable Controller



Example of Connection to Display Unit



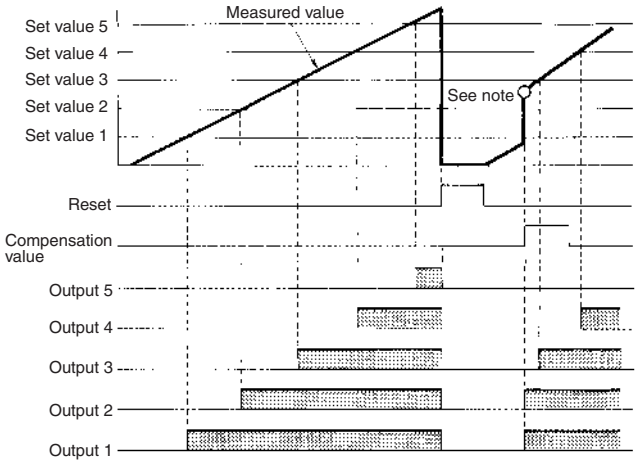
M7E Digital Display Unit

■ Output Operation Timing in RUN Mode (Relay and Transistor Outputs)

The K3NC 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

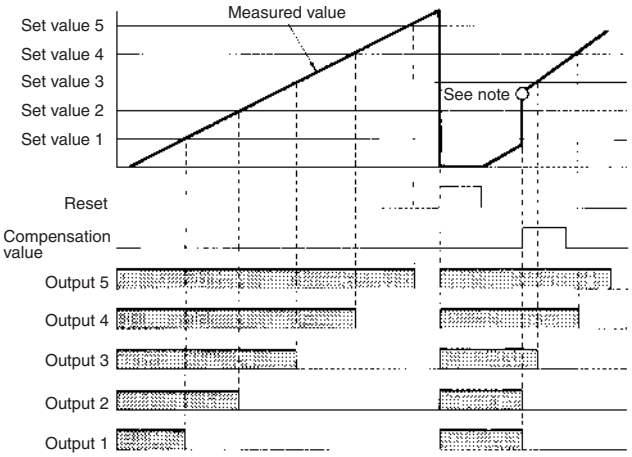
If the ALL-H output mode is selected, outputs 1 to 5 will be ON when the measured value exceeds set values 1 to 5.



Note: Set value 2 < compensation value < set value 3
While the reset signal is ON, the counting value will return to zero.

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

When the compensation signal is ON, the K3NC will be in counting operation starting with the preset compensation value. Depending on the setting conditions, the compensation value will be effective only for the incrementing operation.

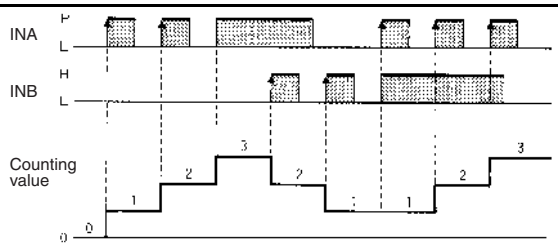
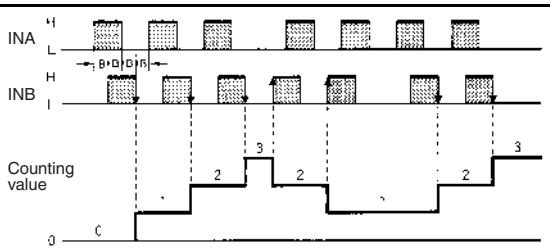
■ Output Delay (Reference Value)

The following table shows the time required for a K3NC in a system to go into reverse output operation after the counting value reaches the value preset with the K3NC, and is due to the output processing time of the K3NC, signal transmission time of the system, and the relay connected to the K3NC.

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 K3NC to the system.

