HITACHI PROGRAMMABLE CONTROLLER

EH-150 EHV-CPU

APPLICATION MANUAL

(SERVICE MANUAL)

NJI-481F(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 wither 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.

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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 blow:

: 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.

⚠ CAUTION

- Use power supply unit of EH-PS series for supplying electric power.

⚠ CAUTION

- Do not connect DC power supply module EH-PSD to a master power circuit. Supply a power to EH-PSD through an appropriate isolation transformer less than up to 150VA by all means.

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	2006.03	NJI-481(X)
2	- EHV-CPU64/32/16 has been added and the manual has been reorganized accordingly.	2006.10	NJI-481A(X)
3	- The special internal output WFRE9F and MBMST command have been added. - Typos correction. Modified chapter: 6, 7, 14, Appendix 2, 3	2007.01	NJI-481B(X)
4	- New modules have been added. - “Comment transfer in RUN” was added. - Improvement of “ASR communication ” was added. - Error Code, the special internal output were added. - Words and terms have been changed according to the instruction manual of Control Editor. Modified chapter: 1, 2, 3, 5, 6, 9, 10, 12, 14, Appendix 2, 3	2009.11	NJI-481C(X)
5	- Japanese version and Chinese version of programming software have been added. - “USB2.0FullSpeed” has been added. - The setting example has been added to the descriptions of the unit number of I/O Controller. - Typos correction. Modified chapter: 3, 4, 5, 9	2010.02	NJI-481D(X)
6	- New modules have been added. Redundant power supply(5.1), Redundant base unit(5.2) Memory board(5.4), TTL I/O module(6), Isolated Analog I/O module(7.3), Compact LINK module(9.9) - Caution of power supply was added in safety precaution. - Notation of general specifications in Chapter 3 was changed. - Add operation error code to Appendix 1. - Add note to reset condition of Appendix 2. Modified chapter: All chapters	2013.03	NJI-481E(X)
7	- Add the description of Modbus-TCP server function to Chapter 2.1. - Add the description of Modbus-TCP server function to Table 4.1. - Add error code about Modbus-TCP server function to Table 14.1. - Add bit special internal output about Modbus-TCP server function to Appendix 2.1.	2014.04	NJI-481F(X)

Table of Contents

MEMO

Chapter 1 Introduction

Thank you very much for choosing Hitachi Programmable Controller (hereinafter referred to as PLC) EH-150 series.

This is a manual, which has reedited the EH-150 Application manual (NJI-280(X)), for EHV-CPU which is a higher module of EH-150 series CPU module.

The contents relevant to programming has been separated as a programming manual.

Please read this manual and the following manuals carefully when constructing a system using EHV-CPU module.

Table 1.1 List of Description materials

Items	Title of material	Manual number
EH-150	EH-150 (EHV) Application manual	NJI-481*(X)
	EHV-CPU Programming manual	NJI-482*(X)
Programming software	Control Editor	NJI-486*(X)

* A final number of the manual number may change according to updating version

1.1 Doing after unpacking

(1) Installation of a battery

EHV-CPU is shipped without connecting a battery. (The battery is packed in the module but not connected to a battery connector.)

If you want to use a clock function and hold internal data when the power is off, please use EHV-CPU after connecting the battery.

Refer to “Chapter 13 Maintenance and Inspection” in this manual for installation of a battery.

(2) Initializing of user program

Since a memory in the EHV-CPU is not set at first, error code to mean memory error may be displayed on the 7-segment LED. Please initialize the memory in the EHV-CPU first after connecting a battery.

Reference

Initializing of CPU initializes a user program, a data memory (internal output), and part of a parameter. A communication parameter is not initialized.

(3) Setting of communication parameters

Communication parameters are effective when the power is on. Default value is set at the shipment. Therefore, turn the power supply on again after setting necessary parameters, connecting programming tools*.

(Set parameters are stored on a backup memory. Once setting is completed, there is no need to set later.)

* In connecting programming tools to a serial communication port and an Ethernet port, communication setting of programming tools should be set to the default values shown in Table 1.2. There is no parameter to need to ser.

Table 1.2 Communication parameter (at the shipment)

No.	Parameter			At the shipment
1	IP address	IP address		192. 168. 0. 1
		Subnet mask		255. 255. 255. 0
		Default gateway		0. 0. 0. 0
2	NTP	Valid / Invalid		Invalid
		Time zone		GMT + 09:00
3	Serial communication setting	Dedicated / General-purpose		Dedicated
		Port type		RS-232C
		Communication speed		38400 bps
		Protocol (Communication procedure)		Transmission control procedure 1 (1:1)
		Modem connection Yes or No		None
4	Ethernet communication setting (Task code)	Port 1	Valid / Invalid	Valid
			Port No.	3004
			Protocol	TCP/IP
		Port 2	Valid / Invalid	Valid
			Port No.	3005
			Protocol	TCP/IP
		Port 3	Valid / Invalid	Valid
			Port No.	3006
			Protocol	TCP/IP
		Port 4	Valid / Invalid	Valid
			Port No.	3007
			Protocol	TCP/IP
		Timeout time		30
5	Ethernet communication setting (ASR)	Port 1 Valid / Invalid		Invalid
		Port 2 Valid / Invalid		Invalid
		Port 3 Valid / Invalid		Invalid
		Port 4 Valid / Invalid		Invalid
		Port 5 Valid / Invalid		Invalid
		Port 6 Valid / Invalid		Invalid

(4) Setting of clock data (when using a click function)

If the power supply is turned on after unpacking (or after leaving EHV-CPU for a long time without connecting the battery), the clock data is updated from an initial value. The clock data should be set using a programming tool after connecting the battery when using a clock function.

Refer to “Chapter 13 Maintenance and Inspection” for setting of a clock.

Reference

An initial value of a clock is 00:00:00 on Saturday, January 1, 2000.

1.2 About Manuals

The application manuals for EH-150 series High-function modules are published.

For more details, refer to manuals of high-function modules shown in Table 1.3.

Table 1.3 Related manuals to EHV-CPU

Product name	Model	Type	Application manual number	
			Japanese	English
High-functional module	EH-PT4	Resistance temperature detective input	NJI-323	NJI-324(X)
	EH-CU	2 high-speed counter	NJI-321	NJI-321(X)
	EH-POS	Single-axis pulse positioning	NJI-314	NJI-315(X)
	EH-POS4	4-axes pulse positioning	NJI-409	NJI-409(X)
	EH-ETH	Ethernet communication	NJI-361	NJI-361(X)
	EH-ETH2	Ethernet communication	NJI-543	NJI-543(X)
	EH-LNK	Coaxial CPU link	NJI-381	NJI-381(X)
	EH-OLNK	Optical CPU link	NJI-395	NJI-395(X)
	EH-FLN2	FL-net interface	NJI-410	-
	EH-RMD	DeviceNet master station	NJI-364	NJI-364(X)
	EH-RMP	Profibus master station	-	NJI-332(X)
	EH-IOCD	DeviceNet slave station controller	NJI-364	NJI-364(X)
	EH-IOCP	Profibus slave station controller	-	NJI-333(X)
	EH-ID	ID reader interface	NJI-366	-
	EH-SIO	Serial communication interface	NJI-443	NJI-443(X)
	EH-UKW	UniWire interface	NJI-358	-
	EH-DBW	AnyWire interface	NJI-476	-
	EH-TRMME/ EH-TRMLE	Compact remote module (Master/slave)	NJI-536	NJI-536(X)
Software	EH-RMDCFG	DeviceNet configurater	NJI-364	NJI-364(X)

* A final alphabet of the manual No. represents the edition. An space means the first edition.

1.3 Combination with Control Editor

Version of Control Editor has been updated according to EHV-CPU64/32/16 improved.

Information of the project file used is changed depending on the version of Control Editor.

Table 1.4 Supporting CPU module

Version	EHV-CPU16	EHV-CPU32	EHV-CPU64	EHV-CPU128
Control Editor Ver.1.0*	×			○
Control Editor Ver.1.20	○			

Control Editor ver.1.04 or before are not supported to EHV-CPU 16 – 64. CPU does not work if the program is transferred from Control Editor ver.1.04. (Error indication ”3F”

A format of data created by “circuit write” in off-line mode or on-line mode on Control Editor ver.1.20 is different from data created on ver.1.40. Therefore, if a program created on ver.1.04 is in the CPU, the program does not match in connecting a monitor and on-direct.

If the program created on ver.1.04 is changed on ver.1.20 while Control Editor ver.1.20 is running, shift to the on-direct mode after reading PLC on the on-line mode.

Table 1.5 Compatibility with Control Editor Ver.1.0*

Control Editor Ver.1.0*	Compatibility	Control Editor Ver.1.20
Project file (*.prj)	→ ○ × ←	Project file (*.prj)
Object file (*.cnv)		(Unnecessary due to unifying to the project file)
I/O comment file (*.csv)*1	○←, →○	I/O comment file (*.csv) *1
I/O monitor information file (*.csv)	○←, →○	I/O monitor information file (*.csv) *2

*1 If the I/O comment is saved as the CSV file, the I/O comment is included in the project file.

*2 If the I/O monitor information is saved as the CSV file, the I/O monitor information is included in the project file on ver.1.20.

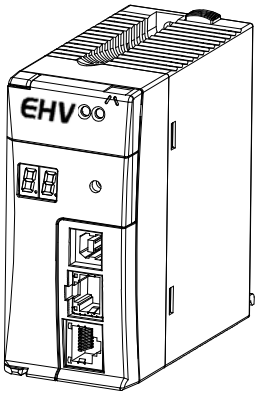
Chapter 2 Features

2.1 Features

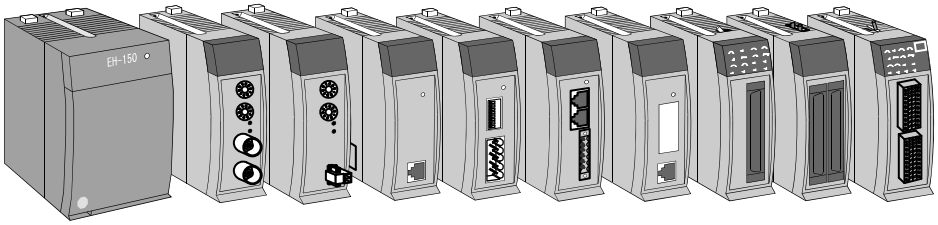
Compact size and stylish body fit for embedded control

EHV-CPU has realized a small size; 372.5mm (W) × 100mm (H) × 109mm (D) with 512 input and output points. A light color body, a slender design, miniaturization of an assembling machine and a device, and space-saving improve the image of EHV-CPU.

EHV-CPU128/64/32/16



EH-150 module

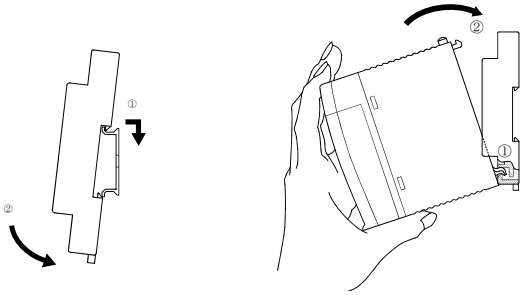


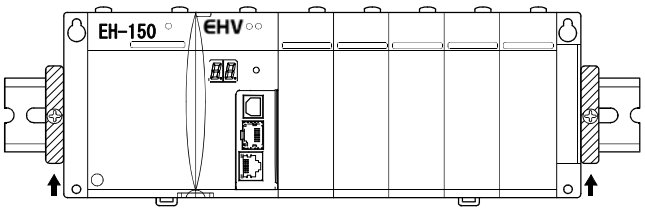
All modules of EH-150 series can be used.

EHV-CPU can use all modules of EH-150 series including input and output module and communication module and can expand 5 expansion base units at the maximum. 66 modules and 4,224 I/O points at the maximum are available (when using EHV-CPU128 and 64-point modules).

Good design for the maintenance when being built in into other devices

DIN rail Installation by snapping

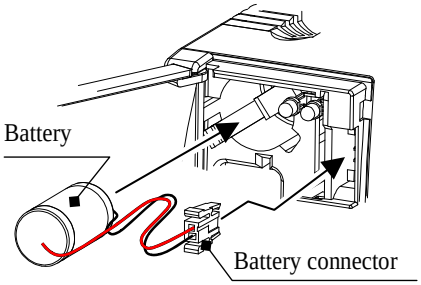




Using a flash memory to protect a user program from consumption of a battery

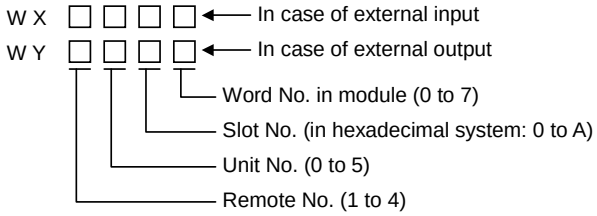
Battery replacement

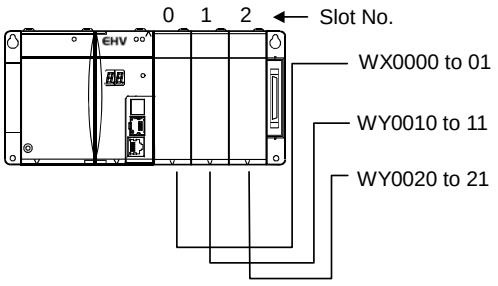
Data memory can be backed up using a battery. The battery can be replaced by opening the front cover without removing the CPU module from the base unit.



Fixed address system to recognize a mounting position by I/O No.

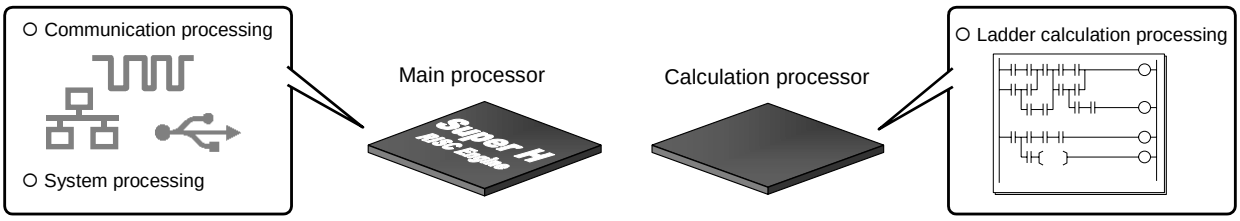
The fixed address system with which the input and output number is decided for every mounting slot is used. Change of the input and output module does not have an influence on other slots at all.





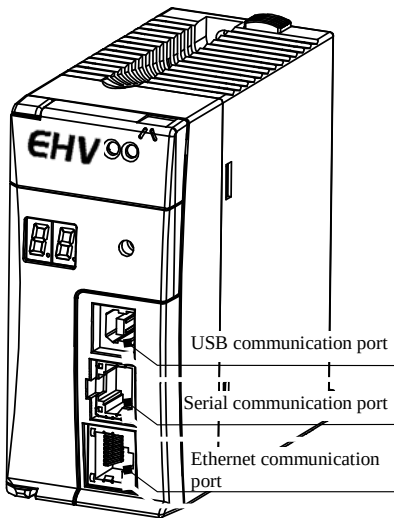
The top-ranking calculation processing speed and a great memory in the business

EHV- CPU module processes a high level and complicated control at high speed by being equipped with a high-speed processor for calculation in addition to a main processor which is RISC chip engine. The basic command 20ns on the calculation processor for a high-speed pipeline processing is realized The programming is possible regardless of the scan time.



And program capacity is 128k steps and data memory capacity is 228k words. (EHV-CPU128)

EHVCPU module　Built-in 3 kinds of communication ports as standard



USB communication port
EHV-CPU has a communication port for universal serial bus as standard.
This is a maintenance port for programming software. Programming software can be used in the notebook without RS-232C serial port.
Supporting USB2.0 Full Speed. Time to transfer a program can be reduced drastically.

Serial communication port
EHV-CPU has a serial port (RS-232C/422/485 changeover) like CPU currently in use. A dedicated procedure and a general-purpose procedure are supported.

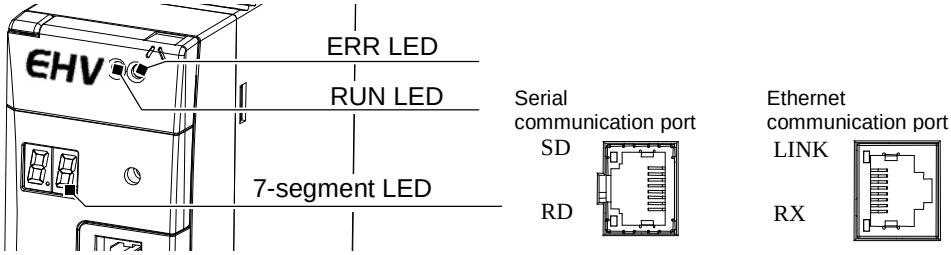
Ethernet communication port
EHV-CPU has a equivalent function to Ethernet communication module（4 dedicated procedure connections and 6 message communications). CPU module can support a network by oneself and 100BASE-TX also.
When communication failure has occurred, reset is possible from an internal output for every logical port (10 ports).

Power failure memory function

If the power supply of PLC is off, internal output data can be memorized. The memory area can be specified up to 10 areas. A un-sequence data can be specified by specifying an address range even if it is the same internal output.

LED display for operation status

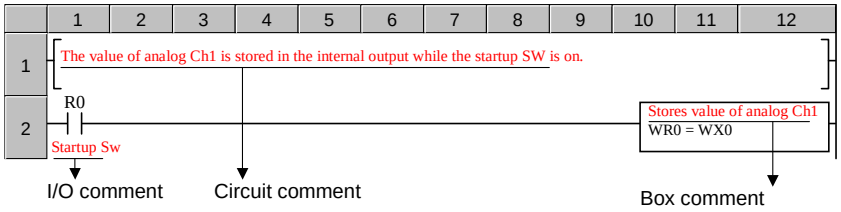
EHV-CPU is equipped with a 2-digit 7-segment LED display for operation status on the front of the module. Error code can be checked without connecting a programming software. Setting of error indication level, such as not displaying slight failure and warning, is possible. And user data, such as progress of a timer and a counter, can be displayed using a user program. Serial port and Ethernet port have a communication LED.



Comment storage function

Program comment is stored in other area with a program storage area. Maintenance of a user program is possible including comment without taking comment data with.

Even if comment is added, program memory is not consumed. All memory capacity for programming can be used by the user program.

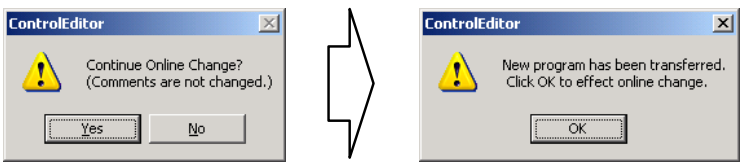


Change during RUN at high-speed

HALT time at the change during RUN has been shortened drastically.

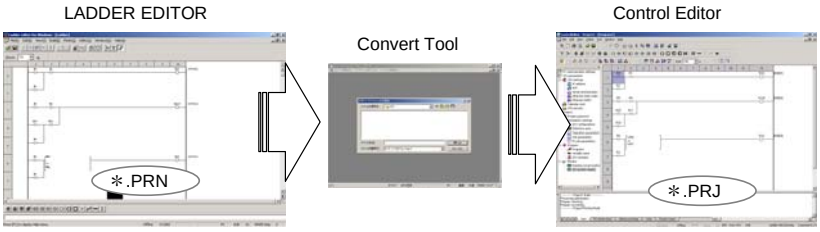
HALT time at the change of a point of contact is 100μs or less.

And there is a check-mode by which user can set a timing of the change during RUN. The change that synchronized in the operation status is possible easily.



Program conversion support tool to protect a program assets

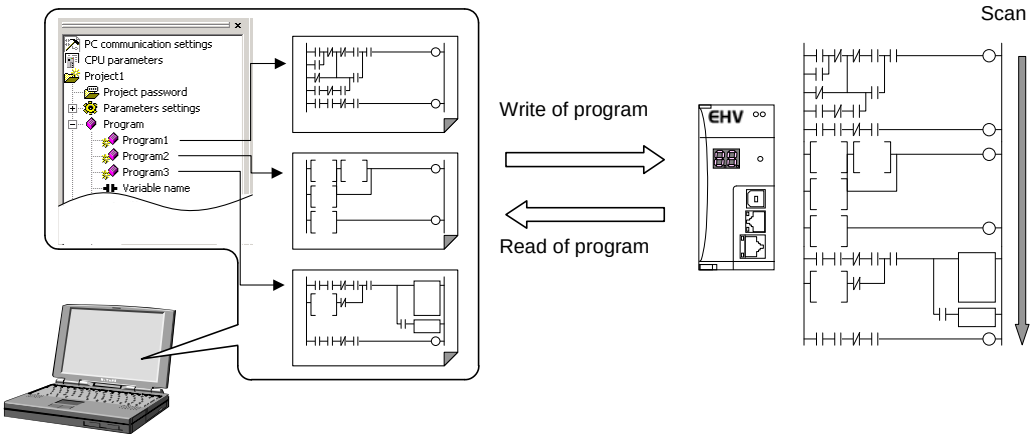
A support tool to convert a ladder program created by the LADDER EDITOR LADDER into a project file of the Control Editor is provided. A program assets currently in use can be used. (I/O comment can be read with only a CSV format file.)



* After converting by a convert tool, conversion by manual operation is necessary depending of commands. Refer to the instruction of Control Editor for details.

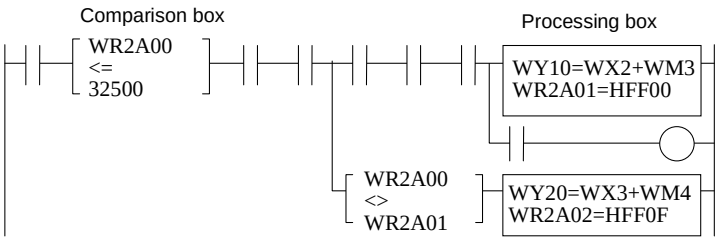
Supporting sheet construction for user program

Supports a program sheet structure which can perform management, diversion, combination, and division of a program easily



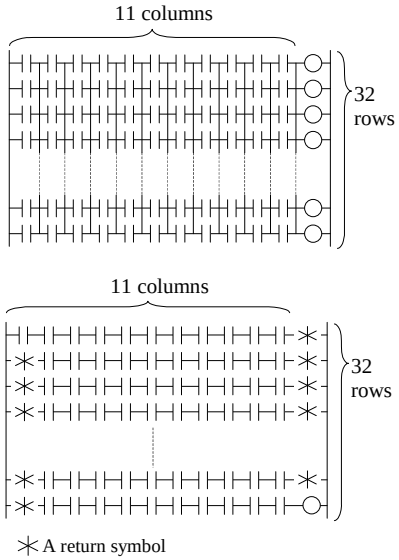
An easy command expression to understand

In addition to a point of contact and a ladder symbol of coil, supports a comparison expressed in a numerical formula. Beginners can create a program and also analyzing of a program created by others is easy.

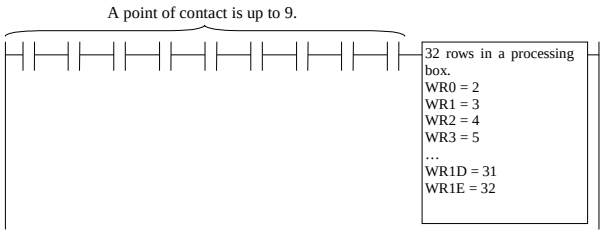


Reinforcement of ladder commands

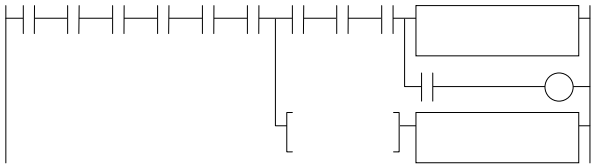
1] Supports 11 points of contact and 32 coils per one circuit at the maximum in ladder configuration.



