HITACHI PROGRAMMABLE CONTROLLER

IEC 61131-3 Compliant PLC

EHV+

APPLICATION MANUAL

NJI-564B(X)

○ Warranty period and coverage

The warranty period is the shorter period either 18 months from the data of manufacture or 12 months from the date of installation.
However within the warranty period, the warranty will be void if the fault is due to;

(1) Incorrect use as directed in this manual and the application manual.

(2) Malfunction or failure of external other devices than this unit.

(3) Attempted repair by unauthorized personnel.

(4) Natural disasters.

The warranty is for the PLC only, any damage caused to third party equipment by malfunction of the PLC is not covered by the warranty.

○ Repair

Any examination or repair after the warranty period is not covered. And within the warranty period ant repair and examination which results in information showing the fault was caused by ant of the items mentioned above, the repair and examination cost are not covered. If you have ant questions regarding the warranty please contact with your supplier or the local Hitachi Distributor. (Depending on failure part, examination might be impossible.)

○ Ordering parts or asking questions

When contacting us for repair, ordering parts or inquiring about other items, please have the following details ready before contacting the place of purchase.

(1) Model

(2) Manufacturing number (MFG.No.)

(3) Details of the malfunction

○ Reader of this manual

This manual is described for the following person.

- Person considering the introduction of PLC
- PLC system engineer
- Person handling PLC
- Manager after installing PLC

Warning

(1) This manual may not be reproduced in its entirety or ant portion thereof without prior consent.
(2) The content of this document may be changed without notice.
(3) This document has been created with utmost care. However, if errors or questionable areas are found, please contact us.

Safety Precautions

Read this manual and related documents thoroughly before installing, operating, performing preventive maintenance or performing inspection, and be sure to use the unit correctly. Use this product after acquiring adequate knowledge of the unit, all safety information, and all cautionary information. Also, make sure this manual enters the possession of the chief person in charge of safety maintenance.
Safety caution items are classifies as “Danger” and “Caution” in this document.

DANGER : Cases where if handled incorrectly a dangerous circumstance may be created, resulting in possible death or severe injury.

CAUTION : Cases where if handled incorrectly a dangerous circumstance may be created, resulting in possible minor to medium injury to the body, or only mechanical damage.

However, depending on the circumstances, items marked with CAUTION may result in major accidents.

In any case, they both contain important information, so please follow them closely.

Icons for prohibited items and required items are shown below:

: Indicates prohibited items (items that may not be performed). For example, when open flames are prohibited, is shown.

: Indicates required items (items that must be performed). For example, when grounding must be performed, is shown.

1. About installation

⚠ CAUTION
• Use this product in an environment as described in the catalog and this document. If this product is used in an environment subject to high temperature, high humidity, excessive dust, corrosive gases, vibration or shock, it may result in electric shock, fire or malfunction. • Perform installation according to this manual. If installation is not performed adequately, it may result in dropping, malfunction or an operational error in the unit. • Do not allow foreign objects such as wire chips to enter the unit. They may become the cause of fire, malfunction or failure.

2. About wiring

REQUIRED

- Always perform grounding (FE terminal).
  If grounding is not performed, there is a risk of electric shocks and malfunctions.

⚠ CAUTION

- Connect power supply that meets rating.
  If a power supply that does not meet rating is connected, fire may be caused.
- The wiring operation should be performed by a qualified personnel.
  If wiring is performed incorrectly, it may result in fire, damage, or electric shock.

3. Precautions when using the unit

⚠ DANGER

- Do not touch the terminals while the power is on.
  There is a risk of electric shock.
- Structure the emergency stop circuit, interlock circuit, etc. outside the programmable controller (hereinafter referred to as PLC).
  Damage to the equipment or accidents may occur due to failure of the PLC.
  However, do not interlock the unit to external load via relay drive power supply of the relay output module.

⚠ CAUTION

- When performing program change, forced output, RUN, STOP, etc., while the unit is running, be sure to verify safety.
  Damage to the equipment or accidents may occur due to operation error.
- Supply power according to the power–up order.
  Damage to the equipment or accidents may occur due to malfunctions.

4. About preventive maintenance

DANGER
• Do not connect the ⊕, ⊖ of the battery in reverse. Also, do not charge, disassemble, heat, place in fire, or short circuit the battery. There is a risk of explosion or fire.

PROHIBITED
• Do not disassemble or modify the unit. Electric shock, malfunction or failure may result.

CAUTION
• Turn off the power supply before removing or attaching module/unit. Electric shock, malfunction or failure may result.

Revision History

No.	Description of revision	Date of revision	Manual number
1	The first edition	Jun. 2010	NJI-564(X)
2	Modbus-TCP/RTU and Global network variables added.	Sep. 2010	NJI-564A(X)
3	.NET framework V3.5 installation added.	Oct. 2010	NJI-564B(X)

Table of Contents

Chapter 1 Introduction

Thank you very much for choosing Hitachi Programmable Controller (hereinafter referred to as PLC), EHV+ series.

1.1 Unpacking

(1) Installation of a battery

EHV+ series CPU is shipped with a lithium battery installed, but a battery connector is disconnected to prevent unnecessary current consumption. If you need real time clock function or retentive data memory, connect the battery cable to a connector mounted on PCB of CPU module. Refer to “Chapter 5 Maintenance” for further information.

(2) Initializing of user program

Since initial status of memory devices in the CPU is undefined, memory error may be displayed on 7-segment LED at the first power up. In order to initialize memory area, execute “Reset origin” in the first use after connecting a battery.

1.2 Instruction Manuals

I/O modules and communication modules of EH-150 series are available with EHV+ series CPU as listed in page 2-2. Besides this application manual, application manuals are available shown in Table 1.1.

Table 1.1 Related manuals to EHV+ series CPU

Product name	Model	Type	Application manual number
High-functional modules	EH-PT4	Resistance temperature detective input	NJI-324*(X)
	EH-CU	2 high-speed counter	NJI-321*(X)
	EH-CUE	Single high-speed counter	NJI-340*(X)
	EH-POS	Single-axis pulse positioning	NJI-315*(X)
Communication modules	EH-SIO	Serial interface module	NJI-443*(X)
	EH-RMD	DeviceNet master module	NJI-364*(X)
	EH-RMP	Profibus master module	NJI-332*(X)
	EH-IOCD	DeviceNet slave controller	NJI-364*(X)
	EH-IOCP	Profibus slave controller	NJI-333*(X)

* The last alphabet of the manual No. stands for version starting from blank, A, B, C...

1.3 System overview

EHV+ series PLC is module type programmable controller shown in Figure 1.1.

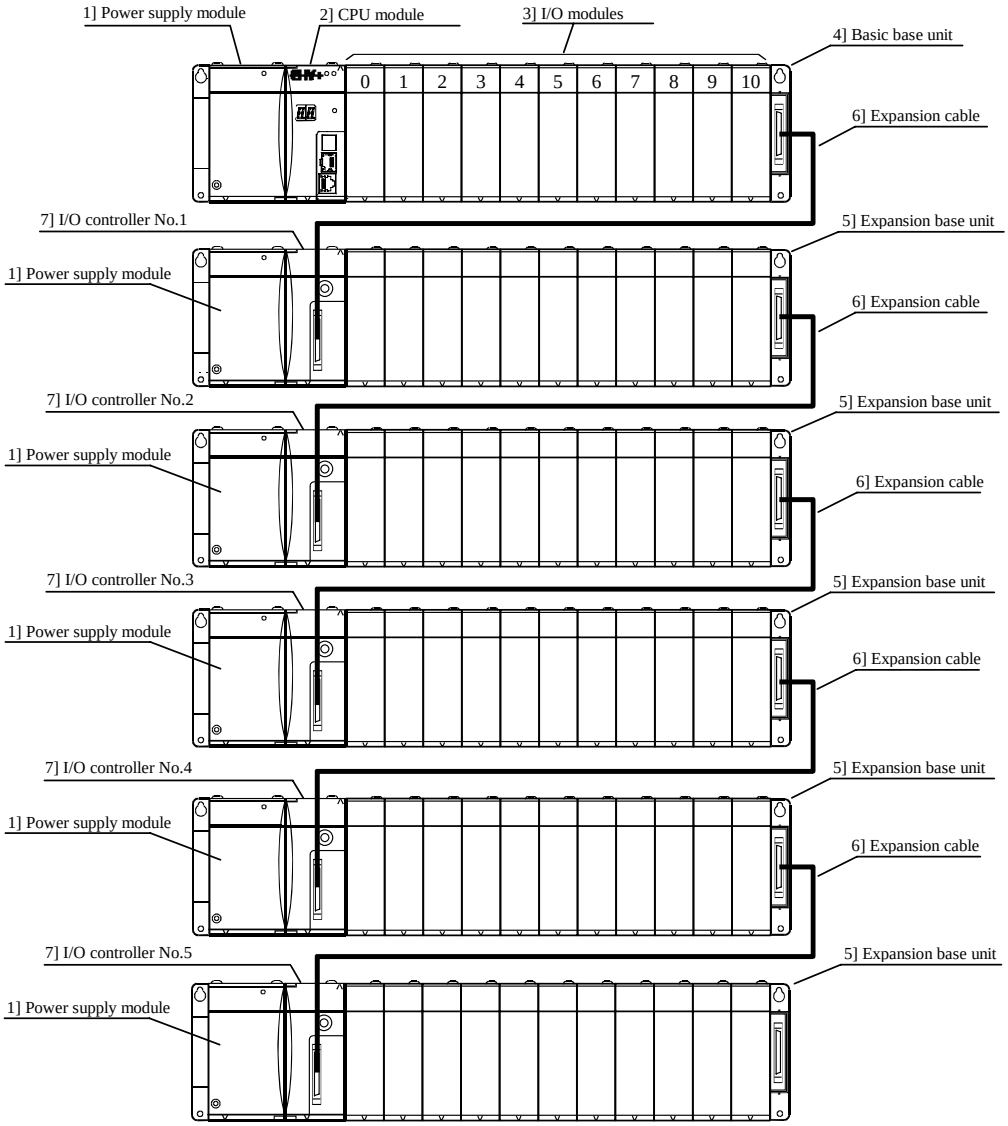


Figure 1.1 EHV+ series System configuration diagram (EHV-CPU1102)

No.	Device name	Description of function
1]	Power supply module	Converts external power to DC5V for CPU and I/O modules through base unit.
2]	CPU module	Reads input signals, executes user application program and writes output signals.
3]	I/O module	Many types of I/O modules are available such as digital input/output modules, analog input/output modules, high-functional modules and communicate modules.
4]	Basic base unit	All modules are mounted to base unit. Basic and expansion base unit are common.
5]	Expansion base unit	All modules are mounted to base unit. Basic and expansion base unit are common.
6]	Expansion cable	0.5m, 1m and 2m cable are available. The max. cable length 8m in total.
7]	I/O controller	Be sure to use each expansion base unit.

EHV-CoDeSys

EHV-CoDeSys is IEC61131-3 compliant programming software for EHV+ series PLC. “CoDeSys” is a Trademark of the company 3S-Smart Software Solutions GmbH. “EHV-CoDeSys” is same tool as “CoDeSys” however, Hitachi specific device description files and libraries are preinstalled.

Chapter 2 Specifications

2.1 General Specifications

Items		Specifications
Input Power voltage	AC	100/110/120V AC (50/60 Hz), 200/220/240V AC (50/60 Hz)
	DC	24 V DC
Power voltage fluctuation range		85 to 264V AC
		21.6 to 26.4V DC
Allowable instantaneous power failure		85 to 100 V AC: when instantaneous power failure of less than 10 ms, operation continues 100 to 264 V AC: when instantaneous power failure of less than 20 ms, operation continues
Operational temperature		0 to 55 °C
Storage temperature		−10 to 75 °C
Operational humidity		20 to 90 % RH (no condensation)
Storage humidity		10 to 90 % RH (no condensation)
Vibration resistance		Conforms to IEC 60068-2-6
Noise resistance		○ Noise voltage 1,500 Vpp, Noise pulse width 100 ns, 1μs (Noise input by a noise simulator across input terminals of a power module according to measuring method of Hitachi-IES. ○ Based on IEC 61131-2 (not applied for input modules) ○ Static noise 3,000 V at electrode part
Insulation resistance		20 MΩ minimum between AC terminal and frame ground (FE) terminal (based on 500 V DC megger)
Dielectric withstand voltage		1,500V AC for 1 minute between AC input terminal and frame ground (FE) terminal
Ground		Class D grounding (grounding with the power supply module)
Usage environment		No corrosive gases, no excessive dust
Structure		Open wall-mount type
Cooling		Natural air cooling

2.2 Product lineup

Table 2.1 List of system equipment (1 / 2)

Product	Type	Specification	I/O type	Remarks
Power module	EH-PSA	Input 100 to 240V AC, Output 5V DC 3.8 A, 24V DC 0.4 A	—	
	EH-PSD	Input 21.6 to 26.4 V DC, Output 5 V DC 3.8 A	—	
I/O controller	EH-IOCH2	I/O control module (1 unit / expansion base) *1	—	
Base unit	EH-BS3A	3 I/O modules installed	—	Commonly used for basic or expansion base
	EH-BS5A	5 I/O modules installed	—	
	EH-BS6A	6 I/O modules installed	—	
	EH-BS8A	8 I/O modules installed	—	
	EH-BS11A	11 I/O modules installed	—	
Input module	EH-XD8	8 pts., 24V DC input	DI 16	*3
	EH-XD16	16 pts., 24V DC input	DI 16	*3
	EH-XDL16	16 pts., 24V DC input, with input filter	DI 16	*3
	EH-XD32	32 pts., 24V DC input	DI 32	
	EH-XDL32	32 pts., 24V DC input, with input filter	DI 32	
	EH-XD32E	32 pts., 24V DC input, Spring type terminal	DI 32	
	EH-XDL32E	32 pts., 24V DC input, Spring type terminal, with input filter	DI 32	
	EH-XD32H	32 pts., 24V DC input, compatible connector with PIM/H-DM (EM/H-200)	DI 32	
	EX-XD64	64 pts., 24V DC input	DI 64	
	EH-XA16	16 pts., 100 to 120V AC input	DI 16	*3
	EH-XAH16	16 pts., 200 to 240V AC input	DI 16	*3
Output module	EH-YR8B	8 pts., Independent relay output, 100/240V AC, 24V DC	DO 16	*3
	EH-YR12	12 pts., Relay output, 100/240V AC, 24 V DC	DO 16	*3
	EH-YR16	16 pts., Relay output, 100/240V AC, 24 V DC	DO 16	*3
	EH-YT8	8 pts., Transistor output, 12/24V DC (sink type)	DO 16	*3
	EH-YTP8	8 pts., Transistor output, 12/24V DC (source type)	DO 16	*3
	EH-YT16	16 pts., Transistor output, 12/24V DC (sink type)	DO 16	*3
	EH-YTP16	16 pts., Transistor output, 12/24V DC (source type)	DO 16	*3
	EH-YTP16S	16 pts., Transistor output, 12/24V DC (source type) *3	DO 16	*4
	EH-YT32	32 pts., Transistor output, 12/24V DC (sink type) *2	DO 32	*4
	EH-YTP32	32 pts., Transistor output, 12/24V DC (source type) *2	DO 32	*4
	EH-YT32E	32 pts., Transistor output, 12/24V DC (sink type), Spring type terminal	DO 32	*4
	EH-YTP32E	32 pts., Transistor output, 12/24V DC (source type), Spring type terminal	DO 32	*4
	EH-YT32H	32 pts., Transistor output, 5/12/24V DC (sink type), compatible connector with POM/H-DM (EM/H-200)	DO 32	
	EH-YT64	64 pts., Transistor output, 12/24V DC (sink type)	DO 64	*4
	EH-YTP64	64 pts., Transistor output, 12/24V DC (source type)	DO 64	*4
	EH-YS4	4 pts., Triac output, 100/240V AC	DO 16	*3
	EH-YS16	16 pts., Triac output, 100/240V AC	DO 16	*3
Analog input module	EH-AX44	12 bits, analog input 8 ch. (4 ch. of 4 to 20 mA, 4 ch. of 0 to 10 V)	AI 8	*3
	EH-AX8V	12 bits, analog input 8 ch., Voltage (0 to 10 V)	AI 8	*3
	EH-AX8H	12 bits, analog input 8 ch., Voltage (-10 to +10 V)	AI 8	*3
	EH-AX8I	12 bits, analog input 8 ch., Current (4 to 20 mA)	AI 8	*3
	EH-AX8IO	12 bits, analog input 8 ch, Current (0 to 22 mA)	AI 8	*3
	EH-AXH8M	14 bits, analog input 8 ch. (0 to 22 mA, 4 to 22 mA, -10 to +10 V, 0 to 10 V)	AI 8	*3
Analog output module	EH-AY22	12 bits, analog output 4 ch. (2 ch. of 4 to 20 mA, 2 ch. of 0 to 10 V)	AO 8	*3
	EH-AY2H	12 bits, analog output 2 ch., Voltage (-10 to +10 V)	AO 8	*3
	EH-AY4V	12 bits, analog output 4 ch., Voltage (0 to 10 V)	AO 8	*3
	EH-AY4H	12 bits, analog output 4 ch., Voltage (-10 to +10 V)	AO 8	*3
	EH-AY4I	12 bits, analog output 4 ch., Current (4 to 20 mA)	AO 8	*3
	EH-AYH8M	14 bits, analog output 8 ch. (0 to 22 mA, 4 to 22 mA, 0 to 10 V)	AO 8	*3

*1 CPU, power module and I/O controller (IOCH2,IOCP,IOCD) can be mounted on reserved positions only.
*2 Short circuit protection version is from May 2001 production. (MFG No. 01Exx)
*3 Use solid or stranded copper cable of 22-14 AWG with torque 9 in.–lbs (1.02 Nm)
*4 Electric short circuit protection

Table 2.2 List of system equipment (2 / 2)

Product	Type	Specification	I/O type	Remarks
RTD input module	EH-PT4	Signed 15 bits, 4 ch. Resistance Temperature Detector input, PT100/PT1000	AI 4	*3
Thermocouple input module	EH-TC8	Signed 15 bits, 8 ch. Thermocouple input (K, E, J, T, B, R, S, N)	AI 8	*3
High function and communication module	EH-CU	2 ch. high-speed counter input, 100 kHz, 4 points open collector output	EH-CU/E	
	EH-CUE	1 ch. high-speed counter input, 100 kHz, 2 points open collector output	EH-CU/E	
	EH-POS	1 axis pulse output positioning module	EH-POS/4	
	EH-SIO	Serial interface module	EH-SIO	
	EH-RMD	Device Net master module, 256/256 words I/O, 8 units per CPU	EH-RMP	
	EH-RMP	PROFIBUS-DP master module, 256/256 words I/O, 8 units per CPU	EH-RMP	
	EH-IOCD	Device Net slave controller, 256/256 words I/O	—	Mounted in CPU position
	EH-IOCP	PROFIBUS-DP slave controller, 208 words I/O	—	
Dummy module	EH-DUM	Module for empty slot	Empty	
Expansion cables	EH-CB5A	Expansion cable (0.5m)	—	
	EH-CB10A	Expansion cable (1m)	—	
	EH-CB20A	Expansion cable (2m)	—	
Relay terminal	HPX7DS-40V6	Relay terminal block for 32/64-point module	—	
32/64 points module cables	EH-CBM01W	32/64-point module cable, both ends connector (1m)	—	
	EH-CBM03W	32/64-point module cable, both ends connector (3m)	—	
	EH-CBM05W	32/64-point module cable, both ends connector (5m)	—	
	EH-CBM10W	32/64-point module cable, both ends connector (10m)	—	
	EH-CBM01	32/64-point module cable, open and connector end (1m)	—	
	EH-CBM03	32/64-point module cable, open and connector end (3m)	—	
	EH-CBM05	32/64-point module cable, open and connector end (5m)	—	
	EH-CBM10	32/64-point module cable, open and connector end (10m)	—	
	CBM-02	EM/H-200 compatible 32 point module cable, open and connector end (2m)	—	
	CBM-05	EM/H-200 compatible 32 point module cable, open and connector end (5m)	—	
	CBM-10	EM/H-200 compatible 32 point module cable, open and connector end (10m)	—	
Counter module cables	EH-CUC01	Counter module cable, open and connector end (1m)	—	
	EH-CUC02	Counter module cable, open and connector end (2m)	—	
	EH-CUC03	Counter module cable, open and connector end (3m)	—	
	EH-CUC04	Counter module cable, open and connector end (4m)	—	
	EH-CUC05	Counter module cable, open and connector end (5m)	—	
Battery	LIBAT-H	Lithium battery for retentive data and RTC	—	

*3 Use solid or stranded copper cable of 22-14 AWG with torque 9 in.–lbs (1.02 Nm)

[Installing restriction]

EH-RMP/RMD can be mounted up to 8 units per CPU. Available position is from slot 0 to 7 of basic base only.

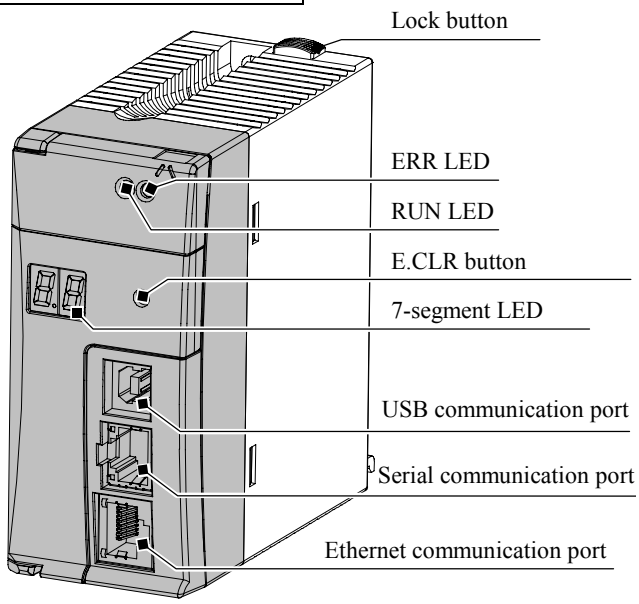
⚠ Caution

Due to limited capacity of power supply module, available module configuration depends on total current consumption of mounted modules. Please select I/O module and base unit according to the current consumption specified in following pages.

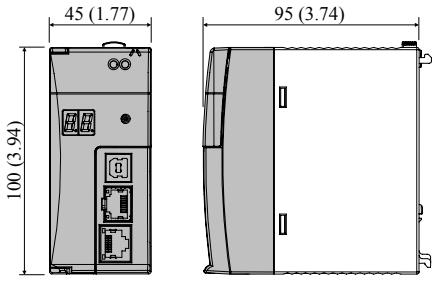
2.3 CPU module

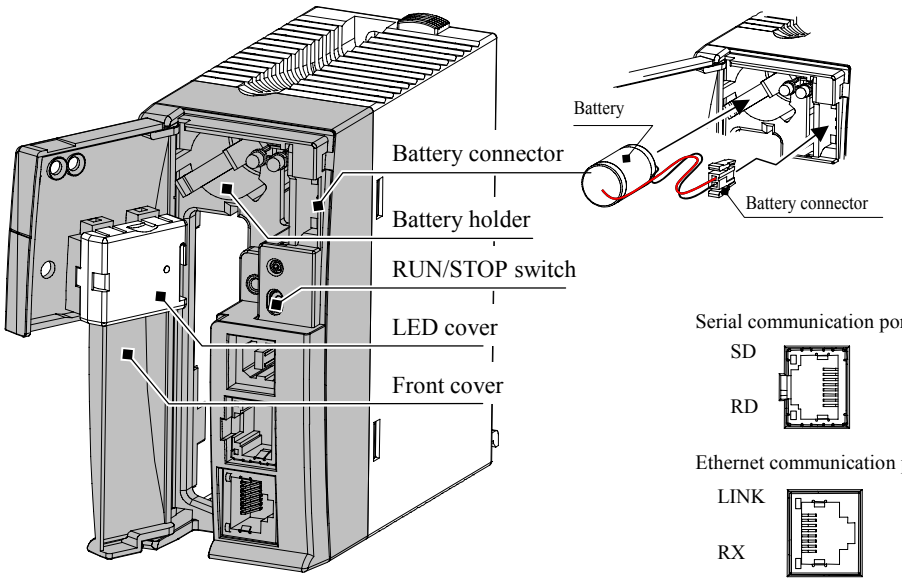
2.3.1 Module features

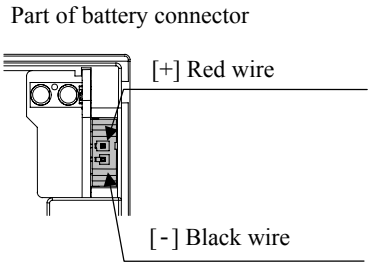
Module features

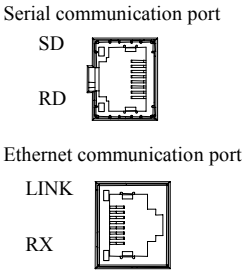


Type (Weight)	EHV-CPU1006 (Approx. 0.2kg (0.4lb.))
	EHV-CPU1025 (Approx. 0.2kg (0.4lb.))
	EHV-CPU1051 (Approx. 0.2kg (0.4lb.))
	EHV-CPU1102 (Approx. 0.2kg (0.4lb.))
Current consumption	750mA
Dimensions (mm (in.))	









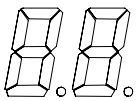
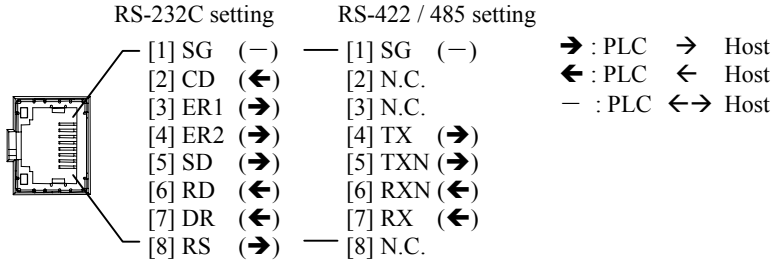
Item	Description
RUN LED	Indicates operation status. (Green lighting: RUN / off: STOP)
ERR LED	Indicates error status. (Red lighting: Error / Red blinking: Battery error)
7-segment LED	Indicates error code. Refer to section 3.16 for error code information. 
E.CLR button	If any error occurs, error code is displayed in 7-segment LED and remains after the error cause is removed. When pressing this button, error code is cleared. If the error cause is still remaining, error code will be displayed again.

Table 2.3 Function specifications

Item	Description
USB communication port	USB port supports gateway function (with EHV-CoDeSys) only. USB cable is not included with CPU package nor supplied by Hitachi-IES. Use type-B USB cable.
Serial communication port	Serial port has both gateway function (with EHV-CoDeSys) and IEC programming function supporting Modbus-RTU master and general purpose communication. * Both a gateway / IEC programming function can be switched to RS-232C / RS-422 / RS-485.  [Note] Be noted that RD LED could light in a moment at power ON/OFF.
Ethernet communication port	Ethernet port has both gateway function (with EHV-CoDeSys) and IEC programming function supporting Modbus-TCP client/server. In addition, network variables are transferred to/from other EHV+ CPUs over Ethernet network.
RUN / STOP switch	When this switch position is in RUN, CPU start executing program. At the same time, remote controlling is enabled, in which case, CPU is started or stopped by EHV-CoDeSys over communication. When this switch position is in STOP. CPU stops executing program. In this status, remote controlling is disabled.
Lock button	Press this button to dismount. Module can be fixed firmly by a screw of M4×10 mm(0.39in.).
Front cover	Open this cover when operating the RUN switch or replacing the battery. Keep the cover closed while the module is running. When the cover is opened, do not touch the printed wiring board.
Battery holder Battery Battery connector	[Battery] Following data are maintained by battery. (1) Data specified as VAR RETAIN and VAR PERSISTENT. (2) RTC (real time clock) data [Note] - Battery has polarity. Check polarity in connecting the battery although opposite connection is mechanically impossible. - Be noted that the battery is not connected with factory default to prevent unnecessary battery consumption. - When using the CPU module, check the battery and plug the battery connector to CPU as shown above. - Refer to the table on page 5-2 for the life of battery. Replace the battery every two years even when total power failure time is less than the guaranteed value.

⚠ Caution

Note the following matters for the communication port.

(1) Do not connect Ethernet cable to the serial port of CPU module. This could cause damage the CPU or connected equipment.

(2) In 100BASE-TX (100Mbps) communication of Ethernet, connection could be unstable due to external noise depending on cable length, installation environment and etc. In this case, take following countermeasures.

1] Increase the number of times to retry in connected device.

2] Change Ethernet communication speed to 10Mbps.

(3) USB communication could be unstable under severe noise environment. Be sure to use short cable and route apart from power line or other communication cables.

(4) Serial communication in 115.2kbps could be unstable depending on PC. If so, change the baud rate to 57.6kbps or slower.

2.3.2 Performance specifications

Table 2.4 Performance specifications

Item		Specification			
		EHV-CPU1006	EHV-CPU1025	EHV-CPU1051	EHV-CPU1102
User program memory		64KB	256KB	512KB	1024KB
Source file memory		2MB	6MB		
Data memory (non retain)		256KB			
Data memory (retain)		16KB (incl. 4KB persistent variables)			
Field bus memory		16KB (2KB/slot × 8)			
No. of expansion bases		0	5		
No. of I/O (using 64 points module)		704	4,224		
Programming language		IEC61131-3 compliant 5 languages LD : Ladder Diagram FBD : Function Block Diagram (incl. CFC : Continuous Function Chart) SFC : Sequential Flow Chart IL : Instruction List ST : Structured Text			
I/O updating cycle		Refresh processing			
Communication	Protocol	CoDeSys V3 protocol			
	USB	USB 2.0 Full speed (Gateway *)			
	Ethernet	10BASE-T / 100BASE-TX (Gateway *, Modbus-TCP client/server **)			
	Serial	RS-232C/422/485 (Gateway *, Modbus-RTU master **, General purpose)			
Switch, Indications	Indications	RUN LED, ERR LED, 7-segment LED (2 digit)			
	RUN switch	STOP / RUN (Remote STOP/RUN enabled when the switch position is RUN.)			
	E.CLR button	Reset error information			
Calendar / Clock		Support (Built-in RTC)			
Battery		LIBAT-H (for retentive data and Real time clock)			
Maintenance function		Diagnosis (micro processor error, watch dog timer error, memory error, battery error, etc.)			

* Gateway : Communication with EHV-CoDeSys

** If Modbus-RTU or Modbus-TCP function is needed, be sure to use EHV-CPU1025 or higher model because Modbus libraries require about 100KB of user program memory.

Table 2.5 Processing speed

Data type (number of bit)	Command	Processing time [μs / IL]
BOOL (1)	OR	0.08
BOOL (1)	AND	0.08
SINT (8)	ADD	0.07
SINT (8)	MUL	0.08
WORD (16)	ADD	0.08
WORD (16)	MUL	0.1
DWORD (32)	ADD	0.1
DWORD (32)	MUL	0.1
REAL (32)	ADD	0.9
REAL (32)	MUL	0.9
LREAL (64)	ADD	2.2
LREAL (64)	MUL	2.2

2.3.3 Serial port specifications

(1) RS-232C

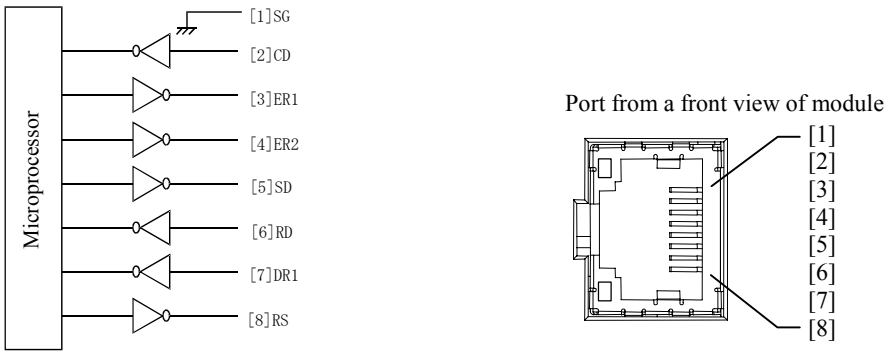


Figure 2.1 Circuit diagram and Pin No. of RS-232C

Table 2.6 List of signal of RS-232C

Pin No.	Signal name	Direction (CPU / Host)	Meaning
1	SG	◀——▶	Signal ground
2	CD	◀——	Carrier Detect signal.
3	ER1	——▶	When CPU is ready to communicate, this signal is high.
4	ER2	——▶	Always high
5	SD	——▶	Sending data from CPU
6	RD	◀——	Receiving data to CPU
7	DR	◀——	When this signal is high, connected device is ready to communicate.
8	RS	——▶	When CPU is ready to receive data, this signal is high.

(2) RS-422/485

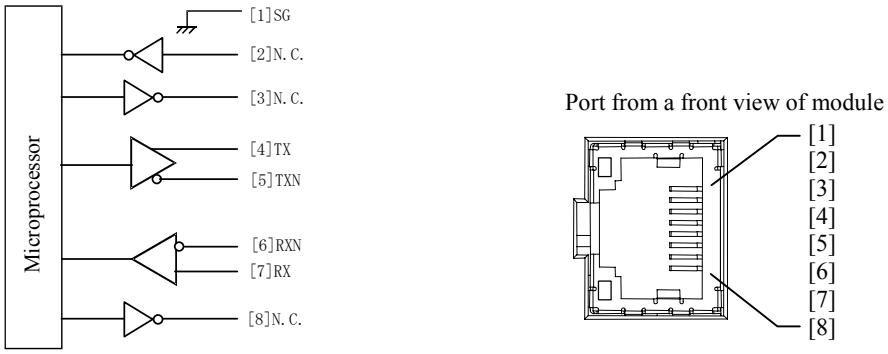


Figure 2.2 Circuit diagram and Pin No. of RS-422/485

Table 2.7 List of signal of RS-422/485

Pin No.	Signal name	Direction CPU / Host	Meaning
1	SG	◀——▶	Signal ground
2	N.C.	◀——	Unused. Do not connect.
3	N.C.	——▶	Unused. Do not connect.
4	TX	——▶	Sending data (+) from CPU
5	TXN	——▶	Sending data (–) from CPU
6	RXN	◀——	Receiving data (–) to CPU
7	RX	◀——	Receiving data (+) to CPU
8	N.C.	——▶	Unused. Do not connect.

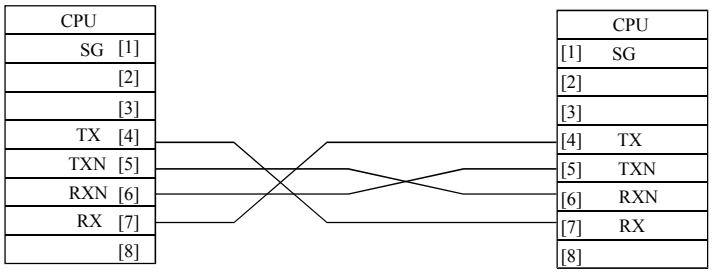


Figure 2.3 RS-422 signal connection diagram

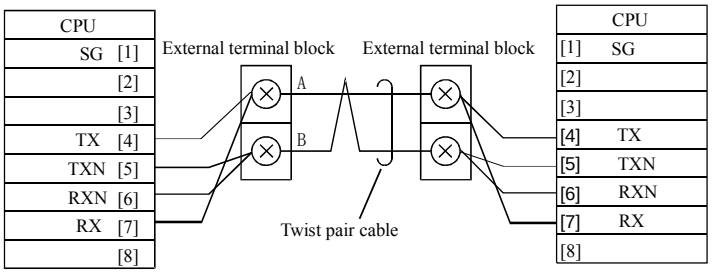


Figure 2.4 RS-485 signal connection diagram

Specifications of serial communication port are shown in Table 2.8.

Table 2.8 Serial port specifications

Item	Specification		
Transmission speed	4,800 / 9,600 / 19,200 / 38,400 / 57,600 / 115,200 bps		
Interface	RS-232C	RS-422	RS-485
Maximum cable length	15 m (16.40 yd.)	500 m (546.81 yd.)	500 m (546.81 yd.)
Connection mode (Maximum connected units)	1 : 1	1 : N (32 units)	1 : N (32 units)
Communication method	Half duplex		
Synchronization method	Start-stop synchronization		
Supported function	Gateway, General purpose communication, Modbus-RTU master		
Transmission method	Serial transmission (bit serial transmission)		
Transmission code outgoing sequence	Send out from the lowest bit in character units		
Error control	Vertical parity check, sum check, overrun check, framing check.		
Transmission unit	Message unit (variable length)		
Maximum message length	1,024 bytes (including control characters)		

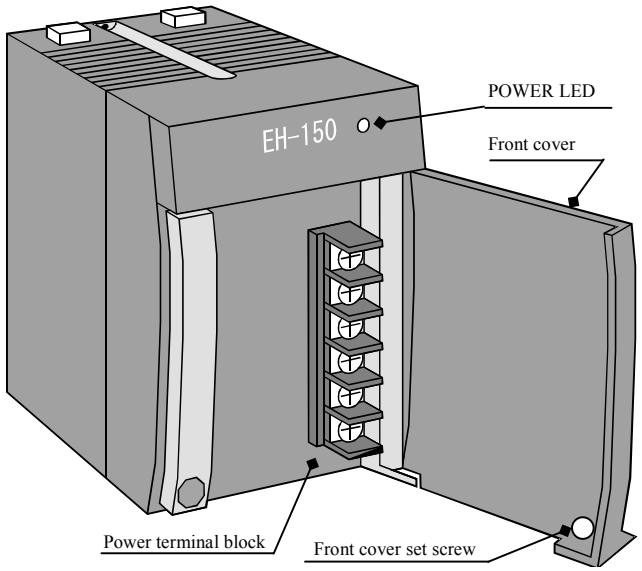
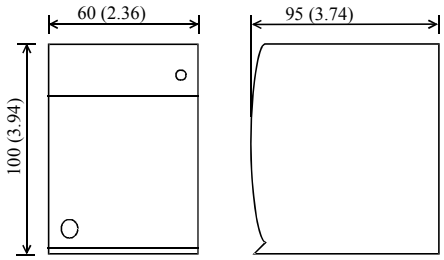
Caution 1:N communication (RS-485)

It is recommended to add about 5 to 20 ms of waiting time between data receiving from devices and data sending from CPU for more stable communication.

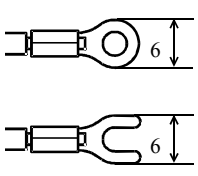
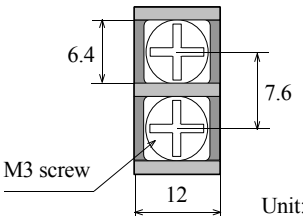
Caution Serial communication in 115.2kbps

Serial communication in 115.2kbps could be unstable depending on PC. If so, change the baud rate to 57.6kbps or slower.

2.4 Power supply module

Module features		
	Type (Weight)	EH-PSA (Approx. 0.36kg (0.79lb.)) EH-PSD (Approx. 0.28kg (0.62lb.))
	Dimensions (mm (in.))	

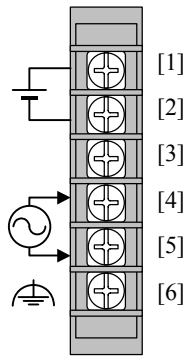
Explanation of function	Power supply module converts externally supplied power into DC5V for CPU and I/O modules via base module and DC24V for output terminals of power supply module. The operating status can be confirmed with the POWER LED on the front of the module. Two types of power supply modules are available, AC type (100 to 240V AC) and DC type (21.6 to 26.4V DC). Refer to a specification table for details.

Name	Description	Remarks
POWER LED	AC power supply: LED lighting — indicates that the AC power is supplied. LED off — indicates that the AC power is not supplied or output of DC power is short-circuit. LED blinking — indicates that output current exceeds the limit. DC power supply: LED lighting — indicates that the DC power is supplied. LED off — indicates that the DC power is not supplied or output of DC power is short-circuit or overvoltage.	LED: green
Front cover / Front cover set screw	Open this cover when wiring. Keep the front cover closed during operation. Before opening the cover, be sure to remove power to prevent the risk of electric shock. Use M3 × 6 mm (0.24 ft.) screws to fix the cover if necessary.	
Power terminal block	The recommended crimp terminal is indicated below.  (Recommended) Handle very carefully since cable could be detached when screw is loose. Unit: mm  Unit: in.	

(1) EH-PSA

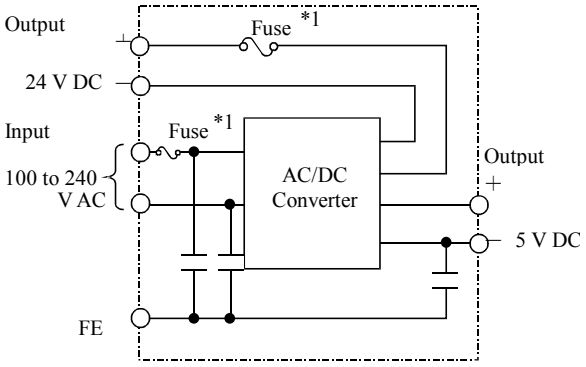
Item	Specification	
Rated output voltage	5 V DC	24 V DC
Maximum DC output current	3.8 A	0.4 A
Efficiency	65 % minimum（Load of 5V 3.8A 24 V 0.4A after conducting electricity for 5 minutes at room temperature and humidity)	
Input voltage range	85 to 264 V AC wide range	
Input current	1 A maximum（85 to 264 V AC）	
Input rush current	50 A maximum (Ta＝25 °C), 100 A maximum (Ta＝55 °C)	
Output overcurrent protection	Output short-circuit protection	
Instantaneous power failure guarantee	10 ms maximum (85 to 100V AC) 20 ms maximum (100 to 264V AC)	
Input leak current	3.5 mA maximum (60 Hz, 264 V AC)	
Dielectric withstand voltage	1 minute at 1,500 V AC between (AC input) and (DC output) 1 minute at 750 V AC between (DC output) and (FE)	
Insulation resistance	20 MΩ minimum (500 V DC) (1) Between AC input and FE (2) Between AC input and DC output	
Vibration resistance	Conforms to JIS C 0911 (16.7 Hz double amplitude 3 mm (0.12 in.) X, Y, Z each direction) Conforms to JIS C 0040 (10 to 57 Hz single amplitude 0.075 mm) (57 to 150 Hz constant acceleration 9.8 m/s^2)	
Shock resistance	Conforms to JIS C 0912 (10G, X, Y, Z directions) Conforms to JIS C 0040 (15G, X, Y, Z directions)	

Terminal configuration



[1]	24 VDC+	Connect when using 24 V DC.
[2]	24 VDC-	
[3]	N.C.	Do not connect.
[4]	100 to 240 VAC	Connect the input power.
[5]	100 to 240 VAC	
[6]	FE	Connect to Class D grounding.

Diagram of internal circuit

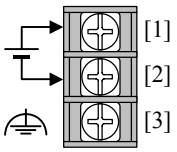


*1 The POWER LED does not light up if the fuse at 24VDC blows. The fuse is not replaced by users. Please contact your local supplier to repair.

(2) EH-PSD

Item	Specification
Rated output voltage	5 V DC
Maximum DC output current	3.8 A
Efficiency	70 % minimum (Load at 5 V DC 3.8 A)
Input voltage range	21.6 to 26.4 V DC
Input current	1.25 A maximum (with 24 V DC)
Input rush current	50 A maximum (Ta＝25 °C), 100 A maximum (Ta＝55 °C)
Output overcurrent protection	Output short-circuit protection
Instantaneous power failure guarantee	1 ms maximum (21.6 to 26.4 V DC)
Dielectric withstand voltage	1 minute at 1,500 V AC between DC input and FE
Insulation resistance	20 MΩ minimum (500 V DC) (Between DC input and FE)
Insulation method	Non insulation

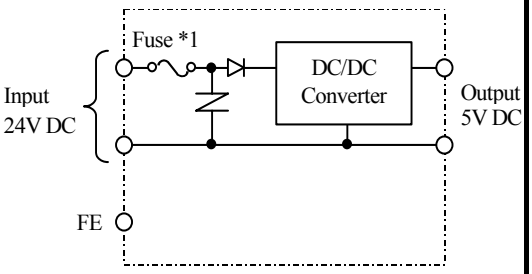
Terminal configuration



[1]	24 VDC+	Connect the input power.
[2]	24 VDC -	
[3]	FE	Connect to Class D grounding. Connect with 24V DC(-) because of supporting CE marking.

Note
Be sure to remove the connection between FE and 24V DC(-) in the insulation resistance measurement and the dielectric withstand voltage test.

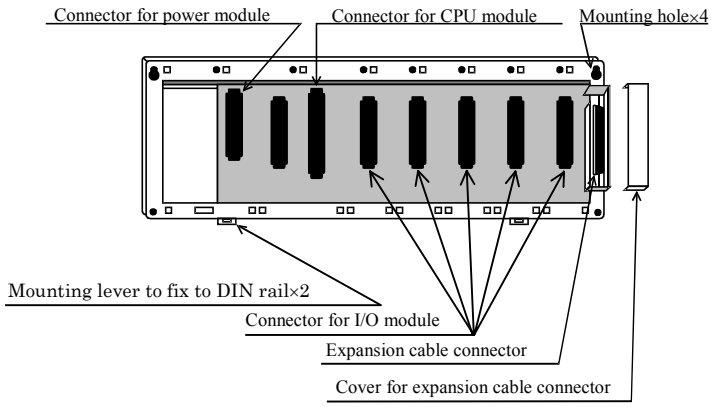
Diagram of internal circuit



*1 The POWER LED does not light up if the fuse at 24VDC blows. The fuse is not replaced by users. Please contact your local supplier to repair.

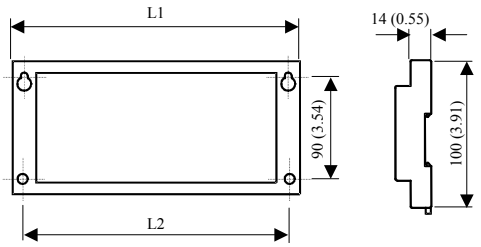
2.5 Base Unit

Module features



Type (Weight)	EH-BS3A (Approx. 0.22 kg (0.48 lb.))
	EH-BS5A (Approx. 0.28 kg (0.62 lb.))
	EH-BS6A (Approx. 0.31 kg (0.67 lb.))
	EH-BS8A (Approx. 0.36 kg (0.79 lb.))
	EH-BS11A (Approx. 0.4 kg (0.87 lb.))

Dimensions (mm (in.))



	L1 (Outer dimensions)	L2 (Mounted dimensions)
EH-BS3A	222.5	207
EH-BS5A	282.5	267
EH-BS6A	312.5	297
EH-BS8A	372.5	357
EH-BS11A	462.5	447

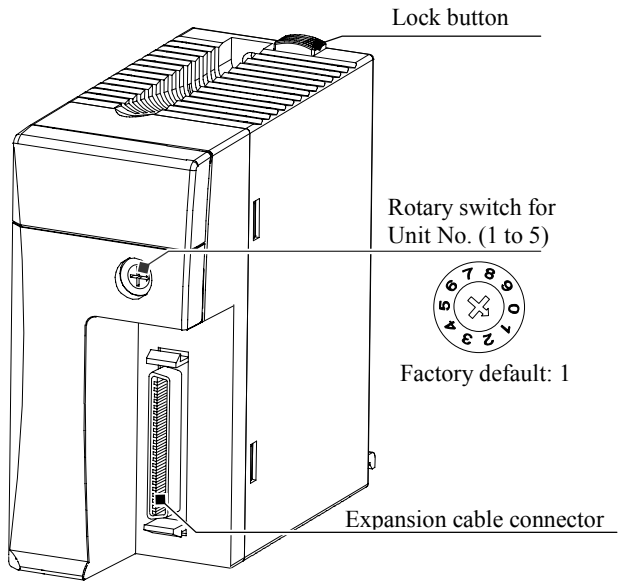
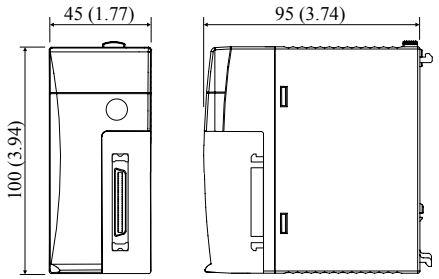
Communication slot (Slot for communication module)

EH-BS3A	all slots
EH-BS5A	all slots
EH-BS6A	all slots
EH-BS8A	all slots
EH-BS11A	only slot 0 to 7 (not available for Slot 8 to A)

Explanation of function	Base unit is one of basic modules for PLC system. Power is supplied from power supply module to CPU and I/O modules via base unit. CPU exchanges data with I/O modules via base unit. Select base unit according to the number of I/O modules for your system.

Item	Description
Connector for power module	This is a connector to power supply module.
Connector for CPU module	This is a connector to CPU module or I/O controller module.
Connector for I/O module	This is a connector to I/O module.
Expansion cable connector	This is a connector to expansion cable.
Mounting hole ×4	Use these holes when installing with screws (M4×20 mm (0.79 in.))
Mounting lever for fixing to DIN rail	This is used when mounting to a DIN rail.
Cover for expansion cable connector	This cover is used for protecting the expansion cable connector when it is not used.

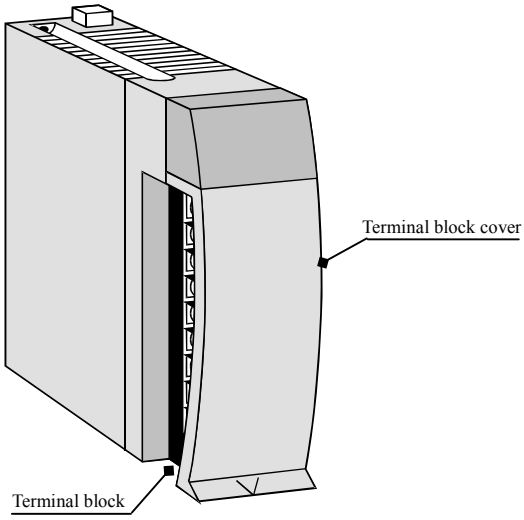
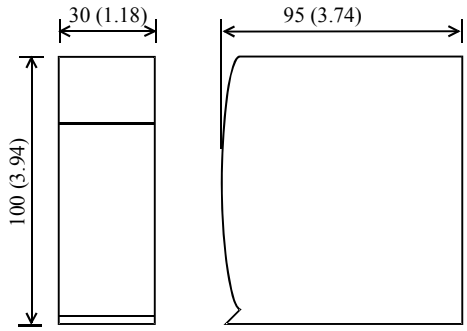
2.6 I/O Controller

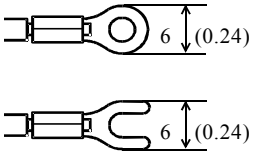
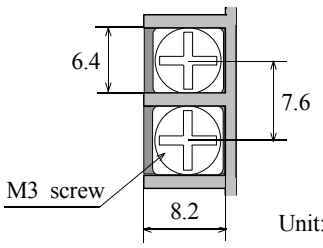
Module features		Type (Weight)	EH-IOCH2 (Approx. 0.14kg (0.31 lb.))
		Dimensions (mm (in.))	
Explanation of function	I/O controller is mounted on CPU's position of an expansion base and controls I/O modules mounted on the same base according to user program in CPU module. Be sure to set unit number with the rotary switch. Unit number must be ascending order from 1 to 5. [Note] - Do not set any other number than 1 to 5. - Although EH-IOCH (predecessor) and EH-IOCH2 can be used together, do not use EH-IOCH in the 5th expansion base. EH-IOCH2 must be used in 5th expansion base.		
Rotary switch for Unit No.	This is a rotary switch for setting the unit No. Please set 1 to 5 from the unit closer to the CPU module in order. Be sure to set without power applied. If unit number is not set properly, it may result in malfunction.		
Expansion cable connector	This is a connector to connect an expansion cable. Connect with the former base unit using the expansion cable.		

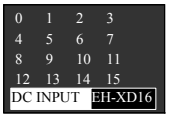
2.7 Digital I/O modules

2.7.1 Overview

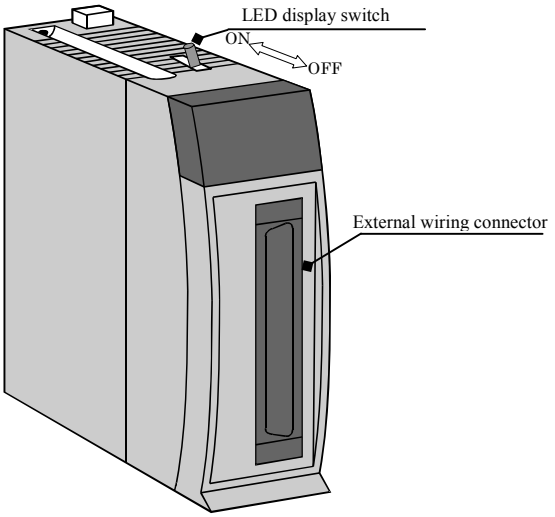
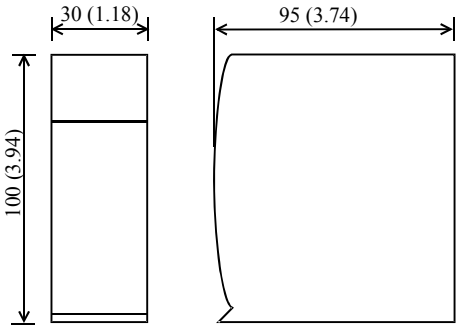
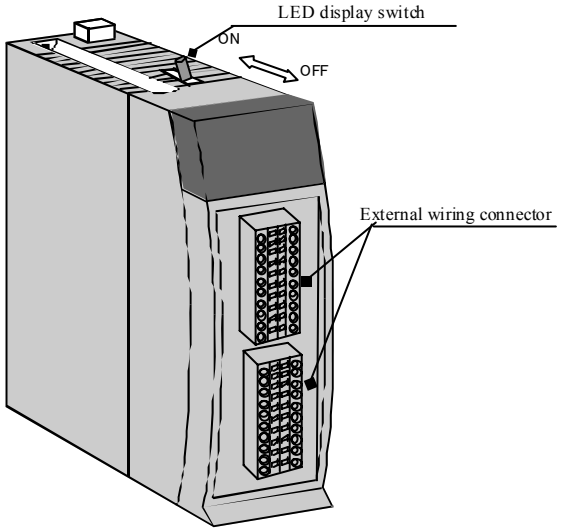
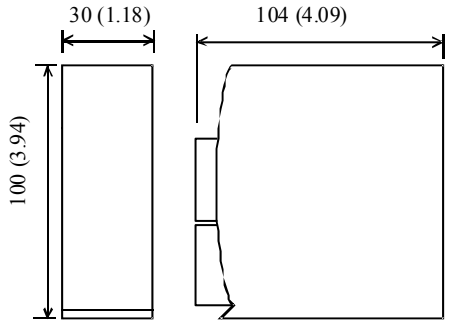
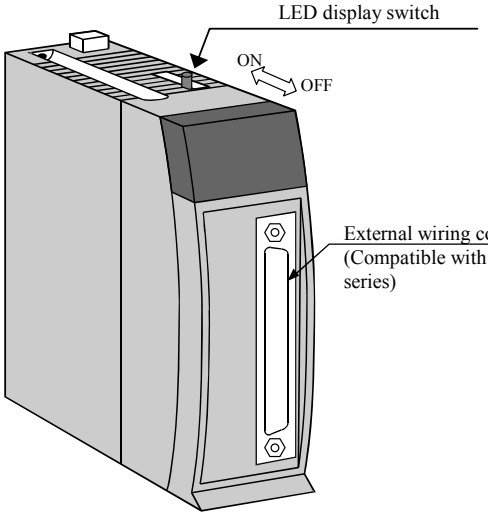
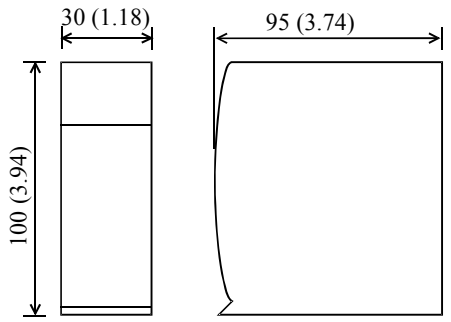
(1) Standard I/O module

Module features		
	Type (Weight)	EH-XD8 (Approx. 0.16kg (0.32lb.)) EH-XD16, XDL16 (Approx. 0.16kg (0.32lb.)) EH-XA16, XAH16 (Approx. 0.18kg (0.41lb.)) EH-YT8,EH-YTP8 (Approx. 0.16kg (0.32lb.)) EH-YT16,EH-YTP16 (Approx. 0.16kg (0.32lb.)) EH-YTP16S (Approx. 0.16kg (0.32lb.)) EH-YR8B (Approx. 0.16kg (0.32lb.)) EH-YR12 (Approx. 0.20kg (0.44lb.)) EH-YR16 (Approx. 0.24kg (0.53lb.)) EH-YS4 (Approx. 0.18kg (0.41lb.)) EH-YS16 (Approx. 0.23kg (0.51lb.))
	Dimensions (mm (in.))	

