

## Absolute Rotary Encoder

## E6C-N

**Ideal for the Tripping Detection of Stepping Motors and the Position Control of Loaders and Unloaders**

**<READ AND UNDERSTAND THIS CATALOG>**

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.



### Ordering Information

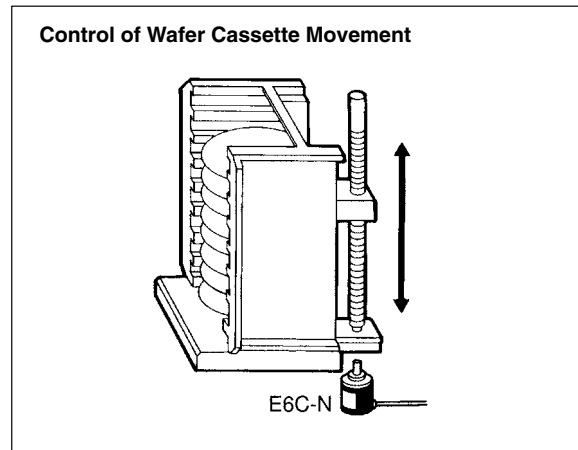
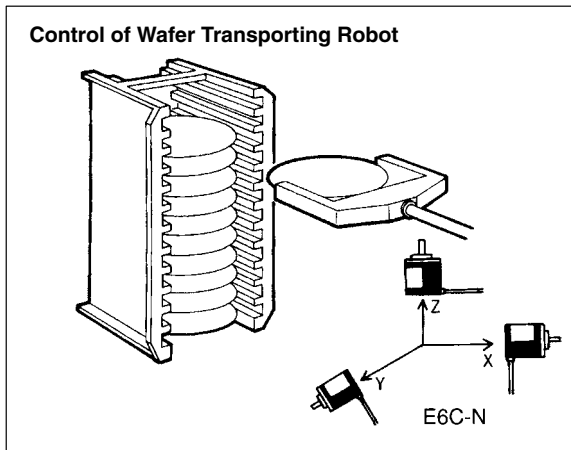
#### ■ Absolute Rotary Encoders

Name	Model
Shaft model with cable	E6C-NN5C
Hollow-shaft model with cable	E6C-NN5CA
Shaft model with connector	E6C-NN5C-C
Hollow-shaft model with connector	E6C-NN5CA-C

#### ■ Accessories (Order Separately)

Name	Model	Remarks
Coupling	E69-06B	---
Coupling	E69-C06M	Metal construction
Flange	E69-FCA	---
Flange	E69-FCA02	---
Mounting Bracket	E69-2	Provided with E69-FCA02 Flange

### Application Examples



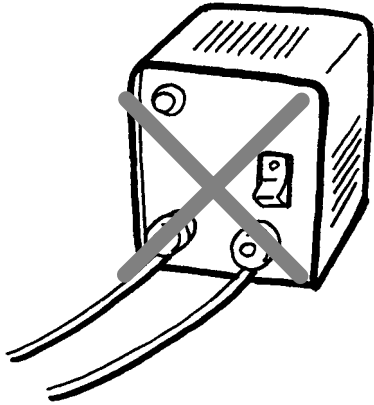
### Origin Reset Ensures Easy Origin Setting after Enclosed Mounting

In addition to the conventional reset function for multi-rotation data, a reset function for single-rotation data is available, which ensures easy origin setting of the E6C-N after enclosed mounting and saves the number of steps required for the reset operation.