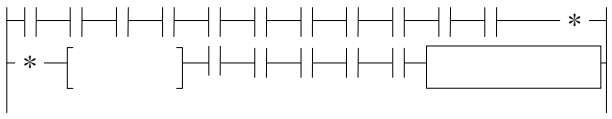
2] 32 rows can be described in arithmetic in a processing box.



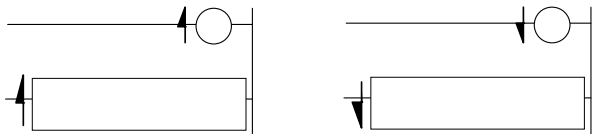
3] A processing box and a coil can be described in parallel.



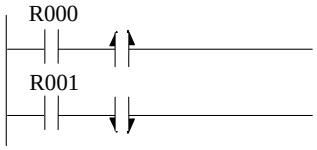
4] A return circuit, a comparison box, and a processing box can be described.



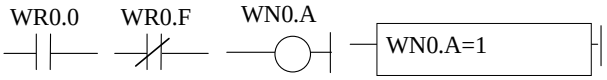
5] Supports a coil with edge and a processing box.



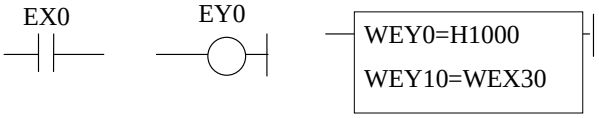
6] Unnecessary the edge (DIF/DFN) No. (Internal auto management)



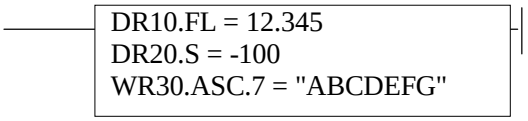
7] Bit cut (Example: WR0.0, WR100.B, etx.)



8] Supports the extension external input and output (EX/EY, WEX/WEY, and DEX/DEY)



9] Data indication format (with signed, floating point, and character string)



4 cycle programs

In addition to a program executed usually, a maximum of 4 cycle scan programs which are executed incorporating a normal program every hour can be created. The cycle can be specified between 1ms and 60,000ms. The shorter the set cycle is, the higher the priority to be executed is.

Image of a normal scan

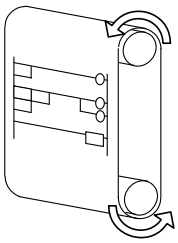
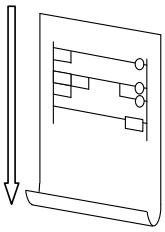


Image of a cycle scan



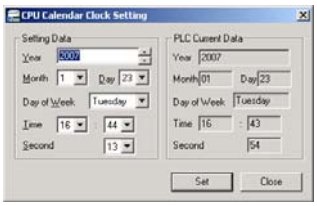
Calendar clock function

Built-in a real-time clock. A calendar function of current time (year, month, date, day, hour, minute, and second) can be used by connecting a battery.

A clock in a personal computer can be set simply by using a programming software.

A calendar clock can be updated by using NTP function to retrieve the current time from a clock server on the network.

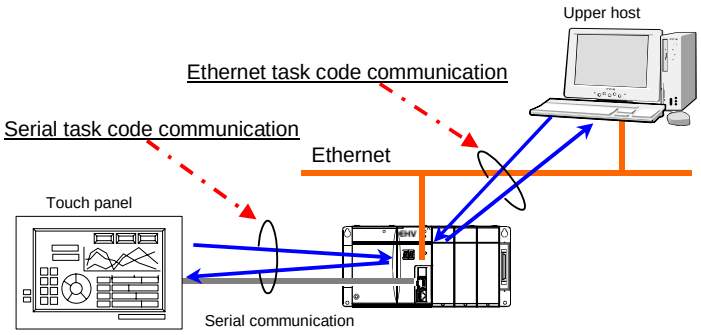
Setting of a calendar clock

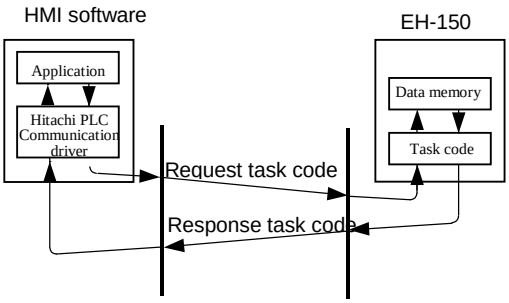


Setting of NTP

Task code communication

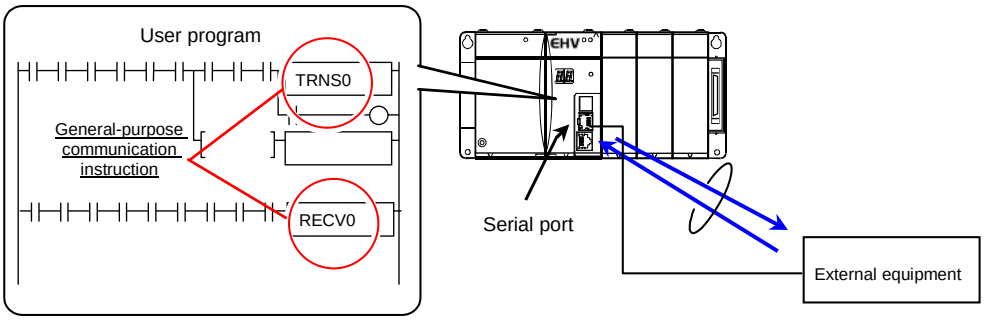
A dedicated procedure communication in Hitachi PLC is called a Task code communication. CPU control and the read/write of I/O are possible from the host. Each sale maker provides drivers for this tack code communication, such as a touch panel and HMI software. For compatible Hitachi PLC, it is unnecessary to create a special communication program.





General-purpose communication for Serial communication port

Serial communication port can be used as a general-purpose communication port which can control by a user program. Various setting for communication and processing for transmitting and receiving can be created with the user program, matching to external equipments.



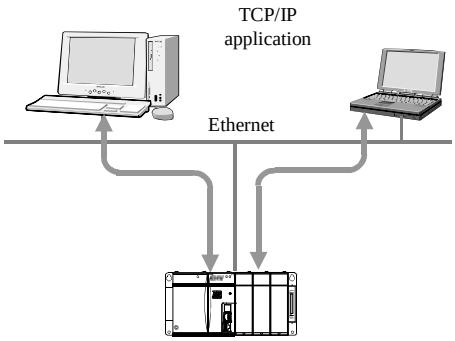
ASR communication for Ethernet communication port

ASR communication function can be used for the event transmitting function which transmits data from the CPU to the upper host actively at the event occurrence, the cycle transmission which transmits data to the upper host at constant interval, and when receiving message data from the upper host at any timing. There are 6 connections and the communication method can be specified respectively. Communication with the upper host is possible by only minimum setting.

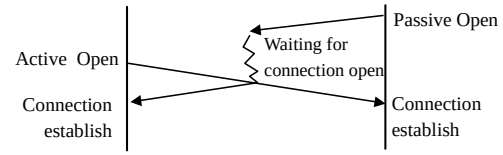
When communication failure occurs, communication can be restored without stopping the operation of CPU module because each logical port can be initialized respectively.

It becomes possible from software Ver.x112 or newer to change dynamically the sending data size in a ladder program, and to refer to the receiving data size. Please refer to the APPLICATION MANUAL for NETWORK (NJI-491B or newer) for further information.

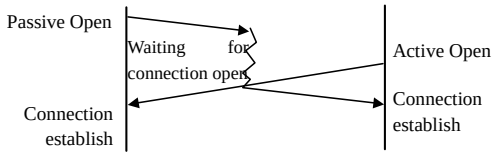
[Any procedure communication]



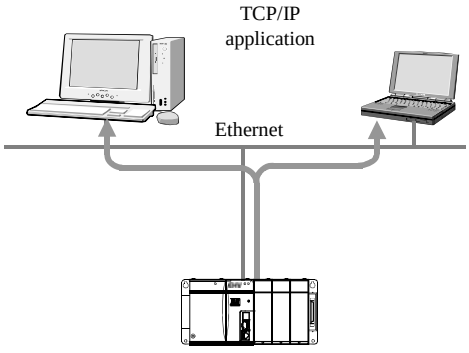
[Active Open]



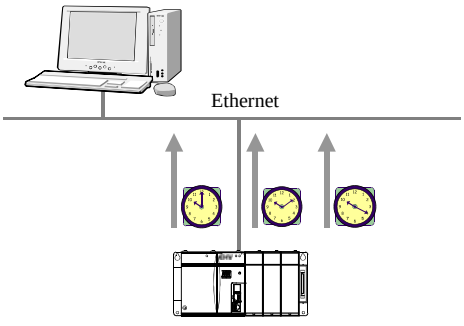
[Passive Open]



[Transmitting Broadcast]



[Cycle transmitting]



Modbus-TCP communication for Ethernet communication port

Modbus-TCP server function is added from CPU software version Vx129 or newer. Please refer to application manual network (NJI-491D or subsequent ones) for details.

2.2 System Configuration

(1) Single system

EH-150 is a module type programmable controller. The basic configuration is shown in Figure 2.1.

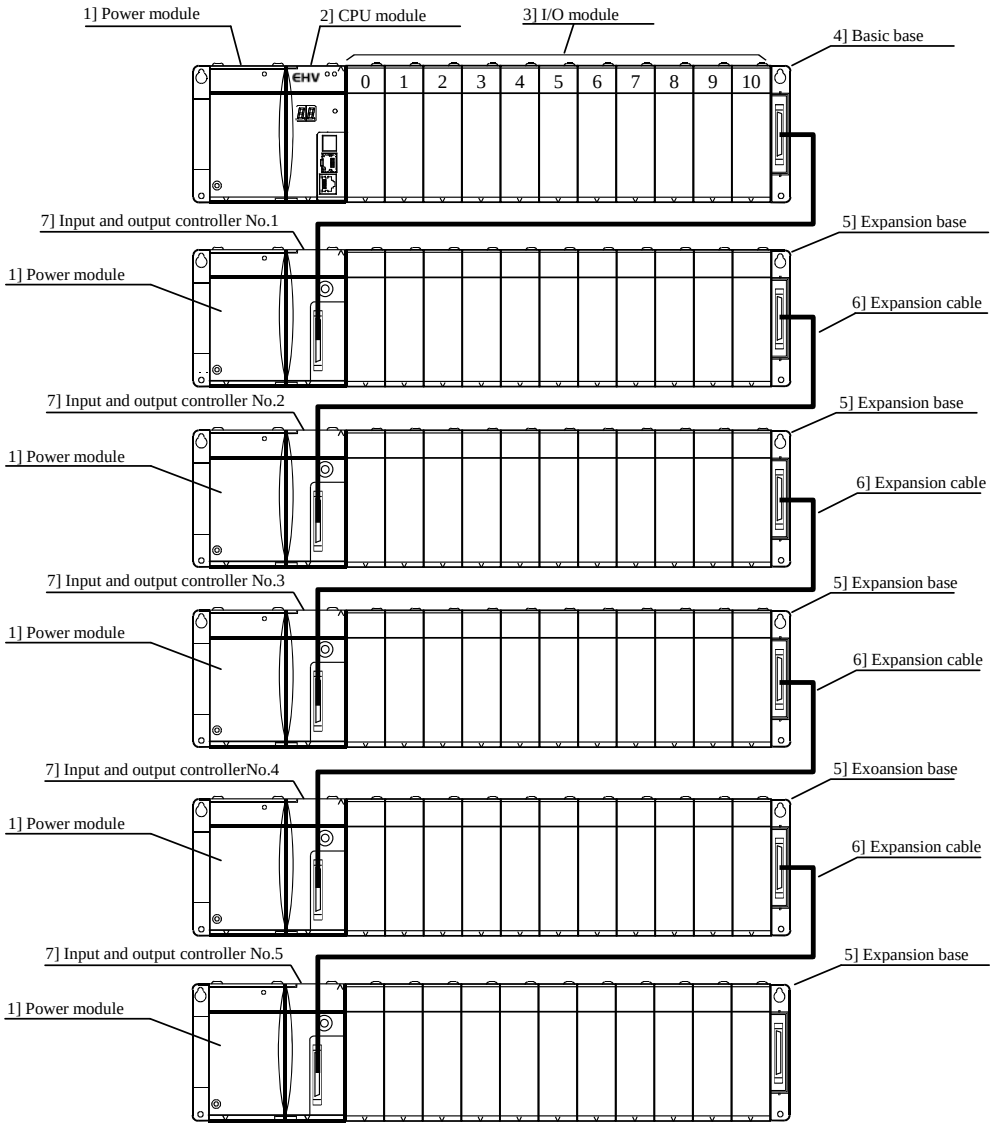


Figure 2.1 EH-150 System configuration diagram (EHV-CPU128)

No.	Device name	Description of function
1]	Power module	Converts power supply to the power to be used within the EH-150.
2]	CPU module	Performs operations based on the content of the user program, receives input and controls output.
3]	I/O module	Input module, output module, analog module, high-functional module, and communicate module
4]	Basic base unit	Base in which the power module, CPU module, I/O module, etc. are loaded.
5]	Expansion base unit	Base in which the power module, input and output controller, I/O module, etc. are loaded.
6]	Expansion cable	Cable to connect the input and output controller for the expansion base with the basic base. Use 2m betweens stations at the maximum and within 8m at total.
7]	Input and output controller	Interface between the expansion base and the CPU module.

* The basic base unit 4] and the expansion base unit 5] are the same product.

(2) Network system configuration

Network system configuration shown in Figure 2.2 can be constructed using various network modules of EH-150.

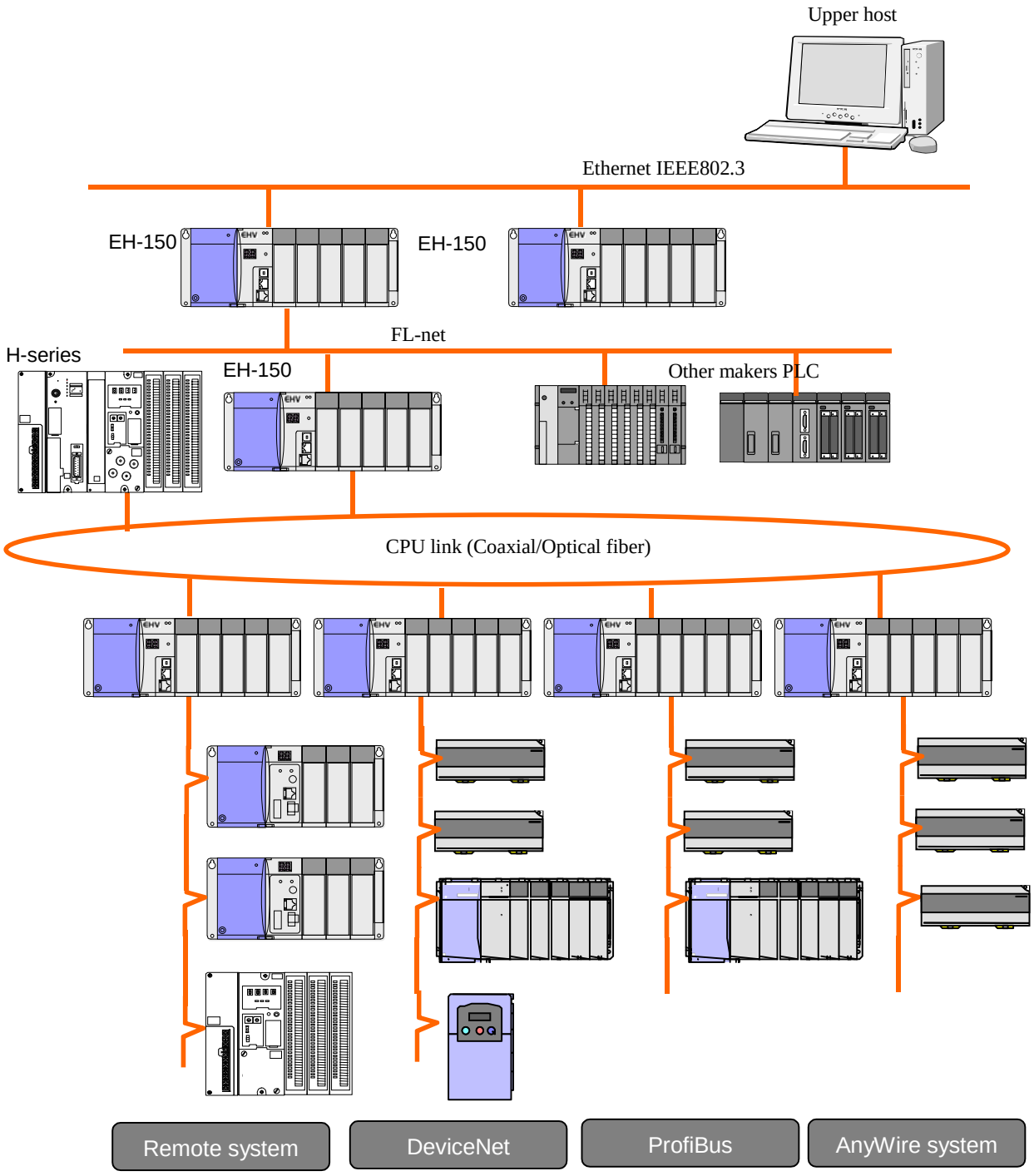


Figure 2.2 EH-150 Network system configuration diagram

MEMO

Chapter 3 General Specifications

3.1 General Specifications

Item	Specification
Operating ambient temperature	0 to 55 °C
Storage ambient temperature	-10 to 75 °C
Operating ambient humidity	5 to 95 % RH (no condensation)
Storage ambient humidity	5 to 95 % RH (no condensation))
Vibration resistance	Conforms to JIS C 60068-2-6
Noise resistance	○ Noise voltage 1,500 Vpp Noise pulse width 100 ns, 1 μ s (Noise created by the noise simulator is applied across the power supply module's input terminals. This is determined by this company's measuring methods.) ○ Conforms to IEC61131-2 ○ Static noise: 3,000 V at metal exposed area
Insulation resistance	20 M Ω or more between the AC external terminal and case ground (FE) terminal (based on 500 V DC)
Dielectric withstand voltage	1,500 V AC for 1 minute between the AC external terminal and case ground (FE) terminal
Grounding	Class D grounding (Ground with power supply module)
Usage environment	No corrosive gases, no excessive dust
Structure	Open, wall-mounted type
Cooling	Natural air cooling

3.2 List of System Equipment

(1) Modules

Product	Model name	Specification	I/O Assignment symbol
Power module*2	EH-PSA	Input 100 to 240 V AC Output 5 V DC 3.8 A, 24 V DC 0.4 A	—
	EH-PSD	Input 21.6 to 26.4 V DC Output 5 V DC 3.8 A	—
	EH-PSR	Input 100 to 240 V AC Output 5 V DC 5.6 A, (up to 45 deg ambient temp)	—
Input and output controller*2	EH-IOCH	Input and output control module (1 unit/1expasion)*1	—
	EH-IOCH2	Input and output control module (1 unit/1expansion)*1	—
Base unit*3	EH-BS3A	3 I/O modules installed.	—
	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.	—
	EH-BS8R	Redundant power supply, 8 I/O modules installed.	—
Memory board	EHV-MEM	Program transfer function	—
Digital input module	EH-XD8	8 points, 24 V DC input	X16
	EH-XD16	16 points, 24 V DC input	X16
	EH-XDL16	16 points, 24 V DC input, Intensified filter	X16
	EH-XD32	32 points, 24 V DC input	X32
	EH-XDL32	32 points, 24 V DC input, Intensified filter	X32
	EH-XD32E	32 points, 24 V DC input, Spring type terminal block	X32
	EH-XDL32E	32 points, 24 V DC input, Spring type terminal block, Intensified filter	X32
	EH-XD32H	32 points, 24 V DC input, Connector compatible with EM/H-200 series	X32
	EX-XD64	64 points, 24 V DC input	X64
	EH-XA16	16 points, 100 to 120 V AC input	X16
	EH-XAH16	16 points, 200 to 240 V AC input	X16
Digital output module	EH-YR8B	8 points, relay output (isolated contact point), 100/240 V AC, 24 V DC	Y16
	EH-YR12	12 points, relay output, 100/240 V AC, 24 V DC	Y16
	EH-YR16	16 points, relay output, 100/240 V AC, 24 V DC, 16 points/1 common	Y16
	EH-YR16D	16 points, relay output, 100/240 V AC, 24 V DC, 8 points/1 common	Y16
	EH-YT8	8 points, transistor output, 12/24 V DC (sink type)	Y16
	EH-YTP8	8 points, transistor output, 12/24 V DC (source type)	Y16
	EH-YT16	16 points, transistor output, 12/24 V DC (sink type)	Y16
	EH-YTP16	16 points, transistor output, 12/24 V DC (source type)	Y16
	EH-YTP16S	16 points, transistor output, 12/24 V DC (source type)	Y16
	EH-YT32	32 points, transistor output, 12/24 V DC (sink type)*4	Y32
	EH-YTP32	32 points, transistor output, 12/24 V DC (source type)*4	Y32
	EH-YT32E	32 points, transistor output, 12/24 V DC (sink type), Spring terminal block	Y32
	EH-YTP32E	32 points, transistor output, 12/24 V DC (source type), Spring terminal block	Y32
	EH-YT32H	32 points, transistor output, 5/12/24 V DC (sink type), Connector compatible with EM/H-200 series	Y32
	EH-YT64	64 points, transistor output, 12/24 V DC (sink type)	Y64
	EH-YTP64	64 points, transistor output, 12/24 V DC (source type)	Y64
	EH-YS4	4 points, triac output, 100/240 V AC	Y16
	EH-YS16	16 points, triac output, 100/240 V AC	Y16
TTL I/O module	EH-MTT32	16 points TTL output, 16 points TTL input, 4 to 27V DC	X1Y1W

* 1 EH-IOCH / EH-IOCH2 can be used together. However, use always EH-IOCH2 when expanding the 5th unit.

Type \ Unit No.	0	1	2	3	4	5	6 to 9
EH-IOCH	-	○	○	○	○	×	×
EH-IOCH2	-	○	○	○	○	○	×

* 2 CPU module, Power module, I/O controller, and etc. are mounted on the specified position. It is impossible to mount on any other positions.

* 3 EH-BS3, -BS5, and -BS8 cannot be used.