Name	Description
Terminal block	The terminal block is to connect I/O signals. It is removable type. M3 screws are used. Use a crimping terminal fitting with screw diameter. The maximum size of the cable is 0.75 mm^2. (Use 0.5 mm^2 cable if using 2 crimping terminals in single terminal.) The recommended crimping terminal is indicated as below.  (Recommended) Handle very carefully since cable could be detached when screw is loose. 
Terminal block cover	This is a cover for installing on the terminal block.

Front view	Indicated contents
	When signal status is ON, LED lights up accordingly.

(2) 32-point I/O module

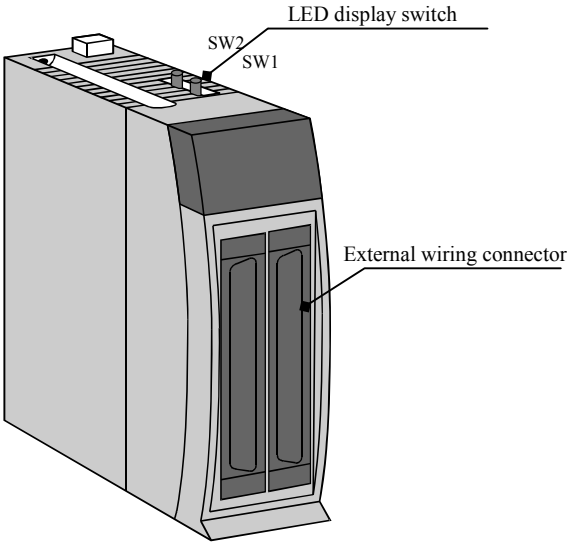
Module features		
	Type (Weight)	EH-XD32, XDL32 (Approx. 0.15kg (0.3lb.)) EH-YT32, YTP32 (Approx. 0.15kg (0.3lb.))
	Dimensions (mm (in.))	
	Type (Weight)	EH-XD32E, XDL32E (Approx. (0.15kg (0.3lb.)) EH-YT32E, YTP32E (Approx. 0.15kg (0.3lb.))
	Dimensions (mm (in.))	
	Type (Weight)	EH-XD32H (Approx. (0.12kg(0.26lb.)) EH-YT32H (Approx. (0.12kg(0.26lb.))
	Dimensions (mm (in.))	

Name	Specification
LED display switch	This is to switch I/O groups to be displayed.
External wiring connector	This is a connector for connecting I/O signals.

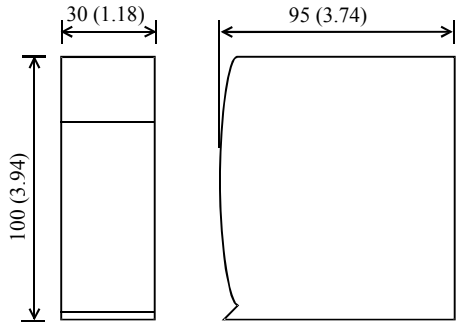
Front view	Indicated contents
	When signal status is ON, LED lights up accordingly. Displayed group can be selected by the LED display switch. SW / LED +16 / Displayed group OFF / OFF / 0 to 15 ON / ON / 16 to 31

(3) 64-point I/O module

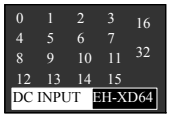
Module features



Type (Weight)	EH-XD64 (Approx. 0.14kg (0.31lb.))
	EH-YT64, YTP64 (Approx. 0.13kg (0.29lb.))
Dimensions (mm (in.))	



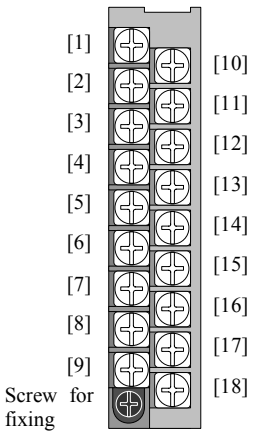
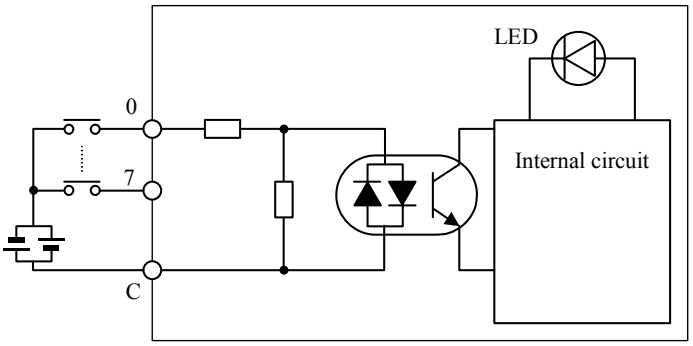
Item	Description
LED display switch	This is to switch I/O groups to be displayed.
External wiring connector	This is a connector for connecting I/O signals.

Front view	Indicated contents
	When signal status is ON, LED lights up accordingly. Displayed group can be selected by the LED display switch. SW1 / SW2 / LED 16 / LED 32 / Displayed group OFF / OFF / OFF / OFF / 0 to 15 ON / OFF / ON / OFF / 16 to 31 OFF / ON / OFF / ON / 32 to 47 ON / ON / ON / ON / 48 to 63

2.7.2 Specifications

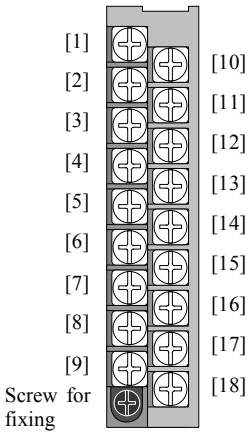
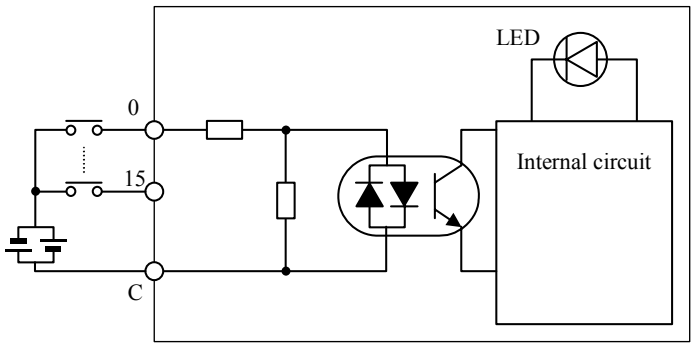
(1) EH-XD8

Specification		EH-XD8
Input type		DC input (common for sink and source)
Number of inputs		8
Input voltage		24V DC (19.2 to 30V DC)
Input current		Approx. 6.9 mA
Input impedance		Approx. 3.5 kΩ
Operating voltage	ON voltage	15V minimum
	OFF voltage	5V maximum
Input response time	OFF➔ON	5ms maximum
	ON ➔OFF	5ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Removable type screw terminal block (M3)
Number of inputs / common		8
Internal current consumption		30 mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
	[2]	1	
	[3]	2	
	[4]	3	
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	N.C.	
	[11]	N.C.	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	C	

(2) EH-XD16

Specification		EH-XD16
Input type		DC input (common for sink and source)
Number of inputs		16
Input voltage		24V DC (19.2 to 30V DC)
Input current		Approx. 4.0 mA
Input impedance		Approx. 5.9 kΩ
Operating voltage	ON voltage	15V minimum
	OFF voltage	5V maximum
Input response time	OFF➔ON	5ms maximum
	ON ➔OFF	5ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Removable type screw terminal block (M3)
Number of inputs / common		16 (1 common, 2 terminals)
Internal current consumption		50 mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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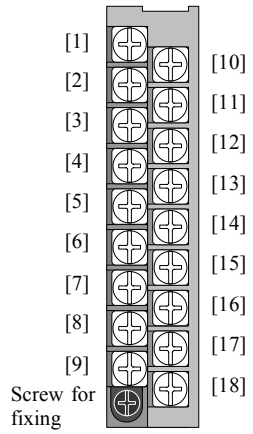
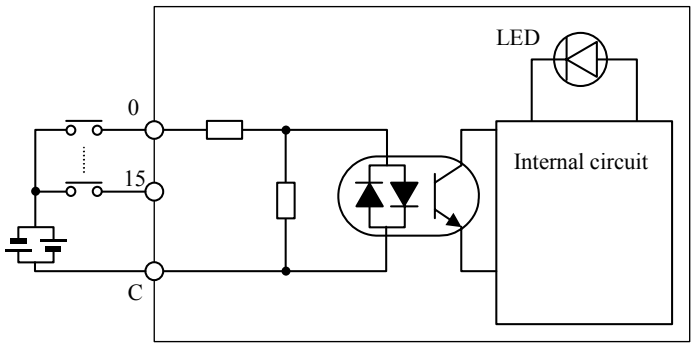
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	

(3) EH-XDL16

Specification		EH-XDL16
Input type		DC input (common for sink and source)
Number of inputs		16
Input voltage		24V DC (19.2 to 30V DC)
Input current		Approx. 4.0 mA
Input impedance		Approx. 5.9 kΩ
Operating voltage	ON voltage	15V minimum
	OFF voltage	5V maximum
Input response time	OFF➔ON	16ms maximum
	ON ➔OFF	16ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Removable type screw terminal block (M3)
Number of input points / commons		16 (1 common, 2 terminals)
Internal current consumption		50 mA maximum

Terminal configuration	No.	Signal name	Diagram of internal circuit
	[1]	0	
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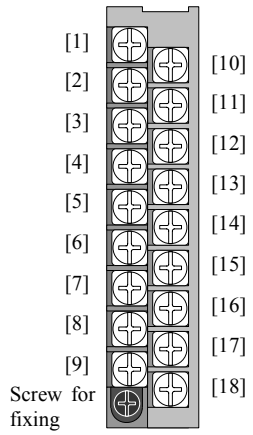
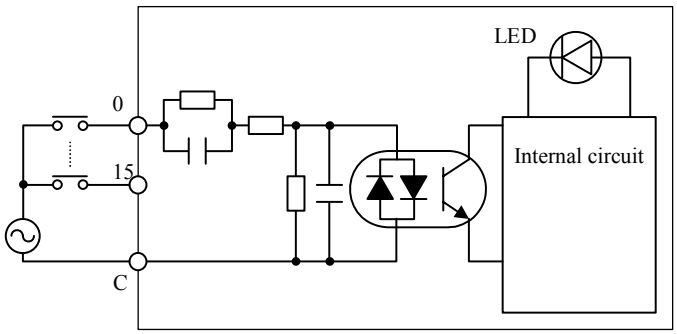
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	

(4) EH-XA16

Specification		EH-XA16
Input type		AC input
Number of inputs		16
Input voltage		100 to 120V AC (85 to 132V AC)
Input current		4.8 to 7.6mA (100V AC / 50Hz)
Input impedance		Approx. 16kΩ (50Hz) / Approx. 13kΩ (60Hz)
Operating voltage	ON voltage	79V AC minimum
	OFF voltage	20V AC maximum
Input response time	OFF➔ON	15ms maximum
	ON ➔OFF	25ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Removable type screw terminal block (M3)
Number of inputs / common		16 (1 common, 2 terminals)
Internal current consumption		50 mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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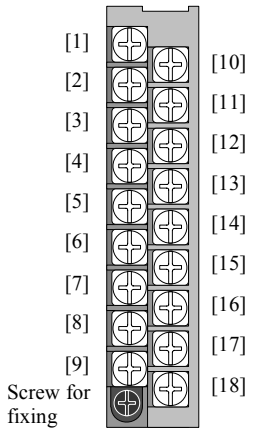
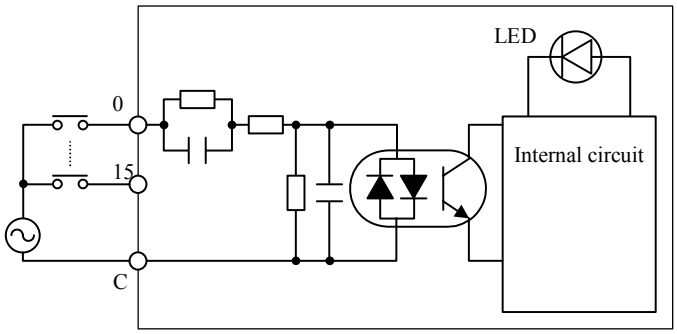
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	

(5) EH-XAH16

Specification		EH-XAH16
Input type		AC input
Number of inputs		16
Input voltage		200 to 240V AC (170 to 264V AC)
Input current		4.3 to 8.0mA (200V AC / 50Hz)
Input impedance		Approx. 32kΩ (50Hz) / Approx. 27kΩ (60Hz)
Operating voltage	ON voltage	164V AC minimum
	OFF voltage	40V AC maximum
Input response time	OFF➔ON	15ms maximum
	ON ➔OFF	25ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Removable type screw terminal block (M3)
Number of inputs / common		16 (1 common, 2 terminals)
Internal current consumption		50 mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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	[6]	5	
	[7]	6	
	[8]	7	
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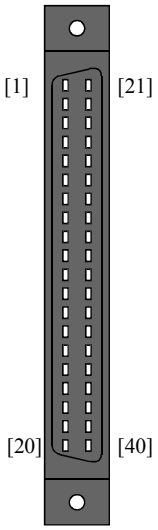
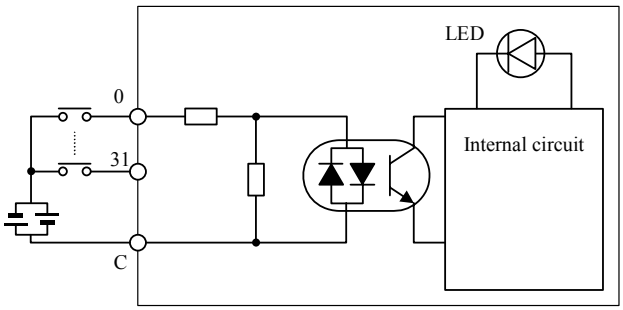
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	

(6) EH-XD32

Specification		EH-XD32
Input type		DC input (Common for sink and source)
Number of inputs		32
Input voltage		24V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3mA
Input impedance		Approx. 5.6kΩ
Operating voltage	ON voltage	15V minimum
	OFF voltage	5V maximum
Input response time	OFF➔ON	5ms maximum
	ON ➔OFF	5ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Connector
Number of inputs / common		32 (1 common, 4 terminals)
Internal current consumption		60 mA maximum

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
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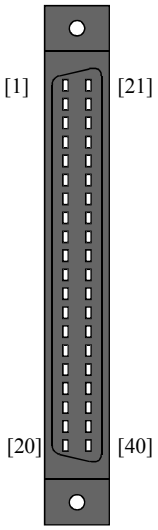
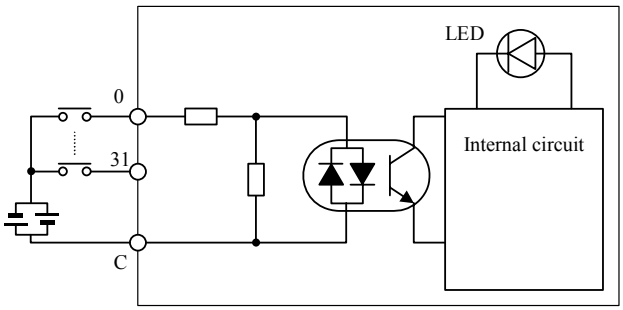
	[8]	7	[28]	23	
	[9]	C	[29]	C	
	[10]	8	[30]	24	
	[11]	9	[31]	25	
	[12]	10	[32]	26	
	[13]	11	[33]	27	
	[14]	12	[34]	28	
	[15]	13	[35]	29	
	[16]	14	[36]	30	
	[17]	15	[37]	31	
	[18]	C	[38]	C	
	[19]	N.C.	[39]	N.C.	
	[20]	N.C.	[40]	N.C.	

Applicable connectors
- 120mm (4.73in.) space is required in front of the module. Be sure to consider this space in installation location.
- Use a shield cable with class D grounding.

Manufacturers			
Manufac-turers	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Crimp type (flat cable)	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(7) EH-XDL32

Specification		EH-XDL32
Input type		DC input (Common for sink and source)
Number of inputs		32
Input voltage		24V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3mA
Input impedance		Approx. 5.6kΩ
Operating voltage	ON voltage	15V minimum
	OFF voltage	5V maximum
Input response time	OFF➔ON	16ms maximum
	ON ➔OFF	16ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Connector
Number of inputs / common		32 (1 common, 4 terminals)
Internal current consumption		60 mA maximum

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
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	[4]	3	[24]	19	
	[5]	4	[25]	20	
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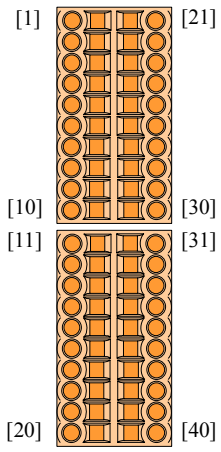
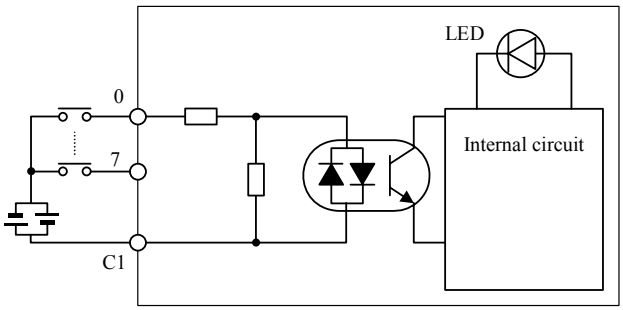
	[7]	6	[27]	22	
	[8]	7	[28]	23	
	[9]	C	[29]	C	
	[10]	8	[30]	24	
	[11]	9	[31]	25	
	[12]	10	[32]	26	
	[13]	11	[33]	27	
	[14]	12	[34]	28	
	[15]	13	[35]	29	
	[16]	14	[36]	30	
	[17]	15	[37]	31	
	[18]	C	[38]	C	
	[19]	N.C.	[39]	N.C.	
	[20]	N.C.	[40]	N.C.	

Applicable connectors
- 120mm (4.73in.) space is required in front of the module. Be sure to consider this space in installation location.
- Use a shield cable with class D grounding.

Manufacturers			
Manufac-turers	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Crimp type (flat cable)	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(8) EH-XD32E

Specification		EH-XD32E
Input type		DC input (Common for sink and source)
Number of inputs		32
Input voltage		24V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3mA
Input impedance		Approx. 5.6kΩ
Operating voltage	ON voltage	15V minimum
	OFF voltage	5V maximum
Input response time	OFF➔ON	1ms maximum
	ON ➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Spring type terminal block (removable)
Number of inputs / common		8 (4 commons, 8 terminals)
Internal current consumption		60 mA maximum

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
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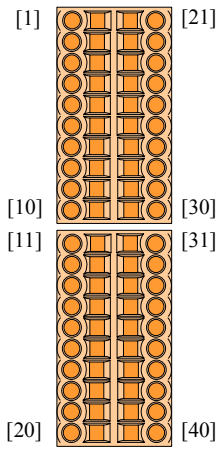
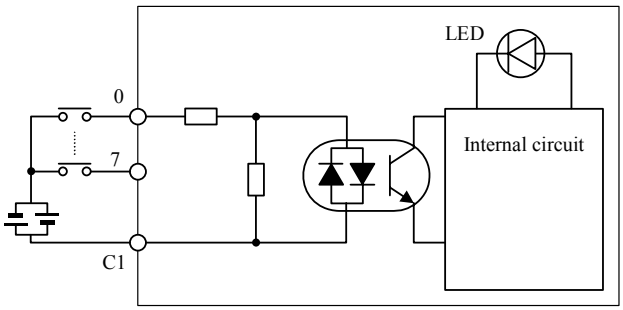
	[6]	5	[26]	21	
	[7]	6	[27]	22	
	[8]	7	[28]	23	
	[9]	C1	[29]	C3	
	[10]	C1	[30]	C3	
	[11]	8	[31]	24	
	[12]	9	[32]	25	
	[13]	10	[33]	26	
	[14]	11	[34]	27	
	[15]	12	[35]	28	
	[16]	13	[36]	29	
	[17]	14	[37]	30	
	[18]	15	[38]	31	
	[19]	C2	[39]	C4	
	[20]	C2	[40]	C4	

Applicable connectors	Applicable cable
Manufacturer: Weidmuller Type: B2L3.5/20AUOR Product No.: 175736	0.5mm^2 – 1.0mm^2 (shared at a twisted pair cable and a single core cable) AWG 28 - 18 Crimping terminal cannot be used.

(9) EH-XDL32E

Specification		EH-XDL32E
Input type		DC input (Common for sink and source)
Number of inputs		32
Input voltage		24V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3mA
Input impedance		Approx. 5.6kΩ
Operating voltage	ON voltage	15V minimum
	OFF voltage	5V maximum
Input response time	OFF➔ON	16ms maximum
	ON ➔OFF	16ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Spring type terminal block (removable type)
Number of inputs / common		8 (4 commons, 8 terminals)
Internal current consumption		60 mA maximum

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
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	[5]	4	[25]	20	
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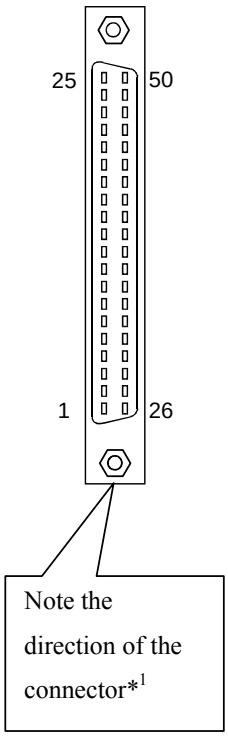
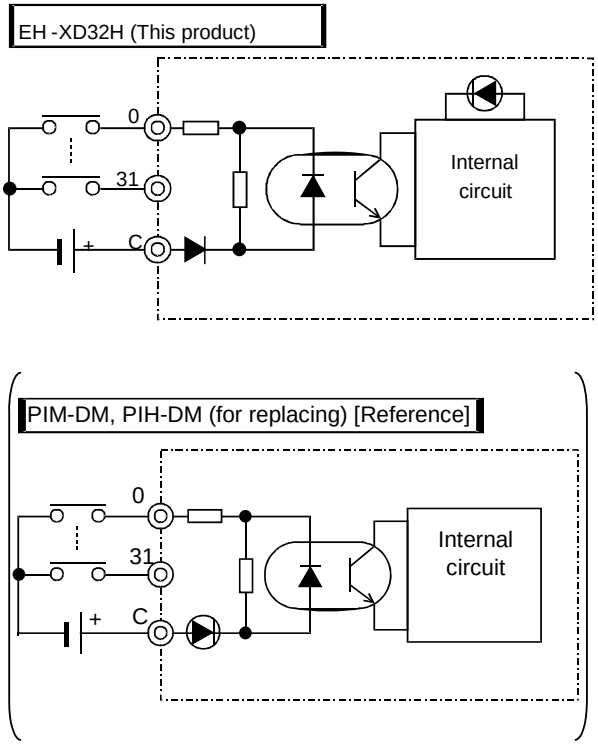
	[9]	C1	[29]	C3	
	[10]	C1	[30]	C3	
	[11]	8	[31]	24	
	[12]	9	[32]	25	
	[13]	10	[33]	26	
	[14]	11	[34]	27	
	[15]	12	[35]	28	
	[16]	13	[36]	29	
	[17]	14	[37]	30	
	[18]	15	[38]	31	
	[19]	C2	[39]	C4	
	[20]	C2	[40]	C4	

Applicable connectors	Applicable cable
Manufacturer: Weidmuller Type: B2L3.5/20AUOR Product No.175736	0.5mm^2 – 1.0mm^2 (Shared at a twisted pair cable and a single core cable.) AWG 28 - 18 Crimping terminal cannot be used.

(10) EH-XD32H

Item		PIM-DM, PIH-DM (for replacing)	EH-XD32H (This product)
Series		EM/EM-Ⅱ, H-200/250/252	EH-150
Input specification		DC source input	
Number of inputs		32	
Input voltage		24 V DC (21.6 to 26.0 V DC)	
Input current (24V DC)		Approx. 4.7 mA	Approx. 4.1 mA
Input impedance		Approx. 5.1 kΩ	Approx. 5.9 kΩ
Operating voltage	ON voltage	19 V minimum	
	OFF voltage	7 V maximum	
Input response time	OFF➔ON	4 ms maximum	
	ON ➔OFF	4 ms maximum	
Insulation method		Photo-coupler insulation	
Number of inputs / common		32 (1 common, 4 terminals)	
Input display		LED (red)	LED (green)
Polarity		Common terminal (+)	
External connection		Connector (50 pins)	
Internal current consumption		20 mA maximum	60 mA maximum

Specification of external wiring connector				Wire
Product name	Manufacturer	Product No.	Connection method	
Plug connector	Hirose Electric Co., Ltd.	DX30-50P	Untie crimping	AWG#30
		DX30A-50P		AWG#28
		DX31-50P	Crimping	AWG#30
		DX31A-50P		AWG#28
		DX40-50P	Soldering	—
Die cast cover		DX-50-CV1	—	—

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[25]	NC	[50]	NC	
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	[14]	8	[39]	24	
	[13]	NC	[38]	NC	
	[12]	C	[37]	C	
	[11]	NC	[36]	NC	
	[10]	7	[35]	23	
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	[8]	5	[33]	21	
	[7]	4	[32]	20	
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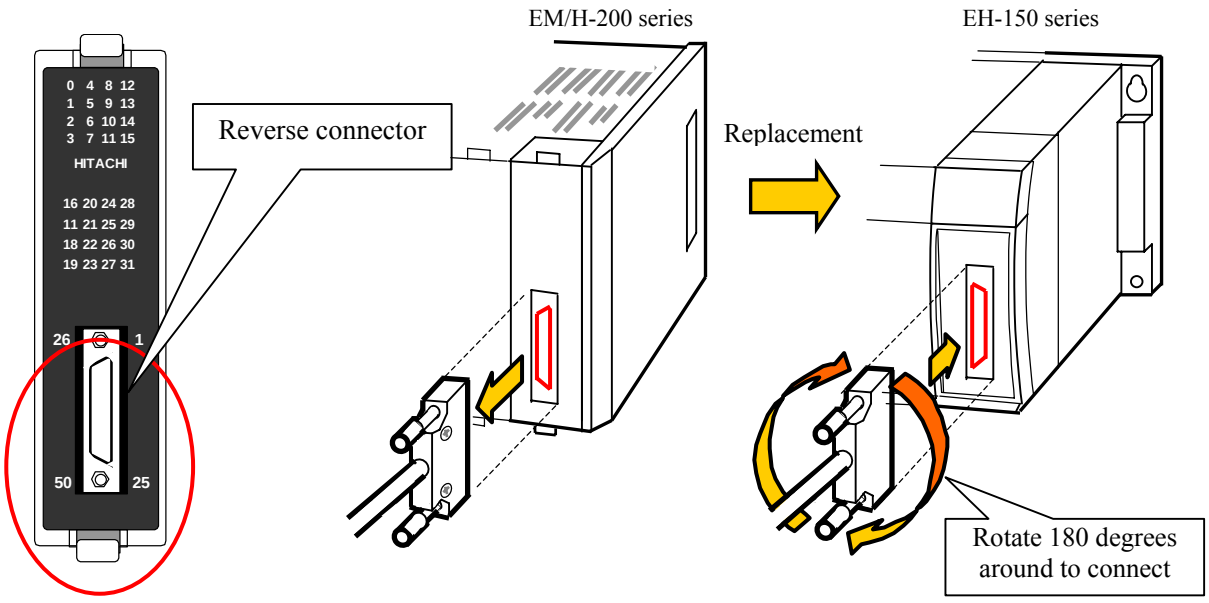
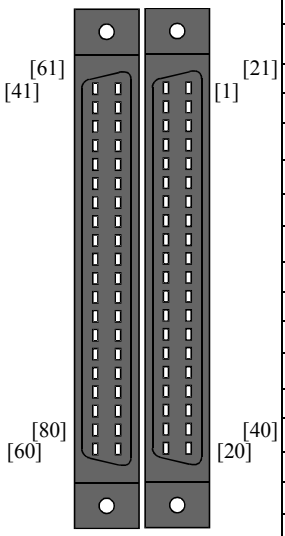
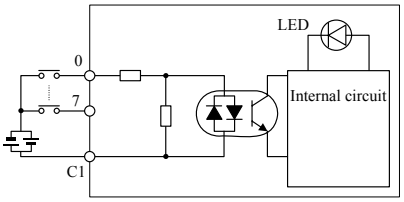
	[5]	2	[30]	18	
	[4]	1	[29]	17	
	[3]	0	[28]	16	
	[2]	NC	[27]	NC	
	[1]	C	[26]	C	

*1 The mounted direction of the connector for EH-XD32H is 180 degrees opposite with EM/H-200 series. Plug cable connector with rotating 180 degrees. (It is mechanically not possible to plug in wrong direction.)



(11) EH-XD64

Specification		EH-XD64
Input type		DC input (Common for sink and source)
Number of inputs		64
Input voltage		24V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3mA
Input impedance		Approx. 5.6kΩ
Operating voltage	ON voltage	15V minimum
	OFF voltage	5V maximum
Input response time	OFF➔ON	1ms maximum
	ON ➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Input display		Green LED
External connection		Connector
Number of inputs / common		32 (2 commons, 4 terminals)
Internal current consumption		80 mA maximum

Terminal configuration	No.	Signal name	No.	Signal name	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[41]	32	[61]	48	[1]	0	[21]	16	
	[42]	33	[62]	49	[2]	1	[22]	17	
	[43]	34	[63]	50	[3]	2	[23]	18	
	[44]	35	[64]	51	[4]	3	[24]	19	
	[45]	36	[65]	52	[5]	4	[25]	20	
	[46]	37	[66]	53	[6]	5	[26]	21	
	[47]	38	[67]	54	[7]	6	[27]	22	
	[48]	39	[68]	55	[8]	7	[28]	23	
	[49]	C2	[69]	C2	[9]	C1	[29]	C1	
	[50]	40	[70]	56	[10]	8	[30]	24	
	[51]	41	[71]	57	[11]	9	[31]	25	
	[52]	42	[72]	58	[12]	10	[32]	26	
	[53]	43	[73]	59	[13]	11	[33]	27	
	[54]	44	[74]	60	[14]	12	[34]	28	
	[55]	45	[75]	61	[15]	13	[35]	29	
	[56]	46	[76]	62	[16]	14	[36]	30	
	[57]	47	[77]	63	[17]	15	[37]	31	
	[58]	C2	[78]	C2	[18]	C1	[38]	C1	
	[59]	N.C.	[79]	N.C.	[19]	N.C.	[39]	N.C.	
	[60]	N.C.	[80]	N.C.	[20]	N.C.	[40]	N.C.	

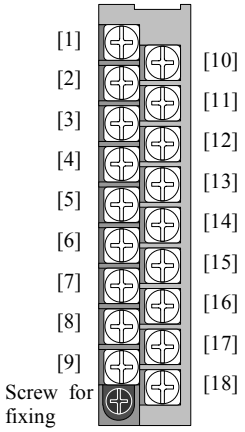
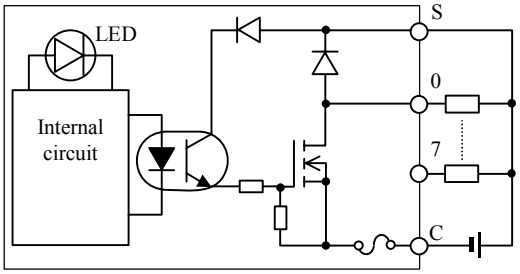
Applicable connectors
- 120mm (4.73in.) space is required in front of the module. Be sure to consider this space in installation location.
- Use a shield cable with class D grounding.

Manufacturers			
Manufacturers	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Crimp type (flat cable)	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(12) EH-YT8

Specification		EH-YT8
Output specification		Transistor output (sink type)
Number of outputs		8
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.5A (0.3A MFG No.02F** or before) *1
	1 common	2.4A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Removable type screw terminal block (M3)
Number of outputs / common		8
Surge removal circuit		Diode
Fuse*2		4A / 1 common
External power supply (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption		30 mA maximum
Short-circuit protection function		None

*1 MFG No. indicates production month. 02F** means June 2002.
*2 The fuse is not replaced by users. Please contact your local supplier to repair.

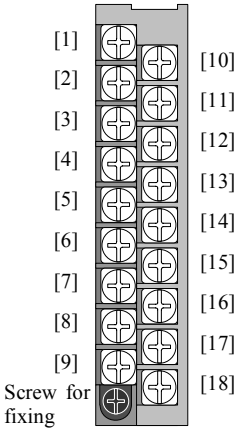
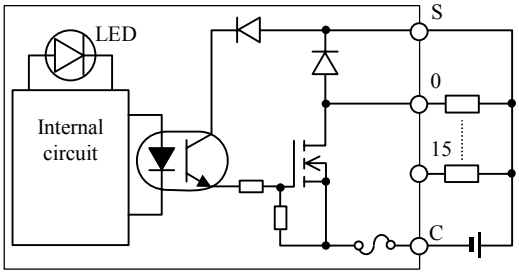
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
	[2]	1	
	[3]	2	
	[4]	3	
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	N.C.	
	[11]	N.C.	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	S	

(13) EH-YT16

Specification		EH-YT16
Output specification		Transistor output (sink type)
Number of outputs		16
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.5A(0.3A MFG No.02F** or before)*1
	1 common	4A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Removable type screw terminal block (M3)
Number of outputs / common		16
Surge removal circuit		Diode
Fuse *2		8A / 1 common
External connection (for supplying power to S-terminal		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption		50 mA maximum
Short-circuit protection function		None

*1 MFG No. indicates production month. 02F** means June 2002.

*2 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal block	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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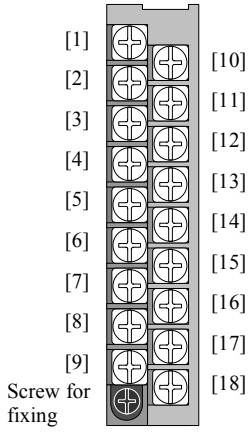
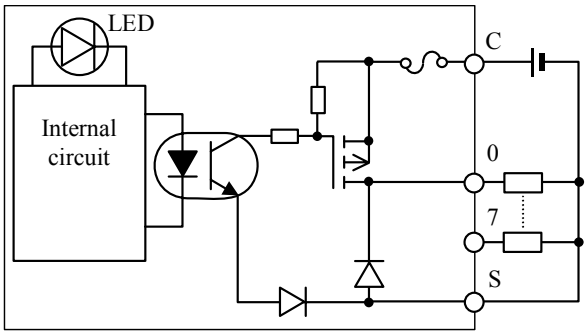
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	S	

(14) EH-YTP8

Specification		EH-YTP8
Output specification		Transistor output (source type)
Number of outputs		8
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.5A(0.3A MFG No.02F** or before) *1
	1 common	2.4A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Removal type screw terminal block (M3)
Number of outputs / common		8
Surge removal circuit		Diode
Fuse *2		4A / 1 common
External connection (for supplying power to S-terminal		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption		30 mA maximum
Short-circuit protection function		None

*1 MFG No. indicates production month. 02F** means June 2002.

*2 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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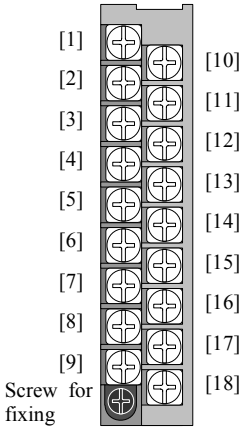
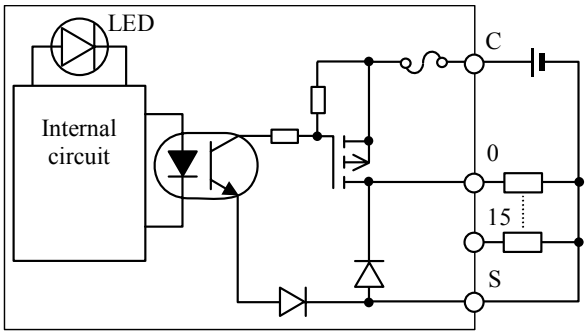
	[4]	3	
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	N.C.	
	[11]	N.C.	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	S	

(15) EH-YTP16

Specification		EH-YTP16
Output specification		Transistor output (source type)
Number of outputs		16
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.5A (0.3A MFG No.02F** or before *1)
	1 common	4A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Removable type screw terminal block (M3)
Number of outputs / common		16
Surge removal circuit		Diode
Fuse *2		8A / 1 common
External connection (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption		50 mA maximum
Short-circuit protection function		None

*1 MFG No. indicates production month. 02F** means June 2002.
*2 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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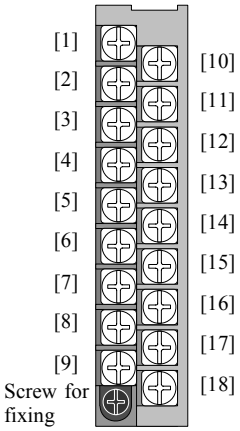
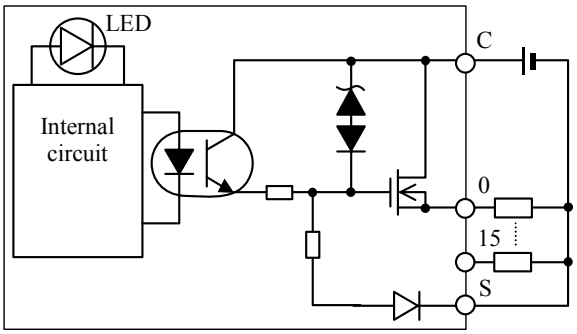
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	S	

(16) EH-YTP16S

Specification		EH-YTP16S
Output specification		Transistor output (source type)
Number of outputs		16
Raged load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.8A
	1 common	5A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Removable type screw terminal block (M3)
Number of outputs / common		16
Surge removal circuit		Built-in
Fuse		None
External connection (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption		50 mA maximum
Short-circuit protection function		Available

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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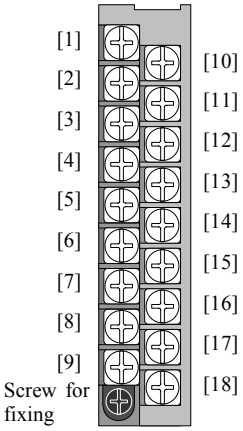
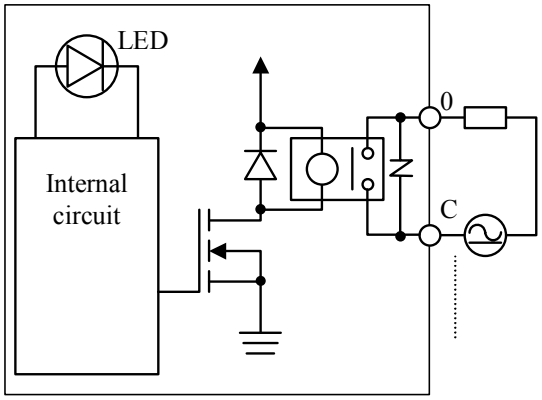
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	S	

(17) EH-YR8B

Specification		EH-YR8B
Output specification		Relay output
Number of outputs		8
Rated load voltage		100/240V AC , 24V DC
Minimum switching current		1mA (5V DC), except after a great current switching
Leak current		None
Maximum load current	1 circuit	2A
	1 common	2A
Output response time	OFF➔ON	10ms maximum
	ON➔OFF	10ms maximum
Insulation system		Relay insulation
Output display		Green LED
External connection		Removable type screw terminal block (M3)
Number of outputs / common		1 (each output separated)
Surge removal circuit		Varistor (Varistor voltage 423 to 517V)
Fuse		None
External power supply		Not necessary
Internal current consumption (5V DC)		220 mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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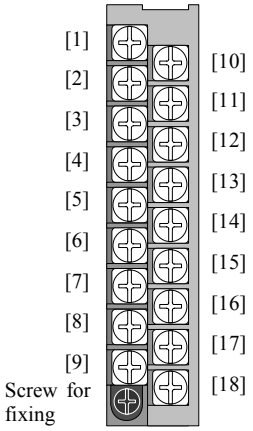
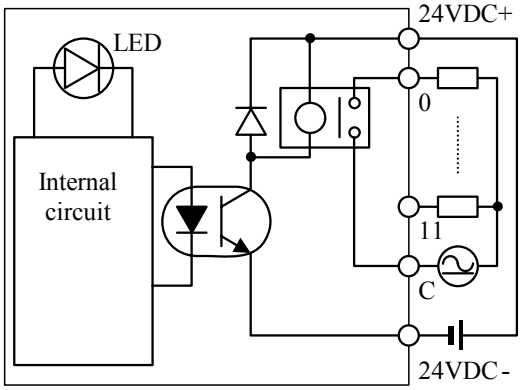
	[3]	2	
	[4]	3	
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	N.C.	
	[10]	C0	
	[11]	C1	
	[12]	C2	
	[13]	C3	
	[14]	C4	
	[15]	C5	
	[16]	C6	
	[17]	C7	
	[18]	N.C.	

(18) EH-YR12

Specification		EH-YR12
Output specification		Relay output
Number of outputs		12
Rated load voltage		100/240V AC, 24V DC
Minimum switching current		1mA (5V DC), except a great current switching
Leak current		None
Maximum load current	1 circuit	2A
	1 common	5A
Output response time	OFF➔ON	10ms maximum
	ON➔OFF	10ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Removable type screw terminal block (M3)
Number of outputs / common		12 (1 common, 2 terminals)
Surge removal circuit		None
Fuse		None
External power supply		24V DC (+10%, -15%) (70mA at the maximum)
Internal current consumption (5V DC)		40 mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	24V DC+	
	[2]	N.C.	
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	[4]	1	
	[5]	2	
	[6]	3	
	[7]	4	
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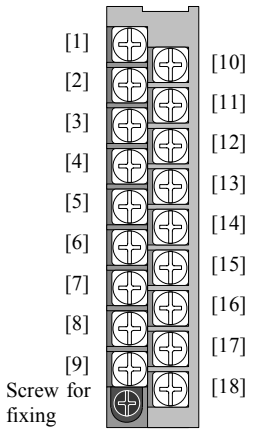
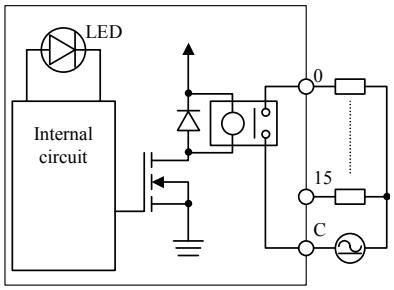
	[10]	24V DC-	
	[11]	N.C.	
	[12]	6	
	[13]	7	
	[14]	8	
	[15]	9	
	[16]	10	
	[17]	11	
	[18]	C	

(19) EH-YR16

Specification		EH-YR16
Output specification		Relay output
Number of outputs		16
Rated load voltage		100/240V AC, 24V DC
Minimum switching current		1mA (5V DC), except after a great current switching
Leak current		None
Maximum load current	1 circuit	2A
	1 common	8A (Ambient temperature 40°C), see the following derating table
Output response time	OFF➔ON	10ms maximum
	ON➔OFF	10ms maximum
Insulation system		Relay insulation
Output display		Green LED
External connection		Removal type screw terminal block (M3)
Number of output points / commons		16 (1 common, 2 terminals)
Surge removal circuit		None
Fuse		None
External power supply		Not used
Internal current consumption (5V DC)		430 mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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	[7]	6	
	[8]	7	
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	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
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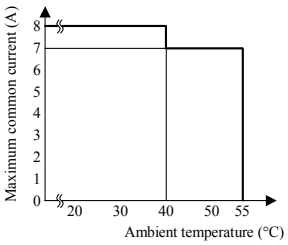
	[17]	15	
	[18]	C	

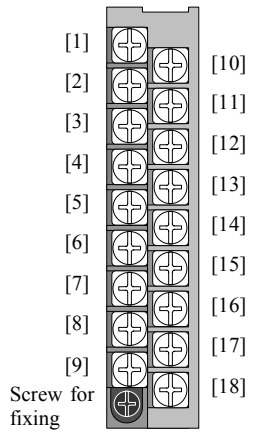
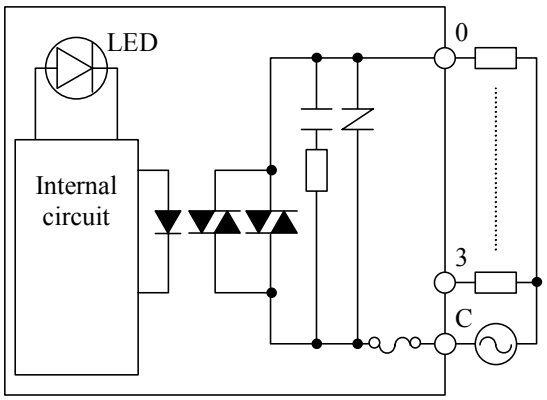
EH-YR16 Derating table



(20) EH-YS4

Specification		EH-YS4
Output specification		Triac output
Number of outputs		4
Rated load voltage		100/240V AC (85 to 250V AC)
Minimum switching current		100mA
Leak current		5mA maximum
Maximum load current	1 circuit	0.5A
	1 common	2A
Output response time	OFF➔ON	1ms maximum
	ON➔OFF	1ms + 1/2 cycle maximum
Insulation system		Photo-coupler triac insulation
Output display		Green LED
External connection		Removable type screw terminal block (M3)
Number of outputs / common		4
Surge removal circuit		Varistor
Fuse *1		4A
Internal current consumption		70 mA maximum

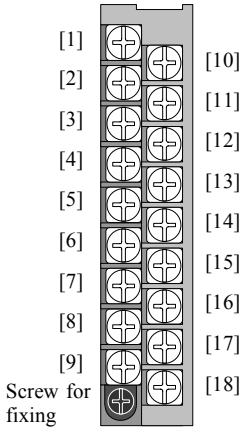
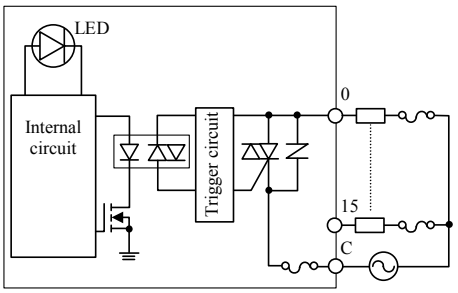
*1 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
	[2]	N.C.	
	[3]	1	
	[4]	N.C.	
	[5]	2	
	[6]	N.C.	
	[7]	3	
	[8]	N.C.	
	[9]	C	
	[10]	N.C.	
	[11]	N.C.	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	N.C.	

(21) EH-YS16

Specification		EH-YS16
Output specification		Triac output
Number of outputs		16
Rated load voltage		100/240V AC (85 to 250V AC)
Minimum switching current		10mA
Leak current		2mA
Maximum load current	1 circuit	0.3A
	1 common	4A (Ambient temperature 45°C), see the following derating table
Output response time	OFF➔ON	1ms maximum
	ON➔OFF	1ms + 1/2 cycle maximum
Insulation system		Photo-coupler triac insulation
Output display		Green LED
External connection		Removable type screw terminal block (M3)
Number of output points / commons		16 (1 common, 2 terminals)
Surge removal circuit		Varistor
Fuse *1		6.3A (Be sure to install external fuse)
Internal current consumption		250 mA maximum

*1 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal configuration	No.	Signal name	Diagram of Internal output
	[1]	0	
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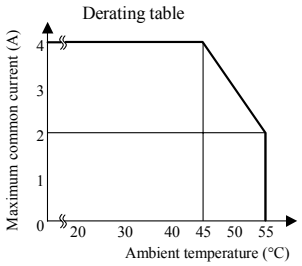
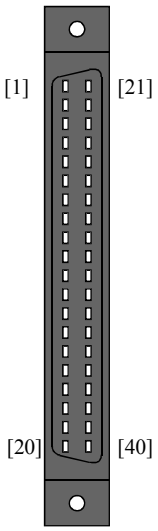
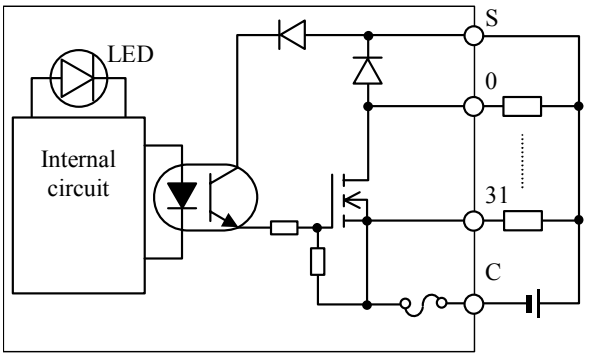
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	



(22) EH-YT32

Specification		EH-YT32
Output specification		Transistor output (sink type)
Number of outputs		32
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.2A
	1 common	4A *1
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Connector
Number of outputs / common		32 (1 common, 4 terminals)
Surge removal circuit		Diode
Fuse *2		10A / 1 common
External connection (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption (5V DC)		90 mA maximum
Short-circuit protection function		Available

*1 Total current of 4 common pins. The maximum current for single common terminal is 3A.
*2 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
	[2]	1	[22]	17	
	[3]	2	[23]	18	
	[4]	3	[24]	19	
	[5]	4	[25]	20	
	[6]	5	[26]	21	
	[7]	6	[27]	22	
	[8]	7	[28]	23	
	[9]	C	[29]	C	
	[10]	S	[30]	S	
	[11]	8	[31]	24	
	[12]	9	[32]	25	
	[13]	10	[33]	26	
	[14]	11	[34]	27	
	[15]	12	[35]	28	
	[16]	13	[36]	39	
	[17]	14	[37]	30	
	[18]	15	[38]	31	
	[19]	C	[39]	C	
	[20]	S	[40]	S	

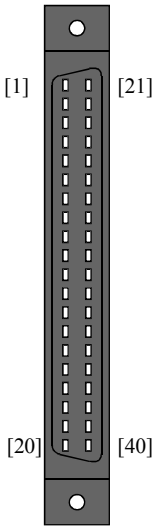
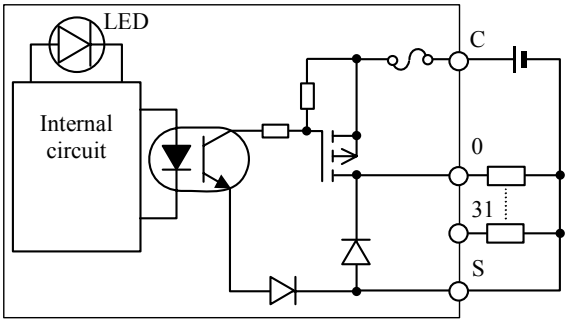
Applicable connectors
- 120mm (4.73in.) space is required in front of the module. Be sure to consider this space in installation location.
- Use a shield cable with class D grounding.

Manufac-turers			
	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Crimp type (flat cable)	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(23) EH-YTP32

Specification		EH-YTP32
Output specification		Transistor output (source type)
Number of outputs		32
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.2A
	1 common	4A *1
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Connector
Number of outputs / common		32 (1 common, 4 terminals)
Surge removal circuit		Diode
Fuse *2		10A / 1 common
External power supply (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption (5V DC)		90 mA maximum
Short-circuit protection function		Available

*1 Total current of 4 common pins. The maximum current for single common terminal is 3A.
*2 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
	[2]	1	[22]	17	
	[3]	2	[23]	18	
	[4]	3	[24]	19	
	[5]	4	[25]	20	
	[6]	5	[26]	21	
	[7]	6	[27]	22	
	[8]	7	[28]	23	
	[9]	C	[29]	C	
	[10]	S	[30]	S	
	[11]	8	[31]	24	
	[12]	9	[32]	25	
	[13]	10	[33]	26	
	[14]	11	[34]	27	
	[15]	12	[35]	28	
	[16]	13	[36]	29	
	[17]	14	[37]	30	
	[18]	15	[38]	31	
	[19]	C	[39]	C	
	[20]	S	[40]	S	

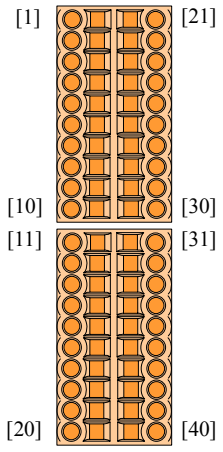
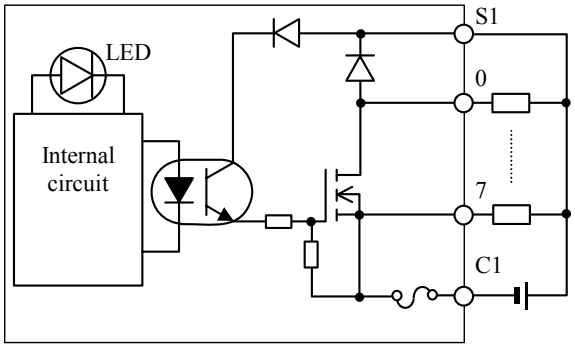
Applicable connectors
- 120mm (4.73in.) space is required in front of the module. Be sure to consider this space in installation location.
- Use a shield cable with class D grounding.

Manufacturers			
Manufacturers	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Crimp type (flat cable)	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(24) EH-YT32E

Specification		EH-YT32E
Output specification		Transistor output (sink type)
Number of outputs		32
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.2A
	1 common	1A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Spring type terminal block
Number of outputs / common		8 (4 commons, 4 terminals)
Surge removal circuit		Diode
Fuse*1		10A / 1 common
External power supply (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption (5V DC)		90 mA maximum
Short-circuit protection function		Available

*1 The fuse is not replaced by users. Please contact your local supplier to repair.

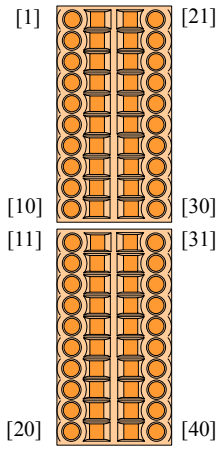
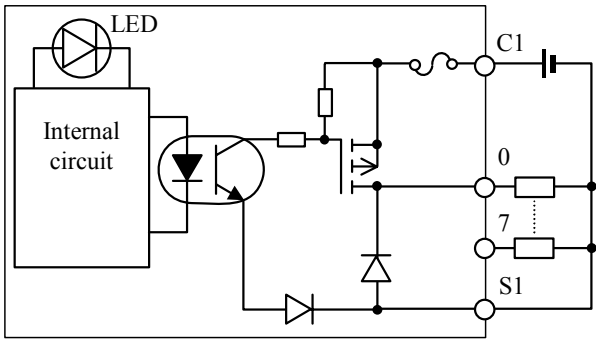
Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
	[2]	1	[22]	17	
	[3]	2	[23]	18	
	[4]	3	[24]	19	
	[5]	4	[25]	20	
	[6]	5	[26]	21	
	[7]	6	[27]	22	
	[8]	7	[28]	23	
	[9]	C1	[29]	C3	
	[10]	S1	[30]	S3	
	[11]	8	[31]	24	
	[12]	9	[32]	25	
	[13]	10	[33]	26	
	[14]	11	[34]	27	
	[15]	12	[35]	28	
	[16]	13	[36]	29	
	[17]	14	[37]	30	
	[18]	15	[38]	31	
	[19]	C2	[39]	C4	
	[20]	S2	[40]	S4	

Applicable connector	Applicable cable
Manufacturer: Weidmuller Type: B2L3.5/20AUOR Product No.: 175736	0.5mm^2 – 1.0mm^2 (shared at a twisted pair cable and a single core cable.) AWG 28 - 18 A crimp terminal cannot be used.

(25) EH-YTP32E

Specification		EH-YTP32E
Output specification		Transistor output (source type)
Number of outputs		32
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.2A
	1 common	1A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Spring type terminal block
Number of outputs / common		8 (4 commons, 4 terminals)
Surge removal circuit		Diode
Fuse *1		10A / 1 common
External power supply (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (30mA at the maximum)
Internal current consumption (5V DC)		90 mA maximum
Short-circuit protection function		Available

*1 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
	[2]	1	[22]	17	
	[3]	2	[23]	18	
	[4]	3	[24]	19	
	[5]	4	[25]	20	
	[6]	5	[26]	21	
	[7]	6	[27]	22	
	[8]	7	[28]	23	
	[9]	C1	[29]	C3	
	[10]	S1	[30]	S3	
	[11]	8	[31]	24	
	[12]	9	[32]	25	
	[13]	10	[33]	26	
	[14]	11	[34]	27	
	[15]	12	[35]	28	
	[16]	13	[36]	29	
	[17]	14	[37]	30	
	[18]	15	[38]	31	
	[19]	C2	[39]	C4	
	[20]	S2	[40]	S4	

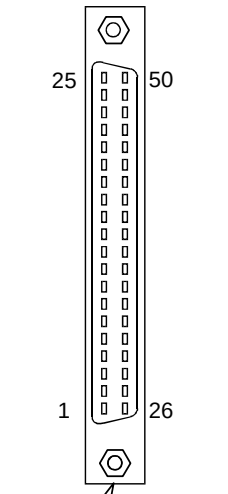
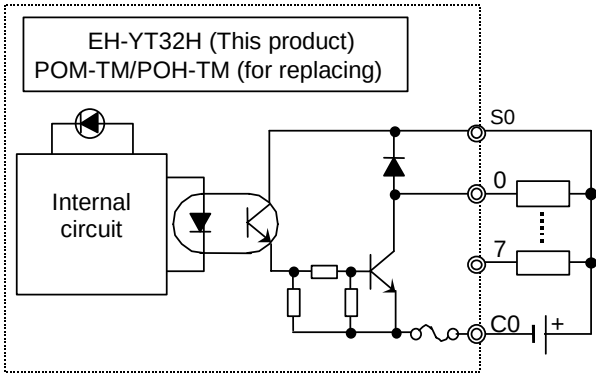
Applicable connectors	Applicable cable
Manufacturer: Weidmuller Type: B2L3.5/20AUOR Product No.: 175736	0.5mm^2 – 1.0mm^2 (shared at a twisted pair cable and a single core cable. AWG 28 - 18 A crimp terminal cannot be used.