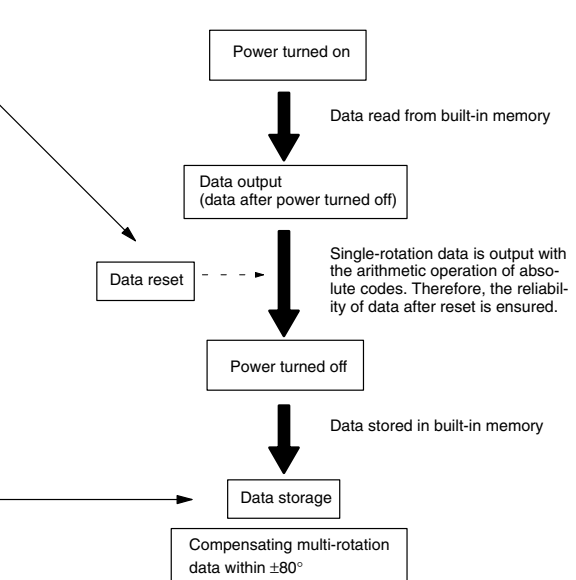
### Data Stored with No Backup Power Supply

Multi-rotation data is stored in the non-volatile built-in memory at the time of power failure, thus eliminating the need for a conventional backup power supply and simplifying the system configuration. Multi-rotation detection is, however, not possible at the time of power failure, and multi-rotation data is compensated according to the rotational operation within  $\pm 80^\circ$  of the position at the time of power failure.



### Select from Two Models According to the Application

Select one suited to the application from a line of shaft and hollow shaft models. The hollow shaft model absorbs the vibration of the driving axis with the special built-in spring.



**Note:** Data: Single-rotation, Multi-rotation data

### Great Cost Reduction

The E6C-N is considerably less expensive than the conventional E6C-M. This was achieved through the use of a plastic casing and ASIC, the minimization of functions to ones that are truly useful, and improvements in assembly.

### CE Marking

# Specifications

## ■ Ratings/Characteristics

<b>Power supply voltage</b>		12 VDC <sup>-10%</sup> to 24 VDC <sup>+10%</sup> , ripple (p-p): 5% max.
<b>Current consumption</b>		80 mA max.
<b>Resolution</b>	<b>Single-rotation absolute</b>	500 P/R
	<b>Multi-rotation absolute</b>	-128 to 127 rotations (see note 2)
<b>Rotational limitation at power failure</b>		±80° (see note 3)
<b>Output</b>	<b>Output code</b>	Binary code
	<b>Alarm output</b>	Counter Overflow Output (see note 4)
	<b>Output configuration</b>	NPN open-collector output
	<b>Output capacity</b>	Applied voltage: 30 VDC max. I <sub>sink</sub> : 10 mA max. (with 30-mA Counter Overflow Output) Residual voltage: 0.4 V max.
	<b>Logic</b>	Negative logic output
<b>Rotational direction</b>		Clockwise, as viewed from the face of the shaft.
<b>Input</b>	<b>Input signal</b>	Single-rotation data reset and multi-rotation data reset (see note 5)
	<b>Input current</b>	1 mA max.
	<b>Input logic</b>	L active, normally open
	<b>Input time</b>	100 ms max.
<b>Max. response frequency</b>		12.5 kHz
<b>Rise and fall times of output</b>		1 μs max.
<b>Starting torque</b>		30 gf • cm (2.94 mN • m) max.
<b>Moment of inertia</b>		1.5 x 10 <sup>-6</sup> kg • m <sup>2</sup> (15 g • cm <sup>2</sup> ) max.
<b>Shaft loading</b>		Radial: 3 kgf (29.4N)
		Thrust: 2 kgf (19.6N)
<b>Max. permissible rotation</b>		1,500 rpm
<b>Ambient temperature</b>		Operating: -10°C to 55°C with no icing (see note 6)
		Storage: -25°C to 65°C
<b>Ambient humidity</b>		35% to 85% with no condensation
<b>Insulation resistance</b>		20 MΩ min. (at 100 VDC) between carry parts and case
<b>Dielectric strength</b>		500 VAC, 50/60 Hz for 1 min between carry parts and case
<b>Vibration resistance</b>		Destruction: 10 to 500 Hz, 1.0-mm single amplitude or 150 m/s <sup>2</sup> (15G) for 11 min, 3 times each in X, Y, and Z directions
<b>Shock resistance</b>		Destruction: 1,000 m/s <sup>2</sup> (100G) 3 times each in X, Y, and Z directions
<b>Enclosure rating</b>		IEC IP50
<b>Housing material</b>		Mechanism: PPS resin
		Case: ABS resin
<b>Weight</b>		400 g max. (with 2-m cord)