* 4 EH-YT32 and EH-YTP32 from May 2001 production or later are applied. (MFG No. 01Exx)

Product	Model name	Specification	I/O assignment symbol
Analog input module	EH-AX44	12 bits analog input (4 to 20mA, 0 to 10 V) each 4 ch.	X8W
	EH-AX8V	12 bits analog input 8 ch., Voltage (0 to +10 V)	X8W
	EH-AX8H	12 bits analog input 8 ch., Voltage (-10 to +10 V)	X8W
	EH-AX8I	12 bits analog input 8 ch., Current (4 to 20 mA)	X8W
	EH-AX8IO	12 bits analog input 8 ch., Current (0 to 22 mA)	X8W
	EH-AXH8M	14 bits analog input (0 to 22mA, 4 to 22mA, -10 to +10V, 0 to 10V) 8 ch.	X8W
	EH-AXG5M	Isolated analog input (0 to 22mA, 4 to 22mA, -10 to +10V, 0 to 10V) 5 ch.	X8W
	EH-PT4	4 channels RTD input, Signed 15 bits Platinum (PT100 / PT1000)	X4W
	EH-TC8	Signed 15 bits, Thermocouple input (K, E, J, T, B, R, S, N) 8 points	X8W
Analog output module	EH-AY22	12 bits analog output (4 to 20mA, 0 to 10 V) each 2 ch.	Y8W
	EH-AY2H	12 bits analog output 2 ch., Voltage (-10 to +10 V)	Y8W
	EH-AY4V	12 bits analog output 4 ch., Voltage (0 to +10 V)	Y8W
	EH-AY4H	12 bits analog output 4ch., Voltage (-10 to +10 V)	Y8W
	EH-AY4I	12 bits analog output 4 ch., Current (4 to 20 mA)	Y8W
	EH-AYH8M	14 bits analog output (0 to 22mA, 4 to 22mA, 0 to 10V) 8 ch.	Y8W
	EH-AYG4M	Isolated analog output (0 to 22mA, 4 to 22mA, -10 to +10V, 0 to 10V) 4 ch.	Y8W
Positioning and counter module	EH-CU	2 channels high-speed counter input, Maximum frequency of 100 kHz, 1/ 2-phases switchover, 4-point opened collector output	X5Y3W
	EH-CUE	1 channel high-speed counter input, Maximum frequency of 100 kHz, 1 /2-phases switchover, 2-point opened collector output	X5Y3W
	EH-POS	1-axis pulse positioning module	X4Y4W
	EH-POS4	4-axes pulse positioning module	X4Y4W
Communication and network module	EH-ETH	Ethernet module IEEE802.3 standard, 10BASE-T, 8 units per CPU	COMM (ETH)
	EH-ETH2	Ethernet module IEEE802.3 standard, 10BASE-T/ 100BASE-TX (Auto negotiation), 8 units per CPU	COMM (ETH)
	EH-LNK	CPU link module (coaxial), 8 units per CPU	LINK
	EH-OLNK	CPU link module (optical fiber), 8 units per CPU	LINK
	EH-OLNKG	CPU link module (support optical fiber GI50/125μm cable), 8 units per CPU	LINK
	EH-OLNKE	CPU link module (support optical fiver GI62.5/125μm cable), 8 units per CPU	LINK
	EH-TRMME	Compact remote master module, Twisted pair cable, 4 units per CPU (when I/O assignment is “REMOTE 2”)	REMOTE2/ X4Y4W
	EH-TRMLE	Compact remote master module, Twisted pair cable, 8units per master	—
	EH-TLNKE	Compact LINK module, Twisted pair cable	LINK / X4Y4W
	EH-TRLLE	Compact I/O LINK module, Twisted pair cable	LINK / X4Y4W / X8W / Y8W
	EH-RMD	Device Net master module CPU link assignment…256/256 words I/O, 8 units per CPU Remote 2 assignment …64 words I/O total, 4 units per CPU can be installed	LINK / REMOTE2
	EH-RMP	PROFIBUS-DP master module, 256/256 words I/O, 8 units per CPU can be installed	LINK
	EH-IOCD	Device Net slave module, 256 words input/256 words output	—
	EH-IOCP	PROFIBUS-DP slave controller, 208 words I/O	—
	EH-SIO	Serial communication module, RS-232C / RS-422 / RS-485 general-purpose, Modbus protocol, Hi-Protocol, Simple data link	X4Y4W (SIO)
Dummy module	EH-DUM	Module for an opened slot	—

[Installation rule]

- EH-ETH and EH-ETH2 can be installed a maximum of 8 units per CPU. The position where units can be installed is one slot from a basic base 0 slot to 7.
- The module of which I/O assignment signal is “LINK” can install a maximum of 8 units per CPU. The position where units can be installed is one slot from a basic base 0 slot to 7.

> ⚠ Caution
> The system of EHV supports a maximum of 8 units. However, the number of modules which can be provided depends on the maximum output current of the power module. Make sure to use EHV in a permissible level of the maximum output current of the power module.

- The module of which I/O assignment signal is “REMOTE2” can be installed a maximum of 4 units. The position where can be installed is one slot from a basic base 0 slot to 7.
- EH-POS4 and EH-SIO can be installed on all slots except the remote slot. (The number of units to be set of EH-SIO is restricted according to the mode to be set. Refer to the manual of EH-SIO for details.)

(2) Peripheral devices

Product	Model name	Specification
Programming software	EH-CTE-E	Control Editor (English)
	EH-CTE-J	Control Editor (Japanese)
	EH-CTE-CT	Control Editor (Traditional Chinese)
	EH-CTE-CS	Control Editor (Simplified Chinese)

* Please refer to "Ladder Programming Software Control Editor instruction manual" for the PC operating environment necessary to use it.

(3) Connection cable

Product	Model name	Specification
Cable for connecting basic base I/O controller*6	EH-CB05A	0.5 m (1.64 ft.) length (basic to expansion and expansion to expansion)
	EH-CB10A	1 m (3.28 ft.) length (basic to expansion and expansion to expansion)
	EH-CB20A	2 m (6.56 ft.) length (basic to expansion and expansion to expansion)
Cable for 32/64-points I/O module (Both edges connector type)	EH-CBM01W	1 m (3.28 ft.) length (32/64-points I/O module to terminal block adaptor)
	EH-CBM03W	3 m (9.84 ft.) length (32/64-points I/O module to terminal block adaptor)
	EH-CBM05W	5 m (16.4 ft.) length (32/64-points I/O module to terminal block adaptor)
	EH-CBM10W	10 m (32.8 ft.) length (32/64-points I/O module to terminal block adaptor)
Cable for 32/64-points I/O module (One edges connector type)	EH-CBM01	1 m (3.28 ft.) length (32/64-points I/O module to external equipments)
	EH-CBM03	3 m (9.84 ft.) length (32/64-points I/O module to external equipments)
	EH-CBM05	5 m (16.4 ft.) length (32/64-points I/O module to external equipments)
	EH-CBM10	10 m (32.8 ft.) length (32/64-points I/O module to external equipments)
Cable for EM/H-200 series compatible 32-points I/O module	CBM-02	2 m (6.56 ft.) length (EM/H-200 series compatible 32-points module to external equipments)
	CBM-05	5 m (16.4 ft.) length (EM/H-200 series compatible 32-points module to external equipments)
	CBM-10	10 m (32.8 ft.) length (EM/H-200 series compatible 32-points module to external equipments)
Cable for TTL I/O module	CBEM-01	1 m (3.28 ft.) length (TTL I/O module to external equipments)
	CBEM-03	3 m (9.84 ft.) length (TTL I/O module to external equipments)
	CBEM-05	5 m (16.4 ft.) length (TTL I/O module to external equipments)
	CBEM-10	10 m (32.8 ft.) length (TTL I/O module to external equipments)
	CBEM-15	15 m (49.2 ft.) length (TTL I/O module to external equipments)
Cable for counter input module	EH-CUC01	1 m (3.28 ft.) length (Counter input module to external equipments)
	EH-CUC02	2 m (6.56 ft.) length (Counter input module to external equipments)
	EH-CUC03	3 m (9.84 ft.) length (Counter input module to external equipments)
	EH-CUC04	4 m (13.1 ft.)) length (Counter input module to external equipments)
	EH-CUC05	5 m (16.4 ft.) length (Counter input module to external equipments)
Conversion cable for connecting peripheral devices*7	EH-RS05	0.5 m (1.64 ft) length between CPU(RJ-45) and D-sub 15-pin (female)
For peripheral devices*8	WVCB02H	2 m (6.56 ft.) length between D-sub 15-pin (male) and DOS/V (9-pin)
	EH-VCB02	2 m (6.56 ft.) length between CPU (RJ-45) and DOS/V (9-pin)

*6 Use in a maximum of 2 m (6.56ft.) between stations, 8 m (26.24ft.) in total

*7 Use with WVCB02H.

*8 EH-VCB02 and WVCB02H can be used for connecting H/EH series by Hitachi-IES and LADDER EDITOR for Windows®.

(4) Optional

Product	Use	Remarks
LIBAT-H	Lithium battery	Common use with H series

One battery is packed in CPU module.

[Reference]

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

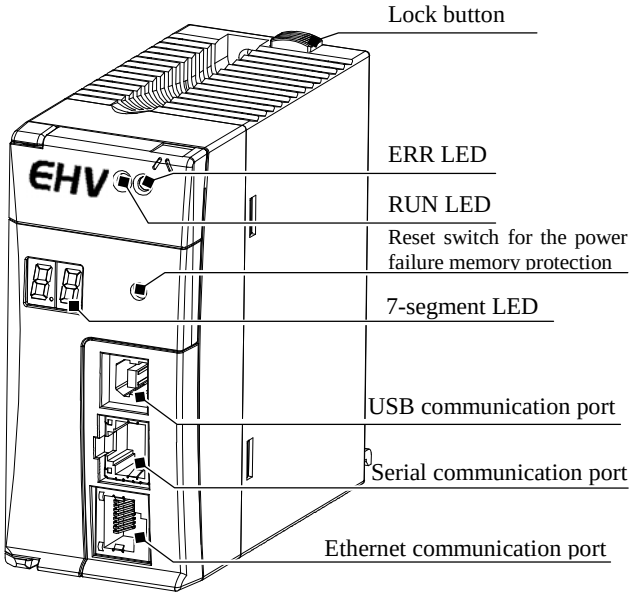
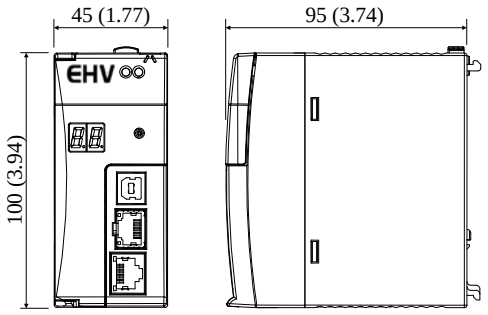
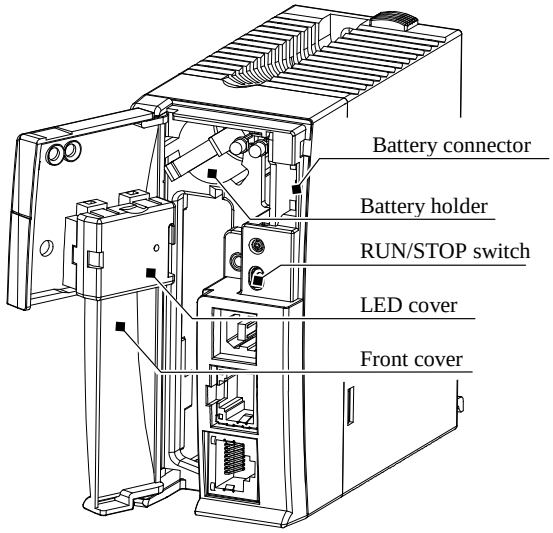
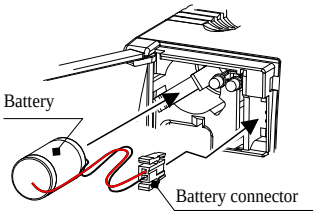
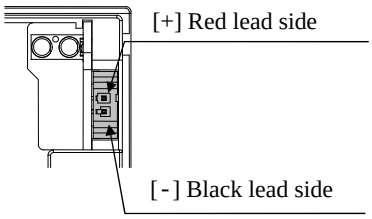
3.3 List of Current Consumption

Product	Model name	Current consumption [mA]	Product	Model name	Current consumption [mA]
CPU module	EHV-CPU128	750	Analog input module	EH-AX44	100
	EHV-CPU64	750		EH-AX8V	100
	EHV-CPU32	750		EH-AX8H	100
	EHV-CPU16	750		EH-AX8I	100
I/O controller	EH-IOCH	80		EH-AX8IO	100
	EH-IOCH2	80		EH-AXH8M	70
Base unit	EH-BS3A	200		EH-AXG5M	300
	EH-BS5A	200		EH-PT4	160
	EH-BS6A	200		EH-TC8	70
	EH-BS8A	200	Analog output module	EH-AY22	100
	EH-BS11A	200		EH-AY2H	100
	EH-BS8R	200		EH-AY4V	100
Input module	EH-XD8	30		EH-AY4H	100
	EH-XD16	50		EH-AY4I	130
	EH-XDL16	50		EH-AYH8M	70
	EH-XD32	60		EH-AYG4M	700
	EH-XDL32	60	Positioning, and Counter module	EH-CU	310
	EH-XD32E	60		EH-CUE	310
	EH-XDL32E	60		EH-POS	300 (600)*1
	EH-XD32H	60		EH-POS4	850
	EX-XD64	80	Communication and network module	EH-ETH	260
	EH-XA16	50		EH-ETH2	470
	EH-XAH16	50		EH-LNK	550
Output module	EH-YR8B	220		EH-OLNK	550
	EH-YR12	40		EH-TRMME	150
	EH-YR16	430		EH-TRMLE	150
	EH-YR16D	430		EH-TLNKE	270
	EH-YT8	30		EH-TRLLE	270
	EH-YTP8	30		EH-RMD	280
	EH-YT16	50		EH-RMP	600
	EH-YTP16	50		EH-IOCD	320
	EH-YTP16S	50		EH-IOCP	600
	EH-YT32	90		EH-SIO	250
	EH-YTP32	90	Dummy module	EH-DUM	0
	EH-YT32E	90			
	EH-YTP32E	90			
	EH-YT32H	90			
	EH-YT64	120			
	EH-YTP64	120			
	EH-YS4	70			
	EH-YS16	250			
TTL I/O module	EH-MTT32	140			

*1 positional connection

Chapter 4 CPU Module

4.1 Outline

Name and function of each part		
	Type (Weight)	EHV-CPU128 (Approx. 0.2kg (0.4lb.)) EHV-CPU64 (Approx. 0.2kg (0.4lb.)) EHV-CPU32 (Approx. 0.2kg (0.4lb.)) EHV-CPU16 (Approx. 0.2kg (0.4lb.))
	Current consumption	750 mA
	Dimensions (mm (in.))	
		
		
Part of battery connector 		
Serial communication port SD RD 		
Ethernet communication port LINK RX 		

Explanation of operation	Operations are performed according to the contents of the program created by the user. The programming device connected to the CPU module communication port writes and reads the user program. Memory is installed inside the CPU module in which the user program and internal output information are stored. The internal output data and clock information can be backed up with the battery.

Table 4.1 Function specifications

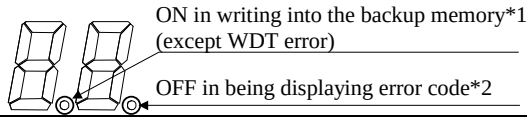
Item	Description	Remarks
RUN LED	Indicates the operation of CPU by ON / OFF of lighting. (ON: RUN, OFF: STOP)	LED: greem
ERR LED	Indicates the contents of error by lighting or flashing.	LED: red
7-segment LED	Indicates the error factor in 2-digit code. And indicates the status of the write into the backup memory with " . " (dot). (It is possible to indicate the code specified by users on the user program.)  	
Reset switch for the power failure memory protection	Pressing this switch when the operation is stopped, clears data from the area specified for power failure memory. The program information is retained as is.	Valid only in stop
USB communication port	Port for connecting with the programming device. (Dedicated port) It is possible to create a program of CPU and monitor, connecting a programming software. * Prepare a communication cable for USB by customer.	
Serial communication port	Port for serial communication with external devices as a dedicated port or a general-purpose port. [Dedicated port] Port for communicating with the programming device, etc. [General-purpose port] Port for communicating with external devices with serial communication function on the user program. * Both of the dedicated and the general-port are switchable of RS-232C / RS-422 / RS-485. SD LED is flashing (orange) during data transmission. RD LED is flashing (green) during data receiving. Note) In turning on/off the power of PLC, RD LED is lighting for a moment but it is no problem.	
Ethernet communication port	Port for communicating with the programming device, the network equipment, and etc. 4 ports as a dedicated port and 6 ports as a port for message communication are usable. Modbus-TCP server function is usable from CPU software version Vx129 or newer. LINK LED lights up (green) if HUB or the communication device are connected with a cable. RX LED is flashing (orange) during data receiving. Initialization can be performed at each logic port from the special internal output when the communication obstacle occurred.	
RUN / STOP switch	CPU runs (operating) when the switch is turned to "RUN". CPU stops when the switch is turned to "STOP". The following conditions are necessary in order to operate correctly. 1. The user program is written. 2. The specified input is ON when being setup the operational defined input. 3. There is no error factor.	
Lock button	When dismounting the module from a base unit, press this button and lift up the module. The module can be fixed firmly by a screw. (It is possible to reinforce using screws after mounting. In this case, use M4×10 mm (0.39 in.) screws.)	
Front cover	Opens and closes the front cover when operating the RUN switch or replacing the battery. Keep the cover closed while the module is running. Also, when the cover is opened, do not touch the printed wiring board with you hands.	

Table 4.1 Function specifications (continuation)

Item	Description	Remarks
Battery holder / Battery connector	[Battery] By connecting a battery, the following data are retained while PLC power is OFF. (1) Data specified to the area for the power failure memory protection. (2) Calendar clock data (WRF00B to WRF00F) (Since the user program is stored on the backup memory, data can be retained without the battery.) ⚠ Caution - Battery has polarity. Check polarity in connecting the connector. - The connector on the battery is dismounted in order to prevent consumption of the battery when shipping and safekeeping. - When using the CPU module, check the battery and connect the lead connector on the battery to the battery connector on the circuit board. - Refer to a table in “13.2 A life of Product” for the life of battery. As a guideline, replace the battery every two years even when the total power failure time is less than the guaranteed value.	

*1 Do not turn off the power because error 31 may occur at the next power ON if the power is turned off while this LED is lighting.
*2 This LED lights up when a value is being displayed on the 7-segment by the user program (SEGCTL command).

⚠ Caution

For communication port, pay attention to the following points.

(1) If the Ethernet communication cable is connected to the serial communication port, there is a danger of injury in the Ethernet communication port of the CPU module and the external devices connected to the Ethernet communication port.

(2) In the high-speed communication of 100BASE-TX connection (100Mbps), there are cases where LINK with the network HUB is not established and LINK is easy to be damaged because communication error occurs by influence of installation environment, cable length, and noise from outside.

In these cases, construct the network system, taking measures as follows.

1] Increases the number of retries if needed, using TCP/IP for protocol to communicate with the other device.

2] Changes the network HUB into 10Mbps or 10Mbps setting, and sets the data communication speed to 10Mbps.

(3) Communication error may occur by the programming tool under noise environment when connecting using the programming tool and USB communication port. Connect using the serial port or the LAN port when communication error occurs under noise environment. And in order to stabilize communication, do not bring the communication cable close to other wirings and do not store in the same duct.

4.2 Performance Specifications

Table 4.2 Performance specifications

Item	Type		Specification			
			EHV-CPU128	EHV-CPU64	EHV-CPU32	EHV-CPU16
Control specification	CPU		32-bit RISC processor / Processor for Ladder operation only			
	Processing method		Stored program cyclic method			
	Processing speed	Basic commands	Point of contact 20 ns , Coil 40 ns			
		Substitution	60 ns			
	User program memory		128 k steps	64 k steps	32 k steps	16 k steps
	Comment (1-character 2-byte)		1M bytes	512k bytes		
Operation processing specification	Ladder	Basic command	55 types such as 			
		Arithmetic command, Application command	168 types such as arithmetic, application, control, and etc.			
I/O processing specification	External I/O	I/O processing method	Refresh processing			
		Using 64-point module	4,224 points	3,520 points	2,112 points	2,112 points
		Number of expandable units	5 *1	4	2	2
		Remote I/O	1,024 points × 4 master stations			
	Internal output	Bit	1,984 points (R0 to R7BF)			
		Word (WR)	61,440 words (WR0 to WREFFF)			
		Word (WN)	131,072 words (WN0 to WN1FFFF)	32,768 words (WN0 to WN7FFF)		
		Bit/ Word shared (WM)	524,288 points, 32,768 words (M0 to M7FFFF, WM0 to WM7FFF)			
		Special internal output Bit	2,112 points (R7C0 to RFFF)			
		Special internal output Word	4,096 words (WRF000 to WRFFFF)			
		CPU link*2	16,384 points, 1,024 words × 8 loops Link system 1 : L0 to L3FFF / WL0 to WL3FF Link system 2 : L10000 to L13FFF / WL1000 to WL13FF Link system 3 : L20000 to L23FFF / WL2000 to WL23FF Link system 4 : L30000 to L33FFF / WL3000 to WL33FF Link system 5 : L40000 to L43FFF / WL4000 to WL43FF Link system 6 : L50000 to L53FFF / WL5000 to WL53FF Link system 7 : L60000 to L63FFF / WL6000 to WL63FF Link system 8 : L70000 to L73FFF / WL7000 to WL73FF			
	Timer	Number of points*3	2560 points (including counter 512 points)			
	Counter	Timer set value	0 to 65,535, Time base 1, 10, 100[ms], 1[s]			
		Counter set value	1 to 65,535 times			
	Edge detection*4		DIF 512 points + DFN 512 points Coil with rising edge 1,024 points, Coil with falling edge 1,024 points Processing box with rising edge 1,024 points, Processing box with falling edge 1,024 points			
Communication function	Serial port		RS-232C × 1, switchable to RS-422/485			
	Ethernet port		1 port (for peripheral devices and network construction)			
	USB port		1 port (for programming tool only), USB 2.0 Full speed			
Peripheral devices	Program method		Ladder diagram			
	Peripheral devices		Programming software (Control Editor) Direct programming by LADDER EDITOR is impossible*5			
Extended function	Calendar and clock		Support			
	Modem control function		Support			
Maintenance function	Self-diagram		PLC abnormal (7-segent display): microcomputer error, watchdog timer error, memory error, program error, system ROM/RAM error, scan time error, battery under-voltage detection, and others			

*1 EH-IOCH and EH-IOCH2 can be used together. But, always use EH-IOCH2 at the expanding 5 units.

*2 The number of link modules to install is the capacity level of the power module. (Areas for 8 units are prepared.)

*3 The timer and the counter cannot share the same number.

*4 Edge No. is controlled in the editor.

*5 The program created by LADDER EDITOR is convertible using a convert tool attached to a package of Control Editor. (Some commands cannot convert.)

4.3 Serial Communication Port Specifications

4.3.1 Physical Layer Interface

(1) RS-232C

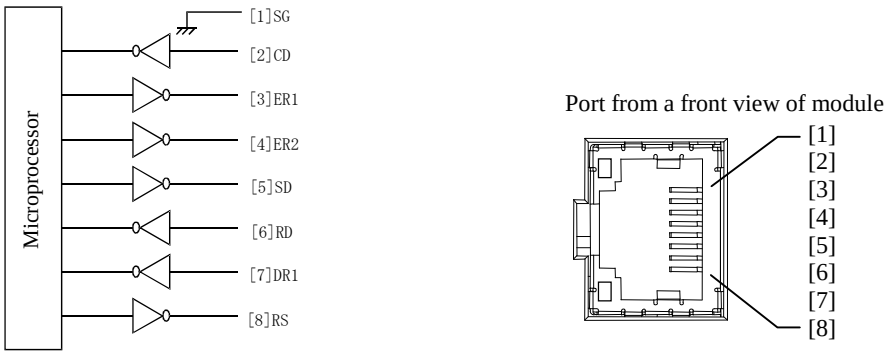


Figure 4.1 Circuit diagram and Pin No. of RS-232C

Table 4.3 List of signal of RS-232C

Pin No.	Signal name	Direction	Meaning
		CPU Host	
1	SG	◄——►	Ground for signal
2	CD	◄——	Signal during carrier receiving
3	ER1	——►	Signal which can communicate. Communication is possible when this signal is High level.
4	ER2	——►	High is output.
5	SD	——►	Transmitting data of CPU
6	RD	◄——	Receiving data of CPU
7	DR	◄——	Peripheral device connection signal. Indicates that peripheral device is connected when this signal is High level.
8	RS	——►	Transmitting request signal. Indicates that CPU can receive data when this signal is High level.

(2) RS-422/485

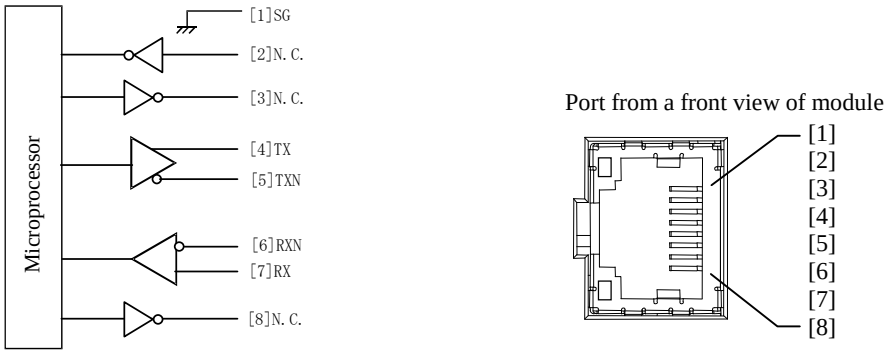


Figure 4.2 Circuit diagram and Pin No. of RS-422/485

Table 4.4 List of signal of RS-422/485

Pin No.	Signal name	Direction CPU / Host	Meaning
1	SG	◄►	Ground for signal
2	N.C.	◄	Un used. Do not connect.
3	N.C.	►	Un used. Do not connect.
4	TX	►	Transmitting data + of CPU
5	TXN	►	Transmitting data – of CPU
6	RXN	◄	Receiving data – of CPU
7	RX	◄	Receiving data + of CPU
8	N.C.	►	Un used. Do not connect.