(26) EH-YT32H

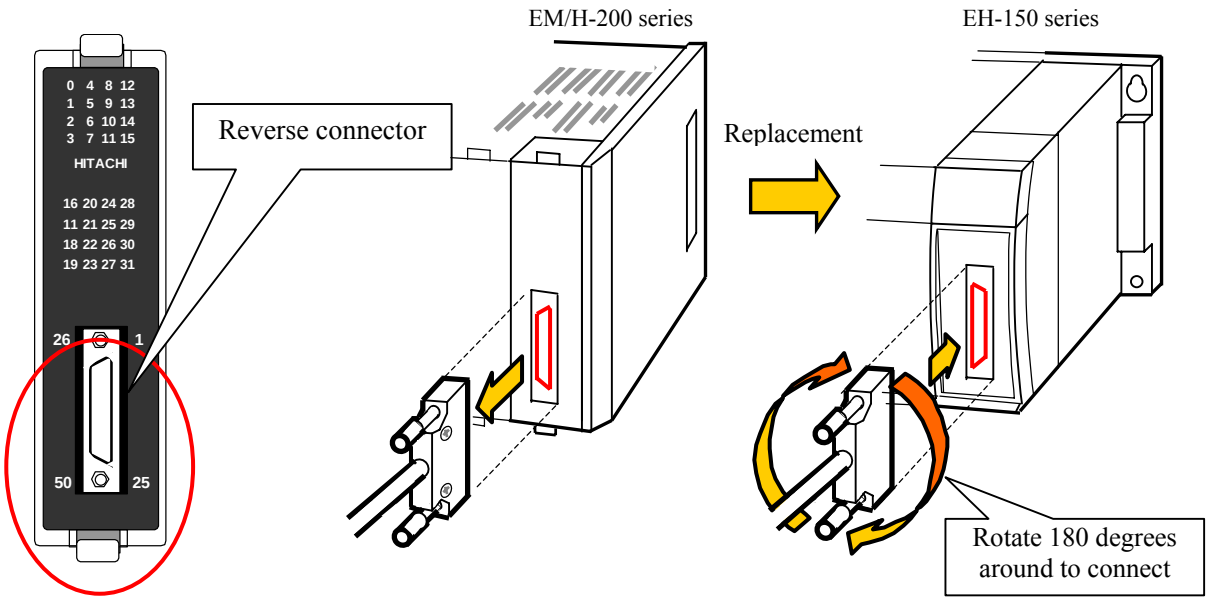
Item		POM-TM, POH-TM (for replacing)	EH-YT32H (This product)
Series		EM/EM-II, H-200/250/252	EH-150
Output specification		Transistor output (sink type)	
Number of outputs		32	
Rated load voltage		5/12/24V DC (5 to 27V DC)	
Minimum switching current		1 mA	
Leak current		0.05 mA maximum	
Maximum output saturation voltage		1 V maximum	
Maximum load current	1 point	0.1 A	
	1 common	0.8 A	
Output response time	OFF➔ON	1 ms maximum	
	ON➔OFF	1 ms maximum	
Insulation method		Photo-coupler insulation	
Output display		LED (red)	LED (green)
External connection		Connector (50 pins)	
Number outputs / common		8 (4 commons, 4 terminals)	
Surge removal circuit		Diode (Connecting case of the S terminal)	
Fuse *1		1.5 A / 1 common	2 A / 1 common
External power supply *2 (For supplying power to the S terminal)		5 to 27 V DC (maximum 100 mA)	
Internal current consumption (5 V DC)		70 mA maximum	90 mA maximum
Short-circuit protection		None	

*1 The fuse is not replaced by users. Please contact your local supplier to repair.
*2 It is necessary to supply 12/24 V DC to the S terminals.

Specification of external wiring connector				Wire
Product name	Manufacturer	Product No.	Connection method	
Plug connector	Hirose Electric Co., Ltd.	DX30-50P	Untie crimping	AWG#30
		DX30A-50P		AWG#28
		DX31-50P	Crimping	AWG#30
		DX31A-50P		AWG#28
		DX40-50P	Soldering	—
Die cast cover		DX-50-CV1	—	—

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
 Please note it in the direction of the connector*1	[25]	NC	[50]	NC	
	[24]	NC	[49]	NC	
	[23]	NC	[48]	NC	
	[22]	NC	[47]	NC	
	[21]	15	[46]	31	
	[20]	14	[45]	30	
	[19]	13	[44]	29	
	[18]	12	[43]	28	
	[17]	11	[42]	27	
	[16]	10	[41]	26	
	[15]	9	[40]	25	
	[14]	8	[39]	24	
	[13]	S1	[38]	S3	
	[12]	C1	[37]	C3	
	[11]	NC	[36]	NC	
	[10]	7	[35]	23	
	[9]	6	[34]	22	
	[8]	5	[33]	21	
	[7]	4	[32]	20	
	[6]	3	[31]	19	
	[5]	2	[30]	18	
	[4]	1	[29]	17	
	[3]	0	[28]	16	
	[2]	S0	[27]	S2	
	[1]	C0	[26]	C2	

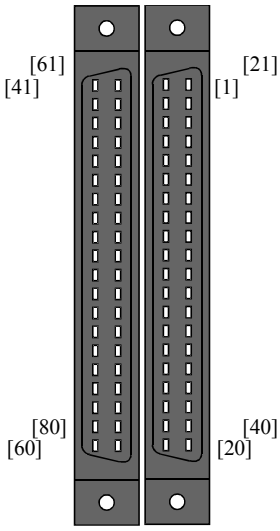
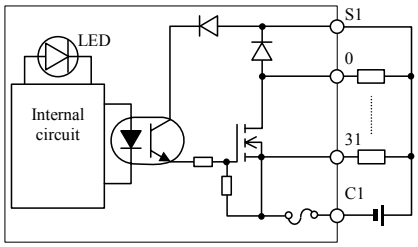
*1 The mounted direction of the connector for EH-YT32H is 180 degrees opposite with EM/H-200 series. Plug cable connector with rotating 180 degrees. (It is mechanically not possible to plug in wrong direction.)



(27) EH-YT64

Specification		EH-YT64
Output specification		Transistor output (sink type)
Number of outputs		64
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.1A
	1 common	3.2A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Connector
Number of outputs / common		32 (2 commons, 8 terminals)
Surge removal circuit		Diode
Fuse *1		5A / 1 common
External power supply (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (100mA at the maximum)
Internal current consumption (5V DC)		120 mA maximum
Short-circuit protection function		Available

*1 The fuse is not replaced by users. Please contact your local supplier to repair.

Terminal configuration	No.	Signal name	No.	Signal name	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[41]	32	[61]	48	[1]	0	[21]	16	
	[42]	33	[62]	49	[2]	1	[22]	17	
	[43]	34	[63]	50	[3]	2	[23]	18	
	[44]	35	[64]	51	[4]	3	[24]	19	
	[45]	36	[65]	52	[5]	4	[25]	20	
	[46]	37	[66]	53	[6]	5	[26]	21	
	[47]	38	[67]	54	[7]	6	[27]	22	
	[48]	39	[68]	55	[8]	7	[28]	23	
	[49]	C2	[69]	C2	[9]	C1	[29]	C1	
	[50]	S2	[70]	S2	[10]	S1	[30]	S1	
	[51]	40	[71]	56	[11]	8	[31]	24	
	[52]	41	[72]	57	[12]	9	[32]	25	
	[53]	42	[73]	58	[13]	10	[33]	26	
	[54]	43	[74]	59	[14]	11	[34]	27	
	[55]	44	[75]	60	[15]	12	[35]	28	
	[56]	45	[76]	61	[16]	13	[36]	29	
	[57]	46	[77]	62	[17]	14	[37]	30	
	[58]	47	[78]	63	[18]	15	[38]	31	
	[59]	C2	[79]	C2	[19]	C1	[39]	C1	
	[60]	S2	[80]	S2	[20]	S1	[40]	S1	

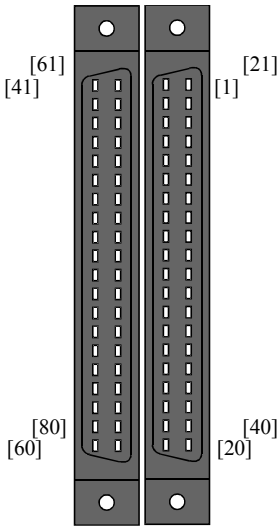
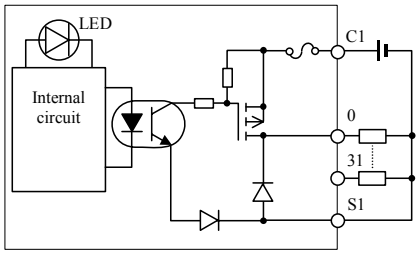
Applicable connectors
- 120mm (4.73in.) space is required in front of the module. Be sure to consider this space in installation location.
- Use a shield cable with class D grounding.

Manufacturers			
Manufacturers	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Crimp type (flat cable)	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(28) EH-YTP64

Specification		EH-YTP64
Output specification		Transistor output (source type)
Number of output points		64
Rated load voltage		12/24V DC (+10%, -15%)
Minimum switching current		1mA
Leak current		0.1mA
Maximum load current	1 circuit	0.1A
	1 common	3.2A
Output response time	OFF➔ON	0.3ms maximum
	ON➔OFF	1ms maximum
Insulation system		Photo-coupler insulation
Output display		Green LED
External connection		Connector
Number of output points / commons		32 (2 commons, 8 terminals)
Surge removal circuit		Diode
Fuse *1		5A / 1 common
External power supply (for supplying power to S-terminal)		12/24V DC (+10%, -15%) (100mA at the maximum)
Internal current consumption (5V DC)		120 mA maximum
Short-circuit protection function		Available

*1 The fuse is not replaced by users. Please contact your local supplier to repair.

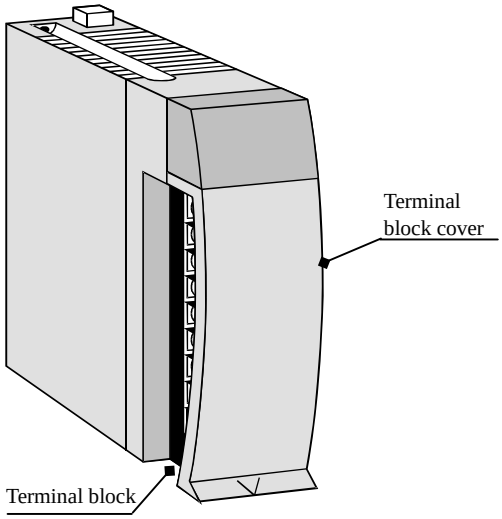
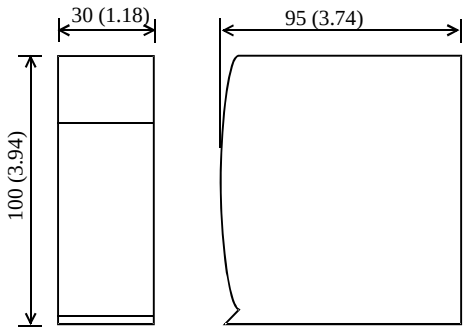
Terminal configuration	No.	Signal name	No.	Signal name	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[41]	32	[61]	48	[1]	0	[21]	16	
	[42]	33	[62]	49	[2]	1	[22]	17	
	[43]	34	[63]	50	[3]	2	[23]	18	
	[44]	35	[64]	51	[4]	3	[24]	19	
	[45]	36	[65]	52	[5]	4	[25]	20	
	[46]	37	[66]	53	[6]	5	[26]	21	
	[47]	38	[67]	54	[7]	6	[27]	22	
	[48]	39	[68]	55	[8]	7	[28]	23	
	[49]	C2	[69]	C2	[9]	C1	[29]	C1	
	[50]	S2	[70]	S2	[10]	S1	[30]	S1	
	[51]	40	[71]	56	[11]	8	[31]	24	
	[52]	41	[72]	57	[12]	9	[32]	25	
	[53]	42	[73]	58	[13]	10	[33]	26	
	[54]	43	[74]	59	[14]	11	[34]	27	
	[55]	44	[75]	60	[15]	12	[35]	28	
	[56]	45	[76]	61	[16]	13	[36]	29	
	[57]	46	[77]	62	[17]	14	[37]	30	
	[58]	47	[78]	63	[18]	15	[38]	31	
	[59]	C2	[79]	C2	[19]	C1	[39]	C1	
	[60]	S2	[80]	S2	[20]	S1	[40]	S1	

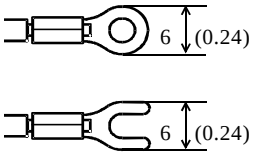
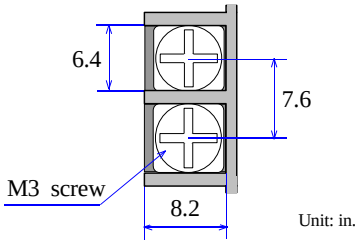
Applicable connectors
- 120mm (4.73in.) space is required in front of the module. Be sure to consider this space in installation location.
- Use a shield cable with class D grounding.

Manufacturers			
Manufacturers	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Crimp type (flat cable)	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

2.8 Analog I/O Modules

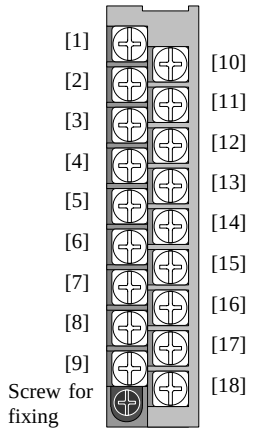
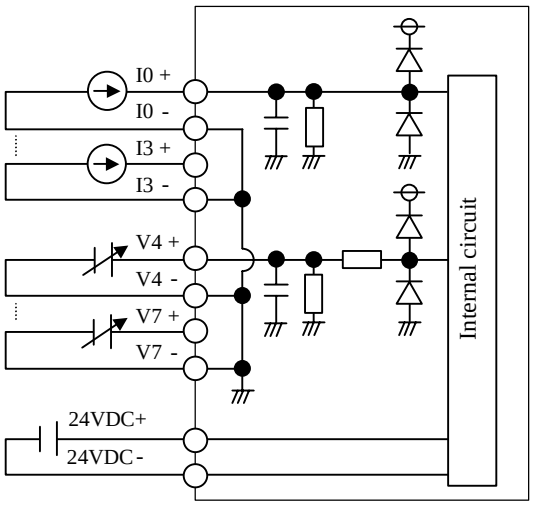
2.8.1 Standard analog modules

Module features		
	Type (Weight)	EH-AX44 (Approx. 0.18kg (0.41lb.))
		EH-AX8V, AX8H (Approx. 0.18kg (0.41lb.))
		EH-AX8I, AX8IO (Approx. 0.18kg (0.41lb.))
		EH-AY22 (Approx. 0.18kg (0.41lb.))
		EH-AY2H (Approx. 0.18kg (0.41lb.))
		EH-AY4V, AY4H (Approx. 0.18kg (0.41lb.))
		EH-AY4I (Approx. 0.18kg (0.41lb))
	Dimensions (mm (in.))	

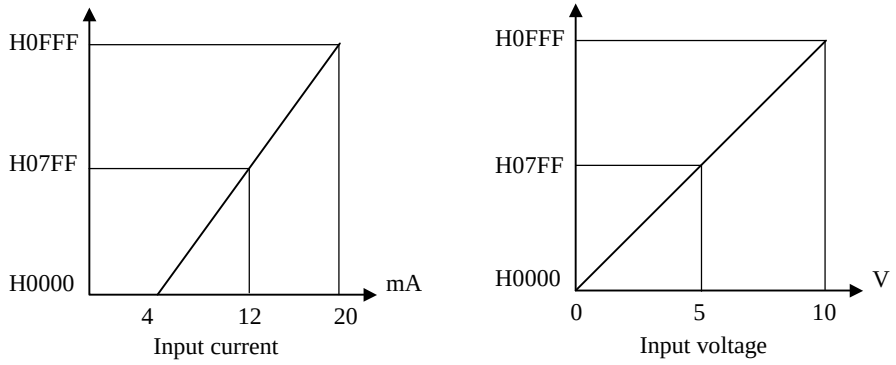
Item	Description
Terminal block	The terminal block is to connect I/O signals. It is removable type. M3 screws are used. Use a crimping terminal fitting with screw diameter. The maximum size of the cable is 0.75 mm^2. (Use 0.5 mm^2 cable if using 2 crimping terminals in single terminal.) The recommended crimping terminal is indicated as below.  (Recommended) Handle very carefully since cable could be detached when screw is loose. 
Terminal block cover	This is a covert for installing on the terminal block.

(1) EH-AX44

Specification		EH-AX44
Current range		4 to 20mA
Voltage range		0 to 10V DC
Number of channels	Current	4 (Ch.0 to 3)
	Voltage	4 (Ch.4 to 7)
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
Input impedance	Current	Approx. 100Ω
	Voltage	Approx. 100kΩ
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 400mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

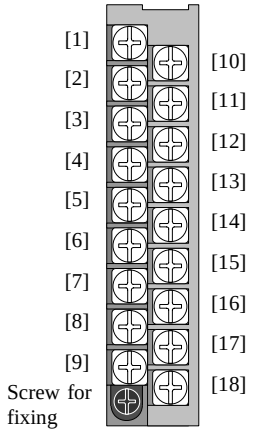
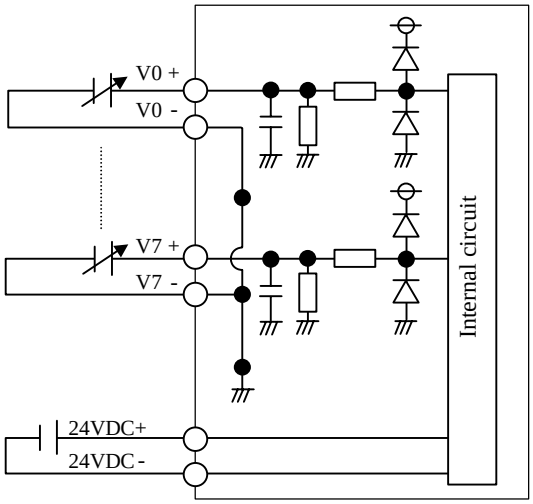
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	I0 +	
	[2]	I1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	V4 +	
	[6]	V5 +	
	[7]	V6 +	
	[8]	V7 +	
	[9]	24 VDC +	
	[10]	I0 -	
	[11]	I1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	V4 -	
	[15]	V5 -	
	[16]	V6 -	
	[17]	V7 -	
	[18]	24 VDC -	

Relation between analog and digital data

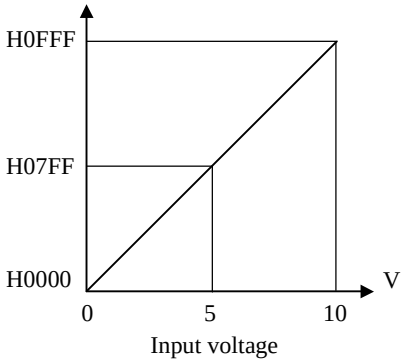


(2) EH-AX8V

Specification		EH-AX8V
Voltage range		0 to 10V DC
Number of channels		8
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
Input impedance		Approx. 100kΩ
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 400mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

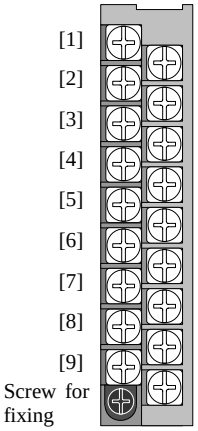
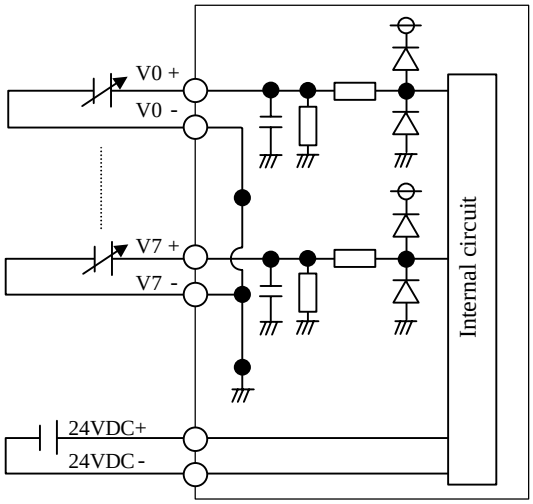
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	V2 +	
	[4]	V3 +	
	[5]	V4 +	
	[6]	V5 +	
	[7]	V6 +	
	[8]	V7 +	
	[9]	24 VDC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	V2 -	
	[13]	V3 -	
	[14]	V4 -	
	[15]	V5 -	
	[16]	V6 -	
	[17]	V7 -	
	[18]	24 VDC -	

Relation between analog and digital data

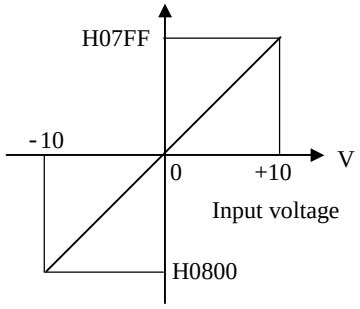


(3) EH-AX8H

Specification		EH-AX8H
Voltage range		-10 to +10V DC
Number of channels		8
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
Input impedance		Approx. 100kΩ
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 400mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	V2 +	
	[4]	V3 +	
	[5]	V4 +	
	[6]	V5 +	
	[7]	V6 +	
	[8]	V7 +	
	[9]	24 VDC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	V2 -	
	[13]	V3 -	
	[14]	V4 -	
	[15]	V5 -	
	[16]	V6 -	
	[17]	V7 -	
	[18]	24 VDC -	

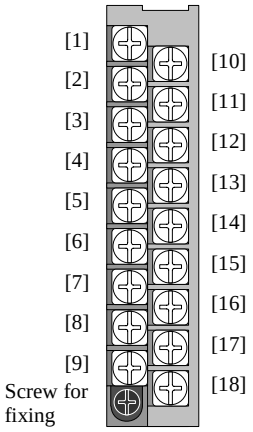
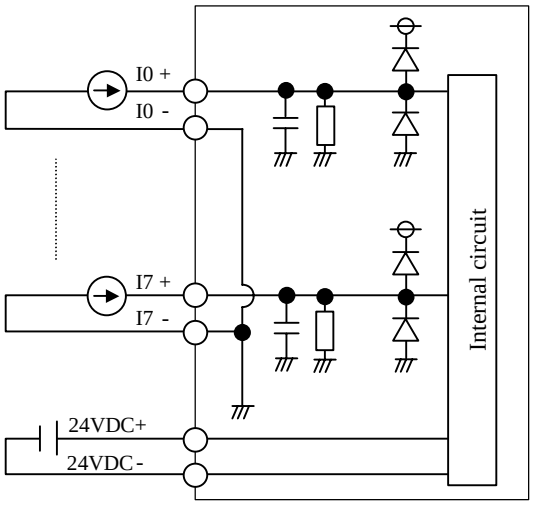
Relation between analog and digital data



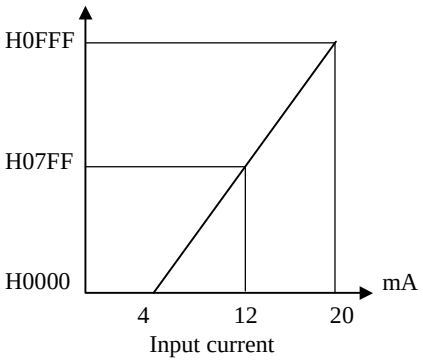
(2's complement)

(4) EH-AX8I

Specification		EH-AX8I
Current range		4 to 20mA
Number of channels		8
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
Input impedance		Approx. 100Ω
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 400mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

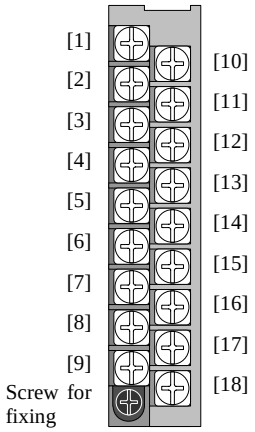
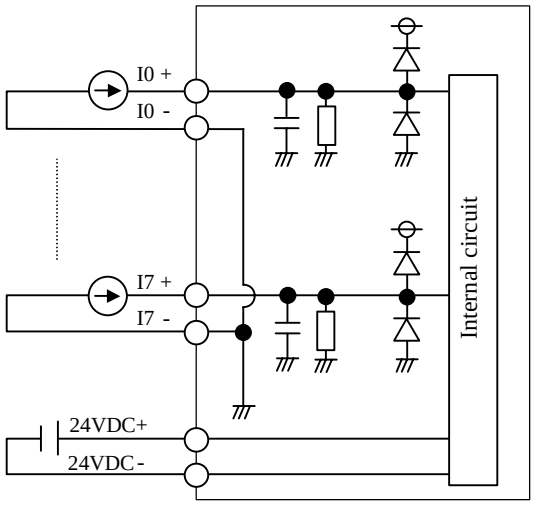
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	I0 +	
	[2]	I1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	I4 +	
	[6]	I5 +	
	[7]	I6 +	
	[8]	I7 +	
	[9]	24 VDC +	
	[10]	I0 -	
	[11]	I1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	I4 -	
	[15]	I5 -	
	[16]	I6 -	
	[17]	I7 -	
	[18]	24 VDC -	

Relation between analog and digital data

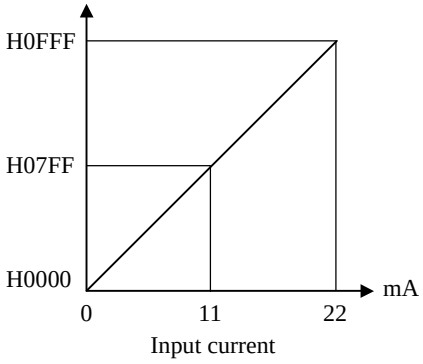


(5) EH-AX8IO

Specification		EH-AX8IO
Current range		0 to 22mA
Number of channels		8
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
Input impedance		Approx. 100Ω
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 400mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

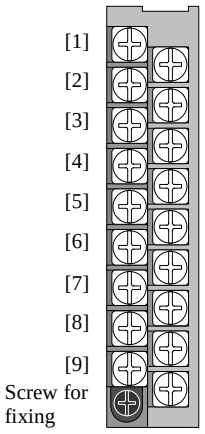
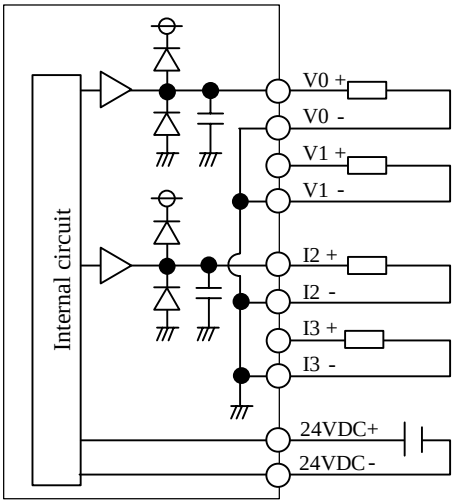
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	I0 +	
	[2]	I1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	I4 +	
	[6]	I5 +	
	[7]	I6 +	
	[8]	I7 +	
	[9]	24 VDC +	
	[10]	I0 -	
	[11]	I1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	I4 -	
	[15]	I5 -	
	[16]	I6 -	
	[17]	I7 -	
	[18]	24 VDC -	

Relation between analog and digital data

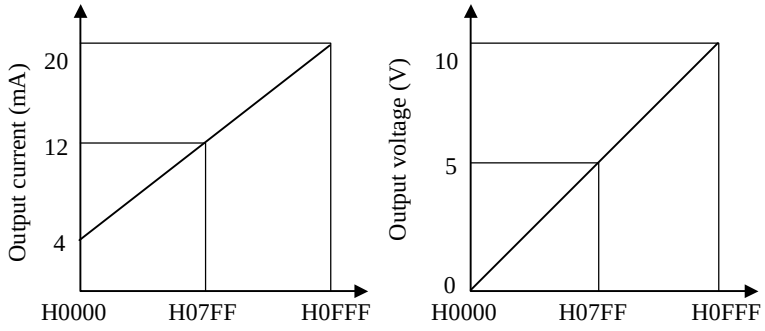


(6) EH-AY22

Specification		EH-AY22
Current range		4 to 20mA
Voltage range		0 to 10V DC
Number of channels	Current	2 (Ch.2 to 3)
	Voltage	2 (Ch.0 to 1)
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
External load resistance	Current	500Ω maximum
	Voltage	10kΩ minimum
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 500mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

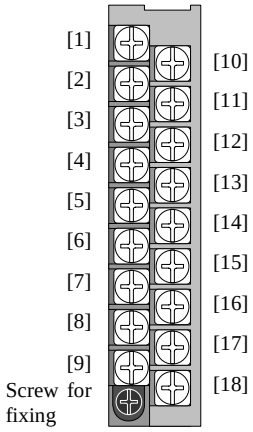
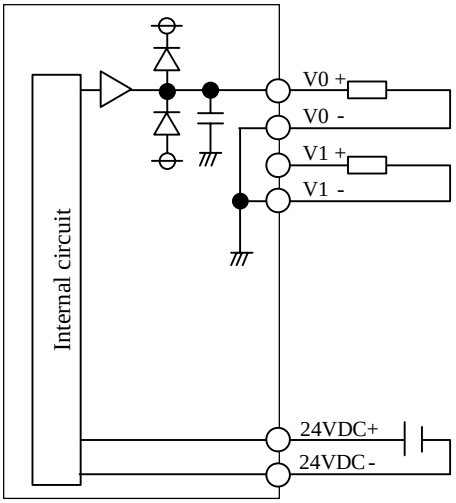
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 VDC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 VDC -	

Relation between analog and digital data

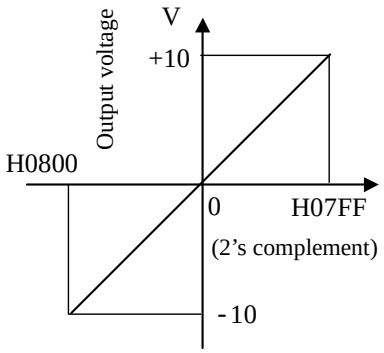


(7) EH-AY2H

Specification		EH-AY2H
Voltage range		-10 to +10V DC
Number of channels		2
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
External load resistance		10kΩ minimum
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 500mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

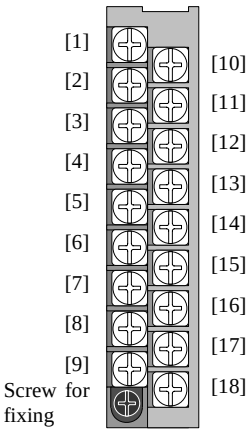
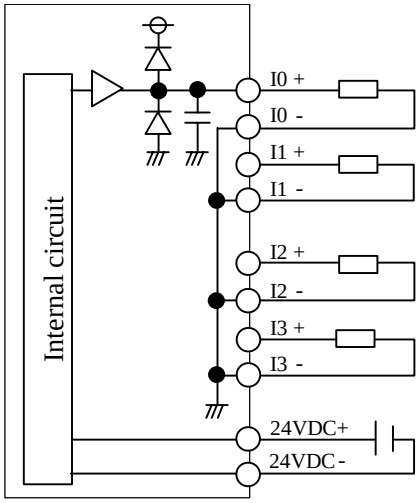
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	N.C.	
	[4]	N.C.	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 VDC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 VDC -	

Relation between analog and digital data

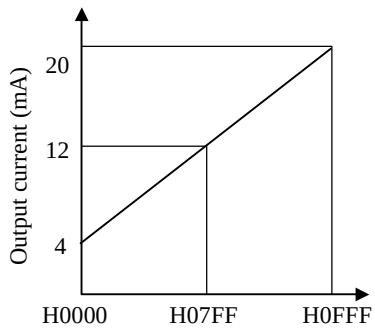


(8) EH-AY4I

Specification		EH-AY4I
Current range		4 to 20mA
Number of channels		4
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
External load resistance		350Ω maximum
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 500mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		130mA maximum

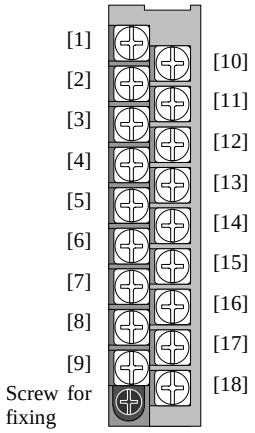
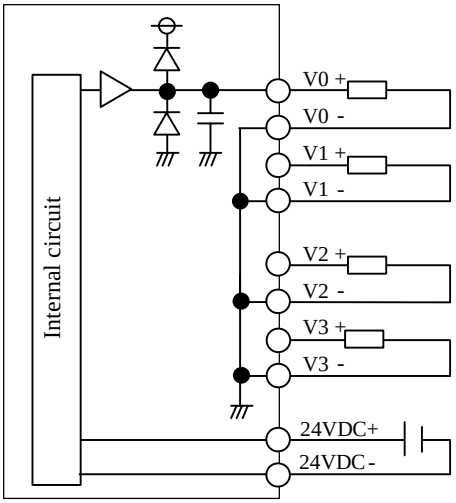
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	I0 +	
	[2]	I1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 VDC +	
	[10]	I0 -	
	[11]	I1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 VDC -	

Relation between analog and digital data

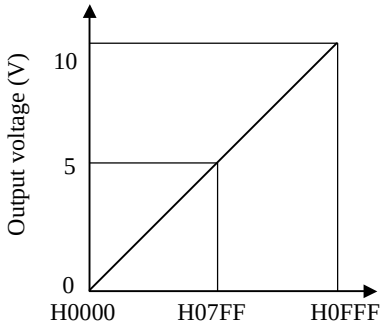


(9) EH-AY4V

Specification		EH-AY4V
Voltage range		0 to 10V DC
Number of channels		4
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
External load resistance		10kΩ minimum
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 500mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

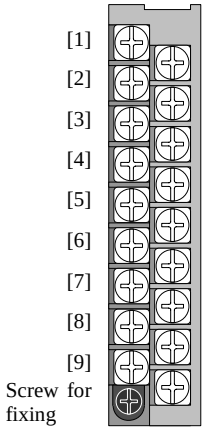
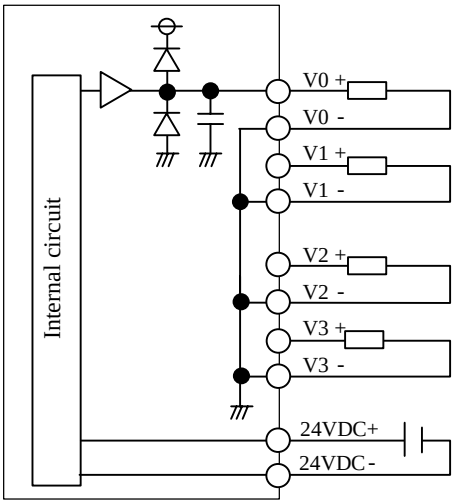
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	V2 +	
	[4]	V3 +	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 VDC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	V2 -	
	[13]	V3 -	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 VDC -	

Relation between analog and digital data

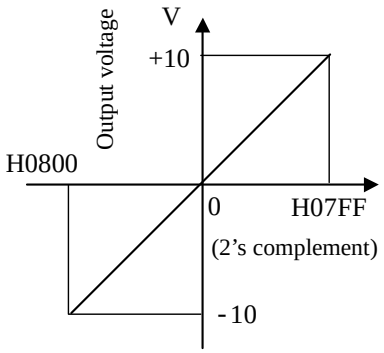


(10) EH-AY4H

Specification		EH-AY4H
Voltage range		–10 to +10V DC
Number of channels		4
Resolution		12 bits
Conversion time		5ms maximum
Overall accuracy		±1% maximum of full-scale
External load resistance		10kΩ minimum
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 500mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		100mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	V2 +	
	[4]	V3 +	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 VDC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	V2 -	
	[13]	V3 -	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 VDC -	

Relation between analog and digital data

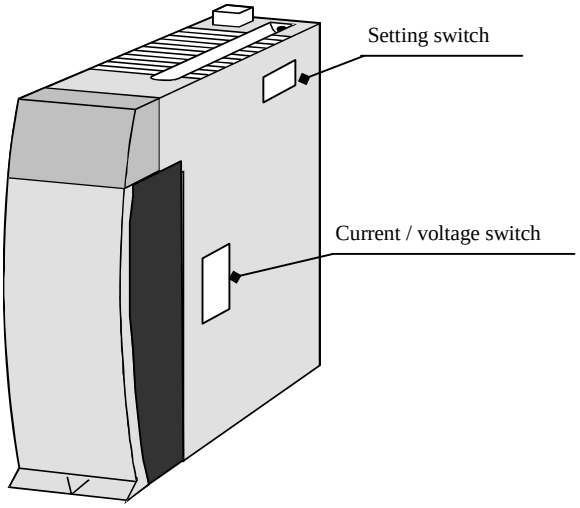


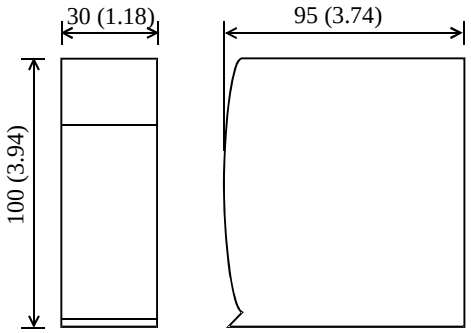
2.8.2 High resolution analog modules

(1) EH-AXH8M

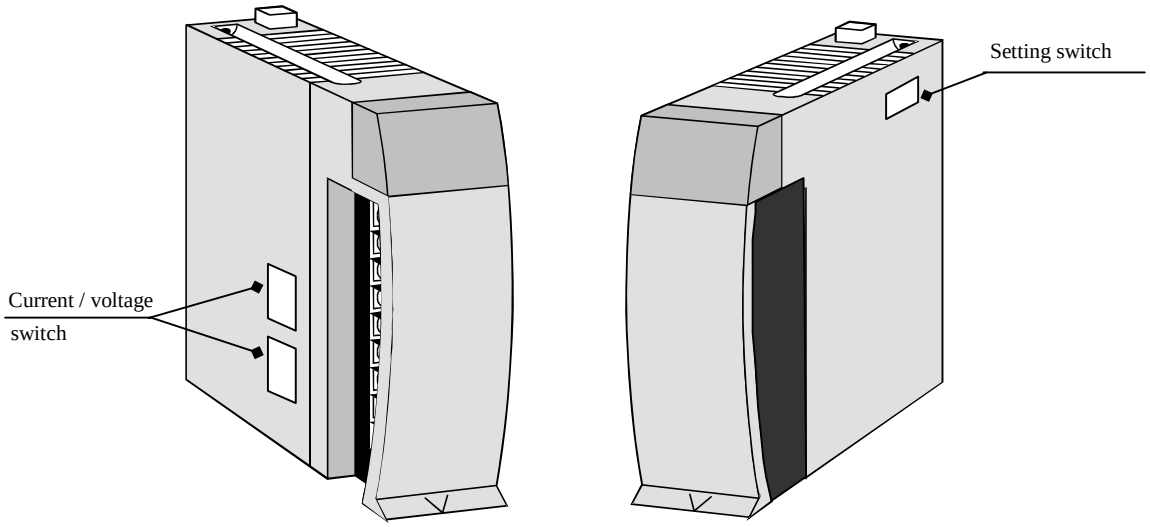
Module features	Type (Weight)	EH-AXH8M (Approx. 0.15kg (0.34lb.))
		EH-AYH8M (Approx. 0.18kg (0.41lb.))
	Dimensions (mm (in.))	

EH-AXH8M





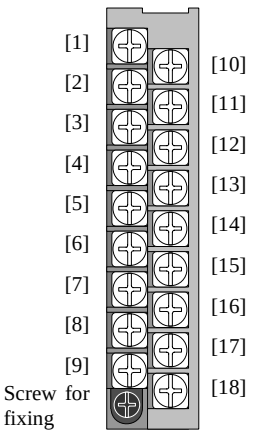
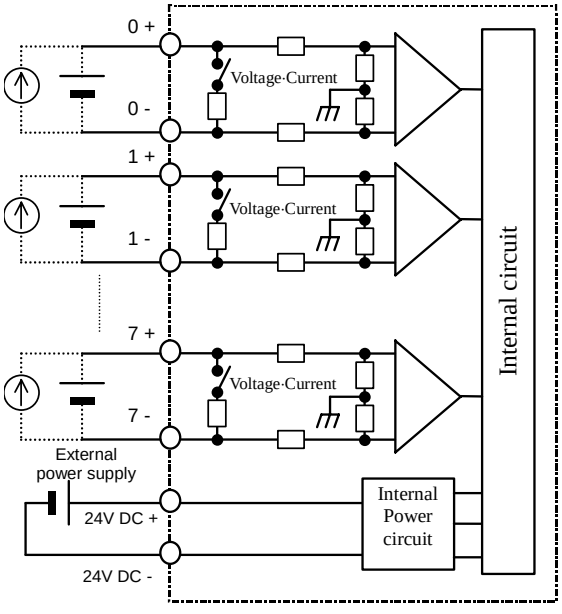
EH-AYH8M



Name	Description
Setting switch	configures I/O range, input filter and resolution mode.
Current / voltage switch	configures current or voltage.

Front view	Indicating contents
	OK LED ON: the module is operating in normal condition. 0 to 7 LED OFF: analog signal is operating in normal condition. **[EH-AXH8M]** If analog signal is less than 2mA, corresponding number LED flashes. (Valid only when 4 to 22mA mode with 0.002mA resolution is selected.) **[EH-AYH8M]** If data out of the range is written, corresponding number LED flashes.

Specification		EH-AXH8M
Current range		0 to 22mA / 4 to 22mA
Voltage range		0 to 10V DC / -10 to +10V DC
Number of channels		8 (current or voltage is selected in 4-ch group.)
Resolution	Current	0.002mA or 1/16384 (14 bits)
	Voltage	1mV or 1/16384 (14 bits)
Conversion time		8.9ms / 8 channels
Overall accuracy	Current	±0.8% maximum of full-scale
	Voltage	±0.5% maximum of full-scale
Linear error		±0.1% maximum of full-scale
Input filter	Enabled	Approx. 90ms maximum (90% arriving time after the step input)
	Disabled	Approx. 18ms maximum (90% arriving time after the step input)
Input impedance	Current	249 Ω
	Voltage	Differential 200kΩ
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 40mA (Approx. 300mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		70mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0 +	
	[2]	1 +	
	[3]	2 +	
	[4]	3 +	
	[5]	4 +	
	[6]	5 +	
	[7]	6 +	
	[8]	7 +	
	[9]	24VDC+	
	[10]	0 -	
	[11]	1 -	
	[12]	2 -	
	[13]	3 -	
	[14]	4 -	
	[15]	5 -	
	[16]	6 -	
	[17]	7 -	
	[18]	24VDC-	

Setting switch

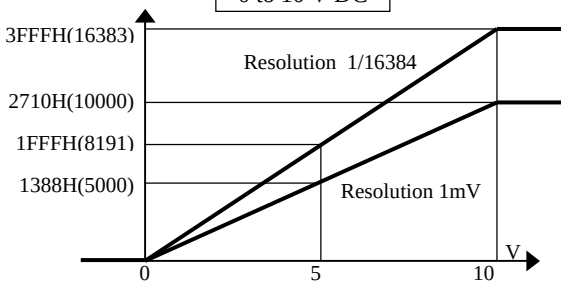
Switch No.	Setup		Function
1, 2	1	2	Input range setting for ch.0 to 3
	OFF	OFF	0 to 10 V DC
	ON	OFF	-10 to +10 V DC
	OFF	ON	0 to 22 mA
	ON	ON	4 to 22 mA
3, 4	3	4	Input range setting for ch.4 to 7
	OFF	OFF	0 to 10 V DC
	ON	OFF	-10 to 10 V DC
	OFF	ON	0 to 22 mA
	ON	ON	4 to 22 mA
5	5		Input filter
	OFF		Enable
	ON		Disable
6	6		Resolution
	OFF		1/16384 (14 bits)
	ON		1mV or 0.002mA
7	7		(System mode)
	OFF		Always OFF (Do not turn ON)
8	8		(System mode)
	OFF		Always OFF (Do not turn ON)

Current / Voltage switch

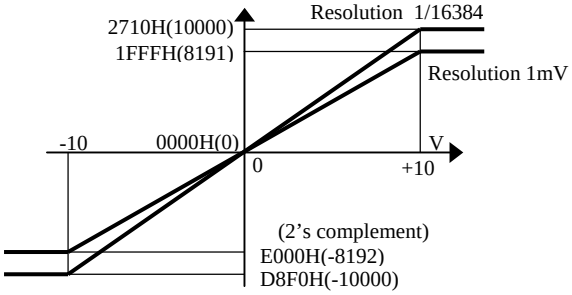
Switch No.	Setup		Function
1 to 8	1 to 4	5 to 8	Select current or voltage
	OFF	OFF	voltage input for ch.0 to 7
	ON	OFF	current input for ch.0 to 3 voltage input for ch.4 to 7
	OFF	ON	voltage input for ch.0 to 3 current input for ch.4 to 7
	ON	ON	current input for ch.0 to 7

Support to analog data and digital data

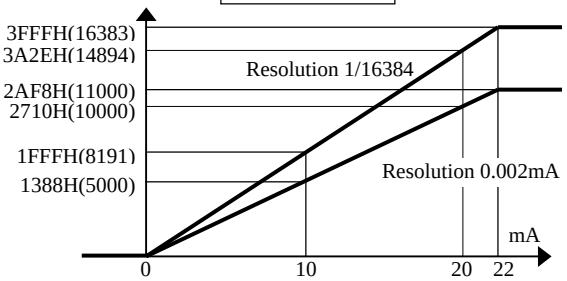
0 to 10 V DC



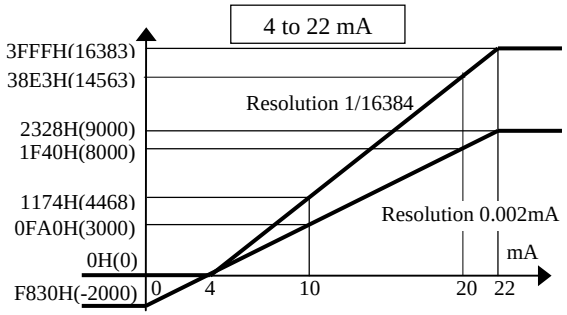
-10 to +10 V DC



0 to 22 mA



4 to 22 mA

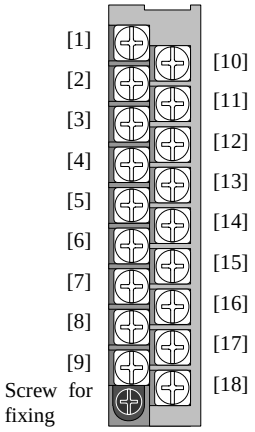
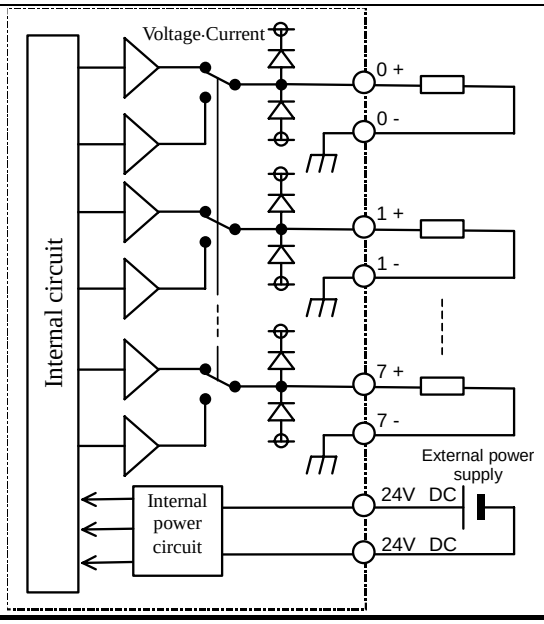


[Highlighted part is factory default setting.]

Note) Be sure to set dip switches before use. The dip switches must be set while power off, otherwise setting status is not updated. When the input range is changed, be sure to set current / voltage switch accordingly.

(2) EH-AYH8M

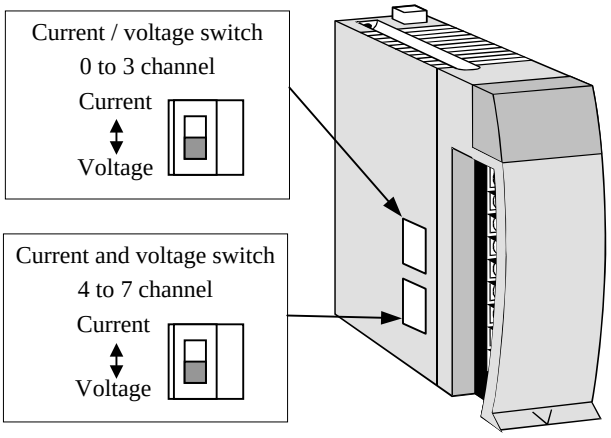
Specification		EH-AYH8M
Current range		0 to 22mA / 4 to 22mA
Voltage range		0 to 10V DC
Number of channels		8 (current or voltage is selected in 4-ch group.)
Resolution	Current	0.002mA or 1/16384 (14 bits)
	Voltage	1mV or 1/16384 (14 bits)
Conversion time		8.9ms / 8 channels
Overall accuracy	Current	±0.8% maximum of full-scale
	Voltage	±0.8% maximum of full-scale
Linear error		±0.2% maximum of full-scale) (range from 0 to 10V and from 0.05 to 22mA)
Output filter	Enabled	Approx. 200ms maximum (90% arriving time after setting)
	Disabled	Approx. 18ms maximum (90% arriving time after setting)
Output impedance	Current	400Ω maximum
	Voltage	10kΩ minimum
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC (+20%, -15%) Approx. 150mA (Approx. 400mA at power ON)
External wiring		2-core shield cable (20m (65.62ft.) maximum)
Internal current consumption		70mA maximum

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0 +	
	[2]	1 +	
	[3]	2 +	
	[4]	3 +	
	[5]	4 +	
	[6]	5 +	
	[7]	6 +	
	[8]	7 +	
	[9]	24VDC+	
	[10]	0 -	
	[11]	1 -	
	[12]	2 -	
	[13]	3 -	
	[14]	4 -	
	[15]	5 -	
	[16]	6 -	
	[17]	7 -	
	[18]	24VDC-	

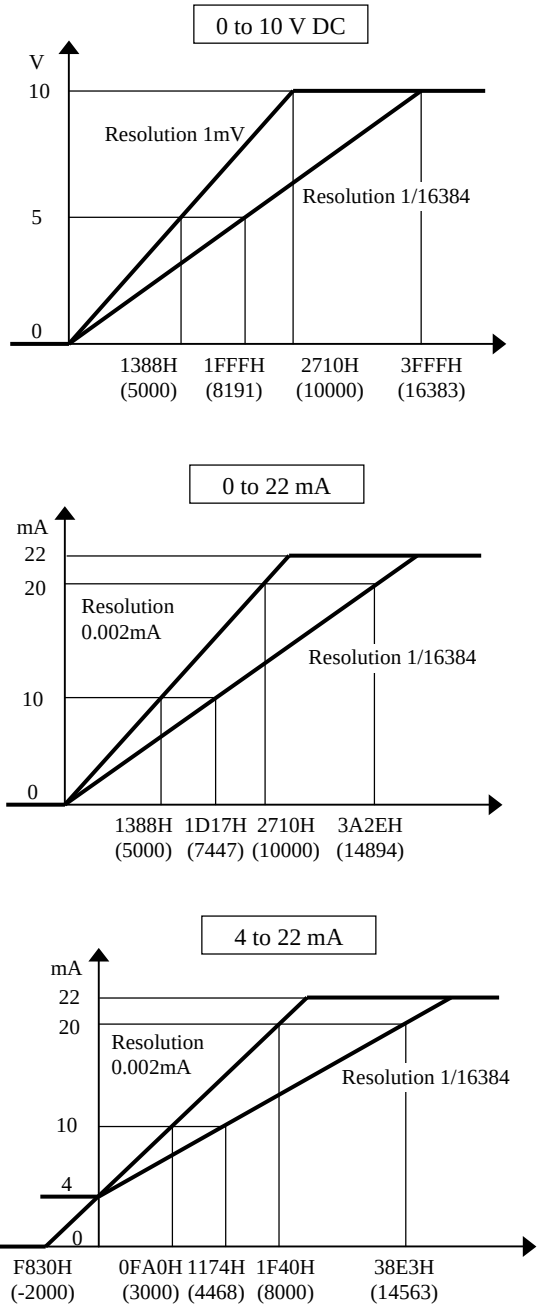
Setting switch

No.	Setup		Function
1, 2	1	2	Output range setting for ch.0 to 3
	OFF	OFF	0 to 10 V DC
	ON	OFF	
	OFF	ON	0 to 22 mA
	ON	ON	4 to 22 mA
3, 4	3	4	Output range setting for ch.4 to 7
	OFF	OFF	0 to 10 V DC
	ON	OFF	
	OFF	ON	0 to 22 mA
	ON	ON	4 to 22 mA
5	5		Output filter
	OFF		Disable
	ON		Enable
6	6		Resolution
	OFF		1/16384 (14 bits)
	ON		1mV or 0.002mA
7	7		(System mode)
	OFF		Always OFF (Do not turn ON)
8	8		(System mode)
	OFF		Always OFF (Do not turn ON)

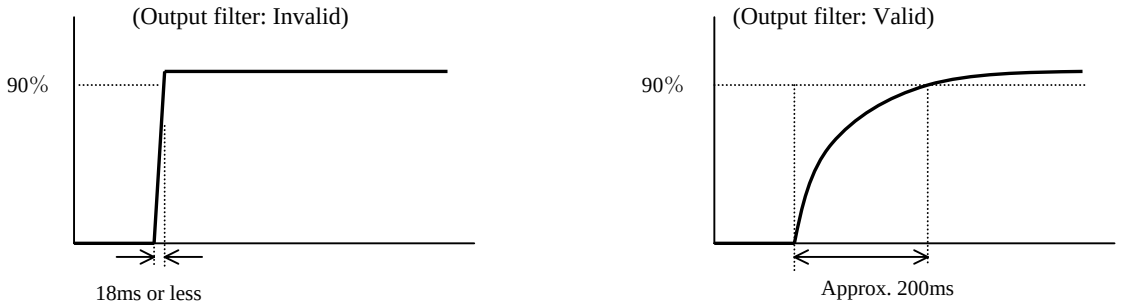
Current / voltage switch



Support to analog data and digital data



Reference) The images is as follows when the output filter is valid.



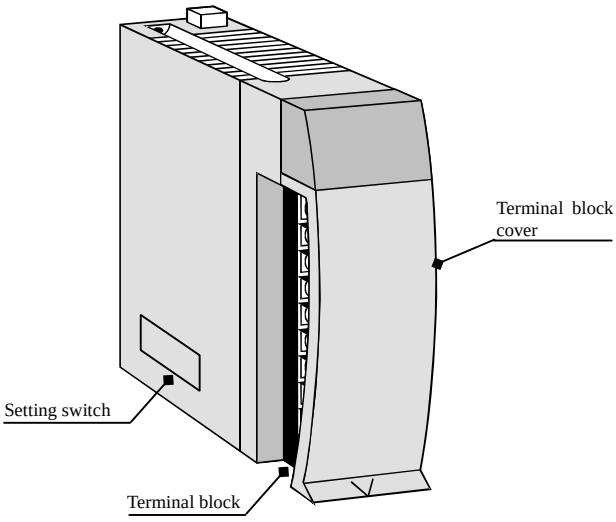
[Highlighted part is factory default setting.]