- Note:**
- When the power supply is turned off, all data output is turned off and no data can be input.
  - Multi-rotation absolute negative values are expressed with 2's complements. Refer to the following list of codes.
  - At the time of power failure, no multi-rotation detection is performed, and multi-rotation data is compensated by comparing the data values immediately before and after the power fails. Therefore, the accuracy of multi-rotation data will be affected if the power fails and there is a rotation exceeding ±80° of the position at the time of power failure. Be sure that the rotation is within the specified range in such cases.
  - Counter Overflow Output will turn ON if the multi-rotation counter exceeds a range between -128 and 127 rotations. This error flag will be reset if the count returns to a value within the above range.
  - If single- and multi-rotation data reset signals are input, single-rotation data will be reset to address 0 and multi-rotation data is reset to rotation 0 independently.
  - Be sure that the equipment connected to the Encoder shaft is within the rated operating range.

**Multi-rotation Absolute Value Codes**

Multi-rotation absolute value	Code
10	00001010
9	00001001
8	00001000
7	00000111
6	00000110
5	00000101
4	00000100
3	00000011
2	00000010
1	00000001
0	00000000
-1	11111111
-2	11111110
-3	11111101
-4	11111100
-5	11111011
-6	11111010
-7	11111001
-8	11111000
-9	11110111
-10	11110110
-11	11110101

**Note:** By replacing values 1 and 0 of a positive value with each other and adding 1, a negative value is expressed.

# Operation

## ■ Connection

### E6C-NN5C□ Cable Specifications

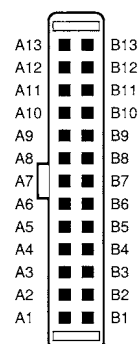
Cable color: Gray				Cable color: Black			
Lead wire color	Signal name	Description		Lead wire color	Signal name	Description	
Brown	ABS0	Single-rotation absolute data	2 <sup>0</sup>	Brown	TKN0	Multi-rotation absolute data	2 <sup>0</sup>
Orange	ABS1		2 <sup>1</sup>	Orange	TKN1		2 <sup>1</sup>
Yellow	ABS2		2 <sup>2</sup>	Yellow	TKN2		2 <sup>2</sup>
Green	ABS3		2 <sup>3</sup>	Green	TKN3		2 <sup>3</sup>
Blue	ABS4		2 <sup>4</sup>	Blue	TKN4		2 <sup>4</sup>
Purple	ABS5		2 <sup>5</sup>	Purple	TKN5		2 <sup>5</sup>
Gray	ABS6		2 <sup>6</sup>	Gray	TKN6		2 <sup>6</sup>
White	ABS7		2 <sup>7</sup>	White	TKN7		2 <sup>7</sup>
Pink	ABS8		2 <sup>8</sup>	Pink	C0F	Counter overflow alarm	
Light blue	ARST	Single-rotation data reset		Light blue	TRST	Multi-rotation data reset	
Black	GND	0 V (see note 2)		Black	GND	0 V (see note 2)	
Red	V <sub>CC</sub>	12 to 24 VDC (see note 2)		Red	V <sub>CC</sub>	12 to 24 VDC (see note 2)	
---	SHIELD	Shield		---	SHIELD	Shield	