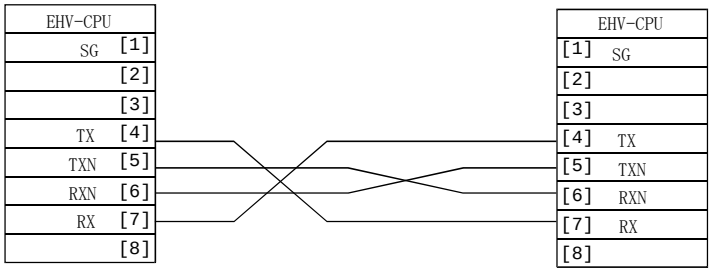


Figure 4.3 RS-422 signal connection diagram

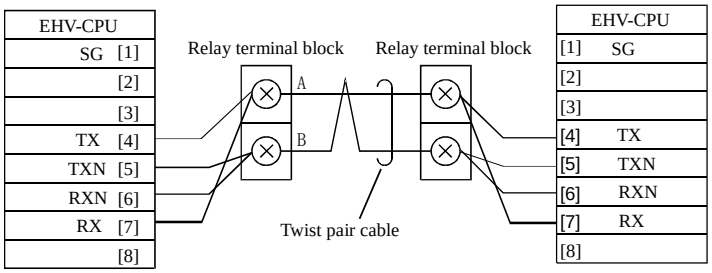


Figure 4.4 RS-485 signal connection diagram

4.3.2 Dedicated Port

Specifications in specifying a serial communication port as a dedicated port are shown in Table 4.5.

Table 4.5 Dedicated port specifications

Item	Specification		
Transmission speed	4,800 bps, 9,600 bps, 19,200 bps, 38,400 bps, 57,600bps Sets from the programming tool		
Interface	RS-232C	RS-422	RS-485
Maximum cable length	15 m (16.40 yd.)	500 m (546081yd.)	500 m (546081 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		
Startup method	One-sided startup using the host side command		
Transmission method	Serial transmission（bit serial transmission）		
Transmission code	ASCII		
Transmission code configuration	ASCII: 7-bit data, 1 start, 1 stop, even number parity		
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	1,460 bytes (including control characters）		
Control procedure	H-series dedicated procedure (High protocol) Standard procedure 1 (Transmission control procedure 1), Simplified procedure (Transmission control procedure 2)		

4.3.3 General-purpose Port

Specifications in specifying a serial communication port as a dedicated port are shown in Table 4.6.

Table 4.6 General-purpose port specifications

Item	Specification		
Transmission speed	300bps, 600bps, 1,200bps, 2,400bps, 4,800 bps, 9,600 bps, 19,200 bps, 38,400bps, 57,600bps Sets by TRNS0 / RECV0 commands		
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		
Startup method	One-sided startup using the host side command		
Transmission method	Serial transmission (bit serial transmission)		
Transmission code	User defined		
Transmission code configuration	User setting (1 start, 7or8-bit data, NON or ODD or EVEN parity, 1 or 2 stop)		
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)		
Control procedure	No procedure		
Control code	User defined		

*** Cautionary note of 1 : N communication (RS-485) in the general-purpose port**

When it is transmitted after the receiving from the other device is completed, It is necessary to insert “WAIT” for the given time.

Insert “WAIT” from the completion of receiving to the start of transmitting, as a guideline from several ms to dozens ms.

4.3.4 Modem Control Function

The serial communication port of EHV-CPU module has a modem control function.

The modem control function can operate with task codes. Please set from the programming tool in order to use this function.

Table 4.7 Modem port specifications

Item	Specification
Transmission speed	2,400bps, 4,800 bps, 9,600 bps, 19,200 bps, 38,400bps Sets from the programming tool
Communication method	Full duplex (communication program is the half duplex control.)
Synchronization method	Start-stop synchronization
Transmission method	Serial transmission (bit serial transmission)
Transmission code	ASCII code
Transmission code configuration	1 start, 7-bit data, even number parity, 1 stop
Transmission code outgoing sequence	Send out from the lowest bit in character units
Error control	Vertical parity check, overrun check, framing check
Interface	Conforms to RS-232C
Control procedure	H-series dedicated procedure (High protocol)
Startup method	One-sided startup using the host sided command

* Since ER signal cannot be controlled, it is necessary to cut the line by the command or to control by connecting the line using other I/O.

Table 4.8 List of signal of RS-232C (in setting modem)

Pin No.	Signal name	Direction CPU : Host	Meaning
1	SG	◄►	Ground for signal
2	CD	◄	Signal during the carrier receiving. Connects to CD of modem.
3	ER1	►	Signal in which terminal communication is possible
4	ER2	►	Un used
5	SD	►	Transmitting data of CPU. Connects to SD of modem.
6	RD	◄	Receiving data of CPU. Connects to RD of modem.
7	DR	◄	Signal in which transmitting and receiving of modem are possible. Connects to DR of modem.
8	RS	►	Transmitting request signal. Connect to RS of modem.

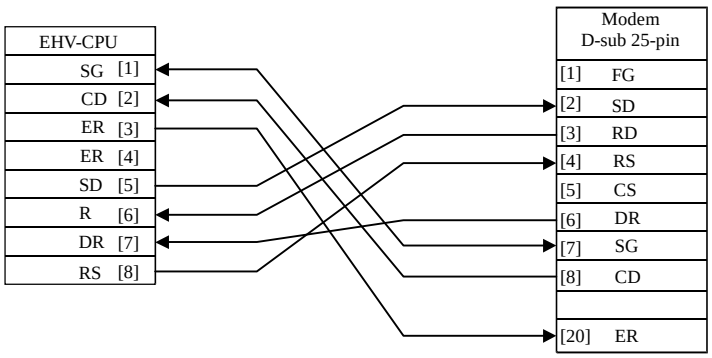
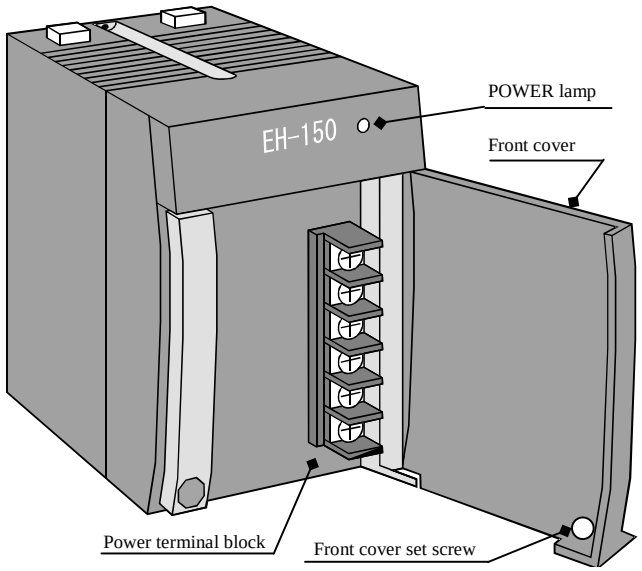
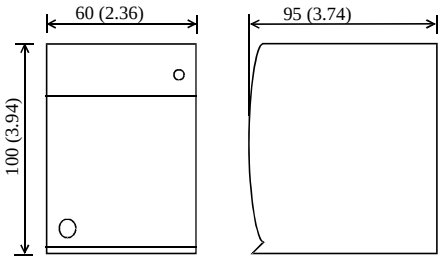


Figure 4.5 Cable connection between a modem (D-sub 25-pin) and EHV-CPU

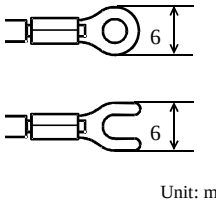
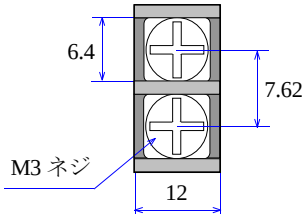
MEMO

Chapter 5 Power Supply, Base, I/O Controller, Memory board

5.1 Power Module

Name and function of each part	Type (Weight)	EH-PSA (Approx. 0.36 kg (0.79 lb.))
		EH-PSD (Approx. 0.28 kg (0.62 lb.))
		EH-PSR (Approx 0.36 kg (0.79 lb.))
	Dimensions (mm (in.))	

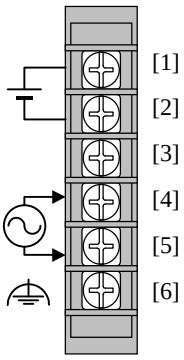
Explanation of function	Converts power supplied externally into the power (5V DC) which can be used inside the EH-150. The operating status can be confirmed with the POWER lamp on the front of the module. There are two types of the external supply voltage, AC type (100-240V AC) and DC type (21.6-26.4V DC). And there is a redundant power supply that is using as large capacity power supply on the standard base. Refer to a specification table for details.

Name	Description	LED
POWER lamp	AC power supply: When the lamp lights up, indicates that the AC power is supplied. When the lamp is off, indicates that the AC power is not turned on or the output of the DC power short-circuits. When the lamp is flashing, indicates that the power has exceeded the rated output. DC power supply: When the lamp lights up, indicates that the DC power is supplied. When the lamp is off, indicates that the DC power is not turned on, the power output short-circuits, or there is a voltage overload. Redundant power supply: When the lamp lights up, indicates that the AC power is supplied. When the lamp is off, indicates that the AC power is not turned on or there is an error in power supply unit.	Green
Front cover / Front cover set screw	Open and close this cover when wiring cable. Keep the front cover closed during operation. Cut the power off first to avoid getting an electric shock when opening the cover. Use M3 × 6 mm (0.24 ft.) screws for the set screws if fixing is necessary.	
Power terminal block	This terminal block is used for output wiring of 24V DC and for wiring of ground when the power is being supplied externally. The recommended crimp terminal is indicate below.  (Recommended) Take great care on handling the terminal because it may fall off if the screw is loose. 	

(1) EH-PSA

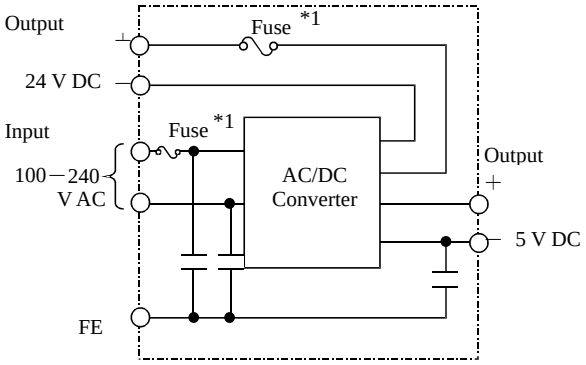
Item	Specification	
Rated output voltage	5 V DC	24 V DC
Maximum DC output current	3.8 A	0.4 A
Efficiency	65 % or more（Load of 5V 3.8A 24 V 0.4A after conducting electricity for 5 minutes at room temperature and humidity)	
Input voltage range	85 to 264 V AC wide range	
Input current	1 A or less（85 to 264 V AC）	
Input rush current	50 A or less（Ta＝25 °C）, 100 A or less（Ta＝55 °C）	
Output overcurrent protection	Output short-circuit protection	
Instantaneous power failure guarantee	Less than 10 ms (85 to 100 V AC), less than 20 ms (Exceed 100 V AC to 264 V AC)	
Input leak current	3.5 mA or less (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 or more (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 V DC+	Connect when using 24 V DC.
[2]	24 V DC-	
[3]	N.C.	Do not connect.
[4]	100 – 240 V AC	Connect the input power.
[5]	100 – 240 V AC	
[6]	FE	Connect to Class D grounding.

Diagram of internal circuit

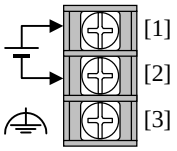


*1 The POWER lamp does not light up if a fuse blows. And the module needs repairs.
User cannot replace the fuse.

(2) EH-PSD

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

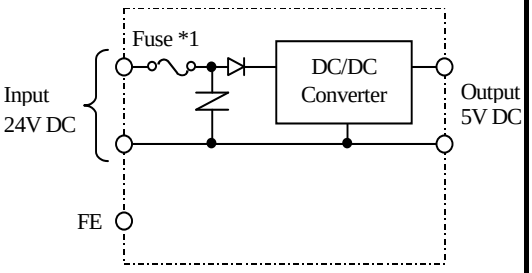
Terminal configuration



[1]	24 V DC+	Connect the input power.
[2]	24 V DC-	
[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

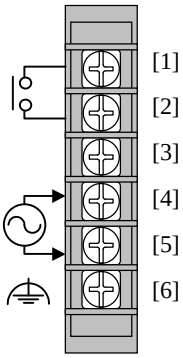


*1 The POWER lamp does not light up if a fuse blows. And the module needs repairs.
User cannot replace the fuse.

(3) EH-PSR

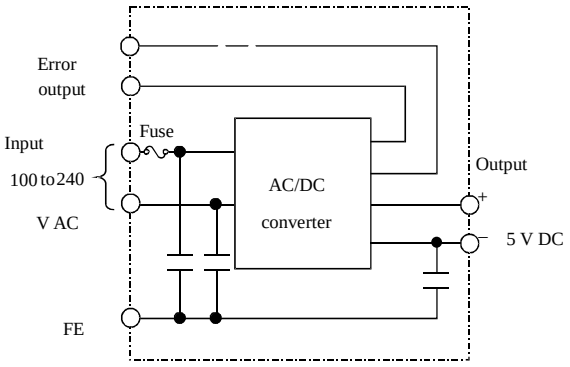
Item	Specifications
Rated output voltage	5 V DC
Maximum output current	5.6 A(up to 45 deg ambient temp),5.0A(from 45 to 55 deg)
Efficiency	65 % or more (Load of 5 V 5.6 A after energizing for 5 minutes at room temperature and humidity)
Input rated voltage range	85 to 264 V AC wide range
Input current	1 A or less (85 to 264 V AC)
Input rush current	50 A or less (Ta=25 °C), 100 A or less (Ta=55 °C)
Output over current protection	Output short circuit protection
Instantaneous power failure guarantee	less than 5 ms (85 to 100 V AC), less than 20 ms (100 to 264 V AC)
Input leak current	3.5 mA or less (60 Hz, 264 V AC)
Dielectric withstand voltage	1 minute at 1500 V AC between (AC input) and (DC output) 1 minute at 750 V AC between (DC output) and (FE)
Insulation resistance	20 M ohm or more (500 V DC)(1) Between AC input and FE (2) Between AC input and DC output
Vibration resistance	Base on IEC60068-2-6
Shock resistance	Base on IEC60068-2-27
Error output	Relay 24 V DC, 0.5A

Terminal configuration



[1]	Error output	Relay contact for error output
[2]	Error output	
[3]	N.C.	Don't connect any wire.
[4]	100 to 240 V AC	Connect AC power
[5]	100 to 240 V AC	
[6]	FE	Connect to ground

Internal circuit



※1 When fuse was blown, the POWER LED don't light. Also the module must repair by manufacture.
It is impossible to replace the blown flow by customer.

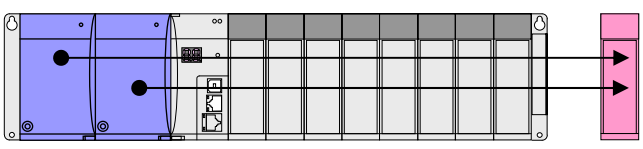
[Available combination]

Base・Power supply / CPU type	EH-PSA/PSD			EH-PSR		
	EH-BS8R	EH-BS3A,5A,6A,8A	EH-BS11A	EH-BS8R	EH-BS3A,5A,6A,8A	EH-BS11A
EHV-CPU	× ※1	○	○	◎	△ ※3	△ ※3
EH-CPU548/516	× ※1	○	○	◎	△ ※3	△ ※3
EH-CPU316A/208A/104A	× ※1	○	×	△ ※2	△ ※2,3	×

※1 EH-PSA/PSD are not mounted in EH-BS8R.
※2 EH-CPU316A/208A/104A can not monitor the operation status.
※3 Redundant power supply module (EH-PSR) is possible to use as large capacity power supply on the standard base. But it can not monitor the operation status.
◎ : Redundant power supply system is available, ○ : Available, △ : limitation on using, ×:it is not available

[Monitor of operation status]

Combination of EH-PSR + EHV-CPU or EH-PSR + EH-CPU548/516, operation status can monitor as input data of slot A.



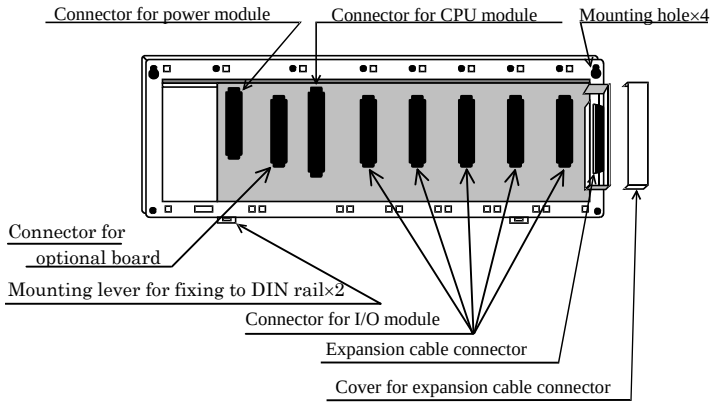
In EH-BS8R, 8 IO modules are available.
The status of power supply can monitor as input data of slot A.
Input X*A00 on : power supply 0 operation is correct
Input X*A01 on : power supply 1 operation is correct
*means the unit number.

power supply 0 1

5.2 Base Unit

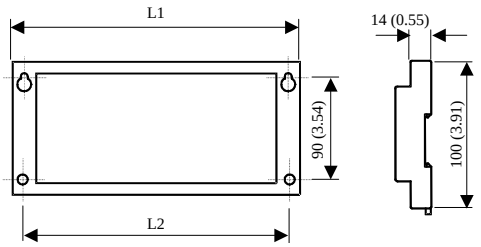
(1) Standard base unit

Name and function of each part



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

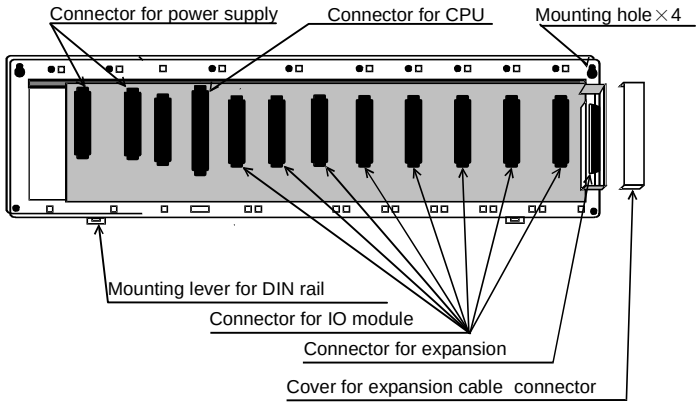
Communication slot (Slot for only communication module)

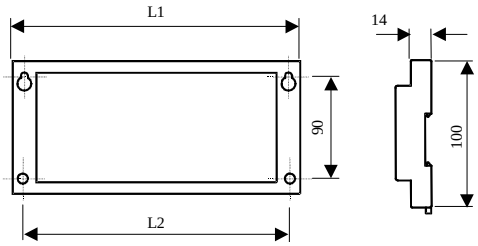
EH-BS3A	Slot 0-2
EH-BS5A	Slot 0-4
EH-BS6A	Slot 0-5
EH-BS8A	Slot 0-7
EH-BS11A	Slot 0-7 (Slot 8,9,A cannot install a communication module.)

Explanation of function	This is a basic unit for installing all modules. Power is supplied from the power module to each of the other modules, using the base unit. Also, signals are transmitted to each module from the CPU module or the I/O controller. Select the base unit according to the number of I/O modules to be used.
Item	Description
Connector for power module	This is a connector for installing the poser module.
Connector for CPU module	This is a connector for installing the CPU module. This becomes a connector for installing the I/O controller when using the unit as an expansion base.
Connector for I/O module	This is a connector for installing the I/O module.
Expansion cable connector	This is a connector for connecting the expansion cable..
Mounting hole (4 locations)	These are used when attaching the base unit to a panel, etc. Use M4×20 mm (0.79 in.) screws.
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) Redundant base unit

Name and function		Type(Weight)	EH-BS8R (0.39 kg (0.86 lb.))
		Dimension（mm）	





Communication slot

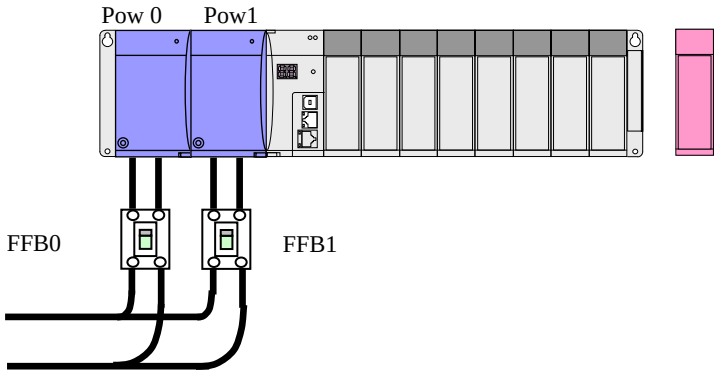
EH-BS8R	Slot 0-7

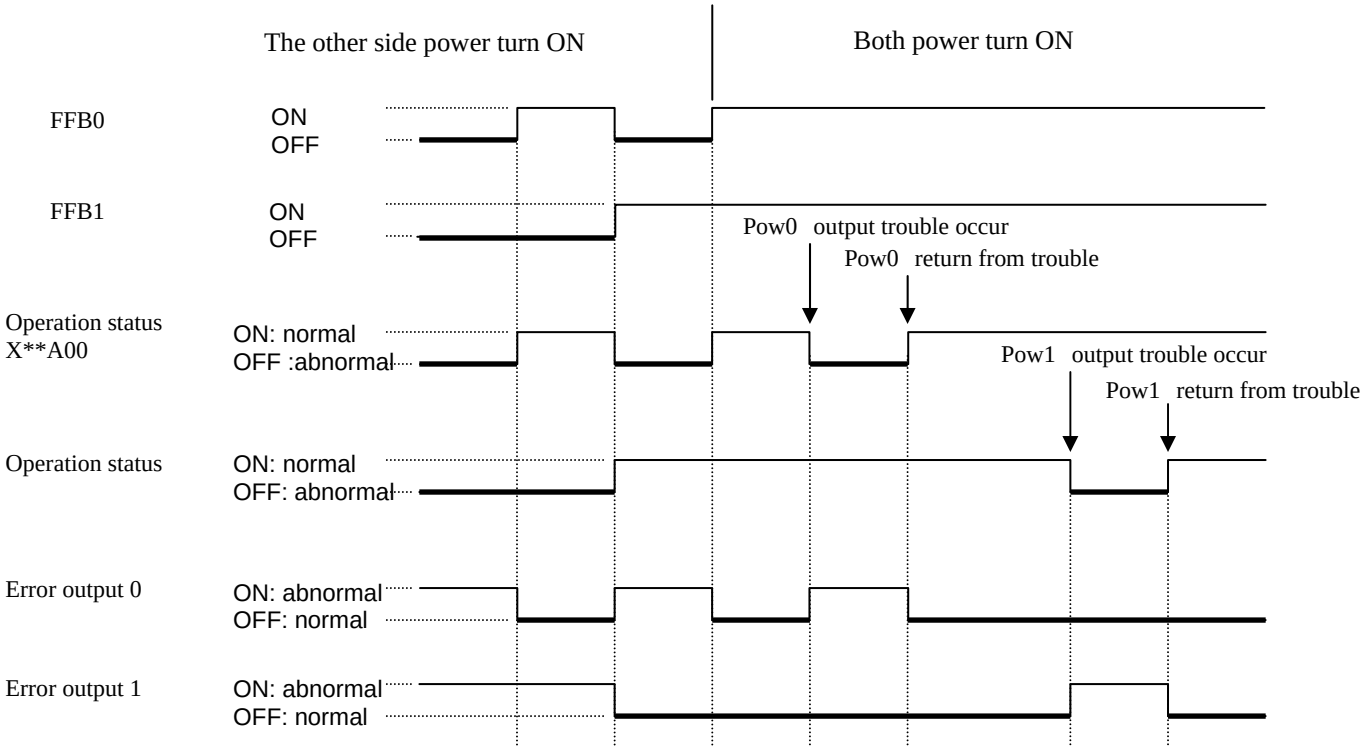
Unit:mm	L1 (Outer dimensions)	L2 (Mounted dimensions)
EH-BS8R	432.5	417

Function	Base unit is mounted various IO modules. Power supply module supply the power to each module through the base unit. Also, CPU module or IO control unit input/output the signal to each module through the base unit.
Item	Description
Connector for power module	This is the connector for loading the power module.
Connector for CPU module	This is the connector for loading the CPU module. When the unit is used as an expansion base, this becomes the connector for loading the I/O controller.
Connector for I/O module	This is the connector for loading the I/O module.
Expansion cable connector	This is the connector for connecting the expansion cable. It can only be used in a base unit in which a CPU is loaded.
Mounting holes (4 locations)	These are used when the base unit is attached to a panel, etc. Use M4 × 20 mm (0.79 in.) screws.
Mounting lever for fixing to DIN rail	This is used when attaching the unit to a DIN rail.
Cover for expansion cable connector	This cover is used for protecting the expansion cable connector when it is not used.

