Counters

With over three decades in the counter market, Omron can provide a solution to every measurement process requirement, including total counting, timing, pre-set counting and specific cam positioning applications.

- Full range of battery-powered counters for total-, timing- and speed counting
- Pre-set version has highly visible colour-change feature
- Relay output and transistor output for pre-set counters
- Models available with communication capability
- Conform to all relevant safety standards
- LCD negative transmission back-lit display in most models

What is the type of counting application?

Totalising

Which size is required?

48 x 24 mm (1/32 DIN)

Which type of application?

Totalising

H7EC

Page D-7

Timer

H7ET

Page D-15

Speed

H7ER

Page D-23

Pre-set counter time count

Which size is required?

48 x 24 mm (1/32 DIN)

H8GN counter / timer

Page D-29

48 x 48 mm (1/16 DIN)

H7CX

Page D-55

H7CX series – multi-functional pre-set counter

The H7CX series offers the ultimate in versatility and intuitive programming. With a display choice of up to six digits the H7CX offers many added-value features, making it ideal for multiple uses.

Every model features a crystal-clear display for excellent visibility in all lighting conditions, dust- and water-proof front casing (IP66) that guarantees top performance under adverse conditions, and extensive functionality in its class. In addition, each unit in this series has the same “look and feel” with its uniform display design, the same front-panel rocker-keys for easy set-up and operation, and the same intuitive way of programming.

Cam positioner

Which size is required?

96 x 96 mm
(1/4 DIN)

H8PS

Page D-99

Table of contents

Selection Table

	Category	Totalisers				
Selection criteria						
	Model	H7EC	H7ET	H7ER	H7GP	H7HP
	Display	LCD			LCD negative transmissive	
	Size	1/32 DIN				72 x 36 mm
Outputs	Control outputs					
	5 stage					
	Total	■	■		□	□
	Time		■		□	□
	Preset					
	Batch					
	Dual					
	Tachometer	■		■		
Inputs	Control inputs	No-voltage, PNP / NPN, DC-voltage, AC / DC multi-voltage	No-voltage, PNP / NPN, DC-voltage, AC / DC multi-voltage	No-voltage, PNP / NPN	No-voltage or DC-voltage (switchable)	No-voltage or DC-voltage (switchable)
Features	Dual operation					
	Number of digits	8	7	4 or 5	6	7
	NPN / PNP switch	■	■	■	■	■
	Back-lit	□	□	□		
	External reset	■	■		■	■
	Manual reset	■	■		■	■
	Number of banks					
	Built-in sensor power supply					
	IP rating	IP66	IP66	IP66	IP66G	IP66G
Terminals	Screw terminals	■	■	■	■	■
	PCB terminals					
	11-pin socket					
Supply voltage	100 to 240 VAC				□	□
	12 to 24 VDC				□	□
	24 VDC	□	□	□		
	Comms					
Functions	Up	■	■		■	■
	Down					
	Up / down					
	Reversible					■
	Speed	0 to 30 Hz or 0 to 1 kHz		1 or 10 kHz	0 to 30 Hz or 0 to 5 kHz	1 to 30 Hz or 0 to 5 kHz
	Counting range	0 to 99999999	0.0 h to 999999.9 h <--> 0.0 h to 3999 d 23.9 h or 0 s to 999 h 59 min 59 s <--> 0.0 min to 9999 h 59.9 min	1000 s^{-1} or 1000 min^{-1}; 1000 s^{-1} or 1000 min^{-1} <--> 10000 min^{-1}	0.1 to 99999.9 h or 1 s to 99 h 59 m 59 s	0.1 to 99999.9 h or 1 s to 99 h 59 m 59 s
Colour	Beige	■	■	■	■	■
	Black	■	■	■	■	■
	Page	D-7	D-15	D-23	CD	CD

	Category	Totalisers	Pre-set counters		Cam positioners
Selection criteria					
	Model	H7E□-N□P	H8GN	H7CX	H8PS
	Display	LCD	LCD negative transmissive		
	Size	44.8 x 22.4 mm	1/32 DIN	1/16 DIN	1/4 DIN
Outputs	Control outputs		1 relay (SPDT)	1 relay (SPDT), transistor	NPN or PNP, cam outputs (8 lines), run out, tachometer
	5 stage				
	Total	□	■	□	
	Time	□	■		
	Preset		■	□	
	Batch		■	□	
	Dual		■	□	
	Tachometer			□	
Inputs	Control inputs	No-voltage	No-voltage	No-voltage, PNP / NPN	Encoder
Features	Dual operation		■	■	□
	Number of digits	7 or 8	PV: 4, SV: 4	PV: 4, SV: 4 or PV: 6, SV: 6	7
	NPN / PNP switch			■	
	Back-lit	■		■	■
	External reset	■	■	■	
	Manual reset	■	■	■	
	Number of banks		4		8 (16- and 32- output models only)
	Built-in sensor power supply			■	
	IP rating	IP00	IP66	IP66	IP40
Terminals	Screw terminals		■	■	■
	PCB terminals	■			■
	11-pin socket			□	
Supply voltage	100 to 240 VAC			■	
	12 to 24 VDC			■	
	24 VDC	3 VDC	■		■
	Comms		□		
Functions	Up	■	■	■	
	Down		■	■	
	Up / down			■	
	Reversible		■	■	
	Speed	0 to 30 Hz or 0 to 1 kHz	0 to 30 Hz or 0 to 5 kHz	0 to 30 Hz or 0 to 5 kHz	
	Counting range	0.0 h to 999999.9 h	-999 to 9999	-999 to 9999 or -99999 to 999999	
Colour	Beige	■			■
	Black		■	■	
	Page	CD	D-29	D-55	D-99

■ Standard □ Available No / not available

LEADING IN SERVICE

Focussed, progressive, distinctive. Be assured, choose Omron

At Omron we set high standards for ourselves. Our products are known all over the world for their unrivalled quality. But we offer more than just excellent quality. In an environment that places ever greater demands with regard to service, quality and costeffectiveness, other things are important too. Providing a top-quality service is what we do every day, including extra service as standard. This helps to ensure that we can provide tailor-made solutions for applications more effectively and more quickly.

More and more companies are choosing Omron as they seek to work in a partnership that is based on reliability and certainty.

Omron – the reassuring choice.

International standards and approvals

Our products carry all relevant international standards and approvals, including CCC (Chinese Compulsory Certification), which makes exporting your system much easier.

- Reliability, also for your customers
- Maximum flexibility
- Confidence

5-day repair service

More and more people are choosing Omron, as a high degree of reliability is a key feature of its products. You can always rely on Omron. Even if a product unexpectedly malfunctions, our repair team is ready to swing into action.

- Product repaired and returned to you within 5 days, including collection and delivery
- You can track the status of your repair on-line
- Repairs within warranty are completely free-of-charge

For more information please visit the Service & Support section at http://omron-industrial.com

EPLAN for Omron products

The majority of standard Omron products are provided in digital EPLAN format, which means that a few clicks of your mouse are all that is needed to design the right product into your switching panel.

For more information please visit: http://omron-industrial.com/en/eplan/

- Very easy to use
- Always the right product
- Reduced engineering time

Downloadable 2-D and 3-D CAD drawings

Designers of switching panels and machines can download clear 2-D and 3-D CAD drawings for all current products from http://omron-industrial.com/en/2D3D, which can easily be incorporated into your design.

- Large number of formats supported for greater flexibility
- Readily available
- Convenience that saves you time

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

H7EC

Total Counter
- 8-digit

H7ET

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

H7ER

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

H7E□-N□P

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

Contents

Self-powered Totalizers

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 3) 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

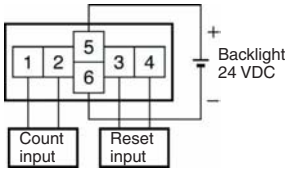
Item	Value	Note
Battery life	7 years min. with continuous input at 25°C (lithium battery)	The battery life is calculated according to the conditions in the left column and therefore is not a guaranteed value. Use these value as reference for maintenance or replacement.

Connections

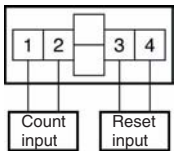
■ Terminal Arrangement

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

Backlight Model



No-backlight Model

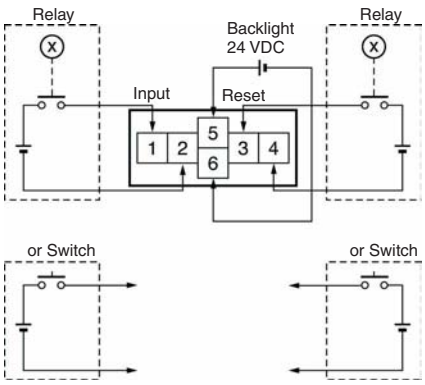


■ Connections

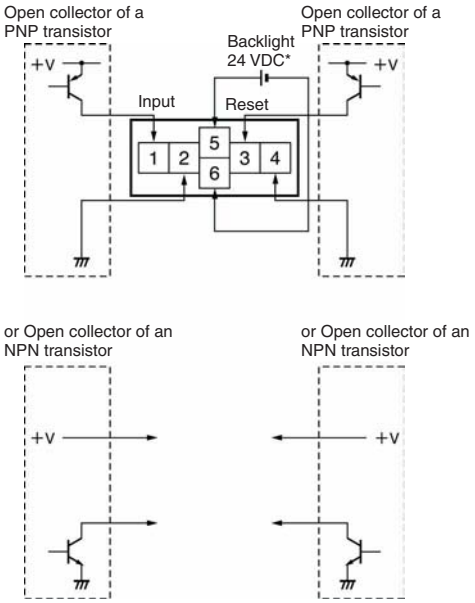
H7EC Total Counter

PNP/NPN Universal DC Voltage Input Model With Backlight

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



2. Solid-state Input



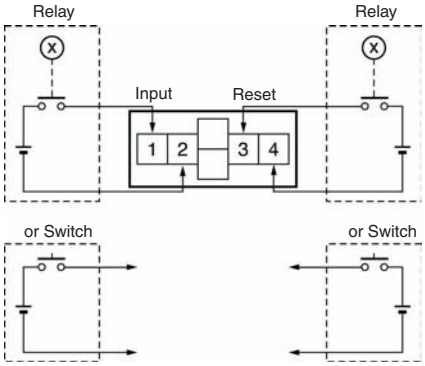
Note: 1. Terminals 2 and 4 (input circuit and reset circuit) are functionally isolated.

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

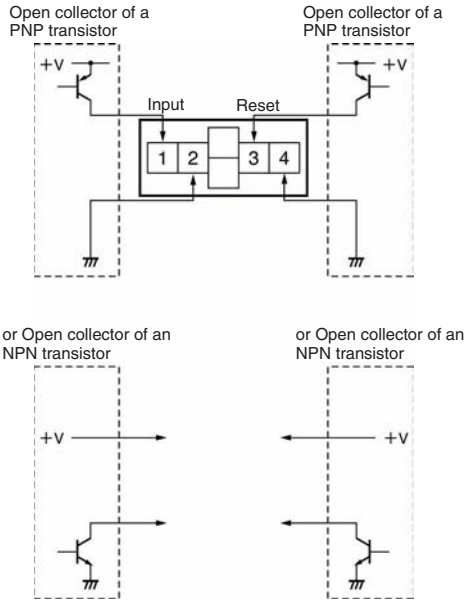
Note: *Recommended Power supply; eg. OMRON S8VS

PNP/NPN Universal DC Voltage Input Model Without Backlight

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



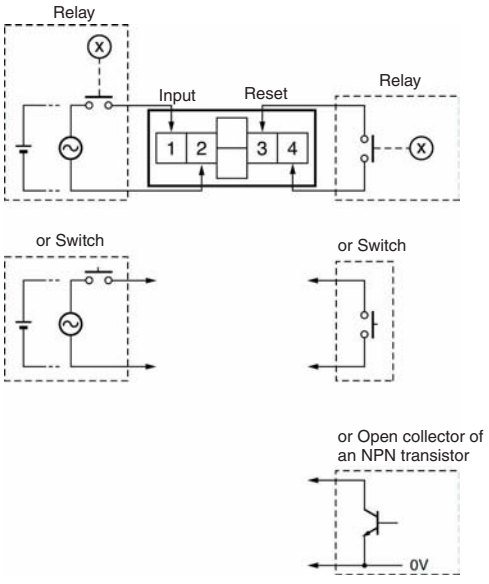
2. Solid-state Input



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

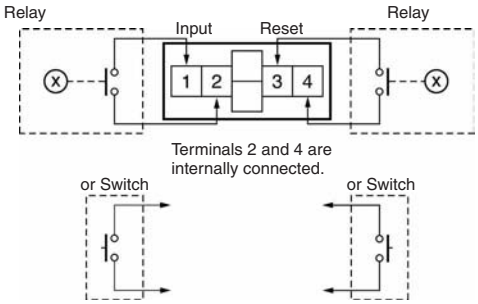
AC/DC Multi-voltage Input Model



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

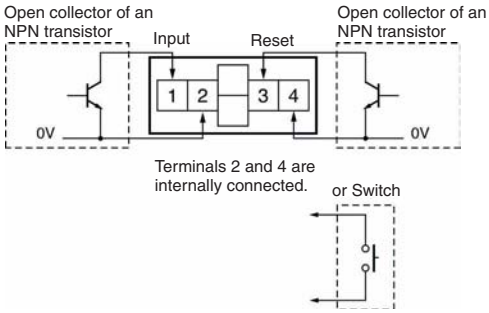
No-voltage Input Model

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.

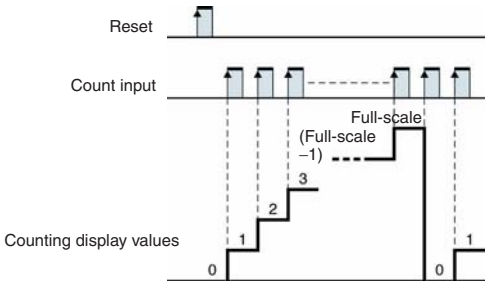
2. Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 1 μA

Operation

■ Operating Modes

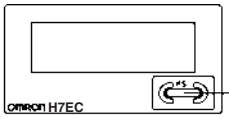
H7EC Total Counter

Incrementing Operation (Up)



Nomenclature

Front view



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

Bottom view

Key-protect Switch

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

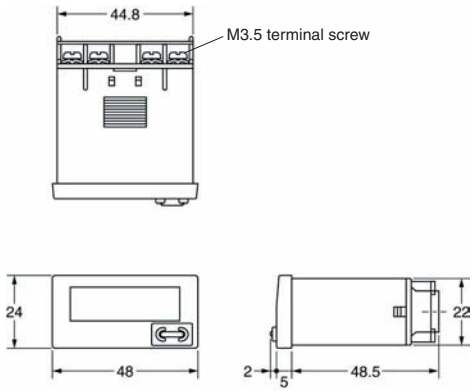
Setting (see note)	Key-protect
Front panel Concave side	OFF (default setting)
Concave side Terminal block	ON

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

Dimensions

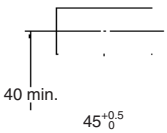
Note: All units are in millimeters unless otherwise indicated.

H7EC-N



Panel Cutout

Separate mounting



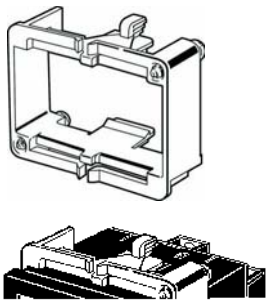
Dense mounting

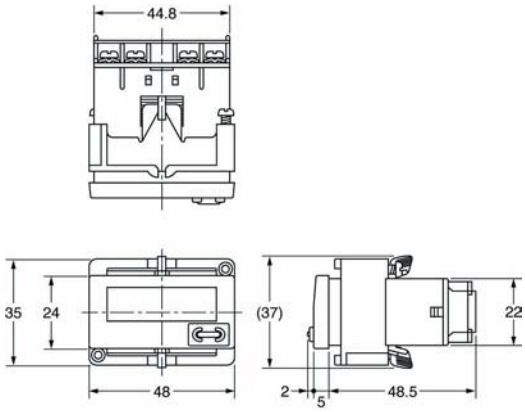
(48 Units – 2.5) +1.0 0

22.2 +0.5 0

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

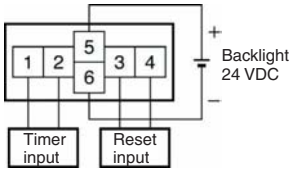
Item	Value	Note
Battery life	10 years min. with continuous input at 25°C (lithium battery)	The battery life is calculated according to the conditions in the left column and therefore is not a guaranteed value. Use these value as reference for maintenance or replacement.

Connections

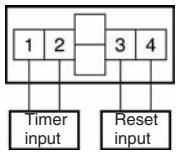
■ Terminal Arrangement

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

Backlight Model



No-backlight Model

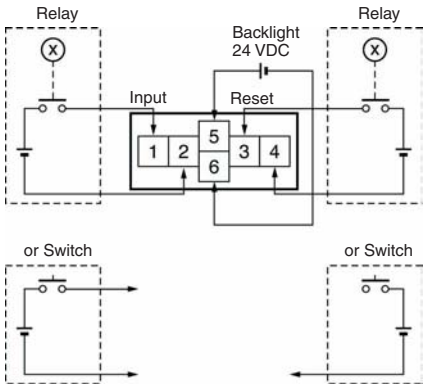


■ Connections

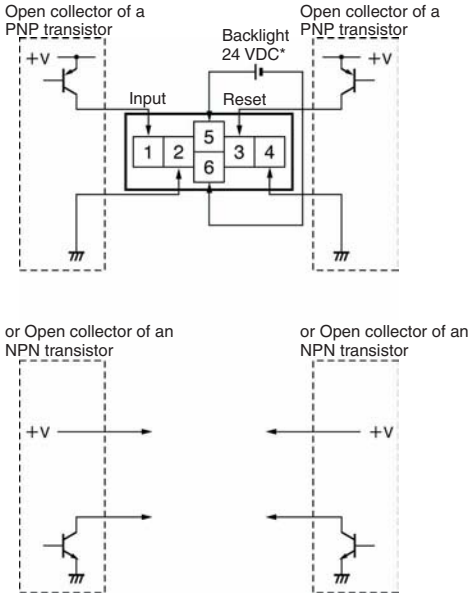
H7ET Time Counter

PNP/NPN Universal DC Voltage Input Model With Backlight

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



2. Solid-state Input



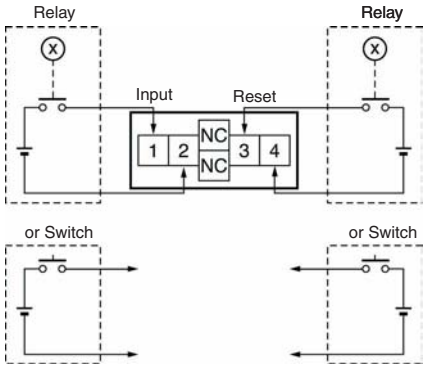
Note: 1. Terminals 2 and 4 (input circuit and reset circuit) are functionally isolated.

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

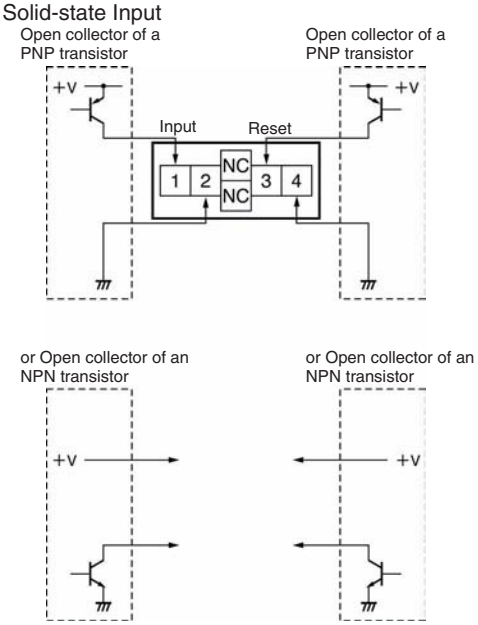
Note: *Recommended power supply; eg. OMRON S8VS

PNP/NPN Universal DC Voltage Input Model Without Backlight

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



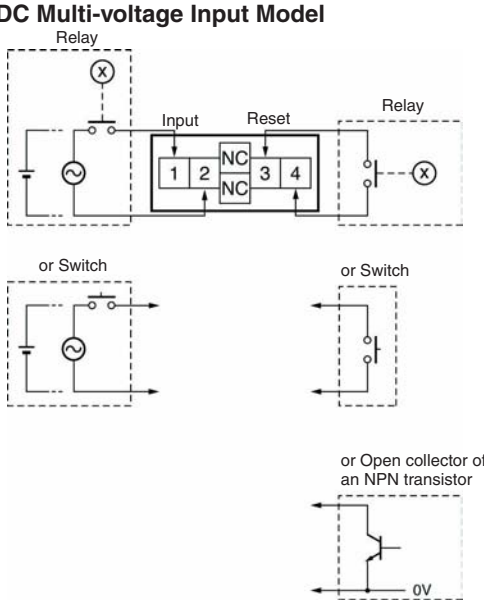
2. Solid-state Input



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

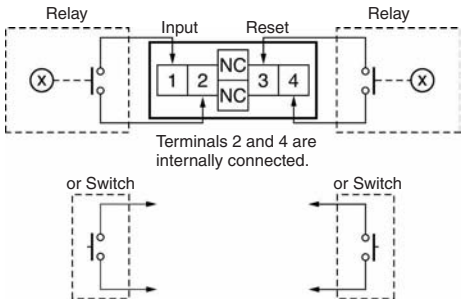
2. Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 1 μA

AC/DC Multi-voltage Input Model



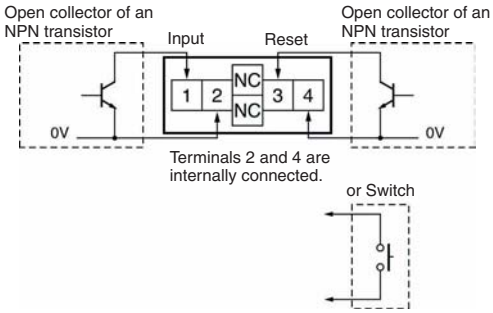
No-voltage Input Model

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.

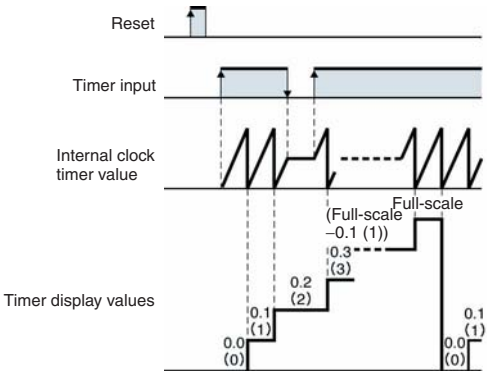
2. Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 1 μA

Operation

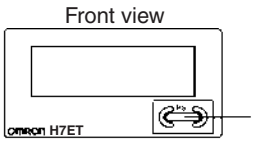
■ Operating Modes

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.

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

Bottom view

Key-protect Switch

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

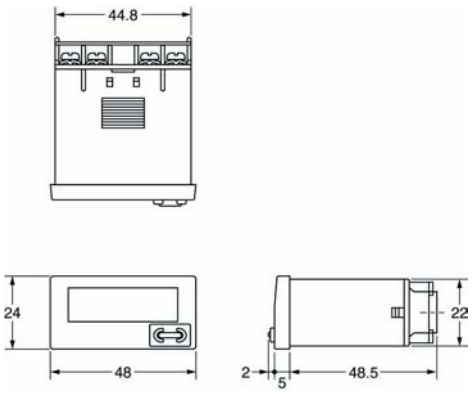
Setting (see note)	Key-protect
Front panel ↑ Concave side	OFF (default setting)
↓ Concave side Terminal block	ON

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

Dimensions

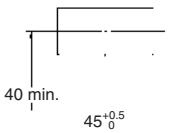
Note: All units are in millimeters unless otherwise indicated.

H7ET-N



Panel Cutout

Separate mounting



Dense mounting

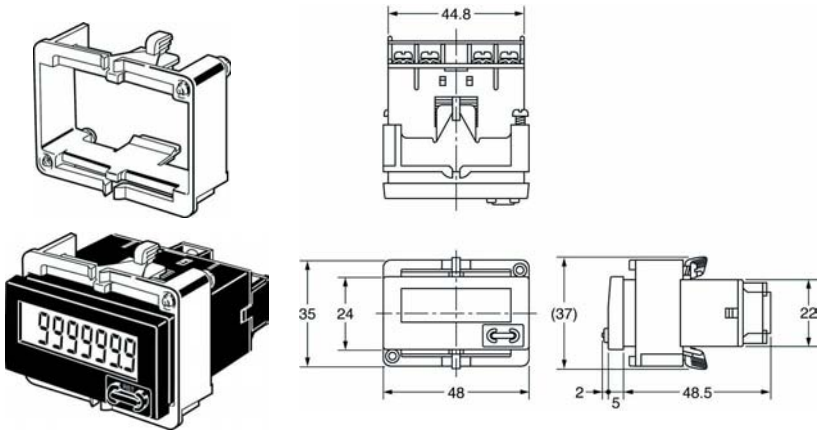
(48 Units – 2.5) +1.0 0

22.2 +0.5 0

Waterproofing is not possible for dense mounting

- When mounting, insert the Counter into the cutout, insert the adapter from the back and push in the Counter while making the gap between the front panel and the cutout panel as small as possible. Use screws to secure the Counter. If waterproofing is desired, insert the waterproof 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.

Dimensions with Flush Mounting Bracket



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

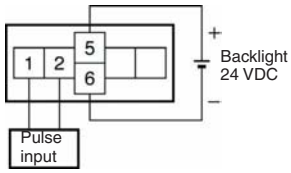
Item	Value	Note
Battery life	7 years min. with continuous input at 25°C (lithium battery)	The battery life is calculated according to the conditions in the left column and therefore is not a guaranteed value. Use these value as reference for maintenance or replacement.

Connections

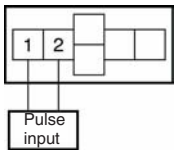
■ Terminal Arrangement

Bottom view: View of the Tachometer rotated horizontally 180°

Backlight Model



No-backlight Model

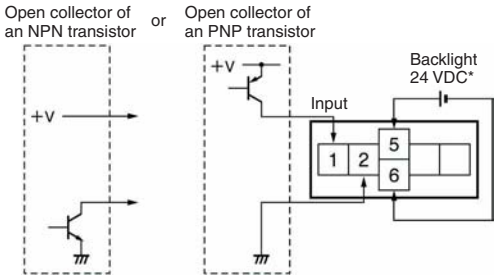


■ Connections

H7ER Tachometer

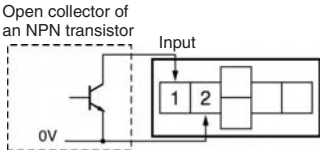
Note: Select input transistors according to the following:
Dielectric strength of the collector ≥ 50 V
Leakage current < 100 μA (1 μA for no-voltage input model)

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

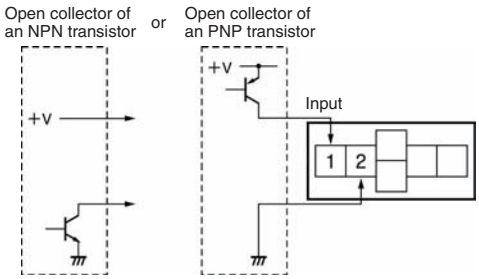


*Recommended power supply; eg. OMRON S8VS

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



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

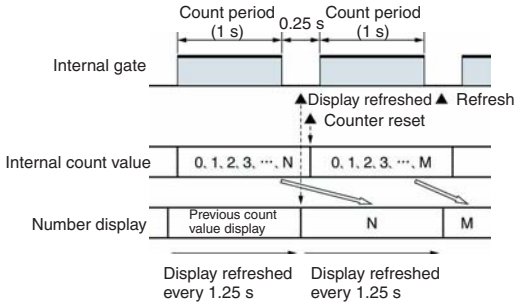


Operation

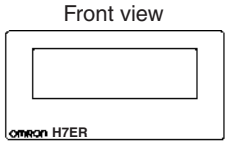
■ Operating Modes

H7ER Tachometer

Incrementing Operation
Within Unit Time (Up)



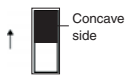
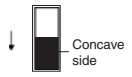
Nomenclature



Counting speed switch
For H7ER-NV1-□□

Bottom view

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.

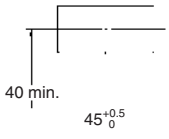
Dimensions

Note: All units are in millimeters unless otherwise indicated.

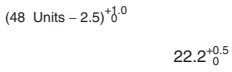
H7ER-N

Panel Cutout

Separate mounting

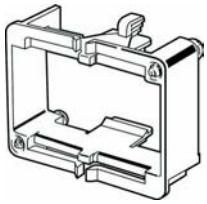


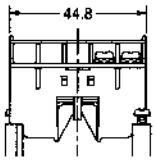
Dense mounting



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.

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-E2-03

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*.

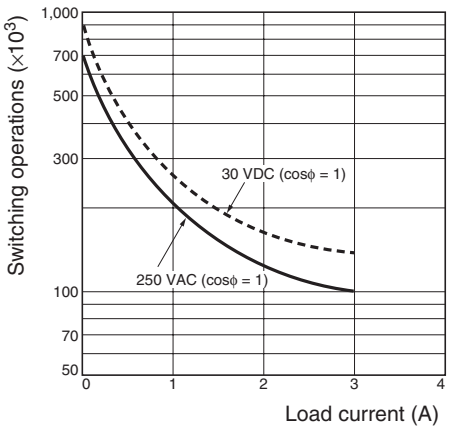
■ Communications Specifications

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)

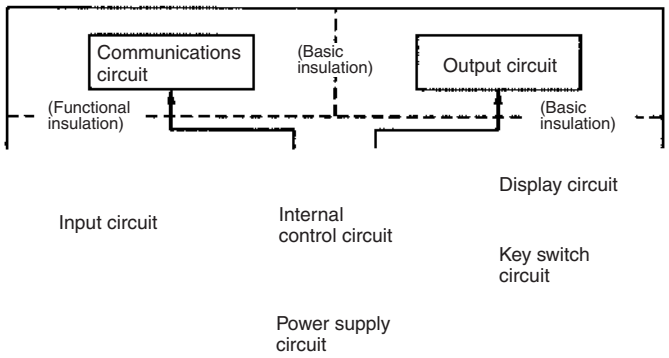
Resistive Load



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

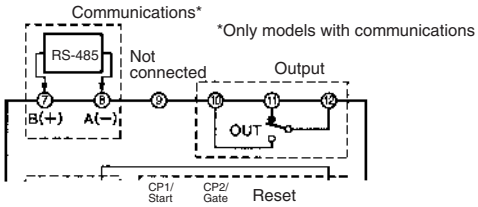
■ Block Diagram



■ 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



24-VDC power supply*

Contact inputs

Open-collector inputs

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

Note: *Recommended power supply; eg. OMRON S8VS

■ Wiring

Use the following type of crimp terminals for M3 screw.

5.8 mm max.

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.

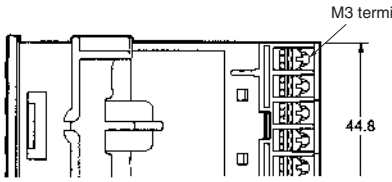
Up/Reset Key
Each press of this key increases values displayed on the No. 2 display. Hold down this key continuously to increase values quickly. Also advances setting items.

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.

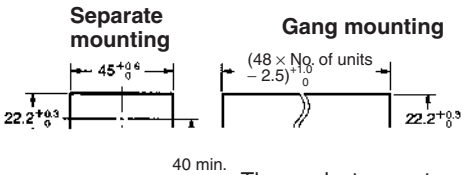
Dimensions

Note: All units are in millimeters unless otherwise indicated.