### E6C-NN5C□-C Connector Specifications

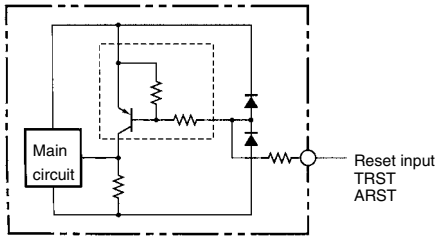
Cable color: Gray				Cable color: Black			
Pin	Signal name	Description		Pin	Signal name	Description	
A1	ABS0	Single-rotation absolute data	2 <sup>0</sup>	B1	TKN0	Multi-rotation absolute data	2 <sup>0</sup>
A2	ABS1		2 <sup>1</sup>	B2	TKN1		2 <sup>1</sup>
A3	ABS2		2 <sup>2</sup>	B3	TKN2		2 <sup>2</sup>
A4	ABS3		2 <sup>3</sup>	B4	TKN3		2 <sup>3</sup>
A5	ABS4		2 <sup>4</sup>	B5	TKN4		2 <sup>4</sup>
A6	ABS5		2 <sup>5</sup>	B6	TKN5		2 <sup>5</sup>
A7	ABS6		2 <sup>6</sup>	B7	TKN6		2 <sup>6</sup>
A8	ABS7		2 <sup>7</sup>	B8	TKN7		2 <sup>7</sup>
A9	ABS8		2 <sup>8</sup>	B9	C0F	Counter overflow alarm	
A10	ARST	Single-rotation data reset		B10	TRST	Multi-rotation data reset	
A11	GND	0 V (see note 2)		B11	GND	0 V (see note 2)	
A12	V <sub>CC</sub>	12 to 24 VDC (see note 2)		B12	V <sub>CC</sub>	12 to 24 VDC (see note 2)	
A13	SHIELD	Shield		B13	SHIELD	Shield	

- Note:**
- Connectors:  
 PS-D4C26 (Hood: PS-HD26) (Nippon Koku Denshi)  
 Connection connectors:  
 PS26PE-D4T□-M□ (straight type) (Nippon Koku Denshi)  
 PS-26PE-D4LT□-M□ (angle type) (Nippon Koku Denshi)
  - It is recommended that both V<sub>CC</sub> lines and GND lines be connected.

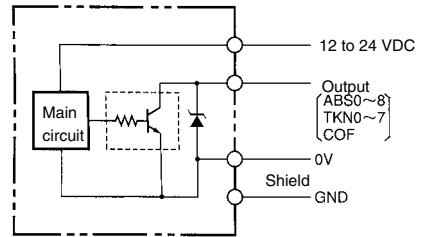
#### Terminal Arrangement



■ Input Circuit Diagram



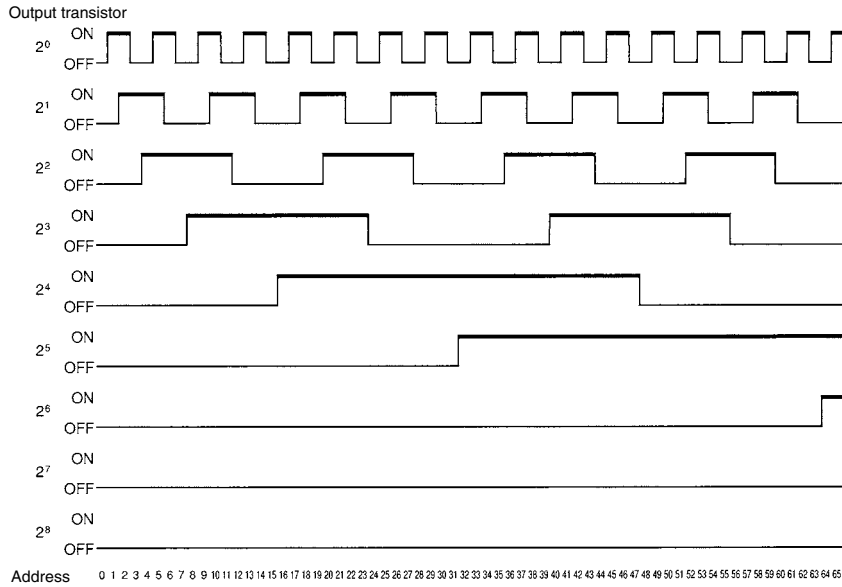
■ Output Circuit Diagram



Note: The output of each bit shares the same circuit.