■ Input Mode and Counting Values

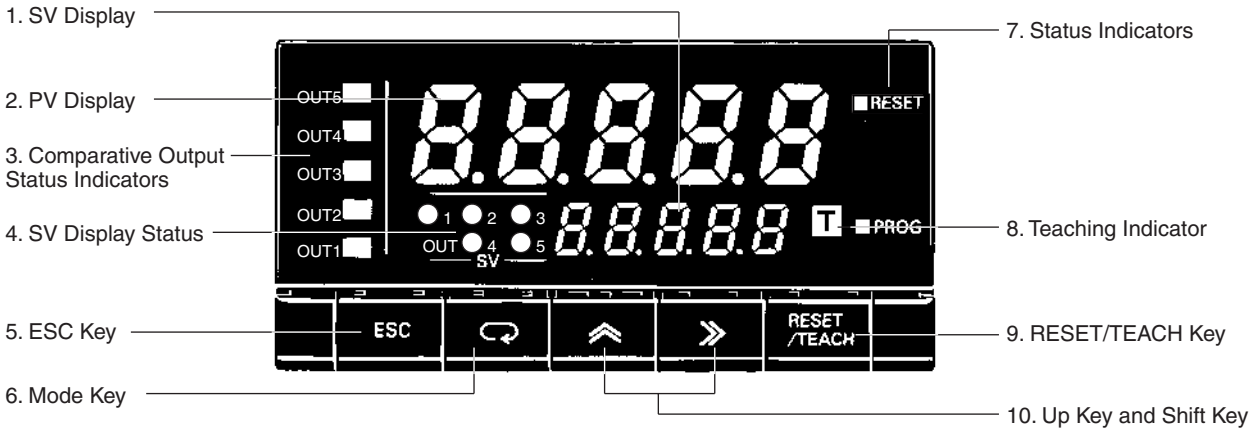
U-d b : Up/Down B individual input	U-d C : Up/Down C phase difference input
	

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

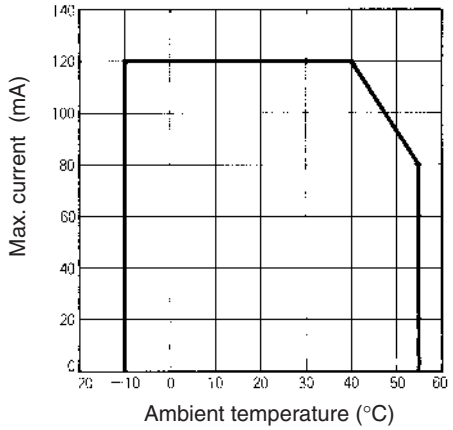
Nomenclature



Name	Functions
1. SV display	Displays the set value or parameter. Available for Set Value LED Models only.
2. PV display	Displays the process value or parameter.
3. Comparative output status indicators	Displays the status of comparative output.
4. SV display status	Indicates which comparative set value is currently on the SV display.
5. ESC Key	Used to return to the RUN mode from the Setting, Protect or Maintenance mode.
6. Mode Key	Used to enter the Setting mode. Used to allow the PV display to indicate set values sequentially. Available for Basic Models only. Used to indicate set values sequentially on the SV display. Available for Set Value LED Models only.
7. Status indicator	RESET: Lit when the RESET input is ON. PROG: Lit or flashes while parameters are being set.
8. Teaching indicator	Lit when the teaching function is enabled and flashes when the K3NC is in teaching operation.
9. RESET/TEACH Key	The counting value is reset by pressing this key. Teaching is available when the teaching function is enabled.
10. Up Key and Shift Key	The digit being set is scrolled by pressing the Shift Key. The set value increases by one whenever the Up Key is pressed.

Engineering Data

Derating Curve for Sensor Power Supply

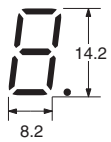


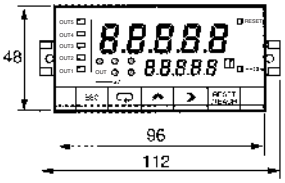
Note: The derating curve shown is for standard installation.
The derating curve depends on the mounting direction.

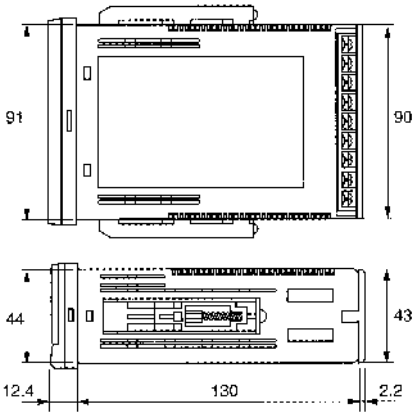
Dimensions

Note: All units are in millimeters unless otherwise indicated.

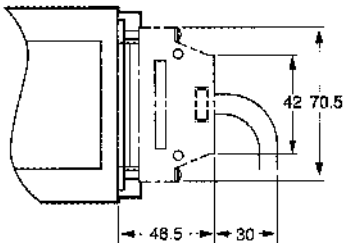
PV Display



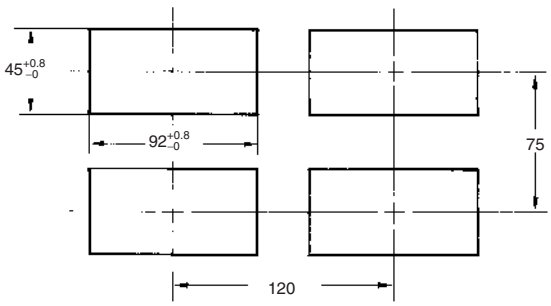




Note: The K3NC uses M3.5 terminals.
A terminal cover is provided.