H8GN



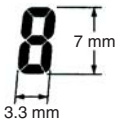
Panel cutout



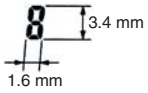
The product cannot be made waterproof when gang-mounted.

- 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.

No. 1 display digit size



No. 2 display digit size



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

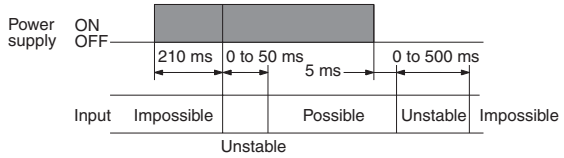
- Store at the specified temperature. If the H8GN has been stored at a temperature of less than −10°C, allow the H8GN to stand at room temperature for at least 3 hours before use.
- Use the product within the ratings specified for vibration, shock, submerging in water, and exposure to oil.
- Do not use 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.

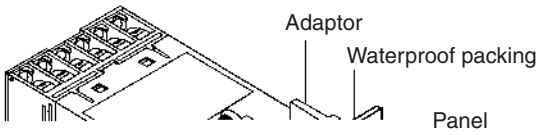
Actual Measurements in N or K Mode

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

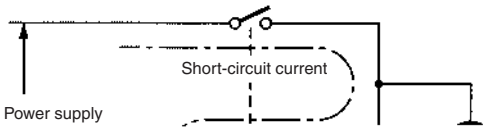
Tighten the two mounting screws on the Adaptor. Tighten them alternately, a little at a time, so as to keep them at an equal tightness.



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

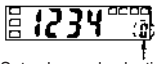
The [Mode] and [Shift] Keys are used to switch between setup menus, and the amount of time that you hold the keys down for determines which setup menu you move to. This section describes two typical examples.

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 [Shift] and [Up] Keys.

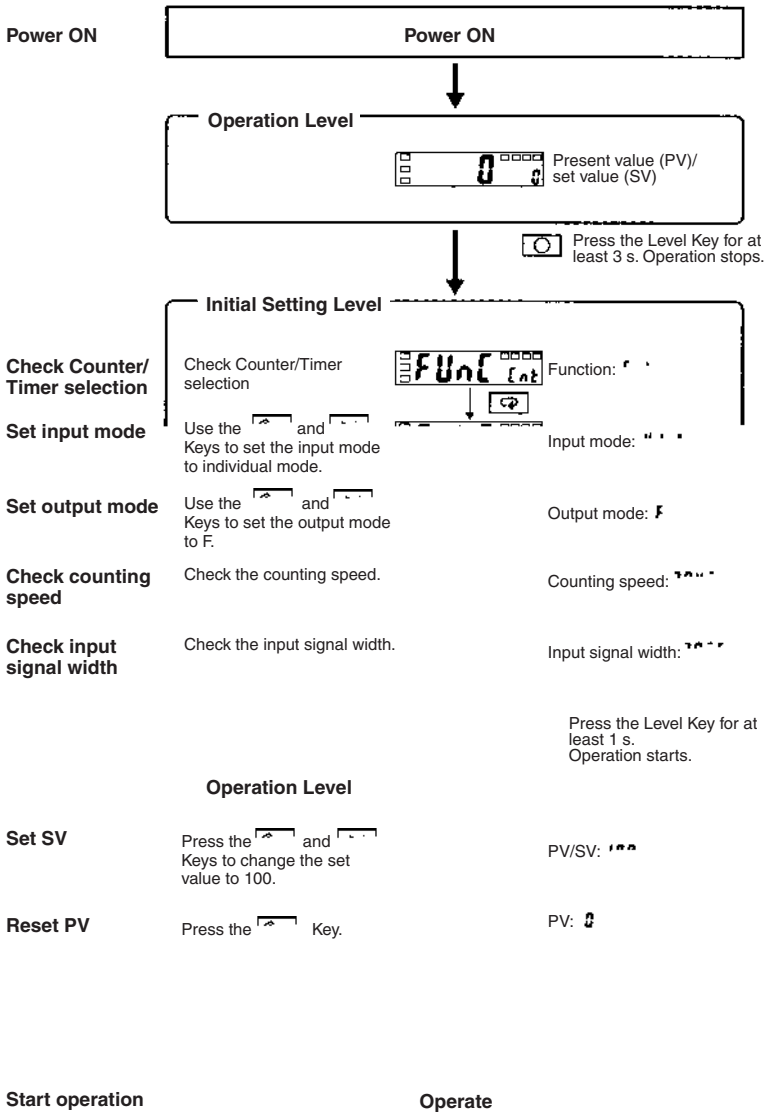
2. Displays

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

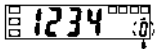


- **Confirming Set Values**
  Set values are effective two seconds after key operation is stopped or when the [Mode] or [Down] Key is pressed.

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.

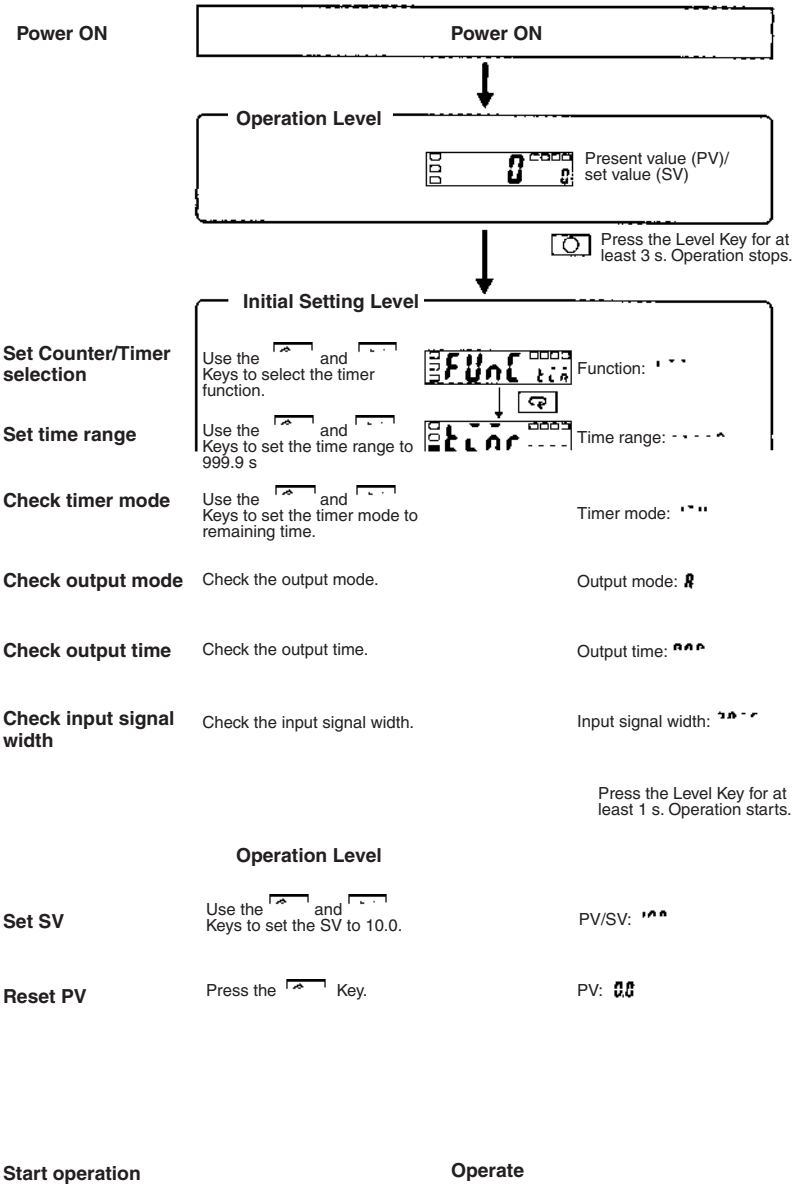
2. Display

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**

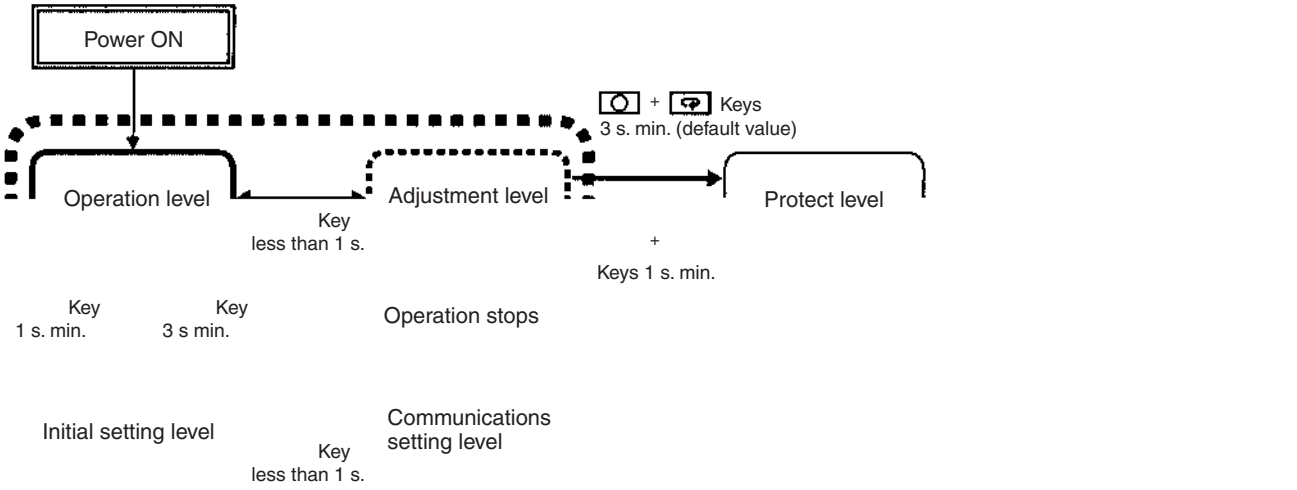
Set values are effective two seconds after key operation is stopped or when the or Key is pressed.

■ 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

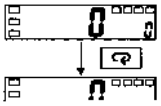
- To select this level, press the Key once for less than one second in the initial setting level. When the communications function is used, set the communications conditions in this level. Communicating with a personal computer (host computer) allows set values to be read and written.

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 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 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.

TOTAL

=Totalizing count value: 12,345,687

Press the Key to simultaneously reset the totalizing count value and the present value.

Key during PV display

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 D-49 for information on totalizing counter operation.

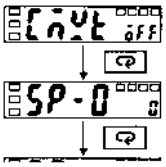
4. SV-bank (n-SP)

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.

SV

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.

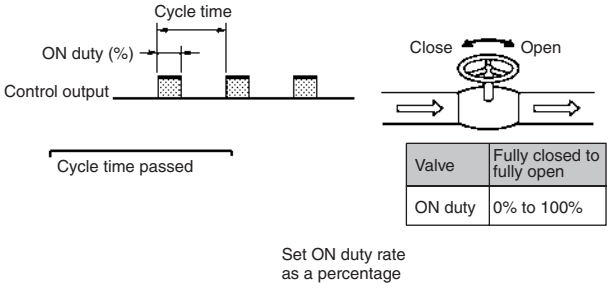
Used to set the set value when the SV-bank function is used. The operator can use the keys on the front to switch between the set values (SV 0 to 3). When the set value is changed in operation mode, the set value (SV 0 to 3) set in the adjustment level for SV-bank will also change.

3. Cycle Time (CYTC)

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.

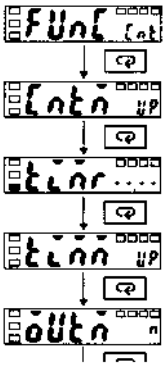
Controlling the flowrate by opening and closing the electromagnetic valve by pulse control.



ON duty can be changed like an analog input by using the Up and Down Keys.

Refer to ***Input/Output Mode Settings*** on page D-50 for information on ON/OFF-duty adjustable flicker mode operation.

Initial Setting Level



(1) Counter/Timer selection

(2) Input mode

(3) Time range

(4) Timer mode

(5) Output mode for counter function

(6) Output mode for timer function

(7) Output time

(8) Counting speed

(9) Input signal width

(10) Decimal point position

(11) Prescale value

(12) Input signal edge

(13) Move to advanced function 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 D-48 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 (tRnM)

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 (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 counter, set the output mode.

Refer to ***Input/Output Mode Settings*** on page D-49 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 D-49 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 (IFLt)

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.

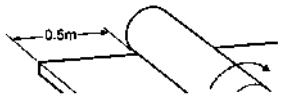
11. Prescale Value (PSCL)

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).



25 pulses

Encoder

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.

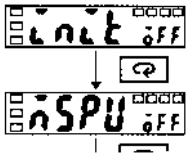
Refer to ***Input/Output Modes and Count Values*** on page D-48 for information on input mode operations.

13.Move to Advanced Function Setting Level (Adου)

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*)

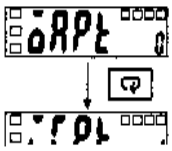
If this function is used, the display in the operation and adjustment levels will automatically return to the PV/SV display if no key operations have been made for the set period. (setting range: 1 to 99 s.)

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 and 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 (*CCPt*)

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	non**E** / **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.

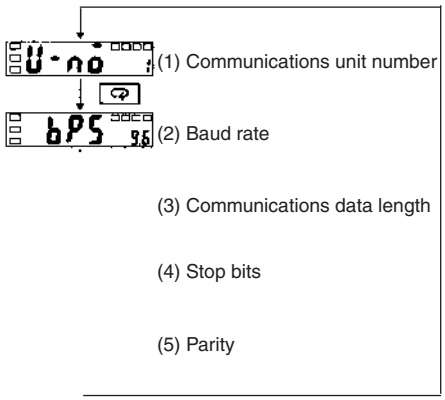
Before performing communications, perform the following procedure with the front panel keys to set the communications unit number, baud rate, and other settings. Refer to the communications manual for operation methods for other communications settings.

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

2.Press the 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.

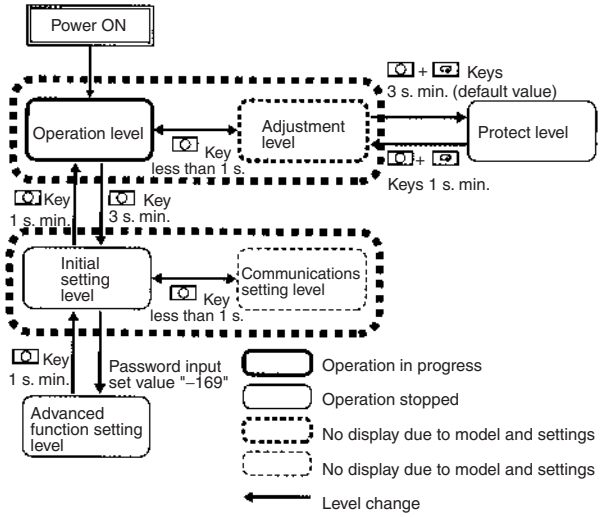
4. Stop Bits (Sbit)

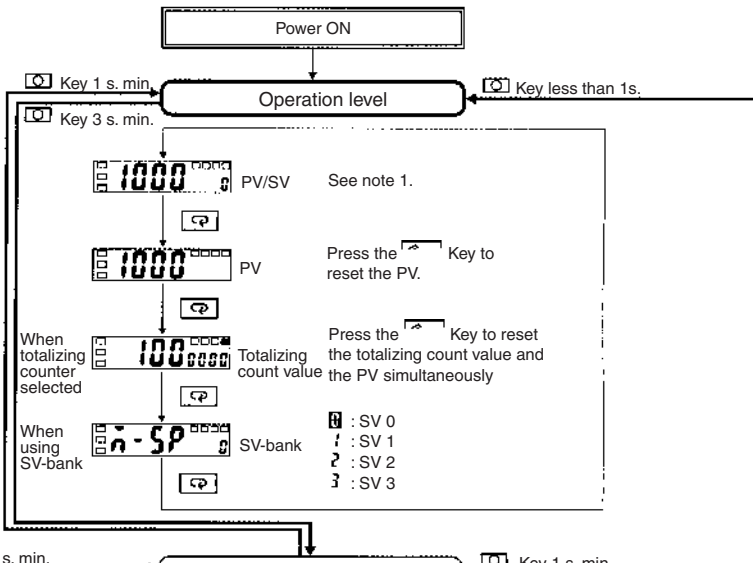
The stop bits can be set to either 1 or 2.

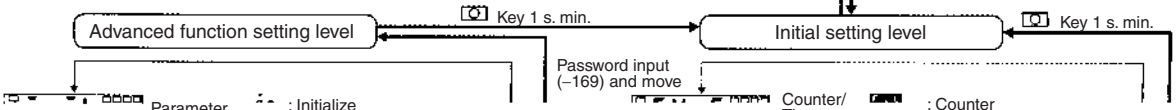
5. Parity (Prty)

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

■ Parameters

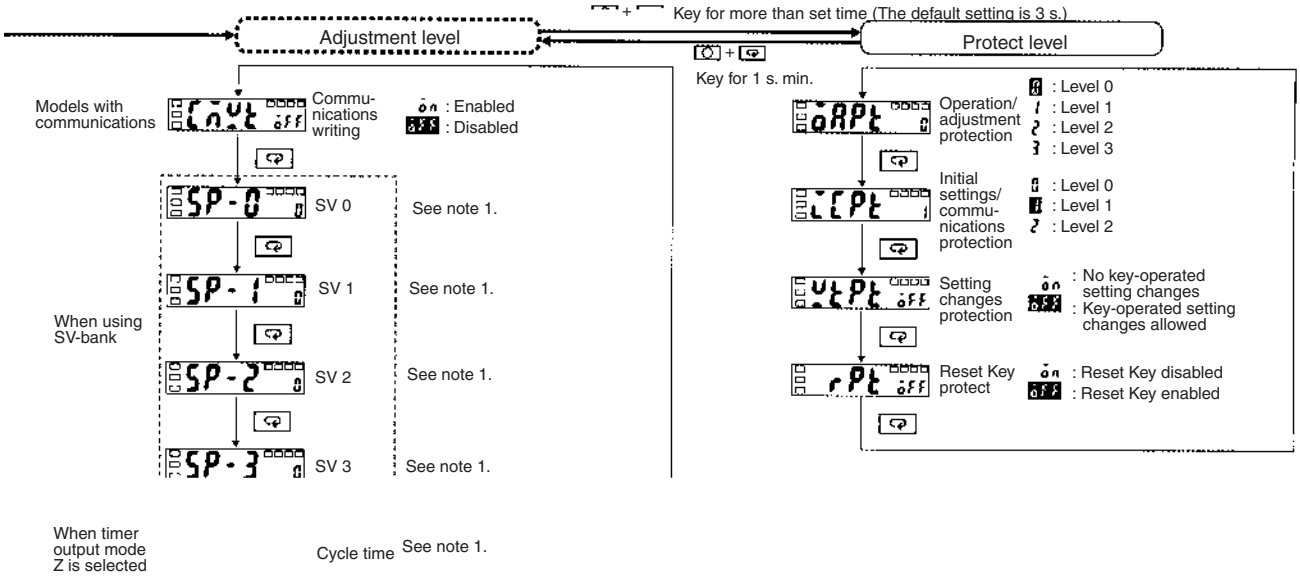






	Parameter initialization	: Initialize : Not initialize	
	Use SV-bank	: Use : Not use	
When counter selected	Use totalizing counter	: Use : Not use	
	Display auto-return time	: No auto-return : 1 to 99 s.	
	Move-to-protect-level time	: 3 to 30 s.	
When counter selected	Counter/ Timer selection	: Counter : Timer	
When counter selected	Input mode	: Increment : Decrement : Individual : Quadrature	
When timer selected	Time range	See note 2.	
	Timer mode	: Elapsed time : Remaining time	
When counter selected	Output mode for counter	: N : F : C* : K*	
When timer selected	Output mode for timer	: A* : B* : D : E : F : Z	
When the above C*, K*, A*, or B* mode selected	Output time	Counter : 0.01 to 99.99 s Timer : 0.00 to 99.99 s Output will be held if output time is 0. Output time cannot be set to 0 when counter function is selected.	
When counter selected	Counting speed	: 30 Hz : 5 kHz	
	Input signal width (start, reset, gate)	: 20 ms : 1 ms	
When counter selected	Decimal point position	: 0 : 0.0 : 0.00 : 0.000	
	Prescale value	: 0.001 to 9.999	
When increment or decrement selected in counter input mode	Input signal edge	: Counting on rising edge : Counting on falling edge	
See note 3.		Move to advanced function setting level.	

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



Communications setting level

Models with communications

Communications Unit No. / : 0 to 99

Baud rate
: 1,200 bps
: 2,400 bps
: 4,800 bps
: 9,600 bps

Data length
: 7 bits
: 8 bits

Stop bits
: 1 bit
: 2 bits

Parity
: None
: Even
: Odd

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

Note: 1. Counter (increment or decrement)
0~9999 : 0 to 9999
Counter (individual or quadrature)
-999~0~9999 : –999 to 9999
Timer (cycle time or mode other than output mode Z)
0.000~9.999 : 0.000 to 9.999 s
00.00~99.99 : 0.00 to 99.99 s
000.0~999.9 : 0.0 to 999.9s, min, h
0000~9999 : 0 to 9999 s, h
00:00~99:59 : 0 min 00 s to 99 min 59 s
000:0~99:59 : 0 h 00 min to 99 h 59 min
Timer (output mode Z)
0~100 : 0% to 100% (ON duty)

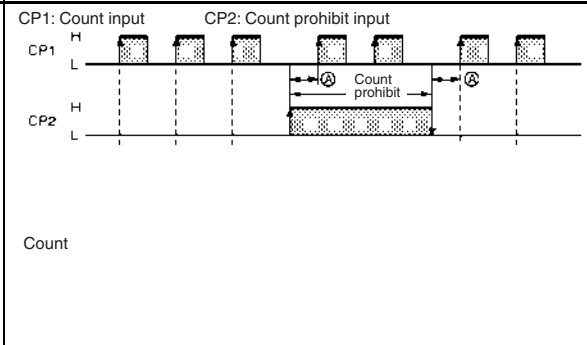
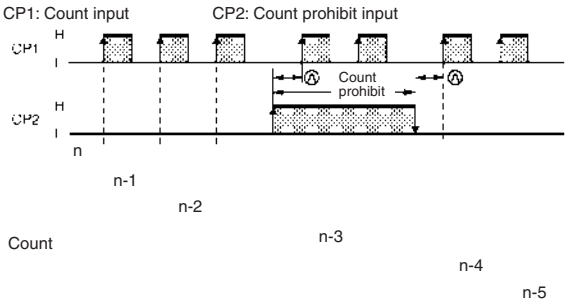
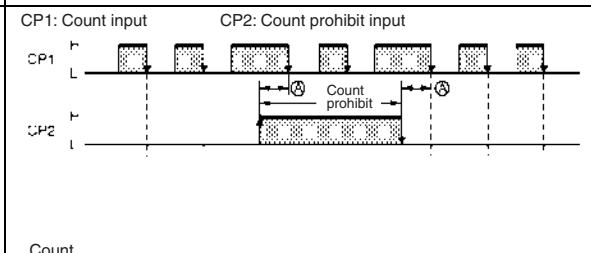
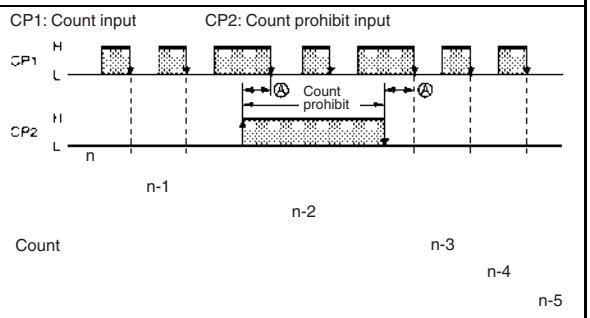
2. Time range

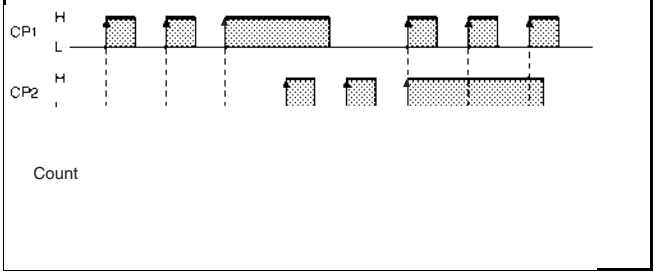
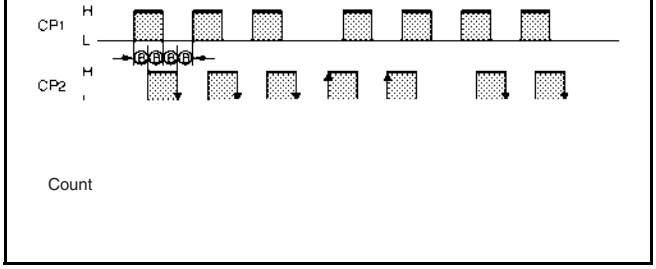
: -.---s
: --.--s (default)
: ---.-s
: ----s
: --min--s
: ---.-min
: --h--min
: ---.-h
: ----h

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

■ Operating Mode

Input/Output Modes and Count Values

		Up (Increment) mode (UP)	Down (Decrement) mode (dOWn)
Input edge	UP		
	DOWN		

Up/Down B Individual input (Ud-b)	Up/Down C quadrature input (Ud-C)
	

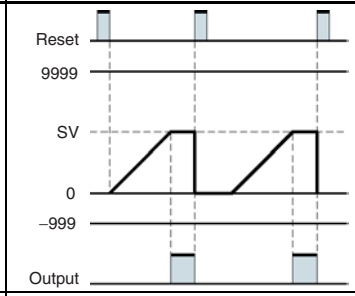
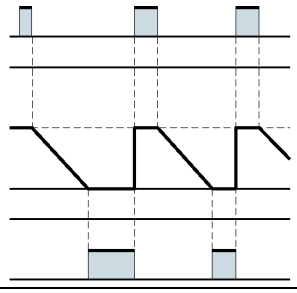
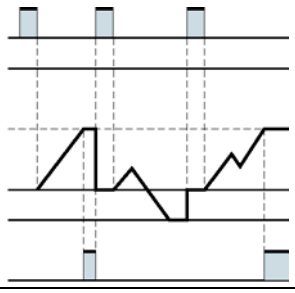
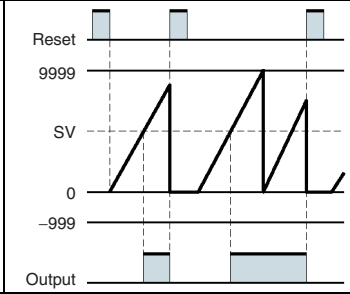
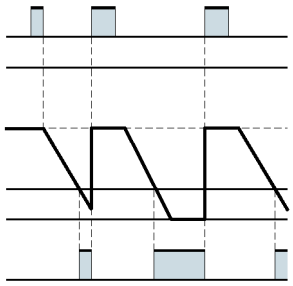
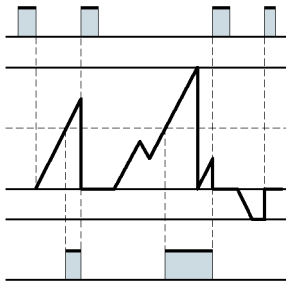
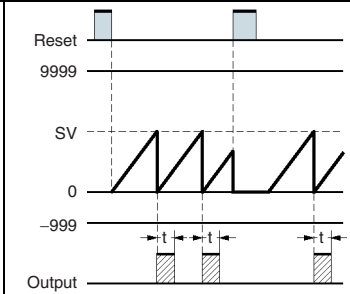
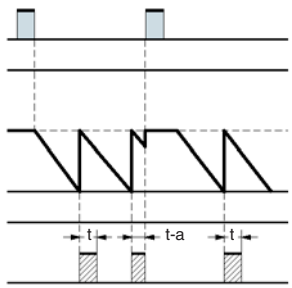
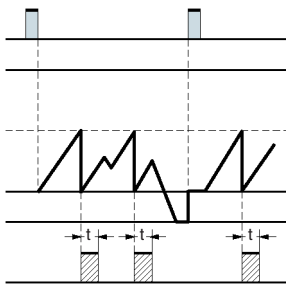
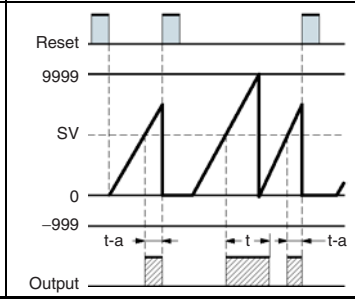
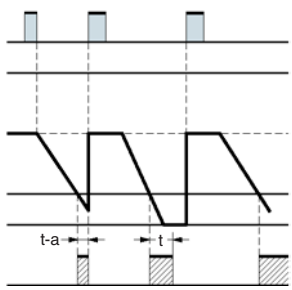
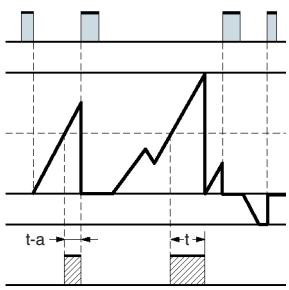
Note: 1. (A) indicates the minimum signal width and (B) requires at least 1/2 the minimum signal width. If these conditions are not met, a counting error (+1 or −1) may occur.

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

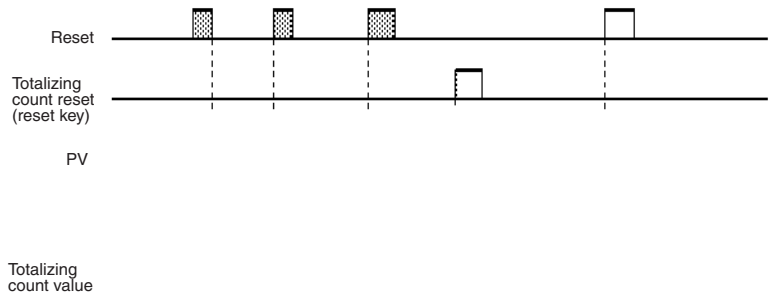
		Input mode		
		Up	Down	Up/Down B.C
Output mode	N			
	F			
	C			
	K			

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.