■ Output Mode

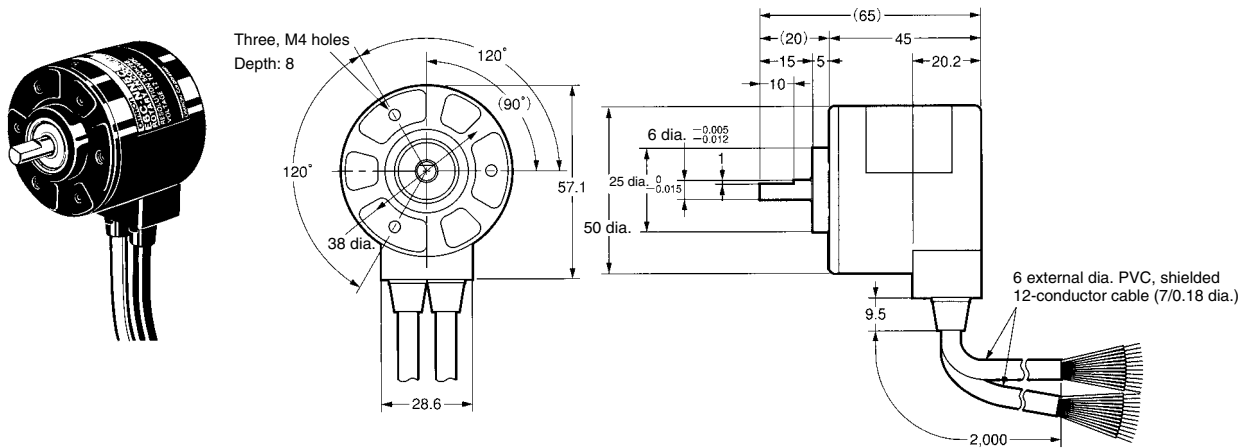
Rotational Direction: Clockwise, as viewed from the face of the shaft.



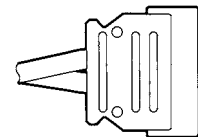
# Dimensions

Note: All units are in millimeters unless otherwise indicated.

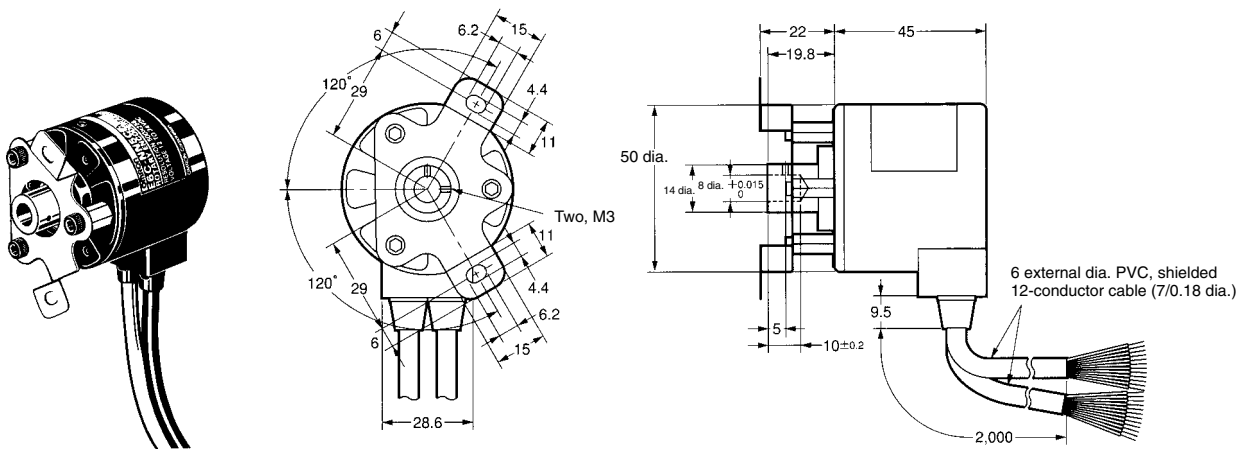
## E6C-NN5C (with Cable) E6C-NN5C-C (with Connector)



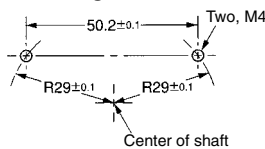
E6C-NN5C-C



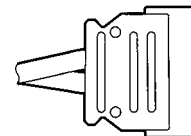
## E6C-NN5CA (with Cable) E6C-NN5CA-C (with Connector)