Panel Cutouts



Precautions

⚠ WARNING

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

⚠ Caution

Do not allow metal objects or conductive wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

⚠ Caution

Do not attempt to take the product apart or touch any internal parts while the power is being supplied. Doing so may result in electric shock.

⚠ Caution

Do not use the product in locations subject to flammable or explosive gases. Doing so may result in explosion.

⚠ Caution

The lifetime of output relays varies greatly with the switching capacity and conditions. Consider the actual operating conditions, and use the relays within the rated load without exceeding the number of operations specified as the rated electrical life. Using relays beyond their rated electrical life may result in contact deposit or burning.

⚠ Caution

Do not use loads exceeding the rated value. Doing so may result in damage or burning.

⚠ Caution

Use a power supply voltage within the specified range. Not doing so may result in damage or burning.

⚠ Caution

Use settings that are appropriate for the control system. Discrepancies between the settings and the actual control conditions may result in unexpected operation leading to damage or accidents.

⚠ Caution

Be sure to tighten terminal screws to the specified torque.
Specified torque for M3.5 screws: 0.74 to 0.90 N·m
Loose screws may result in burning or malfunction.

■ Application Precautions

- Use a power supply voltage within the specified range. Not doing so may result in damage or burning.
- Be sure to perform wiring correctly, verifying the terminal names. Incorrect wiring may result in burning.
- Be sure to tighten the screws on the terminal block properly.
- Do not connect anything to unused terminals.

■ Correct Use

Long-term Use

Use all products within the specified ranges. When using inside a control panel, ensure that the temperature around the product, rather than the temperature around the control panel, does not exceed the specified temperature range. Electronic products, such as this product, have a lifetime that is dependent on the lifetime of internal electronic components, as opposed to the lifetime related to the number of relay switching operations. The lifetime of these components varies with the temperature; the higher the temperature, the shorter the lifetime. Therefore, the product lifetime can be extended by lowering the internal temperature of the product.

When several Counting Meters are mounted close together (either horizontally or vertically), the internal temperature of the Counting Meters may rise, leading to a reduction in the lifetime. In this case, take measures to cool the Counting Meters, such as installing fans. Ensure, however, that the terminals are not cooled as this may lead to incorrect measurement.

Operating Environment

Do not use the product in locations subject to temperatures or humidity levels above the specified ranges, or in locations subject to condensation.

Do not use the product in locations subject to severe shocks or vibrations.

Separate the product from machines that generate high-frequency noise, such as high-frequency welding machines and high-frequency sewing machines.

Do not use the product in locations subject to dust or corrosive gases.

Do not use the product outdoors or in locations subject to direct sunlight.

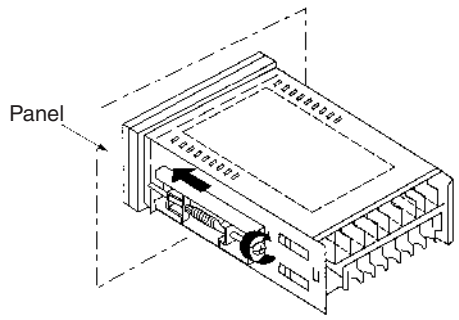
Operation

When using models with comparative outputs, if an error occurs at the Counting Meter, comparative output may not operate correctly. We therefore recommend that you consider providing an alarm system separately as a countermeasure.

Parameter settings that allow the functions to operate properly are made, using the setting menu, at the factory prior to delivery. When using the product, change the settings as required for the application.

Mounting

Recommended panel thickness is 1 to 3.2 mm.



Attach the mounting bracket on the left and right sides of the Counting Meter as shown in the illustration above and gradually tighten each screw evenly in turn by considering the balance of the tightening force until the ratchets start slipping without being further tightened.

Mount the Counting Meter as horizontally as possible.

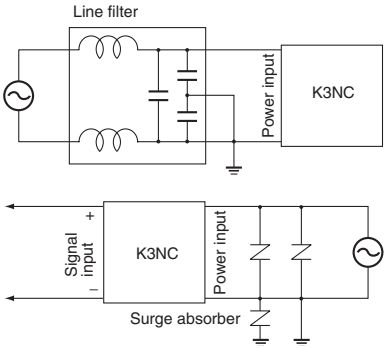
Waterproof Specifications

Products for which the degree of protection is not specified or models with IP□0 degree of protection do not have waterproof specifications.