[Error output, Operation status]

Error output and operation status will be change according to occurrence of error and power ON/OFF as follows.





Time chart of Error output and Operation status

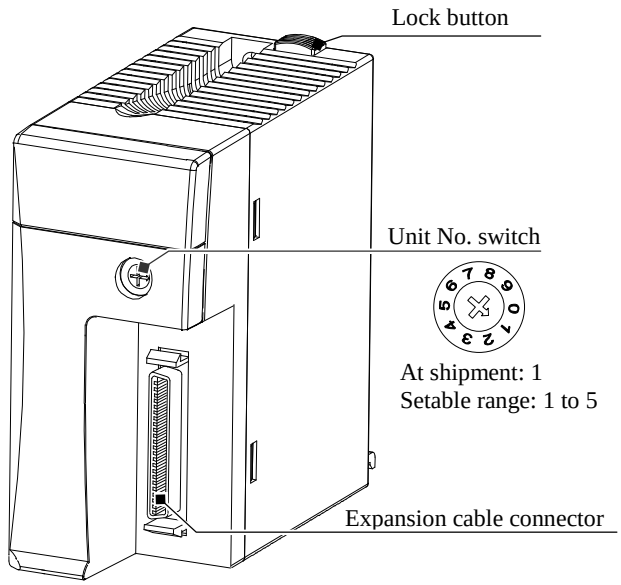
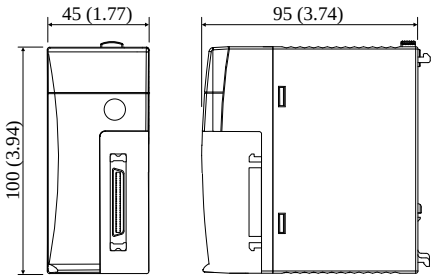
[Replacement of fault power supply module]

In case of fault the power supply module, it is possible to replace while operating another power supply module.

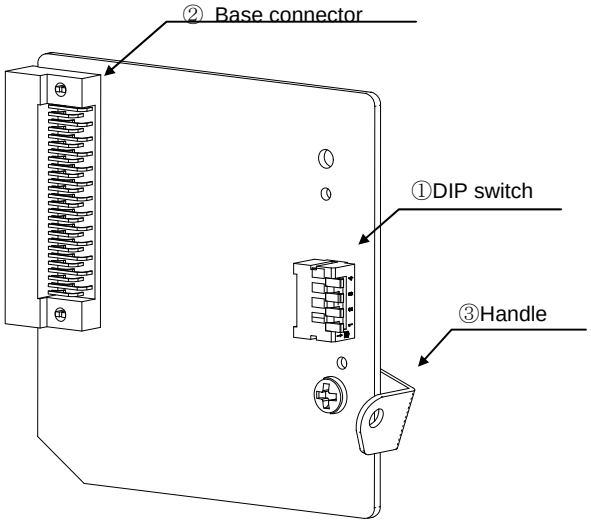
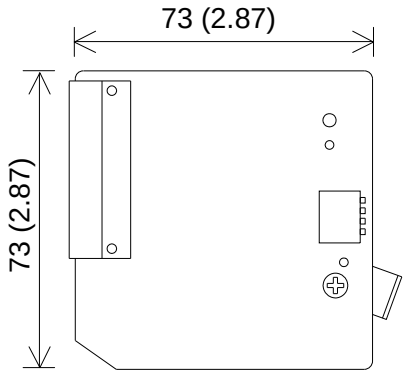
1. To easily replace the fault module, install the circuit breaker to each power line.
2. Please replace the fault module as the power off.
   Please attention the electric shock, because another power supply module is operating.

Please design the system of 5V capacity is used as one power supply module when the redundant power supply.

5.3 I/O Controller

Name and function of each part		Type (Weight)	EH-IOCH2 (Approx 0.14 kg (0.31 lb.))
		Dimensions (mm (in.))	
Explanation of function	I/O controller is a module to output the output signal from the CPU module to the output module mounted on the expansion base unit and to transmit the input signal of the input module to the CPU module. I/O controller is attached adjacent to the power module of the expansion base unit on the right side. For the unit No. switch, please set 1 to 5 from the unit closer to the CPU module in order. Note) - If other than 1 to 5 of the unit No. switch is set, it does not operate normally. - Though this can be used with EH-IOCH, EH-IOCH cannot be used as the 5th unit. Always use EH-IOCH2 at the 5th unit.		
Item	Description		
Unit No. switch	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. Example) 1 -> 2 -> 3, 2 -> 4 -> 5, 1 -> 3 -> 5 Always turns off the power supply when setting. Take care because it may operate abnormally if the unit No. is not set in order.		
Expansion cable connector	This is a connector to connect an expansion cable. Connect with the former base unit using the expansion cable.		

5.4 Memory board

Name and function of each part	Type	EHV-MEM
	Weight	Approx 0.14 kg (0.31 lb.)
	Dimensions (mm (in.))	

Description	This memory board enables uploading (CPU➔memory board), downloading (memory board➔CPU) and verifying of user program without programming software. Operation mode of the memory board is set by the DIP switch on the memory board. The operation mode and status are displayed in 7 segment LED on CPU module.
Available CPU module	EHV-CPU128 (ROM VER.0123 or newer) EHV-CPU64 (ROM VER.1123 or newer) EHV-CPU32 (ROM VER.2123 or newer) EHV-CPU16 (ROM VER.3123 or newer)

No.	Name	Description
①	DIP switch	Operation mode is configured with this DIP switch.
②	Base connector	The memory board is connected to base unit with this connector
③	Handle	When dismounting the memory board, use with handle.

Notes

- This memory board EHV-MEM is for EHV-CPU only. Use EHV-CPU16/32/64/128 with ROM VER.*123 or newer. The first digit of the ROM VER. shown as "*" mark indicates model name of CPU. Do not use other CPU modules.
- User program is written in FLASH memory of CPU module. After downloading or uploading, remove the memory board from base unit.
- Power down the PLC when mounting or dismounting the memory board. When dismounting, pull up with the handle and take it out carefully not to interfere with the CPU cover.
- FLASH memory used in EHV-MEM keeps data without power applied however, the cycling endurance of the device is about 100,000 cycles.

■ How to use the Memory board

(1) Set the DIP switches according to the Table 1.

(2) Mount the memory board in the CPU module (Refer to the Figure 1)

(3) Supply power to PLC.

(4) Check the indication of 7-segment LED on the CPU module.

7-segment LED indicates the operation mode according to DIP switch setting.

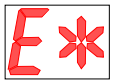
Download➔  Upload➔  Verify (Compare)➔ 

(5) Push the retentive area clear (R.CL) switch on the CPU module to start operation.

(6) Check the indication of 7-segment LED on the CPU module.

When downloading, uploading or verifying starts, RUN LED lights up and lower digit of 7-segment LED shows status.

When the operation is completed, RUN LED turns off and 7-segment LED indicates the result.

Completed successfully➔  Error or verifying mismatch➔  (“*” indicates error code)

After downloading or uploading, target data is verified implicitly. Only when the implicit verifying is correct, “Fn” is indicated.

(7) Turn off PLC power.

Operation mode continues unless power removed. In this case, CPU does not start if RUN/STOP switch is activated.

(8) Dismount the memory board with the handle carefully not to interfere with CPU cover.

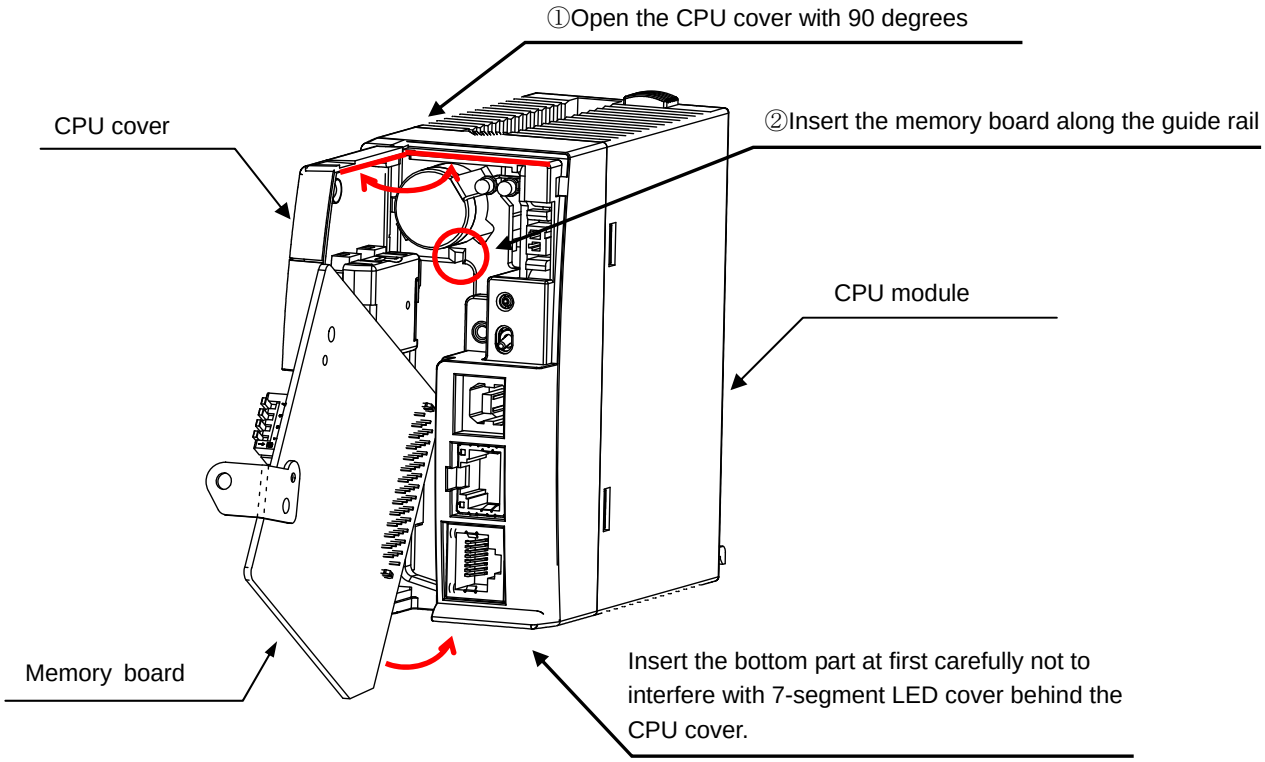


Figure1 Inserting the memory board

■ Operation mode setting

Table 1. Operation mode setting with the DIP switches

Function		Bit1	Bit2	Bit3	Bit4	Description
Normal operation		OFF	OFF	Don't care		Memory board is not recognized by CPU. CPU module works as if memory board is not inserted.
Program Transfer/ Verify	CPU←MEM (Download)	ON	OFF	*1		User program is downloaded from memory board to CPU
	CPU→MEM (Upload)	OFF	ON	Don't care		User program, communication settings and IP address are uploaded from CPU to memory board independent from DIP switch setting of bit 3 and bit 4.
	CPU=MEM (Verify)	ON	ON	*1		User program in CPU and memory board are verified. * Data memory is not verified.

*1: Target data of downloading or verifying are configured by DIP switch bit 3 and 4

DIP switch bit3: ON : With communication settings

OFF: Without communication settings

DIP switch bit4: ON : With IP address

OFF: Without IP address

Table 2. Details of transferred/verified object

Object	Description
Program	・User program ・Comment (I/O Comments, Box Comments, Circuit Comments) ・data memory* R0 to R7BF, WR0 to WREFFF, WN0 to WN1FFFF (WN0 to WN7FFF in case of EHV-CPU64 or smaller) WM0 to WM7FFF (M0 to M7FFFF), TC0 to TC2559 * Data memory is downloaded or uploaded but not verified. Data memory assigned in non-retain area will be reset as 0 when uploaded.
Communication setting	・NTP ・Serial communication settings ・Ethernet (task code) ・Ethernet (ASR) (internal output WRF630 to WRF68F included.)
IP address	IP address (All settings in IP address setting dialog box of Control Editor.)

■ LED indication of the operation mode

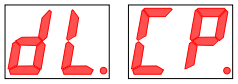
Table 3. LED indication of the CPU module

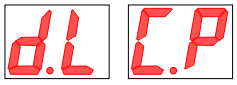
Operation mode	Download (CPU←MEM)			Upload (CPU→MEM)			Verify (Compare) (CPU=MEM)		
LED on CPU module	RUN	ERR	7SEG	RUN	ERR	7SEG	RUN	ERR	7SEG
Operation mode	●	●	dL	●	●	UL	●	●	CP
Up/downloading or verifying in progress	☼	●	d d- d_	☼	●	U_ U- U	☼	●	C_ C-
Completed successfully	●	●	Fn	●	●	Fn	●	●	Fn

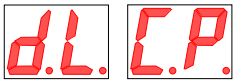
☼ : Lighting ● : Off

- 7-segment LED of up/downloading or verifying in progress shows above indications in sequence.
- Dot mark at 7-segment LED indicates communication and IP address settings as below.

  Dot mark of lower digit: Communication settings, Dot mark of higher digit: IP address

  Download/verify with communication settings : 

  Download/verify with IP address : 

  Download/verify with communication settings and IP address : 
- Depending on error status of CPU (for example 1x, etc.), CPU's error code can be shown instead of above indications.

■ Error information and LED indication

Table 4. Error information and LED indication of CPU module

Error name	Error contents	Download (CPU←MEM)			Upload (CPU→MEM)			Verify (CPU=MEM)		
LED (CPU module)		RUN	ERR	7SEG	RUN	ERR	7SEG	RUN	ERR	7SEG
CPU module type mismatch	・CPU type in user program is mismatched with the CPU that EHV-MEM is mounted.	●	☼	E0	–	–	–	●	☼	E0
User program error in transfer source	・Checksum value mismatched in user program of transfer source.	●	☼	E1	●	☼	E1	–	–	–
User program transfer error / Verification error	・User program transfer (writing) is failed. ・Checksum value is mismatched in transferred program. ・Verification of user program is failed.	●	☼	E2	●	☼	E0	●	☼	E2
Comment error in transfer source	・Checksum value is mismatched in comment data of transfer source.	●	☼	E3	●	☼	E3	–	–	–
Comment transfer error / Verification error	・Comment transfer (writing) is failed. ・Checksum value is mismatched in transferred comment ・Verification of comment data is failed.	●	☼	E4	●	☼	E4	●	☼	E4
Data memory error in transfer source	・Checksum value is mismatched in data memory of transfer source.	●	☼	E5	–	–	–	–	–	–
Data memory transfer error / Verification error	・Data transfer (writing) is failed. ・Verification of data is failed.	●	☼	E6	●	☼	E6	–	–	–
Communication parameter error in transfer source	・Checksum value is mismatched in communication parameter of transfer source.	●	☼	E7	●	☼	E7	–	–	–
Communication parameter transfer error / Verification error	・Communication parameter transfer (writing) is failed. ・Checksum value is mismatched in communication parameter. ・Verification of communication parameter is failed.	●	☼	E8	●	☼	E8	●	☼	E8
IP address error in transfer source	・Checksum value is mismatched in IP address of transfer source.	●	☼	E9	●	☼	E9	–	–	–
IP address transfer error / Verification error	・IP address transfer (writing) is failed. ・Checksum value is mismatched in IP address. ・Verification of IP address is failed.	●	☼	EA	●	☼	EA	●	☼	EA
EHV-MEM data undefined	・Data in EHV-MEM is undefined status.	●	☼	Ed	–	–	–	●	☼	Ed
CPU FLASH memory error	・Erasing of FLASH memory in CPU module is failed.	●	☼	EE	–	–	–	–	–	–
EHV-MEM FLASH memory error	・Erasing of FLASH memory in EHV-MEM is failed.	–	–	–	●	☼	EF	–	–	–

☼ : Lighting ● : Off

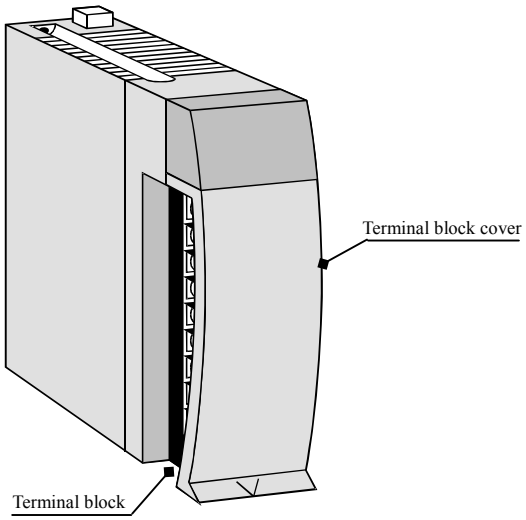
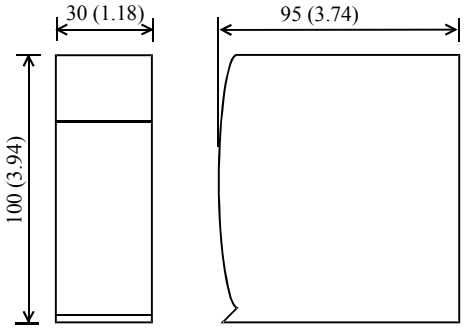
Transfer source means EHV-MEM in case of downloading and CPU module in case of uploading.

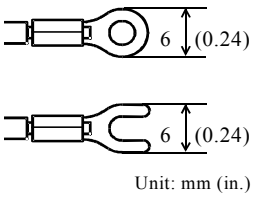
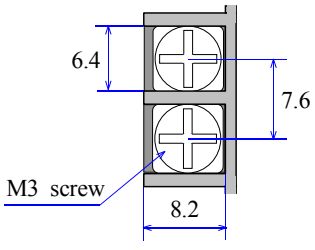
MEMO

Chapter 6 Digital I/O Module

6.1 Outline

(1) The exterior of 16-point I/O module

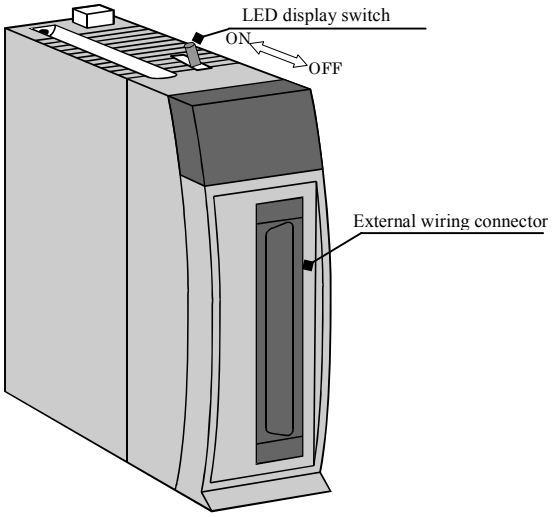
Name and function of each part		
	Type (Weight)	EH-XD8 (Approx. 0.16 kg (0.32 lb.))
		EH-XD16, XDL16 (Approx. 0.16 kg (0.32 lb.))
		EH-XA16, XAH16 (Approx. 0.18 kg (0.41 lb.))
		EH-YT8,EH-YTP8 (Approx. 0.16 kg (0.32 lb.))
		EH-YT16,EH-YTP16 (Approx. 0.16 kg (0.32 lb.))
		EH-YTP16S (Approx. 0.16 kg (0.32 lb.))
		EH-YR8B (Approx. 0.16 kg (0.32 lb.))
		EH-YR12 (Approx. 0.20 kg (0.44 lb.))
		EH-YR16, EH-YR16D (Approx. 0.24 kg (0.53 lb.))
		EH-YS4 (Approx. 0.18 kg (0.41 lb.))
		EH-YS16 (Approx. 0.23 kg (0.51 lb.))
	Dimensions (mm (in.))	

Name	Description
Terminal block	This is a terminal block for connecting the I/O signals. The terminal block can be connected and disconnected. The screws for the terminal block are M3 screws. Use a crimp terminal fitting a screw diameter. The maximum thickness of the cable should be 0.75 mm^2. (Use 0.5 mm^2 cable when attaching 2 crimp terminals to the same terminal.) The recommended crimp terminal is indicated below.  (Recommended) Take great care on handling the terminal because it may fall off if the screw is loose. 
Terminal block cover	This is a cover for installing on the terminal block.

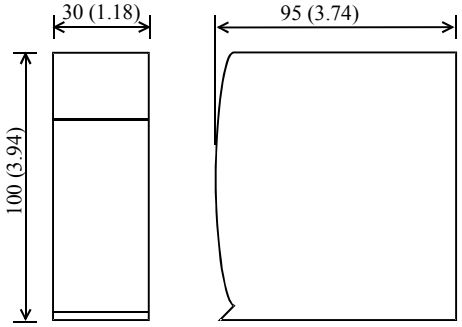
A front view of LED	Indicated contents
	LED of the number that the I/O signal turns on lights up.