### Mounting Dimensions

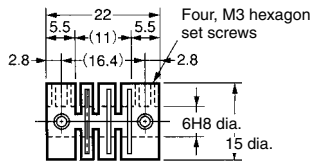


E6C-NN5CA-C



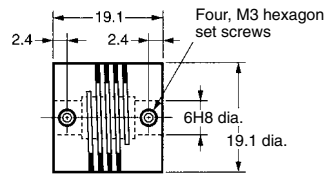
■ Accessories (Order Separately)  
Couplings

E69C-C06B



Note: Material: Glass-reinforced PBT

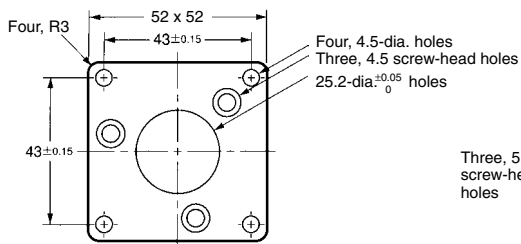
E69-C06M (Metal Construction)



Note: Material: Super duralumin

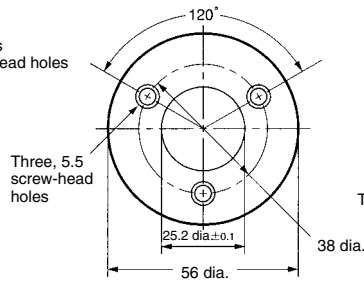
Flanges

E69-FCA



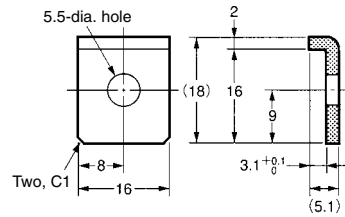
Note: Material: SPCC, t = 3.2

E69-FCA02

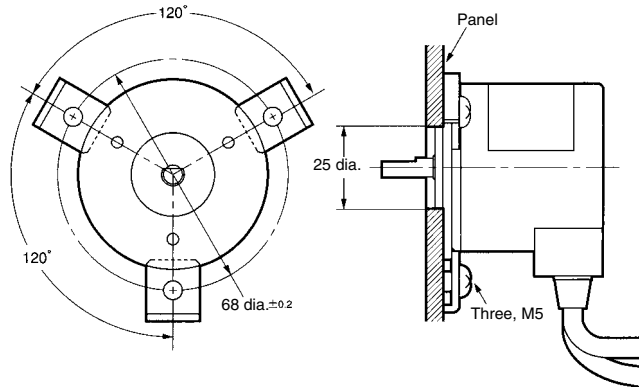


Note: Material: SPCC, t=3.2

Mounting Bracket:  
(A set of three Brackets provided with the E69-FCA02)

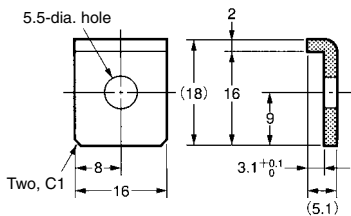


Mounting Dimensions



Servo Mounting Bracket

E69-2 (Set of three)

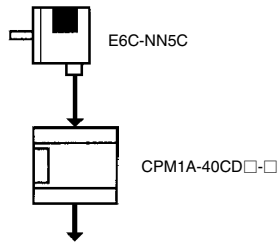


Note: A set of E69-2 Servo Mounting Brackets is provided with the E69-FCA02 Flange.