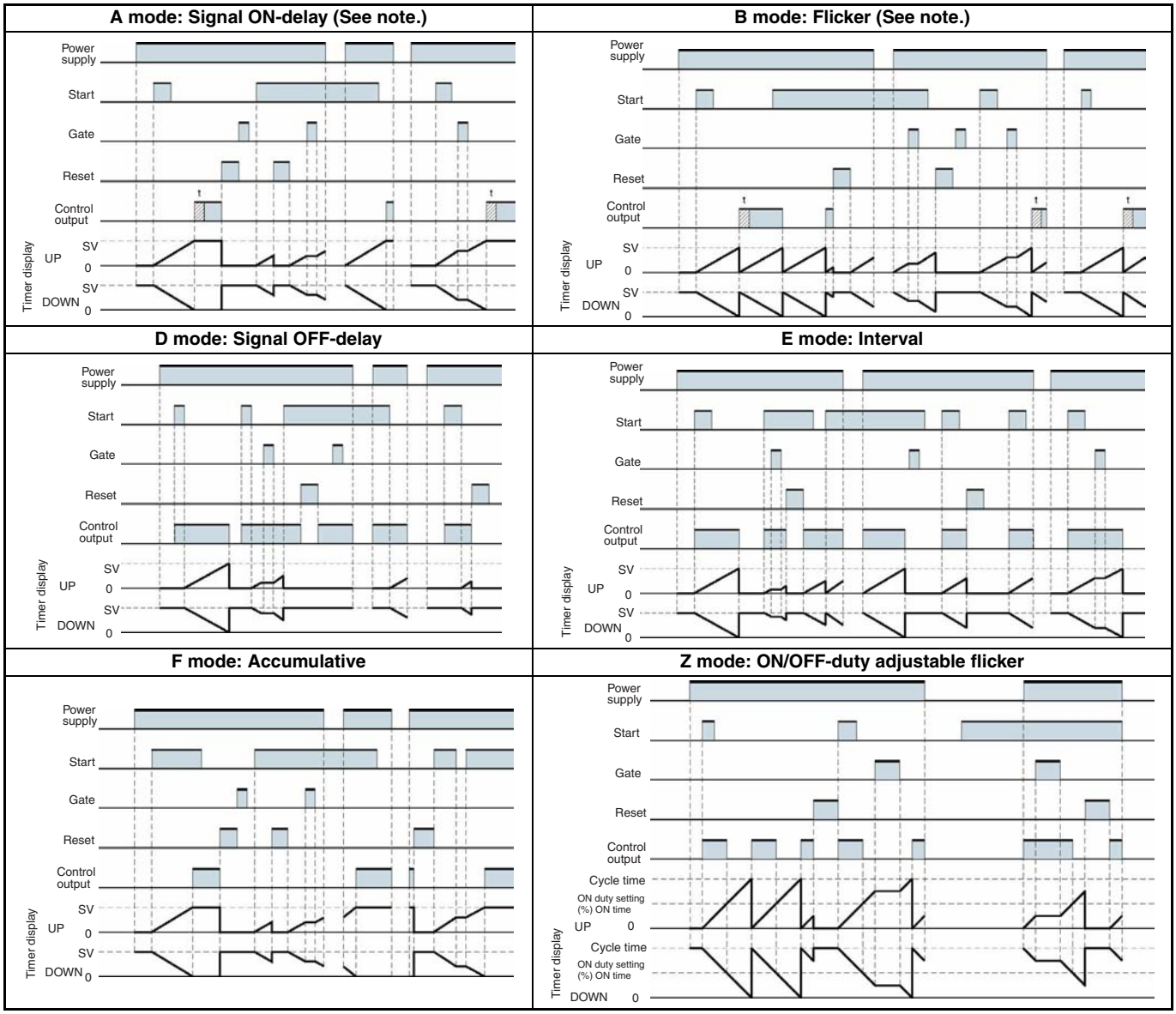
3. Output timing restarted during one-shot outputs is ignored.

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

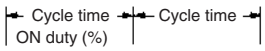


Note: One-shot output or HOLD output can be selected for output: 

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.



Control output

■ 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/tiM	CnT		
Input mode		CntM	UP/dOWn/Ud-b/Ud-C	UP		
Time range		tiMr	-.---S/--.--S/---.-S/----S/ --MiM--S/---.-MiM/--H--MiM/ ---.-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/E	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	30HE/5KHE	30HE		
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		

Counters

Advanced Function Setting Level

Parameter name	Parameter	Setting range	Default value	Unit	Set value
Parameter initialization	InIt	on/oFF	oFF		
SV-bank used	nSPU	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-E2-02

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-rail 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 (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)	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

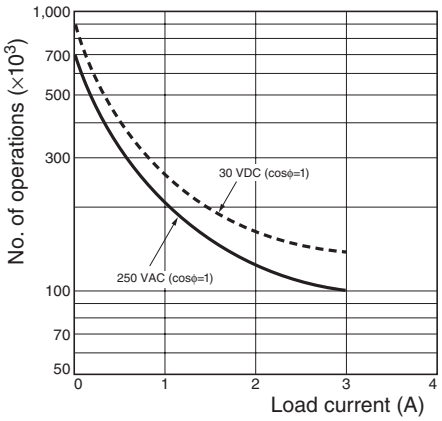
item	H7CX
Insulation resistance	100 MΩ min. (at 500 VDC) between current-carrying terminal and exposed non-current-carrying metal parts, and between non-continuous contacts
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and non-current-carrying metal parts 2,000 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 D-60.
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.

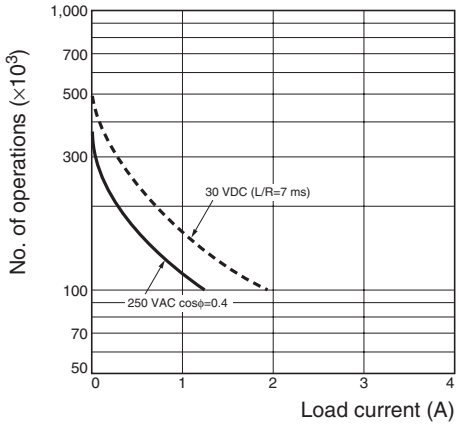
2. A waterproof packing is necessary to ensure IP66 waterproofing between the H7CX and installation panel.

■ Life-test Curve (Reference Values)

Resistive Load



Inductive Load



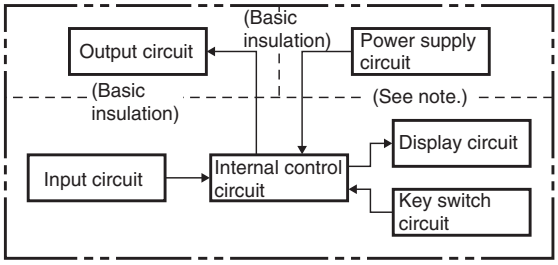
Reference: A current of 0.15 A max. can be switched at 125 VDC (cosϕ=1) and current of 0.1 A max. can be switched if L/R=7 ms. In both cases, a life of 100,000 operations can be expected. The minimum applicable load is 10 mA at 5 VDC (failure level: P).

■ 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.

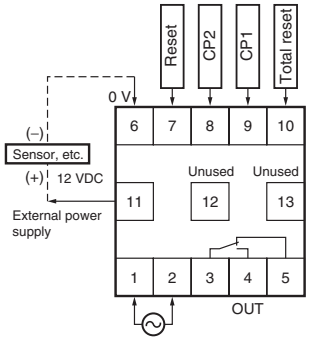
Using as a Tachometer

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.

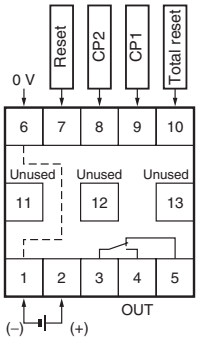
■ Terminal Arrangement

Confirm that the power supply meets specifications before use. Recommended power supply; eg. OMRON S8VS or S82K.

H7CX-A/-A4
1-stage Contact Output

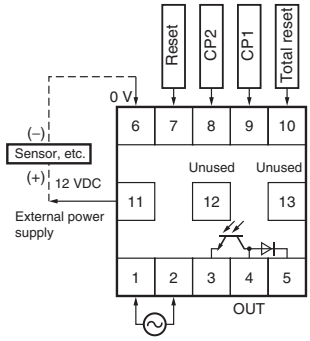


H7CX-AD/-A4D
1-stage Contact Output

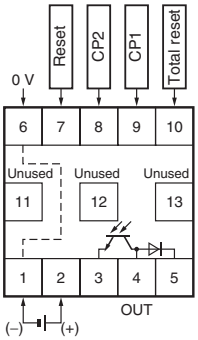


Note: Terminals 1 and 6 are connected internally.

H7CX-AS/-A4S
1-stage Transistor Output

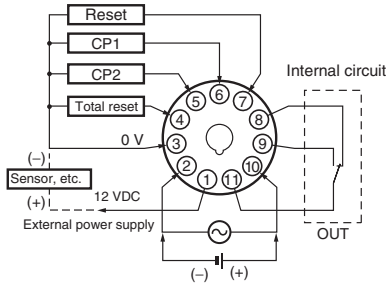


H7CX-ASD/-A4SD
1-stage Transistor Output



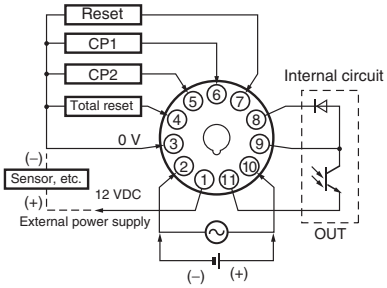
Note: Terminals 1 and 6 are connected internally.

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

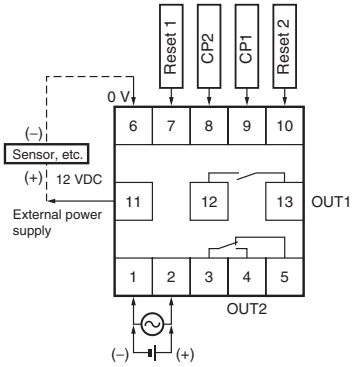


Note: Do not connect unused terminals as relay terminals.

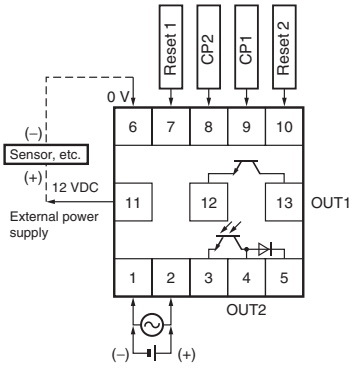
H7CX-A11S/-A114S/-A11SD1
1-stage Transistor Output



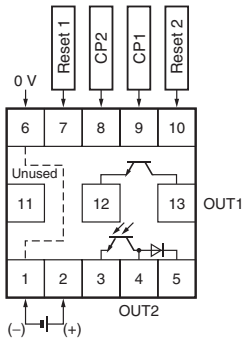
H7CX-AW/-A4W/-AWD1
2-stage Contact Output



H7CX-AWS/-AWSD1
2-stage Transistor Output

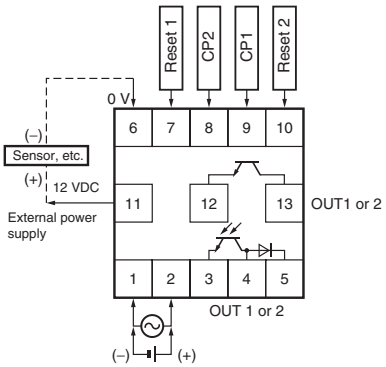


H7CX-AWSD/-A4WSD
2-stage Transistor Output



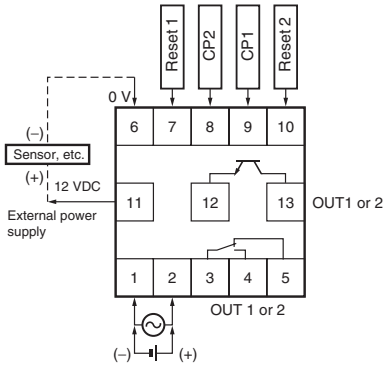
Note: 1. Terminals 1 and 6 are connected internally.
2. Do not connect unused terminals as relay terminals.

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.

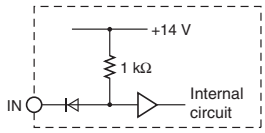
H7CX-AU/-AUD1
1-stage Contact, 1-stage Transistor Output



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



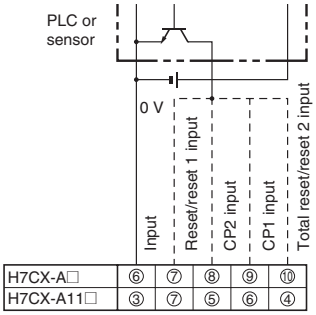
Note: The circuit shown above is for no-voltage input (NPN input).

■ Input Connections

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

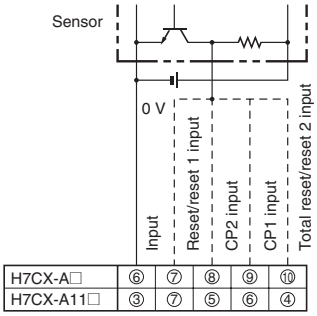
No-voltage Inputs (NPN Inputs)

Open Collector



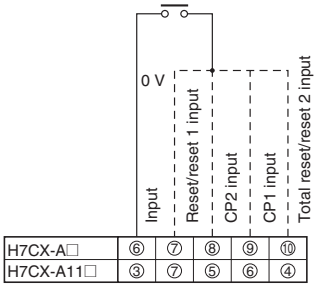
Operates when the transistor turns ON.

Voltage Output



Operates when the transistor turns ON.

Contact Input

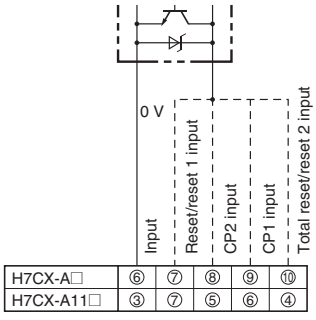


Operates when the contact turns ON.

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



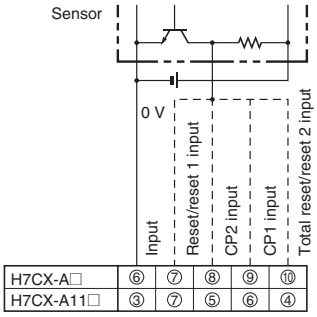
Operates when the transistor turns ON.

Applicable Two-wire Sensor

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

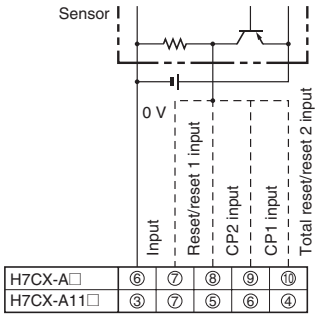
Voltage Inputs (PNP Inputs)

No-contact Input (NPN Transistor)



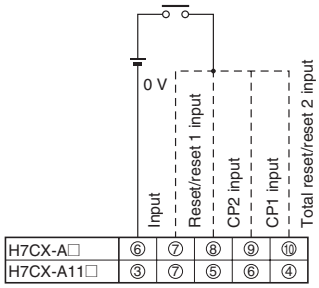
Operates when the transistor turns OFF.

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

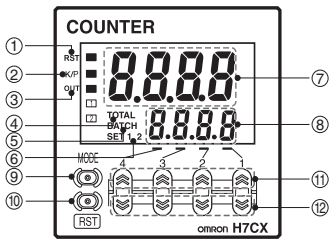
④ Total Count Indicator
Lit when the total count value is displayed.

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

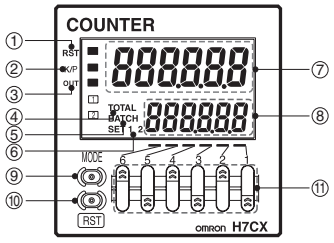
⑥ Set Value 1, 2 Stage Indicator

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

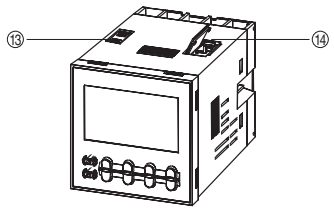
⑧ Set Value (Sub-display)
Character height: 6 mm



Front view of 4-digit model



Front view of 6-digit model



Operation Keys

⑨ Mode Key
Used to switch mode and setting items.

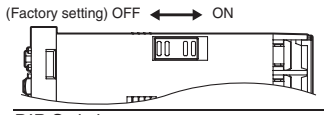
⑩ Reset Key
The operation of the reset function depends on the configuration selected as shown in the table below.

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).

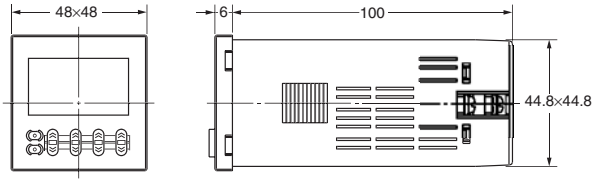
Dimensions

Note: All units are in millimeters unless otherwise indicated.

■ Counter (without Flush Mounting Adapter)

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

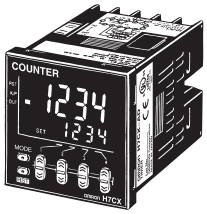
- H7CX-A
- H7CX-AS
- H7CX-A4
- H7CX-A4S
- H7CX-AW
- H7CX-AWS
- H7CX-A4W
- H7CX-AWD1
- H7CX-AWSD1
- H7CX-AU
- H7CX-AUD1
- H7CX-AUSD1

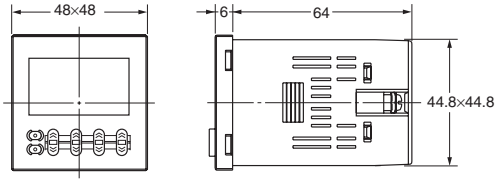


Note: M3.5 terminal screw (effective length: 6 mm)

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

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

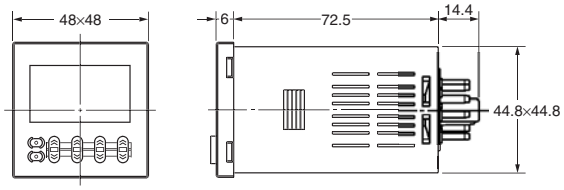




Note: M3.5 terminal screw (effective length: 6 mm)

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

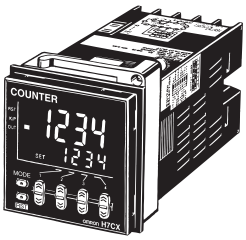
- H7CX-A11
- H7CX-A11S
- H7CX-A11D1
- H7CX-A11SD1
- H7CX-A114
- H7CX-A114S
- H7CX-A114D1

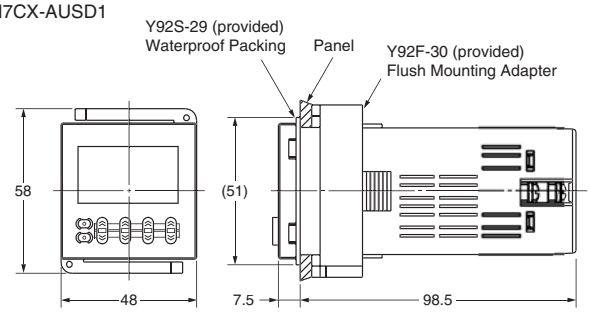


■ Dimensions with Flush Mounting Adapter

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

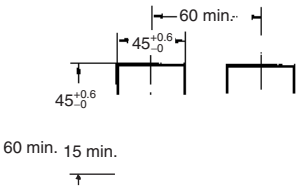
- H7CX-A
- H7CX-AS
- H7CX-A4
- H7CX-A4S
- H7CX-AW
- H7CX-AWS
- H7CX-A4W
- H7CX-AWD1
- H7CX-AWSD1
- H7CX-AU
- H7CX-AUD1
- H7CX-AUSD1





Panel Cutouts

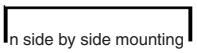
Panel cutouts are as shown below.
(according to DIN43700).



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

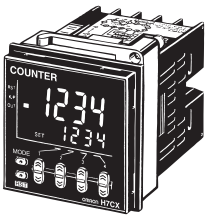
$A = (48n - 2.5)^{+1}_{0}$

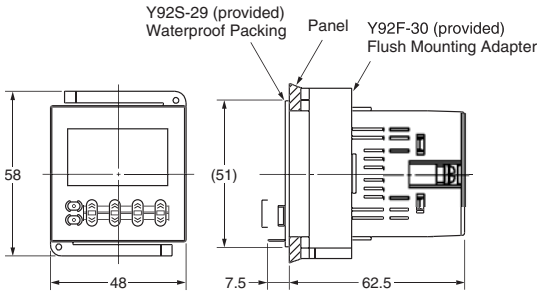
With Y92A-48F1 attached.
$A = \{48n-2.5 + (n-1) \times 4\}^{+1}_{0}$

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

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

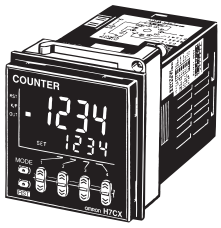
- H7CX-AD
- H7CX-ASD
- H7CX-A4D
- H7CX-A4SD
- H7CX-AWSD
- H7CX-A4WSD

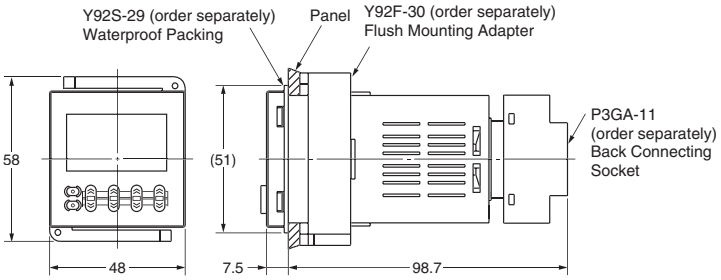




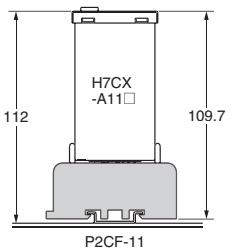
11-pin Socket Models
(Adapter and Waterproof Packing Ordered Separately)

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





■ Dimensions with Front Connecting Socket

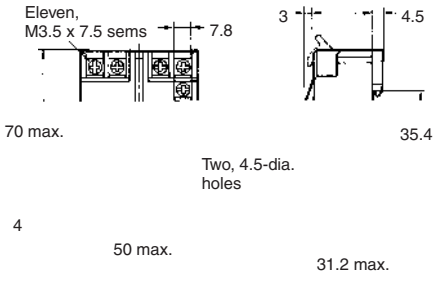


Note: These dimensions vary with the kind of DIN-rail (reference value).

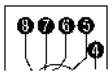
■ Accessories (Order Separately)

Note: All units are in millimeters unless otherwise indicated.

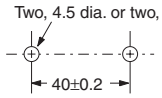
Track Mounting/Front Connecting Socket
P2CF-11



Terminal Arrangement/ Internal Connections (Top View)

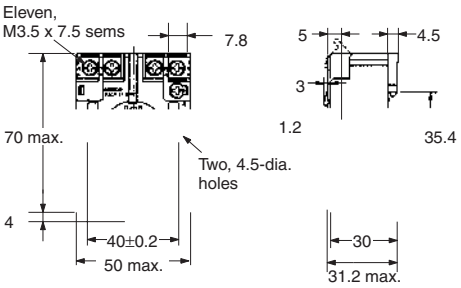


Surface Mounting Holes

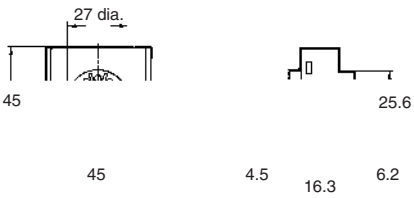


Note: Track mounting is also possible.

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



Back Connecting Socket
P3GA-11

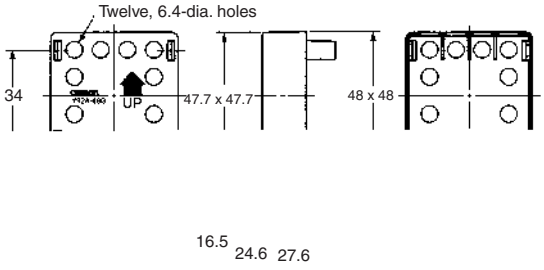


Terminal Arrangement/ Internal Connections (Bottom View)

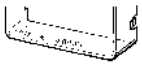
Note: Finger protection can be ensured by using in combination with the Y92A-48G Terminal Cover.

Finger Safe Terminal Cover Conforming to VDE0106/P100

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



Hard Cover
Y92A-48



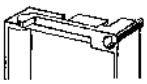
Soft Cover
Y92A-48F1

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.

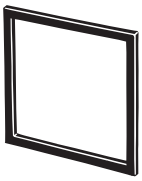
Flush Mounting Adapter
(provided with screw-terminal models)

Y92F-30

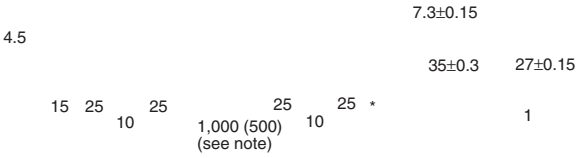


Waterproof Packing
(provided with screw-terminal models)

Y92S-29



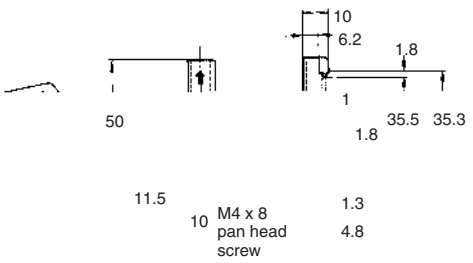
Mounting DIN-rail
PFP-100N, PFP-50N



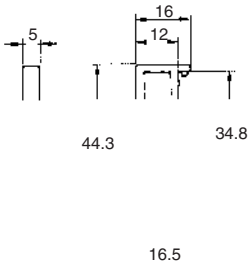
PFP-100N2

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.

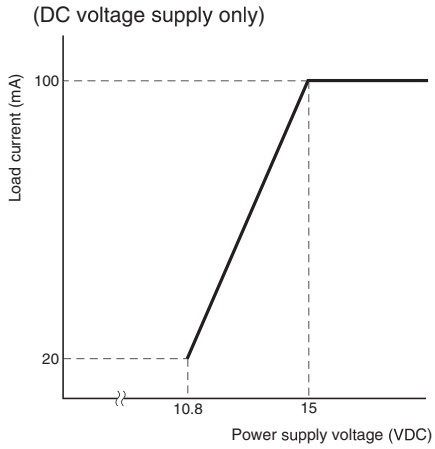
The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life. Using the product beyond its service life may result in contact deposition or burning.

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.

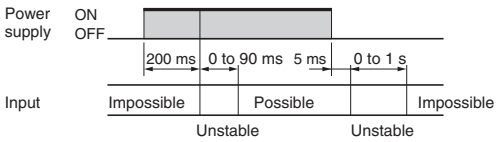
■ External Power Supply

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.

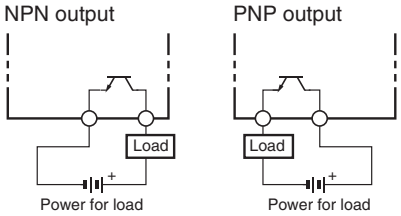
Be sure that the capacity of the power supply is large enough, otherwise the counter may not start due to inrush current (reference value: approx. 10 A, 1.2 ms at 26.4 VAC) that may flow for an instant when the counter is turned ON.

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

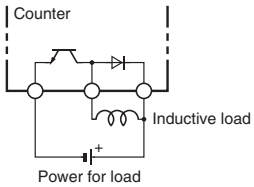
Make sure that the voltage applied is within the specified range, otherwise the internal elements of the counter may be damaged.

■ 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

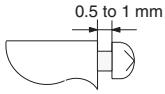
Wiring input lines in the same conduit as power lines or other high-voltage lines may result in malfunction due to noise. Wire the input lines separately, away from lines carrying high-voltages. In addition, make the input wiring as short as possible and use shield lines or metal wiring conduits.

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.

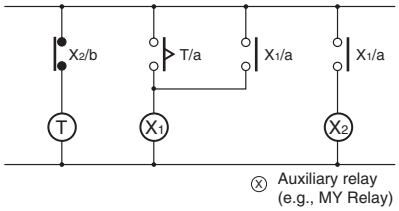
The H7CX's panel surface is water-resistive (conforming to NEMA 4 and IP66). In order to prevent the internal circuit from water penetration through the space between the timer and operating panel, attach a waterproof packing between the timer and installation panel and secure the waterproof packing 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 D-75.

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 D-76.

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 D-86.

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.

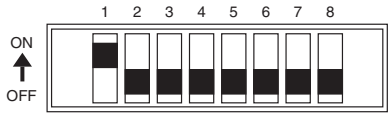
Setting for Tachometer Operation

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 D-76.



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 D-87.

Advanced Functions

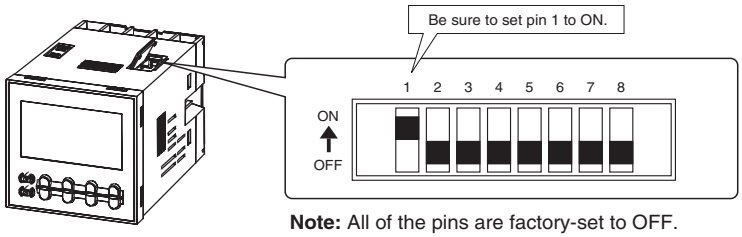
- Decimal point position
- Prescale value
- Auto-zero time
- Startup time
- Display color
- Output allocation
- Key protect level

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 D-92.

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.

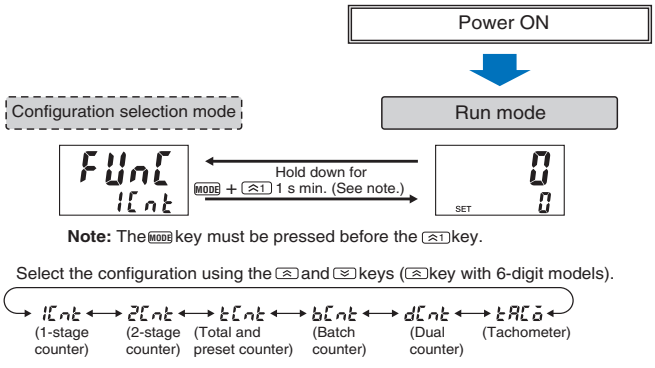
2. Changes to DIP switch settings are enabled when the power is turned ON.

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 D-76. 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.



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

Select the configuration using the ↑ and ↓ keys (↑ key with 6-digit models).

Note: The configurations that can be selected vary with the model.

Advanced-Function Settings

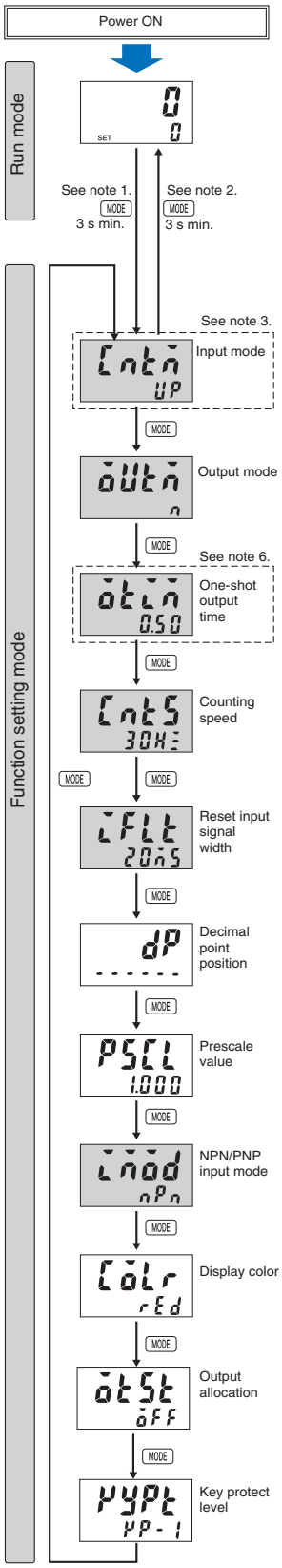
After making DIP switch settings for basic operations, advanced functions (see note) can be added using the operation keys.
For details, refer to page D-76.

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 D-92.

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 D-76.

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 ↔ K-1 ↔ P ↔ Q ↔ A ↔ K-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.

30kHz ↔ 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
See note. Add ↔ Sub
(Addition) (Subtraction)
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 (CntM) (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 D-80.)

Dual Count Calculating Mode (CALM)

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 (oUtM) (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 D-81.)