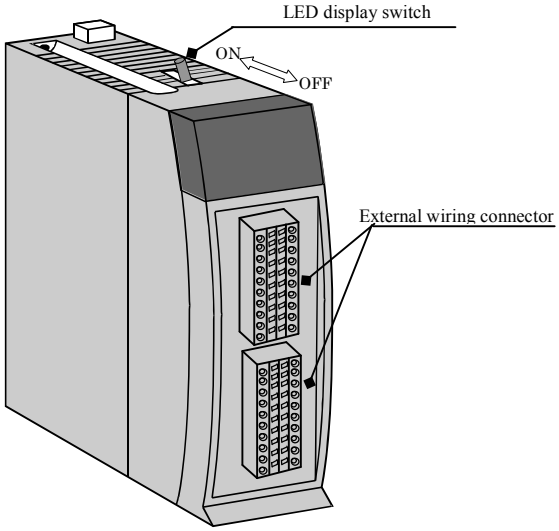
(2) The exterior of 32-point I/O module

Name and function of each part

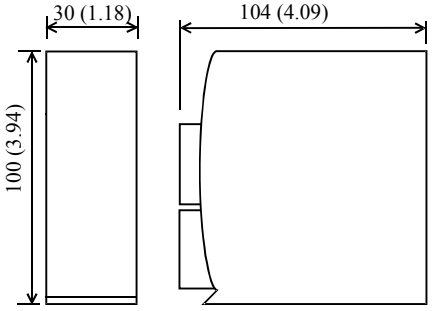


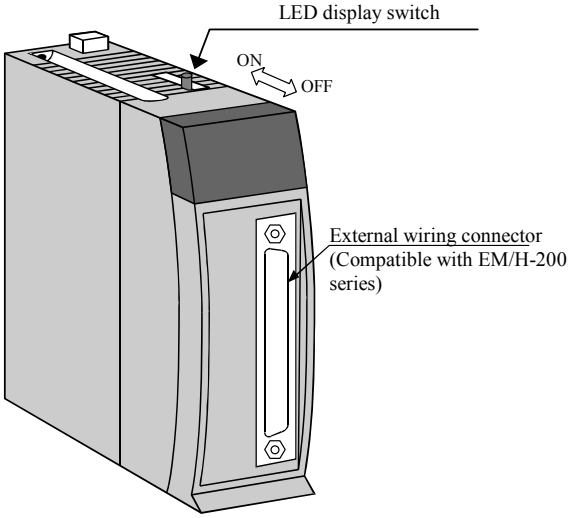
Type (Weight)	EH-XD32, XDL32 (Approx. 0.15 kg (0.3 lb.))
	EH-YT32, YTP32 (Approx. 0.15 kg (0.3 lb.))
Dimensions (mm)	



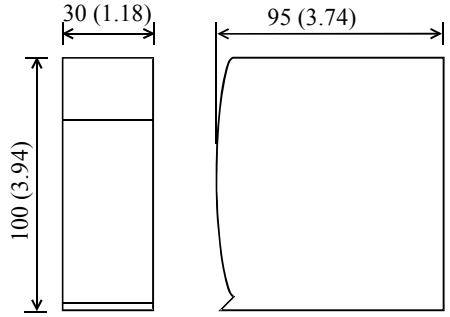


Type (Weight)	EH-XD32E, XDL32E (Approx. (0.15 kg (0.3lb.))
	EH-YT32E, YTP32E (Approx. 0.15 kg (0.3 lb.))
Dimensions (mm (in.))	





Type (Weight)	EH-XD32H (Approx. (0.12 kg(0.26 lb.))
	EH-YT32H (Approx. (0.12 kg(0.26 lb.))
Dimensions (mm (in.))	



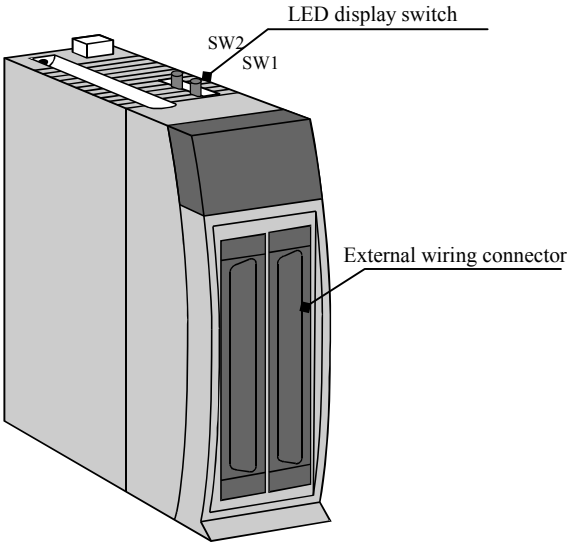
Name	Specification
LED display switch	This switch is used to switch the group to be displayed, in the I/O display.
External wiring connector	This is a connector for connecting the I/O signal.

A front view of LED	Indicated contents
	LED of the number that the I/O signal turns on lights up. LED display switch is switched as follows.

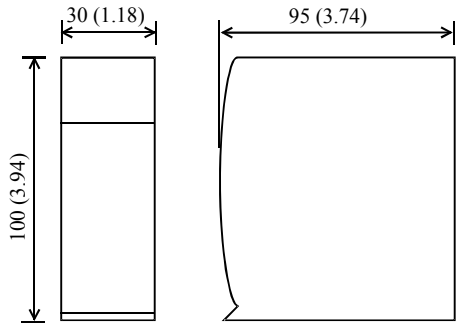
Switch	LED +16	Display group
OFF	No lighting	0-15
ON	Lighting	16-31

(3) 64-point I/O module

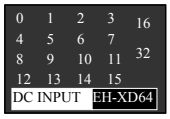
Name and function of each part



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

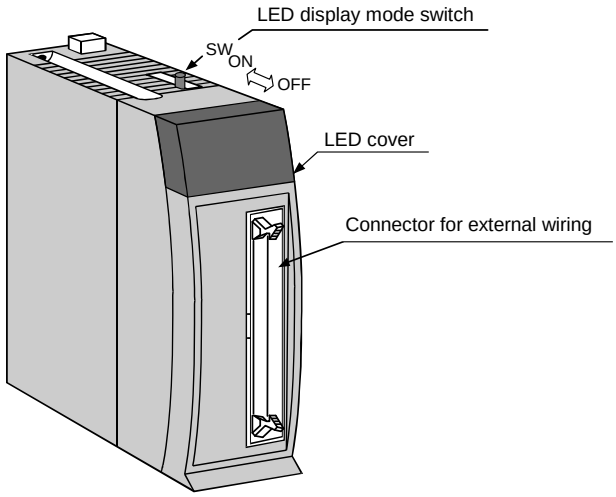
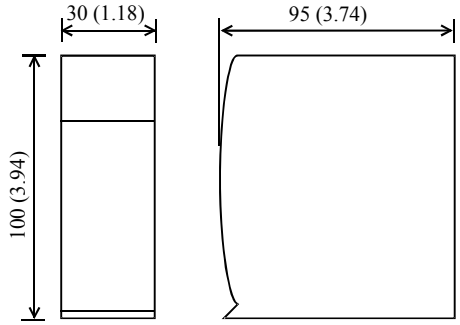


Item	Description
LED display switch	This switch is used to switch the group to be displayed, in the I/O display.
External wiring connector	This is a connector for connecting the I/O signals.

A front view of LED	Indicated contents
	LED of the number that the I/O signal turns on lights up. LED display switch is switched as follows.

SW1	SW2	LED 16	LED 32	Display group
OFF	OFF	Non- lighting	Non-lighting	0-15
ON	OFF	Lighting	Non-lighting	16-31
OFF	ON	Non-lighting	Lighting	32-47
ON	ON	Lighting	Lighting	48-63

(4) TTL I/O module

Name and function of each part	Type (Weight)	EH-MTT32 (Approx. 0.12 kg (0.26 lb.))
	Dimensions (mm (in.))	

Item	Description
LED display switch	This switch is used to switch the group to be displayed, in the I/O display.
External wiring connector	This is a connector for connecting the I/O signals.

A front view of LED	Indicated contents
	It is a switch to change a group to display in input and output indication. LED display switch is switched as follows.

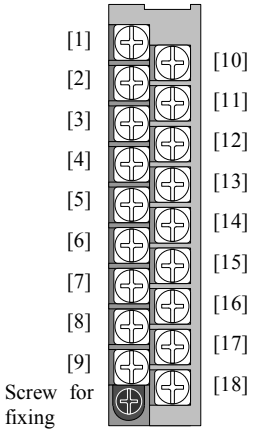
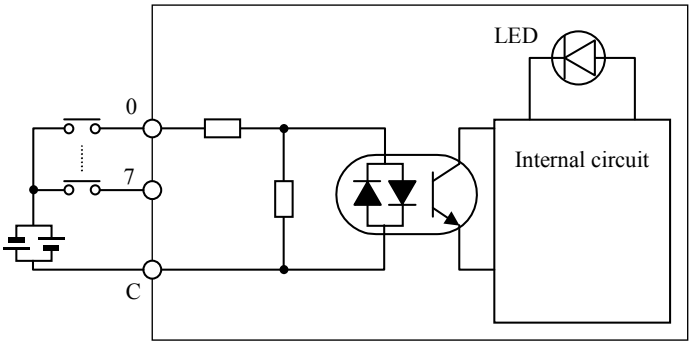
Position of this switch	The choice Indication LED of the external TTL input IN	The choice Indication LED of the external TTL output OUT	LED No.0 to 15
OFF	Turn on (green)	Turn off	Displays the status of the external TTL input. (corresponding to the address Xrus00 to 15)
ON	Turn off	Turn on (green)	Displays the status of the external TTL output. (corresponding to the address Yrus16 to 31)

"r" shows a remote number. (The range is from 0 to 4.)
"u" shows a unit number. (The range is from 0 to 5.)
"s" shows a slot number. (The range is from 0 to A.)

6.2 Specifications

(1) EH-XD8

Specification		EH-XD8
Input type		DC input (common use to sink and source)
Number of input points		8 points
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	15 V or more
	OFF voltage	5 V or less
Input response time	ON response	5 ms or less
	OFF response	5 ms or less
Insulation system		Photo-coupler insulation
Input display		LED display (green)
External connection		Removable type screw terminal block (M3)
Number of input points / commons		8 points / 1 common
Internal current consumption		Approx. 30 mA

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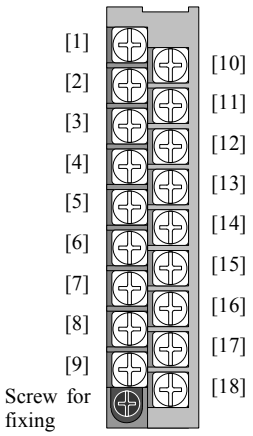
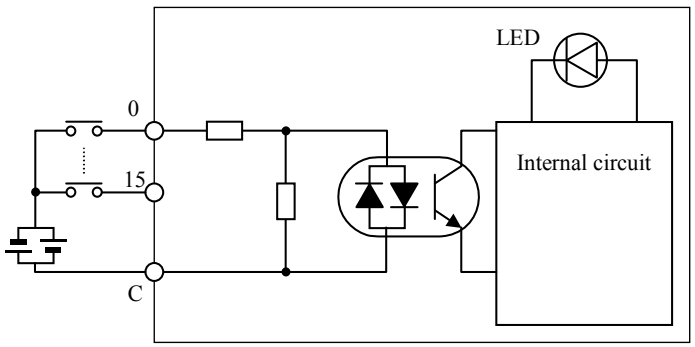
	[10]	N.C.	
	[11]	N.C.	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	C	

(2) EH-XD16

Specification		EH-XD16
Input type		DC input (common use to sink and source)
Number of input points		16 points
Input voltage		24 V DC (19.2 to 30 V DC)
Input current		Approx. 4.0 mA
Input impedance		Approx. 5.9 kΩ
Operating voltage	ON voltage	15 V or more
	OFF voltage	5 V or less
Input response time	ON response	5 ms or less
	OFF response	5 ms or less
Insulation system		Photo-coupler insulation
Input display		LED display (green)
External connection		Removable type screw terminal block (M3)
Number of input points / commons		16 points / 1 common (common terminal is 2 points.)
Internal current consumption		Approx. 50 mA

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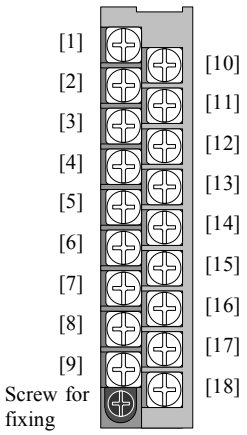
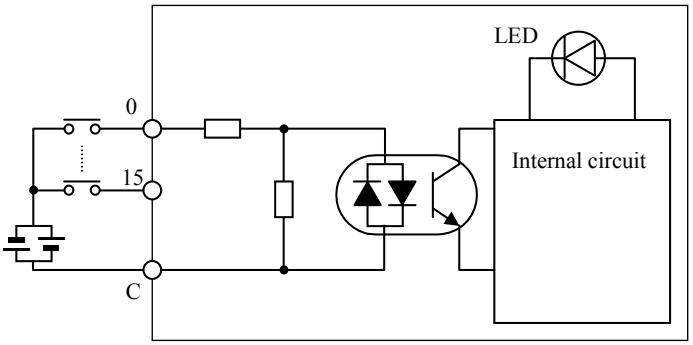
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	

(3) EH-XDL16

Specification		EH-XDL16
Input type		DC input (common use to sink and source)
Number of input points		16 points
Input voltage		24 V DC (19.2 to 30 V DC)
Input current		Approx. 4.0 mA
Input impedance		Approx. 5.9 kΩ
Operating voltage	ON voltage	15 V or more
	OFF voltage	5 V or less
Input response time	On voltage	16 ms or less
	OFF voltage	16 ms or less
Insulation system		Photo-coupler insulation
Input display		LED display (green)
External connection		Removable type screw terminal block (M3)
Number of input points / commons		16 points / 1 common (Common terminal is 2 points.)
Internal current consumption		Approx. 50 mA

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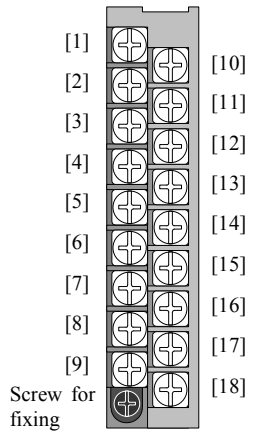
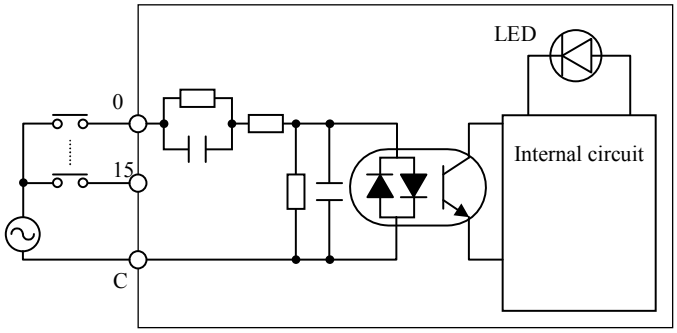
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	

(4) EH-XA16

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

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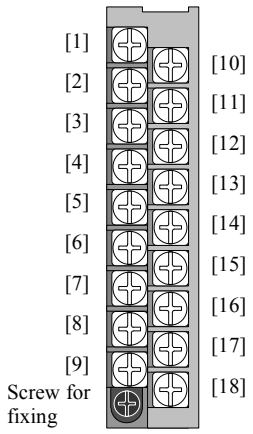
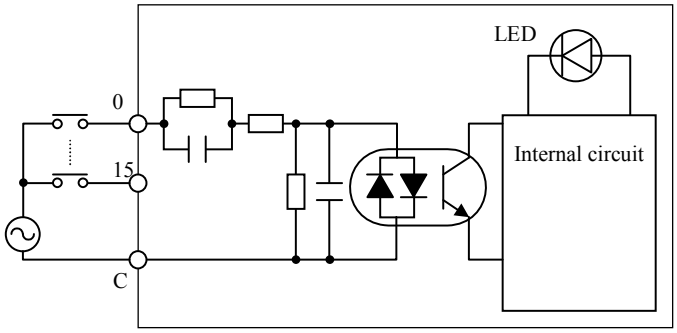
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	

(5) EH-XAH16

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

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
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	[12]	10	
	[13]	11	
	[14]	12	
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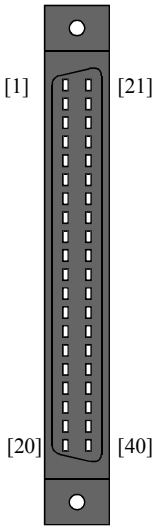
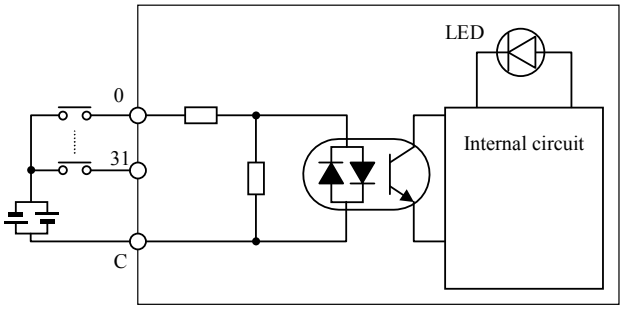
(6) EH-XD32

Specification		EH-XD32
Input type		DC input (Common use to sink and source)
Number of input points		32 points
Input voltage		24 V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3 mA
Input impedance		Approx. 5.6 kΩ
Operating voltage	ON voltage	15 V or more
	OFF voltage	5 V or less
Input response time	ON response	5 ms or less
	OFF response	5 ms or less
Insulation system		Photo-coupler insulation
Input display		LED connector (green)
External connection		Connector
Number of input points / commons		32 points / 1 common (Common terminal is 4 points.)
Internal current consumption		Approx. 60 mA

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
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	[9]	C	[29]	C	
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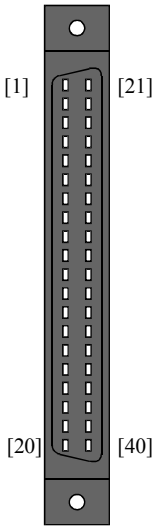
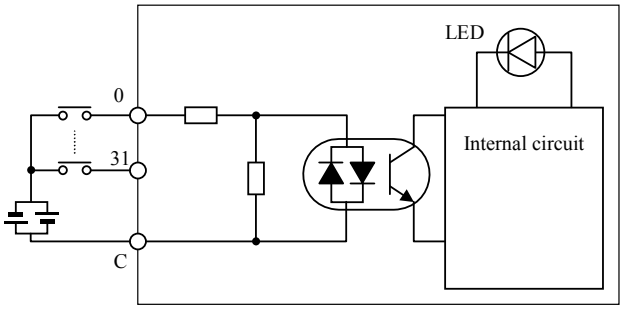
	[14]	12	[34]	28	
	[15]	13	[35]	29	
	[16]	14	[36]	30	
	[17]	15	[37]	31	
	[18]	C	[38]	C	
	[19]	N.C.	[39]	N.C.	
	[20]	N.C.	[40]	N.C.	

Applicable connectors
- A 120mm (4.73in.) space is required for the front of the module. Please choose the installing location (space) accordingly.
- Use a shield cable and always use a class D grounding.

Maker	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Pressure-displacement type	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(7) EH-XDL32

Specification		EH-XDL32
Input type		DC input (Common use to sink and source)
Number of input points		32 points
Input voltage		24 V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3 mA
Input impedance		Approx. 5.6 kΩ
Operating voltage	ON voltage	15 V or more
	OFF voltage	5 V or less
Input response time	ON response	16 ms or less
	OFF response	16 ms or less
Insulation system		Photo-coupler insulation
Input display		LED connector (green)
External connection		Connector
Number of input points / commons		32 points / 1 common (Common terminal is 4 points.)
Internal current consumption		Approx. 60 mA

Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
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	[9]	C	[29]	C	
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	[16]	14	[36]	30	
	[17]	15	[37]	31	
	[18]	C	[38]	C	
	[19]	N.C.	[39]	N.C.	
	[20]	N.C.	[40]	N.C.	

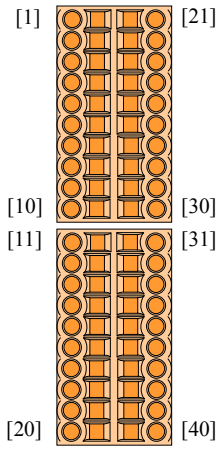
Applicable connectors
- A 120mm (4.73in.) space is required for the front of the module. Please choose the installing location (space) accordingly.
- Use a shield cable and always use a class D grounding.

Maker	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Pressure-displacement type	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(8) EH-XD32E

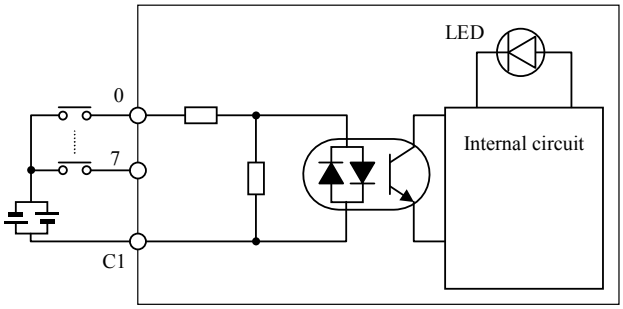
Specification		EH-XD32E
Input type		DC input (Common use to sink and source)
Number of input points		32 points
Input voltage		24 V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3 mA
Input impedance		Approx. 5.6 kΩ
Operating voltage	ON voltage	15 V or more
	OFF voltage	5 V or less
Input response time	ON response	1 ms or less
	OFF response	1 ms or less
Insulation system		Photo-coupler insulation
Input display		LED display (green)
External connection		Spring type terminal block (removable type)
Number of input points / commons		8 points / 1 common (Common terminal is 2 points each. 4 system common is independent.)
Internal current consumption		Approx. 60 mA

Terminal configuration



No.	Signal name	No.	Signal name
[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]	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

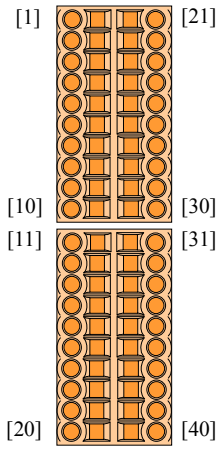
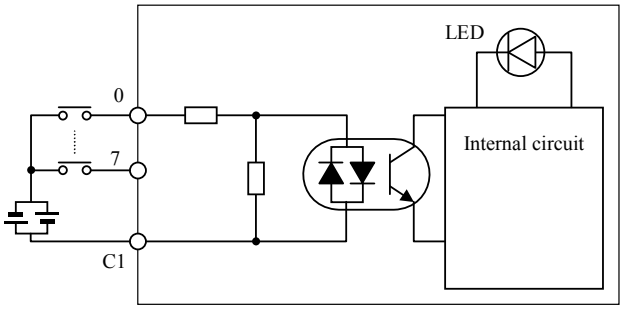
Diagram of Internal circuit



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.

(9) EH-XDL32E

Specification		EH-XDL32E
Input type		DC input (Common use to sink and source)
Number of input points		32 points
Input voltage		24 V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3 mA
Input impedance		Approx. 5.6 kΩ
Operating voltage	ON voltage	15 V or more
	OFF voltage	5 V or less
Input response time	ON response	16 ms or less
	OFF response	16 ms or less
Insulation system		Photo-coupler insulation
Input display		LED display (green)
External connection		Spring type terminal block (removable type)
Number of input points / commons		8 points / 1 common (Common terminal is 2 points each. 4 system common is independent.)
Internal current consumption		Approx. 60 mA

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]	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 A crimp terminal cannot be used.