# Installation

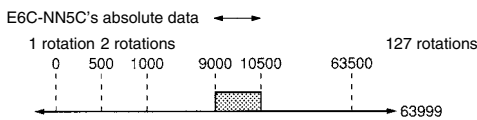
## ■ Connection Example Connection with CPM1A



### Wiring between E6C-NN5C and CPM1A

E6C-NN5C output signal		CPM1A input signal	
Single-rotation data	Cable cover color (gray)	Brown (2 <sup>0</sup> )	00000
		Orange (2 <sup>1</sup> )	00001
		Yellow (2 <sup>2</sup> )	00002
		Green (2 <sup>3</sup> )	00003
		Blue (2 <sup>4</sup> )	00004
		Purple (2 <sup>5</sup> )	00005
		Gray (2 <sup>6</sup> )	00006
		White (2 <sup>7</sup> )	00007
Multi-rotation data	Cable cover color (black)	Brown (2 <sup>0</sup> )	00100
		Orange (2 <sup>1</sup> )	00101
		Yellow (2 <sup>2</sup> )	00102
		Green (2 <sup>3</sup> )	00103
		Blue (2 <sup>4</sup> )	00104
		Purple (2 <sup>5</sup> )	00105
		Gray (2 <sup>6</sup> )	00106
		White (2 <sup>7</sup> )	00107
Code + = 0 - = 1			

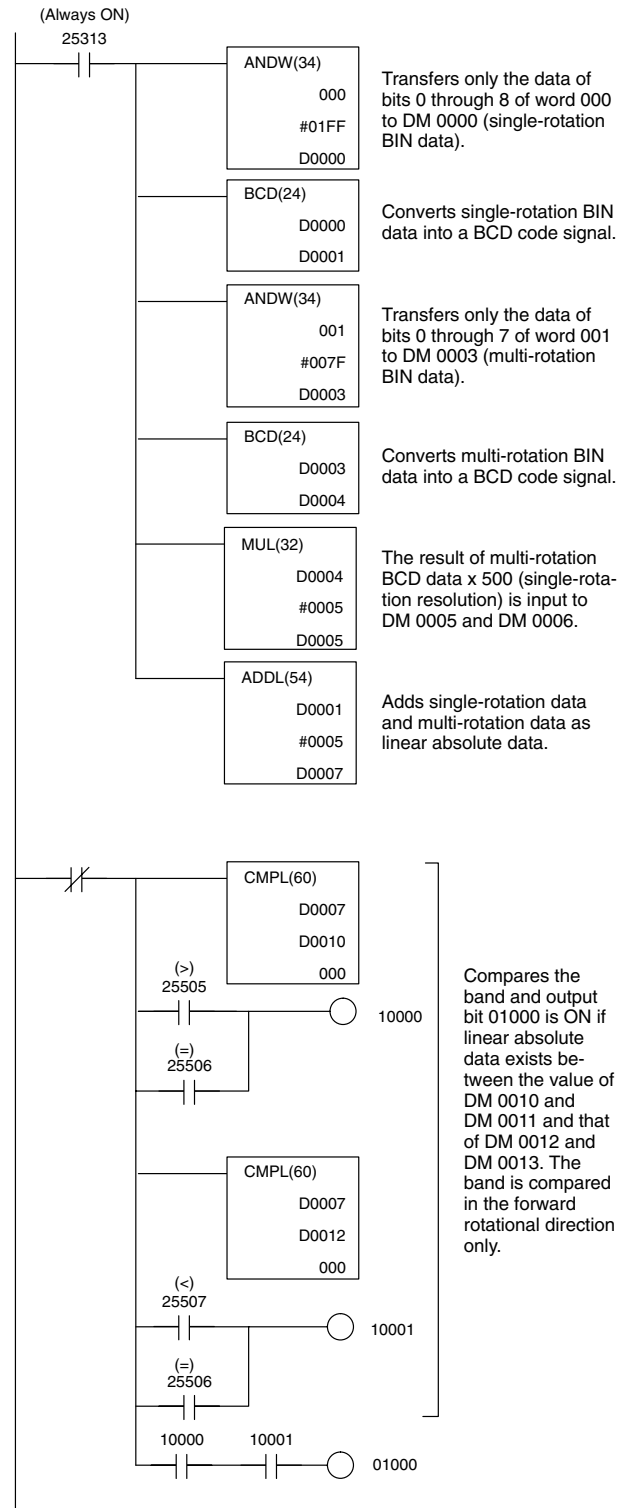
### Output Timing



### DM Setting

DM 0000		Data program work area
0001		
0002	0000	
0003		
0004		
0005		
0006		
0007		
0008		Linear absolute data
0009		Comparison data
0010	9000	
0011	0000	Upper-limit setting
0012	0500	Lower-limit setting
0013	0001	

### Ladder Program Example



## Precautions



### WARNING

This product is not designed or rated for ensuring safety of persons.  
Do not use it for such purposes.