Noise Countermeasures

Separate the product as far as possible from machines that generate high-frequency noise, such as high-frequency welding machines and high-frequency sewing machines, and machines that generate surges.

Attach surge absorbers or noise filters to noise-generating peripheral devices (in particular, devices with inductance such as motors, transformers, solenoids, and magnet coils).

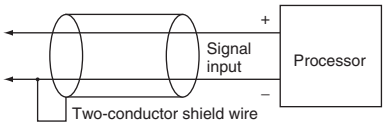


In order to prevent inductive noise, wire the lines connected to the terminal block separately from power lines carrying high voltages or large currents. Also, do not wire in parallel to, or in the same cable as power lines. There are other methods that are effective for reducing noise, such as running wires along ducts and using shield lines.

When using a noise filter for the power supply, check the voltage and current and install as close to the Counting Meter as possible.

Inductive Noise Countermeasure for Input Line

Analog Input



Temperature Input

In order to prevent the influence of induction, separate the lead wire joining the temperature sensor and the Counting Meter from power and load lines.

Using the product near radios, television sets, or other wireless devices may result in reception interference.

Unit Label (Provided)

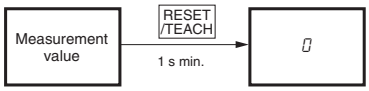
No product is shipped with the unit label attached. Select a unit label from the sheet provided and attach it to the Counting Meter.

Operating Procedures

■ Operation in RUN Mode

Reset

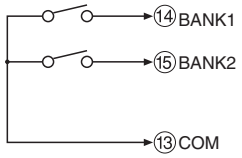
Press the RESET/TEACH Key [RESET/TEACH] for 1 s min. to reset the counting value to 0. (Enabled when key protection is cleared.)



Checking the Bank Number

Press the Shift Key [»] for 1 s min. during measurement to display the bank number in the PV display. (The display will return to the measurement value if there is no key operation for 5 seconds.)

Bank Selection



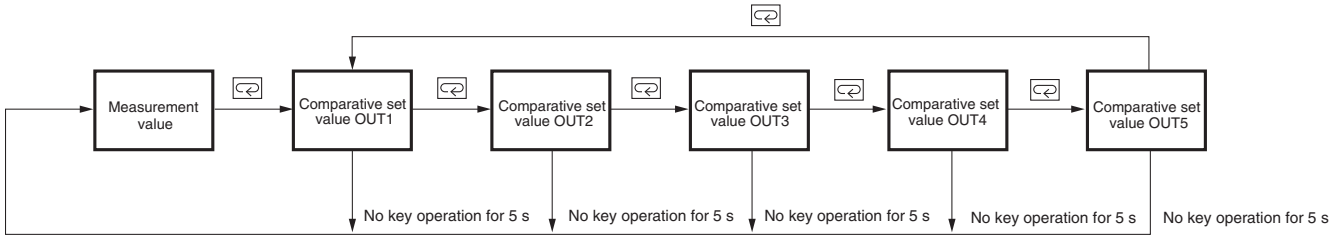
- Switch between the comparative set values and the prescaling values for banks 1 to 4 using the BANK 1 and BANK 2 signals.
- The relationship between the BANK 1 and BANK 2 signals and the bank numbers is shown in the following table.

Bank number	BANK 1	BANK 2	Comparative set value	Prescaling value
1	OFF	OFF	Su 1.**	PS 1.**
2	ON	OFF	Su2.**	PS2.**
3	OFF	ON	Su3.**	PS3.**
4	ON	ON	Su4.**	PS4.**

Note: If the prescale value bank is set to OFF, then the prescaling value for each bank is fixed.

Confirming and Setting Comparative Set Values

During measurement display, press the Mode Key [↺] repeatedly to display the comparative set values in the order OUT1, OUT2, OUT3, OUT4, and OUT5. (With models that have an SV display, the comparative set values are displayed in the SV display.)



Note: When a comparative set value is displayed, it can be changed using the Up Key [^] and Shift Key [»] (if key protection is OFF).