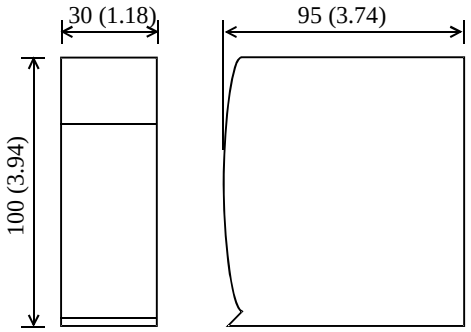
Note) Be sure to set dip switches before use. The dip switches must be set while power off, otherwise setting status is not updated.
When the input range is changed, be sure to set current / voltage switch accordingly.

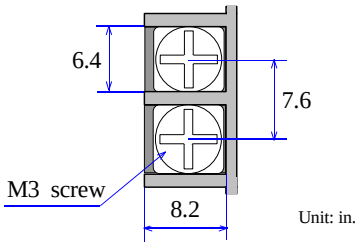
2.8.3 RTD input analog module

EH-PT4

Module features	Type (Weight)	EH-PT4 (Approx. 0.18kg (0.41lb.))
	Dimensions (mm (in.))	





Name	Description
Terminal block	The terminal block is to connect I/O signals. It is removable type. M3 screws are used. Use a crimping terminal fitting with screw diameter. The maximum size of the cable is 0.75 mm^2. (Use 0.5 mm^2 cable if using 2 crimping terminals in single terminal.) The recommended crimping terminal is indicated as below.  6 (0.24) (Recommended)  6 (0.24) Unit: mm (in.) Handle very carefully since cable could be detached when screw is loose.  6.4, 7.6, M3 screw, 8.2, Unit: in.
Terminal block cover	This is a covert for installing on the terminal block.
Select switch	Selects RTD type and range according to your system.

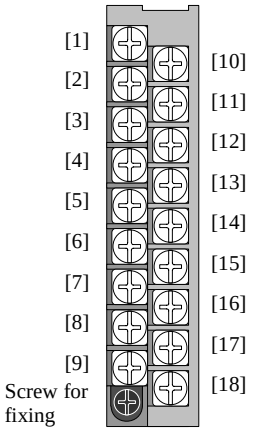
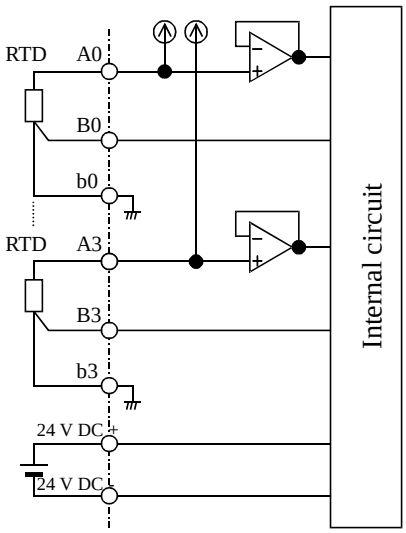
Resistance temperature detector Measuring temperature range	Switch setup							
	1	2	3	4	5	6	7	8
Pt100 -20 to 40°C	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
Pt100 -50 to 400°C	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
Pt1000 -50 to 400°C	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF

Be noted that temperature data is undefined value if configured as other than above.

Specification		EH-PT4
Applicable resistance thermometer		Platinum resistance thermometer Pt100 (JIS C 1604-1989) / Pt1000
Temperature conversion data		Signed 15 bits
Accuracy *1	-20 to 40°C (Pt100)	±0.1°C @25°C (±0.5°C @0 to 55°C)
	-50 to 400°C (Pt100)	±0.6°C @25°C (±3°C @0 to 55°C)
	-50 to 400°C (Pt1000)	±0.8°C @25°C (±6°C @0 to 55°C)
Measuring temperature range		-20 to 40°C / -50 to 400°C (2mA constant current system)
Number of Input channels		4
Conversion time		Approx. 1s/4 channels
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24V DC
External wiring		Shield cable
Unused terminal processing		Temperature conversion data is H7FFF
External wiring resistance		Total resistance of 4 channels 400Ω at the maximum
Additional function		Linearization
Error detection *2		Data is H7FFF if measured value exceeds -51°C or 410°C
Wire breakage processing		Temperature conversion data is H7FFF
Internal current consumption		160mA maximum

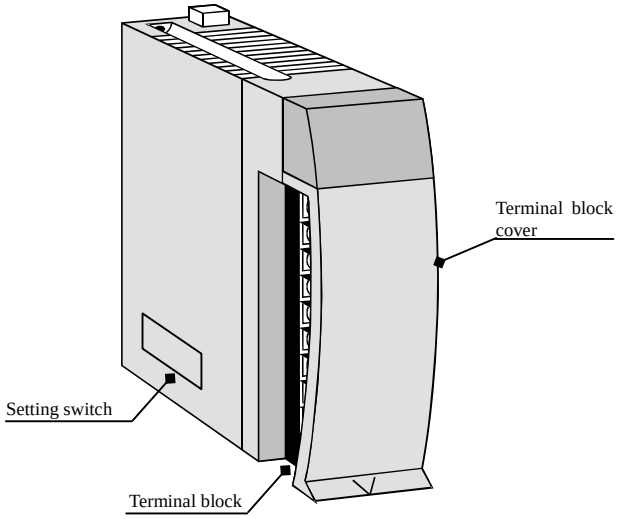
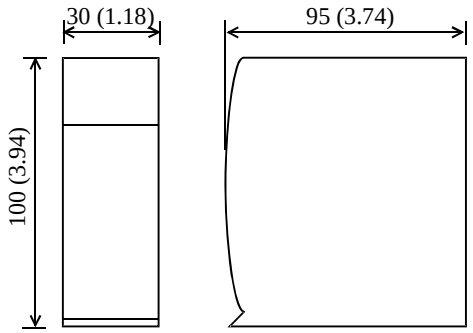
*1 The accuracy indicates the value of 10 minutes after power up. The value may become slightly higher immediately after power up. Also check the resistance thermometer in advance because small error could exist in RTD.

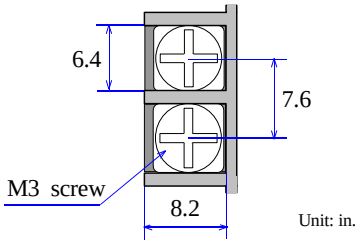
*2 If Ax or Bx cable is open, data will be H7FFF. If bx cable is open, data will be undefined value.

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	b0	
	[2]	B0	
	[3]	b1	
	[4]	B1	
	[5]	b2	
	[6]	B2	
	[7]	b3	
	[8]	B3	
	[9]	24V DC+	
	[10]	A0	
	[11]	N.C.	
	[12]	A1	
	[13]	N.C.	
	[14]	A2	
	[15]	N.C.	
	[16]	A3	
	[17]	N.C.	
	[18]	24V DC-	

2.8.4 Thermocouple input analog module

EH-TC8

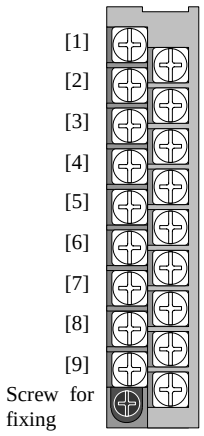
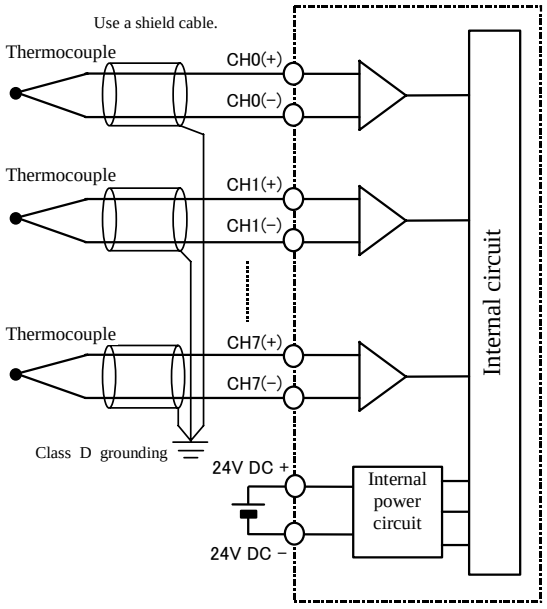
Module features	Type (Weight)	EH-TC8 (Approx. 0.16kg (0.35lb.))
	Dimensions (mm (in.))	

Name	Description
Terminal block	The terminal block is to connect I/O signals. It is removable type. M3 screws are used. Use a crimping terminal fitting with screw diameter. The maximum size of the cable is 0.75 mm^2. (Use 0.5 mm^2 cable if using 2 crimping terminals in single terminal.) The recommended crimping terminal is indicated as below.  (Recommended)  Handle very carefully since cable could be detached when screw is loose. Unit: mm (in.) 
Terminal block cover	This is a covert for installing on the terminal block.
Select switch	Selects thermocouple types and Celsius/Fahrenheit, etc.

Front view	Indicating contents
	OK LED ON: the module is operating in normal condition. 0 to 7 LED OFF: analog signal is operating in normal condition. 0 to 7 LED Flash : Error status in corresponding number of channel.

Specification		EH-TC8	
Applicable thermocouple types (selectable)		Conforms to JIS C 1602-1995 Type K, E, J, T, B, R, S, N	
Temperature conversion data		Signed 15 bits	
Measuring temperature range and accuracy *1	Type	Accuracy guaranteed range	Input range
	K	-200 to 1200°C 0.4% (FS)	-270 to 1370°C
	E	-200 to 900°C 0.3% (FS)	-270 to 1000°C
	J	-40 to 750°C 0.3% (FS)	-270 to 1200°C
	T	-200 to 350°C 0.8% (FS)	-270 to 400°C
	B	600 to 1700°C 1.0% (FS)	0 to 1820°C
	R	0 to 1600°C 1.0% (FS)	-50 to 1760°C
	S	0 to 1600°C 1.0% (FS)	-50 to 1760°C
	N	-200 to 1200°C 0.4% (FS)	-270 to 1300°C
Cold junction temperature error *2		±2°C maximum (Ambient temperature 15 to 35°C) ±3°C maximum (Ambient temperature 0 to 55°C)	
Resolution		0.1 °C / 0.1 °F (K, E, J, T, N) 1.0 °C / 1.0 °F (B, R, S)	
Number of Input channels		8	
Conversion time		108/860ms	
Insulation system	Channel and Internal circuit	Photo-coupler insulation	
	Between channels	No insulation	
External connection		Removable type screw terminal block (M3)	
External power supply		24V DC ±10% 100mA at the maximum	
External wiring *3		Shield cable	
Internal current consumption		70mA maximum	
Error detection	Over upper limit value / Breaking wiring detection	Data: H7FFF (corresponding number LED flashes.)	
	Under lower limit value	Data: H8000	

*1 The sum of accuracy of each sensor and the cold junction temperature error is the overall accuracy. Note that thermocouple device includes small level of error.
*2 Error is the value of 10 minutes after power up. Error may increase slightly due to quick change of ambient temperature.
*3 The maximum length of thermocouple wire is 100m (328ft.), however, it depends on environmental conditions.

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	CH0(+)	
	[2]	CH1(+)	
	[3]	CH2(+)	
	[4]	CH3(+)	
	[5]	CH4(+)	
	[6]	CH5(+)	
	[7]	CH6(+)	
	[8]	CH7(+)	
	[9]	24V DC+	
	[10]	CH0(-)	
	[11]	CH1(-)	
	[12]	CH2(-)	
	[13]	CH3(-)	
	[14]	CH4(-)	
	[15]	CH5(-)	
	[16]	CH6(-)	
	[17]	CH7(-)	
	[18]	24V DC-	

Item	Switch setup			Setting contents
Thermocouple sensor types (Common to all channels)	1	2	3	
	OFF	**OFF**	**OFF**	Type K
	ON	OFF	OFF	Type E
	OFF	ON	OFF	Type J
	ON	ON	OFF	Type T
	OFF	OFF	ON	Type B
	ON	OFF	ON	Type R
	OFF	ON	ON	Type S
	ON	ON	ON	Type N
Celsius (°C) / Fahrenheit (°F) switching (Common to all channels)	4			
	OFF			Celsius (°C)
	ON			Fahrenheit (°F)
Data updating cycle	5			
	OFF			860ms
	ON			108ms
Internal cold junction compensation	6			
	OFF			Cold junction compensation; Valid
	ON			Cold junction compensation; Invalid
(System mode)	7			
	OFF			Always OFF (Do not turn ON.)
	8			
	OFF			Always OFF (Do not turn ON.)

[Highlighted part is factory default setting.]

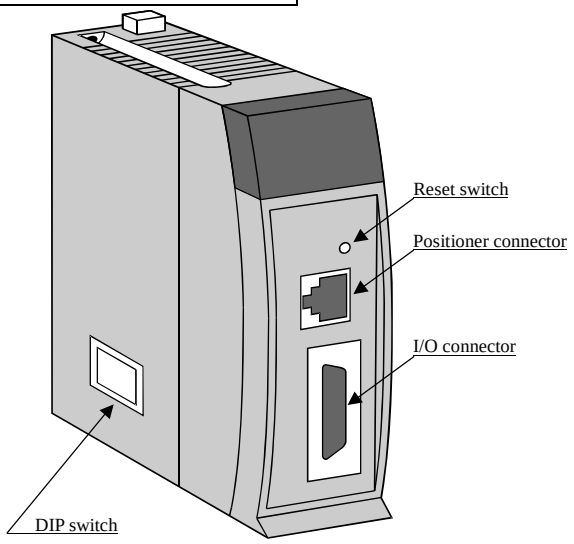
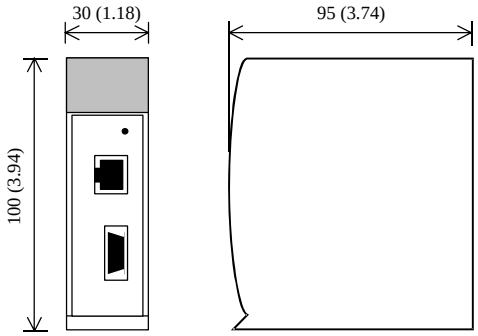
Note) Be sure to set dip switches before use. The dip switches must be set while power off, otherwise setting status is not updated. When the input range is changed, be sure to set current / voltage switch accordingly.

Reference

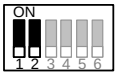
If the internal cold junction compensation is disabled and high accurate ice-bus is installed externally, higher accuracy of temperature measurement would be achieved.

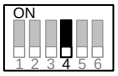
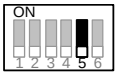
2.9 Special modules

2.9.1 Positioning module : EH-POS

Module features		Type (Weight)	EH-POS (Approx. 0.17kg (0.37lb.))
		Dimensions (mm (in.))	

Name	Description
Reset switch	Hardware-reset switch.
Positioner connector	This is used for connecting a special programming console called positioner.
I/O connector	This is a connector (20 pins) for the pulse output and the external control input. Applicable connector Manufacturer: Sumitomo 3M Connecting system: 10120-3000VE (Soldering type) Shell: 10320-52F0-008 (or equivalents)
DIP switch	Switches the choice of pulse output method (CW/CCW or CK/Direction switching), output logic (positive/negative logic), and whether external input signal is in or not. Turn off the power and remove the module out of the base to change the setting.

Purpose	Applied switch	Bit 1	Bit 2	Explanation
Choice of pulse output method	Bit 1-2 	OFF	OFF	Clock pulse / Direction signal output (Positive logic)
		OFF	ON	Clock pulse / Direction signal output (Negative logic)
		ON	OFF	CW/CCW pulse output (Positive logic)
		ON	ON	CW/CCW pulse output (Negative logic)

Purpose	Applied switch		Explanation
Positioning complete external input signal Choice of (COIN) is in or not	Bit 4 	OFF	COIN signal
		ON	No COIN signal
+ Direction overrun external input signal Choice of (+0.RUN) is in or not	Bit 5 	OFF	+0.RUN signal
		ON	No +0.RUN
- Direction overrun external input signal Choice of (-0.RUN) is in or not	Bit 6 	OFF	-0.RUN signal
		ON	No -0.RUN signal

Always use Bit 3 with OFF.

Specifications

Item		Specification
Number of control axes		1 axis
Highest frequency		400 k pulse/s
Positioning data	Capacity	256 points
	Setting procedure	1. Sequence program 2. Positioner (Note, a positioner is optional.)
Positioning	Method	1. Absolute system 2. Absolute system + Increment system 3. Increment system
	Positioning instruction	1. Pulse specifying 2. μm specifying 3. inch specifying 4. degree specifying
	Speed instruction	Automatic, manual, and homing 6.25 pulse/s to 400 k pulse/s μm/s, inch/s, degree/s input function
	Speed stage	10 stages
	Acceleration and deceleration system	Trapezoid acceleration and deceleration S-curve acceleration and deceleration (3-stage acceleration and deceleration)
	Acceleration and deceleration time	1 to 65,535 ms
	Backlash	0 to 255 pulse
	High and low limit setting	+2,147,483,647 to -2,147,483,648 pulse
	Pulse output method	1. Pulse chain (CW/CCW) 2. Clock + direction signal (CK/Direction) (DIP switch No.1 and No.2 set the choice of pulse output system and the switching of each positive and negative logic.)
	Pulse output procedure	1. Open collector output (Photo-coupler insulation) 2. Line driver output (Photo-coupler insulation)
Homing function		1. Free home position 2. Low speed homing 3. High speed homing 1 4. High speed homing 2 5. Absolute value encoder homing
Teaching		Possible
Manual (JOG) operation		Pulse output by manual input signal
Operation when CPU has stopped		Operation is possible via I/O set or using the positioner
Absolute value encoder input		Supports to Σ series / Σ II series by Yasukawa Electric Co. and P series by SANYO electric Co.
Internal current consumption		300mA maximum

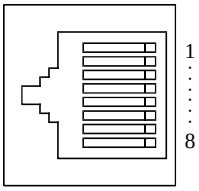
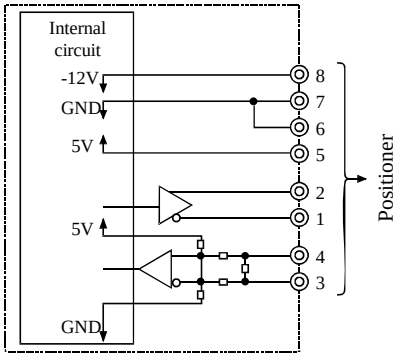
(continued on the following page)

Note - When the CPU is stopped during operation, the motor decelerates and stops.
- The maximum travel per one movement is 2,147,483,647 pulses. If the operation is performed exceeding the maximum travel, the motor decelerates and stops at the maximum travel position.

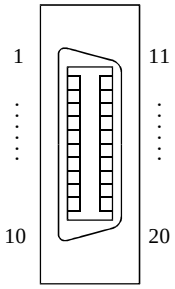
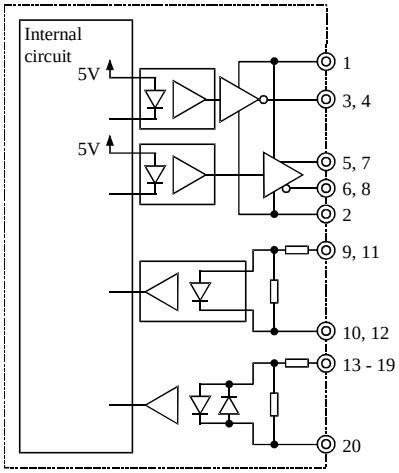
Specifications (continued from the preceding page)

Item			Specification
Output	Pulse chain (CW/CCW) output Clock + Direction signal (CK/Direction) pulse output		1. Open collector output photo-coupler insulation (30 V DC at the maximum, 30 mA resistive load) 2. Line driver output photo-coupler insulation (5 V DC)
	Maximum leak current		100 μA
	Maximum voltage drop at ON		0.8 V at the maximum (at output current 30 mA)
Input	Input voltage		10.8 to 30 V DC
	Input impedance		Approx. 2.2 kΩ
	Input current		10 mA (24 V DC) maximum
	Operating voltage	Minimum ON voltage	9 V
		Maximum OFF voltage	3.6 V
	Input lag	ON → OFF	1 ms maximum
		OFF → ON	1 ms maximum
	Polarity		Only encoder signal input uses the plus common inside the unit, and other inputs do not specify polarity.
	Insulation system		Photo-coupler

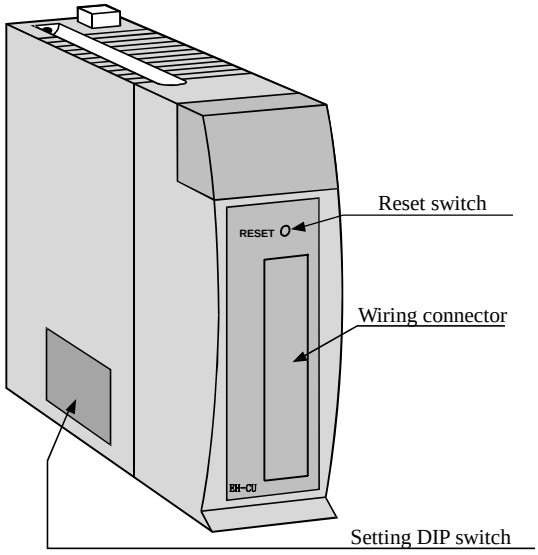
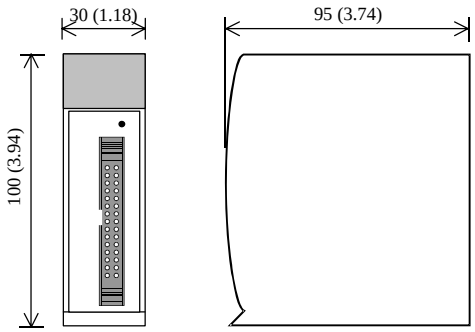
A) Specifications of Positioner connector (CN1): conforms to RS-422

Terminal configuration	No.	Signal	Signal name	Diagram of Internal circuit
	1	Do -	Driver output -	
	2	Do +	Driver output +	
	3	Ri -	Receiver input -	
	4	Ri +	Receiver input +	
	5	5 V DC +	+ 5 V	
	6	0 V	GND	
	7	0 V	GND	
	8	12 V DC -	-12 V	

B) Specifications of I/O connector (CN2)

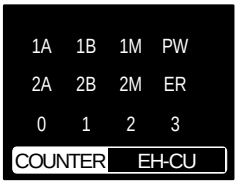
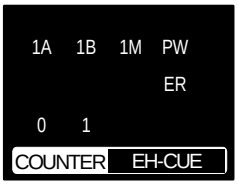
Terminal configuration	No.	Signal	Signal name	Diagram of Internal circuit
	1	5 V DC +	Pulse output power supply	
	2	0 V		
	3	CW	Open collector pulse output	
	4	CCW		
	5	CW +	Line driver pulse output	
	6	CW -		
	7	CCW +		
	8	CCW -		
	9	C +	Encoder C phase	
	10	C -		
	11	PS -	Encoder position signal	
	12	PS +		
	13	COIN	Positioning complete	
	14	PROG	Home position LS	
	15	+ 0.RUN	+ Overrun	
	16	- 0.RUN	- Overrun	
	17	MODE - SEL	Control mode switch	
	18	M – CW	Manual CW	
	19	M – CCW	Manual CCW	
	20	24 V DC +	Control power supply	

2.9.2 High speed counter module : EH-CU/CUE

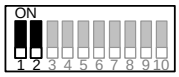
Module features	Type (Weight)	EH-CU (0.16kg (0.35lb.))
EH-CU: 2-ch High counter, EH-CUE: 1-ch High speed counter		EH-CUE (0.16kg (0.35 lb.))
	Dimensions (mm (in.))	

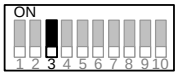
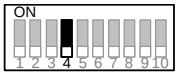
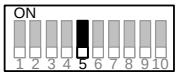
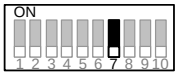
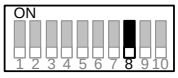
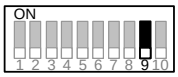
Name	Description
Reset switch	The module is reset if this switch is pressed.
Wiring connector	This is a connector with 30 pins (15×2 lines) for connecting the external wiring. (Note) In EH-CU, common to 2 channels Applicable connector on the module side Manufacturer: Hirose Electric Co. Type: HIF3BA-30PA-2.54DS (30 pins male) Applicable connector on the wiring side Manufacturer: Hirose Electric Co. Type: HIF3BA-30D-2.54C (30 pins connector) HIF3-2226SCC (connector pin) HIF3-TB2226HC (crimp tool) HIF3--30CV (connector cover)
Setting DIP switch	The dip switches are to configure several parameters of EH-CU/E. Be sure to set dip switches while power off.

LED name

Front view	LED name	Details	Color
 EH-CU (2-ch type)	PW	Lighted when the power is ON and the module operates regularly.	Green
	ER	Lighted when the hardware error of the module occurs.	Red
	1A	Lighted depending on ON/OFF of the A-phase input signal of Channel 1.	Green
	1B	Lighted depending on ON/OFF of the B-phase input signal of Chnnale1.	Green
	1M	Lighted depending on ON/OFF of the marker input signal of Channel 1.	Green
	2A	Lighted depending on ON/OFF of the A-phase input signal of Channel 2.	Green
	2B	Lighted depending on ON/OFF of the B-phase input signal of Channel 2.	Green
	2M	Lighted depending on ON/OFF of the marker input signal of Channel 2.	Green
	0	Lighted depending on ON/OFF of Y0 output terminal.	Green
	1	Lighted depending on ON/OFF of Y1 output terminal.	Green
	2	Lighted depending on ON/OFF of Y2 output terminal.	Green
 EH-CUE (1-ch type)	3	Lighted depending on ON/OFF of Y3 output terminal.	Green

"ER" LED lights up for an instance if the reset switch is pressed down. That is no error.

Purpose	Applied switch	Bit1	Bit 2	Explanation
Select the counter mode (Common between channels)	Bit 1-2 	OFF	OFF	2-phase counter (100 kHz at the maximum)
		OFF	ON	1-phase counter (CW, CCW)
		ON	OFF	1-phase counter (CK, UP/DOWN)
		ON	ON	2-phase multiplied by 4 counter (25 kHz at the maximum)

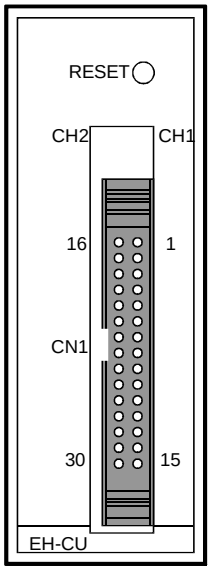
Purpose	Applied switch		Explanation
Select the marker polarity	Bit 3 	OFF	Channel 1 Detects the marker at the input OFF edge.
		ON	Channel 1 Detects the marker at the input ON edge.
	Bit 4 	OFF	Channel 2 Detects the marker at the input OFF edge.
		ON	Channel 2 Detects the marker at the ON edge.
Select counting operation during STOP	Bit 5 	OFF	Channel 1. Stops counting while the CPU module stops.
		ON	Channel 1 Keeps counting while the CPU module stops.
	Bit 6 	OFF	Channel 2 Stops counting while the CPU module stops.
		ON	Channel 2 Keeps counting while the CPU module stops.
Select normal counter/ ring counter	Bit 7 	OFF	Channel 1 Normal counter
		ON	Channel 1 Ring counter
	Bit 8 	OFF	Channel 2 Normal counter
		ON	Channel 2 Ring counter
Select the test mode	Bit 9 	OFF	Normal operation
		ON	Test mode (Program for checking is started up.)

Always use Bit 10 with OFF.

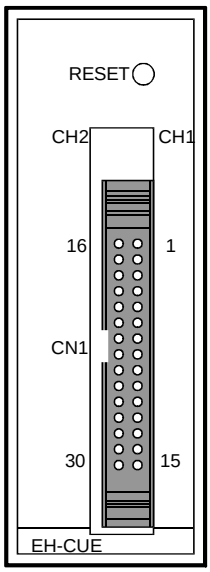
Specifications

Item		Specification	
Type		EH-CU	EH-CUE
Number of channels		2	1
Number of counts at the maximum		32 bits（0 to 4,294,967,295）	
Maximum frequency		100 k Hz (25 k Hz at multiplied by 4)	
Count mode		Select by setting of DIP switch. (EH-CU is common to both channels.) 2-phase, 1-phase (CW/CCW, CK, U/D), 2-phase multiplied by 4	
Differential input current		4 mA minimum	
Differential input voltage		12 to 24V DC	
	Minimum ON voltage	10V DC	
	Minimum OFF voltage	4V DC	
Insulation system		Photo-coupler	
Number of input points 3 points / CH	A:A, CW, CK	Phase difference of each channel (A – B) during 2-phase counting +45° to +125° when up, -45° to -125° when down	
	B:B, CCW, U/D		
	M: Marker (z)		
Minimum counter pulse width		ON: 4 μs, OFF: 4 μs	
Minimum marker pulse width		10 μs (detected at ON edge)	
External wiring method		30-pin connector	
External wiring		Wired with twisted pair cables and batch shielded cables	
Output voltage		12/24 V DC (30 V DC at the maximum)	
Load current		20 mA / point at the maximum	
Output method		Open collector output	
Minimum load current		1 mA	
Output delay time	ON → OFF	1 ms maximum	
	OFF → ON	1 ms maximum	
Voltage down at ON		1.5 V at the maximum	
Number of external output points		4	2
	Normal counter	Current value = Set value 1, or Current value > Set value 1	
	Ring counter	Current value = Set value 2	
Leak current		0.5 mA at the maximum	
Polarity		(-) common within the module	
External power supply		12/24 V DC (30 V DC at the maximum)	
Insulation system		Photo-coupler	
Internal current consumption		310mA maximum	

Specifications of I/O terminal

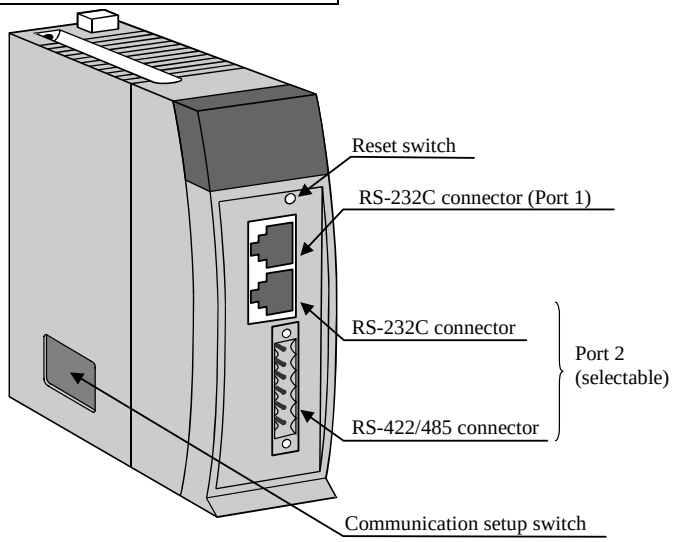
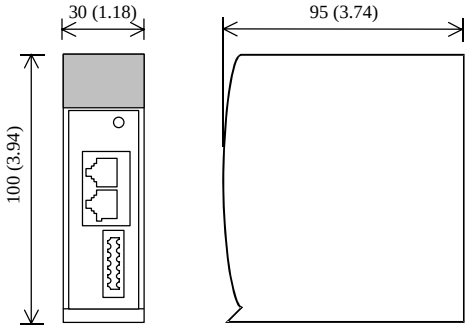
EH-CU	Terminal configuration	No.	CH2	No.	CH1	Meaning of signal	
		16	Vin A	1	Vin A	Phase A	Connects to a 12 to 24V DC power supply at using voltage input.
		17	A (+)	2	A (+)		Connects (+) polarity at using differential input.
		18	A (-)	3	A (-)		Connects an open collector signal at using voltage input. Connects (-) polarity at using differential input.
		19	Vin B	4	Vin B	Phase B	Connects a 12 to 24V DC power supply at using voltage input.
		20	B (+)	5	B (+)		Connects (+) polarity at using differential input.
		21	B (-)	6	B (-)		Connects an open collector signal at using voltage input. Connects (-) polarity at using differential input.
		22	Vin M	7	Vin M	Marker	Connects a 12 to 24V DC power supply at using voltage input.
		23	M (+)	8	M (+)		Connects (+) polarity at using differential input.
		24	M (-)	9	M (-)		Connects an open collector signal at using voltage input. Connects (-) polarity at using differential input.
		25 to 27 N.C.		10 to 12 N.C.			Connect nothing.
		28	Y2	13	Y0	Output	Coincidence output. Connects to the other input.
		29	Y3	14	Y1		Coincidence output. Connects to the other input.
		30	Com2	15	Com1		(-) common for coincidence common. Commons 1 and 2 are independent.

Note: Pin No. defined in EH-CU does not accord with pin No. defined by connector maker.

EH-CUE	Terminal configuration	No.	CH2	No.	CH1	Meaning of signal	
		16	N.C.	1	Vin A	Phase A	Connects to a 12 to 24V DC power supply at using voltage input.
		17	N.C.	2	A (+)		Connects (+) polarity at using differential input.
		18	N.C.	3	A (-)		Connects an open collector signal at using voltage input. Connects (-) polarity at using differential input.
		19	N.C.	4	Vin B	Phase B	Connects to a 12 to 24V DC power supply at using voltage input.
		20	N.C.	5	B (+)		Connects (+) polarity at using differential input.
		21	N.C.	6	B (-)		Connects an open collector signal at using voltage input. Connects (-) polarity at using differential input.
		22	N.C.	7	Vin M	Marker	Connects to a 12 to 24V DC power supply at using voltage input.
		23	N.C.	8	M (+)		Connects (+) polarity at using differential input.
		24	N.C.	9	M (-)		Connects an open collector signal at using voltage input. Connects (-) polarity at using differential input.
		25 to 27 N.C.		10 to 12 N.C.			Connect nothing.
		28	N.C.	13	Y0	Output	Coincidence output. Connects to the other input.
		29	N.C.	14	Y1		Coincidence output. Connects to the other input.
		30	N.C.	15	Com1		(-) common for coincidence output

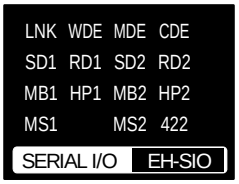
Note: Pin No. defined in EH-CUE does not accord with pin No. defined by the connector maker.

2.9.3 Serial interface module : EH-SIO

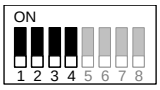
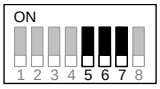
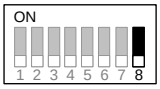
Module features	Type (Weight)	EH-SIO (Approx. 0.13kg (0.29lb.))
	Dimensions (mm (in.))	

Name		Description
Reset switch		The module is reset if this switch is pressed.
Port 1	RS-232C port	Connects a transmission channel of RS-232C.
Port 2	RS-232C port	Connects a transmission channel of RS-232C.
	RS-422 / 485 port	Connects a transmission channel of RS-422 / 485.
Communication setup switch		Sets specifications of communication with external devices. Set the module correctly after confirming the specification of communication of the external device. Turn off the power supply and remove the module from the base to set it.

LED display

Front view	Name	Details	Color
	LNK	Lights up in the simple data link mode.	Green
	WDE	Lights up when microcomputer error (serious error) occurs. (Common to port 1 / port 2)	Red
	MDE	Lights up when module error (serious error) occurs. (Common to port 1 / port 2)	Red
	CDE	Lights up when error (warning) such as command error occurs. (Common to port 1 / port 2)	Red
	SD1	Flashes while data is transmitted from port 1.	Green
	RD1	Flashes while port 1 receives data.	Green
	MB1	Lights up when Modbus-RTU is set in port 1.	Green
	HP1	Lights up when H-protocol is set in port 1 (not available with EHV+).	Green
	MS1	Lights up when Modbus-RTU master is set in port1.	Green
	SD2	Flashes while data is transmitted from port 2	Green
	RD2	Flashes while port 2 receives data.	Green
	MB2	Lights up when Modbus-RTU is set in port 2.	Green
	HP2	Lights up when H-protocol is set in port 2 (not available with EHV+).	Green
	MS2	Lights up when Modbus-RTU master is set in port2.	Green
	422	Lights up when RS-422/485 is set in port 2.	Green

Communication setup switch

Setting	Details
Communication speed setup - DIP Sw1 is for port 1 setup - DIP Sw2 is for port 2 setup	Bit 1, 2, 3, and 4 are used for the communication speed setting. 
Transmission letter configuration setup - DIP Sw1 is for port 1 setup. - DIP Sw2 is for port 2 setup.	Bit 5, 6, and 7 are used for the transmission letter configuration setup. 
Select of I/F of port 2 communication (Only DIP Sw2)	Bit 8 is used for selecting I/F of port 2 (RS-232C or RS-422 / 485) (RS-422 / 485 is decided according to external wiring.) 

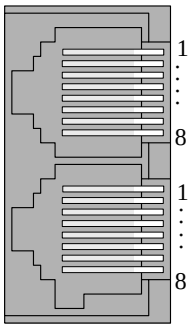
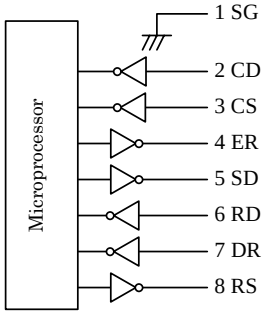
Bit1	Bit2	Bit3	Bit4	Communication speed
OFF	OFF	OFF	OFF	Do not set these patterns.
OFF	OFF	OFF	ON	
OFF	OFF	ON	OFF	
OFF	OFF	ON	ON	1,200 bps
OFF	ON	OFF	OFF	2,400 bps
OFF	ON	OFF	ON	4,800 bps
OFF	ON	ON	OFF	9,600 bps
OFF	ON	ON	ON	19,200 bps
ON	OFF	OFF	OFF	38,400 bps
ON	OFF	OFF	ON	57,600 bps
ON	OFF	ON	OFF	Do not set these patterns.
ON	OFF	ON	ON	
ON	ON	OFF	OFF	
ON	ON	OFF	ON	
ON	ON	ON	OFF	
ON	ON	ON	ON	

Bit5	Bit6	Bit7	Communication format setup		
			Data length	Stop bit	Type of parity
OFF	OFF	OFF	7	2	Even number
OFF	OFF	ON	7	2	Odd number
OFF	ON	OFF	7	1	Even number
OFF	ON	ON	7	1	Odd number
ON	OFF	OFF	8	2	None
ON	OFF	ON	8	1	None
ON	ON	OFF	8	1	Even number
ON	ON	ON	8	1	Odd number

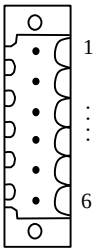
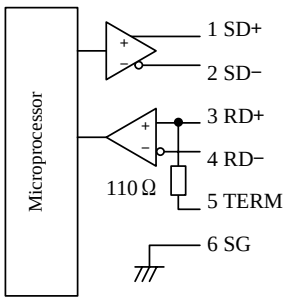
Bit8	Select I/F of Port 2 communication
OFF	RS-232C port
ON	RS-422 / RS-485 port

[Note] The system uses DIP Sw1(Bit8). Do not turn on it.

RS-232C connector

External view of connector	No.	Signal	Signal name	Diagram of Internal circuit
	1	SG	Signal grounding	
	2	CD	Career detection	
	3	CS	Transmittable	
	4	ER	Data terminal ready	
	5	SD	EH-SIO transmitting data	
	6	RD	EH-SIO receiving data	
	7	DR	Data set ready	
	8	RS	Transmitting request	

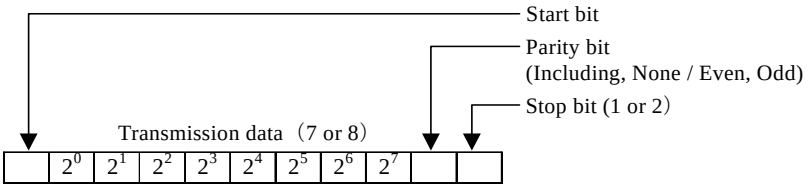
RS-422 / 485 connector

External view of connector	No.	Signal	Signal name	Diagram of Internal circuit
	1	SD＋	EH-SIO transmitting data ＋	
	2	SD－	EH-SIO transmitting data －	
	3	RD＋	EH-SIO receiving data ＋	
	4	RD－	EH-SIO receiving data －	
	5	TERM	For terminator	
	6	SG	Signal grounding	

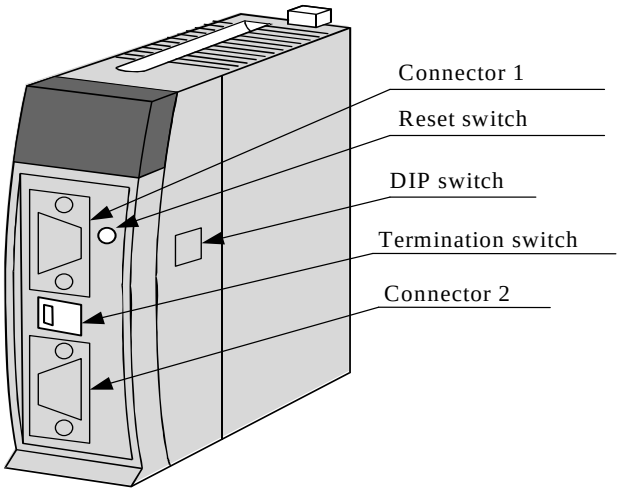
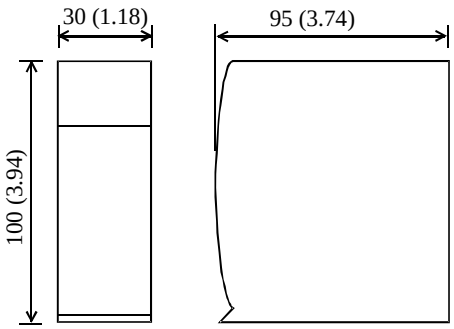
Functional specifications

Item	Specification
Mounting position	Basic base and Expansion base (cannot mount on Remote base)
The number of units to be mounted	Unlimited within the range of power supply capacity of the power module.
Supporting communication mode	No protocol (General purpose communication), Modbus mater (RTU)

Communication specifications

Item		Specification	
Interface		Port 1	RS-232C
		Port 2	RS-232C or RS-422/485
Transmission speed		Selectable from 4,800 / 9,600 / 19,200 / 38,400 / 57,600 bps	
Transmission system		Bit serial system (Transmitted from the lowest bit of transmission signal)	
Synchronization		Asynchronous	
Transmission character configuration			
Input buffer		1,024 bytes / port	
Output buffer		1,024 bytes / port	
Error control		Overrun error, framing error, parity error, input buffer full, message error, timeout error	
RS-232C port	Connection mode	1 : 1	
	Transmission distance	15 m (49.37ft.) (Maximum)	
	Connector	RJ-45 connector	
RS-422 / 485 port	Connection mode	1 : N (N : 32 units at the maximum)	
	Transmission distance	500 m (548.61yd.) (Maximum)	
	Connector	Attached with the module (BL3.5/6F by Weidmuller)	

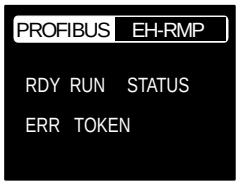
2.9.4 PROFIBUS-DP master module : EH-RMP

Module features	Type (Weight)	EH-RMP (Approx. 0.13kg (0.28Ib.))
	Dimensions (mm (in.))	

Name	Description		
Connector 1	Connect to PC (configurator), 9pin male Sub-D Be careful, this connector become hot.		
Reset switch	When module is abnormal, module is reset by pushing this.		
DIP switch *1 (No. 1,2 not used)	Switch No.		Supplementary explanation (when the CPU is stopped)
	4	3	
	OFF	OFF	CLEAR mode: the output data is cleared.
	OFF	ON	FREEZE mode: the output data is frozen.
	ON	OFF	COPY mode: the output data is coped from the CPU.
	ON	ON	Not use
Termination switch	ON: bus termination enabled OFF: bus termination disabled		
Connector 2	Connect to field bus, 9pin female Sub-D The screw is the terminal for functional earth.		

*1: For setting of this switch, remove the module from the rack. If the setting ends, cover with the protection sheet.

LED name

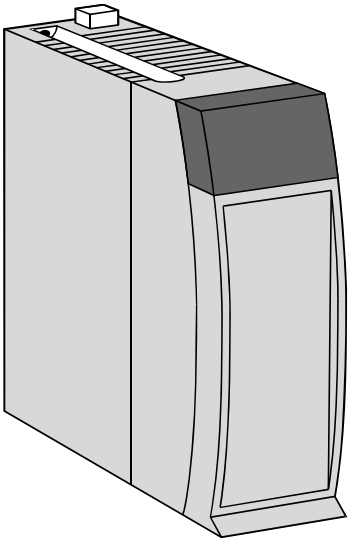
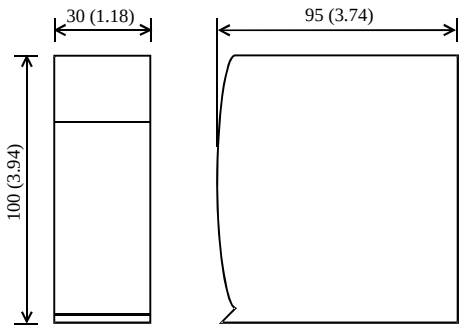
Front view	LED name	Description	Color
	STATUS	The state of the EH-RMP	Green
	RUN	Communication running	Green
	ERR	Error on communication line	Red
	RDY	Device has no error	Green
	TOKEN	Lit all the time	Green

Specifications

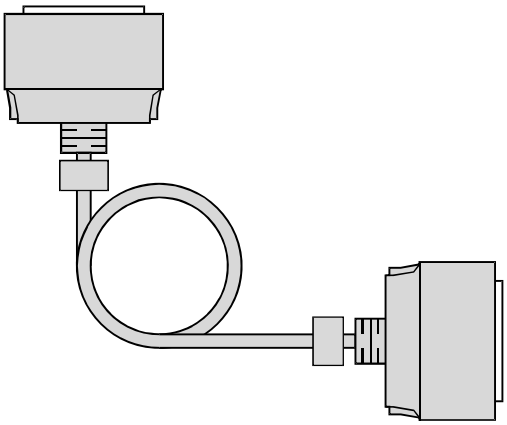
Item	Specification
The number of modules	8 / CPU (slot 0 to 7 only)
Number of slaves	Up to 124 slaves
Output data	256 words
Input data	256 words
Data transfer rate : Max segment length	9.6 kbps: 1200 m 19.2 kbps: 1200 m 93.75 kbps: 1200m 187.5 kbps: 1000m 500 kbps: 400m 1500 kbps: 200m 3 Mbps: 100m 6 Mbps: 100m 12 Mbps: 100m
Self-diagnosis	System ROM/RAM check, watch-dog timer check
GSD file	File name : Hms_1004.gsd This file can either be downloaded from the webpage http://www.hms.se/fbfiles.htm or received by contacting **HMS Fieldbus AB**.
Configurator	Please prepare the configurator from **HMS Fieldbus AB**. Order number: **KONF-PDP**

2.10 Accessories

2.10.1 Dummy module: EH-DUM

Module features		Type (Weight)	EH-DUM (Approx. 0.06kg (0.132lb.))
		Dimensions (mm (in.))	
Function	This module is used for protecting the un-mounted slot.		

2.10.2 Expansion cable

Features		Type	EH-CB5A / 10A / 20A
		Weight	Approx. 0.21 (0.46) / 0.24 (0.53)/ 0.30 kg (0.66 lb.)
		Length	0.5 (1.64)/ 1.0 (3.28)/ 2.0 m (6.56 ft.)
Function	Connects to the expansion cable connector of the base unit and to the connector of the I/O controller. There is no directivity in the cable. Either connector can be connected to the base side.		

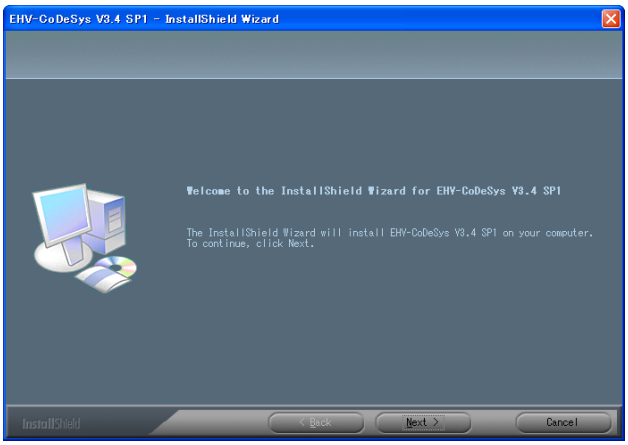
Chapter 3 Programming

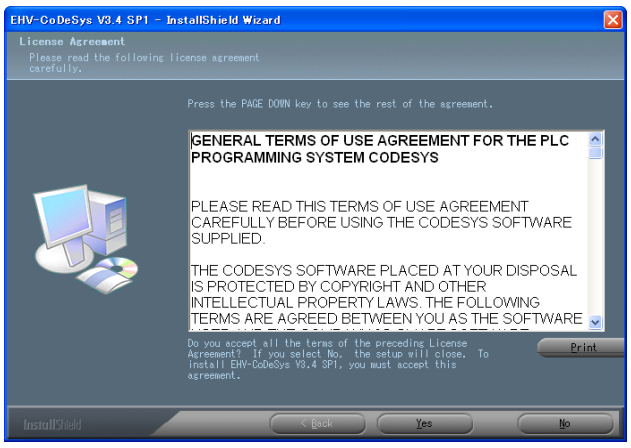
3.1 Installation

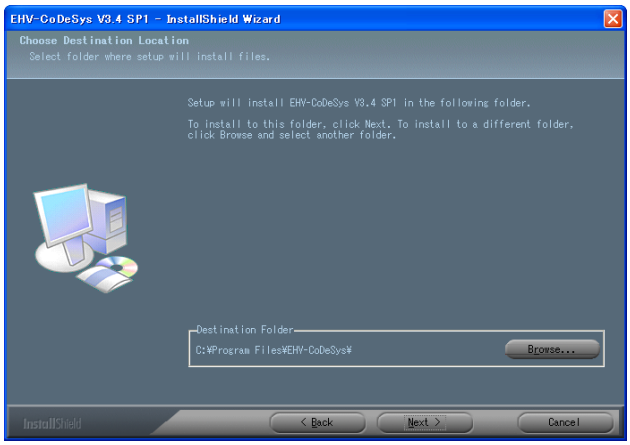
3.1.1 Installation of EHV-CoDeSys

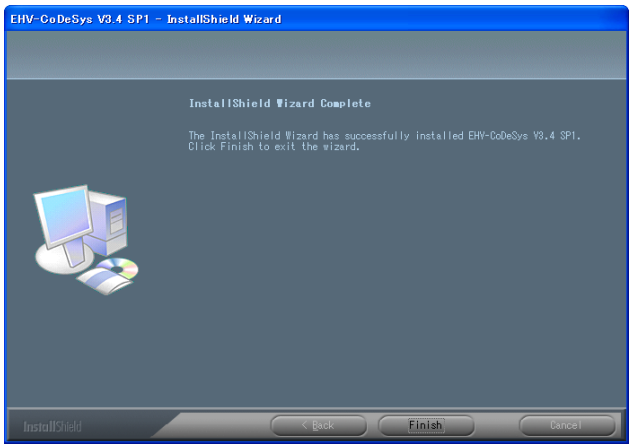
1. Double click setup file

2. Follow the instructions



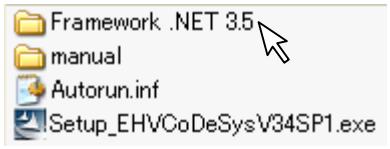


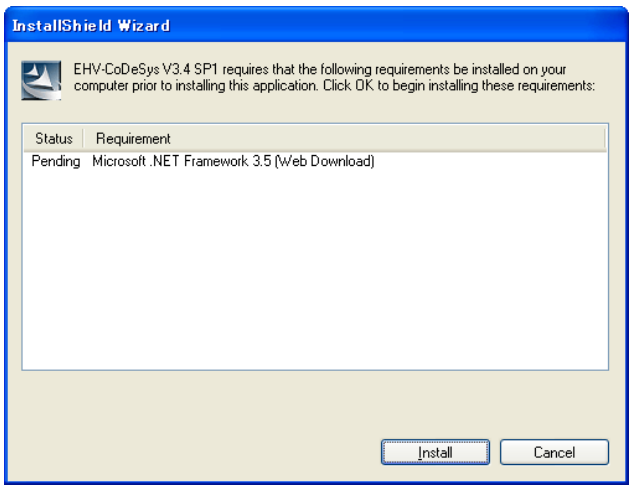




Note

.NET framework V3.5 is necessary to be installed for EHV-CoDeSys. If it is not installed, the installation of EHV-CoDeSys stops and message appears as right window. Click [Install] to download over the Internet. If it's not possible to access the Internet, click [cancel] and install from the CD of EHV-CoDeSys. Full-package of .NET framework V3.5 service pack 1 is included in the CD.

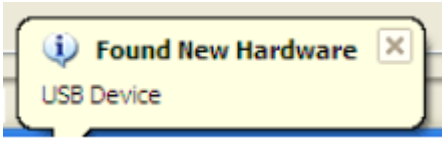




3.1.2 Installation of USB driver

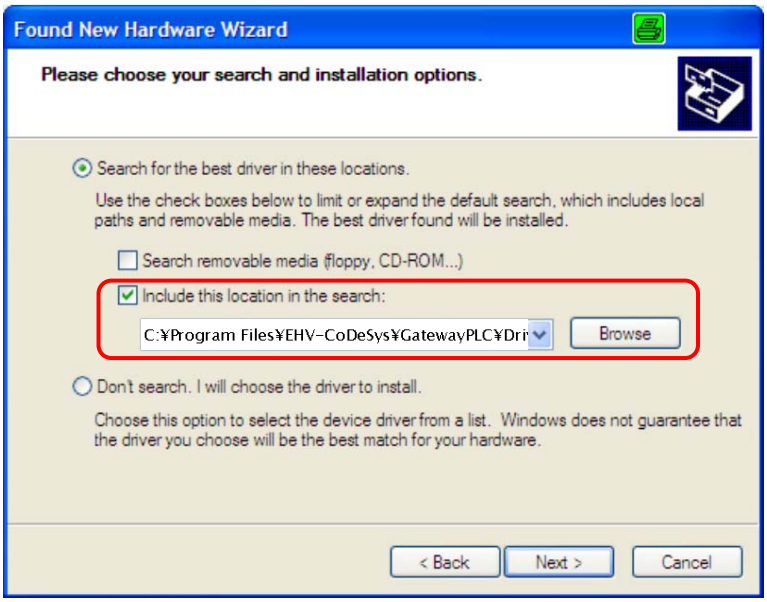
1. Plug in USB cable to CPU module.

2. Popup window appears at right-bottom of screen. Click the popup window.

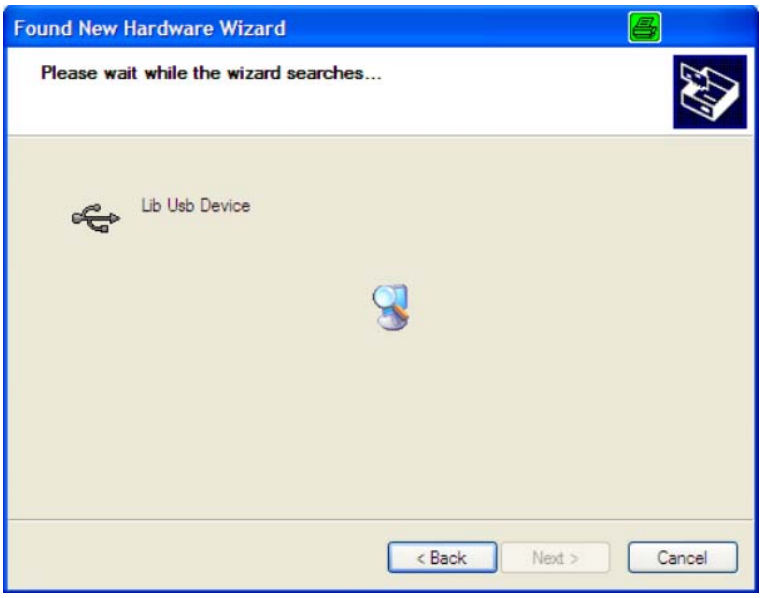


3. Click “Install from a list or specific location (Advanced)” and “Next” button.

4. Click “Include this location in the search” with the path C:¥Program Files¥EHV-CoDeSys¥GatewayPLC¥Driver and “Next” button.