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 (CntS) (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 (rFLt) (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)

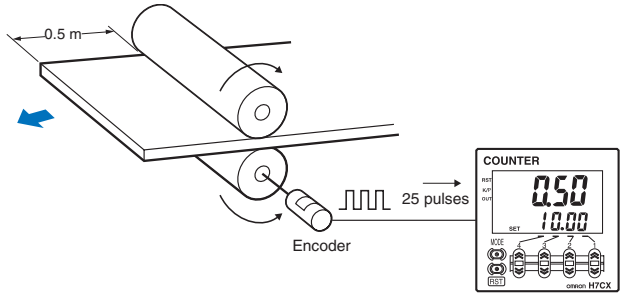
Decide the decimal point position for the present value, CP1/CP2 present values, set value (SV1, SV2), total count value, and dual count set value.

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 (inMd)

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 D-64.

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)

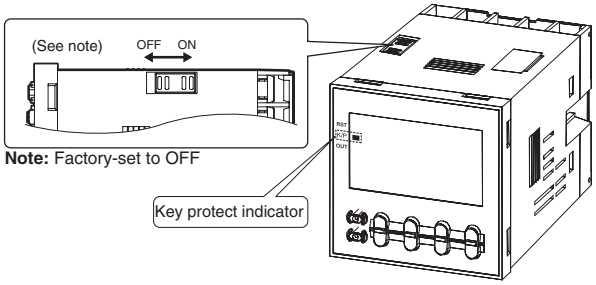
H7CX-AUSD1

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

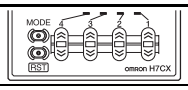
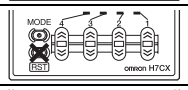
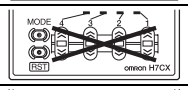
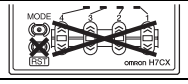
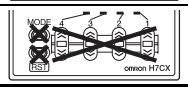
Key Protect Level (KYPt)

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

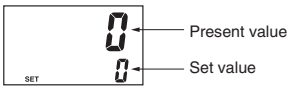
Level	Meaning	Details			
		Changing mode (See note.)	Switching display in run mode	Reset key	Up/down key (Up key for 6-digit models)
KP-1 (default setting)		No	Yes	Yes	Yes
KP-2		No	Yes	No	Yes
KP-3		No	Yes	Yes	No
KP-4		No	Yes	No	No
KP-5		No	No	No	No

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

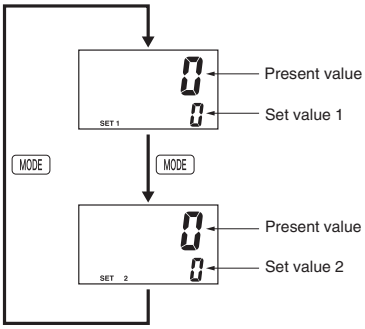
Operation in Run Mode

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

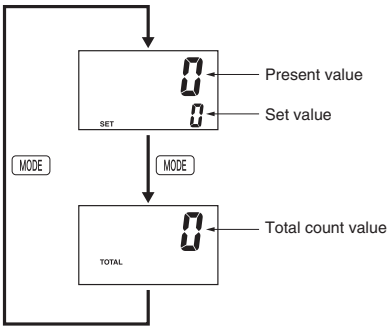
1-stage Counter



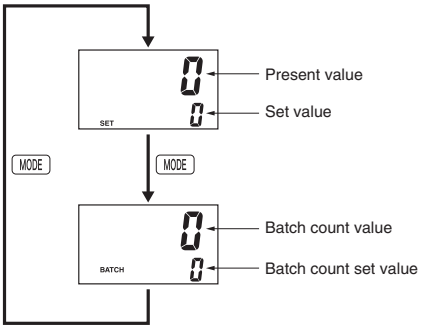
2-stage Counter



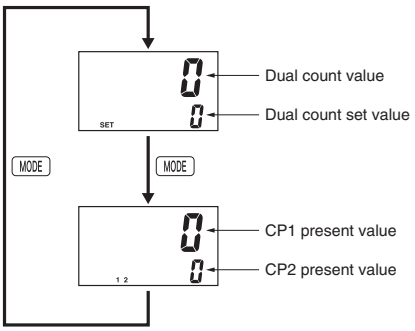
Total and Preset Counter



Batch Counter



Dual 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.

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

Total Count Value
Shows the present total count value.

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 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.

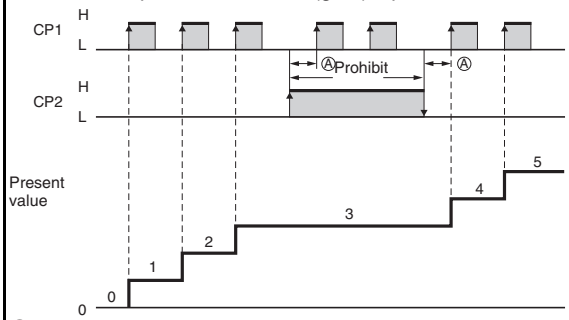
Dual Count Set Value
Set the dual count set value. When the dual count value reaches the dual count set value, signals are output according to the specified output mode.

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

Input Modes and Present Value

UP (Increment) Mode

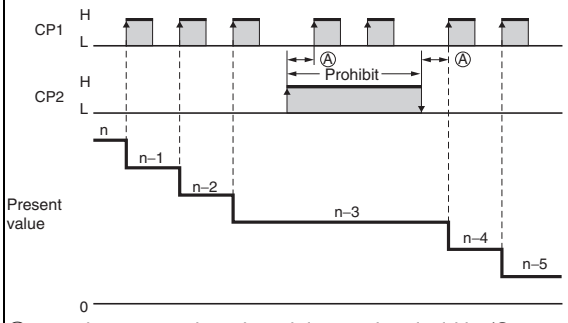
CP1: Count input; CP2: Prohibit (gate) input



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

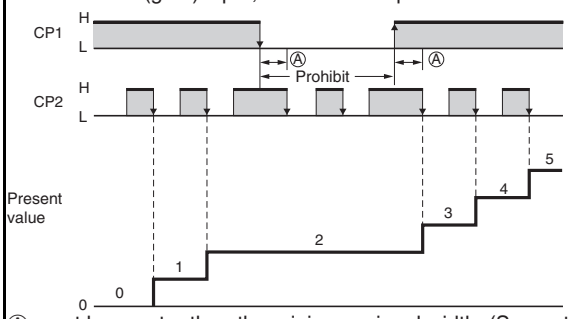
DOWN (Decrement) Mode

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



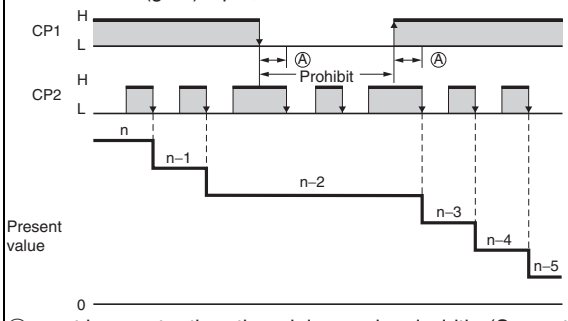
Ⓐ must be greater than the minimum signal width. (See note 2.)

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



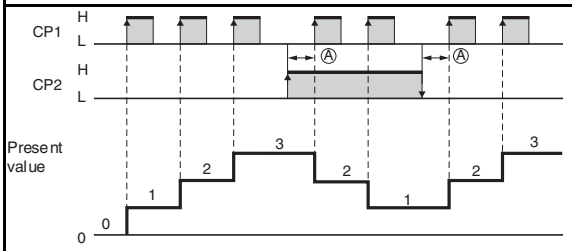
Ⓐ must be greater than the minimum signal width. (See note 2.)

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



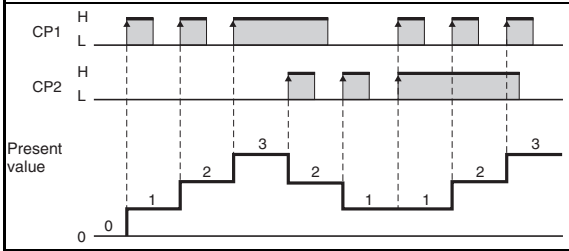
Ⓐ must be greater than the minimum signal width. (See note 2.)

UP/DOWN A Command Input Mode

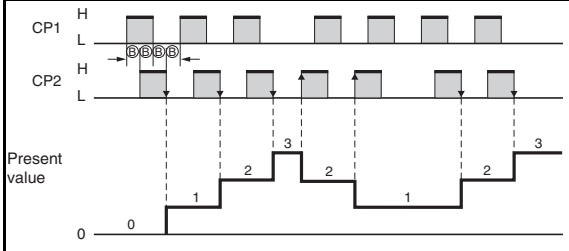


Ⓐ must be greater than the minimum signal width. (See note 2.)

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)

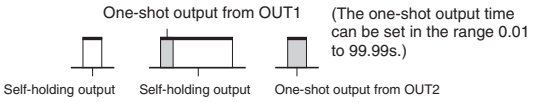
3. The meaning of the H and L symbols in the tables is explained below.

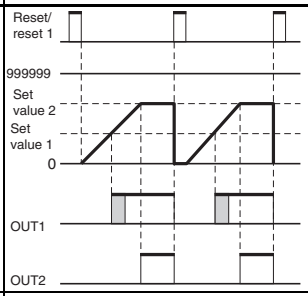
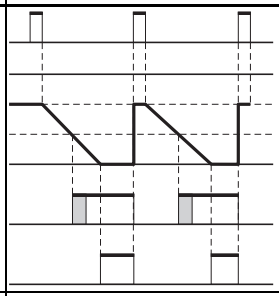
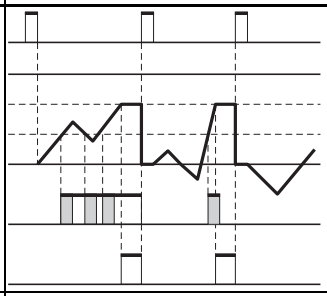
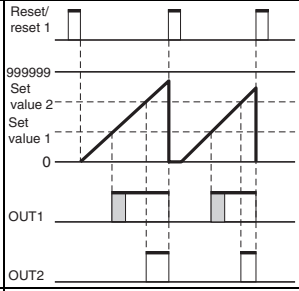
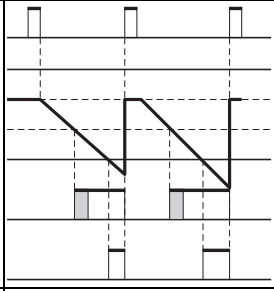
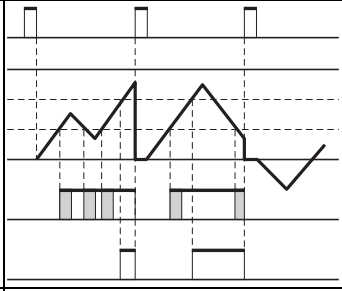
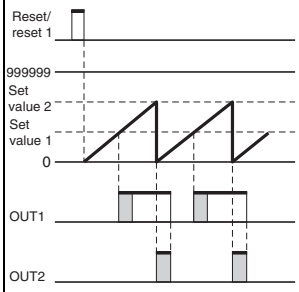
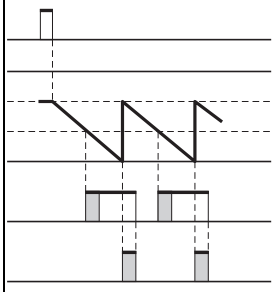
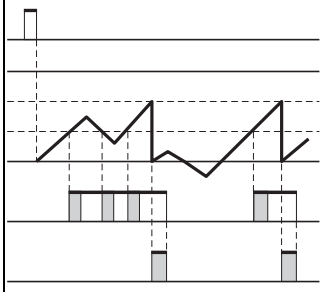
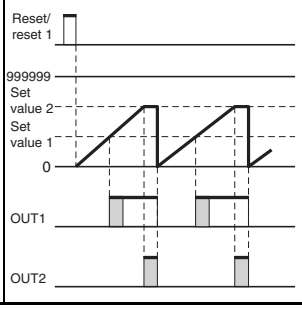
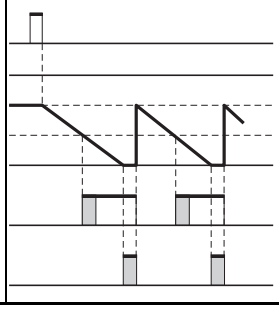
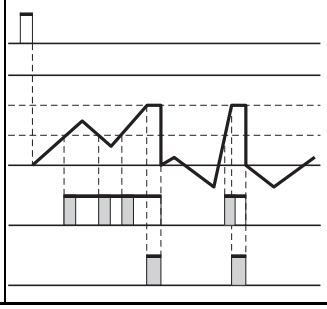
Input method Symbol	No-voltage input (NPN input)	Voltage input (PNP input)
H	Short-circuit	4.5 to 30 VDC
L	Open	0 to 2 VDC

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.

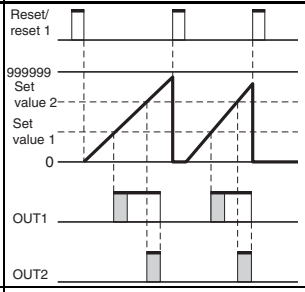
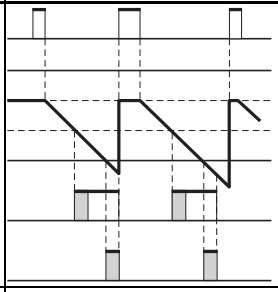
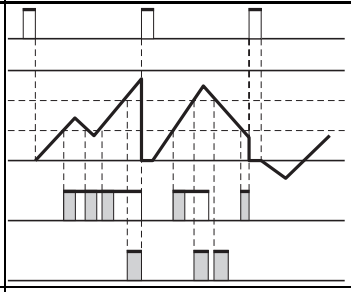
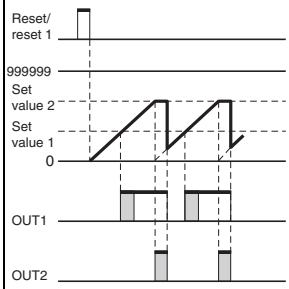
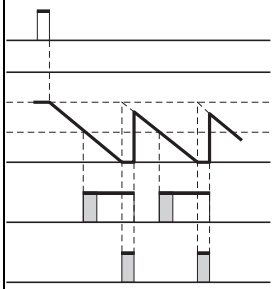
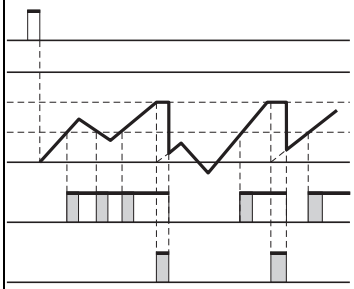
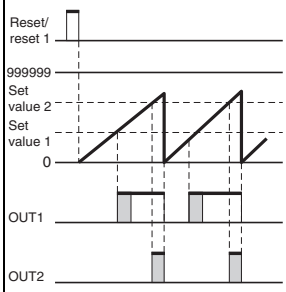
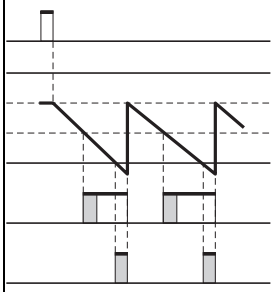
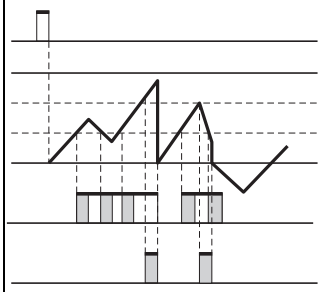
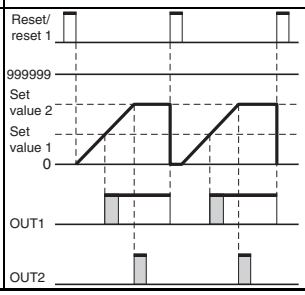
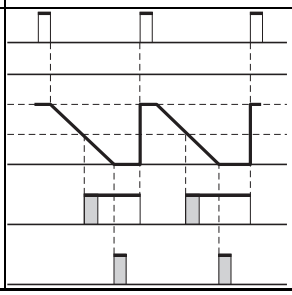
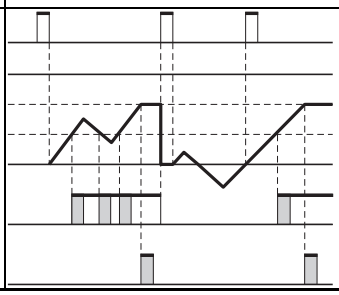
2. When the present value reaches 999999, it returns to 0.

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.

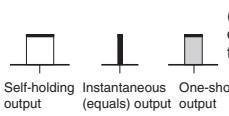
2. When the present value reaches 999999, it returns to 0.

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

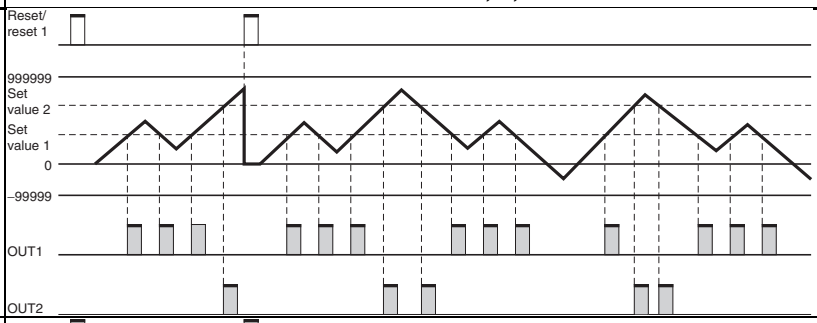
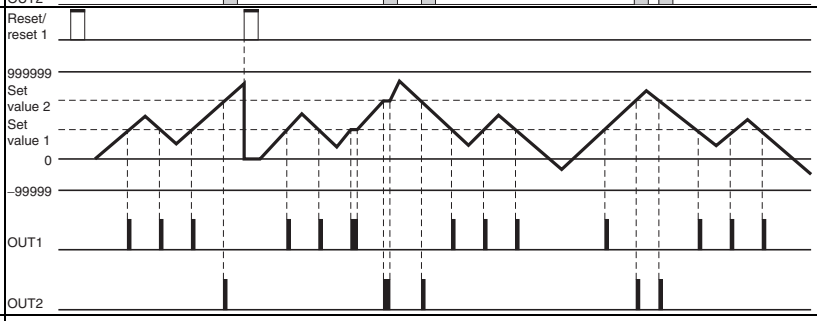
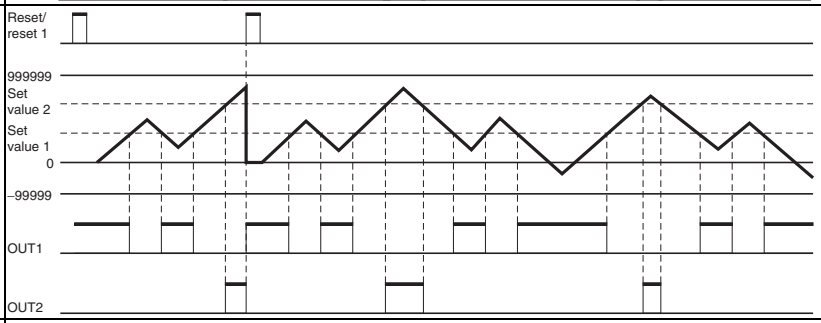
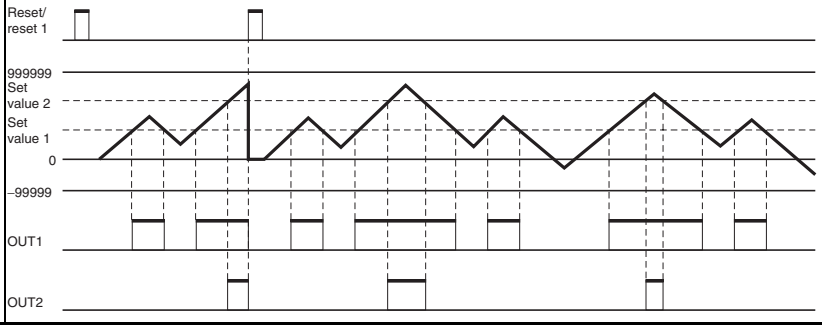
4. If reset/reset 1 is input while one-shot output is ON, one-shot output turns OFF.

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.

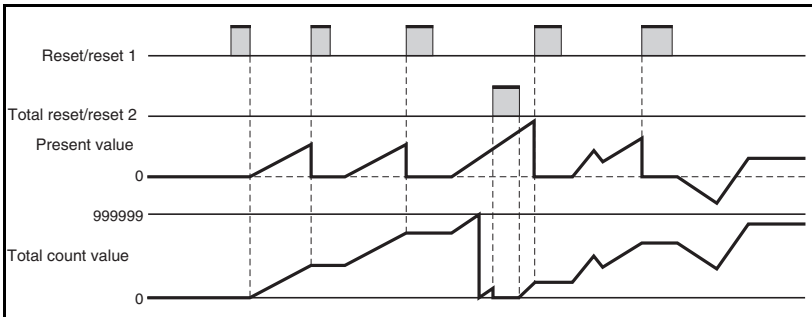
2. If reset/reset 1 is input while one-shot output is ON, one-shot output turns OFF.

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.

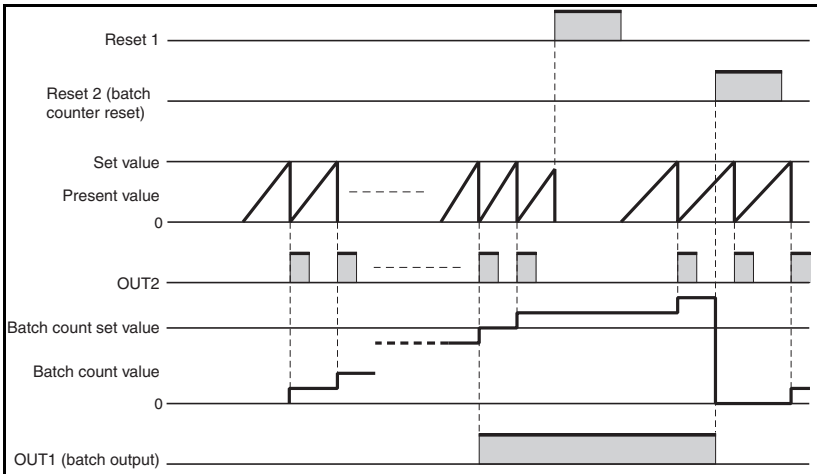


Note: The full scale (FS) for H7CX 4-digit models is 9999.

- 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.

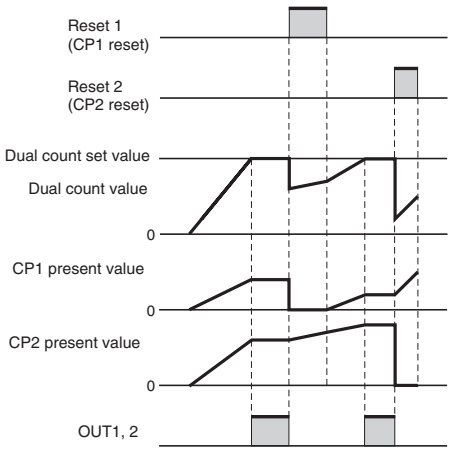
5. If the batch count set value is changed from a value that is greater than the batch count value to one that is less, batch output will turn ON.

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

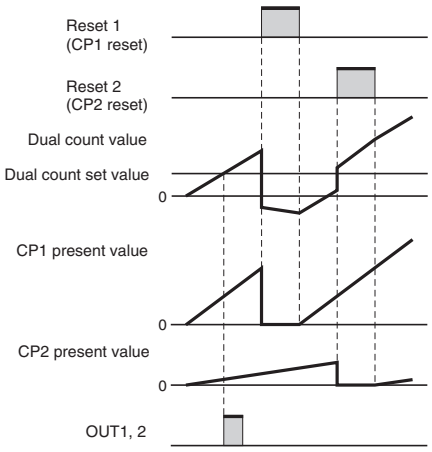
Using the dual counter allows the count from 2 inputs to be added or subtracted and the result displayed. It is possible to specify a set value for which output turns ON when the set value matches the added or subtracted result.
OUT1 and OUT2 turn ON and OFF simultaneously.

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.

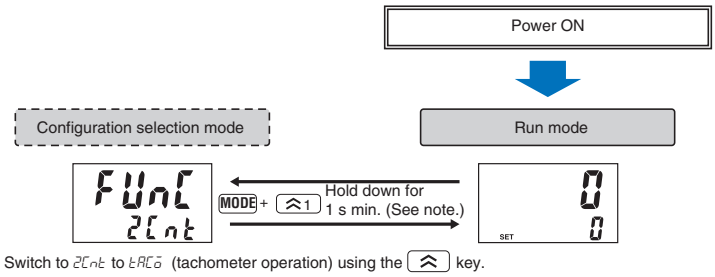
Reset Function List

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

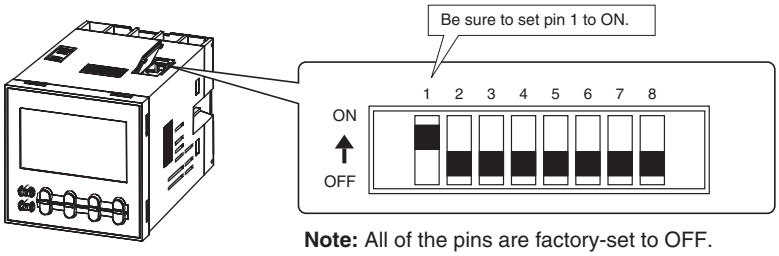
The H7CX is factory-set to the 2-stage counter (1-stage counter for H7CX-AU□ models) configuration. To switch to the tachometer configuration, use the procedure shown on the right. For details, refer to page D-92.



Note: The MODE key must be pressed before the 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 D-92.

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

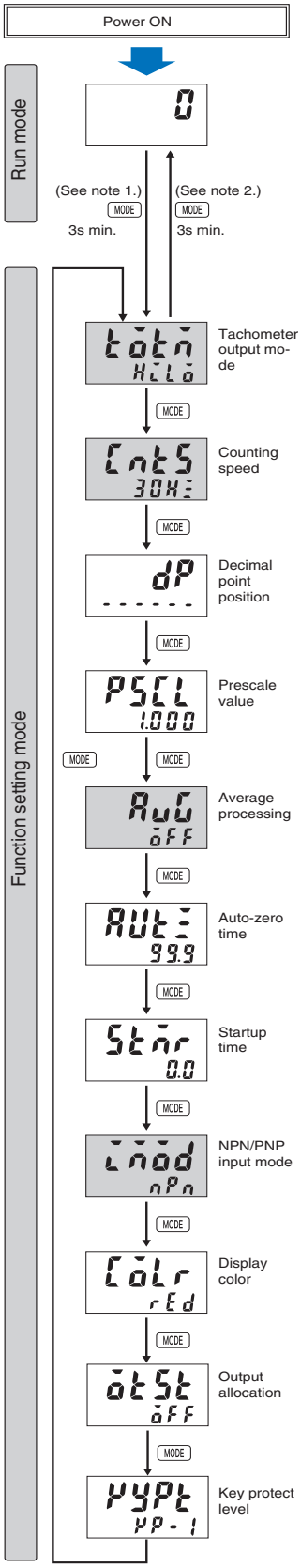
After making DIP switch settings for basic operations, advanced-functions (see note) can be added using the operation keys. For details, refer to page D-76.

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 D-92.

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 D-90.

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 measure-) (Average of 4 measure-) (Average of 8 measure-)

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 (tAtA) (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 D-91.)

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

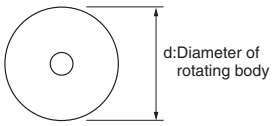
Example: In order to display the rate of rotation for a machine that outputs 5 pulses per revolution in the form □□.□ rpm:

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.)

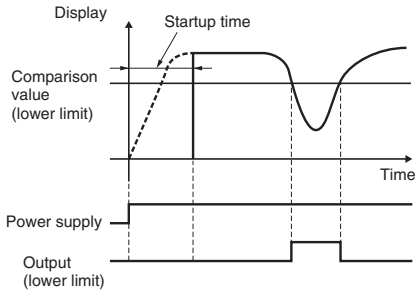
Flickering display and output chattering can be prevented using average processing (simple averaging). Average processing can be set to one of four levels: no average processing, 2 times (i.e., the average of 2 measurement values), 4 times, or 8 times. The measurement cycle will be equal to the sampling 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 (StAr)

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 (CnPd)

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 D-64.

Display Color (CoLr)

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)

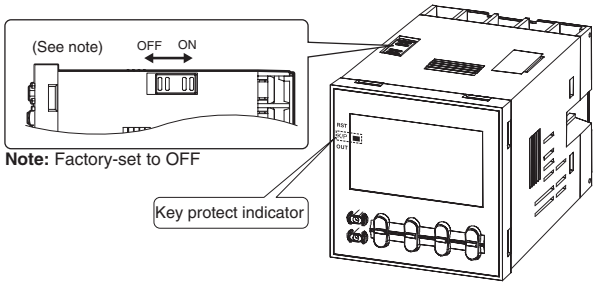
H7CX-AUSD1

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

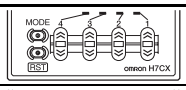
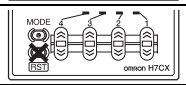
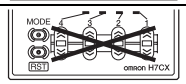
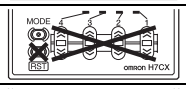
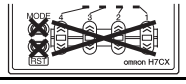
Key Protect Level (KYPt)

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.



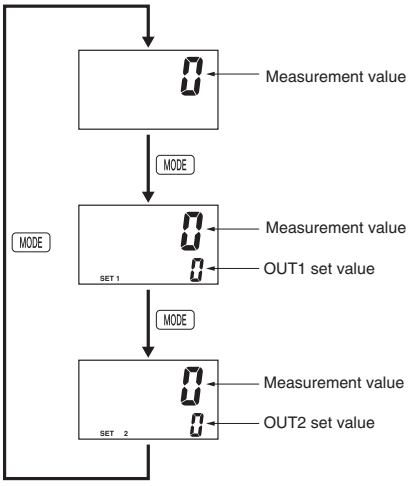
Note: Factory-set to OFF

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

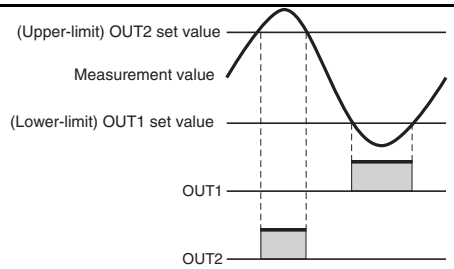
Set values for each digit as required using the ≪ key.

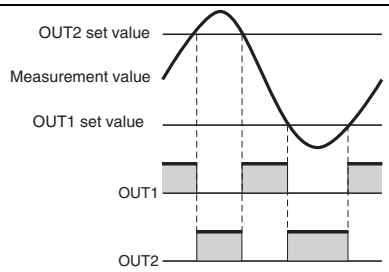


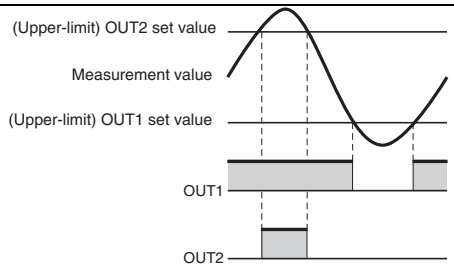
Measurement Value
Displays the currently measured value.

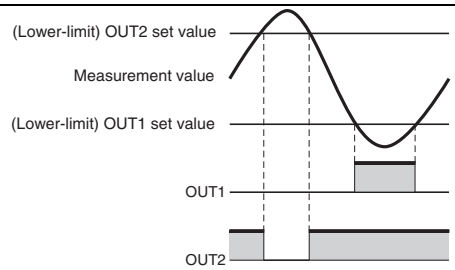
OUT1/OUT2 Set Value
Set OUT1 set value and OUT2 set value. The measurement value is compared to OUT1 set value and OUT2 set value and output is made according to the selected output mode.