■ Setting Procedures

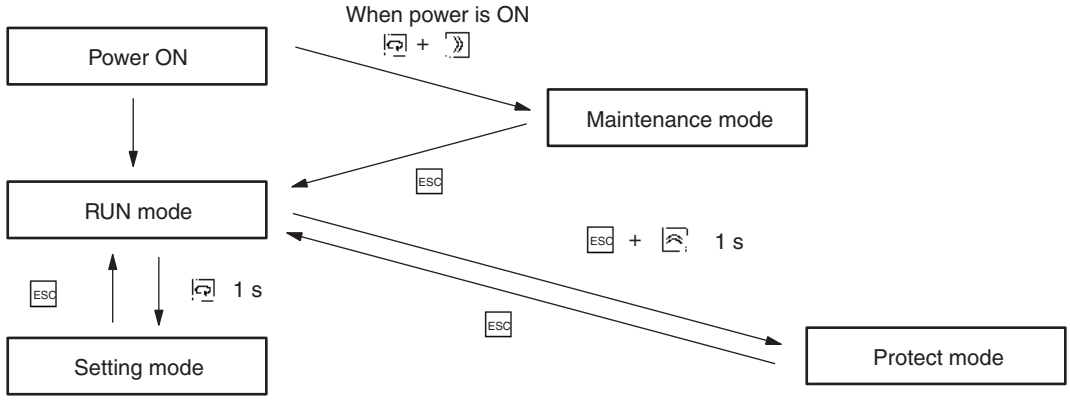
The K3NC has four modes: RUN mode for normal operations, Setting mode for initial parameter input, Protect mode for lock-out configuration, and Maintenance mode for initializing set values. The parameters that are accessible on any individual K3NC will vary depending on the Output Board installed. Refer to the *K3NC Operation Manual* for details.

RUN Mode: Remains in this mode under normal operation.
The process value can be monitored.
Using the front panel keys, the comparative set value can be changed and counting value reset can be performed.

Setting Mode: Used for making initial settings.
Includes settings for four menus (Set value (SuSEt), prescaling (PSCL), setup (SEtUP), option (oPt)) and the output test.

Protect Mode: Used for locking the front key operation or parameter changes.

Maintenance Mode: Used for initializing set values.



SuSEt - Program set values

- S.bAnK Select bank no. of set values
- Su*.01 Enter set value OUT1 of bank 1
- Su*.02 Enter set value OUT2 of bank 1
- Su*.03 Enter set value OUT3 of bank 1
- Su*.04 Enter set value OUT4 of bank 1
- Su*.05 Enter set value OUT5 of bank 1

Note: The above is an example when the bank number is set to 1.

PSCL - Display prescaling

- P.bAnK Select bank no. of prescale values
- PS*.Ao Set the mantissa (X) of the prescale value
- PS*.AY Set the exponent (Y) of the prescale value
- dECP.* Select decimal point

Note: The above is an example when the bank number is set to 1.

SEtUP - Program input mode/input sensor/serial communications

- CoUnt Specify input mode
- in Select a sensor type
- U-no Enter the unit no. for the host
- bPS Select the baud rate
- LEn Select the word bit length
- Sbit Select the stop bits
- PrtY Select the parity bits

oPt - Supplementary settings related to display or control

- nEno Select power failure memory function
- CoPn Set compensation value
- Con-P Select conditions that allow compensation input
- oUt Select output mode
- LSEt.H Enter the upper limit (H) of linear output range
- LSEt.L Enter the lower limit (L) of linear output range
- r-L Select the remote/local programming

tESt - Generating simulated input for testing the output function

Prot - Program lock-out configuration

- ALL Enable all key protection
- SuSEt Enable set value change prohibition
- rESEt Enable prohibition of counting value reset using the front panel keys
- SECr Specify the menus to be protected against setting in the setting mode

■ Initial Settings

Power ON

Press the Mode Key for 1 s min. to move to the Setting Mode.

Select the setup menu (SEtUP) with the Mode Key and set the input mode, the input type, and other settings.

If required, set a prescale value in the prescaling menu (PSCL).

Set comparative set values in the set value menu (SuSEt).

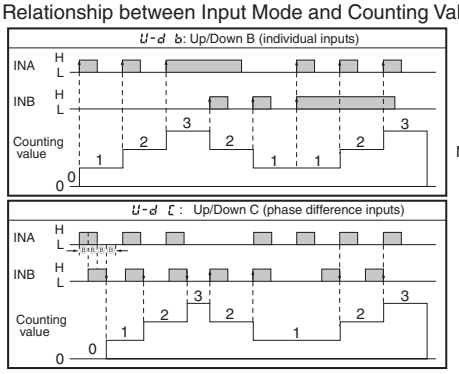
Make settings in the option menu (oPt) as required.

If necessary, generate simulated input for testing the output function in output test (tESt).

After completing all the settings, press the ESC Key ESC to return to RUN Mode.

Measurement starts.