### ■ Precautions for Safe Use

Do not use the E6C-N at a voltage exceeding the rated voltage range, otherwise the E6C-N may be damaged.

Do not wire power lines or high-tension lines alongside the lines of the E6C-N in the same conduit, otherwise the E6C-N may be damaged or malfunction due to induction. Be sure to wire the lines of the E6C-N separated from power lines or high-tension lines or laid in a separate, shielded conduit.

Do not make mistakes in wiring, such as mistakes in polarity, otherwise the E6C-N may be damaged.

Be sure that the E6C-N is turned off when wiring, otherwise the output circuit may be damaged if active output line comes in contact with the power line.

### ■ Precautions for Correct Use

If the power supply has surge voltage, connect a surge absorber in parallel to the power supply to absorb the surge voltage.

To protect the E6C-N from noise interference, be sure that each wire connected to the E6C-N is as short as possible.

The E6C-N may output a pulse signal when the E6C-N is turned on or off. Therefore, turn on each device connected to the E6C-N one second after turning on the E6C-N and turn each device off one second before turning off the E6C-N.

The E6C-N consists of high-precision components. Be sure to handle the E6C-N with care.

- Be sure that the E6C-N is free of water or oil drops.
- Do not short-circuit the load, otherwise the E6C-N may be damaged.
- If the E6C-N is mounted with a cable wired, do not pull the cable with a force exceeding 3 kgf (29.4 N).
- The torque required to tighten each screw must be 5 kgf • cm (0.49 N • m) maximum. Excessive tightening torque may damage the E6C-N.
- Do not impose excessive loads on the shaft, otherwise the shaft may be damaged.  
Do not directly connect the shaft to chains, timing belts, or gears. Be sure to connect the shaft through appropriate bearings and couplings.
- If there is a difference in angle between the shaft and the other shaft connected, an excessive load that may damage the shaft will be imposed on the shaft. Be sure that the shaft is connected properly.
- When inserting the shaft to a coupling, do not strike the shaft or coupling with a hammer or impose any other shock to the shaft or coupling.
- When connecting or disconnecting the coupling to or from the shaft, do not excessively bend, press, or pull the coupling.



## **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 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.

## **SUITABILITY FOR USE**

THE PRODUCTS CONTAINED IN THIS DOCUMENT ARE NOT SAFETY RATED. THEY ARE NOT DESIGNED OR RATED FOR ENSURING SAFETY OF PERSONS, AND SHOULD NOT BE RELIED UPON AS A SAFETY COMPONENT OR PROTECTIVE DEVICE FOR SUCH PURPOSES. Please refer to separate catalogs for OMRON's safety rated products.

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 product.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

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 PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

## **PERFORMANCE DATA**

Performance data given in this document is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

## **CHANGE IN SPECIFICATIONS**

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

## **DIMENSIONS AND WEIGHTS**

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

## **ERRORS AND OMISSIONS**

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

## **PROGRAMMABLE PRODUCTS**

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

**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. Q110-E1-02

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

**OMRON Corporation**  
Industrial Automation Company

Sensing Devices Division H.Q.  
Industrial Sensors Division

Shiokoji Horikawa, Shimogyo-ku,  
Kyoto, 600-8530 Japan

Tel: (81)75-344-7022/Fax: (81)75-344-7107

Printed in Japan

0805-0.5C (0997) (M)

AUDIN - 8, avenue de la malle - 51370 Saint Brice Courcelles - Tel : 03.26.04.20.21 - Fax : 03.26.04.28.20 - Web : <http://www.audin.fr> - Email : [info@audin.fr](mailto:info@audin.fr)