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>


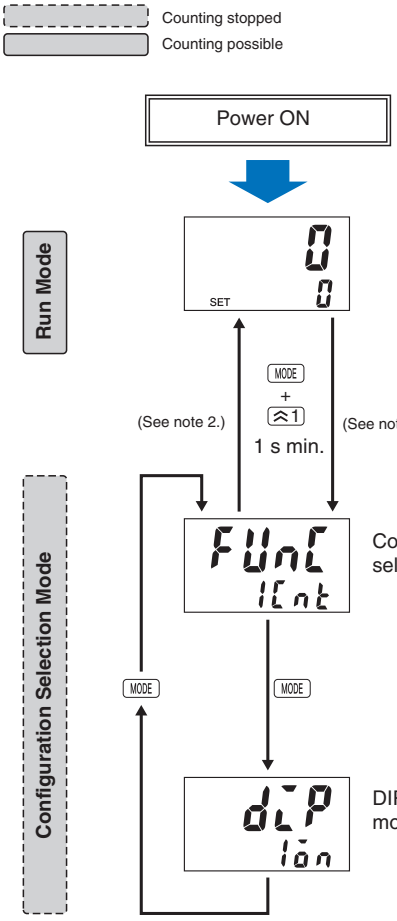
<table>
<tr><th>Condition</th><th>OUT1 set value ≤ OUT2 set value</th><th>OUT1 set value > OUT2 set value</th></tr>
<tr><td>ON condition for OUT1</td><td>OUT1 set value ≤ measurement value ≤ OUT2 set value</td><td>OUT2 set value ≤ measurement value ≤ OUT1 set value</td></tr>
<tr><td>ON condition for 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>


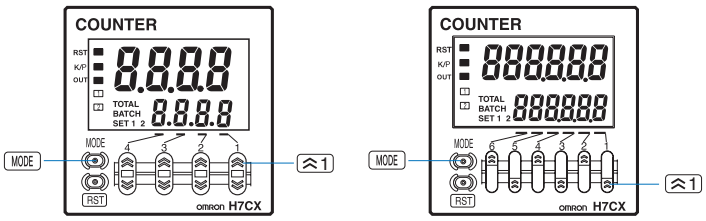
ON condition for OUT1: Measurement value ≥ OUT1 set value
ON condition for OUT2: Measurement value ≥ OUT2 set value
</td></tr>
<tr><td>Lower limit (LO-LO)</td><td>


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

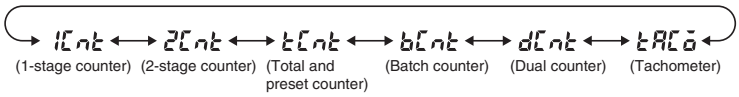
Select which H7CX configuration is used (i.e., 1-stage counter, 2-stage counter, total and preset counter, batch counter, dual counter, or tachometer) in configuration selection mode. The H7CX is also equipped with a DIP switch monitor function, a convenient function that enables the settings of the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

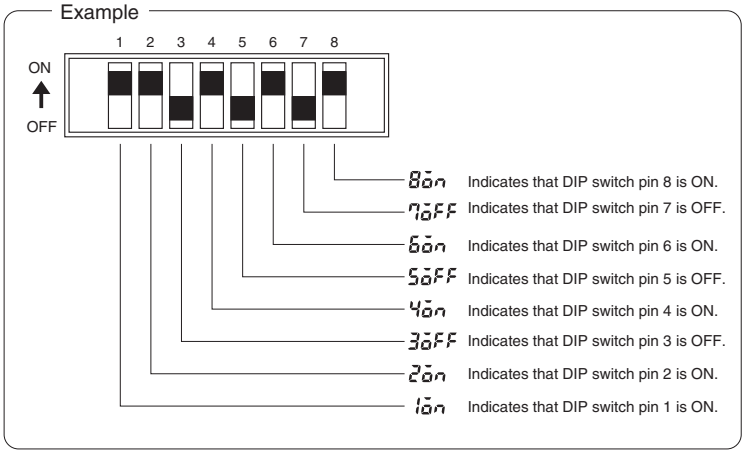


(1-stage counter) (2-stage counter) (Total and preset counter) (Batch counter) (Dual counter) (Tachometer)

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).



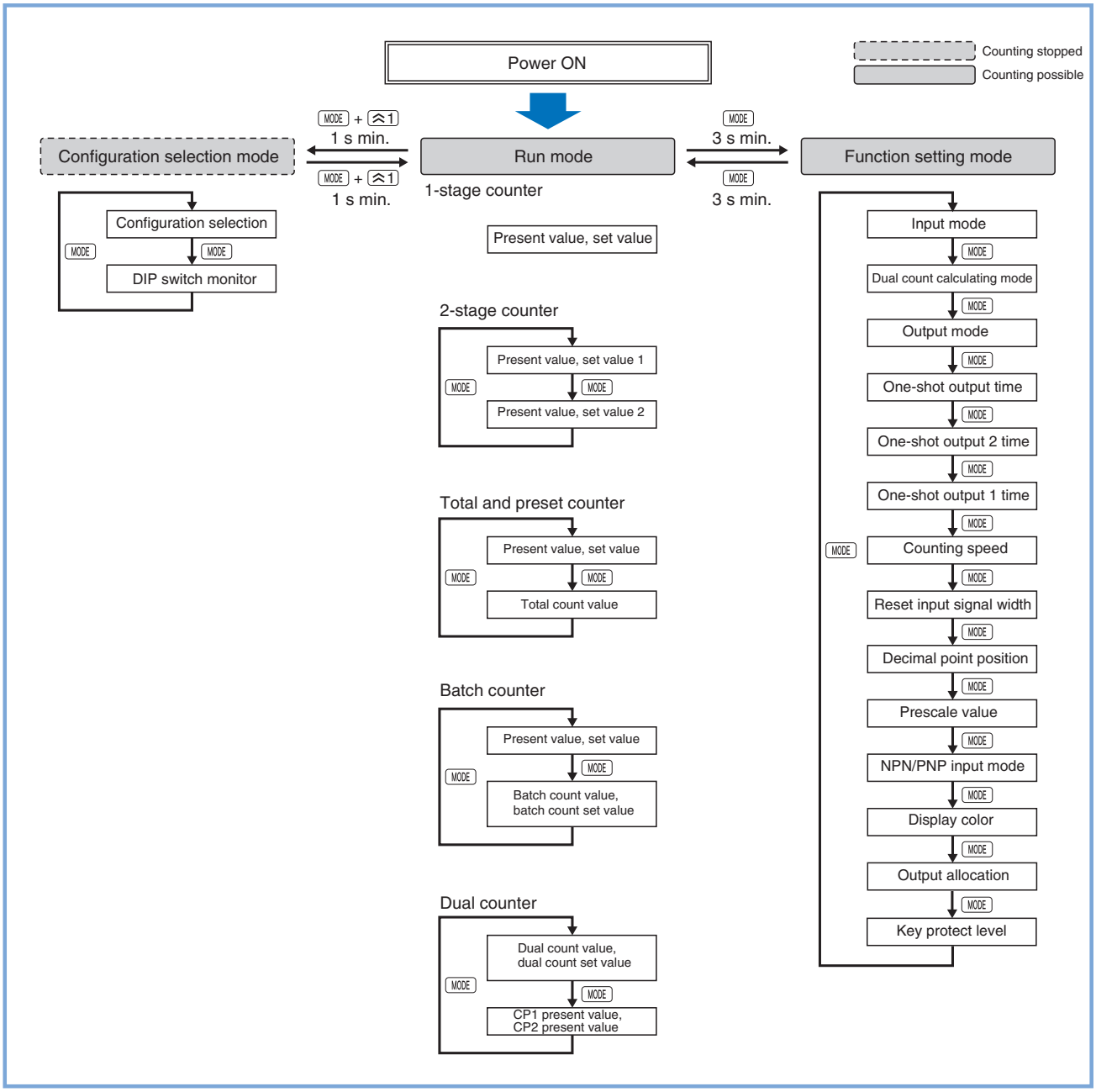
Note: 1. When the mode is changed to configuration selection mode, the present value is reset, outputs turns OFF, and counting (measuring) stops.

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

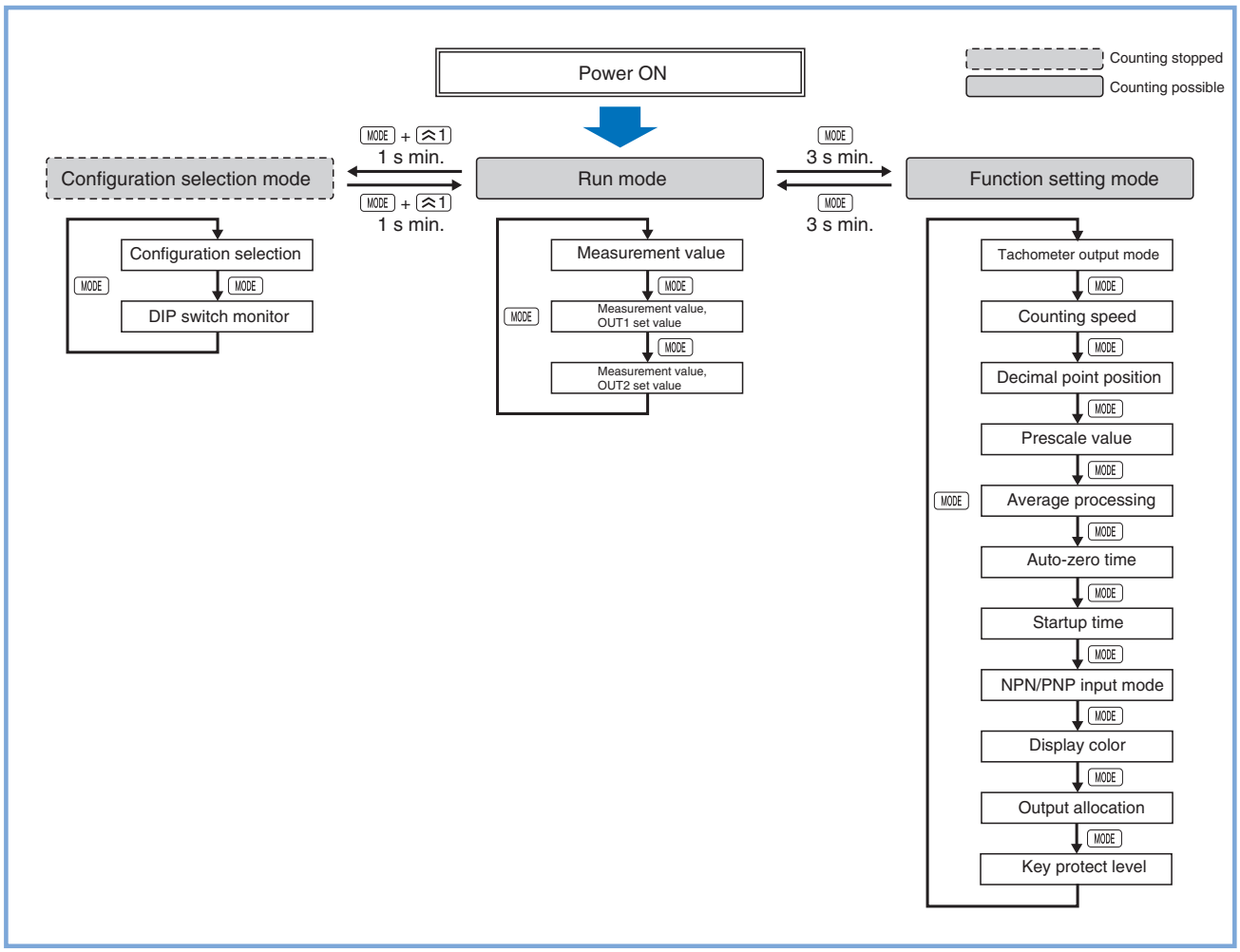
Counter Operation



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 D-75.

Tachometer Operation



Note: 1. All setting changes are performed using the ≪ key.
2. For details, refer to page D-87.

■ 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/Y-1/P/3/A/Y-2/d/L/H (See note 2.)	n	---	
One-shot output time	otIM	0.01 to 99.99	0.50	s	
One-shot output 2 time	otM2	0.01 to 99.99	0.50	s	
One-shot output 1 time	otM1	HoLd/0.01 to 99.99 (See note 3.)	HoLd	s	
Counting speed	CntS	30HZ/5KHZ	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	InMod	nPn/PnP	nPn	---	
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	---	

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	tAtn	HoLd/PrER/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-E2-03

Cam Positioner
H8PS

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments. Refer to *Warranty and Application Considerations* (page 131), and *Safety Precautions* (pages 115 and 116).

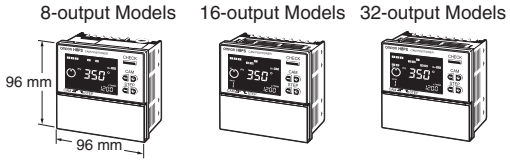
This Compact Cam Positioner, Popular for It's Ease-of-use, Now Comes with Even Better Functions.

- Compact 8-, 16-, and 32-output Models available that are 1/4-DIN size at 96 x 96 mm.
- High-speed operation at 1,600 r/min and high-precision settings to 0.5° ensure widespread application.
- Highly visible display with backlit negative transmissive LCD.
- Advance angle compensation function to compensate for output delays.
- Bank function for multi-product production (8 banks). (H8PS-16□/-32□ models.)

Features

Models with 8, 16, or 32 Outputs

The lineup includes Models with 32 outputs in a compact 1/4-DIN size. Using the optional Parallel Input Adapter (Y92C-30) enables expanding to up to 64 outputs for one encoder to support anything from a simple positioning application to a large-scale system.



Simple Programming

The programming method is designed based on a one key-one action concept for settings that could not be simpler. Both initial settings and factory adjustments are effort-free.

Large, Backlit Negative LCDs

Large LCDs, red for the process value and green for set values, show a wealth of operation information, making operating status visible at a glance.

High Speed Up To 1,600 r/min
High Precision Up To 0.5° (at 720 Resolution)

High-speed, high-precision applications can be easily handled and productivity increased.

Bank Function for Multi-product Production

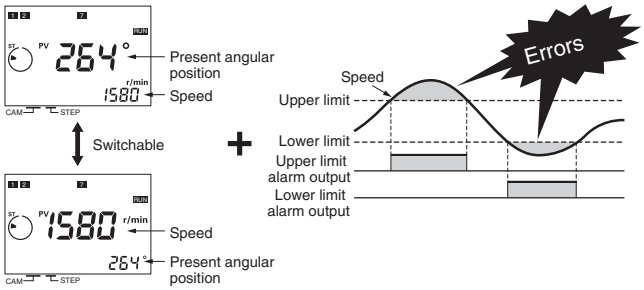
Up to eight different programs can be registered in advance to enable fast and easy switching between products (16/32-output Models only).

USB Communications for Easy Setting from a Computer

Optional Support Software can be used to enable programming from a personal computer via USB communications. Programs can be easily copied, saved, printed, and much more.

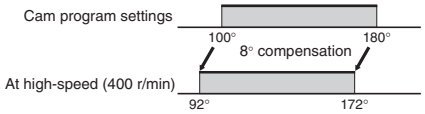
Speed Display and Speed Alarm Output

Both the speed (rotations/minutes) and present angular position can be displayed at the same time. Alarm outputs can be produced for both upper and lower speed limits.



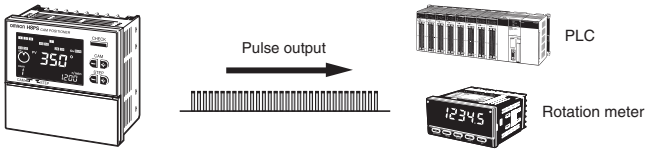
Advance Angle Compensation Function to Compensate for Output Delays

The advance angle compensation (ADV) function automatically advances the ON/OFF angle of outputs in proportion to machine (encoder) speed to compensate for the delay in timing of ON/OFF operation. ADV values can be set individually for 7 cam outputs.



Pulse Output for Timing Control

The number of pulses per rotation and the pulse output start angle can be set to enable operations like adjusting timing with a PLC or outputting to a rotation meter.



Model Number Structure

■ Model Number Legend

H8PS-□□□□
1 2 3 4

1. **Number of outputs**
   8: 8 outputs
   16: 16 outputs
   32: 32 outputs
2. **Panel language**
   B: English
3. **Mounting method**
   None:Flush mounting
   F: Surface mounting/ track mounting
4. **Output configuration**
   None:NPN transistor output
   P: PNP transistor output

Ordering Information

■ List of Models

Cam Positioner

Number of outputs	Mounting method	Output configuration	Bank function	Model
8 outputs	Flush mounting	NPN transistor output	No	H8PS-8B
		PNP transistor output		H8PS-8BP
	Surface mounting/ track mounting	NPN transistor output		H8PS-8BF
		PNP transistor output		H8PS-8BFP
16 outputs	Flush mounting	NPN transistor output	Yes	H8PS-16B
		PNP transistor output		H8PS-16BP
	Surface mounting/ track mounting	NPN transistor output		H8PS-16BF
		PNP transistor output		H8PS-16BFP
32 outputs	Flush mounting	NPN transistor output		H8PS-32B
		PNP transistor output		H8PS-32BP
	Surface mounting/ track mounting	NPN transistor output		H8PS-32BF
		PNP transistor output		H8PS-32BFP

Dedicated Absolute Encoder

Type	Resolution	Cable length	Model
Economy	256	2 m	E6CP-AG5C-C 256 2M
Standard	256	1 m	E6C3-AG5C-C 256 1M
		2 m	E6C3-AG5C-C 256 2M
	360		E6C3-AG5C-C 360 2M
	720		E6C3-AG5C-C 720 2M
Rigid	256	2 m	E6F-AG5C-C 256 2M
	360		E6F-AG5C-C 360 2M
	720		E6F-AG5C-C 720 2M

Accessories (Order Separately)

Name	Specification	Model
Discrete Wire Output Cable	2 m	Y92S-41-200
Connector-type Output Cable	2 m	E5ZE-CBL200
Support Software	CD-ROM	H8PS-SOFT-V1
USB Cable	A miniB, 2 m	Y92S-40
Shaft Coupling for the E6CP	Axis: 6 mm dia.	E69-C06B
Shaft Coupling for the E6C3	Axis: 8 mm dia.	E69-C08B
Shaft Coupling for the E6F	Axis: 10 mm dia.	E69-C10B
Extension Cable (See note.)	5 m (same for E6CP, E6C3, and E6F)	E69-DF5
Parallel Input Adapter	Two Units can operate in parallel.	Y92C-30
Protective Cover	---	Y92A-96B
Watertight Cover	---	Y92A-96N
Track Mounting Base	---	Y92F-91
Mounting Track	50 cm × 7.3 mm (ℓ × t)	PFP-50N
	1 m × 7.3 mm (ℓ × t)	PFP-100N
	1 m × 16 mm (ℓ × t)	PFP-100N2
End Plate	---	PFP-M
Spacer	---	PFP-S

Note: Ask your OMRON representative about the availability of non-standard lengths.

Specifications

■ Ratings

Item			H8PS-□B	H8PS-□BF	H8PS-□BP	H8PS-□BFP
Rated supply voltage			24 VDC			
Operating voltage range			85% to 110% of rated supply voltage			
Mounting method			Flush mounting	Surface mounting, track mounting	Flush mounting	Surface mounting, track mounting
Power consumption			Approx. 4.5 W at 26.4 VDC for 8-output models Approx. 6.0 W at 26.4 VDC for 16-/32-output models			
Inputs	Encoder input		Connections to a dedicated absolute encoder			
	External inputs	Input signals	8-output Models: None 16-/32-output Models: Bank inputs 1/2/4, origin input, start input			
		Input type	No voltage inputs: ON impedance:1 kΩ max. (Leakage current: approx. 2 mA at 0 Ω) ON residual voltage: 2 V max., OFF impedance: 100 kΩ min., Applied voltage: 30 VDC max. Minimum input signal width: 20 ms			
Outputs	Cam outputs RUN output		NPN open-collector transistor outputs 30 VDC max., 100 mA max. (Do not exceed 1.6 A total for all cam outputs and the RUN output.), residual voltage: 2 VDC max.		PNP open-collector transistor outputs 30 VDC max. (26.4 VDC for 16-/32-output Models), 100 mA max. (Do not exceed 1.6 A total for all cam outputs and the RUN output.), residual voltage: 2 VDC max.	
	Pulse output		NPN open-collector transistor output 30 VDC max., 30 mA max., residual voltage: 0.5 VDC max.		PNP open-collector transistor output 30 VDC max. (26.4 VDC for 16-/32-output Models) 30 mA max., residual voltage: 2 VDC max.	
	Number of outputs		8-output Models: 8 cam outputs, 1 RUN output, 1 pulse output 16-output Models: 16 cam outputs, 1 RUN output, 1 pulse output 32-output Models: 32 cam outputs, 1 RUN output, 1 pulse output			
Number of banks			8 banks (for 16-/32-output Models only)			
Display method			7-segment, negative transmissive LCD (Main Display: 11 mm (red), Sub-display: 5.5 mm (green))			
Memory backup method			EEPROM (overwrites: 100000 times min.) that can store data for 10 years min.			
Ambient operating temperature			−10 to 55°C (with no icing or condensation)			
Storage temperature			−25 to 65°C (with no icing or condensation)			
Ambient humidity			25% to 85%			
Degree of protection			Panel surface: IP40, Rear case: IP20			
Case color			Light gray (Munsell 5Y7/1)			

■ Characteristics

Setting unit		0.5° increments at a resolution of 720, 1° increments at a resolution of 256 or 360 (See note 1.)
Number of steps		Up to 10 steps can be set for each cam to turn the output ON/OFF 10 times. (See note 2.)
Inputs	**Encoder input**	Connections to a dedicated absolute encoder • Response rotation speed (in Run/Test Mode) 1600 r/min max. at a resolution of 256 or 360 (1200 r/min max. if ADV function is set for 4 or more cams) (See notes 3 and 4.) 800 r/min max. at a resolution of 720 (600 r/min max. if ADV function is set for 4 or more cams) • Includes error data detection
Encoder cable extension distance		256/360 resolution 100 m max. at 330 r/min or less 52 m max. at 331 to 1200 r/min (331 to 900 r/min if ADV function is set for 4 or more cams) 12 m max. at 1201 to 1600 r/min (901 to 1200 r/min if ADV function is set for 4 or more cams) 720 resolution 100 m max. at 330 r/min or less 52 m max. at 331 to 600 r/min (331 to 450 r/min if ADV function is set for 4 or more cams) 12 m max. at 601 to 800 r/min (451 to 600 r/min if ADV function is set for 4 or more cams)
Output response time		0.3 ms max.
Insulation resistance		100 MΩ min. (at 500 VDC) between current-carrying terminals and exposed non-current-carrying metal parts, between all current-carrying parts and the USB connector
Dielectric strength		1000 VAC, 50/60 Hz for 1 min between current-carrying terminals and exposed non-current-carrying metal parts 500 VAC, 50/60 Hz for 1 min between current-carrying section and USB connector, and between current-carrying terminals and non-current-carrying metal part of output connector
Impulse withstand voltage		1 kV between power terminals 1.5 kV between current-carrying terminals and exposed non-current-carrying metal parts
Noise immunity		±480 V between power terminals, ±600 V between input terminals Square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise)
Static immunity		8 kV (malfunction), 15 kV (destruction)
Vibration resistance	**Destruction**	10 to 55 Hz with 0.75-mm single amplitude each in 3 directions for 2 hours each
	Malfunction	10 to 55 Hz with 0.5-mm single amplitude each in 3 directions for 10 minutes each
Shock resistance	**Destruction**	300 m/s² 3 times each in 6 directions
	Malfunction	200 m/s² 3 times each in 6 directions
Approved safety standards		cULus (Listing): UL508/CSA C22.2 No. 14
EMC		(EMI) EN61326 Emission Enclosure: EN55011 Group1 Class A (EMS) EN61326 Immunity ESD: EN61000-4-2: 4 kV contact discharge, 8 kV air discharge Immunity RF-interference: EN61000-4-3: 10 V/m (Amplitude-modulated, 80 MHz to 1 GHz), 10 V/m (Pulse-modulated, 900 MHz ±5 MHz) Immunity Conducted Disturbance EN61000-4-6: 10 V (0.15 to 80 MHz) Immunity Burst: EN61000-4-4: 2 kV for power-line, 1 kV for I/O signal-line Immunity Surge: EN61000-4-5: 1 kV line to line (power line), 2 kV line to ground (power line)
Weight		Approx. 300 g (Cam Positioner main unit only)

Note: 1. Cam output precision, however, is 2° max. for Encoder with 256 resolution (P/R).

2. Although 32-output Models can have 10 steps set for any one output, there must be no more than 160 steps total set for all cam outputs.

3. The maximum is 1000 r/min when an E6CP-AG5C-C Encoder is connected.

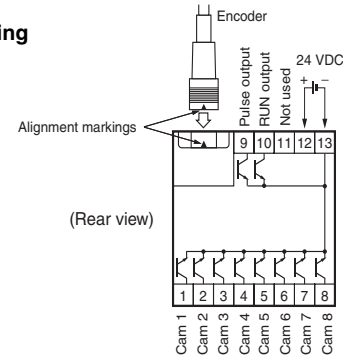
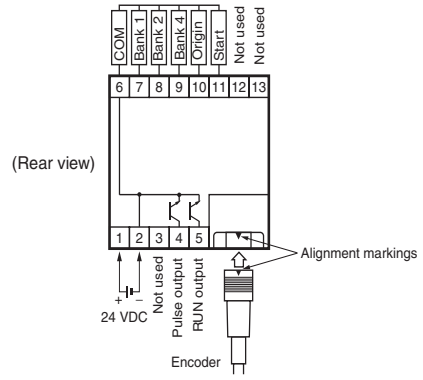
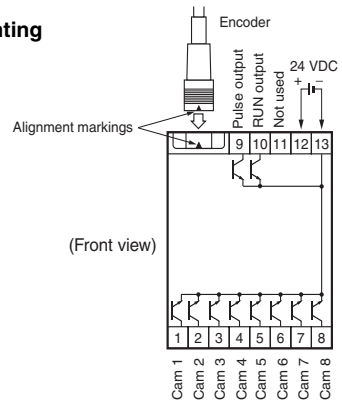
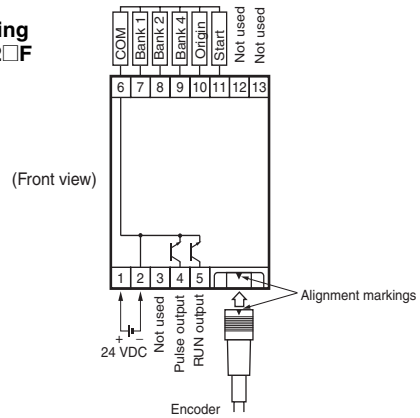
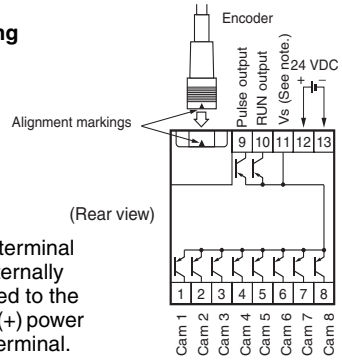
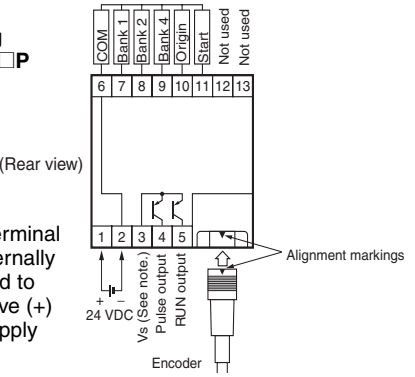
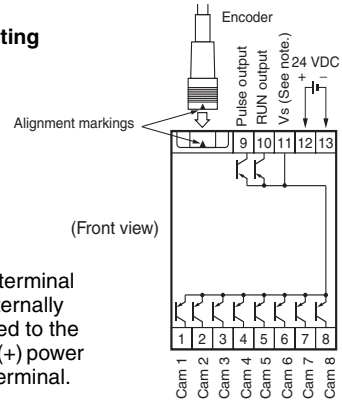
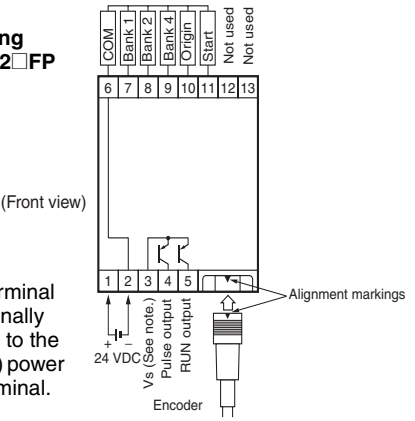
4. ADV stands for Advance Angle Compensation.

■ Functions

Item	H8PS-8□	H8PS-16□	H8PS-32□
Encoder rotation direction switching	Encoder data can be set with a DIP switch to forward (CW) or reverse (CCW) direction.		
Encoder origin designation	The present display angular position can be set to 0° (origin) by pressing the ORIGIN Key on the front panel.	The present display angular position can be set to 0° (origin) by using the origin input terminal or the ORIGIN Key on the front panel. **Note:** All banks use the same origin.	
Angle display switch	Converts the Absolute Encoder value display from 256 divisions/revolution to 360°/revolution.		
Rotation display monitor	Graphically displays the Encoder rotational angular position.		
Teaching function	Sets the cam output ON/OFF angle based on actual machine (Encoder) operation.		
Pulse output	Outputs a preset number of pulses per Encoder rotation. It also sets the pulse output start angle.		
Switching the angle and speed displays	Displays both the present angular position and the number of Encoder revolutions (speed) in Run Mode. Switches back and forth between the main display showing the present angular position with the sub-display showing the speed and the main display showing the speed with the sub-display showing the present angular position.		
Bank function	---	Enables the entire cam program to be changed at one time by switching banks (0 to 7). The bank that is running can be switched using the bank input terminal or the BANK Key on the front panel. Also enables programs to be copied between banks.	
Advance angle compensation (ADV) function	Automatically advances the ON/OFF angle of cam outputs in proportion to machine (encoder) speed to compensate for the delay in timing of ON/OFF operation. ADV values can be set individually for 7 cam outputs.		
Speed alarm output	A specified cam output can be used as an Encoder speed alarm output. The function can output upper and lower limit speed alarms.		
All protection function	Disables all key and switch operations in Run Mode to prevent incorrect or unauthorized operation.		
Cam protection function	Prohibits program changes at the cam output level. Any cam numbers can be protected.		
Step number limit	Limits the number of steps that can be set per cam output. Prohibits incorrect operations by adding to the program.		
Output prohibit	---	The start input can be turned OFF in Run or Test Mode to prohibit cam output. **Note:** Use this function carefully for the application because no cam outputs are provided when the start input is turned OFF.	
Support Software settings	---	Programs can be uploaded or downloaded easily by connecting a personal computer to the Cam Positioner using a USB Cable (Y92S-40, sold separately) and the Support Software (H8PS-SOFT-V1, sold separately).	