Relationship between Input Mode and Counting Value



Note 1: The meaning of H and L in the graphs:

Symbol	No-voltage input
H	Closed
L	Open

2: At least 1/2 of the first signal width is required for B. Otherwise a counting error of ±1 may occur.

Selecting the Sensor Type

	NO: Voltage pulse H	NC: Voltage pulse L
No-contact or voltage pulse input	00	01
Contact input	10	11

Prescaling

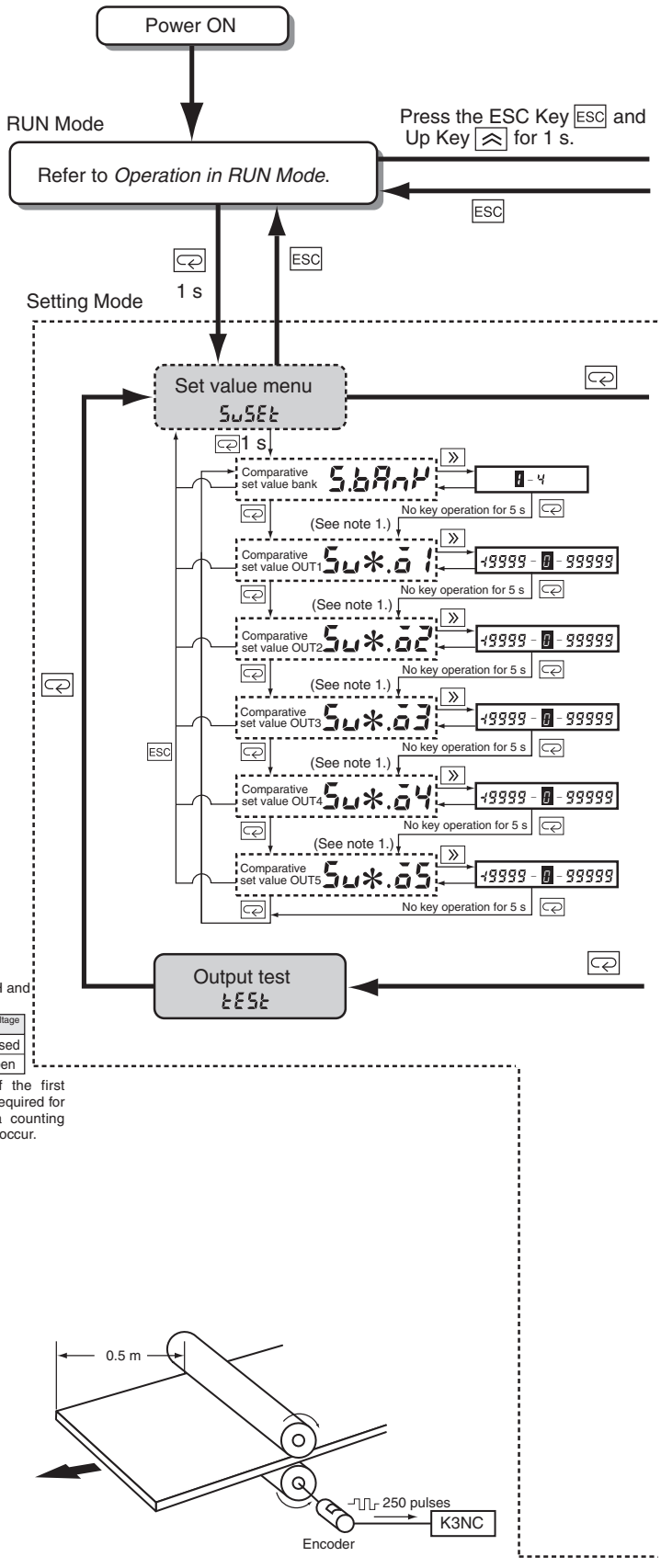
The prescale function makes it possible to convert the counting value of the K3NC into an appropriate value.

For example, the system shown in the illustration outputs 250 pulses when the object is advanced 0.5 m. To enable the K3NC to display □□□□.□ (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 = 2.0000, Y = 00
2. Set the decimal point to the left of the rightmost digit.