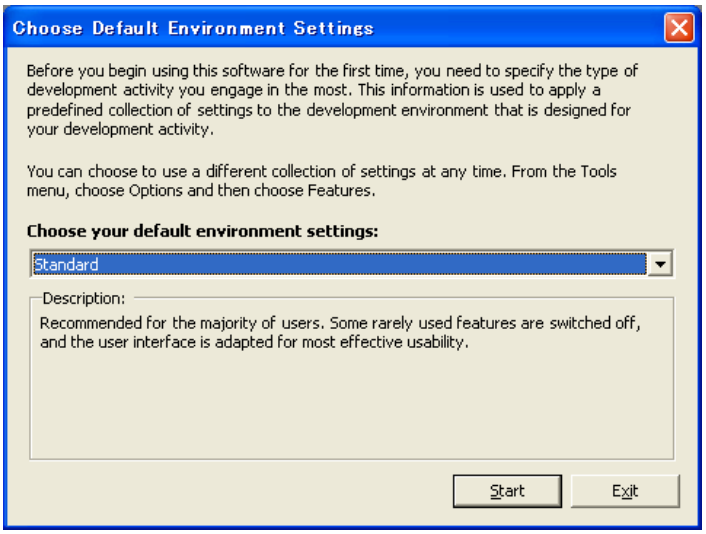
5. USB driver installation is in progress.



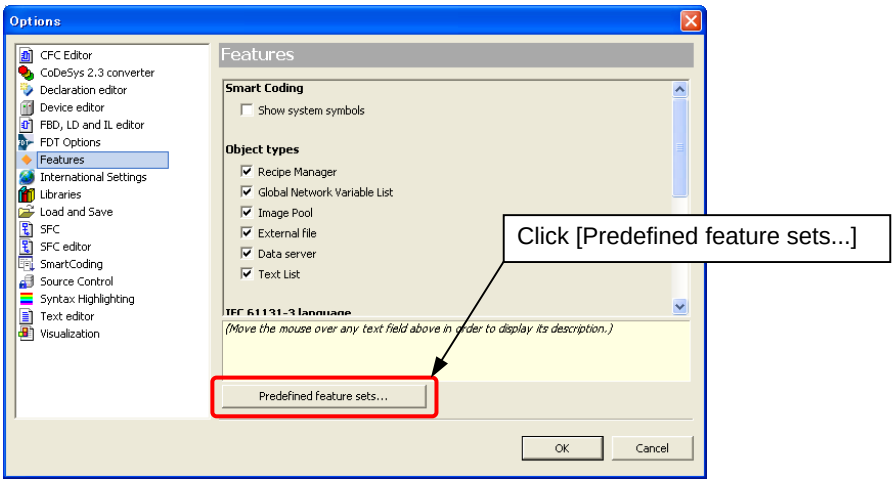
6. USB driver installation has been completed. Click “Finish” to close the wizard.

3.2 Startup

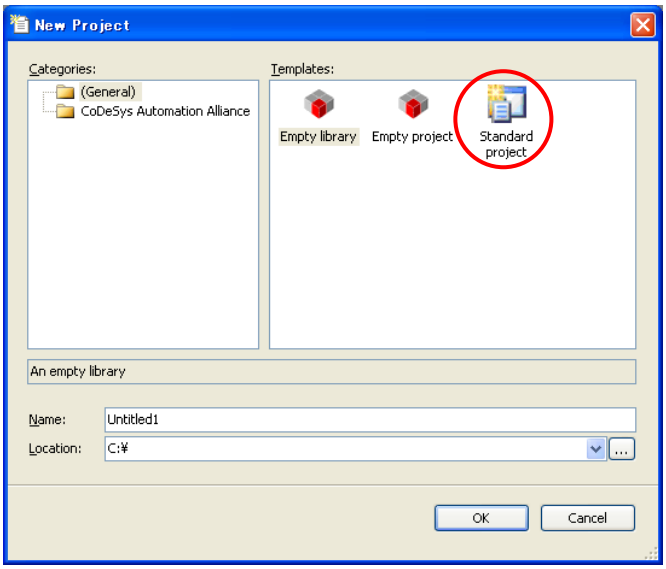
In the first use, you need to specify the type of development activity “Standard” or “Professional” you engage in the most.



This setting can be changed at any time in the menu [Tools]-[Options]-[Features] as below.

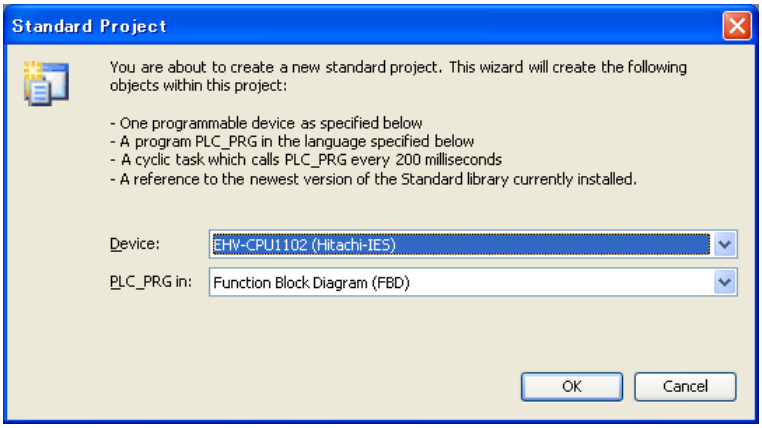


Click  icon or choose [File]-[New Project...] to create a new project file. Then New Project dialog box appears as below. Choose “Standard project”, enter new file name, specify location and click [OK].

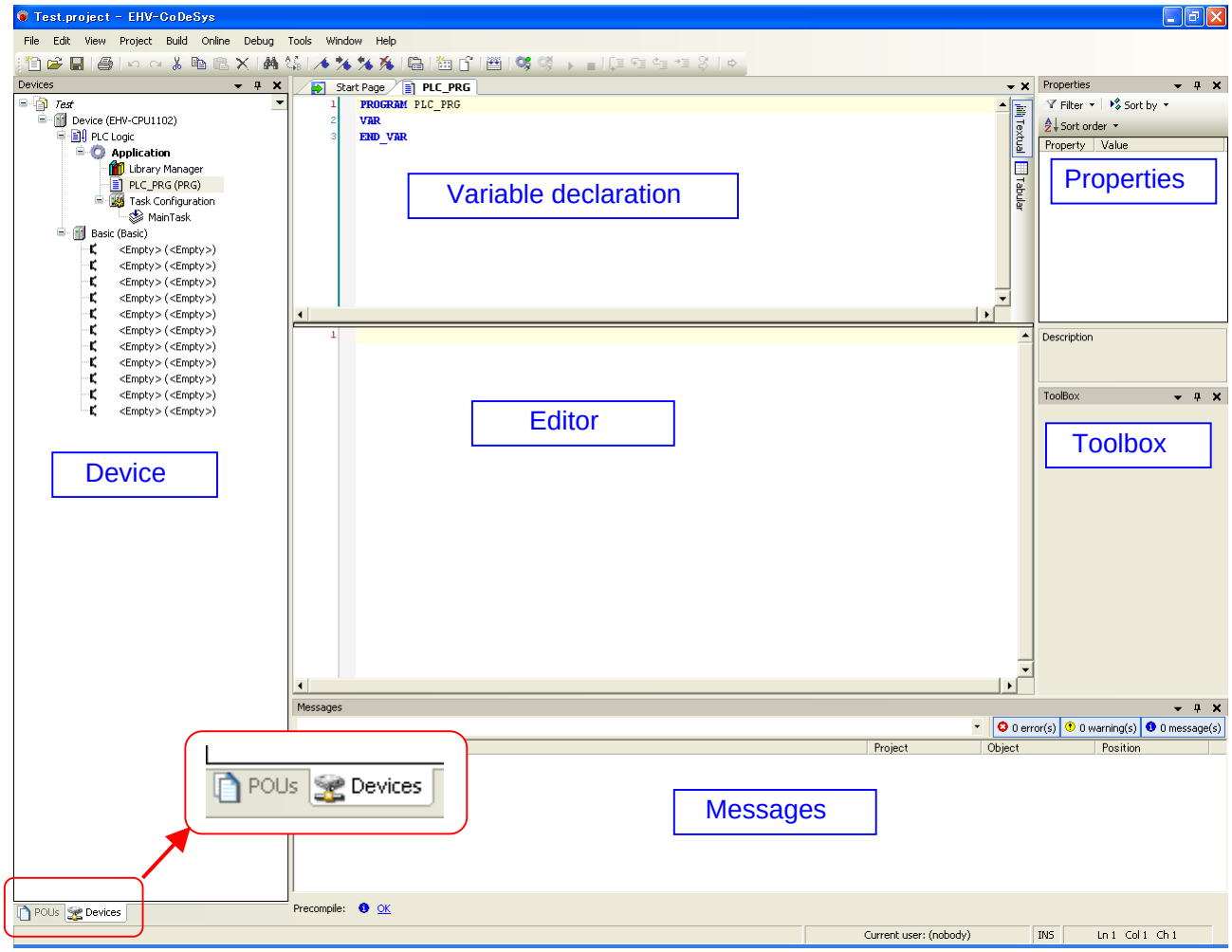


Choose CPU type and programming language and click [OK].
Available languages are as follows.

- Continuous Function Chart (CFC)
- Function Block Diagram (FBD)
- Instruction List (IL)
- Ladder Logic Diagram (LD)
- Sequential Function Chart (SFC)
- Structured Text (ST)



Initial screen shot of EHV-CoDeSys is shown below.

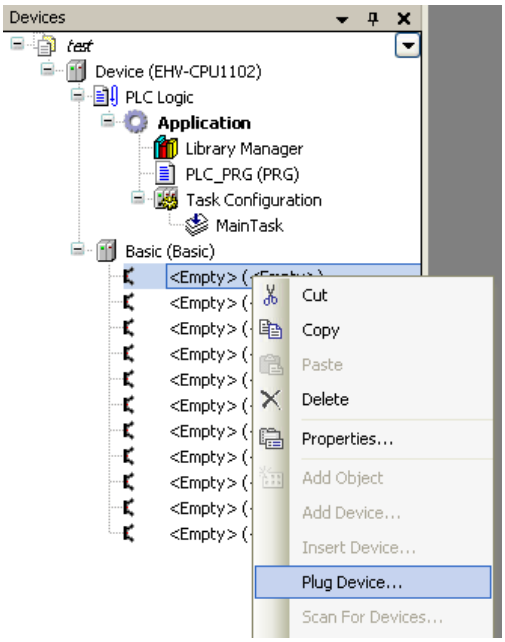


In the default setting, Device tree is behind the POU window. Click Devices tab to show it. “Toolbox” and “Properties” windows can be shown by [View] menu.

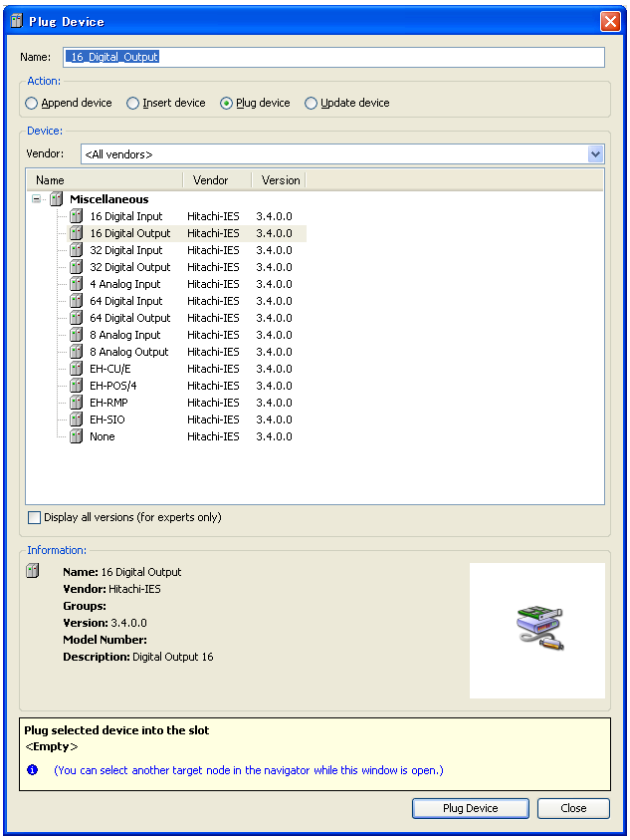
3.3 I/O Configuration

3.3.1 Plug Device (I/O configuration)

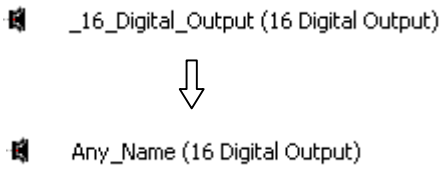
Right click on <Empty> slot and choose “Plug Device...”.



Choose I/O module for each slot. The next slot can be configured by clicking next empty slot without closing the Plug Device window every time.



Module name can be renamed at “Properties” in right mouse click menu.



Configure I/O modules according to the list below.

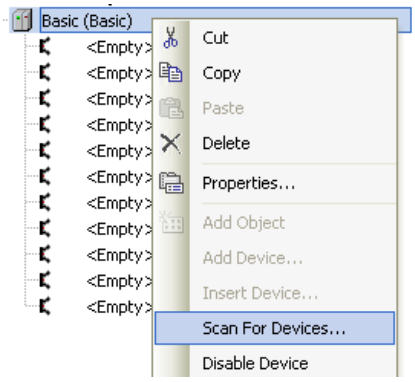
Model names	Device Names
EH-XD8, 16	16 Digital input
EH-XA16, H16	
EH-XD32, 32E, 32H	32 Digital input
EH-XD64	64 Digital input
EH-YR8B, 12, 16	16 Digital output
EH-YT8, 16	
EH-YTP8, 16, 16S	
EH-YS4, 16	
EH-YT32, 32E, 32H	32 Digital output
EH-YTP32, 32E	
EH-YT64	64 Digital output
EH-YTP64	
EH-PT4	4 Analog input
EH-AX44, 8V, 8H, 8I, 8IO	8 Analog input
EH-AXH8M	
EH-TC8	
EH-AY22, 2H, 4V, 4H, 4I *1	8 Analog output
EH-AYH8M	
EH-CU, CUE	EH-CU/E
EH-POS	EH-POS/4
EH-RMP	EH-RMP
EH-SIO	EH-SIO

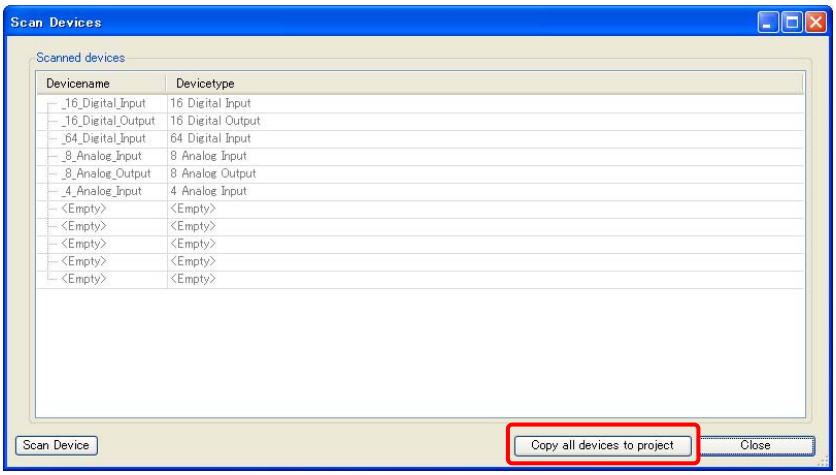
*1 Although the number of channel is not 8, configure “8 ch. Analog output”.

3.3.2 Scan For Devices

Instead of plugging I/O modules one by one, actual information can be read out from connected CPU.

Right click on basic or expansion base and choose “Scan For Devices...”. Then “Scan Devices” dialog appears. Click “Copy all devices to project”. This function works for chosen base only. If you have several expansion bases, repeat “Scan For Device” for each base.



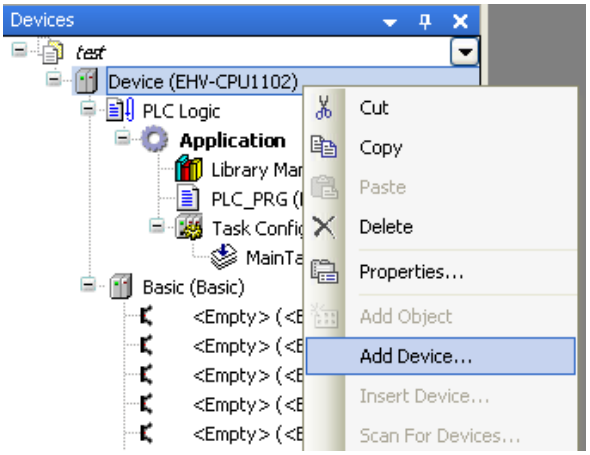


Note

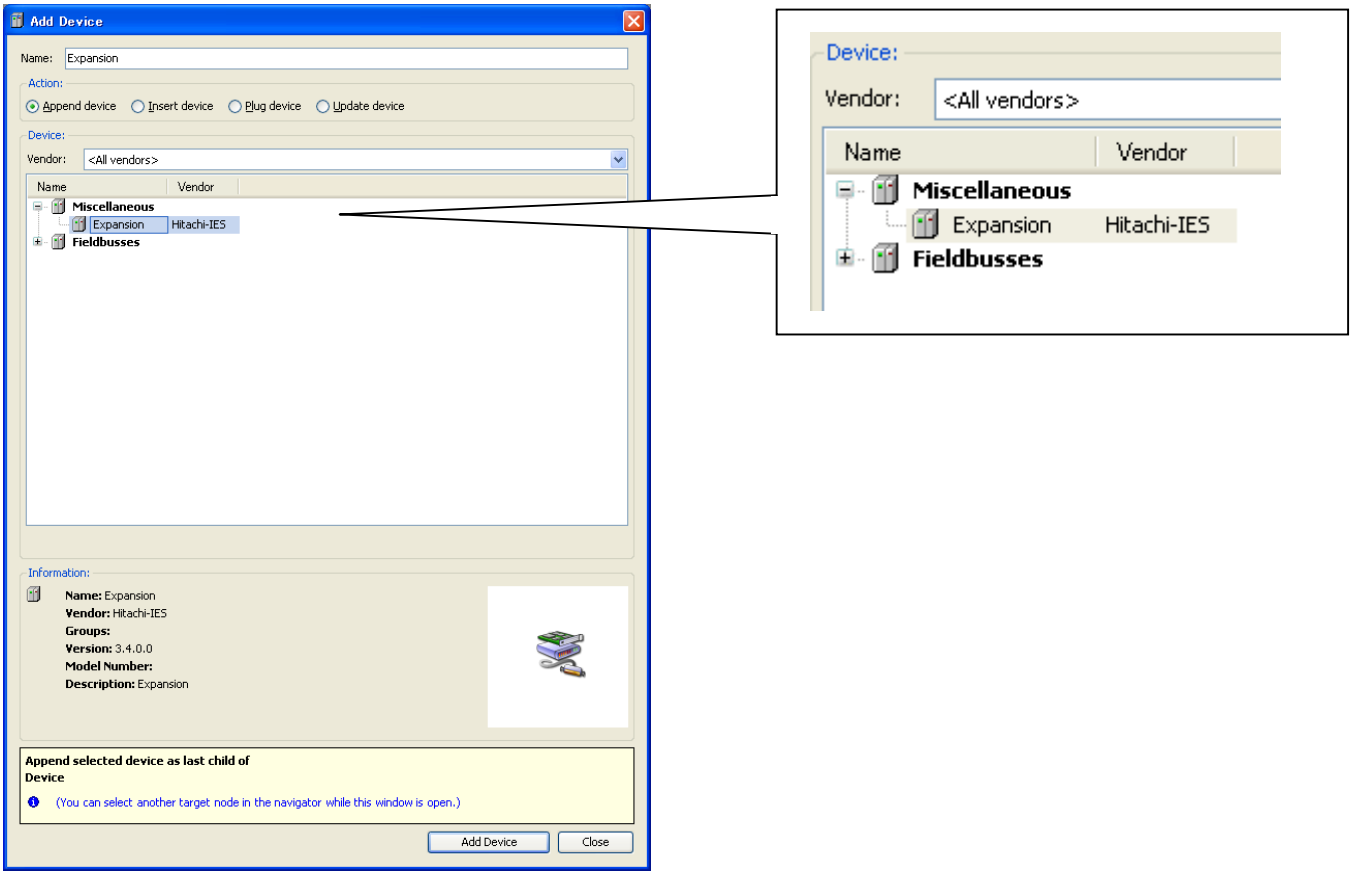
“Scan For Devices” works only when logout, however, gateway and active path must be set accordingly.

3.3.3 Expansion unit

Instead of “Plug Device”, choose “Add Device” to configure expansion units.

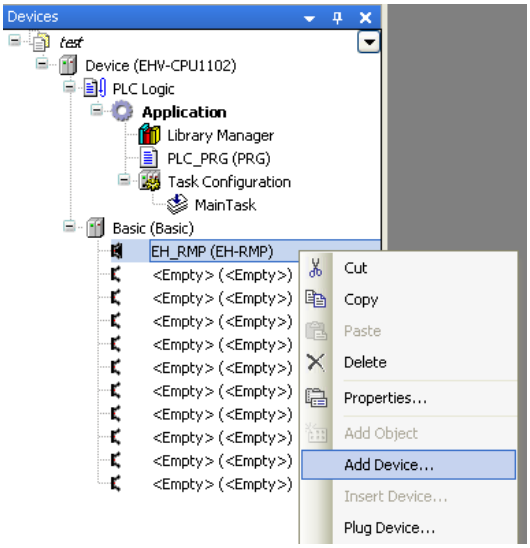


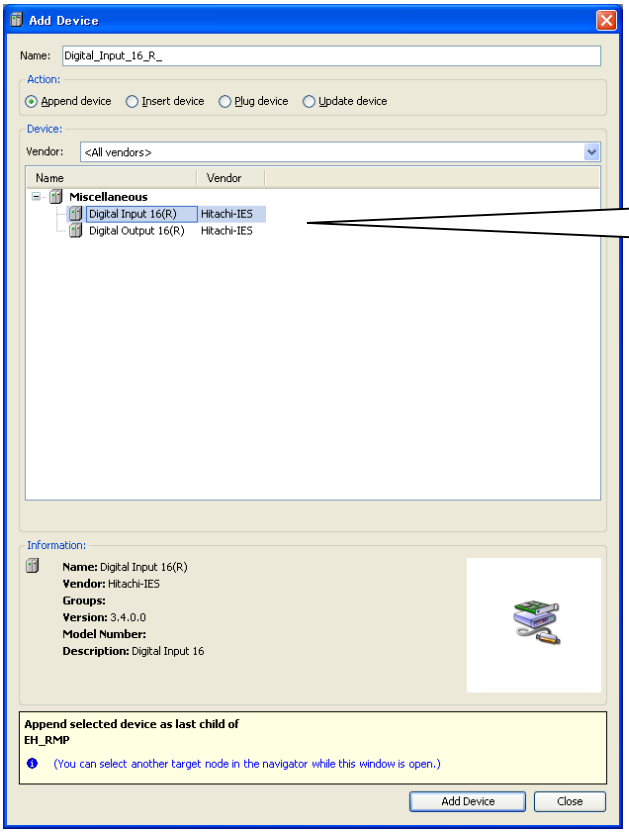
EHV-CPU1025 to CPU1102 allows to expand up to 5 expansion bases. The low end type “EHV-CPU1006” is not expandable.

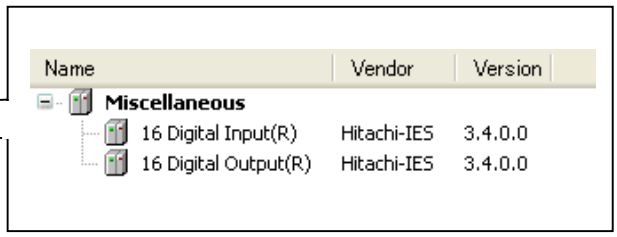


3.3.4 EH-RMP (Profibus) configuration

Separate configuration by Sycon is required for EH-RMP. In EHV-CoDeSys, total size of input and output must be configured by adding digital in/output 16 module. Choose “Add Device” on EH-RMP and choose digital input 16 or digital output 16 module according to actual total size of slave units.







Note

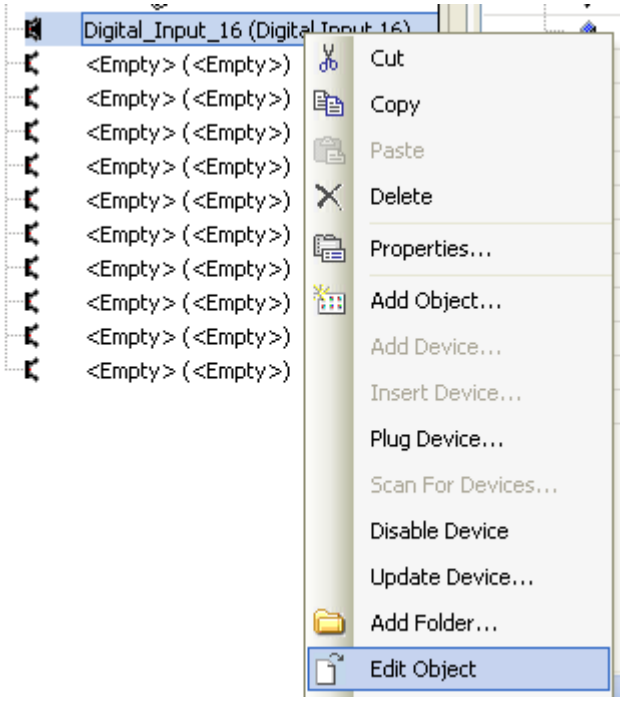
- Any types of slave units are available for EH-RMP, but only digital input 16 and digital output 16 module can be configured under EH-RMP in EHV-CoDeSys. Configure those modules according to total input and output size. For example, if the total input and output size of slave modules are 4 and 8 words, configure 4 times of Digital Input 16 (R) and 8 times of Digital Output 16 (R) under EH-RMP.
- Be sure to mount EH-RMP on slot 0 to 7 of basic base although it can be configured on slot 8 to A also in EHV-CoDeSys.

3.3.5 I/O address

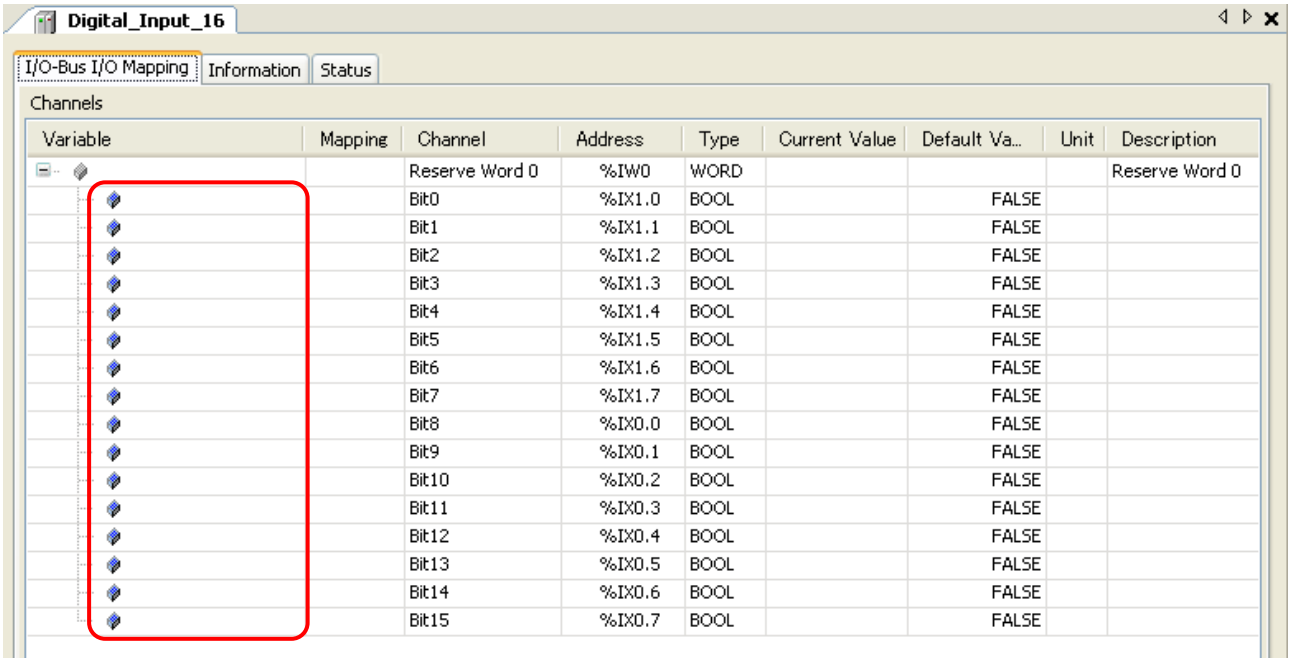
I/O addresses and variable names can be linked in two different ways: Global variable or Local variable as below.

[Global variable]

Double click on plugged I/O module or right click and choose “Edit Object”.

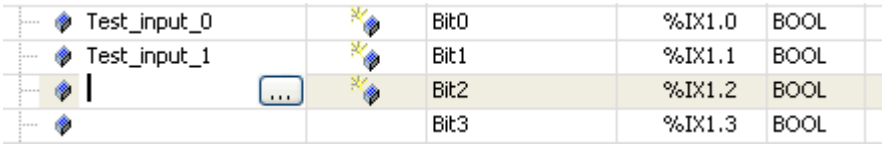


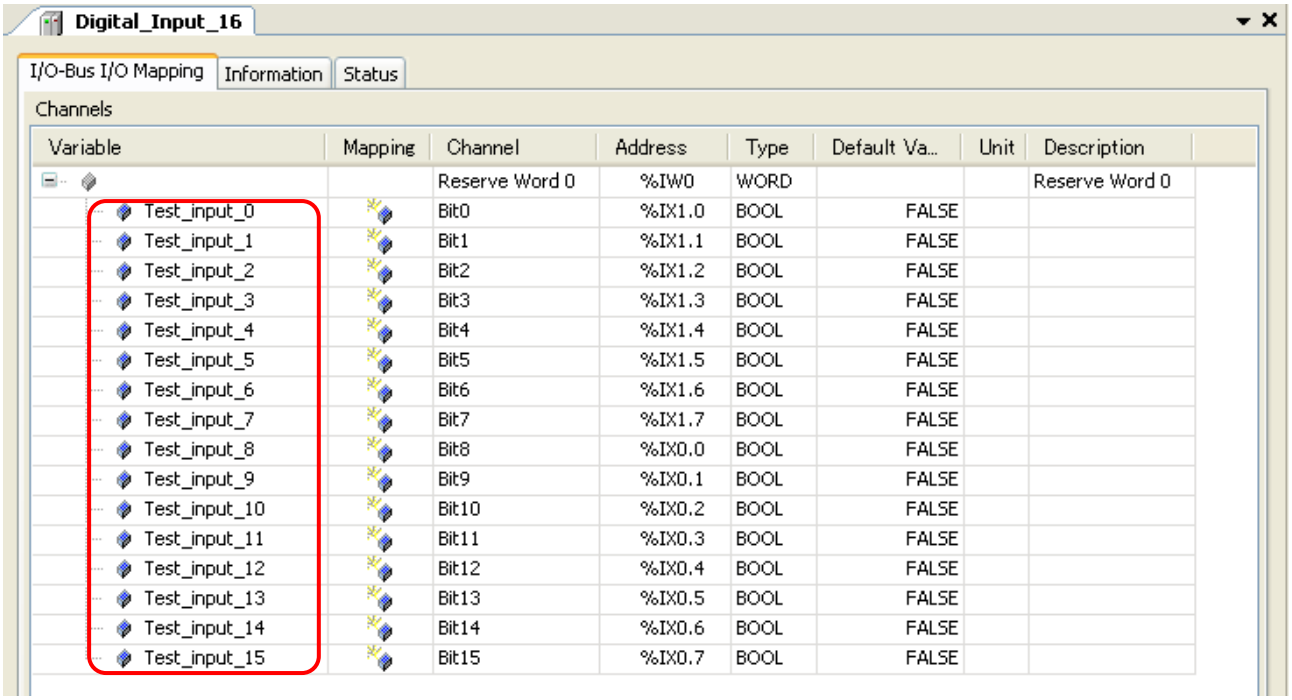
I/O-Bus Mapping window appears as below. Due to Motorola type byte order of SH-2 processor, IEC address of 16-bit data starts from 1.0 and ends to 0.7 as follows. Since the bit number shown at “Channel” corresponds to actual signal number, put variable names according to the bit number.



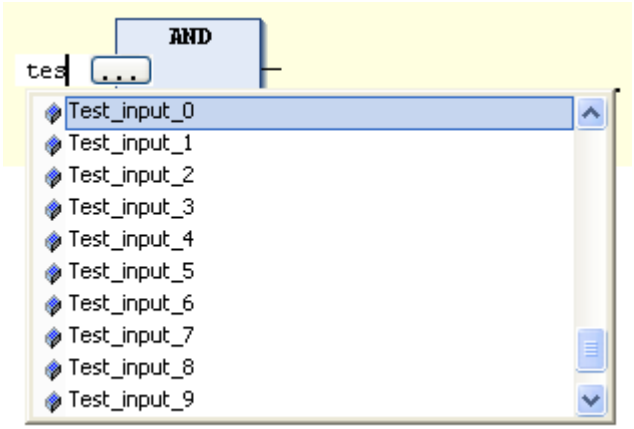
Variable	Mapping	Channel	Address	Type	Current Value	Default Va...	Unit	Description
		Reserve Word 0	%IW0	WORD				Reserve Word 0
		Bit0	%IX1.0	BOOL		FALSE		
		Bit1	%IX1.1	BOOL		FALSE		
		Bit2	%IX1.2	BOOL		FALSE		
		Bit3	%IX1.3	BOOL		FALSE		
		Bit4	%IX1.4	BOOL		FALSE		
		Bit5	%IX1.5	BOOL		FALSE		
		Bit6	%IX1.6	BOOL		FALSE		
		Bit7	%IX1.7	BOOL		FALSE		
		Bit8	%IX0.0	BOOL		FALSE		
		Bit9	%IX0.1	BOOL		FALSE		
		Bit10	%IX0.2	BOOL		FALSE		
		Bit11	%IX0.3	BOOL		FALSE		
		Bit12	%IX0.4	BOOL		FALSE		
		Bit13	%IX0.5	BOOL		FALSE		
		Bit14	%IX0.6	BOOL		FALSE		
		Bit15	%IX0.7	BOOL		FALSE		

Input any variable names in the field “Variable” according to your system.

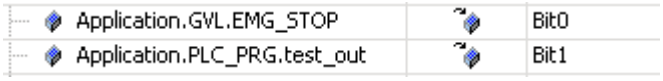




After defining variable names, they will be automatically listed up when it is used in all POU with assist of auto-complete.



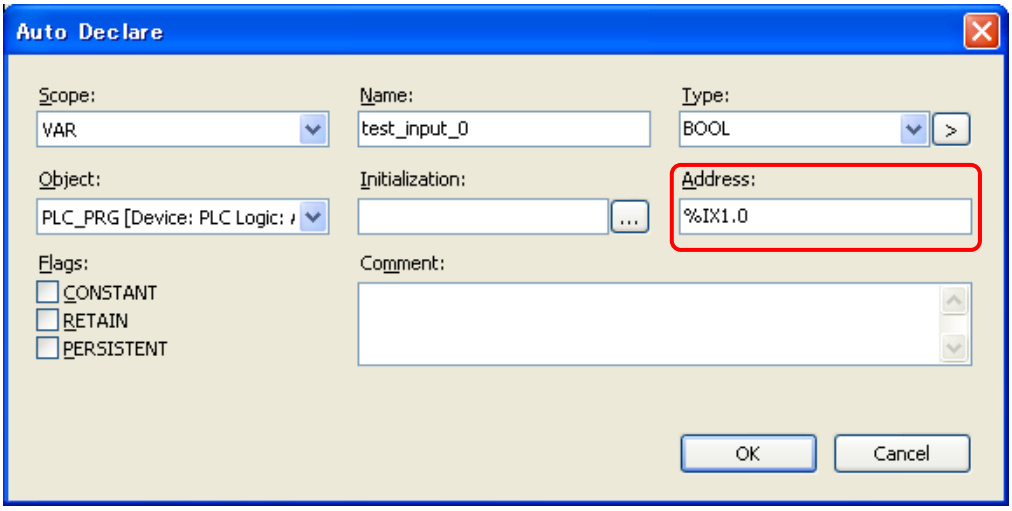
If a variable is already used (declared) in POU or global variable list, it can be taken by clicking ... icon in I/O mapping window. (... icon appears by clicking empty field.)



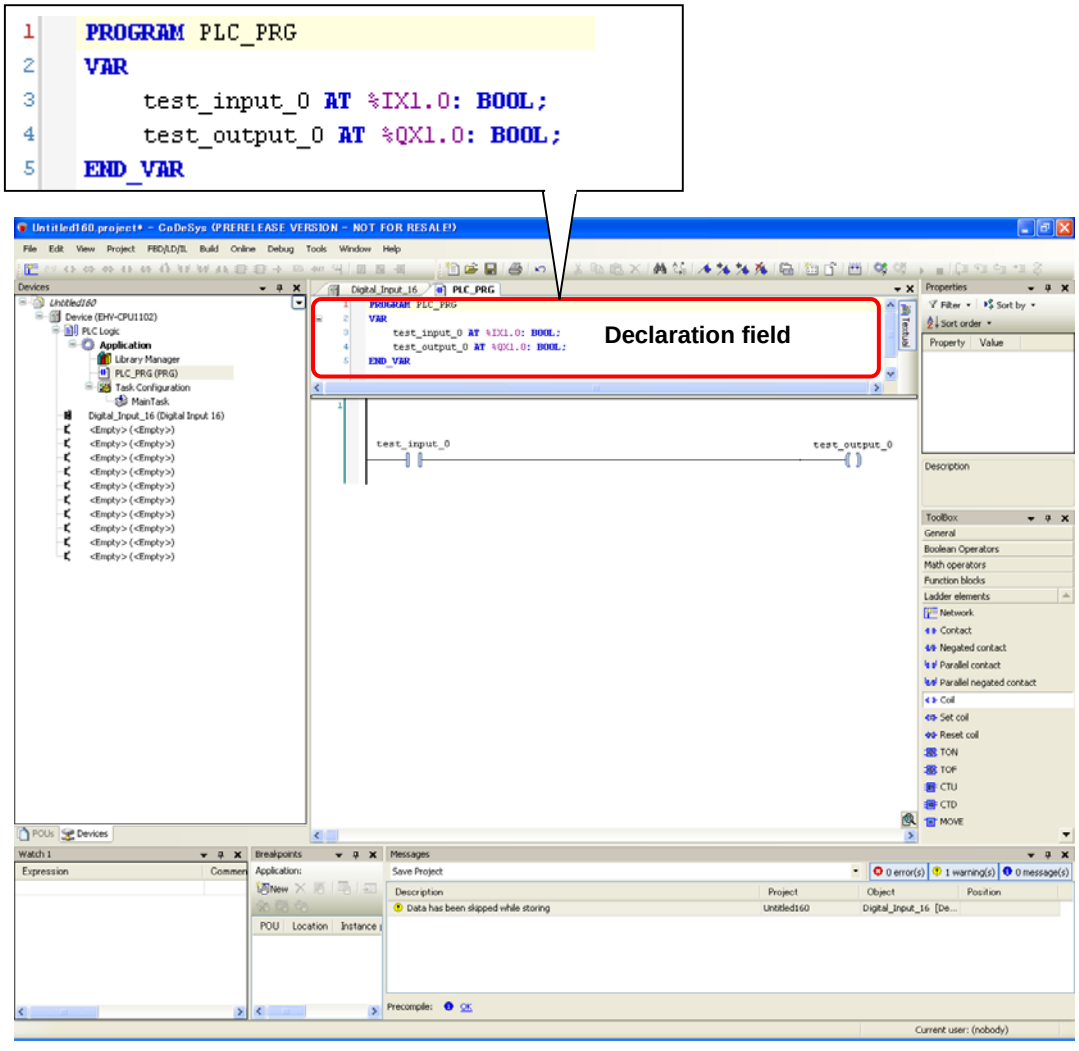
[Local variable]

Local variables are defined in each POU and valid only in the POU.

If new variable name is used in the first time, Auto Declare window will appear as below. In this window, there is the input field “Address”. Enter I/O address in this field according to data types. If it is remained as blank, the variable will be mapped in memory area.



After clicking [OK] button, declared information is added automatically as below.



I/O address example of 64 points output module

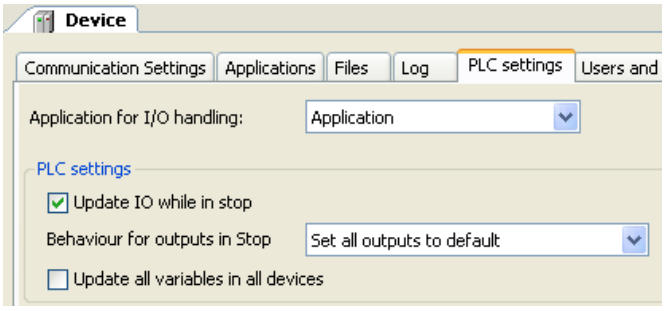
Bit number	BOOL	BYTE	WORD	DWORD	LWORD	
Bit 0	%QX7.0	%QB7	%QW3	%QD1	%QL0	LSB
Bit 1	%QX7.1					
Bit 2	%QX7.2					
Bit 3	%QX7.3					
Bit 4	%QX7.4					
Bit 5	%QX7.5					
Bit 6	%QX7.6					
Bit 7	%QX7.7					
Bit 8	%QX6.0	%QB6				
Bit 9	%QX6.1					
Bit 10	%QX6.2					
Bit 11	%QX6.3					
Bit 12	%QX6.4					
Bit 13	%QX6.5					
Bit 14	%QX6.6					
Bit 15	%QX6.7					
Bit 16	%QX5.0	%QB5	%QW2			
Bit 17	%QX5.1					
Bit 18	%QX5.2					
Bit 19	%QX5.3					
Bit 20	%QX5.4					
Bit 21	%QX5.5					
Bit 22	%QX5.6					
Bit 23	%QX5.7					
Bit 24	%QX4.0	%QB4				
Bit 25	%QX4.1					
Bit 26	%QX4.2					
Bit 27	%QX4.3					
Bit 28	%QX4.4					
Bit 29	%QX4.5					
Bit 30	%QX4.6					
Bit 31	%QX4.7					
Bit 32	%QX3.0	%QB3	%QW1	%QD0		
⎮	⎮					
Bit 39	%QX3.7					
Bit 40	%QX2.0	%QB2				
⎮	⎮					
Bit 47	%QX2.7					
Bit 48	%QX1.0	%QB1	%QW0			
⎮	⎮					
Bit 55	%QX1.7					
Bit 56	%QX0.0	%QB0				
⎮	⎮					MSB
Bit 63	%QX0.7					

Following 5 different programs in ST are the same meaning.

```
%QX7.0:=1;
%QB7  :=1;
%QW3  :=1;
%QD1  :=1;
%QL0  :=1;
```

3.4 I/O-update

Input data is read at the beginning of a task and output data is written at the end of a task. I/O-update settings are configured in “PLC settings” in Device tab. Be noted that only used I/Os in program are updated.



Update IO while in stop

If this option is activated (default), the values of the input and output channels get also updated when the PLC is stopped.

Behaviour for outputs in Stop

Keep current values: The current values will not be modified. If “Update IO while is stop” is deactivated, output data is not updated at CPU stopping.

Set all outputs to default: The default values resulting from the mapping will be assigned. If this setting is used, “Reset all outputs in STOP” of [Device]-[Configurtion] parameter must be set as “No”, otherwise default value of TRUE is not valid. Refer to the next page for further information.

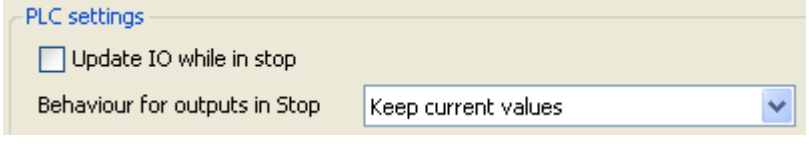
Execute program: You might determine the outputs behaviour by a program available within the project. Enter the name of this program here and it will be executed when the PLC gets stopped. Via button [...] the input Assistant can be used for this purpose.

Update all variables in all devices

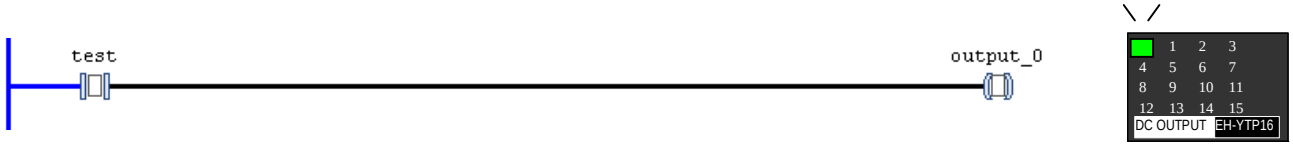
If this option is activated, then for all devices of the current PLC configuration all I/O variables will get updated in each cycle of the bus cycle task. This corresponds to option “Always update variables”, which can be set separately for each device in the "I/O Mapping" dialog.

Note

If PLC settings are configured as follows (“Update IO while in stop” disabled and “Keep current values” in “Behaviour for outputs in Stop”) and Reset warm or Reset cold is operated, the last status of output remains although monitored output status is reset.



Actual output remains after Reset warm/cold



This is expected behaviour however, if this mismatching is to be avoided, change the setting of either “Update IO while in stop” or “Behaviour for outputs in Stop”.

Reset all outputs in STOP

This setting is in [Device]-[Configuration]. If “Reset all outputs in STOP” is “Yes” (default), all the PLC outputs including counter outputs and pulse train output of positioning module are reset because it is reset by a certain hardware signal running on the back plane bus. This means that default value configured in I/O mapping table is ignored. If default values need to be set, set “Reset all outputs in STOP” as “No.” In this case, you must aware following limitation.

Note

If “Reset all outputs in STOP” is “No”, PLC outputs without IEC address, such as counter outputs or pulse train outputs, are NOT reset when CPU stops. We recommend you to set “Yes” when using counter or positioning modules.

Parameter	Type	Value	Default Value
IP Address	STRING	'192.168.0.1'	'192.168.0.1'
Subnet Mask	STRING	'255.255.255.0'	'255.255.255.0'
Default Gateway	STRING	'0.0.0.0'	'0.0.0.0'
Ethernet port Link speed / Duplex mode	Enumeration of BYTE	10Mbps/Half Duplex	10Mbps/Half Duplex
Change IP information	Enumeration of BYTE	No	No
Serial port mode	Enumeration of BYTE	Gateway	Gateway
Serial port type	Enumeration of BYTE	RS-232C	RS-232C
Serial port term. resistor (RS-422/485)	Enumeration of BYTE	No	No
Reset all outputs in STOP	Enumeration of BYTE	Yes	Yes
Stop switch definition	Enumeration of BYTE	Reset warm	Reset warm

Note

If “Reset all outputs in STOP” is “Yes” (default), default values as “TRUE” in each I/O mapping table are ignored.

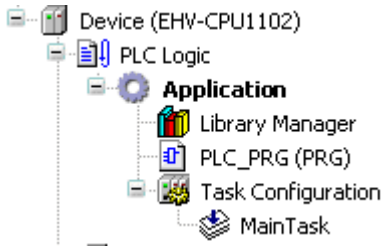
16 Digital Output I/O Mapping | Information | Status

Channels

Variable	Mapping	Channel	Address	Type	Default Value	Unit
			%QW0	WORD		
		Bit0	%QX1.0	BOOL	FALSE	
		Bit1	%QX1.1	BOOL	FALSE	
		Bit2	%QX1.2	BOOL	FALSE	
		Bit3	%QX1.3	BOOL	FALSE	
		Bit4	%QX1.4	BOOL	FALSE	
		Bit5	%QX1.5	BOOL	FALSE	
		Bit6	%QX1.6	BOOL	FALSE	
		Bit7	%QX1.7	BOOL	FALSE	
		Bit8	%QX0.0	BOOL	FALSE	
		Bit9	%QX0.1	BOOL	FALSE	
		Bit10	%QX0.2	BOOL	FALSE	
		Bit11	%QX0.3	BOOL	FALSE	
		Bit12	%QX0.4	BOOL	FALSE	
		Bit13	%QX0.5	BOOL	FALSE	
		Bit14	%QX0.6	BOOL	FALSE	
		Bit15	%QX0.7	BOOL	FALSE	

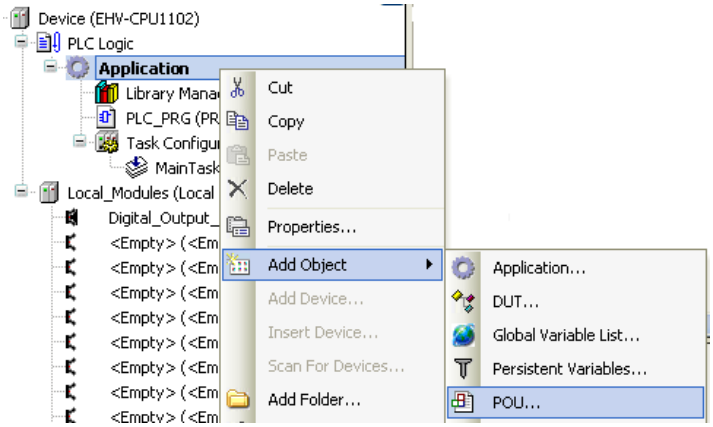
3.5 POU and task

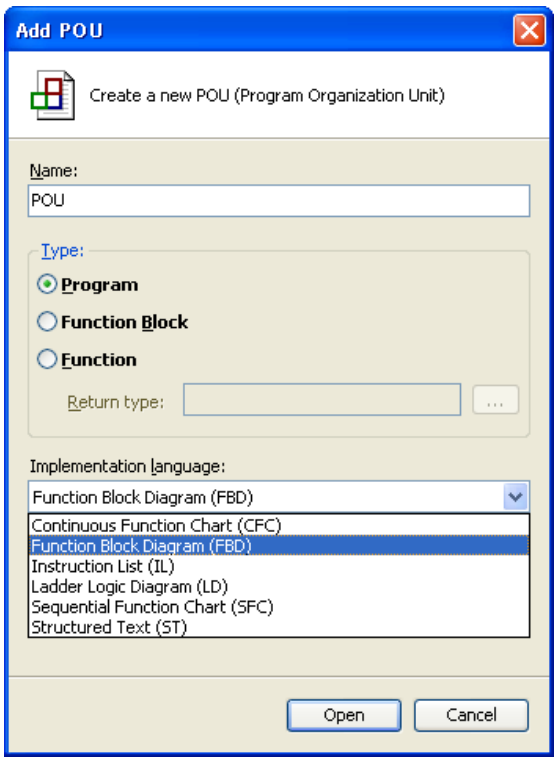
One application has at least one POU and one task as shown below.



POU

POU stands for Program Organization Unit. This can be assumed as a paper to create your program. Only one programming language can be used in one POU. If you need another language, add POU by right click on "Application" and choose "Add object"-"POU" and choose language.

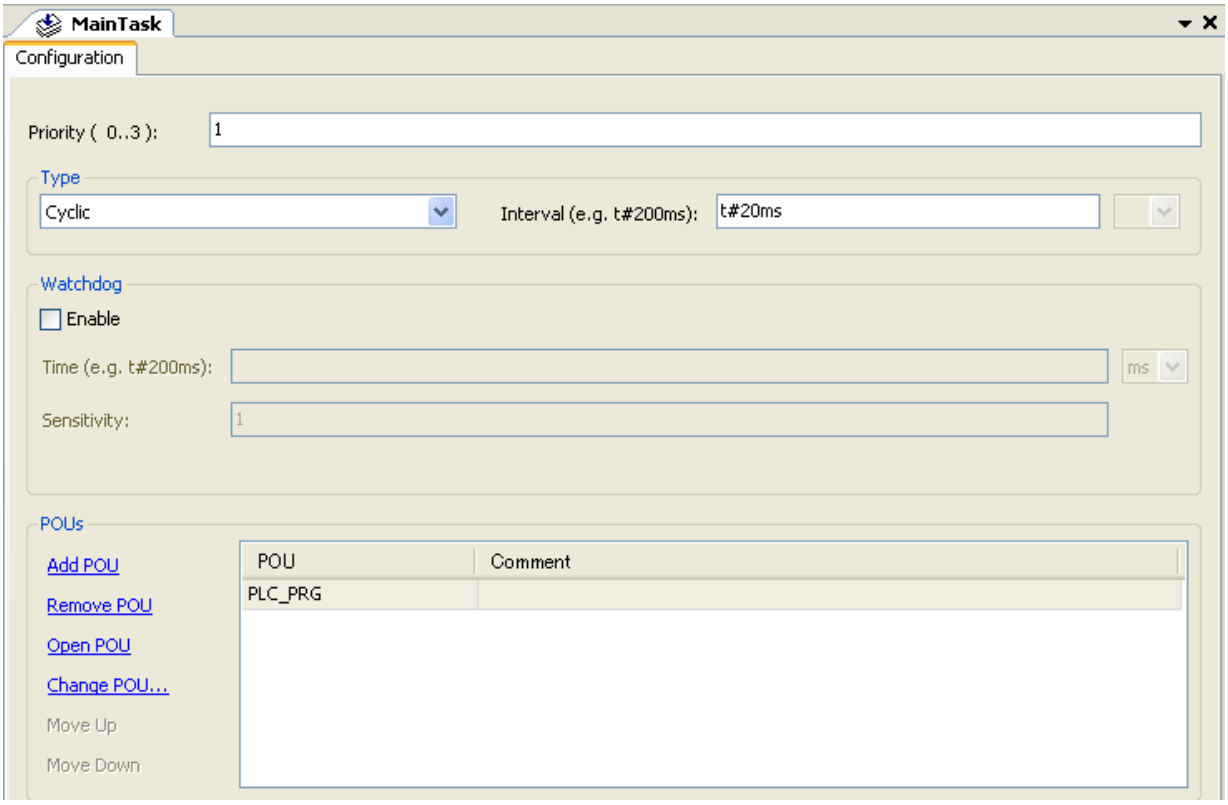




Task

POU does not have information how to execute POU. This information is handled by task.

Put priority, choose type of task and add or remove POU accordingly.



Priority (0-3)

0 is the highest priority, 3 is the lowest.

Cyclic task

The task will be processed cyclic according to the time definition given in the field “Interval”.

Event task

The task will be started as soon as the variable defined in the field gets a rising edge.

External task

The task will be started as soon as the system event occurs. The CPU supports two tasks as below.

ApplicationStart: This task is executed at once just after CPU starting.

ApplicationStop: This task is executed at once just after CPU stopping.

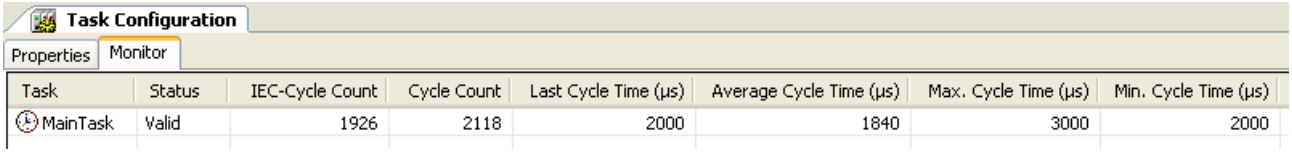
Freewheeling task

The task will be processed as soon as the program is started and at the end of one run will automatically restarted in a continuous loop. There is no cycle time defined. Be noted that the priority of this task is the lowest and 100ms of sleeping time is added at the end of each cycle for other tasks to be executed properly.

Watchdog

When it is enabled, watchdog function is activated. If program execution time exceeds watchdog time, CPU stops program execution with exception status.

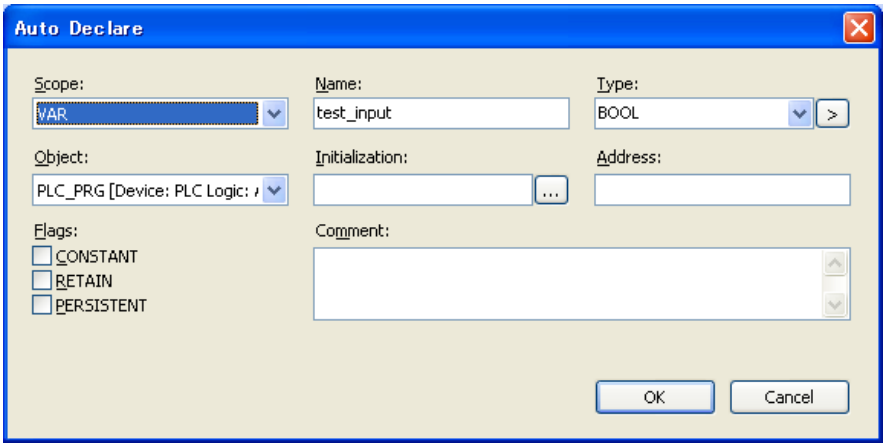
Actual cycle time of each task is monitored in Task configuration as below.