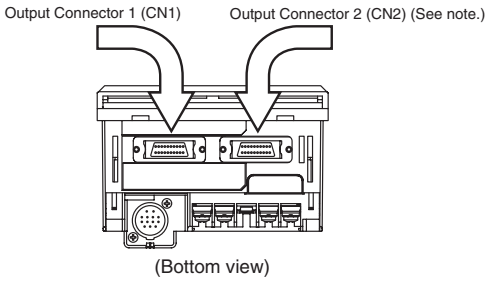
Connections

■ Terminal Arrangement

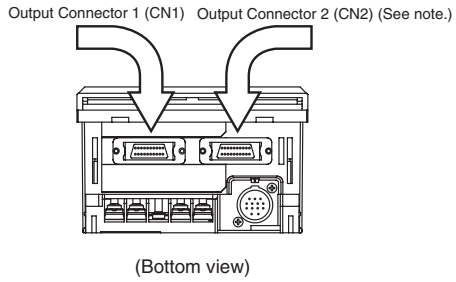
H8PS-8□ (8-output Models)	H8PS-16□/-32□ (16-/32-output Models)
NPN Output, Flush Mounting H8PS-8□ 	**NPN Output, Flush Mounting H8PS-16□/-32□** 
NPN Output, Surface Mounting H8PS-8□F 	**NPN Output, Surface Mounting H8PS-16□F/-32□F** 
PNP Output, Flush Mounting H8PS-8□P  **Note:** The VS terminal is not internally connected to the positive (+) power supply terminal.	**PNP Output, Flush Mounting H8PS-16□P/-32□P**  **Note:** The VS terminal is not internally connected to the positive (+) power supply terminal.
PNP Output, Surface Mounting H8PS-8□FP  **Note:** The VS terminal is not internally connected to the positive (+) power supply terminal.	**PNP Output, Surface Mounting H8PS-16□FP/-32□FP**  **Note:** The VS terminal is not internally connected to the positive (+) power supply terminal.

Output Cable Connections (16-/32-output Models Only)

Flush Mounting Models



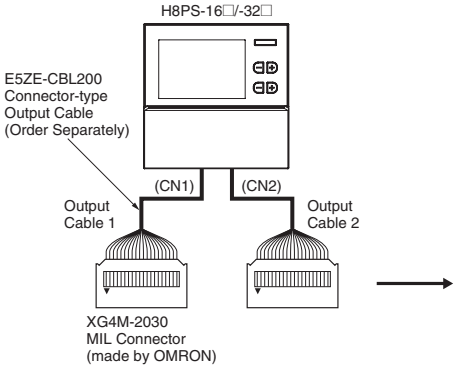
Surface Mounting Models



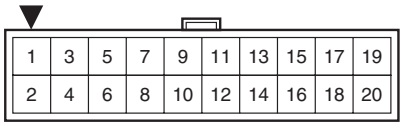
Output Connector	Output signals
Output Connector 1 (CN1)	Cam 1 to Cam 16, COM, Vs
Output Connector 2 (CN2) (See note.)	Cam 17 to Cam 32, COM, Vs

Note: The 16-output Models do not have CN2 Connectors.

1. E5ZE-CBL200 Connector-type Output Cable (Order Separately) Connections



Pin Arrangement of XG4M-2030 Connectors



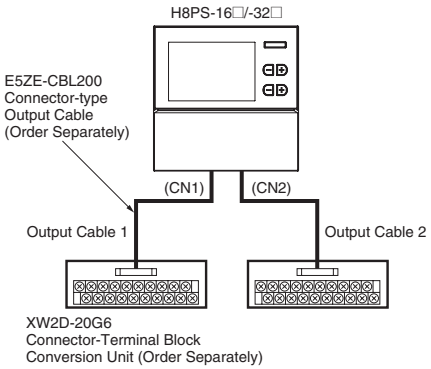
Output Cable 1 Wiring Table

Outputs	Connector pin No.	Outputs	Connector pin No.
Cam 1	20	**Cam 9**	19
Cam 2	18	**Cam 10**	17
Cam 3	16	**Cam 11**	15
Cam 4	14	**Cam 12**	13
Cam 5	12	**Cam 13**	11
Cam 6	10	**Cam 14**	9
Cam 7	8	**Cam 15**	7
Cam 8	6	**Cam 16**	5
COM	4	**COM**	3
Vs	2	**Vs**	1

Output Cable 2 Wiring Table

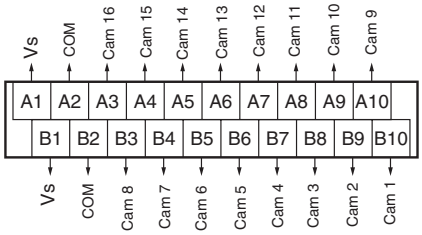
Outputs	Connector pin No.	Outputs	Connector pin No.
Cam 17	20	**Cam 25**	19
Cam 18	18	**Cam 26**	17
Cam 19	16	**Cam 27**	15
Cam 20	14	**Cam 28**	13
Cam 21	12	**Cam 29**	11
Cam 22	10	**Cam 30**	9
Cam 23	8	**Cam 31**	7
Cam 24	6	**Cam 32**	5
COM	4	**COM**	3
Vs	2	**Vs**	1

Using Connector-Terminal Block Conversion Units

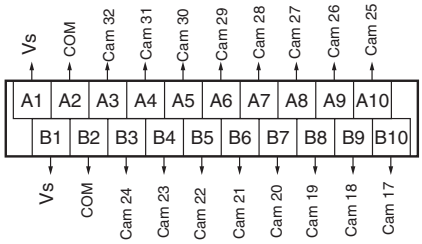


Terminal Arrangement of the XW2D-20G6 Connector-Terminal Block Conversion Unit

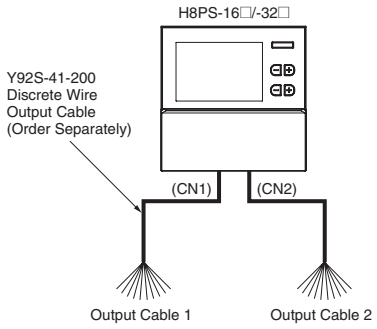
Output Cable 1



Output Cable 2



2. Y92S-41-200 Discrete Wire Output Cable (Order Separately) Connections



Output Cable 1 Wiring Table

Outputs	Cable color	Marks	Marking color	Outputs	Cable color	Marks	Marking color
Cam 1	Orange	■	Black	**Cam 9**	Orange	■	Red
Cam 2	Gray	■	Black	**Cam 10**	Gray	■	Red
Cam 3	White	■	Black	**Cam 11**	White	■	Red
Cam 4	Yellow	■	Black	**Cam 12**	Yellow	■	Red
Cam 5	Pink	■	Black	**Cam 13**	Pink	■	Red
Cam 6	Orange	■■	Black	**Cam 14**	Orange	■■	Red
Cam 7	Gray	■■	Black	**Cam 15**	Gray	■■	Red
Cam 8	White	■■	Black	**Cam 16**	White	■■	Red
COM	Yellow	■■	Black	**COM**	Yellow	■■	Red
Vs	Pink	■■	Black	**Vs**	Pink	■■	Red

Output Cable 2 Wiring Table

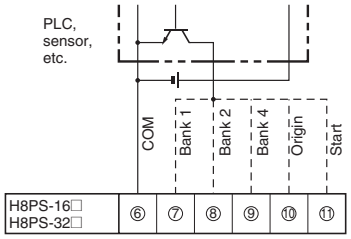
Outputs	Cable color	Marks	Marking color	Outputs	Cable color	Marks	Marking color
Cam 17	Orange	■	Black	**Cam 25**	Orange	■	Red
Cam 18	Gray	■	Black	**Cam 26**	Gray	■	Red
Cam 19	White	■	Black	**Cam 27**	White	■	Red
Cam 20	Yellow	■	Black	**Cam 28**	Yellow	■	Red
Cam 21	Pink	■	Black	**Cam 29**	Pink	■	Red
Cam 22	Orange	■■	Black	**Cam 30**	Orange	■■	Red
Cam 23	Gray	■■	Black	**Cam 31**	Gray	■■	Red
Cam 24	White	■■	Black	**Cam 32**	White	■■	Red
COM	Yellow	■■	Black	**COM**	Yellow	■■	Red
Vs	Pink	■■	Black	**Vs**	Pink	■■	Red

■ Input Connections

Only the Encoder inputs are connected with 8-output Models. The inputs are no-voltage (short-circuit or open) inputs.

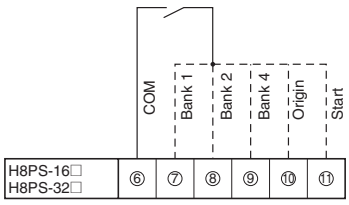
No-voltage Inputs

Open Collector



Note: Operates when the transistor turns ON.

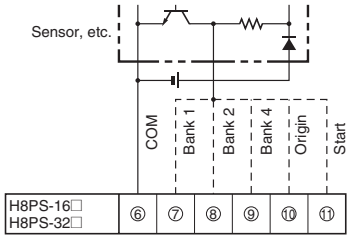
Contact Input



Note: Operates when the contact turns ON.

Voltage-output sensors can also be connected.

Connection Examples



Note: Operates when the transistor turns ON.

No-voltage Input Signal Levels

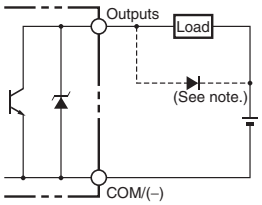
No-contact inputs	Short-circuit level for transistor ON • Residual voltage: 2 V max. • Impedance when ON: 1 kΩ max. (The leakage current is approx. 2 mA when the impedance is 0 Ω.)
	Open level for transistor OFF • Impedance when OFF: 100 kΩ min.
Contact inputs	Use a contact that can adequately switch 2 mA at 5 V.

Note: Use a maximum DC power supply of 30 V.

■ Output Connections

Note: Internal circuit damage may result from a short circuit in the load.

NPN Output Models

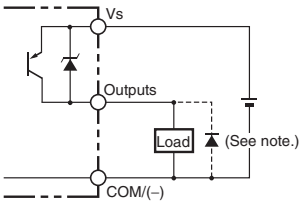


Note: Always connect a diode to absorb counter-electromotive force when connecting an inductive load.

Item	Cam outputs, RUN output	Pulse output
Output method	NPN open collector	
Dielectric strength	30 VDC	
Rated current	100 mA (See note.)	30 mA
Residual voltage	2 VDC max.	0.5 VDC max.
Leakage current	100 μA max.	5 μA max.

Note: Do not exceed 1.6 A total for all cam outputs and the RUN output.

PNP Output Models



Note: Always connect a diode to absorb counter-electromotive force when connecting an inductive load.

Item	Cam outputs, RUN output	Pulse output
Output method	PNP open collector	
Dielectric strength	8-output Models: 30 VDC 16-/32-output Models: 26.4 VDC	
Rated current	100 mA (See note.)	30 mA
Residual voltage	2 VDC max.	
Leakage current	100 μA max.	

Note: Do not exceed 1.6 A total for all cam outputs and the RUN output.

Operating Mode

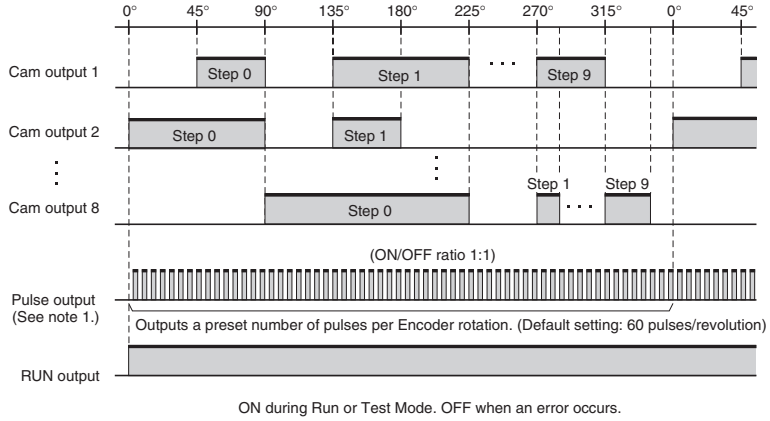
■ Functions

The H8PS Cam Positioner receives angle signal inputs from the Dedicated Absolute Encoder and outputs the preset ON/OFF angles as cam outputs.

Program Examples

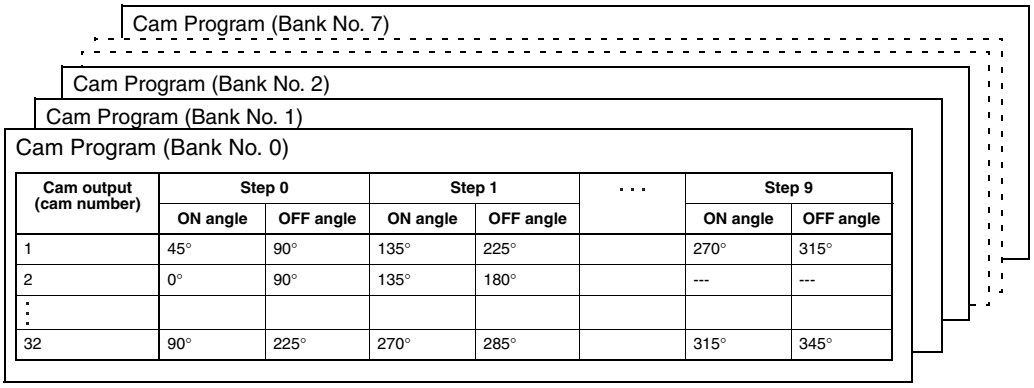
1. H8PS-8□ (8-output Models)

Cam output (cam number)	Step 0		Step 1		...	Step 9	
	ON angle	OFF angle	ON angle	OFF angle		ON angle	OFF angle
1	45°	90°	135°	225°		270°	315°
2	0°	90°	135°	180°		---	---
⋮							
8	90°	225°	270°	285°		315°	345°

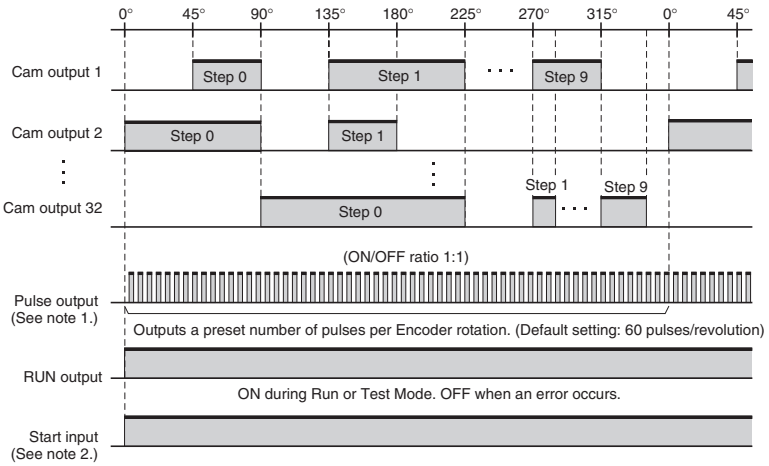


Note 1: The number of pulses per Encoder rotation and the pulse output start angle can be set.
Note 2: With counterclockwise rotation (359°, 358° ...1°, 0°), step 0 for cam output 1 turns ON at 89° and OFF at 44° at in the diagram.

2. H8PS-16□ /-32□ (16-/32-output Models)



Cam output (cam number)	Step 0		Step 1		...	Step 9	
	ON angle	OFF angle	ON angle	OFF angle		ON angle	OFF angle
1	45°	90°	135°	225°		270°	315°
2	0°	90°	135°	180°		---	---
⋮							
32	90°	225°	270°	285°		315°	345°



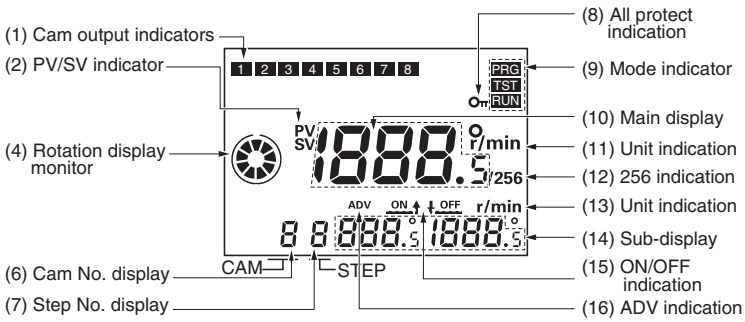
Note 1: The number of pulses per Encoder rotation and the pulse output start angle can be set.
Note 2: Be sure to turn ON the start input in Run and Test modes. Otherwise, there will be no outputs (output prohibited), including the cam outputs, pulse output, and RUN output.
Note 3: With counterclockwise rotation (359°, 358° ...1°, 0°), step 0 for cam output 1 turns ON at 89° and OFF at 44° in the diagram.

Note: The entire cam program can be changed at one time with 16- and 32-output Models with the bank function (banks 0 to 7). For details on the procedure for switching banks, refer to page 126.

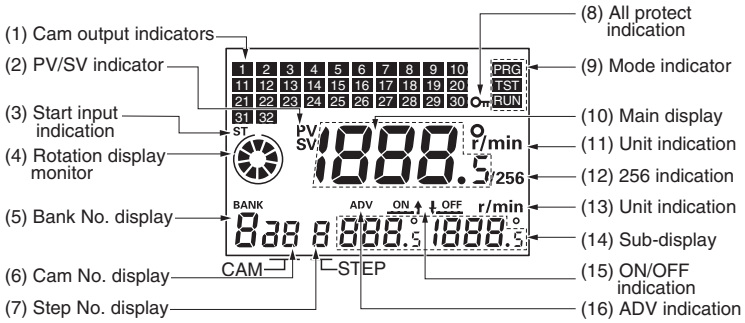
Nomenclature

■ Displays

8-output Models



16-/32-output Models

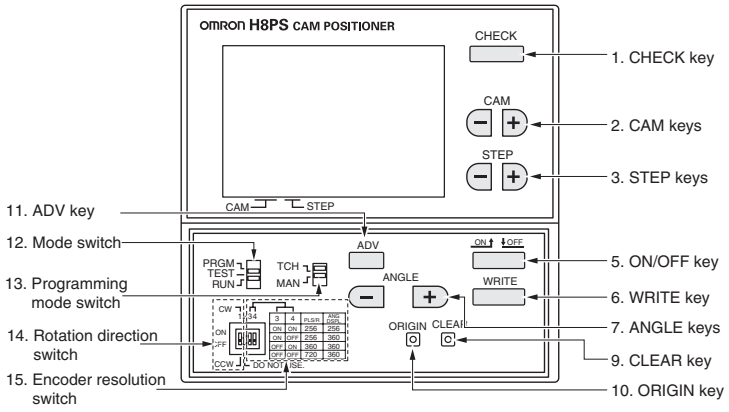


Display Details

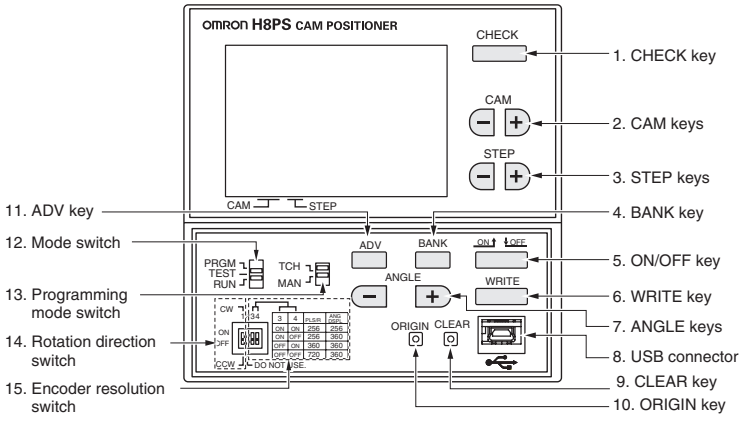
No.	Display color	Description
(1)	Orange	Lit while cam outputs are ON.
(2)	Red	PV: Lit while the present angular position or speed is displayed in main display. SV: Lit while the setting value is displayed in main display.
(3)	Orange	Lit while the start input is ON in Run or Test Mode. Not lit when an error occurs.
(4)	Orange	Displays Encoder present angular position, direction, and speed guidelines.
(5)	Green	Displays the bank number that is running in Run or Test Mode and the bank number selected in Programming Mode.
(6)	Green	Displays the cam number for the angle setting displayed on sub-display.
(7)	Green	Displays the step number for the angle setting displayed on sub-display.
(8)	Orange	Lit while the All Protection function is enabled.
(9)	Orange	The indicator for the selected mode is lit. PRG: Programming Mode TST: Test Mode RUN: Run Mode
(10)	Red	Displays the present angular position or the speed and settings being made.
(11)	Red	Displays units for the angle or the speed displayed on main display.
(12)	Red	Lit while using an Encoder with a resolution of 256 if 256° display is selected.
(13)	Green	Displays units for the angle or the speed displayed on sub-display.
(14)	Green	Displays the speed or the ON/OFF angle settings.
(15)	Green	Indicates whether main display displays the ON or OFF angle setting.
(16)	Green	Lit while setting the Advance Angle Compensation (ADV) Function.

■ Operation Keys

8-output Models



16-/32-output Models



Operation Key Details

No.	Description
1	Displays program details in Run Mode.
2	Selects the cam number with [+] [−] Keys.
3	Selects the step number with [+] [−] Keys.
4	Selects the bank number.
5	Selects the ON angle, or OFF angle
6	Writes the set data to memory.
7	Changes the angle or other setting value with [+] [−] Keys.
8	Connects the Cam Positioner to a personal computer via USB cable (order separately) for programming with the Support Software (order separately).
9	Moves to the screen for clearing settings
10	Designates the current angle of the machine (Encoder) as the origin (0°).
11	Programming or Test Mode: Press to shift to the ADV function setting screen. Programming Mode: Press and hold at least 3 s to shift to the Function Setting Mode. Run Mode: Press and hold at least 5 s to enable/disable the All Protection function.
12	Switches modes. Programming Mode (PRGM): Used to write cam programs, set the ADV function, etc. Test Mode (TEST): Used to modify settings while the Encoder is running. Run Mode (RUN): Used for normal operation and to check the cam program.
13	Select the method used for programming cams. Teaching: ON/OFF Angles can be set based on actual machine (Encoder) operation. Manual: ANGLE Keys can be used to set ON/OFF angles.
14	Sets the H8PS rotation direction (rotation display monitor, etc.) to the machine (Encoder) rotation direction.
15	Sets the resolution of the connected Encoder. Also sets the unit for angle display when using an Encoder with a resolution of 256.

Dimensions

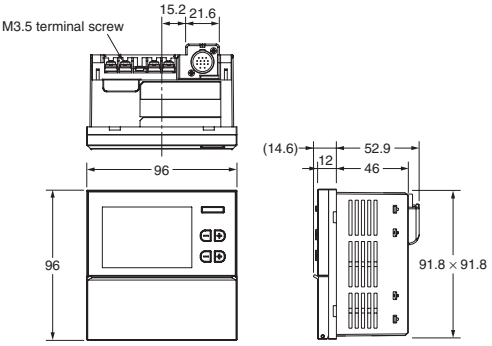
Note: All units are in millimeters unless otherwise indicated.

■ Main Unit

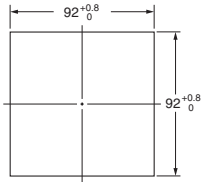
Cam Positioners

Flush Mounting Models

H8PS-8B□ (8-output Models)

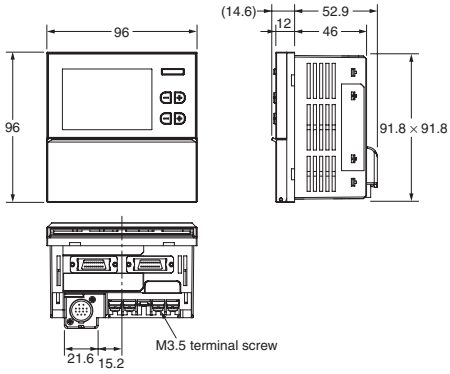


Panel Cutout
(according to DIN 43700)

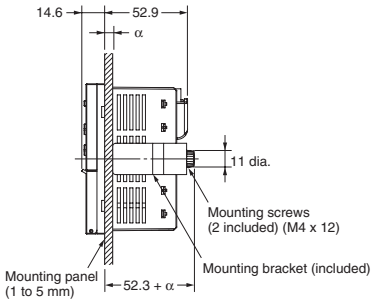


Note: Mounting panel thickness must be 1 to 5 mm.

H8PS-16B□ (16-output Models)
H8PS-32B□ (32-output Models)



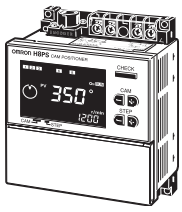
Flush mounting

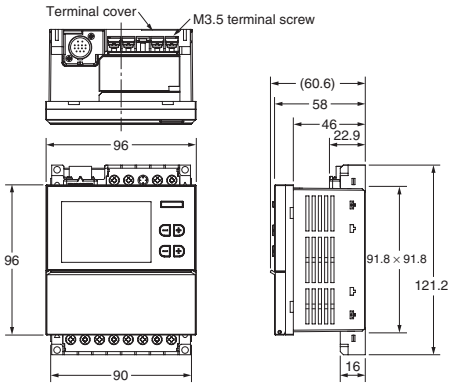


Note: An 8-output Model is shown in the above diagrams. The Encoder is connected from the bottom with 16-/32-output Models.

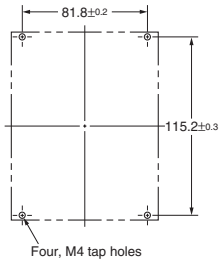
Surface Mounting Models

H8PS-8BF□ (8-output Models)

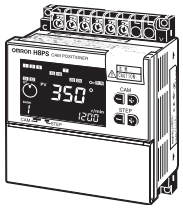


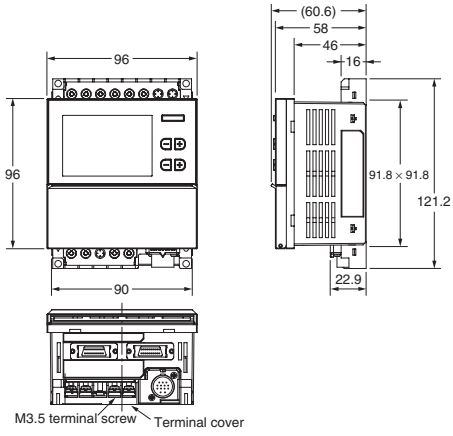


Mounting holes

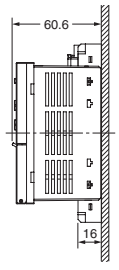


H8PS-16BF□ (16-output Models)
H8PS-32BF□ (32-output Models)

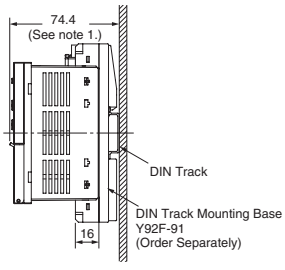




Surface Mounting



Track Mounting

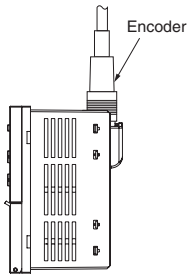


Note: 1. These dimensions vary with the kind of DIN track (reference value).

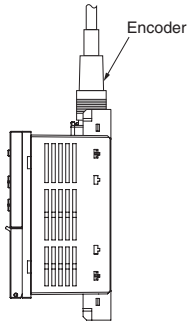
2. An 8-output Model is shown in the above diagrams. The Encoder is connected from the bottom with 16-/32-output Models.

Encoder Connecting Direction

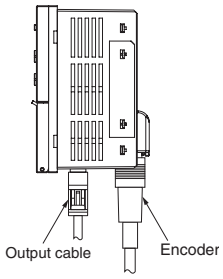
H8PS-8B□



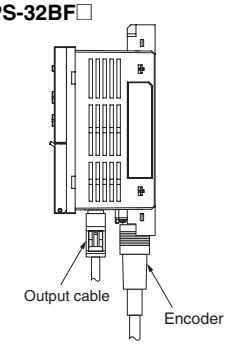
H8PS-8BF□



H8PS-16B□
H8PS-32B□



H8PS-16BF□
H8PS-32BF□

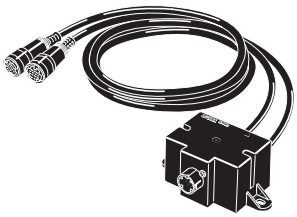


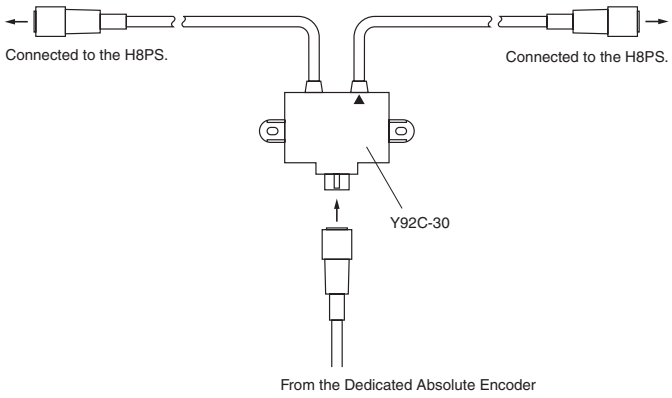
■ Accessories (Order Separately)

Parallel Input Adapters

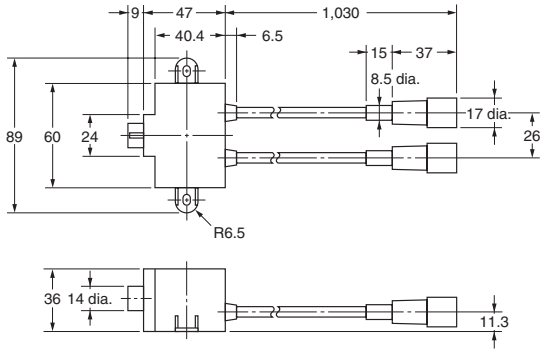
Y92C-30

This Adapter enables two H8PS Cam Positioners to share signals from an Encoder.

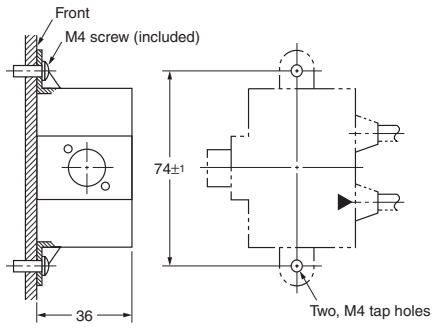




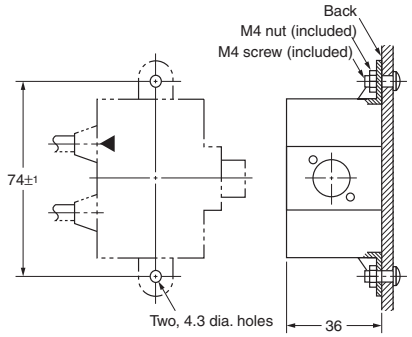
Use the cable marked with a triangle when connecting only one H8PS Cam Positioner to the Parallel Input Adapter.



• Panel Surface Mounting



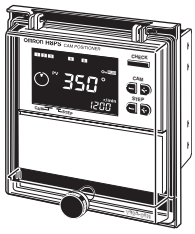
• Panel Back Mounting

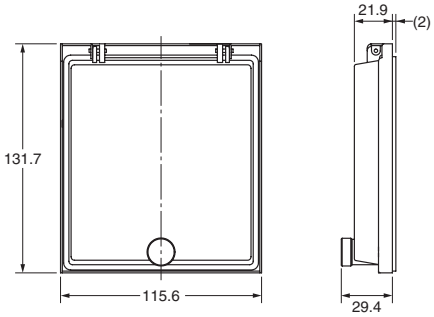


■ Accessories (Order Separately)

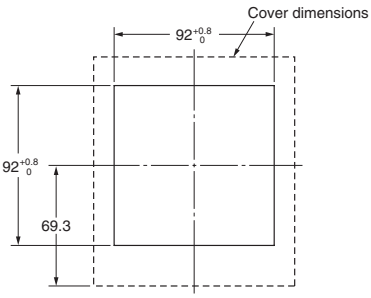
Watertight Cover

Y92A-96N





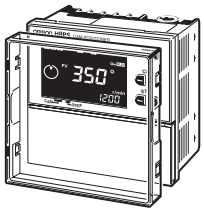
Panel Cutout



Use for flush mounting when waterproofing is required. The Y96A-96N conforms to IP66 and NEMA4 (for indoor use) standards for waterproofing.
The operating environment may cause the waterproof packing to deteriorate, shrink, or harden. Therefore, it is recommended that the packing be replaced regularly.