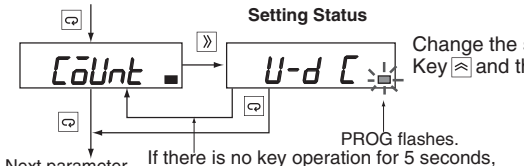
■ Parameters

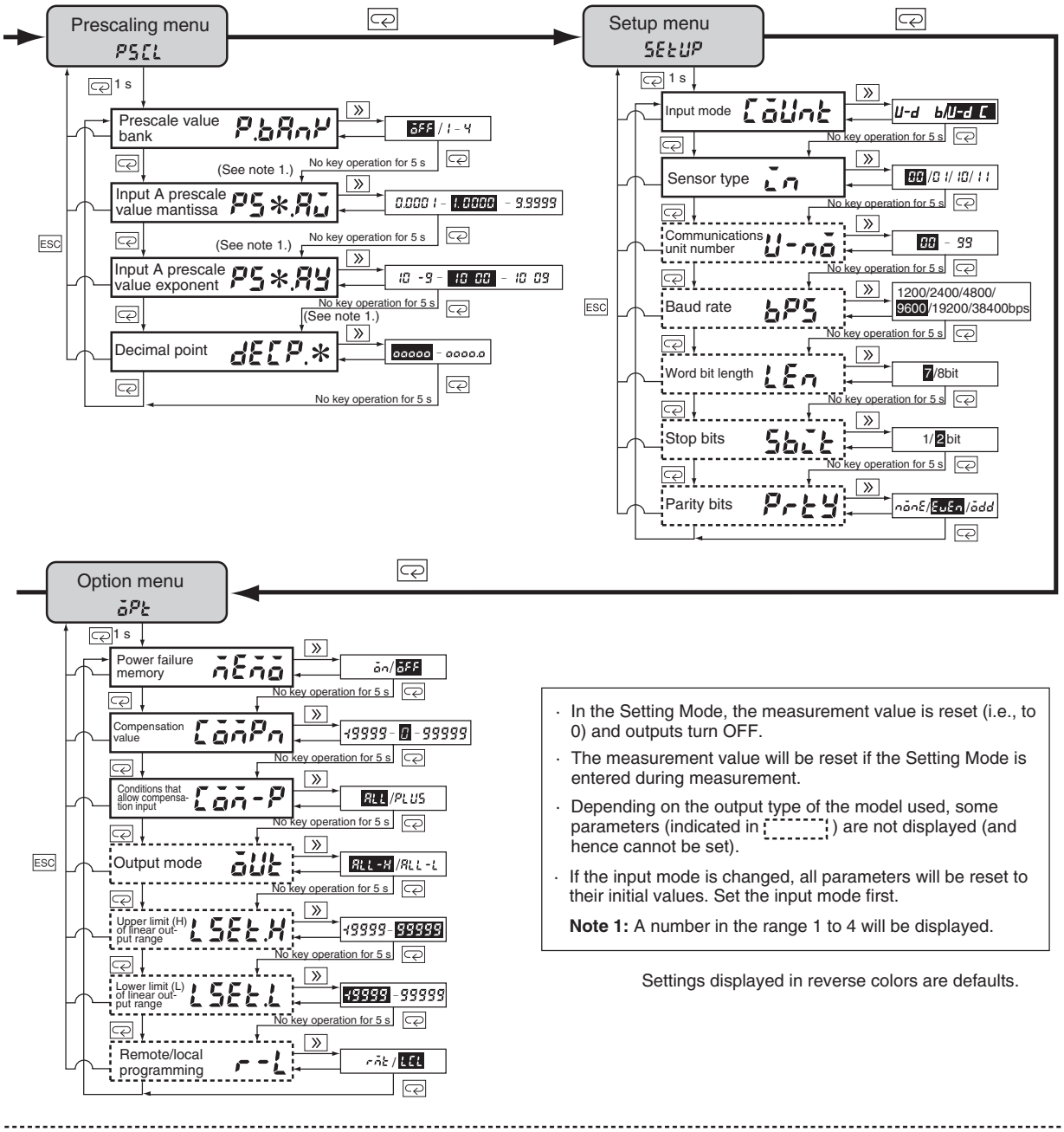


Protect Mode

Changing Set Values

By pressing the Shift Key » while a parameter is displayed, the set value can be changed (setting status). The PROG status indicator will flash. Change the set value as required, and press the Mode Key to register the setting and move to the next parameter.