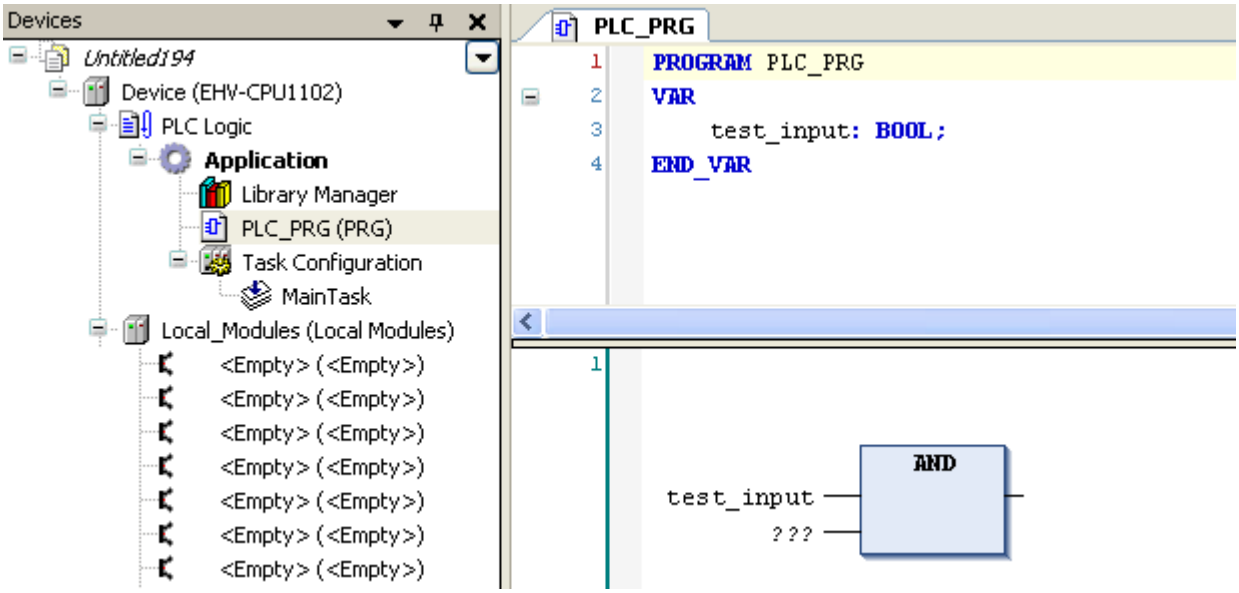
3.6 Local and global variables

[Local variable]

If new variable name is used in POU, Auto Declare window appears as below. If the field “Address” is remained as empty, this variable will be assigned in a certain memory area of CPU.



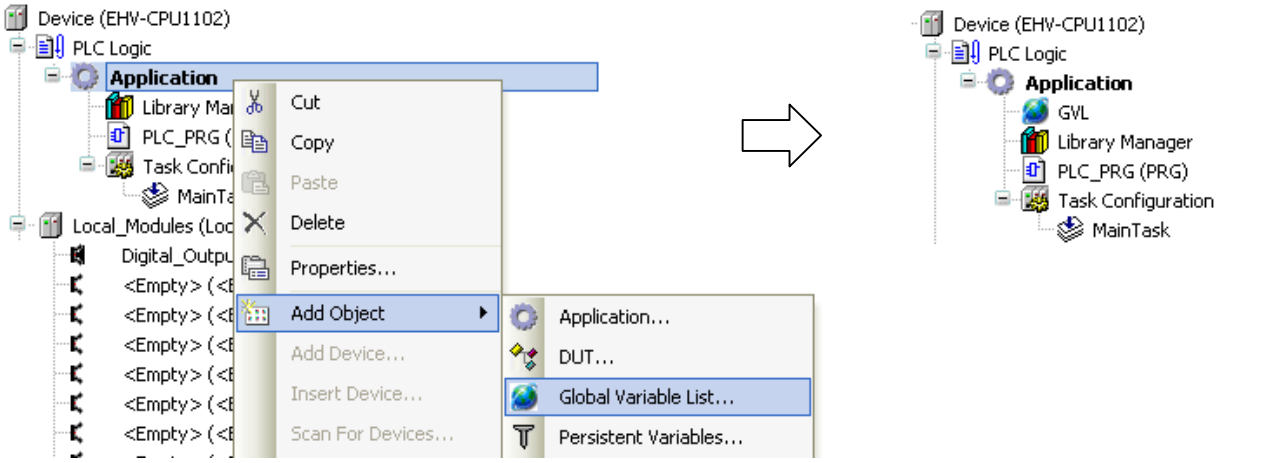
Click [OK] button, this variable is registered in declaration part of POU as below.



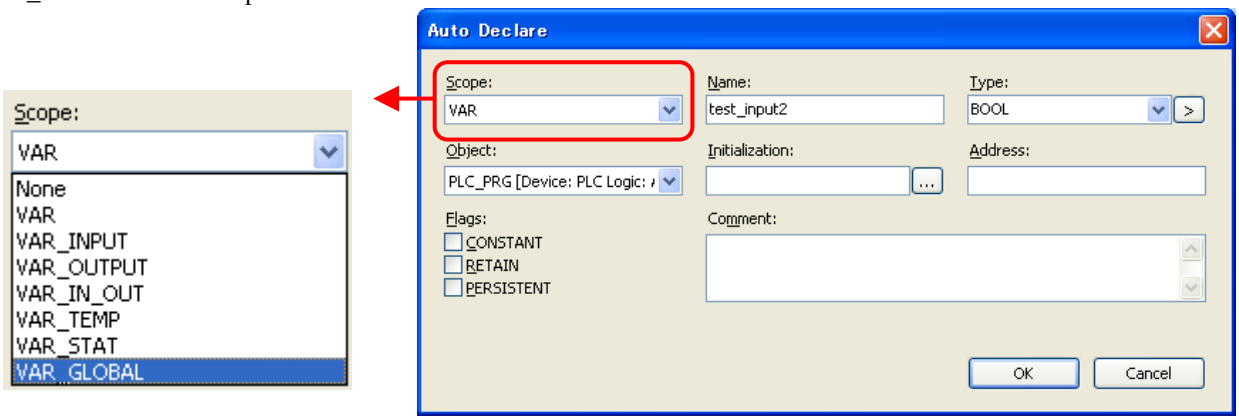
This variable is valid only in the POU. Even if same variable name is used in another POU, Auto Declare window will appear and it will be assigned in another memory location and handled as different variable.

[Global variable]

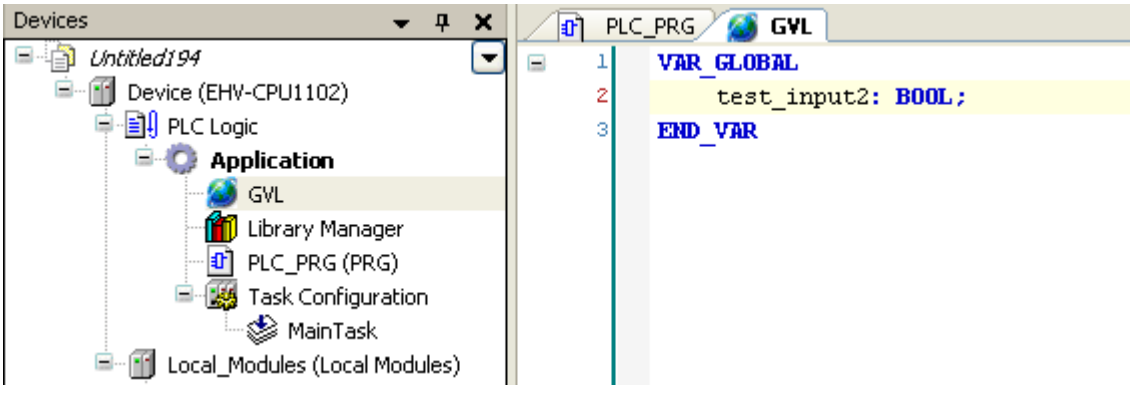
If variables need to be commonly used in all POUs, “Global Variable List” must be created by right click on Application as below.



If new variable name is used in POU, Auto Declare window appears as shown in local variables. Choose “VAR_GLOBAL” at “Scope” as below.



New variable name “test_input2” is registered in GVL as below instead of POU.



3.7 Communication settings

EHV+ series CPUs have 3 types of communication ports as below.

Ethernet port

Default value

IP address: 192.168.0.1

Subnet mask: 255.255.255.0

Function

- Gateway (communication with EHV-CoDeSys) (default port number: 1740)
- Modbus-TCP client/server
- Global network variables

Configuration

Ethernet port parameters are configured in “Device” window. To change IP address, choose “Yes” at “Change IP information” besides IP address settings. New IP address will be updated when downloading in the next time.

USB port

USB port has only gateway function (communication with EHV-CoDeSys). No configuration is necessary.

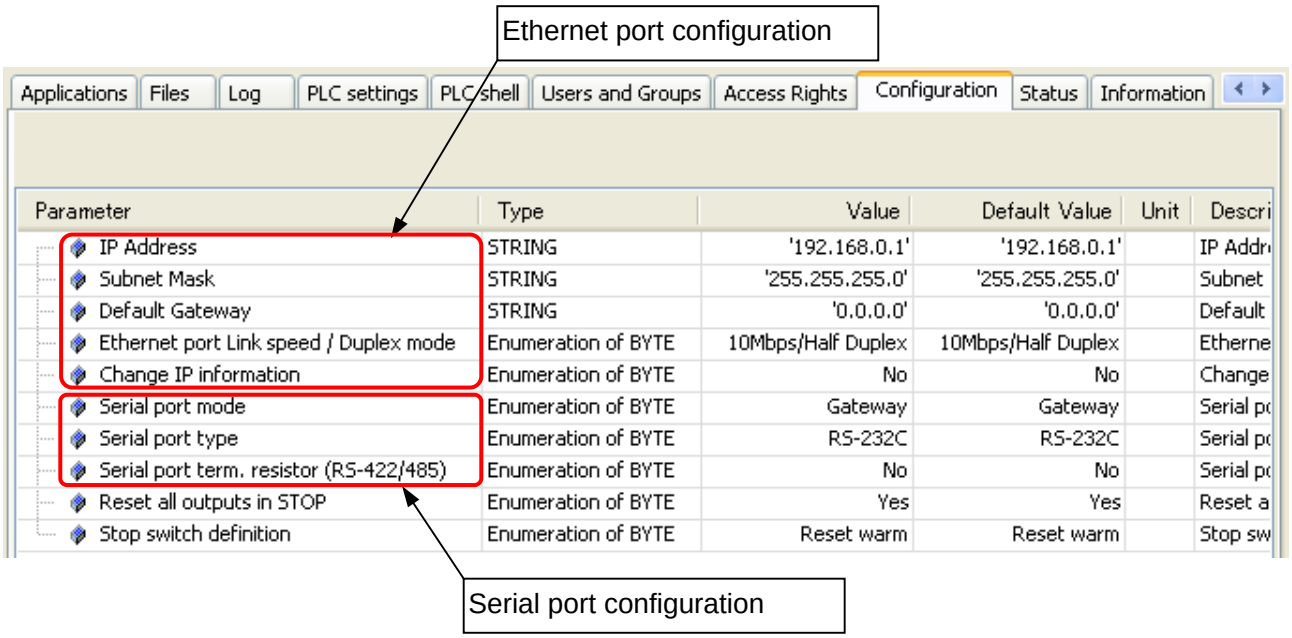
Serial port

Function

- Gateway (communication with EHV-CoDeSys).
- IEC programming (Modbus-RTU master or general purpose communication controlled by user program)

Configuration

Serial port parameters are configured in “Device” window. If the serial port is used for IEC programming (Modbus-RTU or general purpose communication), choose “IEC Programming” at “Serial port mode”.

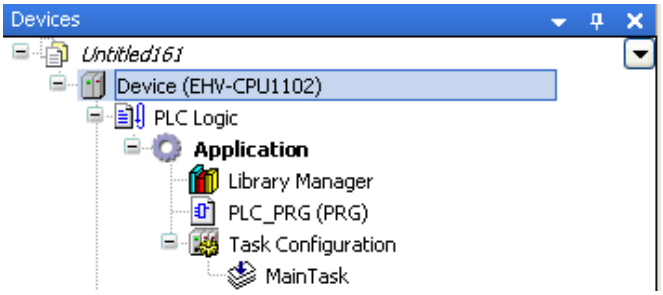


Note

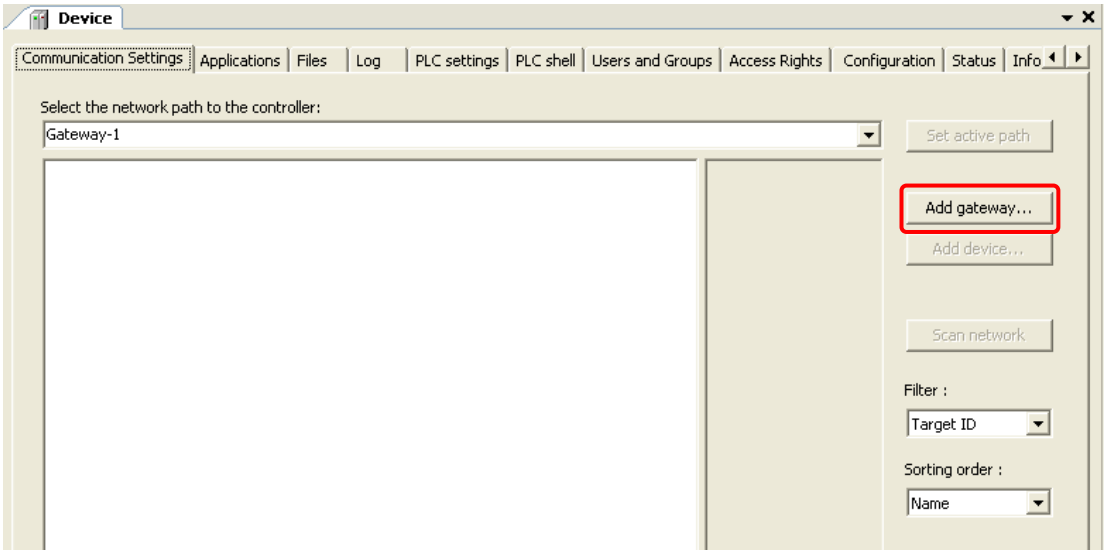
The parameter “Ethernet port Link speed / Duplex mode” requires power cycling to update parameter data.
All the other parameters are updated when program is downloaded.

How to configure

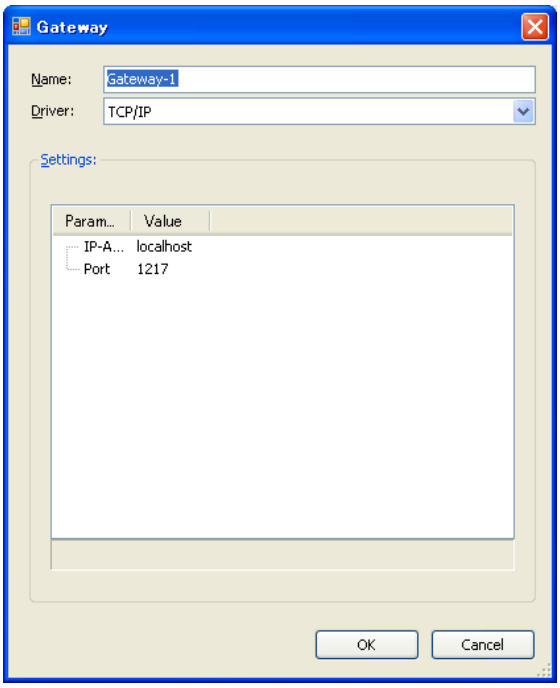
Double click on “Device (EHV-CPUxxxx)” or right click and choose “Edit Object”.



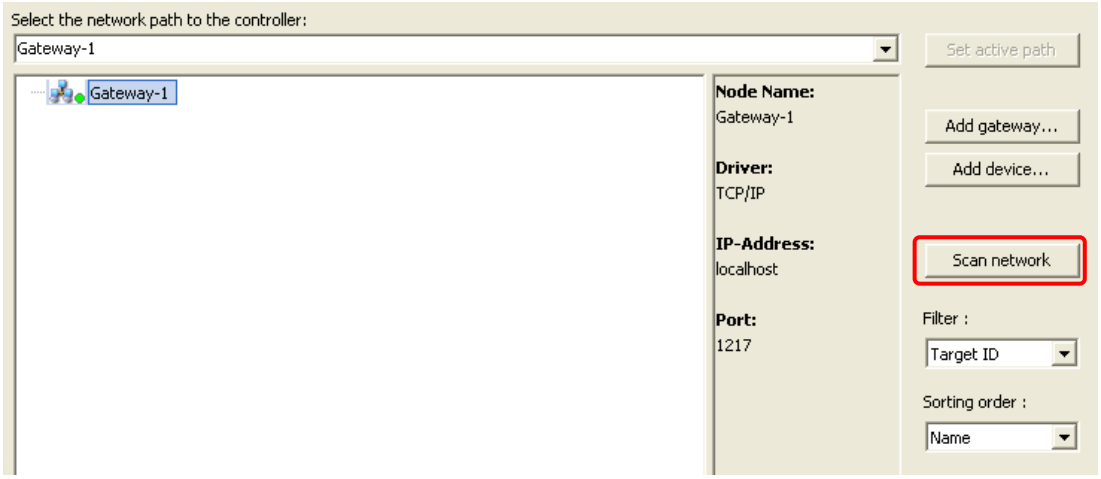
“Device” window will appear as below. Choose “Communication Settings” tab and click “Add gateway”.



“Gateway” window will appear. Click “OK”. Sine the communication type between EHV-CoDeSys and gateway (in PC) is TCP/IP, displayed driver name is “TCP/IP” regardless of CPU’s communication types.



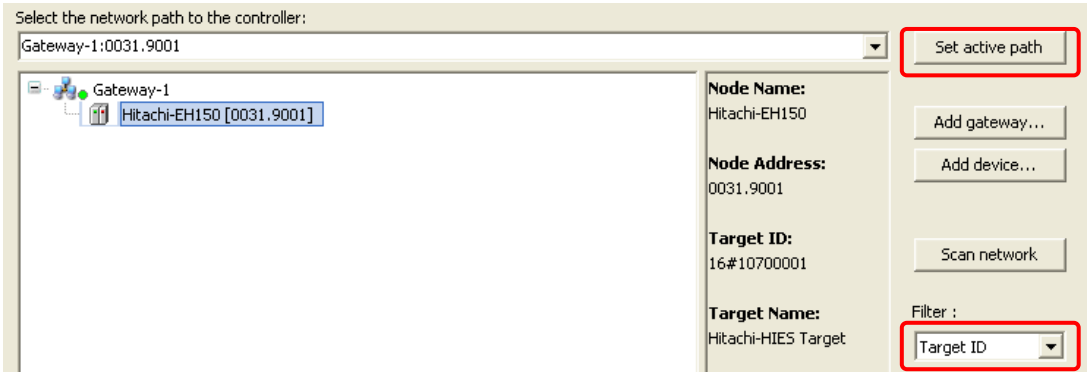
The gateway is displayed as below. Click “Scan network” to search available device in the network.



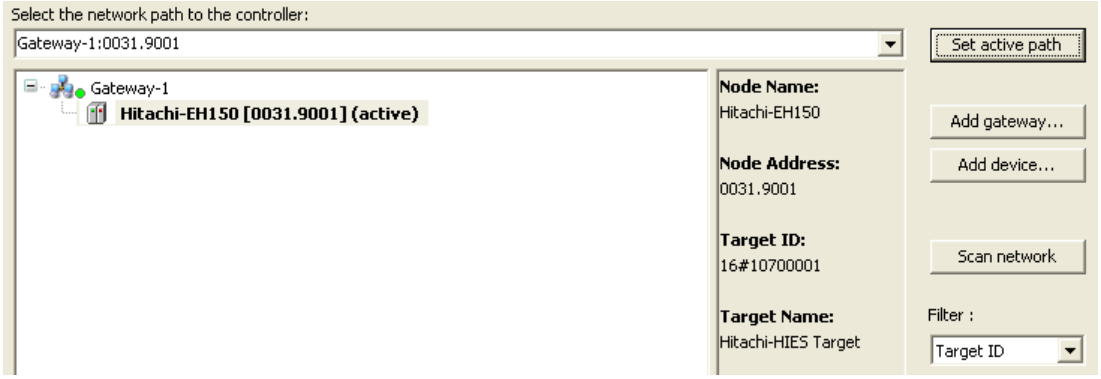
If CPU is found, it is displayed as below. Click “Set active path” to choose as the target device.

Note

Even if all Ethernet cable, USB cable and serial cable are connected, only the first detected device is shown.
If the filter is changed from “Target ID” to “None”, all types of devices in the network are found.



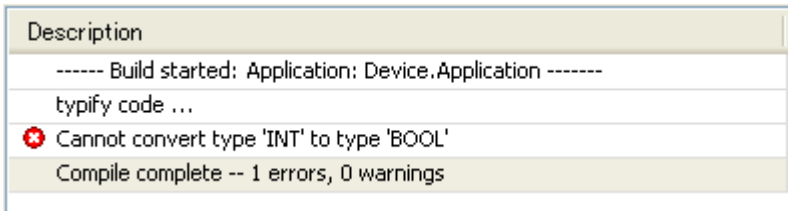
Target CPU is activated. Communication settings are completed.



3.8 Login

Login

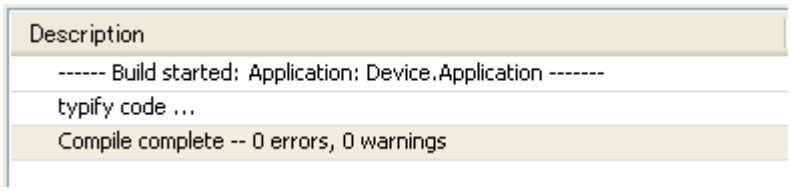
After programming, click  or choose [Build] in Build menu. If compiling fails, error information is shown at "Description" field as follows. Double click the message to jump to the part to be corrected.



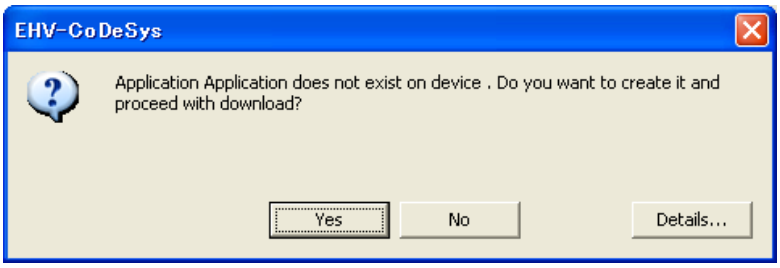
Note

If unknown message appears, it is recommended to [Clean all] in Build menu. All compile information is deleted by this operation.

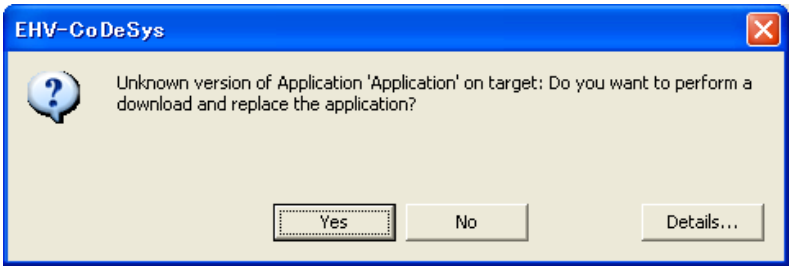
When all errors are removed as below, click  or choose [Login] in Online menu to download the program to CPU.



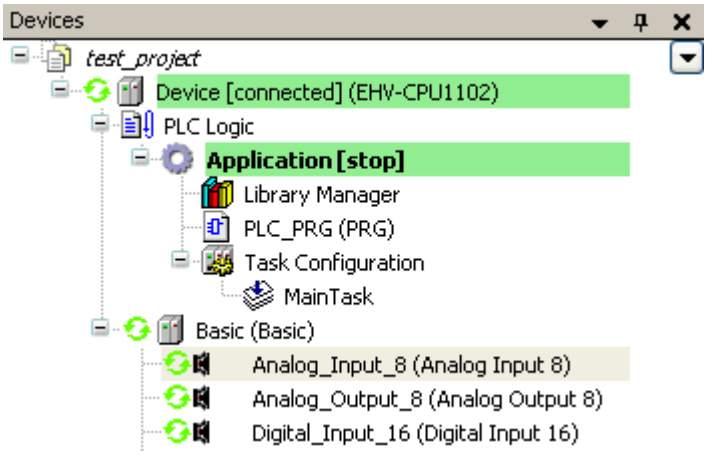
If no application is in the CPU, this message appears. Click [Yes] to download.



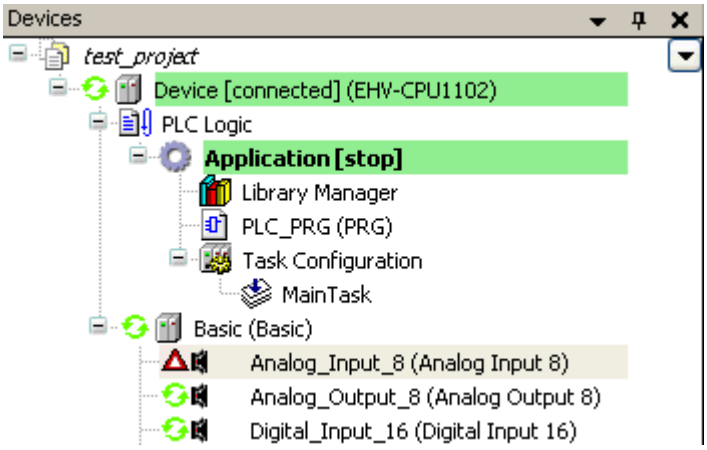
If unknown version of application is in the CPU, this message appears. Click [Yes] to download.



When logging in successfully, green circle icon is displayed at [Device]. If mounted I/O modules are matched with configured ones, green icon is displayed at each I/O module also.



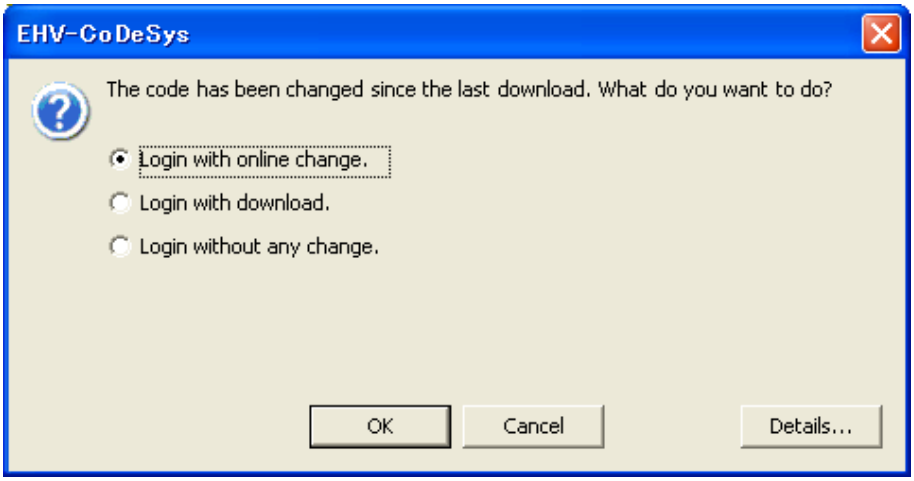
If any mounted I/O module is mismatched, red triangle icon is displayed at mismatched module as below.



Online change

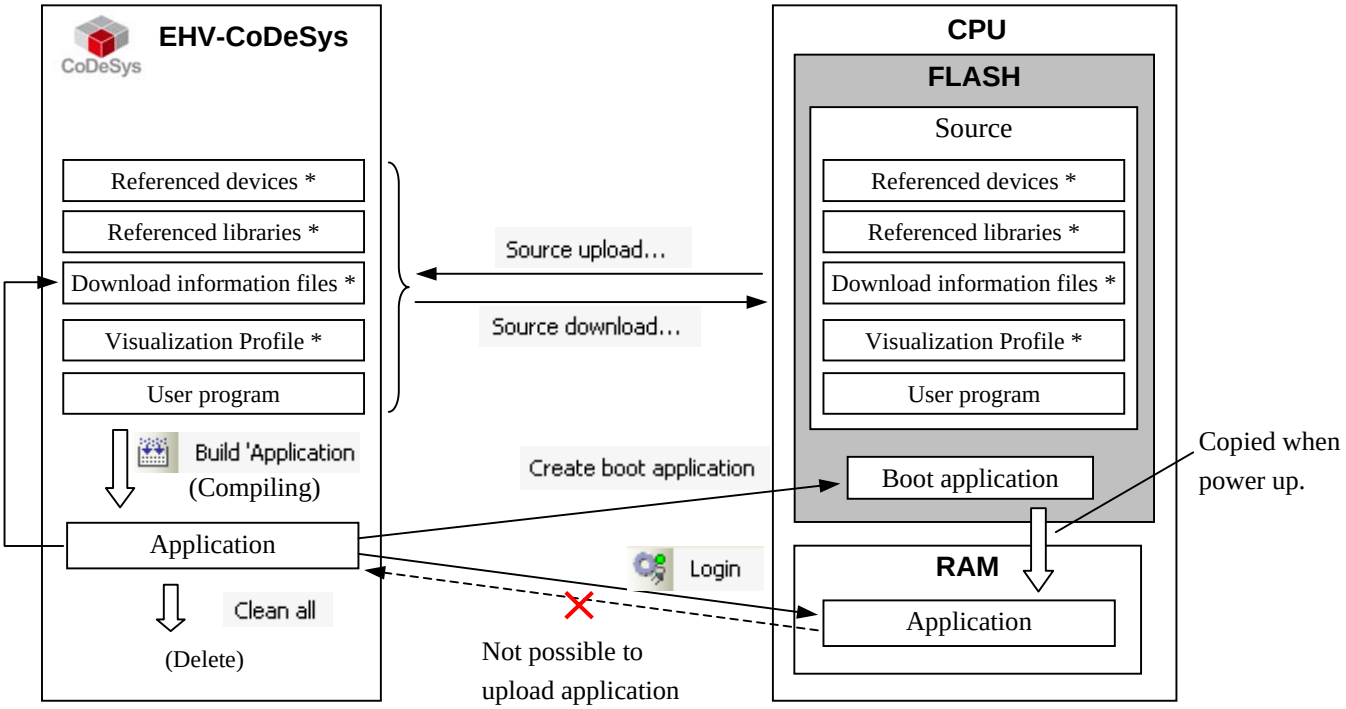
To change your program in running CPU (online change), you have to logout at first. After program changing, choose [Login] again. You will have 3 options as below.

Login with online change:	Only incremental program is downloaded without CPU stop.
Login with download:	Whole the program is downloaded. CPU is forced to stop.
Login without any change:	New program is not downloaded.



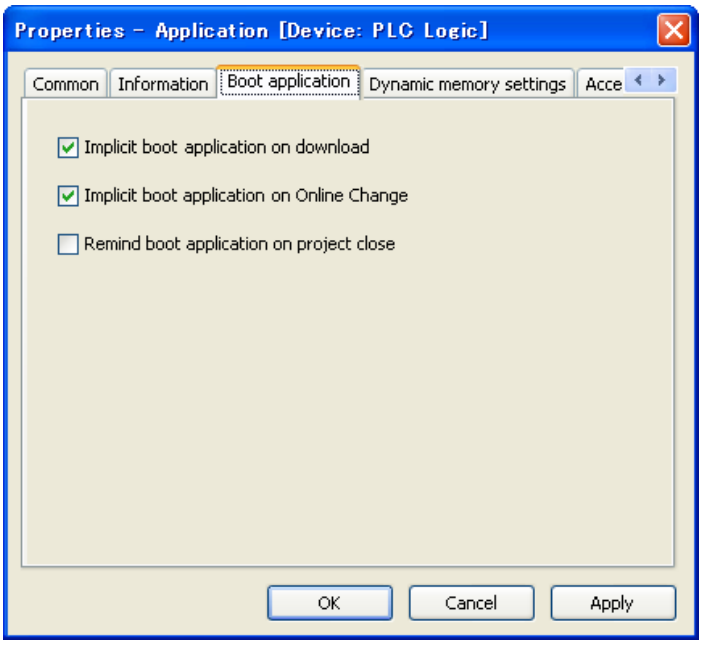
3.9 Boot application

The basic overview of downloading is shown as below picture. Be noted that an application (compiled user program) is downloaded to volatile RAM memory of the CPU, which means the application is lost when power is removed. If your application needs to be saved in non-volatile FLASH memory, choose [Create boot application] in Online menu while Login. When CPU is power up in the next time, the application is copied from FLASH to RAM and executed automatically if RUN/STOP switch is in RUN position.



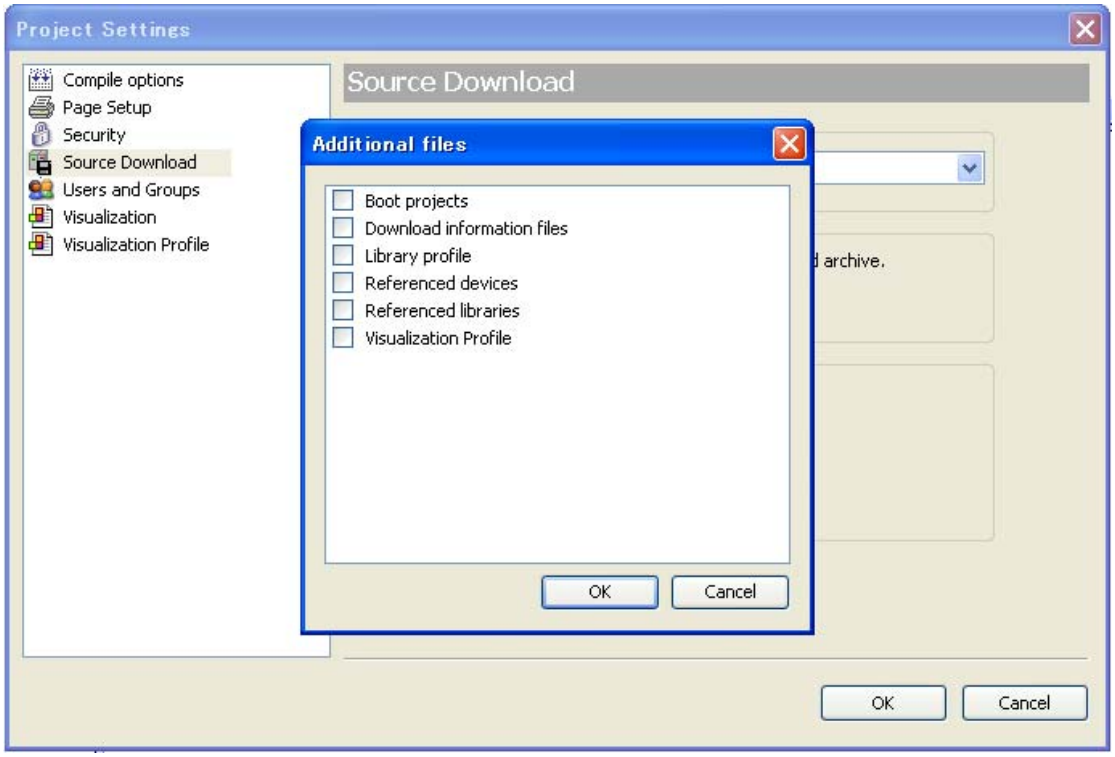
*: Optional

Timing to download boot application can be configured in [Properties] of [Application] (Right click on “Application” of the project tree). The default setting is shown below.



3.10 Source Download / Upload

Besides boot application, source file can be saved in the CPU module, which enables you to upload original program file from PLC even if you don't have it in your PC. Some extra files can be added to source file as below. Choose according to your necessity.



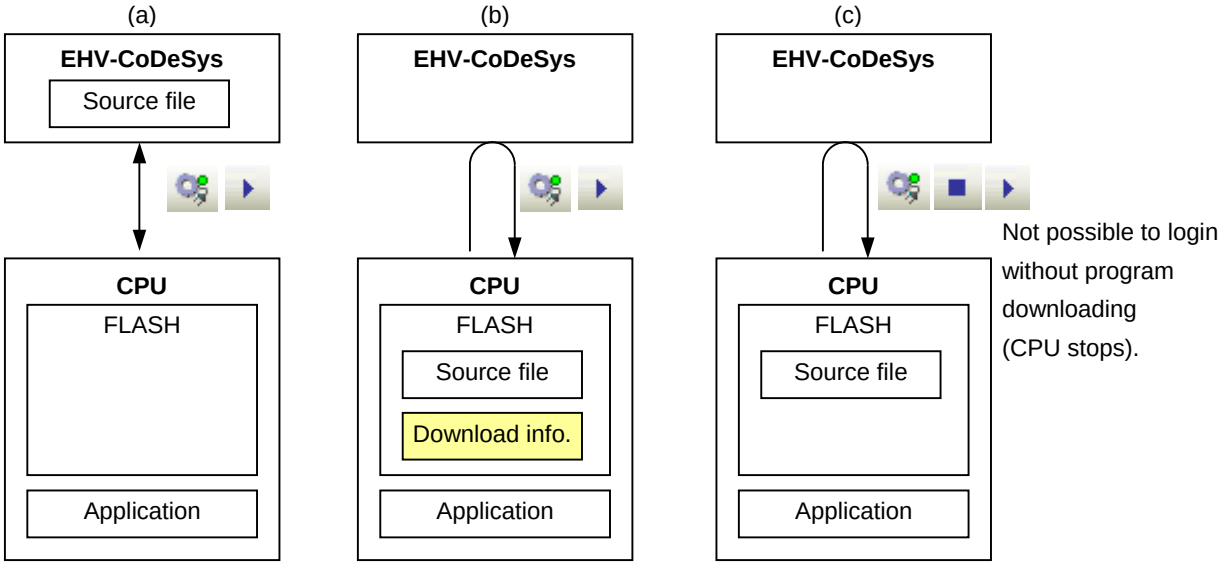
Download information files

"Download information files" in [additional files setting] is not necessary normally, but it is needed if you want to login without CPU stop from the PC which does not have original program file shown below as case (b) and (c).

(a) Online change from PC with source file to CPU without source file. ➔ Login

(b) Online change from PC without source file to CPU with source file and DL info. ➔ Source upload and Login

(c) Online change from PC without source file to CPU with source file. ➔ Source upload and Login, then program download is required because EHV-CoDeSys is not able to verify program identity. It is possible to login after downloading, but CPU must stop at that time.



3.11 Run / Stop / Reset

Run/Stop

CPU can be started with EHV-CoDeSys or Run/Stop switch on the CPU module, but remote controlling with EHV-CoDeSys is not allowed when the Run/stop switch is in Stop position as shown below.

Switch position / User operations	STOP	RUN
Stop with EHV-CoDeSys 	Stop (no effect)	Stop
Run with EHV-CoDeSys 	Stop (no effect)	Run
Reboot PLC (Cycle power)	Stop	Run *

* CPU starts running independent from the last status before power failure.

Reset

When CPU detects a serious error called “exception”, such as watchdog error, program execution stops. If EHV-CoDeSys is connected, “Exception” indication blinks until this status is cleared. This exception status is cleared only by “Reset” operation. EHV-CoDeSys has 3 different types of “Reset” operation: Reset warm, Reset cold and Reset origin. All of them can initialize exception status, but behaviours of CPU are different as shown below. Be noted that “Reset origin” initializes not only an exception but also your application and boot application in CPU module.

Operation	VAR	VAR RETAIN	VAR PERSISTENT	Application (in volatile memory)	Boot application (in non-volatile)
STOP	X	X	X	X	X
Reset warm	-	X	X	X	X
Reset cold	-	-	X	X	X
Reset origin	-	-	-	-	-
Download	-	-	X	(overwritten)	X
Online Change	X	X	X	(modified)	X
Reboot PLC	-	X	X	-	X

X = maintained, - = initialized

Stop switch definition

Definition of stop position of run/stop switch can be configured as “Stop” or “Reset warm” in CPU configuration. Default setting is “Reset warm” since it is almost same behaviour of original “Stop” for existing Hitachi PLC.

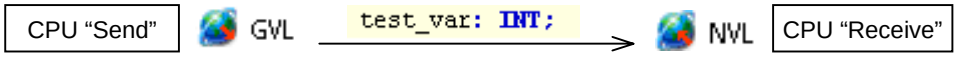
Parameter	Type	Value	Default Value
IP Address	STRING	'192.168.0.1'	'192.168.0.1'
Subnet Mask	STRING	'255.255.255.0'	'255.255.255.0'
Default Gateway	STRING	'0.0.0.0'	'0.0.0.0'
Ethernet port Link speed / Duplex mode	Enumeration of BYTE	10Mbps/Half Duplex	10Mbps/Half Duplex
Change IP information	Enumeration of BYTE	No	No
Serial port mode	Enumeration of BYTE	Gateway	Gateway
Serial port type	Enumeration of BYTE	RS-232C	RS-232C
Serial port term. resistor (RS-422/485)	Enumeration of BYTE	No	No
Reset all outputs in STOP	Enumeration of BYTE	Yes	Yes
Stop switch definition	Enumeration of BYTE	Reset warm	Reset warm

3.12 Global network variables

Any variables can be listed in global network variable list, which are sent to all other CPUs in the network with broadcast address of UDP/IP. Global net work variable function is available only in professional setting. Refer to 3.2 Start up how to change the environment setting.

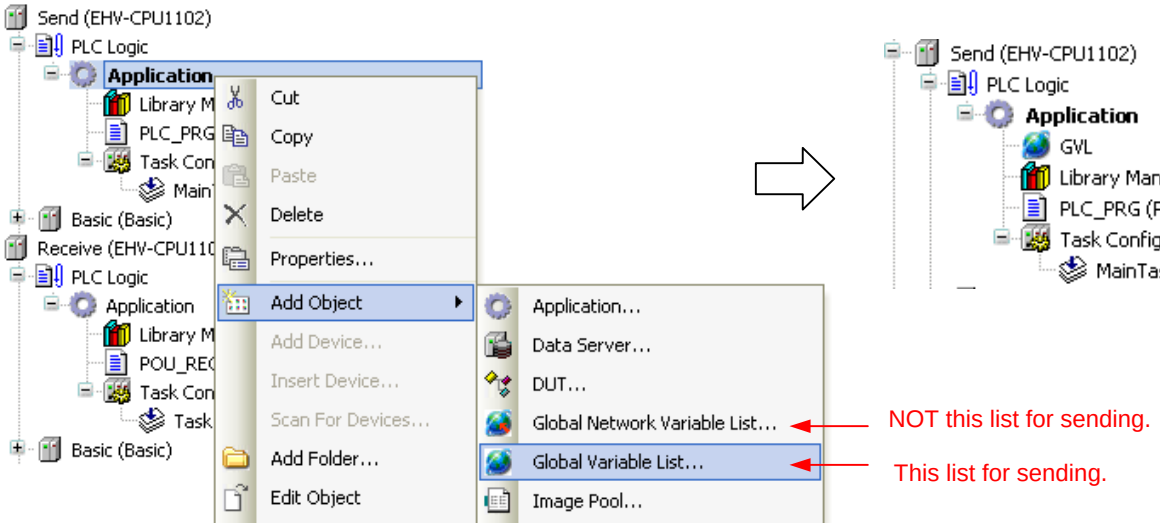
How to configure?

Procedure of configuration is shown below with a simple project: one CPU to send and the other CPU to receive.
Right click on the project and choose “Add Device” to add the 2nd CPU.

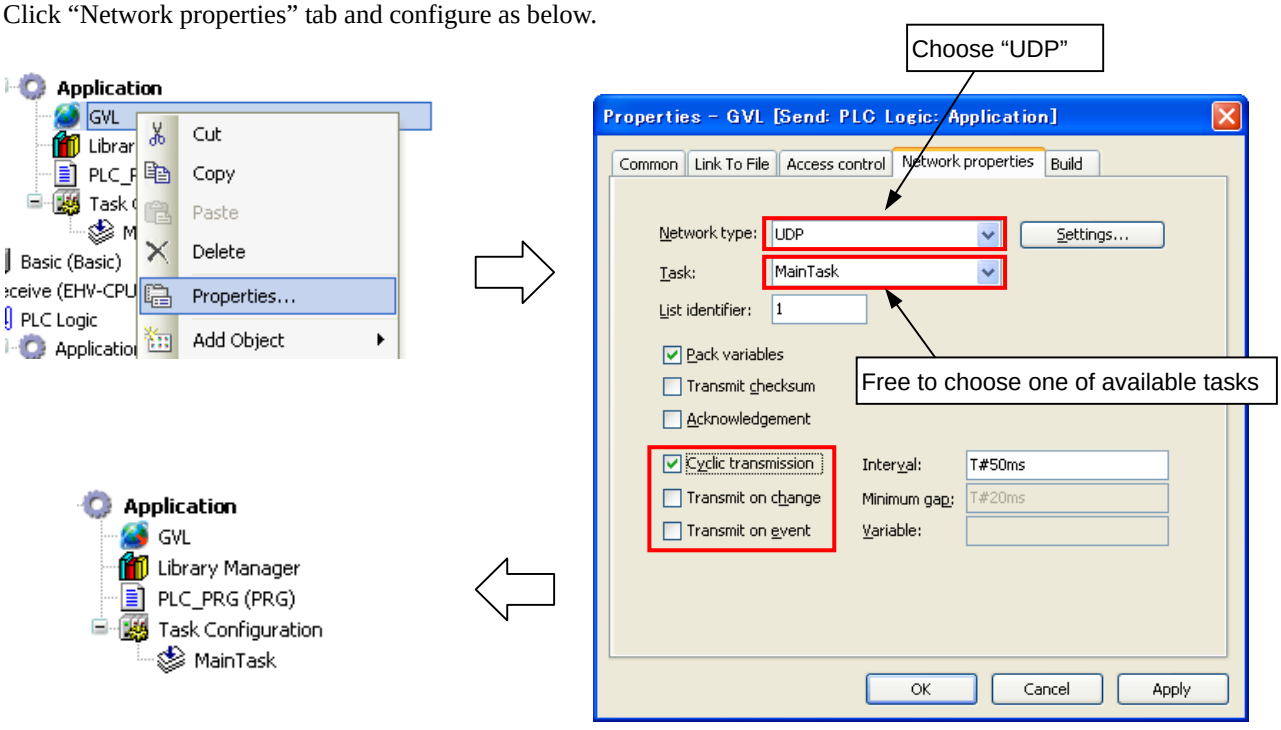


[CPU “Send”]

Right click on “Application” of send-CPU and choose “Global Variable List...” (Not Global Network Variable List).

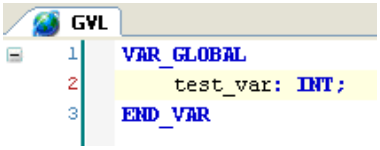


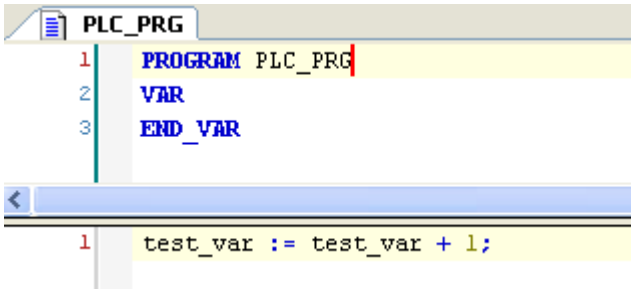
Right click “GVL” and choose “Properties...”.
Click “Network properties” tab and configure as below.



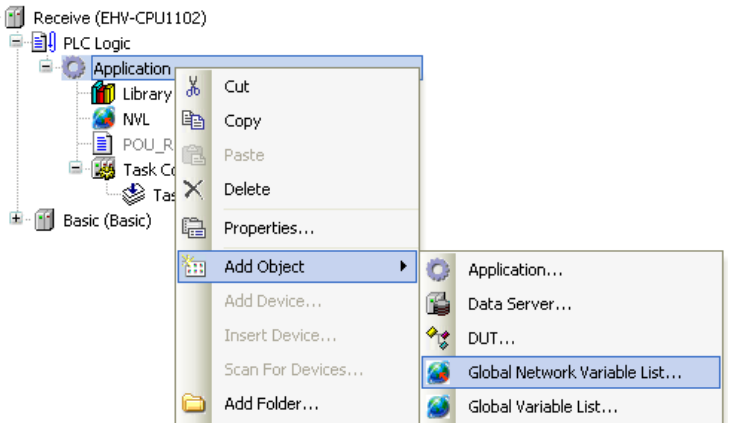
Network type: Choose “UDP”.
Task: Choose any one task. The variables are sent at the end of a task cycle.
List identifier: If more than 2 global variable list is configured, set a number in ascending order.
Cyclic transmission: Since variables are sent every task cycle, set interval time as same or bigger than cycle time of configured task. If smaller time than task cycle is set, actual sending cycle is limited by task cycle.
Transmit on change: Variables are sent only if their values have changed; the Minimum gap can define a minimum time lapse between transfers.
Transmit on event: Variables are sent while specified variable is TRUE. Be noted that it is not edge detection but level detection.
Refer to online help of EHV-CoDeSys for further information.

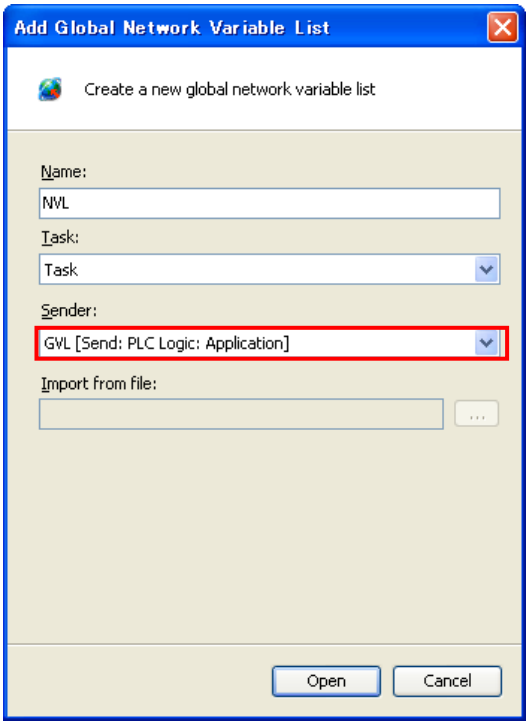
In this sample, one global variable “test_var” is defined and one-line program is written in POU as below.





[CPU “Receive”]
The next step is configuration for receiving CPU. Right click on “Application” of Receive-CPU and choose “Global Network Variable List...” Be sure to check if Sender is properly set as configured list above.





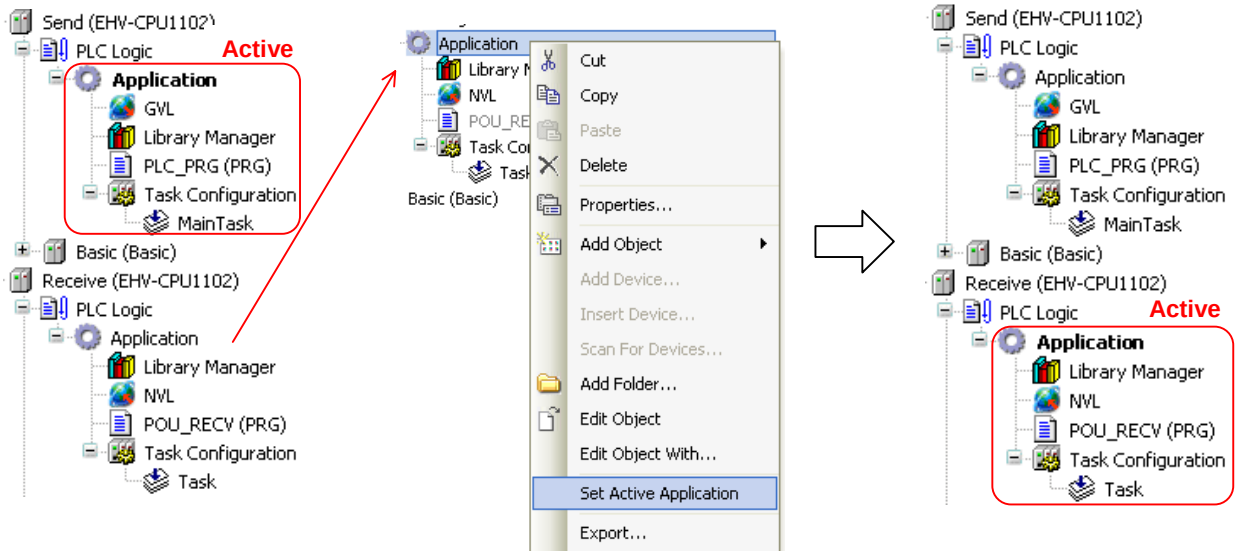
Configuration is completed for both send and receive-CPU.

Login

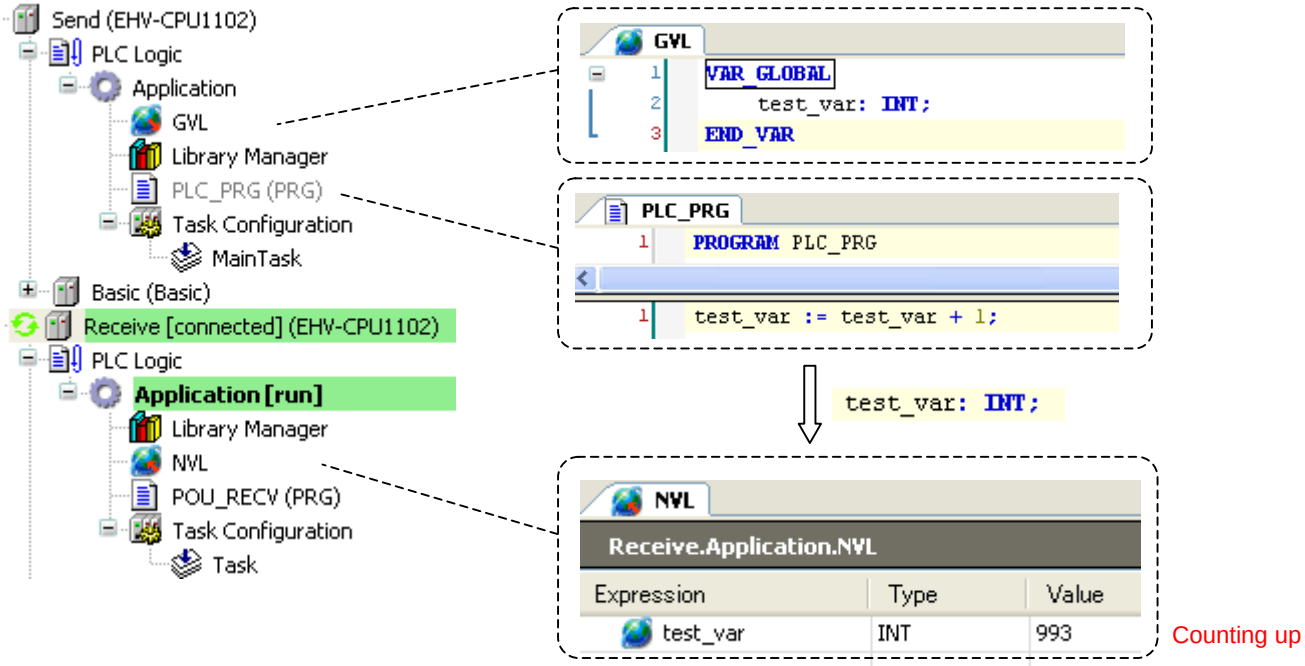
Set the communication path for Send-CPU and login (download application).

After logout, right click on “Application” of Receive-CPU and choose “Set Active Application”.

Set the communication path for Receive-CPU and login (download application).

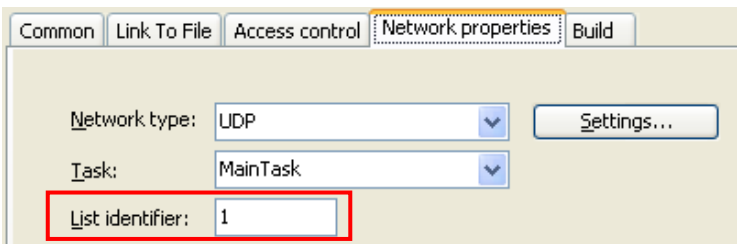


You can see the variable “test_var” is counting up in the global network variable list in the Receive-CPU.



Note

- If any parameters of global variable list is changed, be sure to execute “Clean” or “Clean All” before login.
- If more than 2 global variable lists are configured, be sure to set another “List identifier” in ascending order.



3.13 Modbus-TCP/RTU

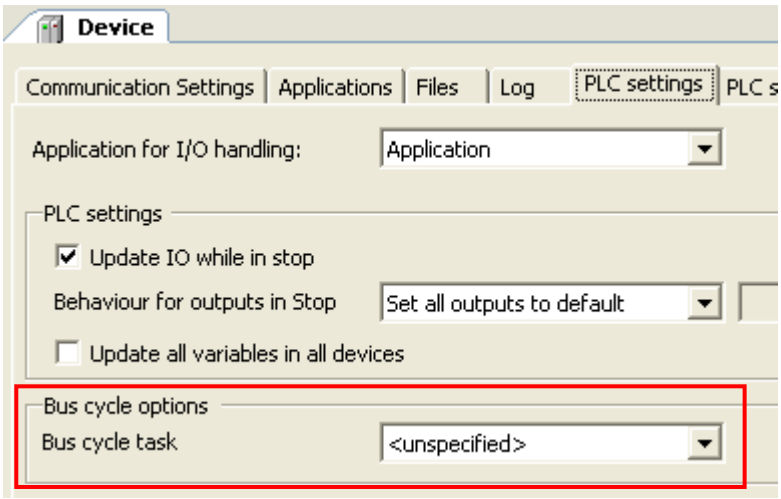
3.13.1 Introduction

Supported function codes are shown in the below table.