Protective Cover

Y92A-96B

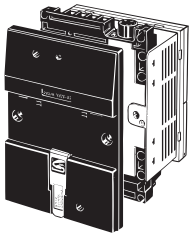


A hardened Y92A-96B Protective Cover is available.
Use it for the following:

- To protect the front panel from dust and dirt.
- To prevents the set value from being altered due to accidental contact with the keys or switches.

DIN Track Mounting Base

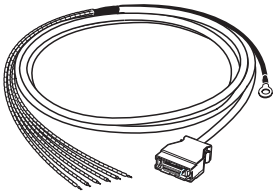
Y92F-91



Discrete Wire Output Cable

Y92S-41-200

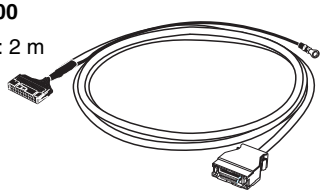
Cable length: 2 m



Connector-type Output Cable

E5ZE-CBL200

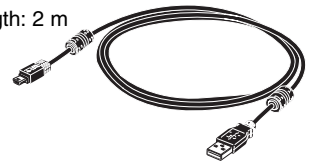
Cable length: 2 m



USB Cable

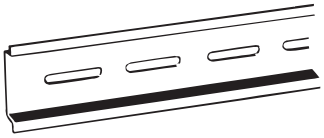
Y92S-40

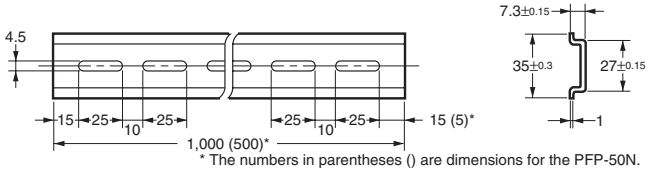
Cable length: 2 m



Mounting Track

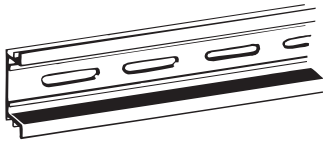
PFP-100N
PFP-50N

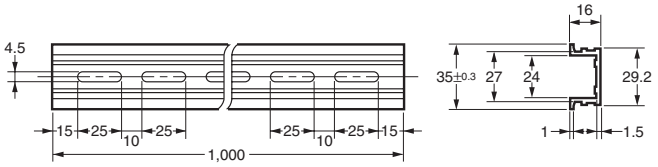




* The numbers in parentheses () are dimensions for the PFP-50N.

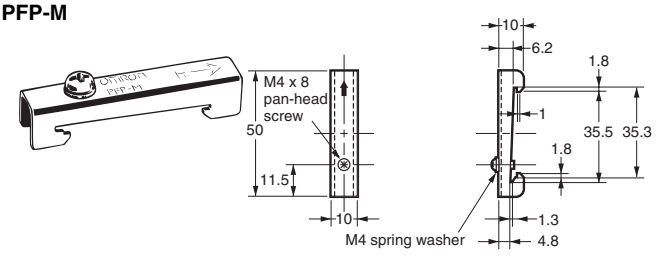
PFP-100N2





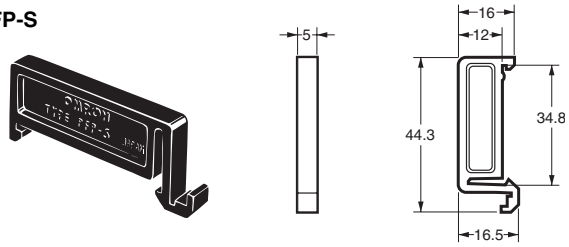
End Plate

PFP-M



Spacer

PFP-S



E6CP-A/E6C3-A/E6F-A Rotary Encoders (Absolute)

- Combining this Encoder with an H8PS Cam Positioner enables high-precision detection of the operation timing of various automatic machines.
- The E6CP-A is a low-cost, money-saving Encoder.
- The standard E6C3-A is well suited to environments subject to water and oil.
- The standard E6F-A is a rigid type that is compatible with high shaft-tolerance applications as well as environments subject to water and oil.

Note: Refer to the relevant datasheet for details.

Ratings and Characteristics

Item		E6CP-AG5C-C	E6C3-AG5C-C	E6F-AG5C-C
Rated supply voltage		12 VDC –10% to 24 VDC +15%, ripple (p-p) 5% max.		
Current consumption (See note 1.)		70 mA max.		60 mA max.
Resolution (pulses per rotation)		256 (8-bit)	256 (8-bit), 360 (9-bit), or 720 (10-bit)	
Output code		Gray binary		
Output configuration		NPN open-collector output		
Output capacity		Applied voltage: 28 VDC max. Sink current: 16 mA max. Residual voltage: 0.4 V max. (sink current at 16 mA)	Applied voltage: 30 VDC max. Sink current: 35 mA max. Residual voltage: 0.4 V max. (sink current at 35 mA)	
Logic		Negative logic (H = 0, L = 1)		
Accuracy		Within ±1°		
Rotation direction		Clockwise (viewed from the shaft) for output code increment		
Rise and fall times of output		1.0 μs max. (control output voltage: 16 V; load resistance: 1 kΩ; output cord: 2 m max.)	1.0 μs max. (control output voltage: 5 V; load resistance: 1 kΩ; output cord: 2 m max.)	
Starting torque		0.98 m N·m max.	10 m N·m max. (at room temperature), 30 m N·m max. (at low temperature)	9.8 m N·m max. (at room temperature), 14.7 m N·m max. (at low temperature)
Moment of inertia		1×10^{-6} kg·m^2 max.	2.3×10^{-6} kg·m^2 max.	1.5×10^{-6} kg·m^2 max.
Shaft-load tolerance	Radial	30 N	80 N	120 N
	Thrust	20 N	50 N	
Max. permissible rotation		1000 r/min	5000 r/min	
Ambient temperature		–10 to 55°C (with no icing)	–10 to 70°C (with no icing)	
Storage temperature		–25 to 85°C (with no icing)		–25 to 80°C (with no icing)
Ambient humidity		35% to 85% (with no condensation)		
Degree of protection		IEC standard IP50	IEC standard IP65 (JEM standard IP65f) (See note 2.)	IEC standard IP65 (JEM standard IP65f)
Insulation resistance		20 MΩ min. (at 500 VDC) between charged parts and the case		
Dielectric strength		500 VAC, 50/60 Hz for 1 min between charged parts and the case		
Vibration resistance		Destruction: 10 to 55 Hz,1.5-mm double amplitude for 2 hr each in X, Y, and Z directions	Destruction: 10 to 500 Hz, 2-mm double amplitude, 150 m/s^2 3 times each in X, Y, and Z directions, 11-min sweep time	Destruction: 10 to 500 Hz,1.5-mm double amplitude 3 times each in X, Y, and Z directions, 11-min sweep time
Shock resistance		Destruction: 1000 m/s^2 3 times each in X, Y, and Z directions		
Weight		Approx. 200 g (with 2-m cord)	Approx. 300 g (with 1-m cord)	Approx. 500 g (with 2-m cord)
Datasheet Cat. No.		---	F058	E283

Note: 1. The following inrush currents flow when the power is turned ON.
E6CP-AG5C-C: Approx. 8 A (time: approx. 0.3 ms),
E6C3-AG5C-C: Approx. 6 A (time: approx. 0.8 ms),
E6F-AG5C-C: Approx. 9 A (time: approx. 5 μs)

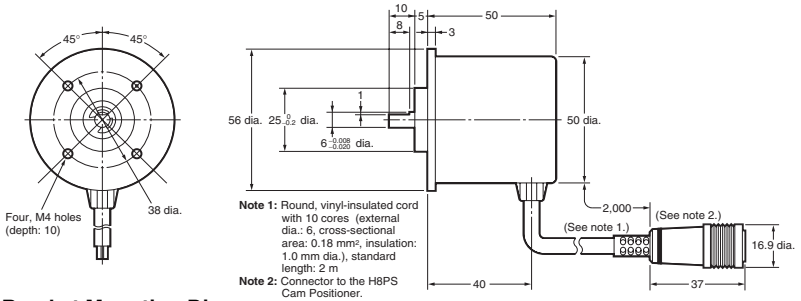
2. JEM1030: Applicable as of 1991

Dimensions

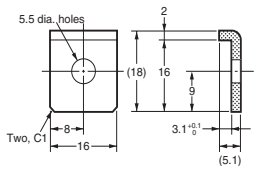
Note: All units are in millimeters unless otherwise indicated.

E6CP-AG5C-C

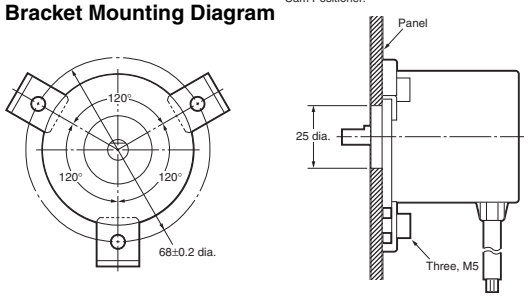
Note: Order the E69-C06B Coupling separately.



Accessory
Mounting Bracket (Included)

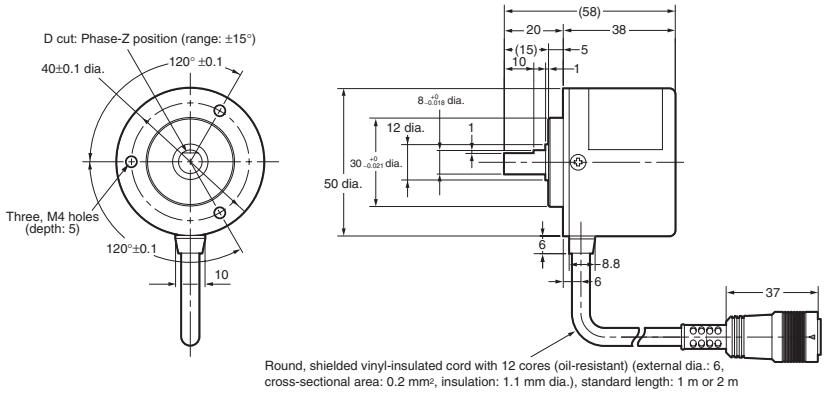


Bracket Mounting Diagram

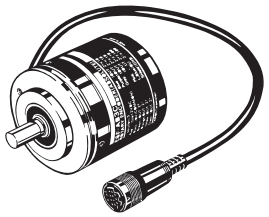


E6C3-AG5C-C

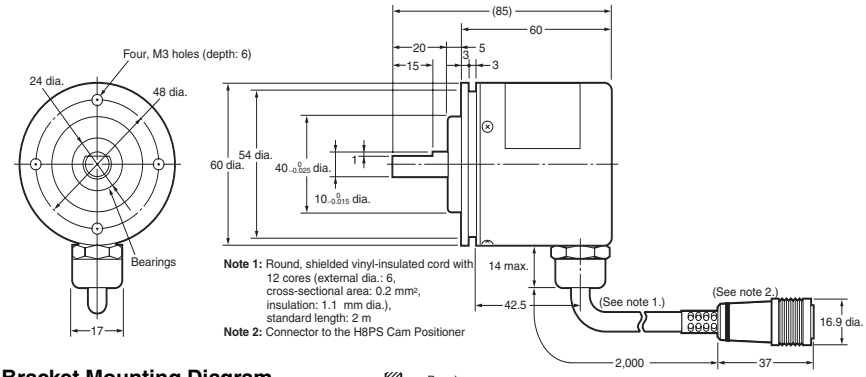
Note: Order the E69-C08B Coupling separately.



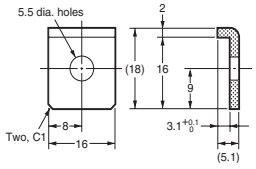
E6F-AG5C-C



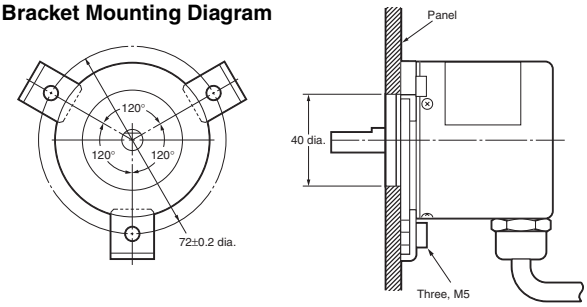
Note: Order the E69-C10B Coupling separately.



Accessory
Mounting Bracket (included)

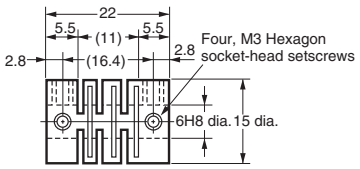


Bracket Mounting Diagram



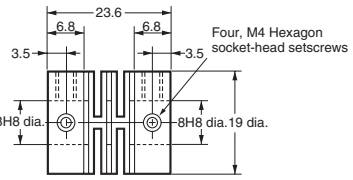
Accessories (Order Separately)

E69-C06B Shaft Coupling (for the E6CP)



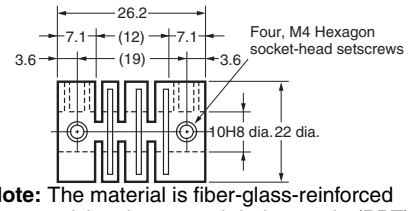
Note: The material is fiber-glass-reinforced polybutylene terephthalate resin (PBT).

E69-C08B Shaft Coupling (for the E6C3)



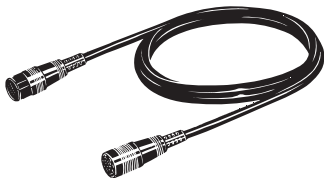
Note: The material is fiber-glass-reinforced polybutylene terephthalate resin (PBT).

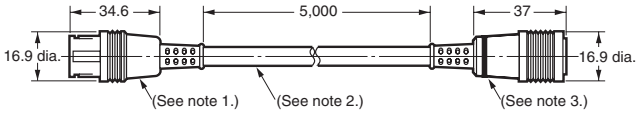
E69-C10B Shaft Coupling (for the E6F)



Note: The material is fiber-glass-reinforced polybutylene terephthalate resin (PBT).

E69-DF5 Extension Cable





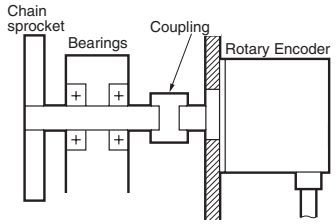
Note 1: E6F-AG5C-C, E6CP-AG5C-C, and E6C3-AG5C-C Connectors for the H8PS.
Note 2: 6-dia., 12-core shielded cord (cross-sectional area: 0.2 mm^2, insulation: 1.1 mm dia.), standard length: 5 m
Note 3: Connected to the H8PS Cam Positioner.

Note: Refer to "Characteristics" on page 102 for the maximum cable length.

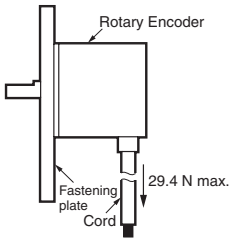
Safety Precautions (Encoder)

■ Precautions for Correct Use

- Do not subject the E6CP Encoder to oil or water.
- The Encoder consists of high-precision components. Handle it with utmost care and do not drop it, otherwise malfunctioning may result.
- When connecting the shaft of the Encoder with a chain timing belt or gear, connect the chain timing belt or gear with the shaft via a bearing or coupling as shown in the following diagram.



- If the decentering or declination value exceeds the tolerance, an excessive load imposed on the shaft may damage or shorten the life of the Encoder.
- Do not place excessive loads on the shaft if the shaft is connected to a gear.
- The tightening torque must not exceed the value given in the table at the right when the Rotary Encoder is mounted with screws.
- Do not pull wires with a force greater than 29.4 N while the Rotary Encoder is secured and wired.



- Do not subject the shaft to shock. Therefore, do not strike the shaft or coupling with a hammer when inserting the shaft into the coupling.
- Make sure there is no foreign matter in the Connector before connecting it to the Encoder.

Mounting Procedure

1. Insert the shaft into the Coupling. — Do not secure the Coupling and shaft with screws at this time.
2. Secure the Encoder.
3. Secure the Coupling.
4. Connect the power and I/O lines. — Be sure to turn OFF the Encoder before connecting the lines.
5. Turn ON the power and check the outputs.

Refer to the table for the maximum insertion lengths of the shaft into the Coupling.

Coupling	Maximum insertion length
E69-C06B	5.5 mm
E69-C08B	6.8 mm
E69-C10B	7.1 mm

Coupling	Tightening torque
E69-C06B	0.25 N·m
E69-C08B	0.44 N·m
E69-C10B	0.44 N·m

Safety Precautions (Cam Positioner)

⚠ CAUTION	
Tighten terminal screws to a torque of 0.80 N·m so that they do not become loose. Minor fires or malfunction may occasionally occur.	
For 16- and 32-output Models, leave the protective label attached to the H8PS when wiring. Removing the label before wiring may occasionally result in fire if foreign matter enters the Unit. Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may occasionally result in fire.	
Do not disassemble, modify, or repair the H8PS or touch any of the internal parts. Otherwise, minor electric shock, fire, or malfunction may occasionally occur.	
Do no allow metal fragments, lead wire scraps, or chips from processing during installation to fall inside the H8PS. Otherwise, minor electric shock, fire, or malfunction may occasionally occur.	
Do not touch the terminals when power is being supplied. For Surface-mounting H8PS, always connect the terminal cover for after completing wiring. Otherwise, minor injury due to electric shock may occasionally occur.	

■ Precautions for Safe Use

Observe the following items to ensure the safe use of this product.

Environmental Precautions

- Store the H8PS within specified ratings. If the H8PS has been stored at temperatures −10°C or lower, let it stand for 3 hours or longer at room temperature before turning ON the power supply.
- Use the H8PS within the specified ratings for operating temperature and humidity.
- Do not operate the H8PS in locations subject to sudden or extreme changes in temperature, or locations where high humidity may result in condensation.
- Do not use the H8PS in locations subject to vibrations or shock. Extended use in such locations may result in damage due to stress.
- Do not use the H8PS in locations subject to excessive dust, corrosive gas, or direct sunlight.
- Install the H8PS well away from any sources of static electricity, such as pipes transporting molding materials, powders, or liquids.
- The H8PS is not waterproof or oil resistant.
  Do not use it in locations subject to water or oil.
- The life expectancy of internal components may be reduced if the H8PS is mounted side-by-side.
- Do not use organic solvents (such as paint thinner or benzine), strong alkaline, or strong acids because they will damage the external finish.

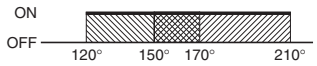
Usage Precautions

- Install a switch or circuit breaker that allows the operator to immediately turn OFF the power, and label it to clearly indicate its function.
- Pay careful attention to polarity to avoid wrong connections when wiring terminals.
- Do not connect more than two crimp terminals to the same terminal.
- Use the specified wires for wiring.
  Applicable Wires

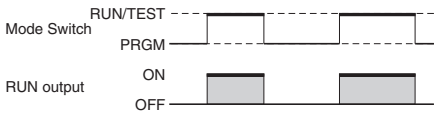
  AWG24 to AWG18 (cross-sectional area of 0.208 to 0.832 mm^2)
  Solid or twisted wires of copper
- Do not connect loads that exceed the rated output current. The output elements may be destroyed, possibly resulting in short-circuit or open-circuit faults.
- Always connect a diode to protect against counterelectromotive force when using an inductive load. Counterelectromotive force may destroy output elements, possibly resulting in short-circuit or open-circuit faults.
- Use the specified cables to connect outputs.
- Do not install input lines in the same duct or conduit as power supply or other high-voltage lines. Doing so may result in malfunction due to noise. Separate the input lines from high-voltage lines.
- Internal elements may be destroyed if a voltage outside the rated voltage is applied.
- Maintain voltage fluctuations in the power supply within the specified range.
- Use a switch, relay, or other contact so that the rated power supply voltage will be reached within 0.1 s. If the power supply voltage is not reached quickly enough, the H8PS may malfunction or outputs may be unstable.
- Do not turn OFF the power supply when changing or deleting settings. The contents of the EEPROM may be corrupted.

■ Precautions for Correct Use

- A cam output will remain ON if the set angles for two steps overlap for the same cam number.
  Step 1: 120° ON → 170° OFF
  Step 2: 150° ON → 210° OFF

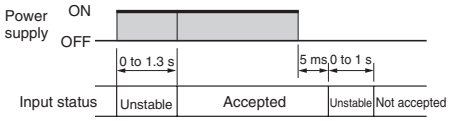


- A step will produce no output if the ON and OFF angle for the step are the same.
- The RUN output does not turn ON during programming.

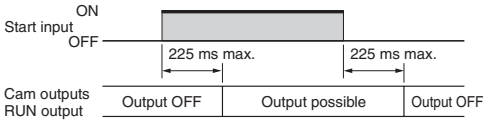


Note: The RUN output turns ON with the timing shown in the diagram, but it remains OFF when an error occurs. Thus, you can use the output as a timing signal during operation, including trial operation.

- Input signals may be accepted, not accepted, or unstable for the following times when the power supply is turned ON or OFF. Set the system to allow leeway in the timing of input signals. Approx. 1 second is required from the time the power supply is turned ON until outputs are made. Refer to the *Operation Manual* (Cat. No. Z199) for information on other timing.



- When using 16-/32-output Modules, the operation timing of the outputs will be as shown below in relation to the ON/OFF timing of the start input. Refer to *Bank Functions (F7/F8/F9)* on page 127 when switching banks.



- Do not subject H8PS Connectors (outputs, Encoder) to more than 30 N of force.
- Confirm the waveform of the power supply circuit and install a surge absorber. Surge or noise applied to the power supply may destroy internal elements or cause malfunctions.
- Switch the power supply circuit with a device rated at 3.5 A or higher.
- Inrush current of approximately 3.5 A will flow for a short period of time when the power supply is turned ON. The H8PS may not start if the capacity of the power supply is not sufficient. Be sure to use a power supply with sufficient capacity.
- EEPROM is used as memory when the power is interrupted. The write life of the EEPROM is 100000 writes. The EEPROM is written when settings are changed or deleted or when the resolution is changed.
- Make sure that all settings are appropriate for the application. Unexpected operation resulting in property damage or accidents may occur if the settings are not appropriate.
- Connect all negative (–) terminals, COM terminals, and Vs terminals.
- When using the Y92C-30 Parallel Input Adapter for parallel operation, do not connect more than two H8PS Cam Positioners to the same Encoder.

Refer to the following manual for precautions in using the Cam Positioner and other information required for operation:
H8PS Cam Positioner Operation Manual (Cat. No. Z199)

Operating Procedures

■ Flow of Operation

Initial Settings

Setting Resolution and Rotation Direction
The Encoder resolution and rotation direction is set on a DIP switch.
⇒ For details on the setting methods, refer to page 21.

Setting the Origin
The Encoder is mounted to the machine and the origin for operation is determined.
⇒ For details on the setting methods, refer to page 21.

Setting Functions (Advanced function)
Parameters can be set in Function Setting Mode to perform more advanced operations.
⇒ For details, refer to page 26 *Advanced Functions*.

Programming Cams (Programming Mode)

Setting ON/OFF Angles
There are three methods that can be used to set or change ON/OFF angles (i.e., cam programming).
- Using the ANGLE Keys (Manual Mode)
- Actually turning the Encoder (Teaching Mode)
- Setting from personal computer using Support Software (order separately)

⇒ For details on the setting methods, refer to pages 22 to 23.

Setting the ADV Function (Advanced function)
Advance angle compensation (ADV) function can be set if required.
⇒ For details on the setting methods, refer to page 27.

Checking Timing (Test Mode)
The machine is operated and outputs are actually made to check the timing of operation.
If the timing of operation is not correct, it can be changed.
⇒ For details, refer to page 23.

Operation (Run Mode)
Operation is started.
⇒ For details, refer to page 24.

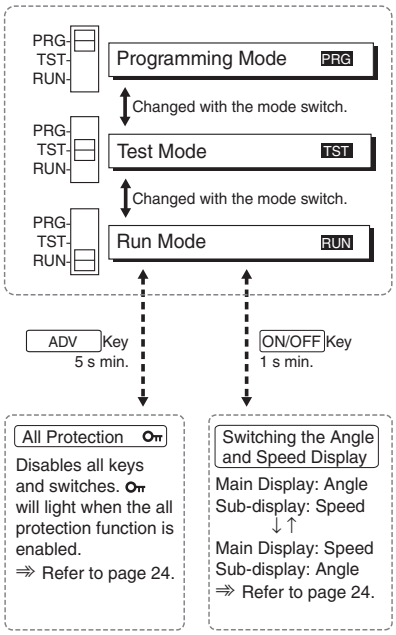
Checking ON/OFF Angle Settings
The ON/OFF angles that have been set can be checked.
⇒ For details, refer to page 24.

Clearing Settings
Deletes settings. There are two methods that can be used to delete settings.
- Clearing all programs (deletes all programming)
- Clearing individual steps, cams, and banks

⇒ For details, refer to page 25.

■ Settings for Basic Functions

Changing the Mode



Programming Mode

Used to write cam programs, set the advance angle compensation function, etc.
All outputs will remain OFF.

Test Mode

Used to write cam programs, set the advance angle compensation function, and perform other operations while actually turning ON outputs to confirm operation timing. This mode is also used to adjust settings during operation.

Run Mode

Used for normal operation. Settings, such as writing cam programs and setting the advance angle compensation function, cannot be performed.

Setting Resolution and Rotation Direction

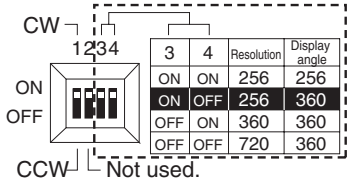
One of three resolutions can be selected for the Encoder connected to the H8PS: 256, 360, or 720. The resolution and display angle are set here.

Turn OFF the power supply.

↓

Set the display angle and the Encoder resolution.

Open the front cover at the lower part of the H8PS and set pins 3 and 4 on the DIP switch.



3	4	Resolution	Display angle
ON	ON	256	256
ON	OFF	256	360
OFF	ON	360	360
OFF	OFF	720	360

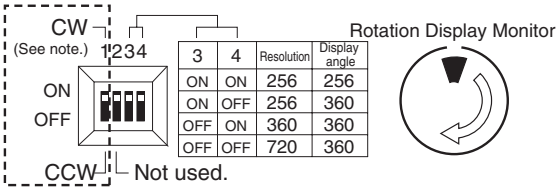
(See note 2.)

Note 1: Default settings are shown in reverse type.
Note 2: When using an Encoder with a resolution of 256, displaying 360° directly is not possible. The H8PS thus provides a convenient setting that enables converting the display and settings to 360° when using an Encoder with a resolution of 256. When using a 360° display, however, some angles will not be displayed.

↓

Check the rotation direction of the machine (Encoder).

Turn ON the power supply.
Turn the Encoder in the actual direction of operation and confirm that the rotation display monitor turns clockwise.
If the monitor turns counterclockwise, turn OFF the power supply and change pin 1 on the DIP switch to CCW.



3	4	Resolution	Display angle
ON	ON	256	256
ON	OFF	256	360
OFF	ON	360	360
OFF	OFF	720	360

Note: Default setting.

↓

Connect the machine (Encoder) and turn ON the power supply.

↓

End of preparations.

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

Setting the Origin

The origin of the Cam Positioner is set to match the origin of the machine (Encoder). The same origin is used for all banks.
(The bank function is supported only for 16-/32-output models.)

Example: Setting the Present Angular Position of 150° to 0°

Change the mode. — Set the mode switch to PRGM.

↓

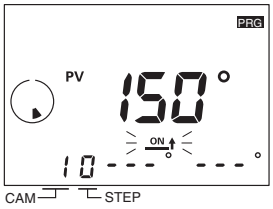
Set the programming mode switch. — Set the programming mode switch to TCH.

Mode	Programming mode
PRG TST RUN	TCH MAN

↓

Set the machine to its origin.

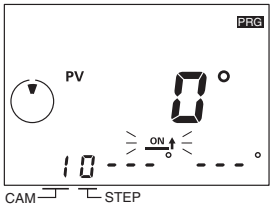
Turn the machine (Encoder) to the position of the desired origin (150° in this example).



↓

Specify the origin.

Press the ORIGIN Key. (See note.)
In approx. 1 s, the present angular position display will change to 0° and the previous display will return.



Note: With 16-/32-output models, the origin input from the terminal block can be turned ON to specify the origin.

↓

End

Setting ON/OFF Angles in Manual Mode

ON/OFF angles can be set manually using the ANGLE Keys [+] [−] on the front of the Cam Positioner.

Example: Setting Step 1 of Cam No. 2 to Turn ON at 28° and Turn OFF at 51°

Change the mode. Set the mode switch to PRGM.

Set the programming mode switch. Set the programming mode switch to MAN.

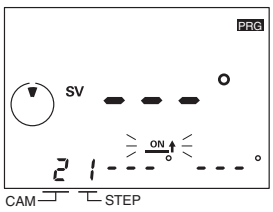
Mode	Programming mode
PRGM TEST RUN	TCH MAN

Set the bank No. Banks can be specified only for 16-/32-output models.

- Press the [BANK] Key to specify the bank number and then press the [WRITE] Key.

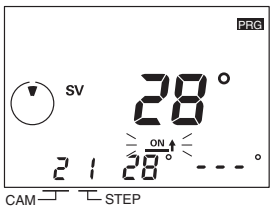
Set the cam and step No.

- Press the CAM Keys [+] [−] to specify cam No. 2.
- Press the STEP Keys [+] [−] to specify step No. 1.



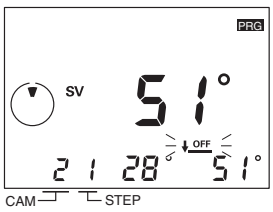
Set the ON angle.

- Press the [ON↑ ↓OFF] Key to flash the "ON↑".
- Press the ANGLE Keys [+] [−] to set an angle of 28 and then press the [WRITE] Key.



Set the OFF angle.

- Press the [ON↑ ↓OFF] Key to flash the "↓OFF".
- Press the ANGLE Keys [+] [−] to set an angle of 51 and then press the [WRITE] Key.



End

Note: Pressing the [+] or [−] Key continually will automatically increment or decrement the value. Pressing the other key during automatic increment or decrement will increase the speed.

Setting ON/OFF Angles in Teaching Mode

ON/OFF angles can be set based on actual machine (Encoder) operation.

Example: Setting the ON/OFF Angles by Teaching Step 2 of Cam No. 3

Change the mode. Set the mode switch to PRGM.

Set the programming mode switch. Set the programming mode switch to TCH.

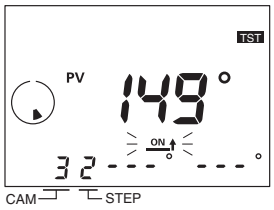
Mode	Programming mode
PRGM TEST RUN	TCH MAN

Set the bank No. Banks can be specified only for 16-/32-output models.

- Press the [BANK] Key to specify the bank number and then press the [WRITE] Key.