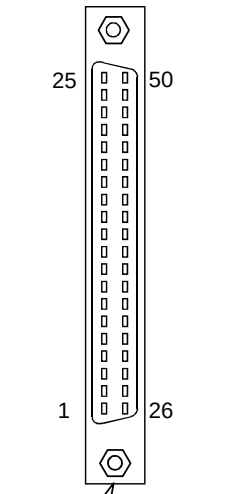
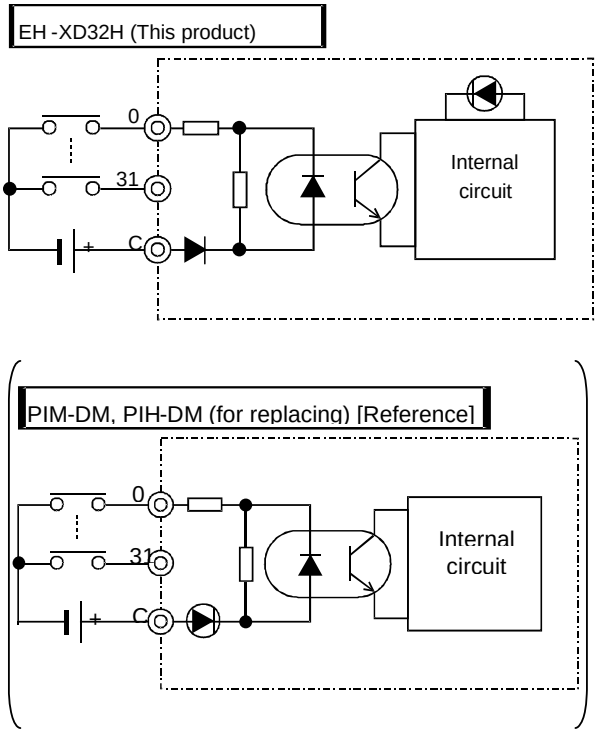
(10) EH-XD32H

Item		PIM-DM, PIH-DM (for replacing)	EH-XD32H (This product)
Series		EM/EM-Ⅱ, H-200/250/252	EH-150
Input specification		DC input (Common use to source)	
Number of input points		32 points	
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 or more	
	OFF voltage	7 V or less	
Input response time	ON response	4 ms or less	
	OFF response	4 ms or less	
Insulation method		Photo-coupler insulation	
Number of common points		32 points / 1 common (common terminal is 4 *1)	
Input display		LED (red)	LED (green) *2
Polarity		Common terminal (+)	
External connection		Connector (50 pins)	
Internal current consumption (5 V DC)		Approx. 20 mA	Approx. 60 mA
I/O assignment		X32	

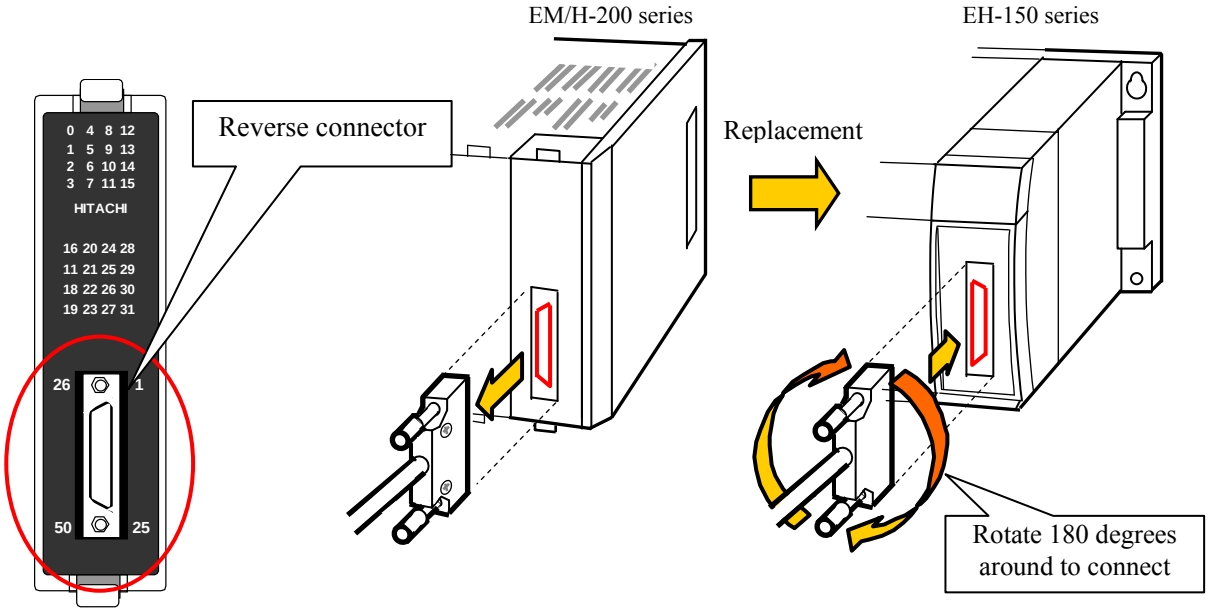
*1 Common terminals are connected internally.

*2 There are 16 points for each LED display. The displayed group is toggled using a switch.

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]	NC	[38]	NC	
	[12]	C	[37]	C	
	[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]	NC	[27]	NC	
	[1]	C	[26]	C	

*1 EH-XD32H has a turned connector to a 32-point I/O module for EM/H-200 series. Connect an external wiring cable rotating 180 degrees around when replacing the module. (You cannot connect the cable in wrong direction due to the structure for avoiding improper connection.)

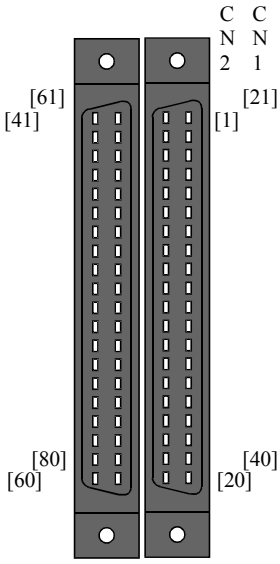


(11) EH-XD64

Specification		EH-XD64
Input type		DC input (Common used to sink and source)
Number of input points		64 points
Input voltage		24 V DC (20.4 to 28.8 V DC)
Input current		Approx. 4.3 mA
Input impedance		Approx. 5.6 kΩ
Operating voltage	ON voltage	15 V or more
	OFF voltage	5 V or less
Input response time	ON response	1 ms or less
	OFF response	1 ms or less
Insulation system		Photo-coupler insulation
Input display		LED display (green)*1
External connection		Connector
Number of input points / commons		32 points / 1 common (Common terminal is 4 points each. 2 system common is independent.*2)
Internal current consumption		Approx. 80 mA

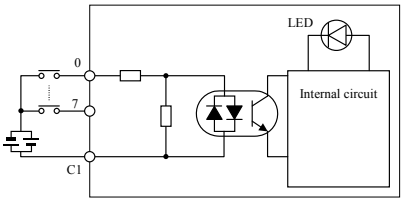
*1 There are 16 points of LED indication. The indication group is switched by toggle switch.
*2 2 groups(C1,C2) are separated. 4 common terminals in one group are connected internally.

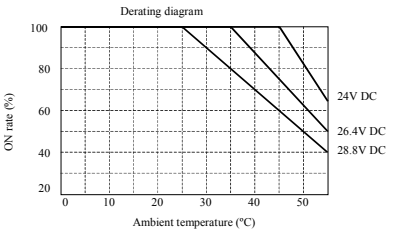
Terminal configuration



No.	Signal name	No.	Signal name	No.	Signal name	No.	Signal name
[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.

Diagram of Internal circuit





Applicable connectors
- A 120 mm (4.73 in.) space is required for the front of the module. Please choose the installing location (space) accordingly.
- Use a shield cable and always use a class D grounding.

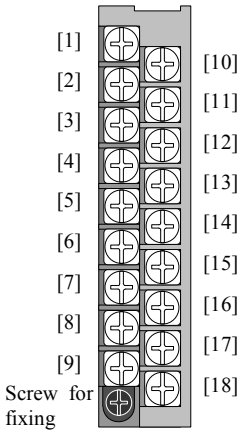
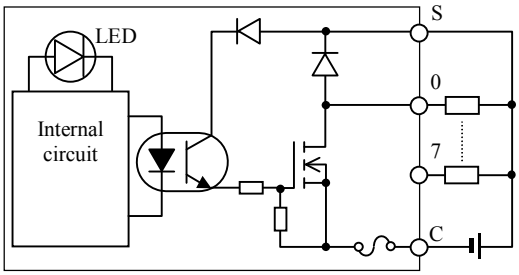
Manufacturer	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Pressure-displacement type	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(12) EH-YT8

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

*1 MFG NO. (02F**) indicates products of June 2002.

*2 The module needs to be repaired in case the short-circuited load causes the fuse to blown out. But, users cannot replace the fuse.

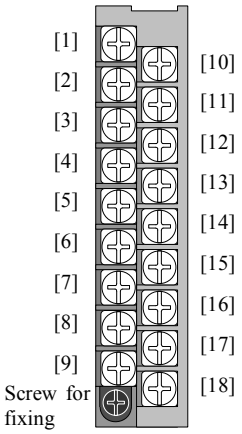
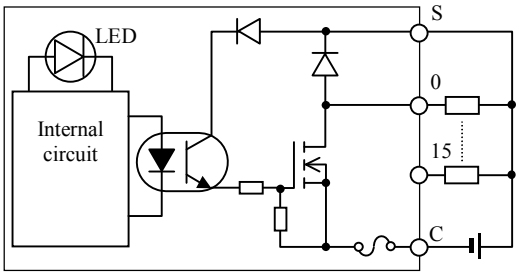
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	0	
	[2]	1	
	[3]	2	
	[4]	3	
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	N.C.	
	[11]	N.C.	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	S	

(13) EH-YT16

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

*1 MFG NO. (02F**) indicates products of June 2002.

*2 The module needs to be repaired in case the short-circuited load causes the fuse to blown out. But, users cannot replace the fuse.

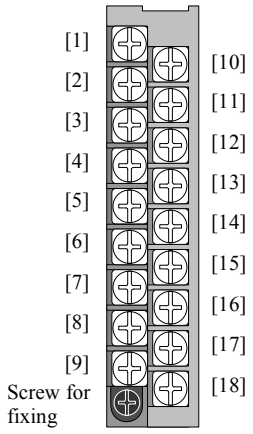
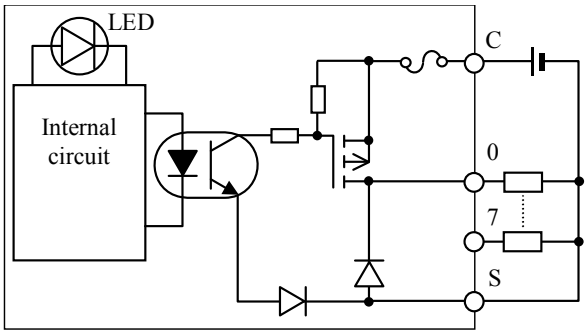
Terminal block	No.	Signal name	Diagram of Internal circuit
	[1]	0	
	[2]	1	
	[3]	2	
	[4]	3	
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	S	

(14) EH-YTP8

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

*1 MFG NO. (02F**) indicates products of June 2002.

*2 The module needs to be repaired in case the short-circuited load causes the fuse to blown-out. But, users cannot replace the fuse.

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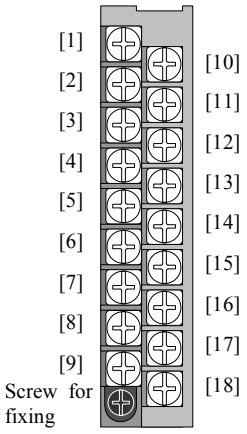
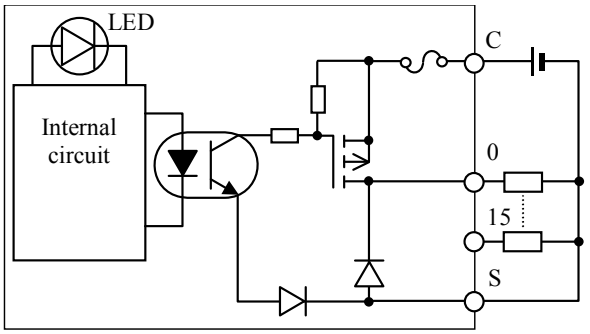
	[3]	2	
	[4]	3	
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	N.C.	
	[11]	N.C.	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	S	

(15) EH-YTP16

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

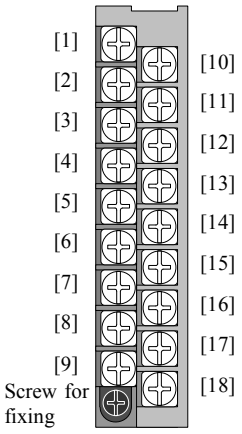
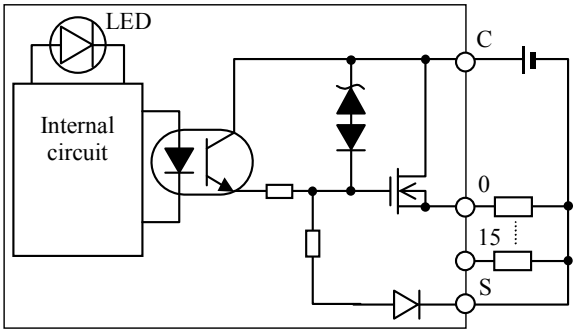
*1 MFG NO. (02F**) indicates products of June 2002.

*2 The module needs to be repaired in case the short-circuited load causes the fuse to blown out. But, users cannot replace the fuse.

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]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	S	

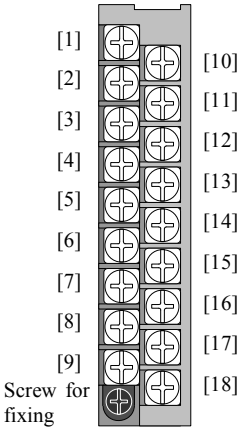
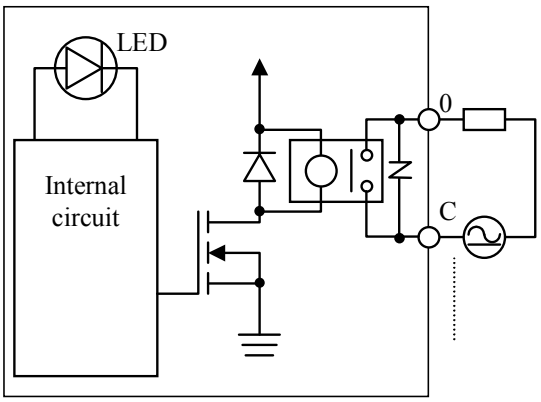
(16) EH-YTP16S

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

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]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	S	

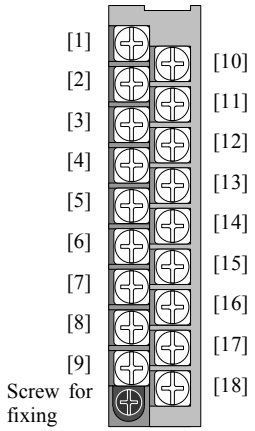
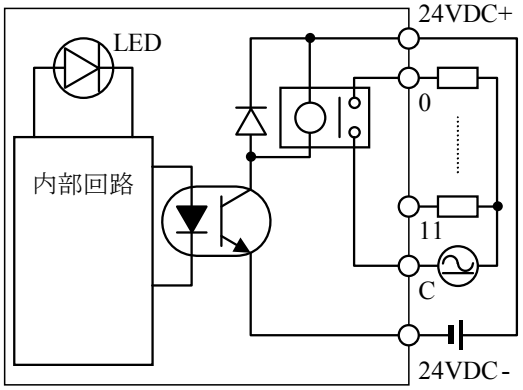
(17) EH-YR8B

Specification		EH-YR8B
Output specification		Relay output
Number of output points		8 points
Rated load voltage		100/240 V AC , 24 V DC
Minimum switching current		1 mA(5 V DC), except after a great current switching
Leak current		None
Maximum load current	1 circuit	2 A
	1 common	2 A
Output response time	OFF➔ON	10 ms or less
	ON➔OFF	10 ms or less
Insulation system		Relay insulation
Output display		LED display (green)
External connection		Removable type screw terminal block (M3)
Number of output points / commons		1 point / 1 common (Each channel is independent.)
Surge removal circuit		Varistor (Varistor voltage 423 to 517 V)
Fuse		None
External power supply		Not used
Internal current consumption (5V DC)		Approx. 220 mA

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

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

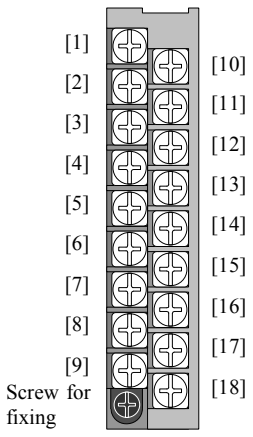
(19) EH-YR16 / EH-YR16D

Item		Specification	
Type		EH-YR16	EH-YR16D
Output specification		Relay output	
Rated load voltage		100/240 V AC, 24 V DC	
Minimum switching current		1 mA	
Leak current		None	
Maximum load current	1 circuit	2 A	
	1 common	8 A (Ambient temperature 40 ºC) See the below derating table	4 A (Ambient temperature 40 ºC) See the below derating table
Output response time	OFF → ON	10 ms or less	
	ON → OFF	10 ms or less	
Number of output points		16 points/module	
Number of common points		16 points/1 common (Common terminal is 2)*1	8 points/1 common (Common terminal is 2)*2
Surge removal circuit		There is no Surge removal circuit and Fuse internal of this module. Please Install proper device in the each output and/or the common line.	
Fuse			
Insulation system		Relay insulation	
Output display		LED (green)	
External connection		Removable type screw terminal block (M3)	
Internal current consumption (5 V DC)		Approximately 430 mA	
I/O assignment		Y16	

*1 The common terminals are connected internally.

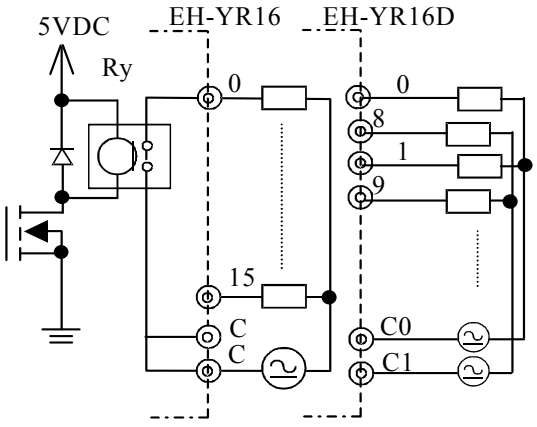
*2 The common terminals are separated.

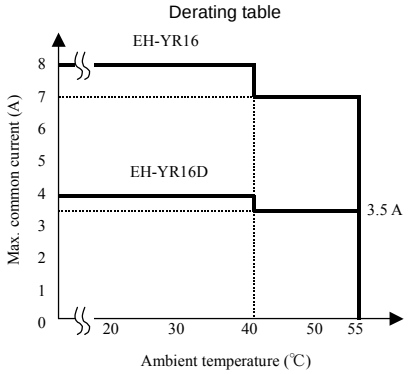
Terminal configuration



No.	Signal name YR16	Signal name YR16D
[1]	0	0
[2]	1	1
[3]	2	2
[4]	3	3
[5]	4	4
[6]	5	5
[7]	6	6
[8]	7	7
[9]	C	C0
[10]	8	8
[11]	9	9
[12]	10	10
[13]	11	11
[14]	12	12
[15]	13	13
[16]	14	14
[17]	15	15
[18]	C	C1

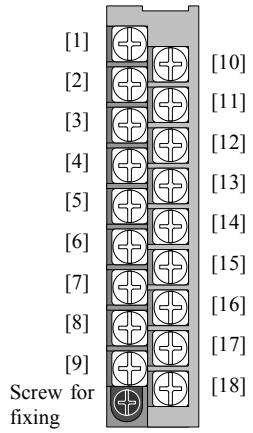
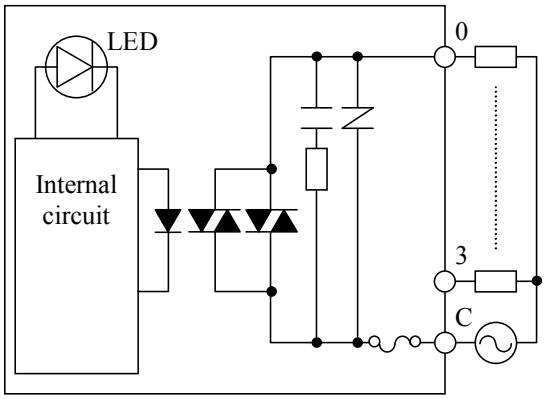
Diagram of Internal circuit





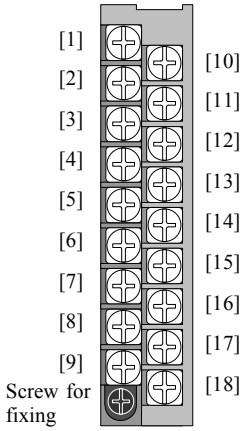
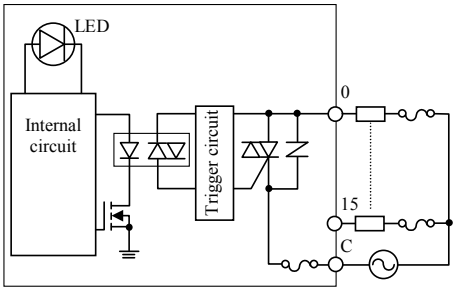
(20) EH-YS4

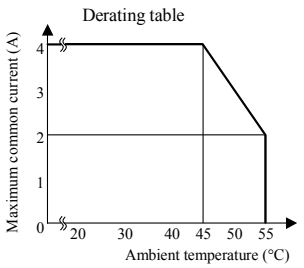
Specification		EH-YS4
Output specification		Triac output
Number of output points		4 points
Rated load voltage		100/240 V AC (85 to 250 V AC)
Minimum switching current		100 mA
Leak current		5 mA or less
Maximum load current	1 circuit	0.5 A
	1 common	2 A
Output response time	OFF➔ON	1 ms or less
	ON➔OFF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

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 output points		16 points
Rated load voltage		100/240 V AC (85 to 250 V AC)
Minimum switching current		10 mA
Leak current		2 mA or less
Maximum load current	1 circuit	0.3 A
	1 common	4 A (Ambient temperature 45 °C), see the following derating table
Output response time	OFF➔ON	1 ms or less
	ON➔OFF	1 ms + 1/2 cycle or less
Insulation system		Photo-coupler triac insulation
Output display		LED display (green)
External connection		Removable type screw terminal block (M3)
Number of output points / commons		16 pints / 1 common
Surge removal circuit		Varistor
Fuse		6.3 A (Mounting a fuse to external is necessary.)
Internal current consumption		Approx. 250 mA

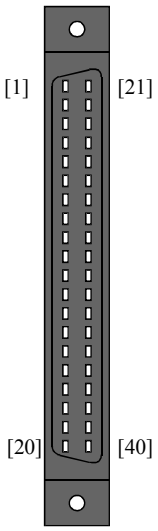
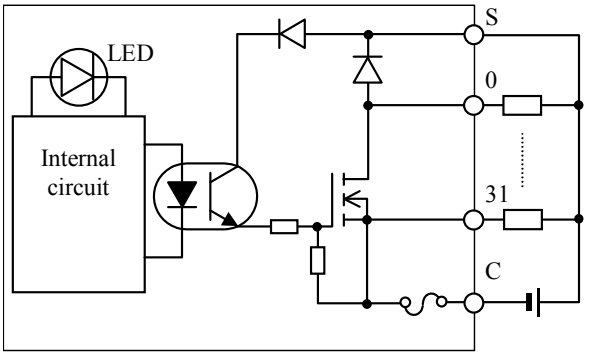
Terminal configuration	No.	Signal name	Diagram of Internal output
	[1]	0	
	[2]	1	
	[3]	2	
	[4]	3	
	[5]	4	
	[6]	5	
	[7]	6	
	[8]	7	
	[9]	C	
	[10]	8	
	[11]	9	
	[12]	10	
	[13]	11	
	[14]	12	
	[15]	13	
	[16]	14	
	[17]	15	
	[18]	C	



(22) EH-YT32

Specification		EH-YT32
Output specification		Transistor output (sink type)
Number of output points		32 points
Rated load voltage		12/24 V DC (+10 %, -15 %)
Minimum switching current		1 mA
Leak current		0.1 mA
Maximum load current	1 circuit	0.2 A
	1 common	6.4 A*1
Output response time	OFF➔ON	0.3 ms or less
	ON➔OFF	1 ms or less
Insulation system		Photo-coupler insulation
Output display		LED display (green)*2
External connection		Connector
Number of output points / commons		32 points / 1 common (Common terminal is 4 points.)
Surge removal circuit		Diode
Fuse*3		10 A / 1 common
External connection (for supplying power to S-terminal)		12/24 V DC (+10 %, -15 %) (30 mA at the maximum)
Internal current consumption (5V DC)		Approx. 90 mA
Short-circuit protection function		Available

*1 Total current of 4 common pins.
For each common pin of a connector, please make common current which is sent into one common pin into 3A or less.
*2 There are 16 points for each LED display. The display group is switched using a switch.
*3 The module needs to be repaired in case a fuse is blown out. But, users cannot replace the fuse.

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	

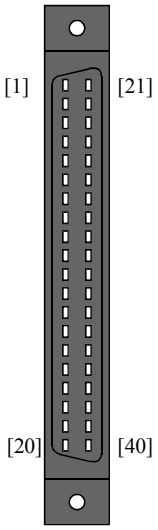
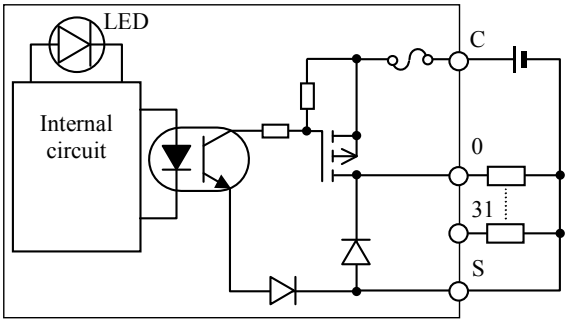
Applicable connector
- A 120mm (4.73in.) space is required for the front of the module. Please choose the installing location (space) accordingly.
- Use a shield cable and always use a class D grounding.