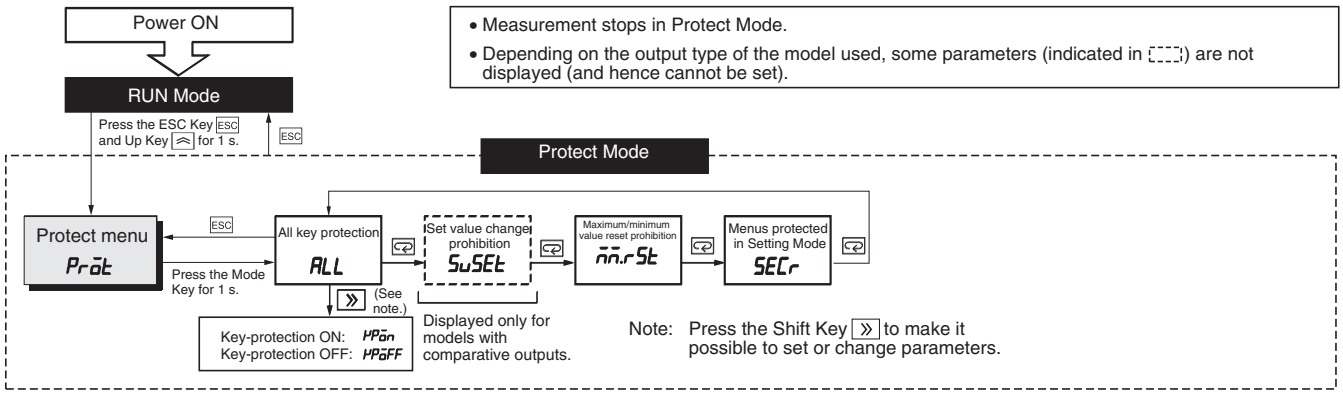




- In the Setting Mode, the measurement value is reset (i.e., to 0) and outputs turn OFF.
- The measurement value will be reset if the Setting Mode is entered during measurement.
- Depending on the output type of the model used, some parameters (indicated in ⬚) are not displayed (and hence cannot be set).
- If the input mode is changed, all parameters will be reset to their initial values. Set the input mode first.

Note 1: A number in the range 1 to 4 will be displayed.

Settings displayed in reverse colors are defaults.



Menu display	Parameter display	Meaning of parameter	Setting range	Setting key (See note.)
Prōt Press the Mode Key to display the parameter. Press the ESC Key to return to the menu.	ALL Setting: » Next parameter: ↺	All key protection: All key operations are prohibited in RUN Mode. (If all key protection is ON, only the key for going to Protect Mode is enabled.)	Key protection ON: HPōn Key protection OFF: HPōFF	Use the Up Key to change the setting. HPōn → HPōFF Use the Mode Key to enable the setting and move to the next parameter.
	SuSEt Setting: » Next parameter: ↺	Set value change prohibition: Changes to comparative set values are prohibited in RUN Mode. (Displayed only for models with comparative outputs.)		
	rESEt Setting: » Next parameter: ↺	Reset prohibition: Resetting the counting value using the front panel keys is prohibited. (Resetting by external signals is not prohibited.)		
	SECr Setting: » Next parameter: ↺	Menus protected in Setting Mode: Setting operations in Setting Mode are prohibited in the way shown below.	0/1/2	Use the Up Key to change the setting. 1 → 2 → 3 Use the Mode Key to enable the setting and move to the next parameter.

Setting menu	Setting		
	0	1	2
Set value menu			×
Scaling menu			×
Setup menu		×	×
Option menu			×

Note: If there is no key operation for 5 seconds, the setting is automatically registered.

■ Troubleshooting

When an error occurs, error details will be displayed in the PV display. Take the appropriate countermeasures according to the error displayed.

Error display	Error contents		Comparative output			Countermeasure
		Output status	BCD output	Communications output	Linear output	
M1.Err (M1.ERR) M2.Err (M2.ERR)	Memory error	OFF	OFF (all outputs in "H" status)	OFF	OFF	Reset the power. If the same error occurs, repair is necessary.
M3.Err (M3.ERR)		OFF	OFF (all outputs in "H" status)	OFF	OFF	Reset the power while holding down the ESC Key, the Up Key, and the RESET/TEACH Key. The settings will be returned to their initial values. Redo the settings. If the same error occurs, repair is necessary.
Err-O (ERR-O) CHG-O (CHG-O)	Output error	OFF	OFF (all outputs in "H" status)	OFF	OFF (minimum value)	Reset the power. If the same error occurs, repair is necessary. If normal operation is restored, it is possible that the original error was caused by the influence of noise. Check that there are no sources of noise in the vicinity.
(Display value flashes.)	The input range and display range were exceeded.	Continues	Continues The OVER signal turns ON.	Continues The OVER or UNDER signal turns ON.	Continues	Take steps to ensure that the input values and display values are within the allowable ranges.
rmt (RMT) (Flashes for 3 s.)	The remote/local section is set to remote.	Continues	Continues	Continues	Continues	If an attempt to change a setting using key operations is made with the remote/local selection set to remote, this error will flash for 3 s. To enable settings to be changed, set the remote/local selection to local.

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. N089-E1-02