16#	10#	Function code	CPU		EH-SIO
			Modbus-TCP Master Modbus-RTU Master	Modbus-TCP Slave	Modbus-RTU Master
0x01	01	Read Coils	X	-	X
0x02	02	Read Discrete Inputs	X	-	X
0x03	03	Read Holding Registers	X	X	X
0x04	04	Read Input Registers	X	X	X
0x05	05	Write Single Coil	X	-	X
0x06	06	Write Single Register	X	X	X
0x0F	15	Write Multiple Coils	X	-	X
0x10	16	Write Multiple Registers	X	X	X
0x17	23	Read/Write Multiple Registers	X	X	X

X = Supported, - = Not supported

Modbus command processing is executed in bus cycle tack, which is configured in PLC settings of Device as below. You can specify any existing IEC tasks. If the bus cycle task is <unspecified>, task with the shortest cycle time is taken.

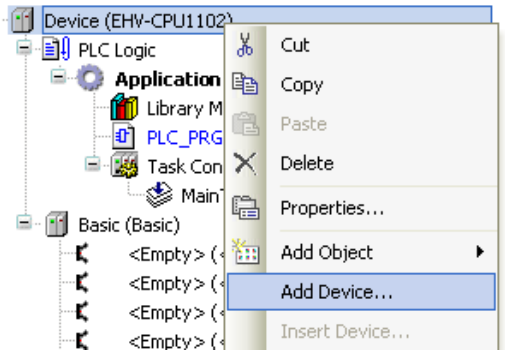


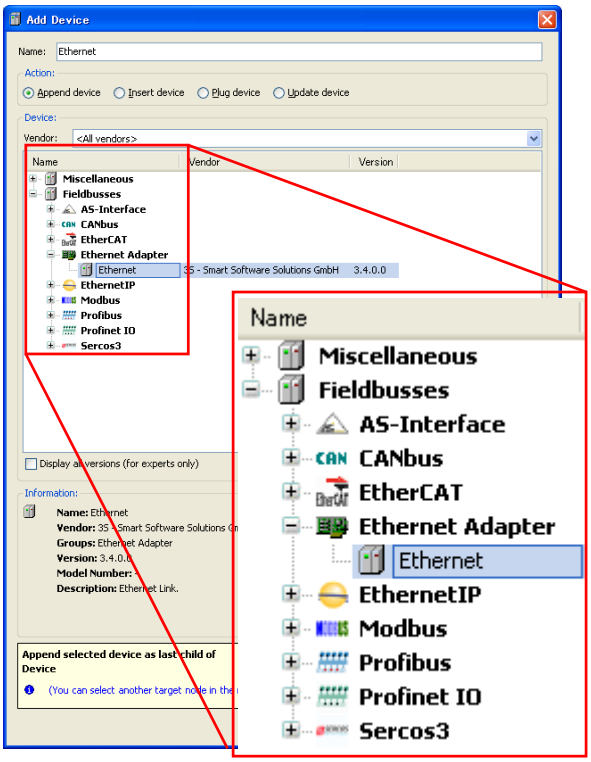
Note

If Modbus-RTU or TCP function is needed, be sure to use EHV-CPU1025 or higher model because Modbus libraries require about 100KB of user program memory.

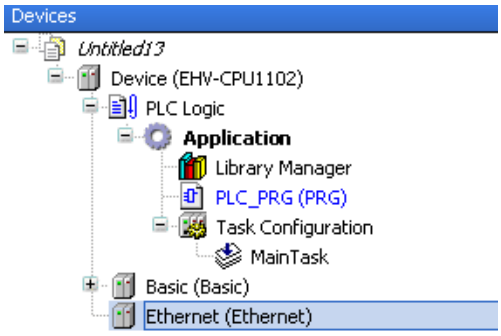
3.13.2 Modbus-TCP master (client)

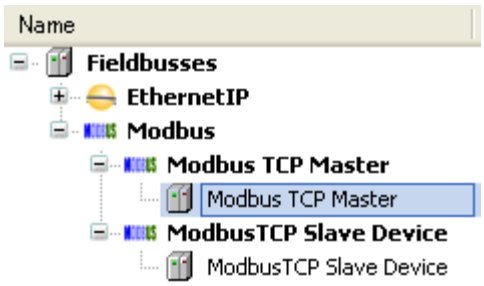
Right click on “Device” and choose “Add Device...”.
“Add Device” window appears.
Click “Ethernet” and [Add Device] button.



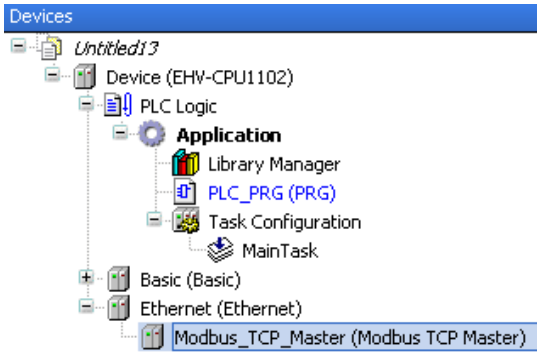


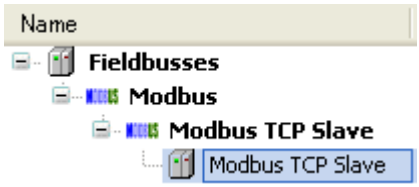
With “Add device” window opened, click “Ethernet” in the device tree. Then available devices will be shown in the “Add Device” window. Click “Modbus TCP master” and [Add Device] button

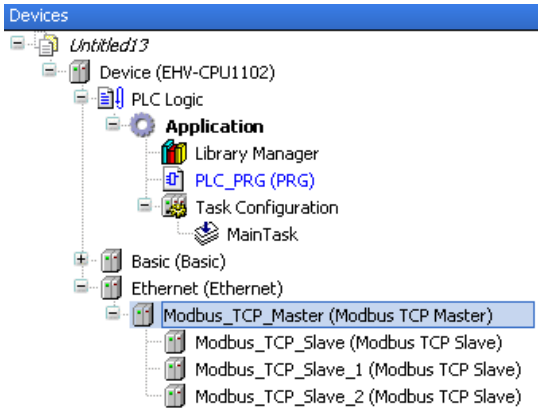




With “Add device” window opened, click “Modbus_TCP_master” in the device tree. Then “Modbus TCP Slave” is shown in the “Add Device” window. Click “Modbus TCP slave” and [Add Device] button according to your Modbus system configuration. e.g. if 3 slaves are to be controlled, add 3 times of slave devices.

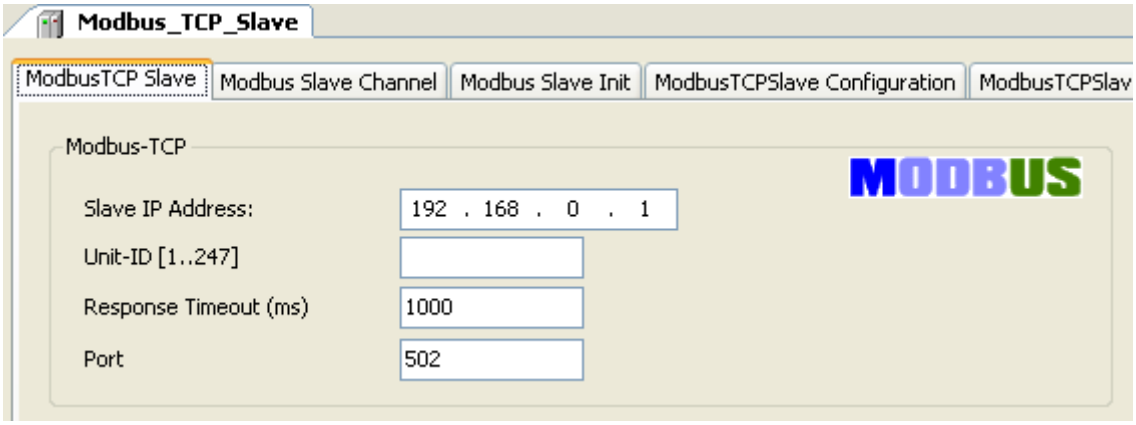




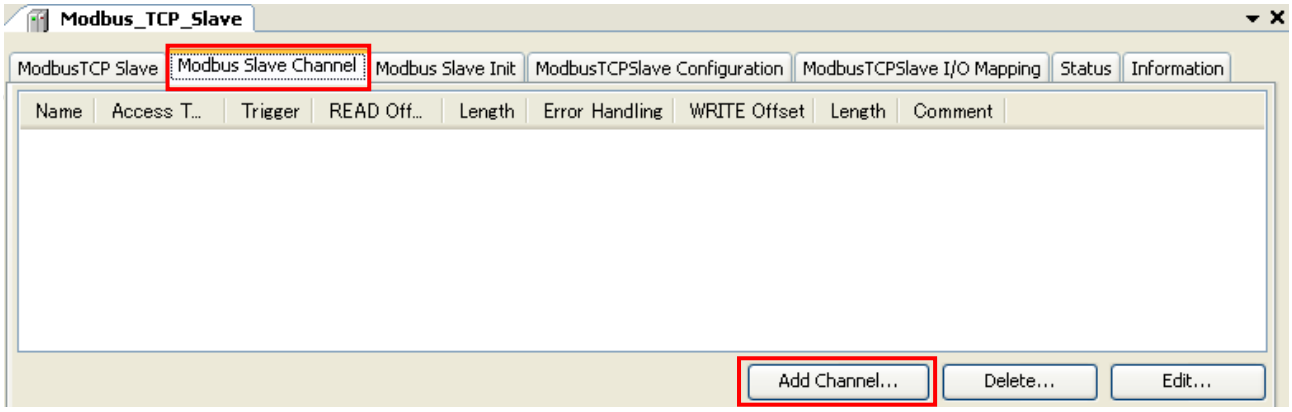


Be sure to configure all slave modules to be controlled.

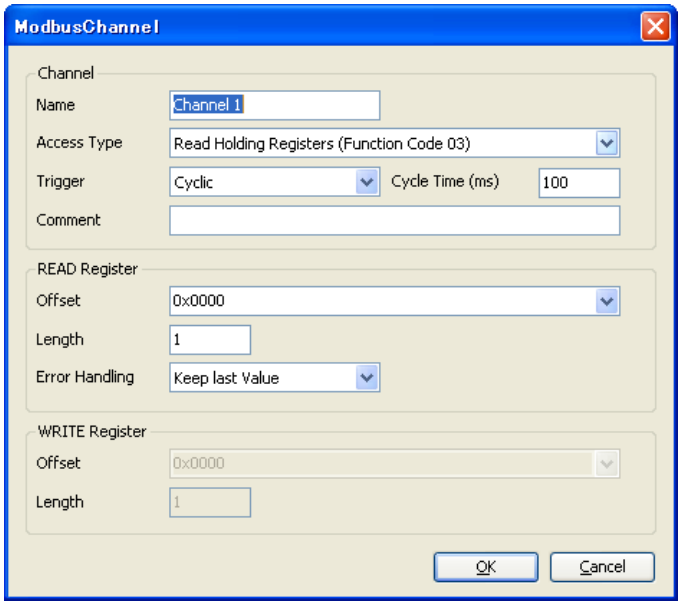
Function codes to be sent are configured in each slave. Double click a slave unit to open configuration window.
Set IP address, response timeout and port number as below. Unit-ID is used when a Modbus-gateway (Ethenet to serial) device is used.



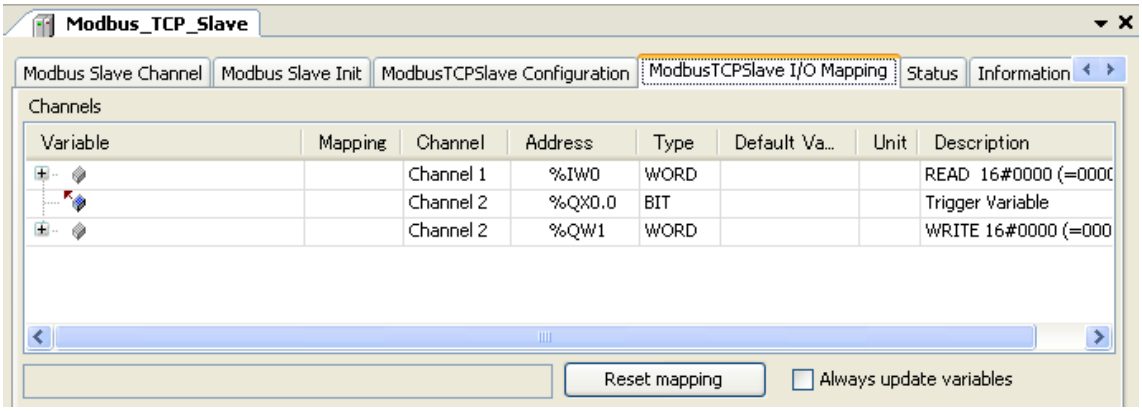
Open “Modbus Slave Channel” tab and click “Add Channel...” to add function codes.



Configure each parameter as below. If the Trigger setting is “Rising edge”, trigger variable (BOOL) will be automatically assigned in %QX address.



Data of Modbus will be assigned to %IW or %QW as seen in “ModbusTCPSlave I/O Mapping” tab. Read data from slave is assigned to input area (%IW) and data to be written to slave is assigned to output area (%QW).



Note

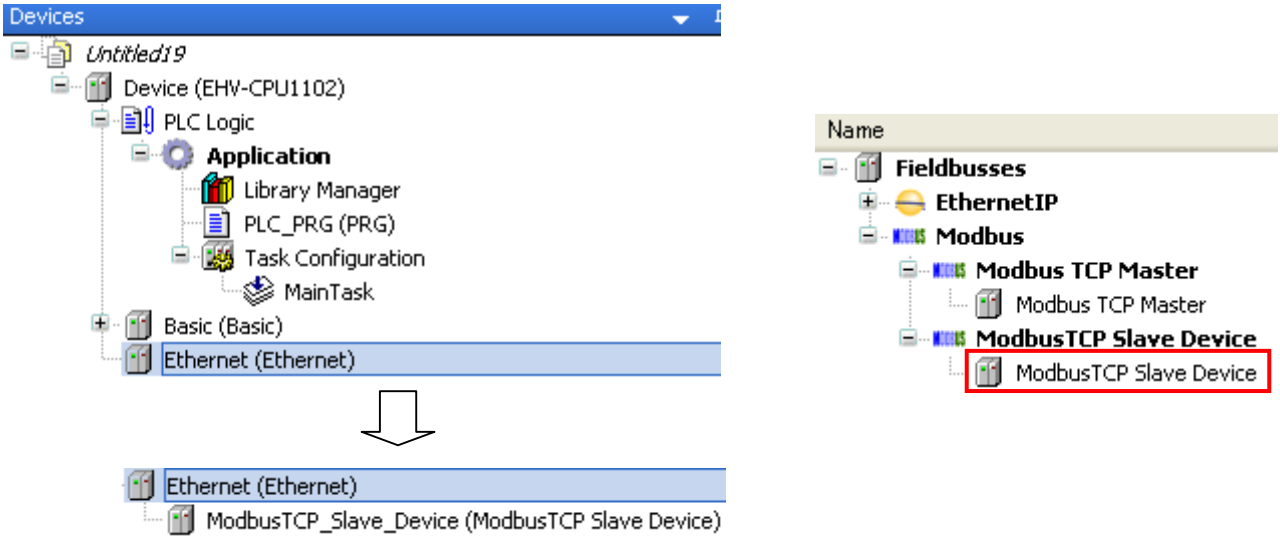
- When trigger type is set as “Rising edge”, do not change the trigger bit too often, otherwise rising edge could be missed. Recommended timing is roughly calculated as follows.
  T1 is the time from beginning of request to end of response per channel. If several channels are used, the sum of T1, T2, ..., Tn is the minimum time to keep low or high the trigger bit. But this is very approximate value and it is not easy to know T1. Recommended time would be 50 to 200ms or more depending on the number of channels.

- If long size data is sent from CPU in low baud rate (eg. 255 byte in 2,400 bps takes about 1 second.), 25 error (processor load watch dog) is detected independent from cycle time of bus cycle task because 25 error is detected based on percentage in 1 second. In this case, add following one line under [CmpSchedule] in config.cfg file. The value 2000 means 2 seconds. Please adjust this value accordingly. Refer to page 3-50 how to access and change config.cfg file.

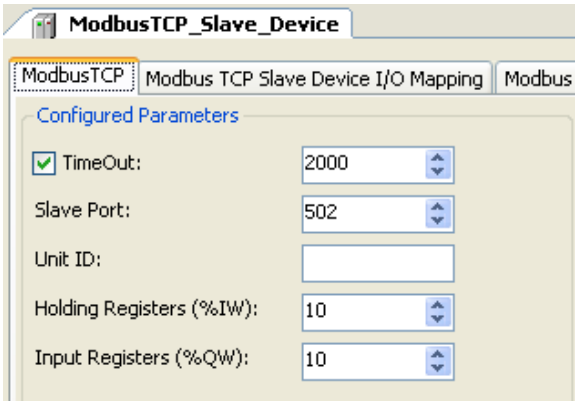
```
[CmpSchedule]
ProcessorLoad.Interval=2000
```

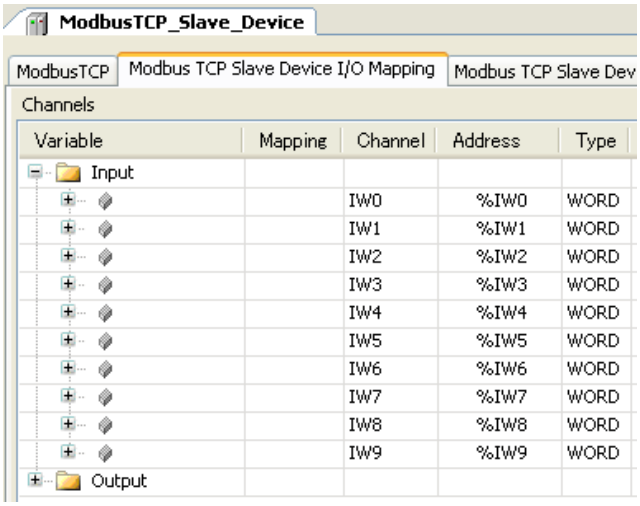
3.13.3 Modbus-TCP slave (server)

Right click on “Ethernet” and choose “Add Device...”. Click “Modbus TCP Slave Device” in the “Add Device” window and [Add Device] button



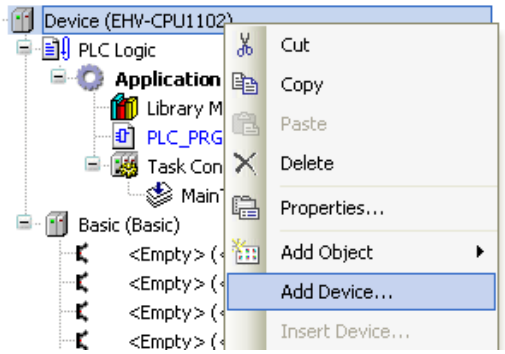
Configure each parameter as below. According to the size of “Holding Registers” and “Input Registers”, data area will be assigned as seen in “ModbusTCPSlave Device I/O Mapping” tab.

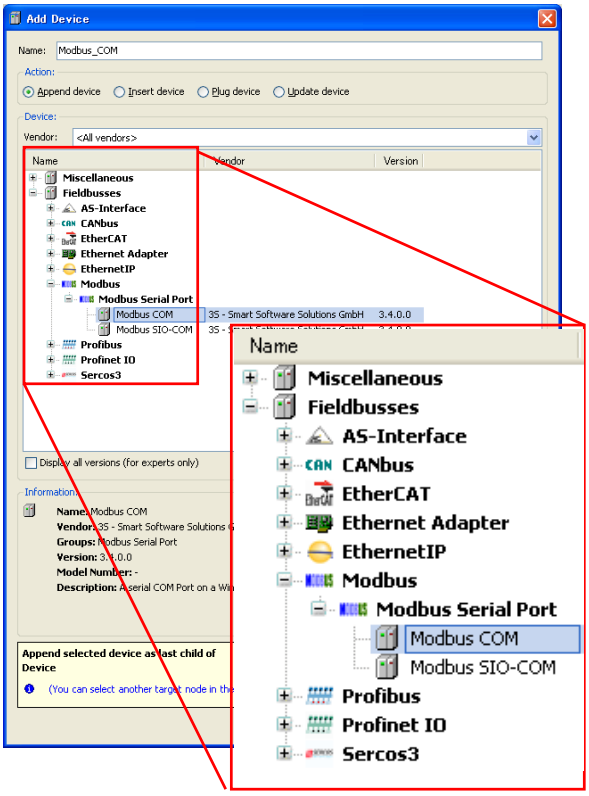




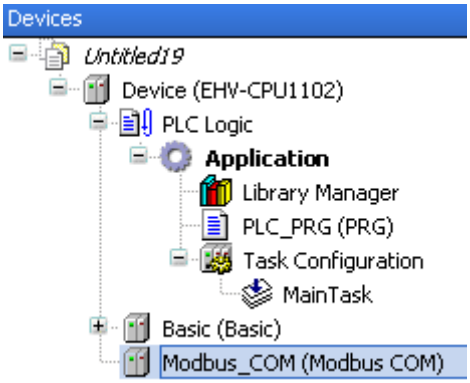
3.13.4 Modbus-RTU master

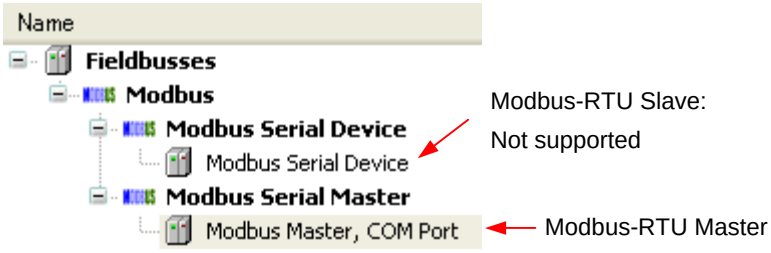
Right click on “Device” and choose “Add Device...”.
“Add Device” window appears.
Click “Modbus COM” and [Add Device] button.





With “Add device” window opened, click “Modbus_COM” in the device tree. Then available devices will be shown in the “Add Device” window. Choose “Modbus Master, COM Port”and [Add Device] button

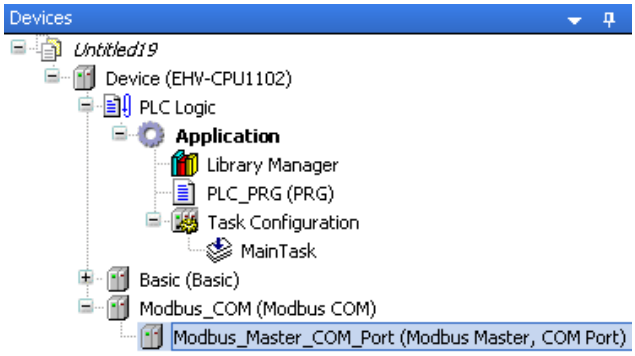


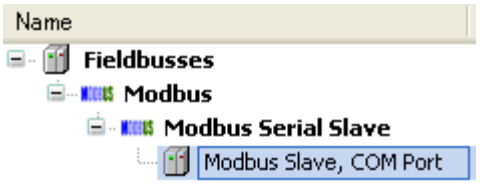


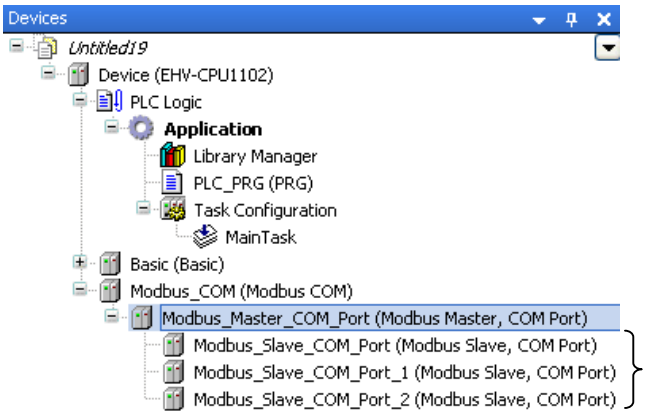
Note

Although CPU’s Serial port does not support Modbus-RTU slave function, slave device (Modbus Serial Device) is available since it is common device for other manufacturer’s CoDeSys based CPUs. Please do not choose this device with EHV+ series CPUs.

With “Add device” window opened, click “Modbus_Master_COM_Port” in the device tree. Then “Modbus Slave, COM Port” is shown in the “Add Device” window. Click “Modbus Slave, COM Port” and [Add Device] button according to your Modbus system configuration. e.g. if 3 slaves are to be controlled, add 3 times of slave devices.

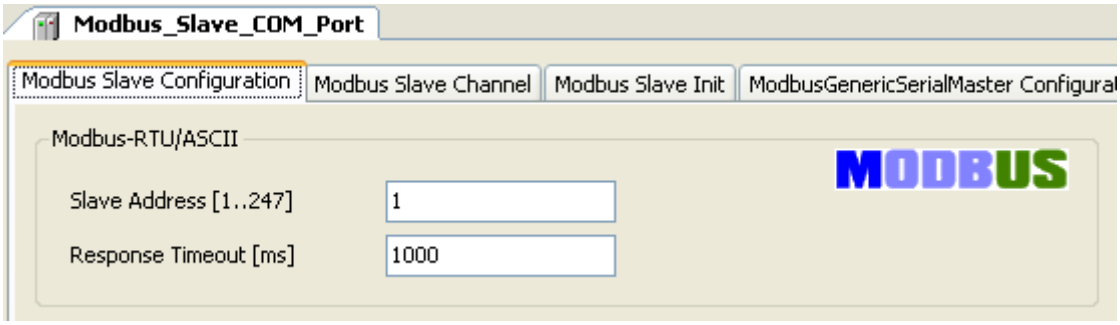




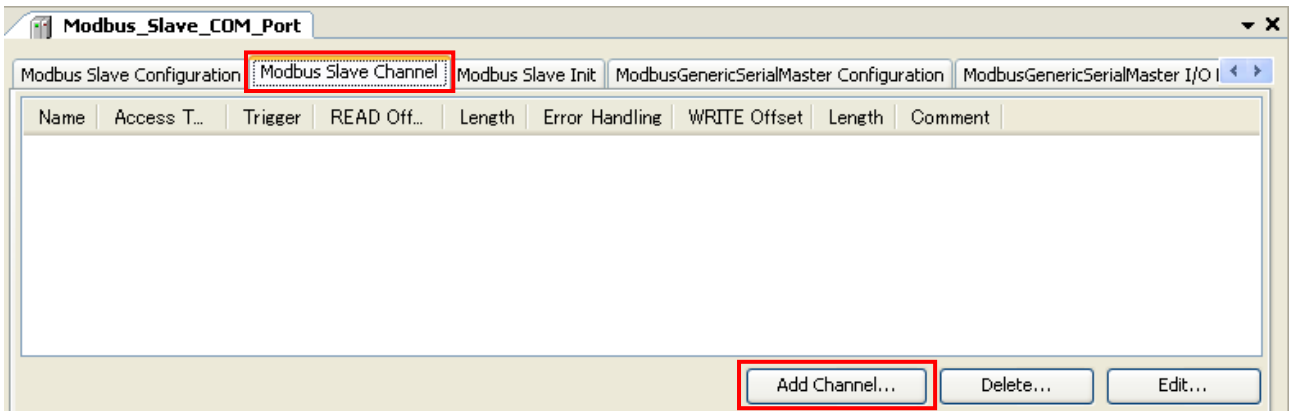


Be sure to configure all slave modules to be controlled.

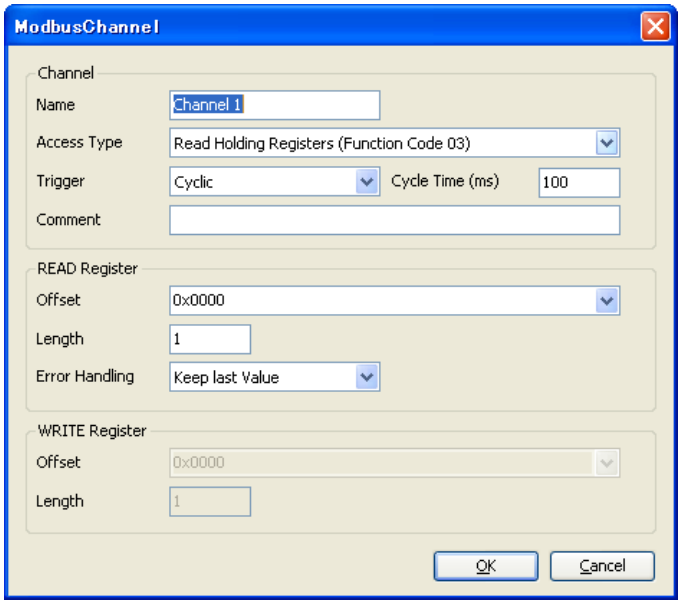
Function codes to be sent are configured in each slave. Double click a slave unit to open configuration window.
Set slave address and response timeout.



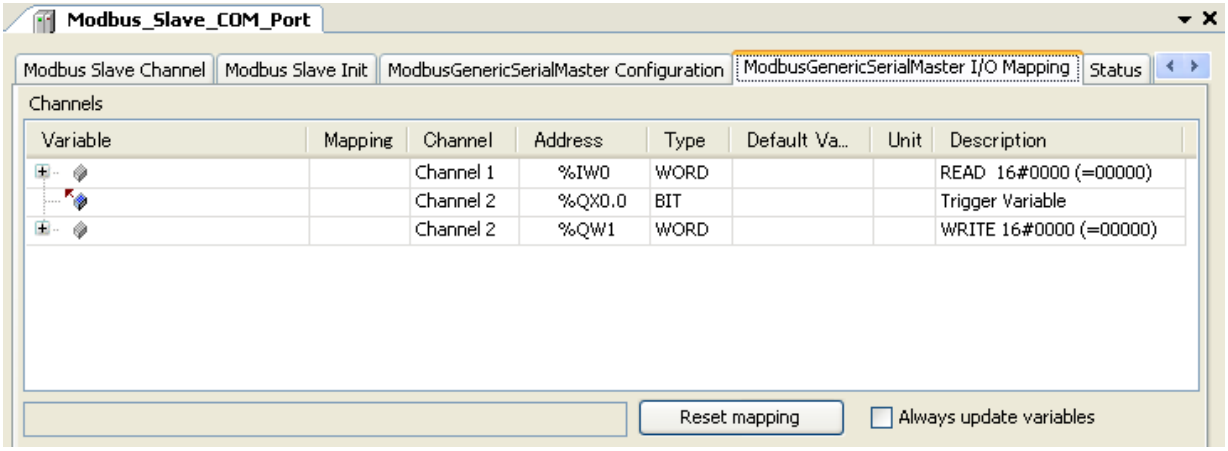
Open “Modbus Slave Channel” tab and click “Add Channel...” to add function codes.



Configure each parameter as below. If the Trigger setting is “Rising edge”, trigger variable (BOOL) will be automatically assigned in %QX address.



Data of Modbus will be assigned to %IW or %QW as seen in “ModbusGenericSerialMaster I/O Mapping” tab. Read data from slave is assigned to input area (%IW) and data to be written to slave is assigned to output area (%QW)



Note

When trigger type is set as “Rising edge”, do not change the trigger bit too often, otherwise rising edge could be missed. Recommended timing is roughly calculated as follows.

T1 is the time from beginning of request to end of response per channel. If several channels are used, the sum of T1, T2, ..., Tn is the minimum time to keep low or high the trigger bit. But this is very approximate value and it is not easy to know T1. Recommended time would be 50 to 200ms or more depending on the number of channels.

3.14 EH-SIO

3.14.1 Supported function

Any version of EH-SIO works with “EHV+” however, supported function is different from EHV/EH series as below.

Function	EHV+	EHV/EH-CPU
Modbus-RTU master	X	X
Modbus-ASCII master	-	X
Modbus-RTU/ASCII slave	-	X
General purpose communication (Free protocol)	X	X
Hi-Protocol	-	X
Simple data link	-	X

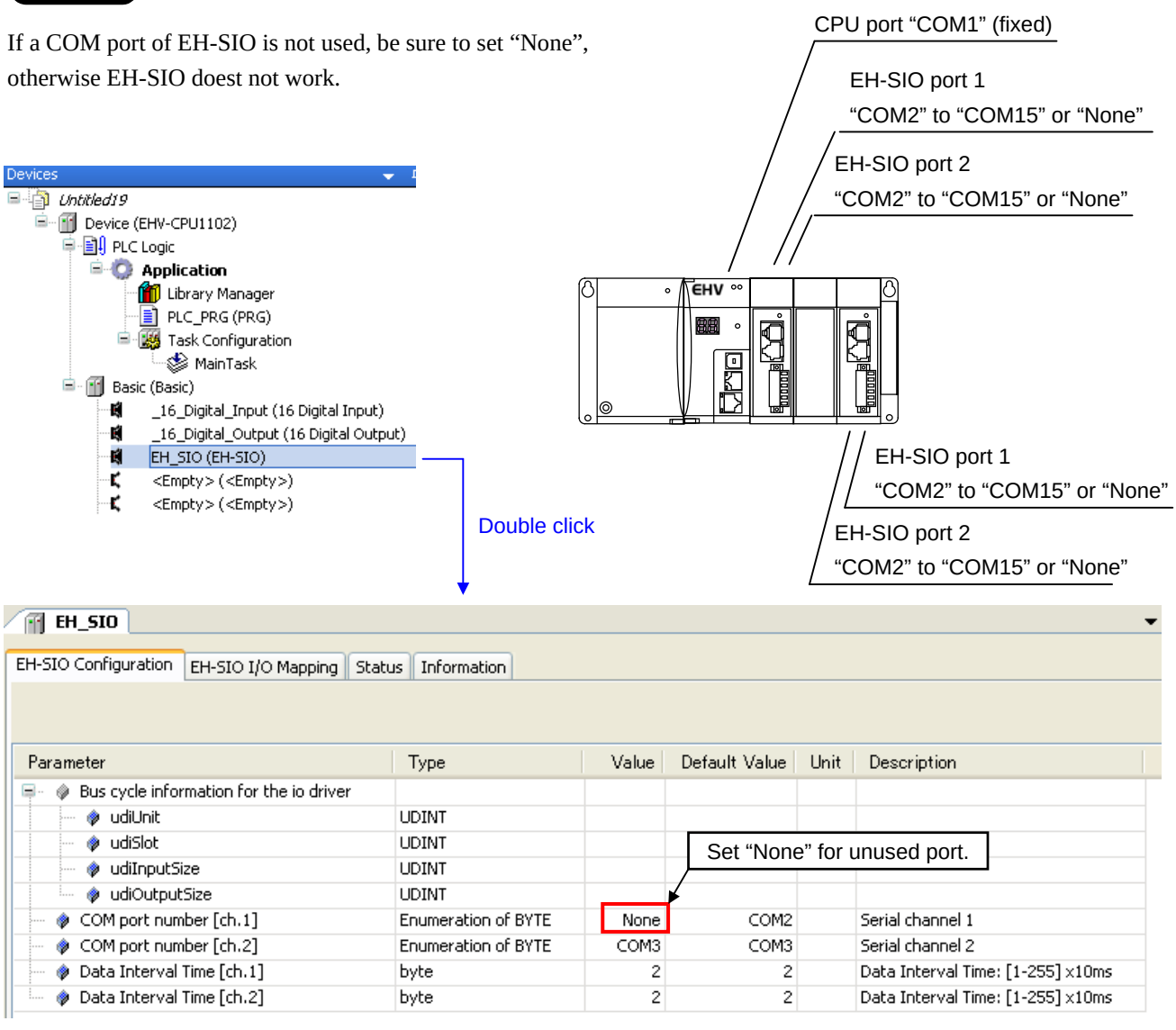
X = Supported, - = Not supported

3.14.2 Port number setting

Open “EH-SIO Configuration” window and set the port number from “COM2” to “COM15” (“COM1” is reserved for CPU local port) or “None”. Each COM port number must be unique. If it is duplicated, EH-SIO does not work.

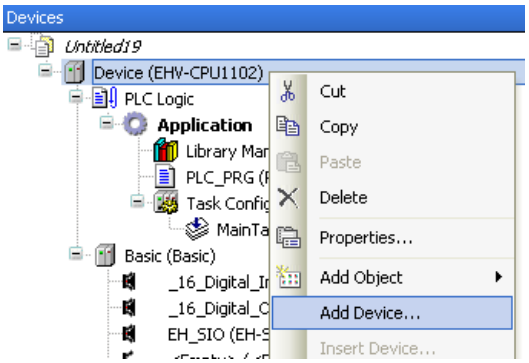
Note

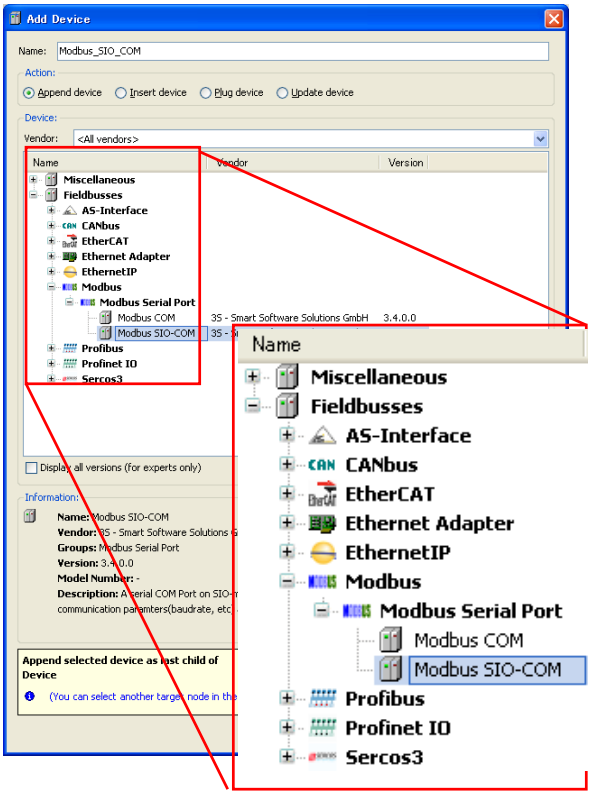
If a COM port of EH-SIO is not used, be sure to set “None”, otherwise EH-SIO doest not work.



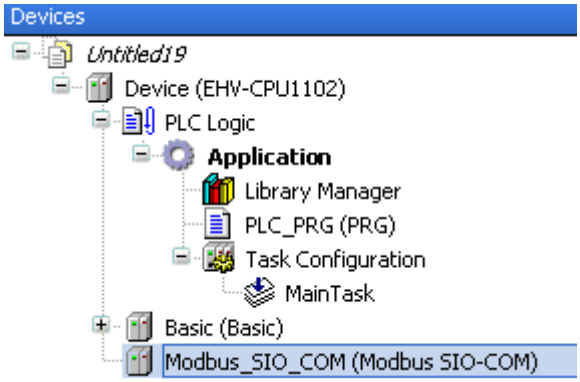
3.14.3 Modbus-RTU master

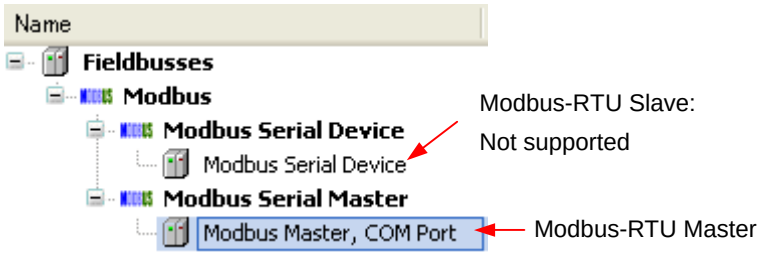
Right click on “Device” and choose “Add Device...”.
“Add Device” window appears.
Click “Modbus SIO-COM” and [Add Device] button.





With “Add device” window opened, click “Modbus__SIO_COM” in the device tree. Then available devices will be shown in the “Add Device” window. Choose “Modbus Master, COM Port” and [Add Device] button

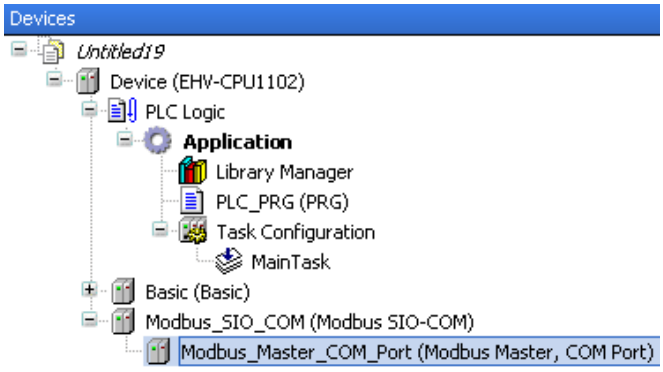


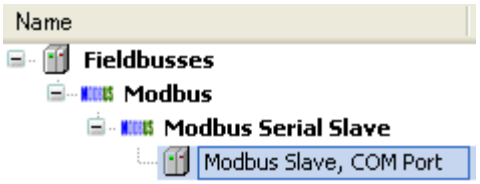


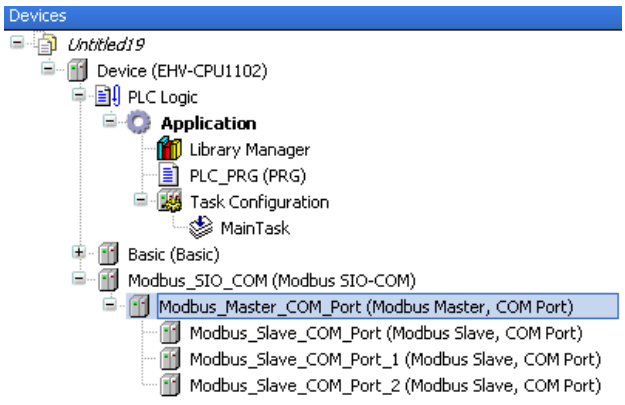
Note

- Although EH-SIO’s Serial port does not support Modbus-RTU slave function, slave device (Modbus Serial Device) is shown since it is common device for other manufacturer’s CoDeSys based CPUs. Please do not choose this device.
- Modbus command processing is executed in bus cycle tack, which is configured in PLC settings of Device (refer to page 3-32). You can specify any existing IEC tasks. If the bus cycle task is <unspecified>, task with the shortest cycle time is taken. If 24 or 25 error appears in CPU, specify longer bus cycle task.

With “Add device” window opened, click “Modbus_Master_COM_Port” in the device tree. Then “Modbus Slave, COM Port” is shown in the “Add Device” window. Click “Modbus Slave, COM Port” and [Add Device] button according to your Modbus system configuration. e.g. if 3 slaves are to be controlled, add 3 times of slave devices.

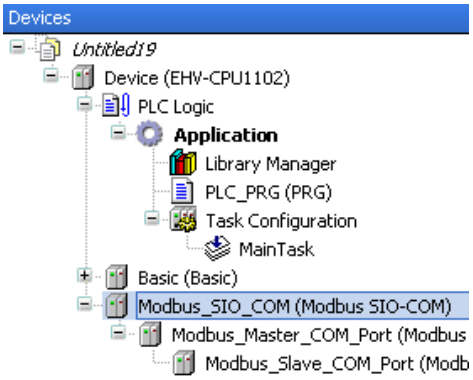


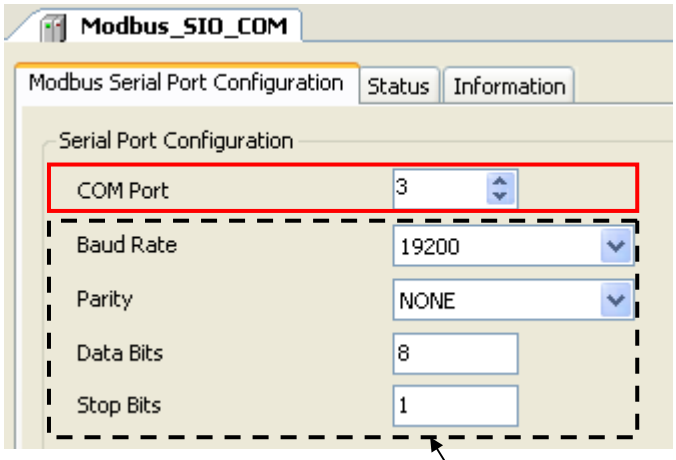




Be sure to configure all slave modules to be controlled.

Double click on “Modbus_SIO_COM” or right click and choose “Edit Object.” Modbus_SIO_COM Configuration window appears. Set the same COM port number as “EH-SIO configuration” window. Although baud rate and data frame format of EH-SIO are configured with dip switches on board, set same parameters as dip switches in this configuration window too.





Set same data as dip switches on board.

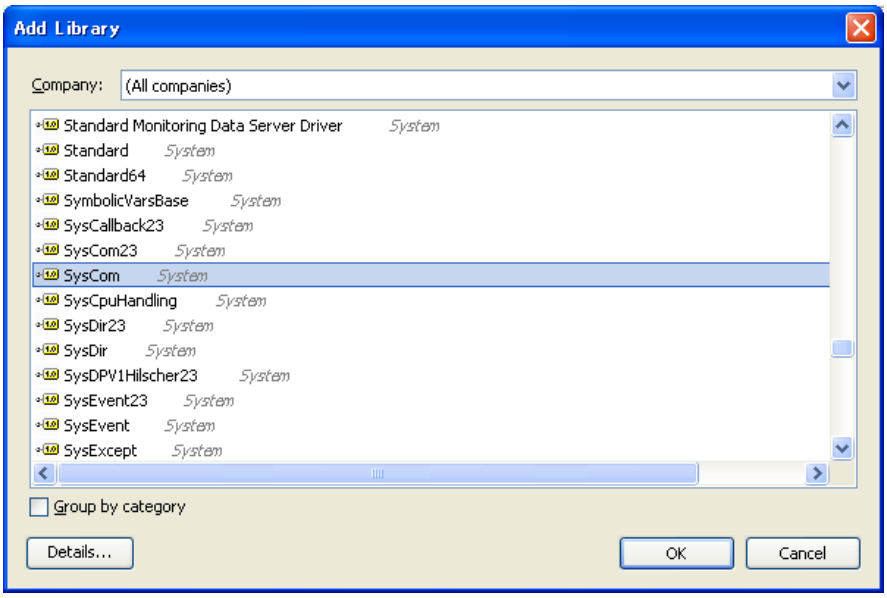
Modbus operation is same as CPU port. Refer to page 3-39 for further information.

Note

In higher baud rate, such as 57.6 or 115.2kbps, if slave device responds less than 1ms, CPU might fail to receive a query. In this case, change the baud rate to slower.

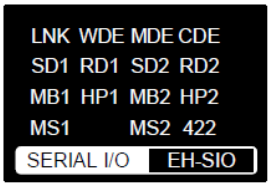
3.14.4 General purpose communication

Besides Modbus-RTU function, EH-SIO supports general purpose communication same as CPU port.
Add “SysCom” library by clicking “Add library” on Library manager. Only the difference from CPU port is COM port number. Be sure to set the same COM port number as “EH-SIO configuration” window. Refer to 3.15.3 Serial communication for further information.



3.14.5 LED indication

MB and MS LED: When CPU has no application (user program) or wrong COM port setting or “None” assigned, LNK, MB, HP and MS LED will light up. If correct COM port setting is downloaded, all of the LED will turn off.
(Even EH-SIO works in Modbus-RTU mode, internal setting of EH-SIO is always general purpose mode. For this reason, MB and MS LED do not light.)
CDE LED: Even if correct COM port setting is downloaded, CDE LED will light up without cable connected because DR signal is expected to be high in RS-232C port.



LNK ... Link mode
WDE ... Watch dog timer error
MDE ... Module error
CDE ... Command error
SD1/2 ... Sending data
RD1/2 ... Receiving data
MB1/2 ... Modbus mode
HP1/2 ... Hi-Protocol mode
MS1/2 ... Modbus Master
422 ... RS-422 port enabled

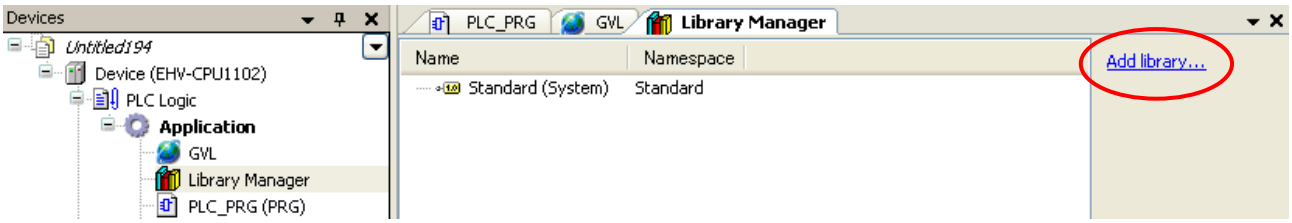
3.14.6 Hardware reset and Software reset

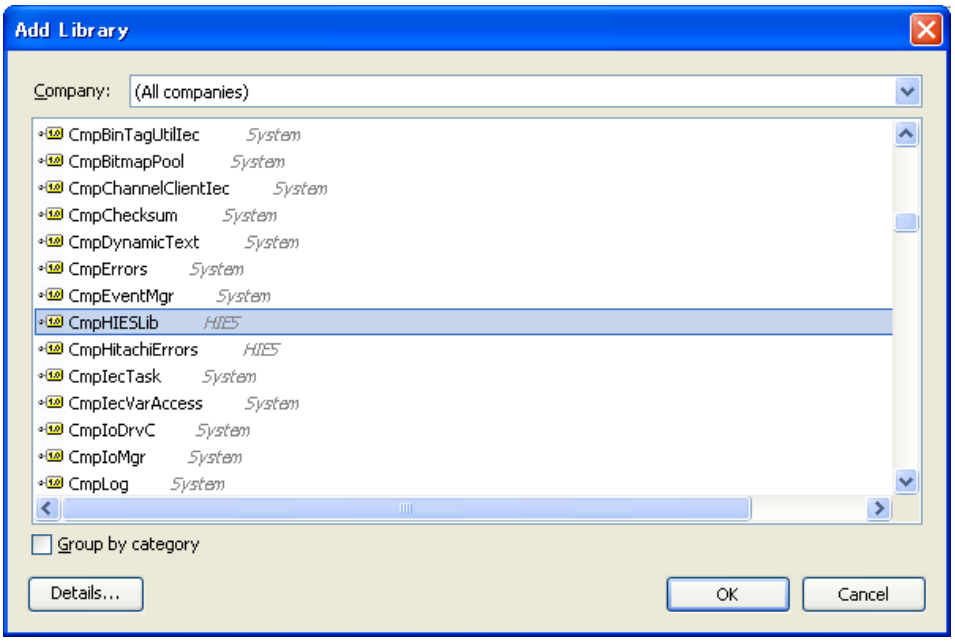
When the reset button is pressed while communication, the communication is aborted since EH-SIO is initialized. This is hardware reset operation. Make stop and run to recover the communication.
Instead of that, SysComPurge command is able to initialize EH-SIO. This is software reset function.

3.15 Libraries

3.15.1 How to install

In order to read/write EHV+ series CPU's specific information, following libraries are available. Add necessary CmpHIESLib by choosing "Add library" as shown below.

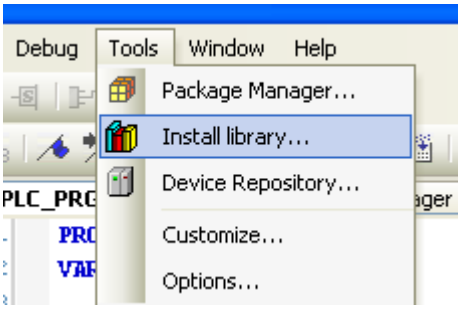




CmpHIESLib is Hitachi-IES's special library including;

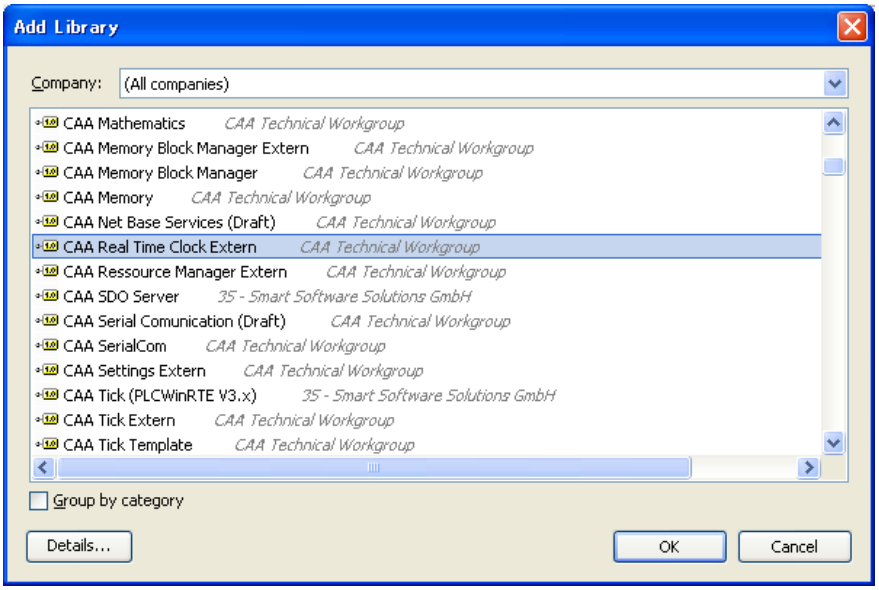
Library for counter module (EH-CU/CUE)
Library for positioning module (EH-POS)
Library for Profibus master module (EH-RMP)

If these libraries are not found in the library list as above, install library by chooseing [Tools]-[Install library...].

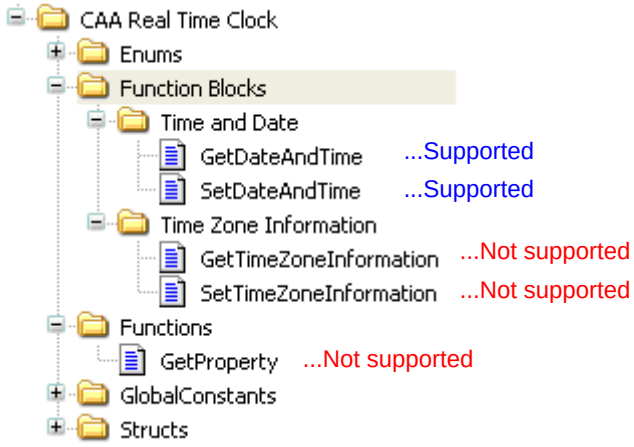


3.15.2 Real time clock

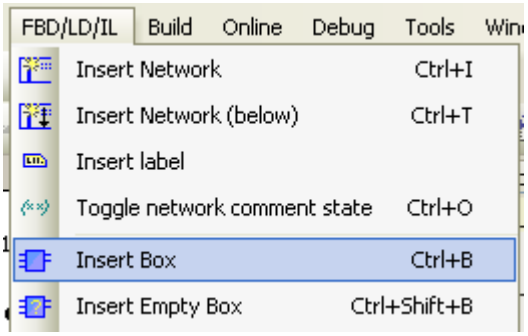
Add “CAA Real Time Clock Extern” library by clicking “Add library” on Library manager.

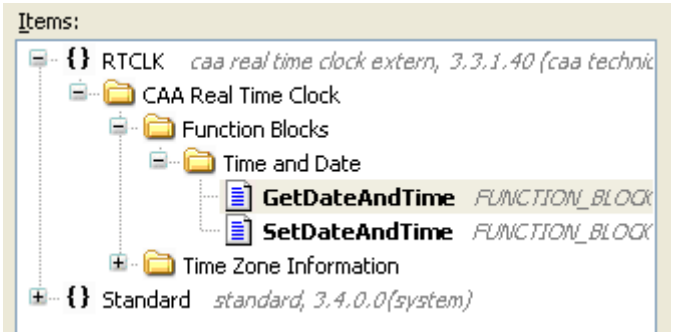


In the CAA Real Time Clock Extern libraries, GetDateAndTime and SetDateAndTime are supported. Be noted that the others are not supported.



Following example is in FBD language. Choose [Insert Box] in [FBD/LD/IL] menu and GetDateAndTime or SetDateAndTime as shown below.