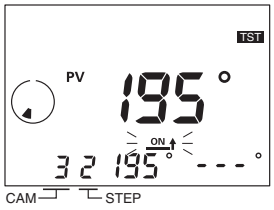
Set the cam and step No.

- Press the CAM Keys [+] [−] to specify cam No. 3.
- Press the STEP Keys [+] [−] to specify step No. 2.



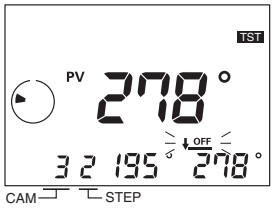
Set the ON angle.

- Press the [ON↑ ↓OFF] Key to flash the "ON↑".
- Turn the machine (Encoder) to the desired ON angle. (195° in this example)
- Press the [WRITE] Key.



Set the OFF angle.

- Press the [ON↑ ↓OFF] Key to flash the "↓OFF".
- Turn the machine (Encoder) to the desired OFF angle. (278° in this example)
- Press the [WRITE] Key.



End

Setting ON/OFF Angles Using Support Software

With 16-/32-output models, programs can be uploaded or downloaded easily with the optional Support Software (H8PS-SOFT-V1) by connecting a personal computer to the Cam Positioner using the optional Y92S-40 USB cable.

Support Software Functions

- Writing cam programs
- Setting functions
- Editing, saving, and printing programs
- Displaying and printing cam program operation charts
- Simple simulations of programs

  Applicable OS: Windows 98, 2000, ME, or XP

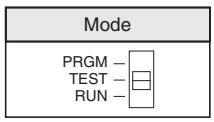
Refer to the user's manual for the Support Software for details.

Checking Timing (Test Mode)

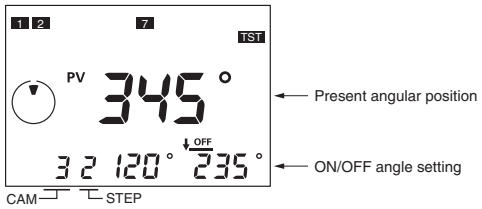
Testing Operation

Operation can be tested to check operation timing.

- Set the mode switch to TEST.



- Operate the Encoder and check the timing of operation.



- If the timing is not correct, change the ON/OFF angle settings. The settings can be changed in Test Mode.

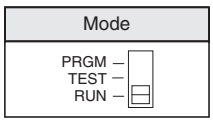
Note: 1. Outputs will turn ON and OFF in Test Mode. Confirm system safety before switching to Test Mode.

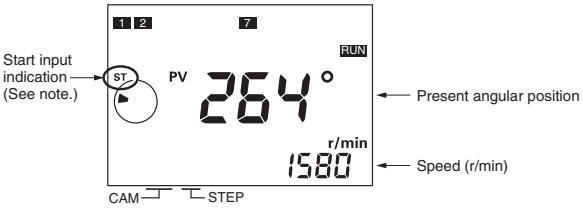
2. With 16-/32-output model, be sure to turn ON the start input. Outputs are not turned ON unless the start input is turned ON.

Operation (Run Mode)

Starting Operation

- Set the mode switch to RUN to start operation.

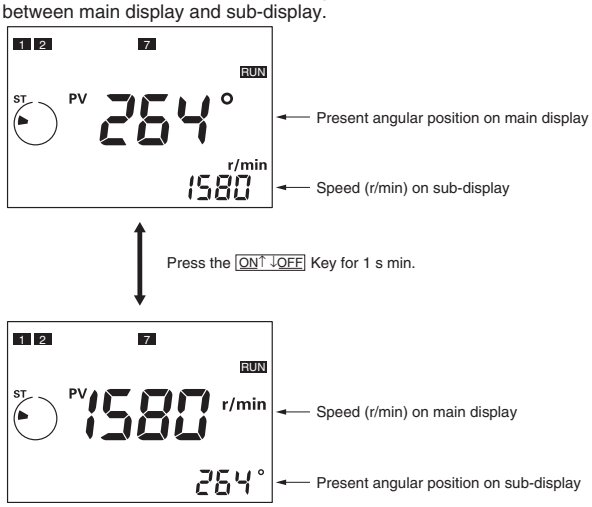




Note: For 16/32-output models, be sure that the start input is ON and that the start input indicator is lit. Outputs (including the cam, pulse, and run outputs) will not function if the start input is OFF. The 8-output models do not have a start input.

Switching the Angle and Speed Displays

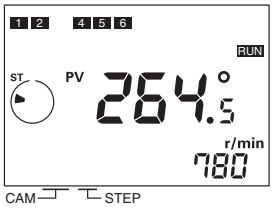
- Press the ON↑ ↓OFF Key for at least 1 s in Run Mode to reverse the display positions of the present angular position and speed (r/min) between main display and sub-display.



All Protection Function

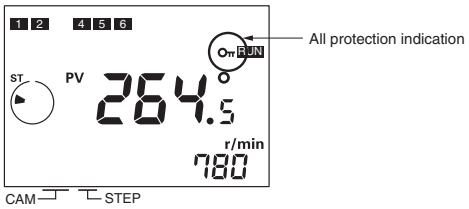
The all protection function locks the H8PS in Run Mode and prohibits any changes to settings. It can be used to prevent incorrect or unauthorized operation. If the ADV Key is pressed for at least 5 s in Run Mode, the All Protection indicator will light on the display and all keys and switches will be disabled. If the mode switch is changed to Programming or Test Mode while protection is enabled, the All Protection indicator will flash to indicate that settings cannot be changed. If a setting on the DIP switch is changed while protection is enabled, the All Protection indicator will flash when the power supply is turned ON to indicate that settings cannot be changed.

All Protection Function Disabled (Normal Operation)



Press the ADV Key for 5 s min.

All Protection Function Enabled



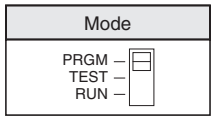
Checking ON/OFF Angle Settings

- During Run Mode, the CAM Keys ⊞⊟ and STEP Keys ⊞⊟ can be used to check the ON/OFF angle settings for any step. Also, the CHECK Key can be pressed to check the ON/OFF angle settings in order for all steps starting from cam 1. If there is no key operation for 10 s or longer during the checking operation, the previous display will be resumed.

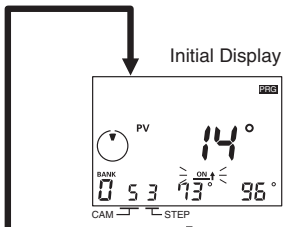
Clearing Settings

Clearing All Programs

The all clear function can be used to delete all cam programs, the settings for advance angle compensation function, and all other settings. All settings in the Function Setting Mode will be returned to their default settings.



Set the mode switch to PRGM or TEST.

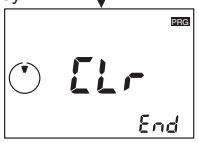


Press the CLEAR Key for 3 s min.

Confirm that CLr flashes on the display.

CLEAR Key

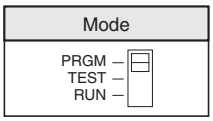
Press the WRITE Key.



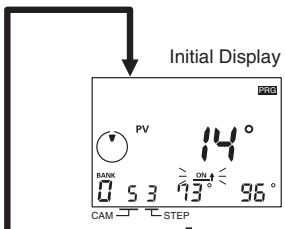
After the completion of all clear processing, the screen displays End for approximately one second and then resume the previously displayed screen. If the CLEAR Key is pressed again before pressing the WRITE Key, the settings will not be deleted and the previous display will be resumed.

Clearing Individual Steps, Cams, and Banks

ON/OFF angle settings can be deleted by step, by cam, or by bank. If settings are deleted by cam, the settings for the advance angle compensation (ADV) function will not be deleted. If settings are deleted by bank, the settings for the ADV function will also be deleted. Settings in the Function Setting Mode will not be deleted.

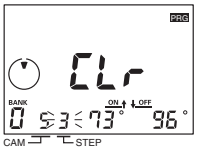


Set the mode switch to PRGM or TEST.

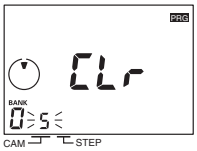


Press the CLEAR Key.

Screens for Individually Clearing Items



Deleting Settings by Step
Press the STEP Keys + − to specify the step to be deleted.

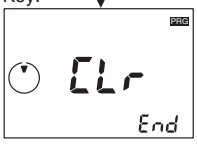


Deleting Settings by Cams
Press the CAM Keys + − to specify the cam to be deleted.

Deleting Settings by Banks
Press the BANK Key to specify the bank to be deleted.

CLEAR Key.

Press the WRITE Key.

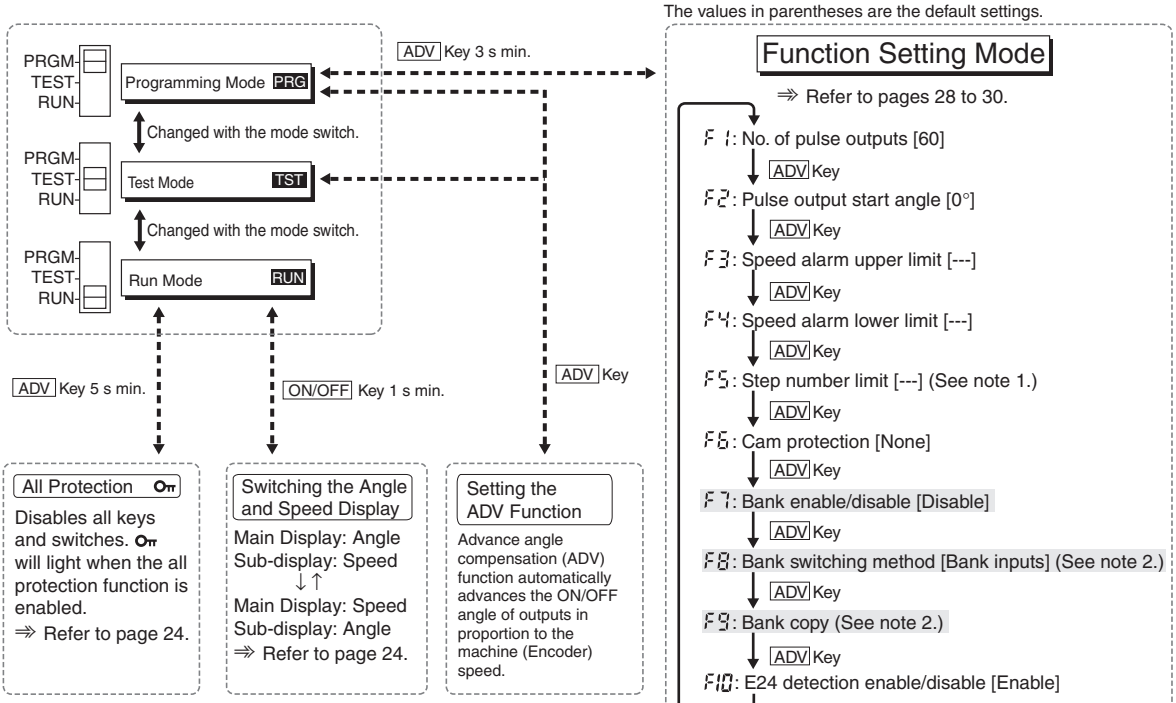


After the completion of all clear processing, the screen displays End for approximately one second and then resume the previously displayed screen. If the CLEAR Key is pressed again before pressing the WRITE Key, the settings will not be deleted and the previous display will be resumed.

■ Advanced Functions

Set the advanced functions as required to perform more advanced operation. Outlines of the advanced functions are provided on the following pages. For details, refer to the *Operation Manual* (Cat. No. Z199).

Mode Transitions

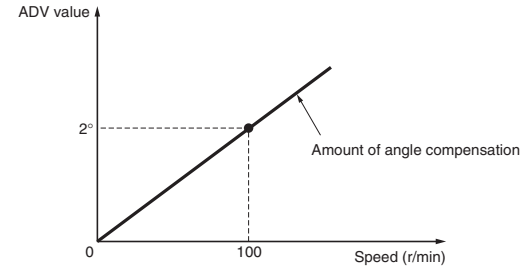


Note 1: The default setting is for 10 steps for all cams.
Note 2: Not displayed when F7 is disabled.

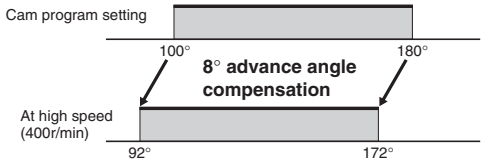
Advance Angle Compensation (ADV) Function

The advance angle compensation function automatically advances the ON/OFF angle of cam outputs in proportion to machine (encoder) speed. As the speed of the machine increases, the system can be affected by the delay in outputs. If the ADV function is used, the output delay caused by higher speeds is automatically compensated.

As shown in the following diagram, ADV function is used to linearly compensate outputs according to the speed based on the ADV value setting for a specific speed.



Note: The maximum amount of angle compensation is 360°.



Example: ADV Value Set to 2° at 100 r/min

ADV value can be set independently for cams 1 to 7 (7 total). For the ADV function, the speed and the amount of angle compensation are set. If "- - -" is displayed for any setting, the ADV function is disabled.

The setting ranges are given in the following table.

Encoder		Speed	ADV value
Resolution	Display angle		
256	256	"- - -", 1 to 1,600	"- - -", 0 to 255
256	360	"- - -", 1 to 1,600	"- - -", 0 to 359
360	---	"- - -", 1 to 1,600	"- - -", 0 to 359
720	---	"- - -", 1 to 800	"- - -", 0 to 359.5

Note: Default settings are shown in reverse type.

The maximum response speed will decrease as shown in the following table when ADV values are set for 4 cams or more.

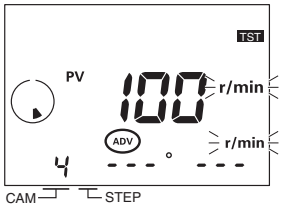
Number of cams with ADV settings	Encoder resolution	Max. response speed
0 to 3	256/360	1,600r/min
	720	800r/min
4 to 7	256/360	1,200r/min
	720	600r/min

Note: Even if the ADV value is set to 0°, the cam must be included in the number of cams with ADV settings.

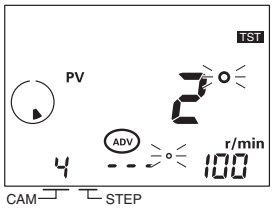
Example: Setting the ADV Value to 2° at 100 r/min for Cam 4

1. Set the mode switch to PRGM or TEST.
2. Set cam number 4 with the CAM Keys ⊞⊟. (See note.)
3. Press the ADV Key to move to the ADV function setting display and confirm that "ADV" is displayed.

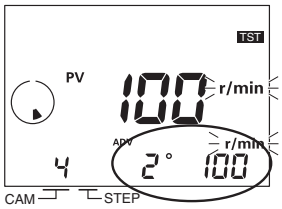
Setting Display



4. Set the speed to 100 with the ANGLE Keys ⊞⊟ and then press the WRITE Key.



5. Set the ADV value to 2 with the ANGLE Keys ⊞⊟.



6. Press the WRITE Key to write the settings to memory.

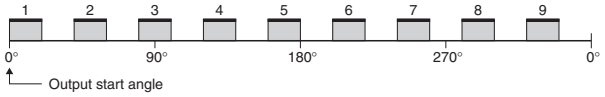
7. Press the ADV Key after finishing setting the ADV function. The previous display in Programming or Test Mode will be resumed.

Note: If the bank function is being used, set the bank number before setting the cam number.

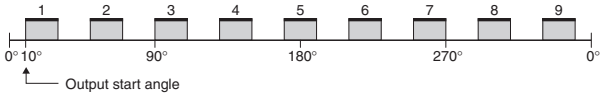
Pulse Output (F1/F2)

Outputs a preset number of pulses per Encoder rotation. Pulses are output at a 1:1 ON/OFF ratio and pulse output can be started from a specified angle.

Operation for 9 Output Pulses and a Start Angle of 0°



Operation for 9 Output Pulses and a Start Angle of 10°



Number of Output Pulses (F1)

Select the number of pulses per rotation from the following table.

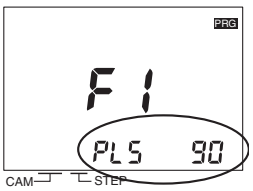
Encoder resolution	Settable number of pulses
256	1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, **60**, 90
360	1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, **60**, 90, 180
720	1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30, 36, 40, 45, **60**, 72, 90, 120, 180, 360

Note: Default settings are shown in reverse type.

Example: Setting 90 Pulses per Rotation

The number of pulses is set using the F1 menu in the Function Setting Mode.

Setting Display



Set the number of pulses with the ANGLE Keys ⊞⊟ and then press the WRITE Key.

Pulse Output Start Angle (F2)

The setting ranges are given in the following table.

Encoder		Start angle
Resolution	Display angle	
256	256	**0** to 255°
256	360	**0** to 359° (See note 2.)
360	---	**0** to 359°
720	---	**0** to 359.5°

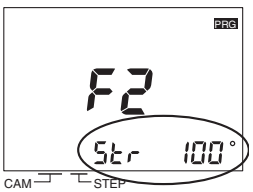
Note: 1. Default settings are shown in reverse type.

2. The output accuracy is 2° maximum, so not all angles can be set.

Example: Setting the Pulse Output Start Angle to 100°

The starting angle for pulse outputs is set using the F2 menu in the Function Setting Mode.

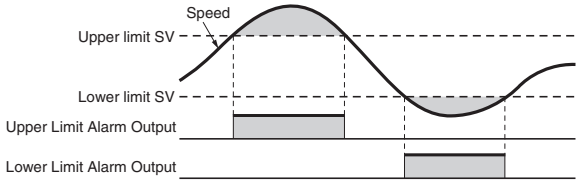
Setting Display



Set the pulse output start angle to 100 with the ANGLE Keys ⊞⊟ and then press the WRITE Key.

Speed Alarm Outputs (F3/F4)

Specific cam outputs can be used as Encoder speed alarm outputs. Alarms can be output for upper and lower speed limits.



The speed alarm outputs are assigned to cam outputs as shown in the following table. The speed alarms are set to "- - -" for the default settings, i.e., the normal cam outputs are enabled. If a speed alarm is set to any value but "- - -", the normal cam output for the corresponding cam number will be disabled.

	Upper Limit Alarm Output	Lower Limit Alarm Output
H8PS-8□ (8 outputs)	Cam 7	Cam 8
H8PS-16□ (16 outputs)	Cam 15	Cam 16
H8PS-32□ (32 outputs)	Cam 31	Cam 32

The setting ranges for the upper and lower limits speed alarm are given in the following table.

Encoder resolution	Speed
256, 360	"**- - -**" or 0 to 1,600 r/min
720	"**- - -**" or 0 to 800 r/min

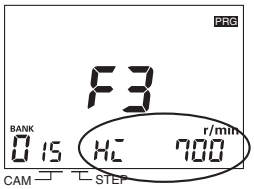
Note: Default settings are shown in reverse type.

Speed Alarm Upper Limit (F3)

Example: Setting the Upper Limit Set Value to 700 r/min for a 16-output Model

The upper limit set value is set using the F3 menu in the Function Setting Mode.

Upper Limit Setting Display



Set the upper limit set value to 700 with the ANGLE Keys ⊞⊟ and then press the WRITE Key. (See note.)

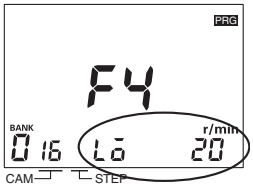
Note: If banks are being used, the bank number must be set.

Speed Alarm Lower Limit (F4)

Example: Setting the Lower Limit Set Value to 20 r/min for a 16-output Model

The lower limit set value is set using the F4 menu in the Function Setting Mode.

Lower Limit Setting Display



Set the upper limit set value to 20 with the ANGLE Keys ⊞⊟ and then press the WRITE Key.

Note: If banks are being used, the bank number must be set.

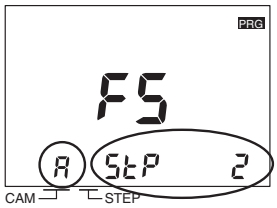
Step Number Limit (F5)

With the H8PS, up to 10 steps can be set to turn the output ON/OFF 10 times for each cam. The number of steps that can be set, however, can be restricted to prevent programming from being added through operating mistakes. Settings can be made for all cams at once or each cam individually. The default setting for the Step Number Limit is 10 steps for all cams.

Example: Limiting the Number of Steps to 2 for All Cams Collectively.

The maximum number of steps to be set is set using the F5 menu in the Function Setting Mode.

Display for Collective Settings



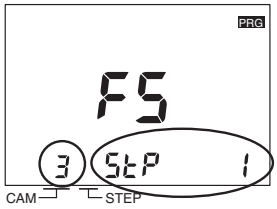
Set the cam number to A with the CAM Keys [+][−] and set the maximum number of steps to 2 with the Angle Keys [+][−]. Press the WRITE Key to write the setting to memory.

The cam number can be set to A on the setting display to set all cams at once. If the number of steps is displayed as "- - -" when the cam number is A, the collective settings for all cams are disabled.

Example: Limiting the Number of Steps to 1 for Cam 3.

The maximum number of steps to be set is set using the F5 menu in the Function Setting Mode.

Display for Individual Settings



Set the cam number to 3 with the CAM Keys [+][−] and set the maximum number of steps to 1 with the Angle Keys [+][−]. Press the WRITE Key to write the setting to memory.

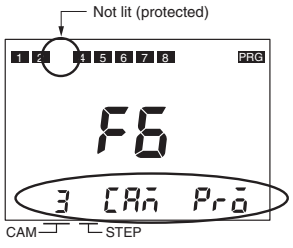
Cam Protection (F6)

Cam programs can be write-protected. Use this setting to protect the programs for only specific cam numbers. Protected cam numbers will not be displayed in Programming Mode or Test Mode. Writing or changing programs will not be possible. Protected cam numbers will also not be displayed in Run Mode and cannot be checked. The default settings are for no protection for all cams.

Example: Protecting Cam 3 with an 8-output Model

Cam protection is set using the F6 menu in the Function Setting Mode.

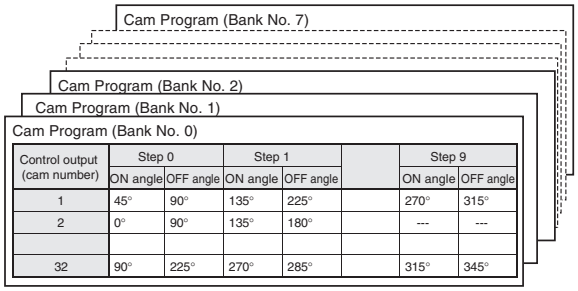
Setting Display



Set the cam number to be protected (and not displayed) to 3 with the CAM Keys [+][−] and then press the WRITE Key. The output display will go out.

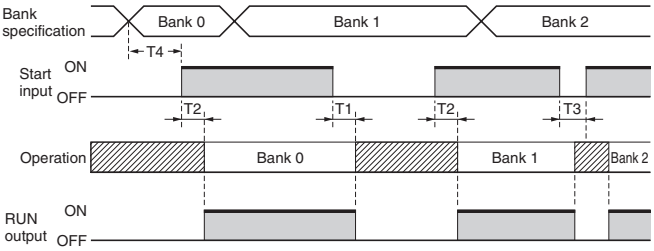
Bank Functions (F7/F8/F9)

The bank function is supported by 16-/32-output models. Banks enable changing the entire cam program at once by switching bank numbers (0 to 7).



Control output (cam number)	Step 0		Step 1			Step 9	
	ON angle	OFF angle	ON angle	OFF angle		ON angle	OFF angle
1	45°	90°	135°	225°		270°	315°
2	0°	90°	135°	180°		---	---
32	90°	225°	270°	285°		315°	345°

In Run Mode or Test Mode, the start input must be turned OFF and ON as shown in the following diagram in order to change banks. Control the start input when changing banks.



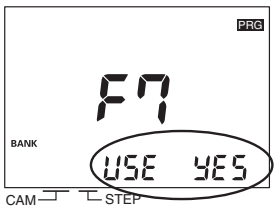
Unstable region (outputs OFF)

T1: 225 ms max.
T2: 400 ms max.
T3: 20 ms min.
T4: 20 ms min.

Bank Enable/Disable (F7)

The default setting disables the bank function. To use banks, change the setting using the F7 menu in the Function Setting Mode.

Setting Display



Enable or disable the bank function with the ANGLE Keys [+][−].

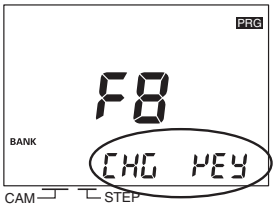
Bank Switching Method (F8)

The following methods can be used to switch the bank: the bank inputs on the terminal block or the BANK Key on the front of the Cam Positioner. The method is set using the F8 menu in the Function Setting Mode.

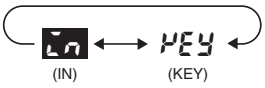
Setting	Display	Description
Bank input (IN)	in	Banks can be changed only with the bank inputs. Even if a different bank number is displayed in Programming Mode, the bank specified with the bank inputs will be used after switching to Run Mode or Test Mode.
Bank Key (KEY)	KEY	Banks can be changed only with the BANK Key. Bank inputs are disabled.

Note: 1. Default settings are shown in reverse type.
2. This setting can be made only when the Bank Function (F7) has been enabled.

Setting Display



Use the ANGLE Keys ⊞⊟ to set the bank switching method.



The bank inputs on the terminal block are used as shown in the following table.

Bank No.	Bank input terminals		
	1	2	4
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
6	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

ON: Shorted to COM terminal.

OFF: Open

Bank Copy (F9)

Programs can be copied between banks. This function is convenient to copy a program to a different bank when only some of the ON/OFF angle settings need to be changed.

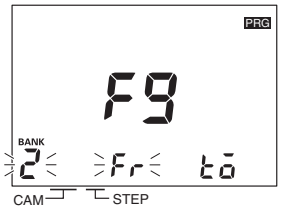
Note: This operation can be used only when the Bank Function (F7) has been enabled.

Example: Copying the Program in Bank 2 to Bank 3

Banks are copied using the F9 menu in the Function Setting Mode.

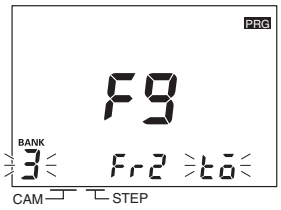
Setting Display

1. Set the number of the bank to be copied.



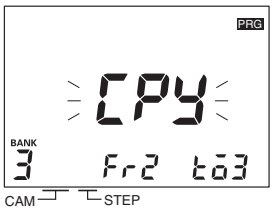
Set bank number 2 (the copy source) with the BANK Key and then press the WRITE Key.

2. Set the number of the bank to receive the copy.



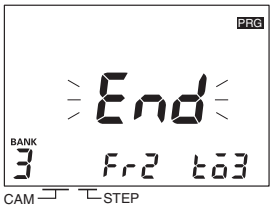
Set bank number 3 (the copy destination) with the BANK Key and then press the WRITE Key.

3. Execute the copy.



Confirm that CPY is displayed and then press the WRITE Key again.

4. Copying completed.



After completion of copying End is displayed for approx. 1 s and the previous display will be resumed.

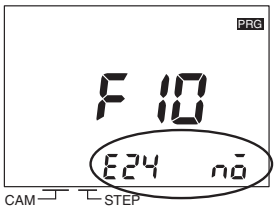
E24 Detection (F10)

Displaying E24 errors (Encoder disconnected) can be disabled. The setting does not normally need to be changed. When the Y92C-30 Parallel Input Adapter (order separately) is used to connect more than one H8PS to the same Encoder, an E24 error can appear even if the Encoder connection is normal. If this happens, use the E24 Detection function (F10) in the Function Setting Mode to disable E24 detection displays.

Setting	Display	Description
Enabled	YES	An E24 error will be displayed if the Encoder is not connected correctly in Run Mode or Test Mode.
Disabled	no	An E24 error will not be displayed even if an Encoder is not connected.

Note: Default settings are shown in reverse type.

Setting Display



Enable or disable E24 detection with the ANGLE Keys ⊞⊟.

■ Self Diagnostic Function

The following displays will appear on the main display if an error occurs. If an error occurs, all outputs (including cam, pulse, and run outputs) will be turned OFF.

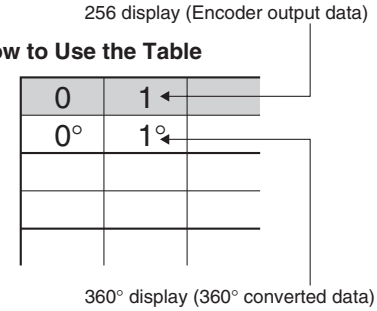
Display	Meaning	Recovery method
E00	Origin designation data error	Press the CLEAR Key for at least 3 s. All settings, including the origin designation data, will be initialized.
E11	Memory error: RAM error	Cycle the power supply.
E12	Memory error: Checksum error	Press the CLEAR Key for at least 3 s. All settings, including the origin designation data, will be initialized.
E13	CPU error	Cycle the power supply.
E21	Response speed exceeded	The Encoder is rotating faster than the allowable range. Reduce the speed to within the allowable range. Then cycle the power supply or switch to Programming Mode and then to Run Mode.
E22	Encoder data error	There are surges or noise around the product or in the wiring. Check the wiring and protect the product from surges and noise. Then cycle the power supply.
E23	Encoder resolution inconsistent	Set the Encoder resolution according to the specifications of the Encoder. Then cycle the power supply.
E24	Encoder disconnected	Connect the Encoder connector properly. Then, cycle the power supply or switch to Programming Mode and then to Run Mode.

Angle Data Table

To assist with programming when using an Encoder with a resolution of 256/rotation, displays and settings may be done by conversion to 360 degrees by setting a pin on the DIP switch inside the front cover. The following table shows the conversions.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0°	1°	3°	4°	6°	7°	8°	10°	11°	13°	14°	15°	17°	18°	20°	21°
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
23°	24°	25°	27°	28°	30°	31°	32°	34°	35°	37°	38°	39°	41°	42°	44°
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
45°	46°	48°	49°	51°	52°	53°	55°	56°	58°	59°	60°	62°	63°	65°	66°
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
68°	69°	70°	72°	73°	75°	76°	77°	79°	80°	82°	83°	84°	86°	87°	89°
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
90°	91°	93°	94°	96°	97°	98°	100°	101°	103°	104°	105°	107°	108°	110°	111°
80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
113°	114°	115°	117°	118°	120°	121°	122°	124°	125°	127°	128°	129°	131°	132°	134°
96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
135°	136°	138°	139°	141°	142°	143°	145°	146°	148°	149°	150°	152°	153°	155°	156°
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
158°	159°	160°	162°	163°	165°	166°	167°	169°	170°	172°	173°	174°	176°	177°	179°
128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
180°	181°	183°	184°	186°	187°	188°	190°	191°	193°	194°	195°	197°	198°	200°	201°
144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
203°	204°	205°	207°	208°	210°	211°	212°	214°	215°	217°	218°	219°	221°	222°	224°
160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
225°	226°	228°	229°	231°	232°	233°	235°	236°	238°	239°	240°	242°	243°	245°	246°
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
248°	249°	250°	252°	253°	255°	256°	257°	259°	260°	262°	263°	264°	266°	267°	269°
192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
270°	271°	273°	274°	276°	277°	278°	280°	281°	283°	284°	285°	287°	288°	290°	291°
208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
293°	294°	295°	297°	298°	300°	301°	302°	304°	305°	307°	308°	309°	311°	312°	314°
224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
315°	316°	318°	319°	321°	322°	323°	325°	326°	328°	329°	330°	332°	333°	335°	336°
240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
338°	339°	340°	342°	343°	345°	346°	347°	349°	350°	352°	353°	354°	356°	357°	359°

How to Use the Table



Warranty and Application Considerations

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

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. M075-E2-03

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