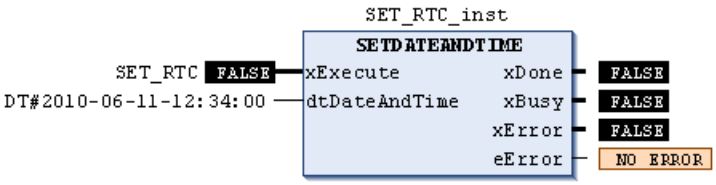


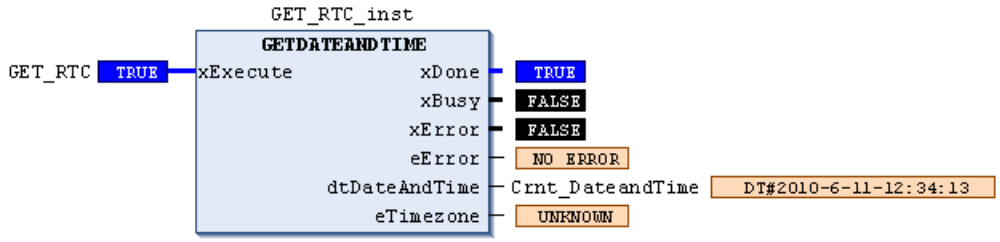


Declare instance of the function blocks and necessary variables as below.

```
PROGRAM PLC_PRG
VAR
    SET_RTC_inst: SETDATEANDTIME;
    SET_RTC: BOOL;
    GET_RTC_inst: GETDATEANDTIME;
    GET_RTC: BOOL;
    Crnt_DateandTime: DATE_AND_TIME;
END_VAR
```

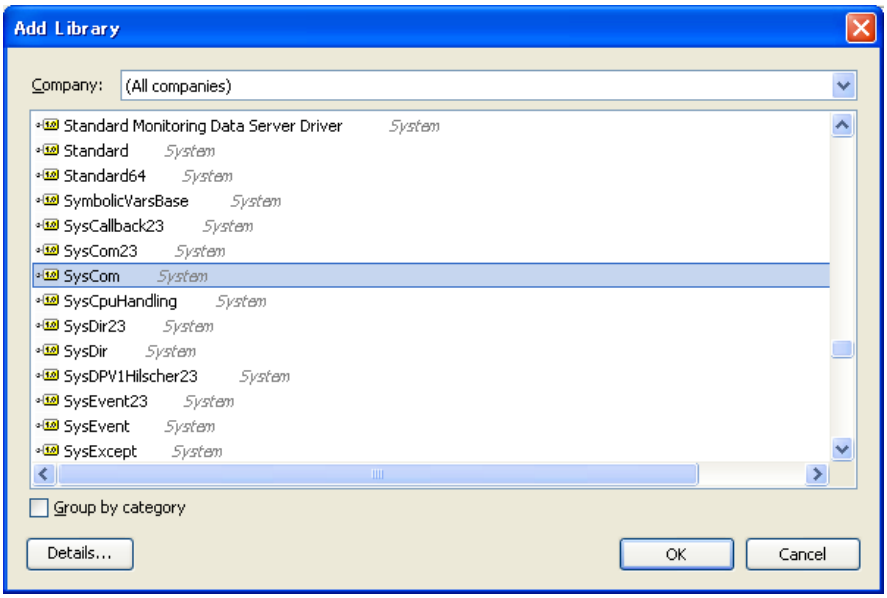
By rising edge of xExecute bit of SETDATEANDTIME, data in dtDateAndTime is written to the RTC device.
By rising edge of xExecute bit of GETDATEANDTIME, current date and time is read out to the variable connected to dtDateAndTime as shown below. When xExecute bit of GETDATEANDTIME is FALSE, dtDateAndTime is default value 1970-1-1-0:0:0.





3.15.3 Serial communication

Add “SysCom” library by clicking “Add library” on Library manager. Instead of SysCom library, CAA SerialCom can be used, but a sample program of SysCom library is shown in this manual.



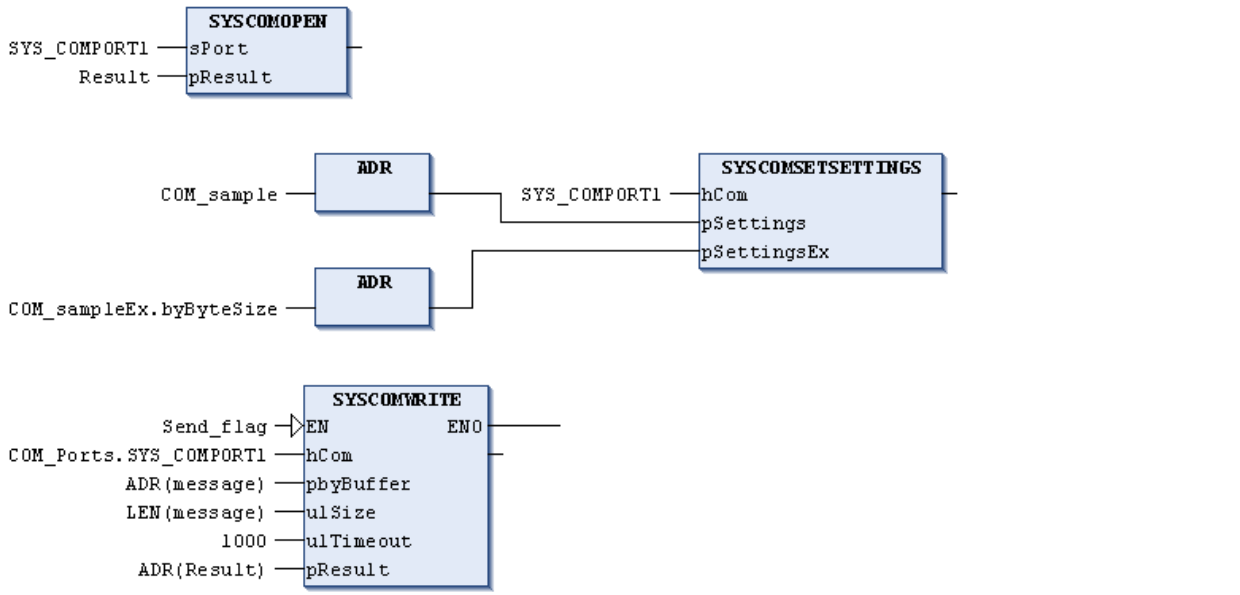
It is recommended to use ST language for serial communication settings since it is more flexible.

```
PROGRAM serial_sample2
VAR
    COM_sample:COM_Settings;
    COM_sampleEx:COM_SettingsEx;
    message: STRING:='123';
    Result: DWORD;
    write_out: UDINT;
    test: INT;
END_VAR
```

```
COM_sample.sPort:=COM_Ports.SYS_COMPORT1;                ...COM1
COM_sample.byParity:=COM_Parity.SYS_NOPARITY;            ...Non parity
COM_sample.byStopBits:=COM_StopBits.SYS_ONESTOPBIT;      ...1 stop bit
COM_sample.ulBaudrate:=COM_Baudrate.SYS_BR_19200;        ...baudrate 19,200bps
COM_sample.ulBufferSize:=100;                            ...buffer size 100 bytes
COM_sample.ulTimeout:=10;                                ...Timeout 10ms
COM_sampleEx.byByteSize:=8;                              ...8 bit / frame

SysComOpen(SYS_COMPORT1, ADR(Result));

SysComSetSettings(SYS_COMPORT1, ADR(COM_sample), ADR(COM_sampleEx));

IF test= 1 THEN;
message := CONCAT('$02', message);        ...Connect  02 + "123"
message := CONCAT(message, '$0d');        ...Connect  02 "123" + 0d
write_out:=SysComWrite( SYS_COMPORT1, ADR(message), LEN(message), 1000, ADR(Result));
test:=0;
END_IF;
```

If the variable "test" is 1, then string data "02 31 32 33 0D" (STX 123 CR) will be sent out.

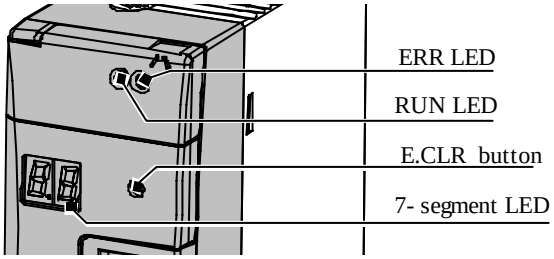
It is possible to write in FBD language as below, but it is necessary to set parameters in COM_Settings and COM_SettingsEx as same as above program line 1 to 7.



3.16 Troubleshooting

Error code

The CPU has 7-segment display and error LED to indicate an error code as listed below. If two or more errors are detected at the same time, smaller error code has higher priority to be displayed. If error is detected, read the descriptake following countermeasures depending on error level.



Error code	Error level	Countermeasure
88, 11 to 1F	Serious error	Cycle power. If it does not solve, contact your local supplier.
20 to 31	Exception	Exception status is cleared only by Reset operation. Execute Reset cold/warm/origin by EHV-CoDeSys
70 to 78	Warning	User program execution does not stop by warning. If you need to activate alarm or any action by warning, use CmpHitachi library. Press E.CLR button to clear error code.

Err. code	Error name [Detected when]	Description	PLC system	Applica-tion	ERR LED
88	Microprocessor failure [Power on]	Overflow of internal watchdog timer due to system program error.	Stop	Stop	
11	System program error (FLASH) [Power on]	Checksum value of system program (Runtime) in FLASH does not match the checksum calculated.	Stop	Stop	
12	System RAM failure [Power on]	Read/write check for system RAM has failed.	Stop	Stop	
13	Misalignment / Illegal instruction / Privileged instruction [Always]	Microprocessor has detected an exception processing in system program.	Stop	Stop	
15	Program RAM failure [Power on]	Read/write check for program RAM has failed.	Stop	Stop	
16	System program error (system RAM)	Checksum value of system RAM does not match the checksum calculated.	Stop	Stop	
18	MAC address error [Power on]	MAC address is missing or wrong value.	Stop	Stop	
19	Data memory failure [Power on]	Read/write check for data memory (RAM) has failed.	Stop	Stop	
1F	System program error (FLASH) [Always]	Checksum value of system program (reset process) in FLASH does not match the checksum calculated.	Stop	Stop	

: ON, : Blink, : OFF

Err. code	Error name [Detected when]	Description	PLC system	Applica-tion	ERR LED
20	Misalignment / Illegal instruction / Privileged instruction [Always]	Microprocessor has detected an exception processing in application.	Run	Stop	
21	Retain identity mismatch [Power on]	Retain data memory is undefined status due to battery empty. Read the next page for further information	Run	Stop	
23	Unresolved external references [Always]	Unresolved external references are detected.	Run	Stop	
24	Software watchdog of IEC task expired [Always]	Actual cycle time has exceeded watchdog time. Set longer watchdog time.	Run	Stop	
25	Processor load watchdog [Always]	Microprocessor load watchdog of all IEC task has been exceeded. Set longer interval time of task.	Run	Stop	
26	IEC task configuration failed [Always]	IEC task configuration has failed.	Run	Stop	
27	Division by zero	The divisor of division command is 0 in IEC program.	Run	Stop	
31	Load boot project failed [Power on]	Checksum value of application (user program) in FLASH does not match the checksum calculated.	Run	Stop	
70	I/O configuration error [Always]	I/O configuration does not match with actual I/O modules.	Run	Run	
71	Battery error [Always]	Battery voltage is low or battery is disconnected.	Run	Run	Blink 
72	Special module failure [Always]	Hardware error is detected in special module or communication module.	Run	Run	
74	Comm. module configuration error [Download]	Configuration error is detected in communication module.	Run	Run	
77	FLASH writing failure [FLASH writing]	Failure has been detected in writing FLASH memory or the number of writing times has been exceeded.	Run	Run	
78	Parameters in FLASH check sum error [Power on]	Checksum value of parameters in FLASH (IP address, etc.) does not match the checksum calculated.	Run	Run	

 : ON,  : Blink,  : OFF

CAUTION

If error cause is removed, error code remains except for error code 71 (battery error).
71 Error and ERR LED blinking automatically disappear if battery is replaced to new one.

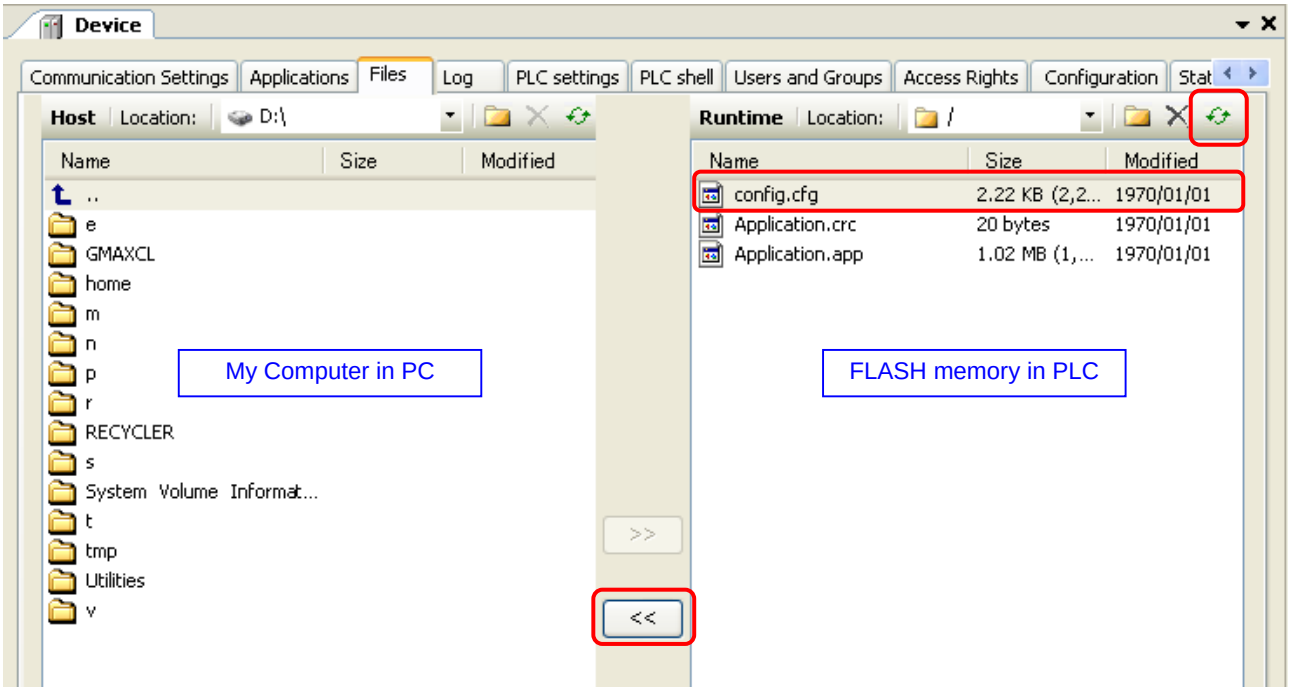
21 Error

(1) If boot application and application are different, 21 error appears at power up. The reason is as follows.
Each application has GUID (globally unique identifier) and this GUID is changed if the application is recompiled (Clean & Build). After downloading of application, this GUID is saved in retain memory. Boot application has GUID also. At every power up, the both GUID are compared and if they are different, 21 error appears.

(2) Due to above mentioned GUID mechanism, when boot project is loaded and battery is empty or disconnected at that time, CPU does not start with 21 error. For this reason, be sure to install a battery even if you don't use retain data or real time clock. If you do not want to use a battery or if application must start regardless of battery full or empty, 21 error can be disabled as follows.

How to edit config.cfg file

1. Open "Device" and click "Files" tab as below.
2. After establishing communication (set active path), click update icon  in the right field.
3. The left field is inside of your PC. Specify a folder to upload config file.
4. Choose config.cfg and click  button.



5. Go to specified folder at #3 and open the config.cfg with text editor.
6. In this file, there is a description shown below. Change "1" to "0" and save as same name.

```
[CmpApp]
Bootproject.RetainMismatch.Exception=1
                    ↓
Bootproject.RetainMismatch.Exception=0
```

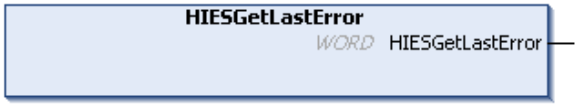
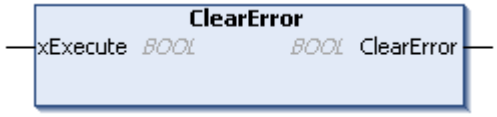
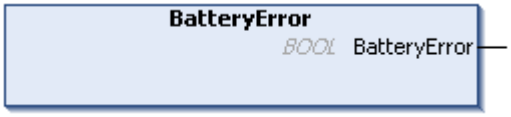
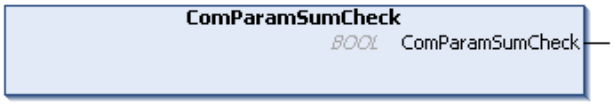
7. Click the updated config.cfg in the left field and click  button.
8. Now config.cfg in CPU is updated.

Note

Config.cfg file has important parameters for CPU operation. Do not modify any other part in this file than described in this manual. Wrong modification could result in serious failure of CPU.

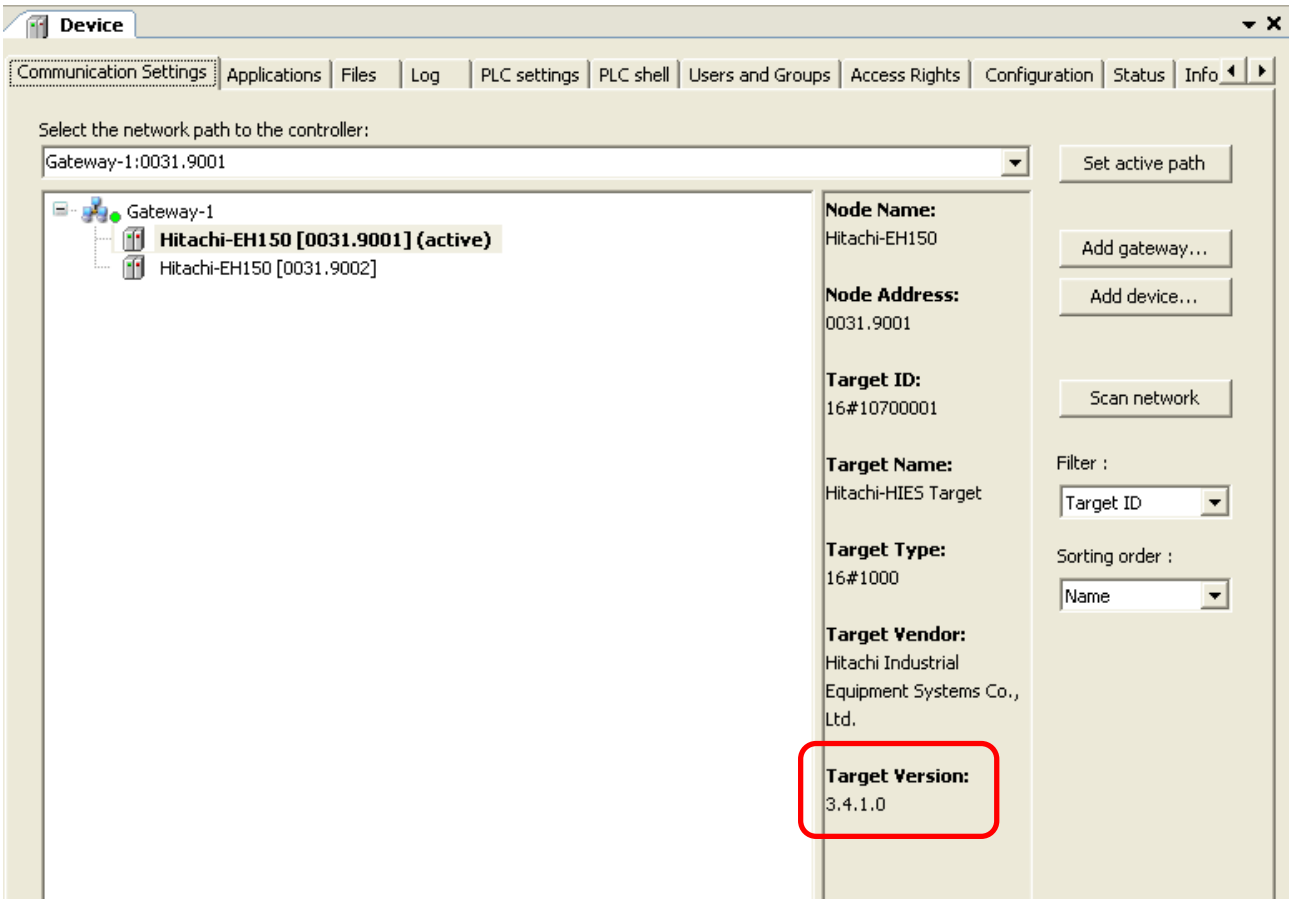
Error libraries

As for warnings (error code 70 to 78), special libraries called “CmpHitachiErrors” are available as below. Use them in your application program if necessary. If it is not registered in your library repository, install CmpHitachiErrors.library by choosing [Tools]-[Install library...].

Error code	Libraries (CmpHitachiErrors.library)	Input	Output
all		-	Last detected error code (WORD)
all		Execution bit to clear error code (BOOL)	Result (BOOL)
70	 (FB)	-	70 Error bit (BOOL) Unit number (WORD) Slot number (WORD)
71		-	71 Error bit (BOOL)
72	 (FB)	-	72 Error bit (BOOL) Unit number (WORD) Slot number (WORD)
74	 (FB)	-	74 Error bit (BOOL) Unit number (WORD) Slot number (WORD)
77		-	77 Error bit (BOOL)
78		-	78 Error bit (BOOL)

3.17 Version

Firmware version (Target-Version) of your CPU is monitored in communication settings of Device as below.



Chapter 4 Installation

For use in safety, avoid installing the PLC in the following locations.

- Excessive dusts, salty air, and/or conductive materials (iron powder, etc.)
- Direct sunlight
- Temperature less than 0°C or more than 55°C
- Dew condensation
- Humidity less than 20% or more than 90%
- Direct vibration and/or impact to the unit
- Corrosive, explosive and/or combustible gasses
- Water, chemicals and/or oil splashing on the PLC
- Close to noise emission devices

4.1 Installation

(1) Installing location and environment

(a) Install the PLC in Use the environment specified in the “2.1 General Specifications”.

(b) Mount the PLC onto the metal plate.

(c) Install the PLC in a suitable enclosure such as a cabinet which opens with a key, tool, etc.

(2) Installation of a base unit

(a) Precaution when installing the base unit

1] Fix the base unit securely with screws in 4 places (M4, length 20mm (0.79in.)or longer) or DIN rail.

2] In order to keep within allowable ambient temperature range,

a) Ensure sufficient space for air circulation. (50mm (1.97in.) or more at top and bottom, 10mm (0.39in.) or more at right and left)

b) Do not install close to equipment that generates a lot of heat (heater, transformer, large-capacity resistance, etc.).

c) If ambient temperature is more than 55°C, install a fan or a cooler so that the ambient temperature becomes below 55°C.

3] Do not install inside a cabinet with high-voltage equipments installed.

4] Install 200mm (7.87in.) or more away from high-voltage wires or power wires.

5] Do not install the PLC upside down in vertical nor in horizontal.

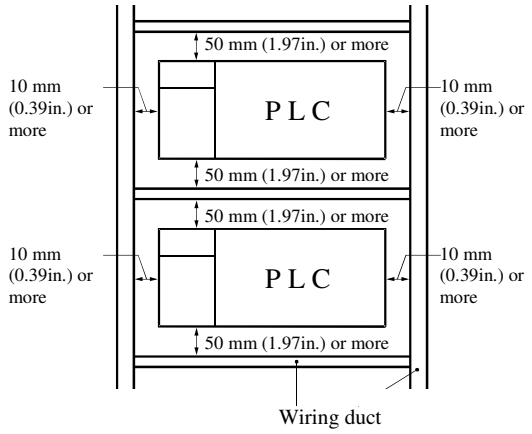


Figure 4.1 Amount of installation

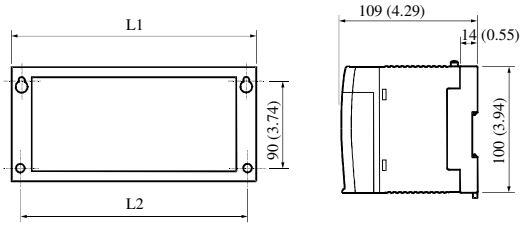


Figure 4.2 External dimensions

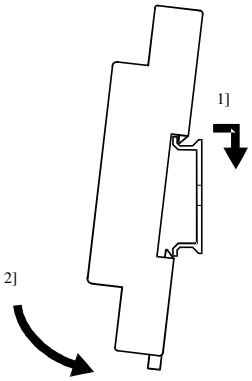
Dimensional table

Base	L1 (External dimensions)	L2 (Mounted dimensions)
3 slots	222.5 (8.76)	207 (8.15)
5 slots	282.5 (11.2)	267 (10.51)
6 slots	312.5 (12.30)	297 (11.69)
8 slots	372.5 (14.67)	357 (14.06)
11 slots	462.5 (18.21)	447 (17.6)

Unit: mm (in.)

(b) Mounting to a DIN rail

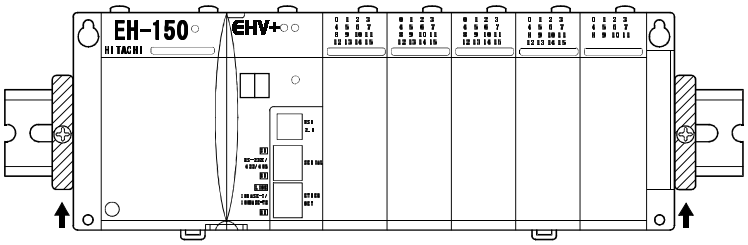
Attaching to a DIN rail



1] Hook the claw fixed at the bottom of the base unit, to the DIN rail.
2] Press the base unit into the DIN rail until it clicks.

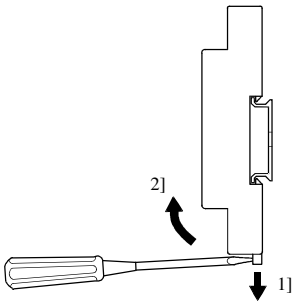
Note: Make sure the base unit is securely fixed after installation.

Fixing the unit



Secure the unit by installing DIN rail fixing brackets from both sides. (The product may go out of place if not secured within the fixing brackets.)

Removing the unit from the DIN rail

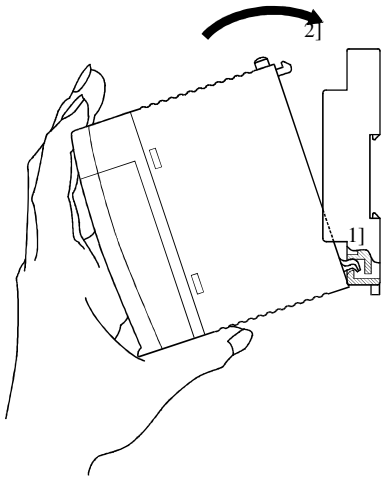


1] While lowering the DIN rail fixing mounting lever toward the bottom,

2] raise the base upward to remove.

4.2 Loading Module

(1) Installing

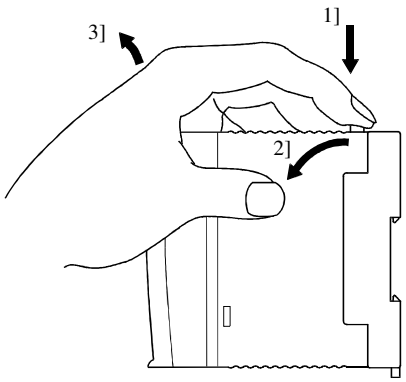


1] Hook the claw at the lower section of the module to the hole in the base.
2] Press in the upper side of the module until it clicks.

Note 1: Make sure the module does not come out after loading the module.
Note 2: Load the power module at the far left side of base unit.
Note 3: Load the CPU module and the I/O controller to the left of the power module.

It can reinforce with the screw after installation.
Use M4 × 10mm screws in this case.

(2) Removing



1] Push in the lock button.
2] With the lock button pushed in, pull the top of the module toward the front.
3] Raise it toward the top and pull it out.

Note: Pull the power module out while pushing down the two lock buttons.

4.3 Wiring

(1) Separation of power system

Several different power sources are used with PLC, such as main power of PLC, power for I/O signal and power for external devices. These power sources should be separated as much as possible.

If these power sources come from one power source, install transformers or noise filters to separate those power lines as much as possible.

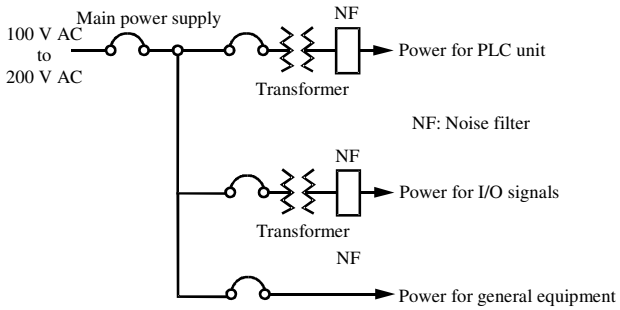


Figure 4.3 Example of power system diagram

(2) Fail safe

1] Construct an interlock circuit outside the PLC.

When the PLC power supply is turned ON/OFF, the lag time and the difference in the startup time between the PLC unit power and the external power (particular DC power supply) for the PLC I/O module signals may temporarily cause the I/O not to operate normally.

Do not control the power for the EH-YR12 relays to have it perform an interlock with the external load, etc. The relay may turn on even when the power has not been supplied by an aluminum electrolytic capacitor inside the module to drive the relay.

Also, it is conceivable that a fault in the external power and a failure in the PLC unit lead to abnormal actions. To prevent such actions from causing abnormal operation the entire system, and from a point of view of creating a fail safe mechanism, construct circuit such as an emergency stop circuit, the protect circuit, and the interlock circuit, for the sections that lead to a mechanical breakdown and accident from abnormal actions outside the PLC.

2] Install a lightning arrester

To prevent damage to equipment as a result of being struck by lightning, we recommend setting up a lightning arrester for each PLC power supply circuit.

The power supply module detects power failures from a voltage drop of the internal 5 V DC power supply. For this reason, the load in the 5 V DC power of the unit is light, the 5 V DC is retained for a long time and operations may continue for more than 100ms. Therefore, when using the AC input module, an OFF delay timer for coordinating with the internal 5 V DC is needed because the AC input signal turns off more quickly than the internal 5 V DC.

(3) Wiring to the power module

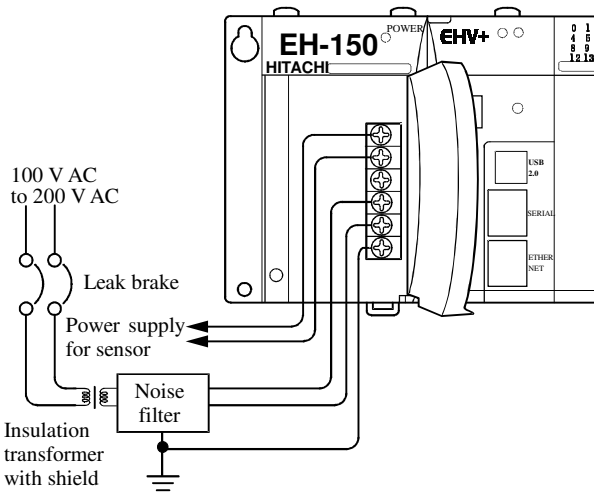


Figure 4.4 Wiring power diagram

(a) For power supply wiring, use a cable of 2 mm^2 (0.0031in^2.) or more to prevent a voltage drop from occurring.

(b) The function ground terminal (FE terminal) should use a cable of 2 mm^2 (0.0031in^2) or more and Class D grounding (100 Ω or less). The appropriate distance for ground cable is within 20m (65.62ft.).

1] Shared with instrumentation panel, relay panel grounding.

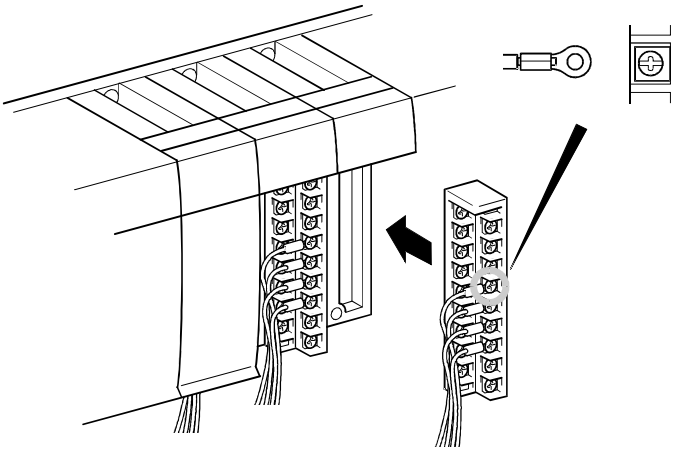
2] Avoid joint grounding with equipment that can generate noise such as high-frequency heating furnace, large power panel (several kW or more), thyristor exchanger, electric welders, etc.

3] Be sure to connect a noise filter (NF) to the power cable.

(c) A terminal screw is an M3. Tighten screws within a torque range of 0.49 to 0.78 N·m when wiring.

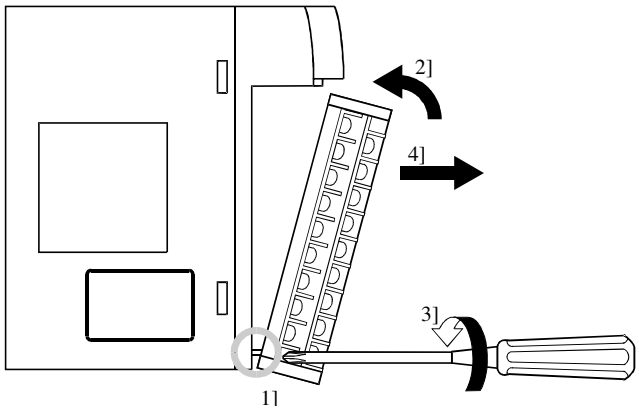
(d) Use the same power supply system for the basic and expansion units.

(4) Wiring cable for I/O signals



A screw for all terminals is M3.
Tighten within a torque range of 0.49 to 0.78 N·m.
Use a crimp terminal with an outer diameter ot 6mm (0.24in.) or less when using it.
Use only up to 2 crimp terminals in the same terminal. Avoid claming down more than 3 at the same time.
Use a cable thickness of 0.75mm^2 (0.0011in^2.) at the maximum. (Use a 0.5mm^2 (0.00075in^2.) cable when adding 2 crimp terminals in the same terminal.)
Note: Use shielded cable for the relay output module when corresponding to CE marking EMC command is necessary.

Attaching the terminal block



1] Align the tip of a terminal block mounting screw to the screw section of the I/O cover insertion fittings.

2] Push in the top of the terminal block until the I/O cover claw section locks with a click.

3] Tighten terminal block mounting screws while holding down the upper part of the terminal block.

4] Pull on the top of the terminal block to make sure that it is locked and cannot come out.

Note: Always reinstall it following the instructions above if the terminal block is removed.

(5) Input wiring for the input module

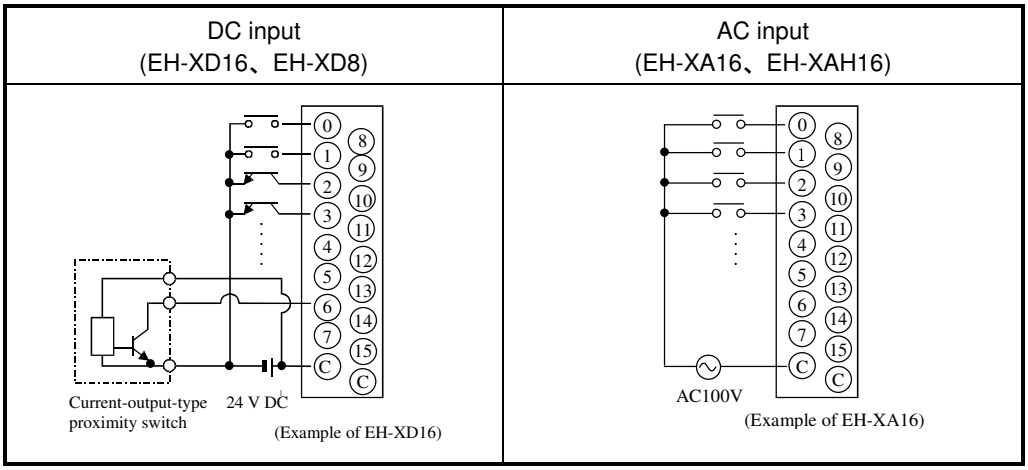


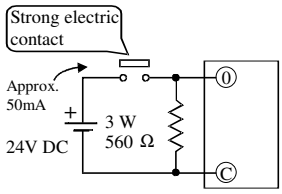
Figure 4.5 Input wiring

(a) DC input module

1] When all input terminal (X0, X1, …) and the common terminal (C) are loaded with 24 V DC, the input changes to ON, and approximately 6.9 mA current in case of EH-XD8 and approximately 4 mA current in case of EH-XD16, flow to the external input contacts.

2] For sensors such as a proximity switch and photoelectric switch, current-output-type (transistor open collector) can be directly connected. For voltage-output-type sensors, connect them to the input terminal after first going through the transistor.

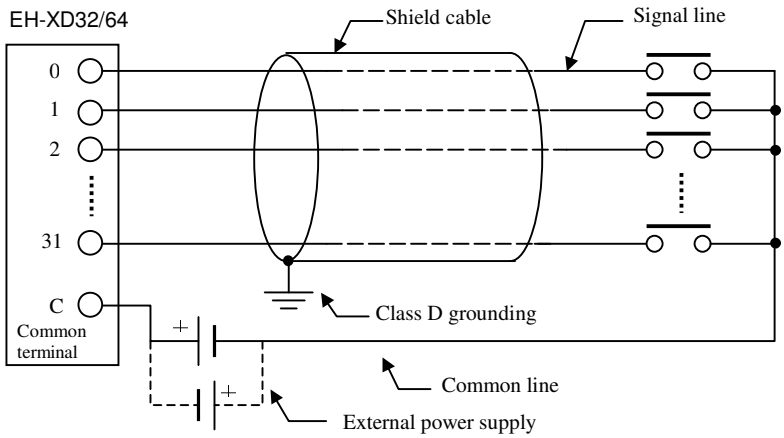
3] Measures to prevent faulty contact in a strong electric contact



The current that flows to a contact when external contacts are closed is approximately 6.9mA for the EH-XD8, and approximately 6.9mA for EH-XD16. If the use of a strong electric contact cannot be avoided, add resistance as shown in the diagram at left and supply sufficient current to the contact to prevent a faulty contact.

4] Limit the wiring length within 30 m (98.43ft.).

(b) Wiring for 32/64-point input module (EH-XD32,EH-XD64) (Based on CE marking)



Note:

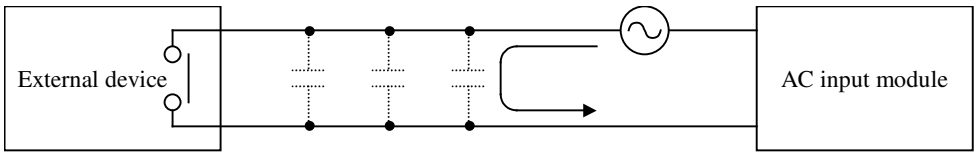
1] Wire only the signal line through the shield cable, and provide class D grounding on the shield cable side.

2] Do not wire the common line or S terminal line through the shield cable. Be sure to wire them independently and separately from the power line, I/O lines or power supply line.

3] The supply line to the external power supply should be wired as close as possible to the common terminal of the output module.

(c) AC input module

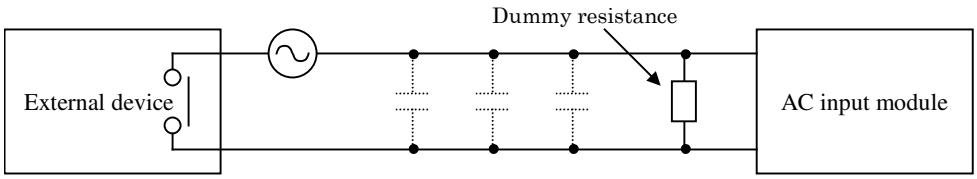
When using the AC input module, if the wiring route gets longer, a phenomenon that voltage is generated on the input terminal though there is no signal actually because the leak current flows by the stray capacity between wirings may occur.



There are the following two methods 1] and 2] as measures. Please limit the voltage caused by the electrostatic combination on the input terminal to half of the maximum OFF voltage of the input module.

1] Lower impedance of the input module by connecting the dummy resistance with the input terminal in parallel.

2] Connect the external power supply to the external device side.



(6) Output wiring for the output module

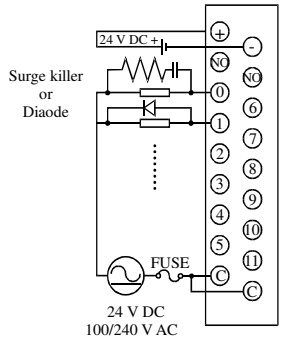
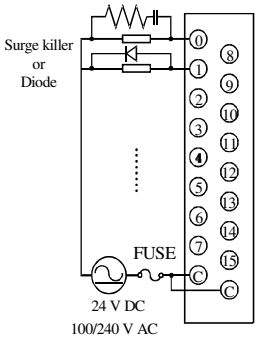
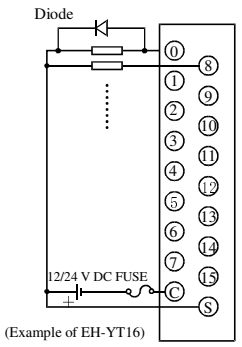
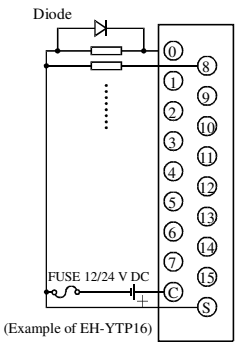
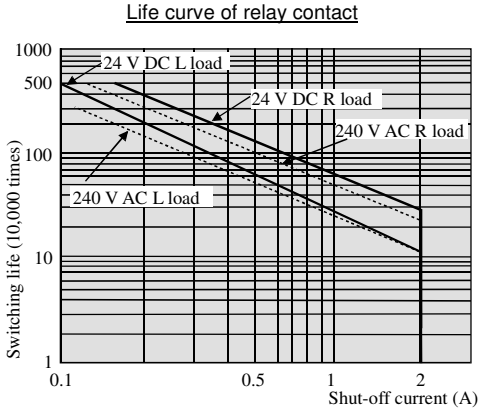
Item	Relay output (EH-YR12)	Relay output (EH-YR16)	Transistor output (sink type) (EH-YT16、EH-YT8)	Transistor output (source type) (EH-YTP16、EH-YTP16S、EH-YTP8)
External wiring				

Figure 4.6 Output wiring

(a) Wiring for the relay output module

1] Life of relay contact



Life of the contact is also in squared reverse proportion to the current, so be aware that interrupting rush current or directly driving the capacitor load will drastically reduce the life of the relay.
When switching is done with high frequency, use a transistor output module.

2] Surge killer

For inductive load, connect a surge killer (capacitor 0.1μF, + resistance of around 100 Ω) in parallel to the load. Also, for DC load, connect a flywheel diode.

3] Fuse

A fuse is not built in this module. Install a 6A fuse in the common to prevent the external wiring from burning out.

4] Power supply for driving the relay

If a 24 V DC power supply is connected to drive the relay, take care with respect to the polarity when connecting. There is a risk that the internal circuit will be damaged if the wiring is done incorrectly. Also, do not perform an interlock, etc. to the external load with the power supply for driving the relay.

(b) Wiring for the transistor output module

1] Flywheel diode

For inductive load, connect a flywheel diode in parallel.

2] S and C terminals

Always connect an S terminal and C (common) terminal. If the module is used without connecting these terminals, the internal flywheel diode does not function and there is a risk that the module will malfunction or breakdown.

3] Fuse

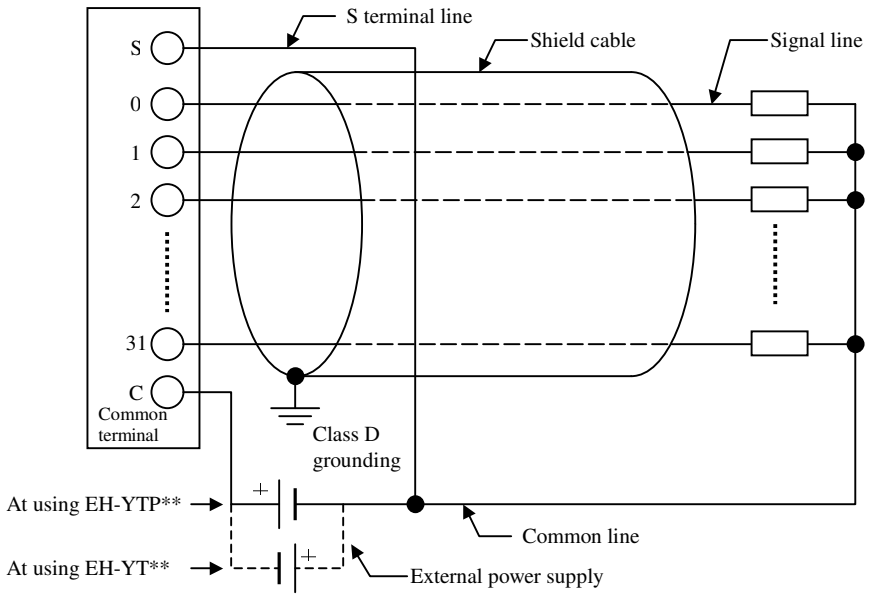
A fuse is inserted in the common to prevent the external wiring from burning out, but this does not protect transistor elements. Therefore, note that these elements are destroyed when the external load is short-circuited. Please contact us for repair if the external load short-circuits.

Also, if the fuse blows, there will be no output even if the LED lights up. (The fuse out lamp for the module at this time as well as a CPU module error will not be displayed.)

Note: If the fuse is melted or blown, do not supply power to the module after changing the fuse without eliminating the source of the problem. Damage escalation, smoke, etc., may otherwise result.

(c) Wiring for the 32/64-point output module (EH-YT32/YTP32,EH-YT64/YTP64) (Based on CE marking)

EH-YT32, EH-YTP32



Note:

1] Wire only the signal line through the shield cable and provide class D grounding on the shield cable side.

2] Do not wire the common line or S terminal line through the shield cable. Be sure to sire them independently and separately from the power line, I/O lines or power supply line.

3] The supply line to the external power supply should be wired as close as possible to the common terminal of the output module.

(7) I/O wiring for the analog module

- Do not apply excess voltage to the analog input module beyond the rated input voltage. Similarly, do not subject the module to current that exceeds the rated input current. Connecting the analog input module to a power supply other than the specified types may cause damage to the product or burning or its internal components.
- For unused channels of the analog input module, short the input terminals before use.
- For unused channels of the analog output module (unused current output channel, 2 to 3 channels), short the outputs before use.
- When wiring the external lines of the analog module, route then through the shield cables while separating them form other power lines or signal lines subject to differential voltage. Shield cables must be grounded on one side. However, whether it is more effective to ground on one side or leave both sides open, depends on the noise environment condition in the actual use. Provide appropriate grounding based on the noise environment.
- Use separate piping for the AC power supply line and the signal/data lines.
- Wire the signal lines and data lines as close as possible to the grounded surface of the cabinet or a metal bar.

(8) Wiring to the module terminal

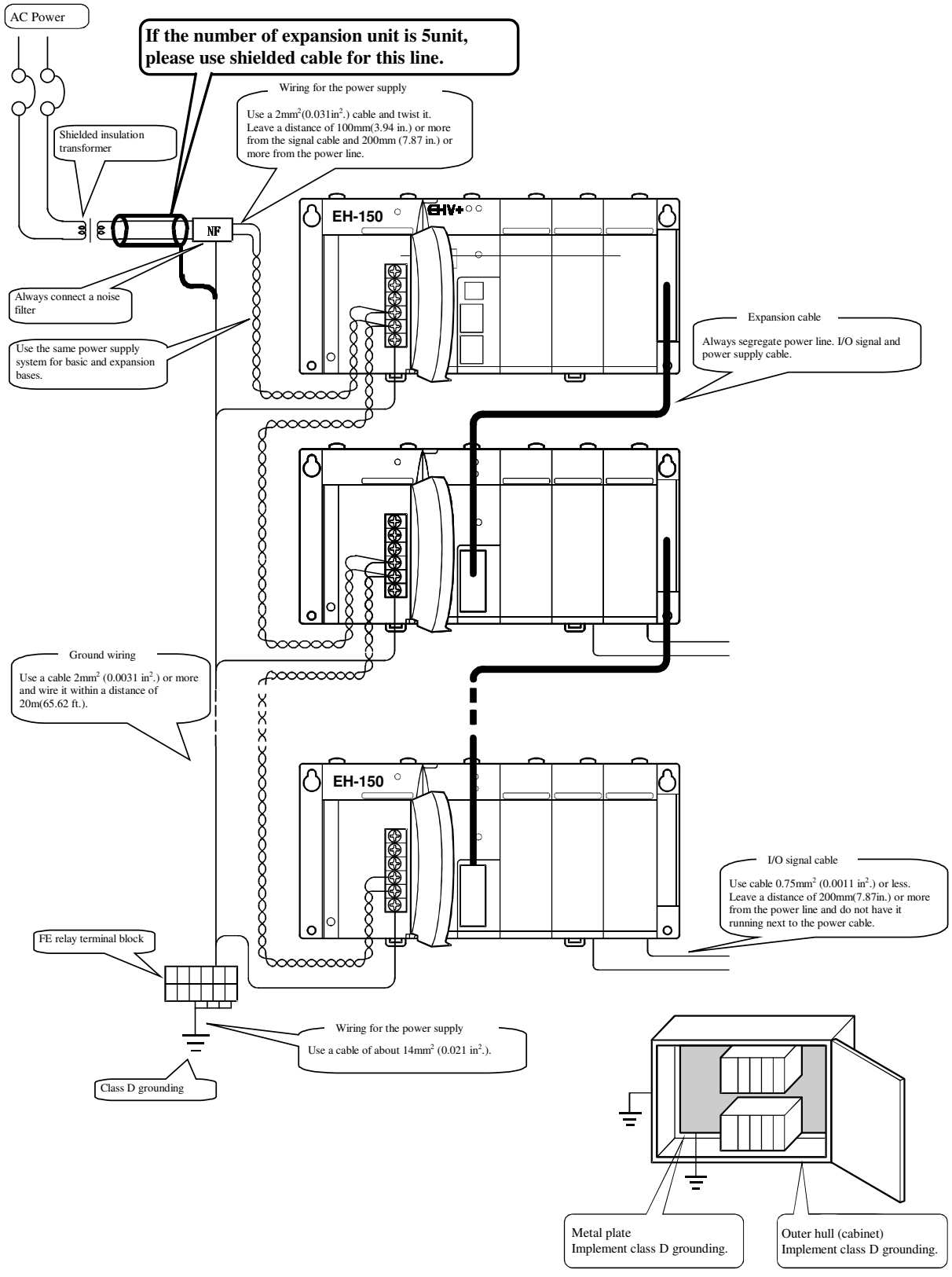


Figure 4.7 Example of wiring

MEMO

Chapter5 Maintenance

In order to use the PLC in the best condition and maintain the system to operate properly, it is necessary to conduct daily and periodic inspections.

5.1 Daily and Periodic Inspection

(1) Daily inspection

Verify the following items while the system is running.

Table 5.1 Items for daily inspection

Item	LED display	Inspection method	Normal status	Main cause of error
Power module display	POW	Visual check	ON	Power supply error, etc.
CPU module display	RUN	Visual check	ON (Running)	OFF: Microprocessor error, memory error, etc. Refer to chapter 3 for further information.
	ERR	Visual check	OFF	ON: Serious errors such as microprocessor error or memory error, etc. Refer to chapter 3. Blink: Battery error (71 error)
	7-segment	Visual check	00	Self-diagnosis error code is displayed. Refer to chapter 3.

*1 If power off time is more than 1 week after battery error detected (ERR LED blinking), retain data and realtime clock data could be lost due to battery empty. If power off time is long enough, it is possible that a battery becomes empty while this power failure. In that case, retain data and realtime clock data would be already lost in the next power up.

(2) Periodic inspection

Turn off the power for the external I/O circuit, and check the following items once every six months.

Table 5.2 Items for periodic inspection

Part	Item	Check criteria	Remarks
Programming device to CPU	Check the operation of the programming device	All switch and display lamps work properly.	
Power supply	Check for the voltage fluctuations	85 to 264 V AC	Tester
I/O module	Output relay life	Electrical life 200,000 times Mechanical life 10 million times	Refer to the relay contact file curve (chapter 4).
	LED	Turns ON/OFF correctly	
	External power voltage	Within the specification for each I/O module.	Refer to the specifications of I/O module
Battery (Lithium battery)	Check voltage and life	ERR lamp flashes. Within 2 years after replacement.	
Installation and connecting areas	(1) All module are securely fixed. (2) All command fits snugly. (3) All screw is tight. (4)All cables are normal.	No defects	Tighten Check insertion Tighten Visual check
Ambient environment	(1) Temperature (2) Humidity (3) Others	0 to 55 °C 20 to 90 % RH (no condensation) No dust, foreign matter, vibration	Visual check
Spare part	Check the number of parts, the storage condition	No defects	Visual check
Program	Check program contents	Compare the contents of the latest program saved and CPU contents, and make sure they are the same.	Check both master and backup.

5.2 Product Life

The lifetime of electrolytic capacitors used in the power module is limited. Electrolytic capacitors are used in some of I/O modules to improve noise resistance. If the lifetime is exceeded, performance of product is not guaranteed. Be sure to conduct inspection and maintenance as follows.

(1) Power module

Many electrolytic capacitors are used in the power module. It is said that lifetime of electrolytic capacitor would be half when ambient temperature increases 10 °C.

If lifetime of electrolytic capacitor is exceeded, output power becomes unstable especially when output current is high due to many point of outputs are activated for example.

Prepare spare units with considering 5 years lifetime in case ambient temperature is 30°C. For longer lifetime, take account of installation location in terms of temperature and air circulation around power unit and.

(2) CPU module

Some electrolytic capacitors are used in CPU module also. I If lifetime of electrolytic capacitor is exceeded, more errors could happen since noise resistance is not enough. Be sure to overhaul CPU module periodically.

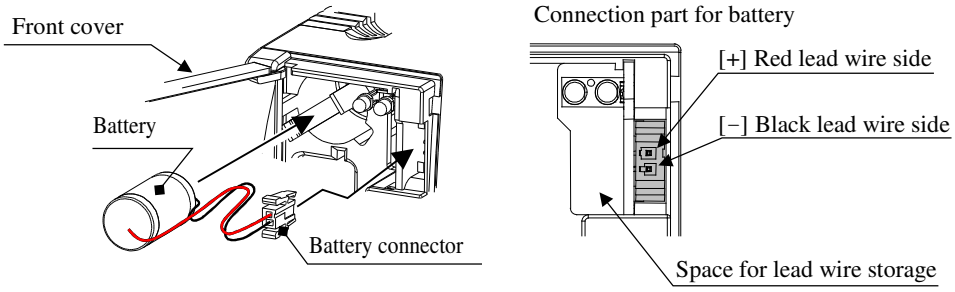
CPU module has a battery to maintain realtime clock data and retain memory. Be noted following points about lifetime of battery.

- The battery life as shown below is total power failure time of PLC.
- When ERR LED blinks and error code 71 is displayed, replace a battery to new one.

As a guideline, replace a battery every two years even when the total power failure time is less than the guaranteed value shown in the table.

Battery life (Total power failure time)[Hr]	
Guaranteed value (MIN) @55°C	Actual value (MAX) @25°C
2,000	17,700

How to replace the battery



Do not open the front cover more than 90 degree when installing and removing the battery.

Figure 5.1 How to replace the battery

1] Prepare a new battery (LIBAT-H).
2] Confirm that the latest program is saved in your PC. If not, it is recommended to save for safety.
3] Power of PLC does not have to be removed while replacing battery.
4] Remove the old battery from the battery case and disconnect the battery cable from CPU.
5] Connect battery cable of new battery to CPU. (Red cable is to ⊕ and black is to ⊖.
6] Fold the excess lead wire and store it in the space for lead wire storage.
(Otherwise, the wire may be damaged by the front cover.)

* If replacing the battery without power supplied, power off time should be less than 1 minute.

⚠ DANGER

Precaution when handling the battery.

Use LIBAT-H for the new battery. Be careful because a false replacement may cause the battery to explode.

Do not connect + and – of the battery reversely, charge them , take them apart, heat them, throw them into the fire, short them.

⚠ CAUTION

Disposal (collection) of the battery

Old battery should be individually put in plastic bag or similar (to prevent short circuit and a disposal company should be requested to dispose of them.

MEMO