Manufacturer	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Pressure-displacement type	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(23) EH-YTP32

Specification		EH-YTP32
Output specification		Transistor output (source type)
Number of output points		32 points
Rated load voltage		12/24 V DC (+10 %, -15 %)
Minimum switching current		1 mA
Leak current		0.1 mA
Maximum load current	1 circuit	0.2 A
	1 common	6.4 A*1
Output response time	OFF➔ON	0.3 ms or less
	ON➔OFF	1 ms or less
Insulation system		Photo-coupler insulation
Output display		LED display (green)*2
External connection		Connector
Number of output points / commons		32 points / 1 common (Common terminal is 4 points.)
Surge removal circuit		Diode
Fuse*3		10 A / 1 common
External power supply (for supplying power to S-terminal)		12/24 V DC (+10 %, -15 %) (30 mA at the maximum)
Internal current consumption (5V DC)		Approx. 90 mA
Short-circuit protection function		Available

*1 Total current of 4 common pins.
For each common pin of a connector, please make common current which is sent into one common pin into 3A or less.
*2 There are 16 points for each LED display. The display group is switched using a switch.
*3 The module needs to be repaired in case a fuse is blown out. But, users cannot replace.

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	

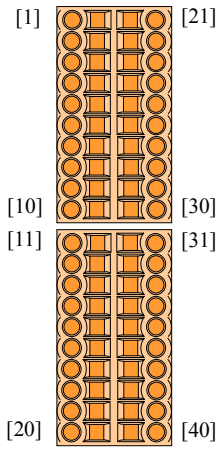
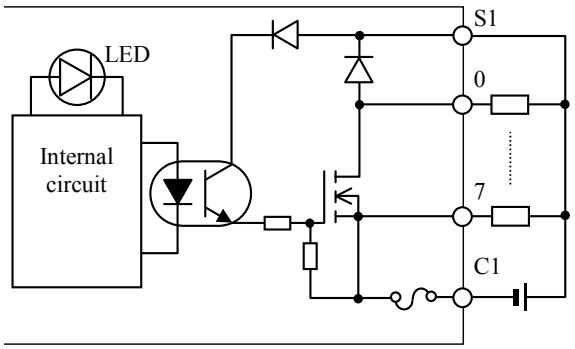
Applicable cable
- A 120mm (4.73in.) space is required for the front of the module. Please choose the installing location (space) accordingly.
- Use a shield cable and always use a class D grounding.

Manufacturer	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Pressure-displacement type	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(24) EH-YT32E

Specification		EH-YT32E
Output specification		Transistor output (sink type)
Number of output points		32 points
Rated load voltage		12/24 V DC (+10 %, -15 %)
Minimum switching current		1 mA
Leak current		0.1 mA
Maximum load current	1 circuit	0.2 A
	1 common	1 A
Output response time	OFF➔ON	0.3 ms or less
	ON➔OFF	1 ms or less
Insulation system		Photo-coupler insulation
Output display		LED display (green)*1
External connection		Spring type terminal block
Number of output points / commons		8 points / 1 common (Common terminal is 4 points.)
Surge removal circuit		Diode
Fuse*2		10 A / 1 common
External power supply (for supplying power to S-terminal)		12/24 V DC (+10 %, -15 %) (30 mA at the maximum)
Internal current consumption (5V DC)		Approx. 90 mA
Short-circuit protection function		Available

*1 There are 16 points for each LED display. The display group is switched using a switch.
*2 The module needs to be repaired in case a fuse is blown out. But, users cannot replace the fuse.

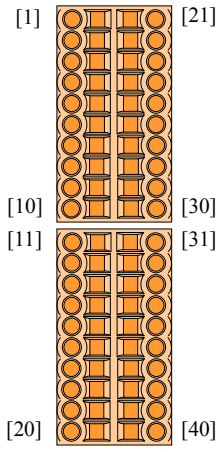
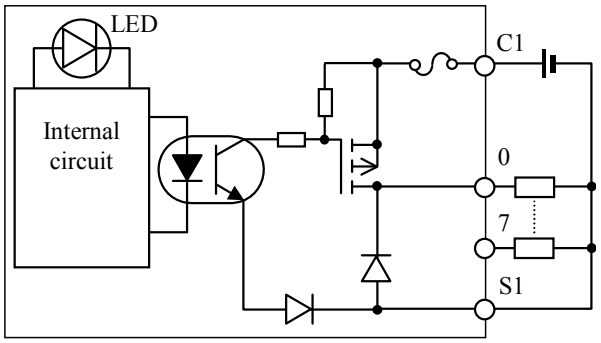
Terminal configuration	No.	Signal name	No.	Signal name	Diagram of Internal circuit
	[1]	0	[21]	16	
	[2]	1	[22]	17	
	[3]	2	[23]	18	
	[4]	3	[24]	19	
	[5]	4	[25]	20	
	[6]	5	[26]	21	
	[7]	6	[27]	22	
	[8]	7	[28]	23	
	[9]	C1	[29]	C3	
	[10]	S1	[30]	S3	
	[11]	8	[31]	24	
	[12]	9	[32]	25	
	[13]	10	[33]	26	
	[14]	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 output points		32 points
Rated load voltage		12/24 V DC (+10 %, -15 %)
Minimum switching current		1 mA
Leak current		0.1 mA
Maximum load current	1 circuit	0.2 A
	1 common	1 A
Output response time	OFF➔ON	0.3 ms or less
	ON➔OFF	1 ms or less
Insulation system		Photo-coupler insulation
Output display		LED display (green)*1
External connection		Spring type terminal block
Number of output points / commons		8 points / 1 common (Common terminal is 4 points.)
Surge removal circuit		Diode
Fuse*2		10 A / 1 common
External power supply (for supplying power to S-terminal)		12/24 V DC (+10 %, -15 %) (30 mA at the maximum)
Internal current consumption (5V DC)		Approx. 90 mA
Short-circuit protection function		Available

*1 There are 16 points for each LED display. The display group is switched using a switch.
*2 The module needs to be repaired in case a fuse is blown out. But, users cannot replace the fuse.

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	

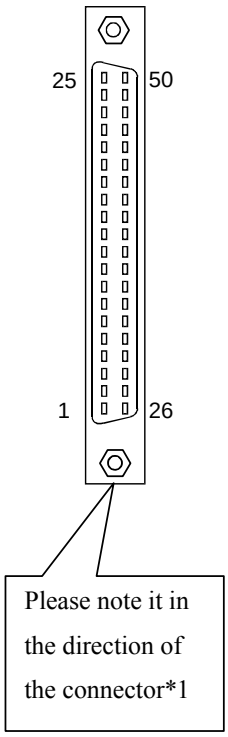
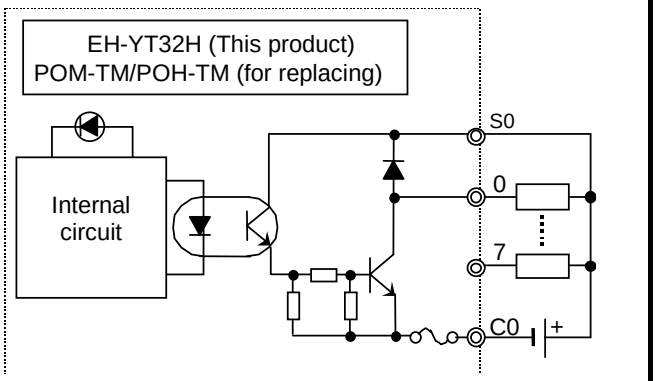
Applicable connectors	Applicable cable
Manufacturer: Weidmuller Type: B2L3.5/20AUOR Product No.: 175736	0.5mm^2 – 1.0mm^2 (shared at a twisted pair cable and a single core cable. AWG 28 - 18 A crimp terminal cannot be used.

(26) EH-YT32H

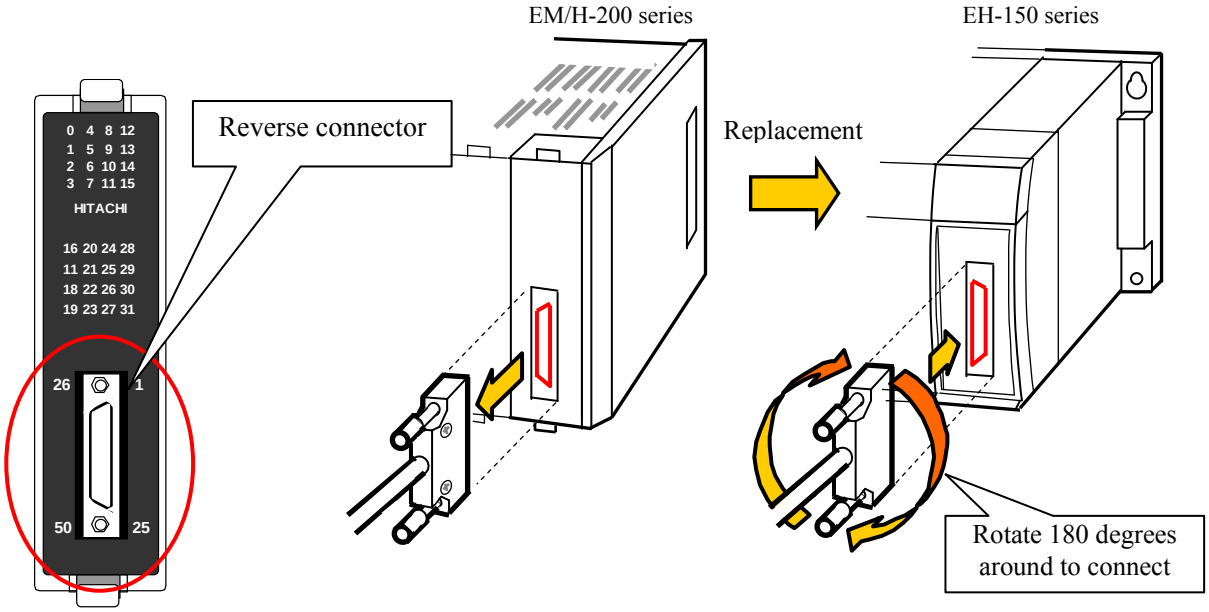
Item		EH-YT32H	POM-TM, POH-TM (for replacing)
Series		EH-150	EM/EM-II, H-200/250/252
Output specification		Transistor output (sink type)	
Number of output points		32 points	
Rated load voltage		5/12/24 V DC (5 to 27 V DC)	
Minimum switching current		1 mA	
Leak current		0.05 mA or less	
Maximum output saturation voltage		1 V or less	
Maximum load current	1 point	0.1 A	
	1 common	0.8 A	
Output response time	OFF➔ON	1 ms or less	
	ON➔OFF	1 ms or less	
Insulation method		Photo-coupler insulation	
Output display		LED (green)*2	LED (red)
External connection		Connector (50 pins)	
Number of common points		8 points / 1 common	
Surge removal circuit		Diode (Connecting case of the S terminal)	
Fuse*1		2 A / 1 common	1.5 A / 1 common
External power supply*3 (For supplying power to the S terminal)		5 to 27 V DC (maximum 100 mA)	
Internal current consumption (5 V DC)		Approx. 90 mA	Approx. 70 mA
Short-circuit protection		None	
I/O assignment		Y32	

*1 The module needs to be repaired in case a load short causes a blown fuse. Further more, it is not allowed for user to replace a fuse as safety reason.
*2 There are 16 points for each LED display. The display group is toggled using a switch. And, LED display is renewed by refresh processing.
*3 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
	[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	

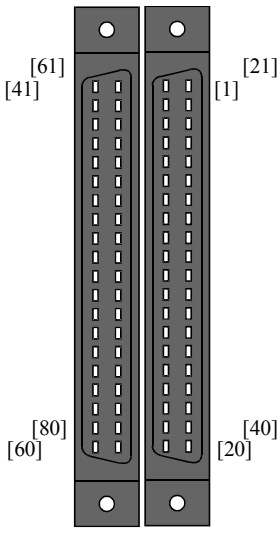
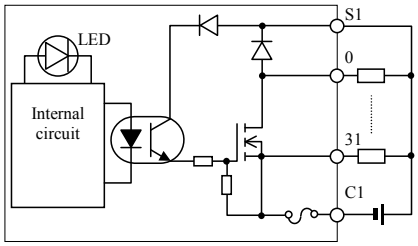
*1 EH-XD32H has a turned connector to a 32-point I/O module for EM/H-200 series. Connect an external wiring cable rotating 180 degrees around when replacing the module. (You cannot connect the cable in wrong direction due to the structure for avoiding improper connection.)



(27) EH-YT64

Specification		EH-YT64
Output specification		Transistor output (sink type)
Number of output points		64 points
Rated load voltage		12/24 V DC (+10 %, -15 %)
Minimum switching current		1 mA
Leak current		0.1 mA
Maximum load current	1 circuit	0.1 A
	1 common	3.2 A
Output response time	OFF➔ON	0.3 ms or less
	ON➔OFF	1 ms or less
Insulation system		Photo-coupler insulation
Output display		LED display (green)*1
External connection		Connector
Number of output points / commons		32 points / 1 common (Common terminal is 4 points each.)
Surge removal circuit		Diode
Fuse*2		5 A / 1 common
External power supply (for supplying power to S-terminal)		12/24 V DC (+10 %, -15 %) (100 mA at the maximum)
Internal current consumption (5V DC)		Approx. 120 mA
Short-circuit protection function		Available

*1 There are 16 points for each LED display. The display group is switched using a switch.
*2 The module needs to be repaired in case a fuse is blown out. But, users cannot replace the fuse.

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	

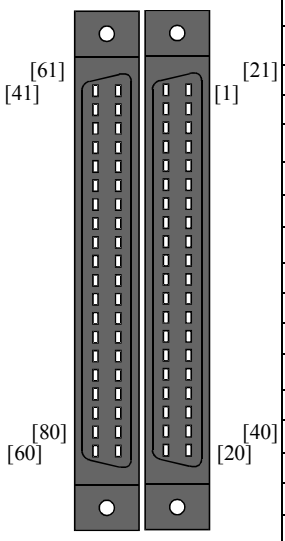
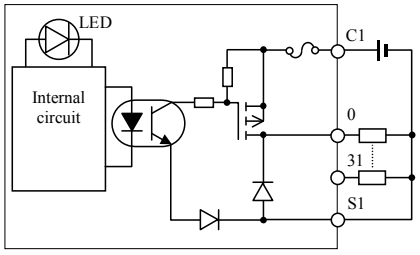
Applicable connectors
- A 120mm (4.73in.) space is required for the front of the module. Please choose the installing location (space) accordingly.
- Use a shield cable and always use a class D grounding.

Manufacturer	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Pressure-displacement type	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 points
Rated load voltage		12/24 V DC (+10 %, -15 %)
Minimum switching current		1 mA
Leak current		0.1 mA
Maximum load current	1 circuit	0.1 A
	1 common	3.2 A
Output response time	OFF➔ON	0.3 ms or less
	ON➔OFF	1 ms or less
Insulation system		Photo-coupler insulation
Output display		LED display (green)*1
External connection		Connector
Number of output points / commons		32 points / 1 common (Common terminal is 4 points each.)
Surge removal circuit		Diode
Fuse*2		5 A / 1 common
External power supply (for supplying power to S-terminal)		12/24 V DC (+10 %, -15 %) (100 mA at the maximum)
Internal current consumption (5V DC)		Approx. 120 mA
Short-circuit protection function		Available

*1 There are 16 points for each LED display. The display group is switched using a switch.
*2 The module needs to be repaired in case a fuse is blown out. But, users cannot replace the fuse.

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
- A 120mm (4.73 in.) space is required for the front of the module. Please choose the installing location (space) accordingly.
- Use a shield cable and always use a class D grounding.

Manufacturer			
	Fujitsu Takamizawa	Solder type	Socket: FCN-361J040-AU, Cover: FCN-360C040-E
		Crimp type	Housing: FCN-363J040, Contact: FCN-363J-AU
		Pressure-displacement type	FCN-367J040-AU/F
	AMP	Solder type	1473381-1

(29) EH-MTT32

Item		EH-MTT32		PHM-TT (Reference)	
		TTL input	TTL output	TTL input	TTL output
Input and output specifications		TTL		TTL	
Input and output voltage		4 to 27 V DC		4 to 27 V DC	
Input current		Approximately 6 mA (5 V DC)	-	Approximately 6 mA (5 V DC)	-
Operating voltage	ON voltage	Less than 1.5 V (5 V DC)	-	Less than 1.5 V (5 V DC)	-
	OFF voltage	More than 3.5 V (5 V DC)	-	More than 3.5 V (5 V DC)	-
Maximum load current		-	20 mA / point	-	20 mA / point
Minimum load current		-	0 mA / point	-	0 mA / point
Maximum leak current		-	50 μA	-	50 μA
Maximum delay time	OFF ➔ ON	1 ms		1 ms	
	ON ➔ OFF	1 ms		1 ms	
Input points / module		16 points / module	-	16 points / module	-
Output points / module		-	16 points / module	-	16 points / module
I/O points / common*1		16 points / common	8 points / common	16 points / Common	8 points / common
Circuit to remove the surge		-	Diode	-	Diode
I/O indication*2		LED display (green) (I/O change by switch)		None	
Polarity		Common (Negative)		Common (Negative)	
Insulation system		Photocoupler insulation		Photocoupler insulation	
Fuse*3		0.63 A	1.6 A	-	1.5 A
External connection		Connector		Connector	
Internal consumption current (5 V DC)		Approximately 140 mA		Approximately 100 mA	
External power supply*4 (For input S terminal supply)		4 to 27 V DC (Maximum 200 mA)	-	4 to 27 V DC (Maximum 200 mA)	-
External power supply*4 (For output S terminal supply)		-	4 to 27 V DC (Maximum 200 mA)	-	4 to 27 V DC (Maximum 200 mA)
I/O assignment*5		B1/1 (LADDER EDITOR for Windows® used)		B1/1 (LADDER EDITOR for Windows® used)	
		X1Y1W (Control Editor used)			

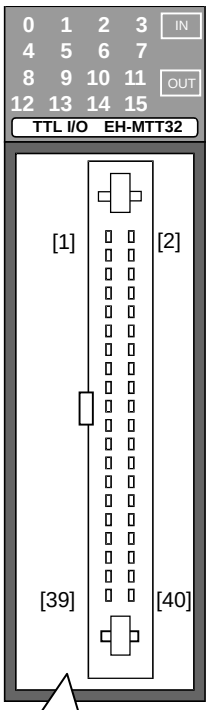
*1 Common terminals are not connected inside.
*2 The displayed I/O group in 16 points LED can be switch by the LED display mode switch.
*3 The module needs to be repaired in the case the short-circuited load blow out. But users cannot exchange the fuse.
*4 It is necessary to supply 4 to 27V DC on each S terminal from the outside.
*5 CPU module that "MFG. NO." (Manufacturing number) is listed in below table can't be used auto setting of I/O configuration by programming software when this module is mounted on the Remote slave unit. Therefore, it is necessary to set up an I/O configuration of this module by manual operation using programming software.
If I/O configuration of this module is set up by auto setting using programming software, it must be set up again by manual operation.

Model of the CPU module	Target manufacturing number	I/O assignment before the change	**I/O assignment after the change**
EHV-CPU128	December, 2012 or before	X1Y1W	**X1Y1W (B1/1)**
EHV-CPU64			
EHV-CPU32			
EHV-CPU16			

Auto setting of I/O configuration can be used that this module is mounted on the basic unit and the expansion unit.

"MFG. NO." is shown on the name plate of left side of product. Please refer to below figure.

Terminal configuration

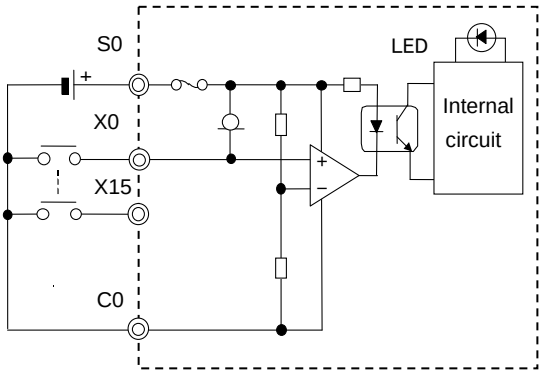


Please be careful to a thing of a connector. *2

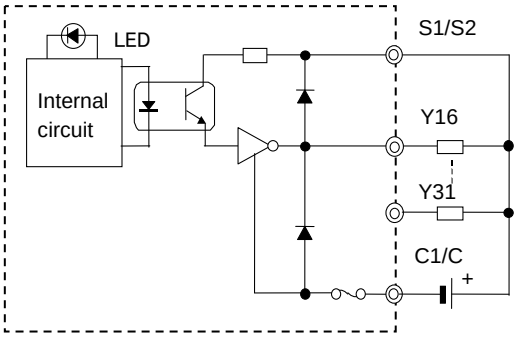
Terminal No.	Signal name	Terminal No.	Signal name
[1]	C0	[2]	C1*3
[3]	S0	[4]	S1*3
[5]	X0	[6]	Y16
[7]	X1	[8]	Y17
[9]	X2	[10]	Y18
[11]	X3	[12]	Y19
[13]	X4	[14]	Y20
[15]	X5	[16]	Y21
[17]	X6	[18]	Y22
[19]	X7	[20]	Y23
[21]	NC*1	[22]	C2*3
[23]	NC*1	[24]	S2*3
[25]	X8	[26]	Y24
[27]	X9	[28]	Y25
[29]	X10	[30]	Y26
[31]	X11	[32]	Y27
[33]	X12	[34]	Y28
[35]	X12	[36]	Y29
[37]	X14	[38]	Y30
[39]	X15	[40]	Y31
TTL input		TTL output	

Diagram of Internal circuit

TTL input



TTL output



*1 NC is not connected internally.

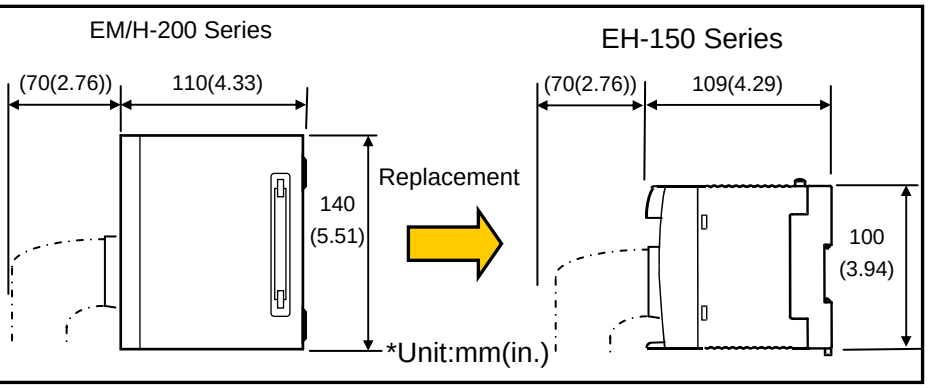
*2 Polar guide will be left.

*3 C1 and C2 as well as external TTL outputs S1 and S2 are independent within each.

[External wiring connector (recommended) Specifications]

Product name	Maker	Product number of the maker	Connection method	Applicable Wire(s)
Socket type (Guided prevent incorrect insertion)	Hirose Electric Co., Ltd.	HIF3BA-40D-2.54R	Collective pressure welding	28 AWG Flat cable UL2651 (Seven cable 0.127 mm Outside diameter : 0.9 ±0.1 mm)
Socket type(Crimp use)		HIF3BA-40D-2.54C	Single line crimp	20 AWG to 28 AWG
Gold plated contact in bag		HIF3-2226SC		22 AWG to 26 AWG
		HIF3-2428SC		24 AWG to 28 AWG
		HIF3-2022SC		20 AWG to 22 AWG
Crimp use of cover case		HIF3-40CV(71)	-	The outer covering is adapted largest Φ1.6 mm.

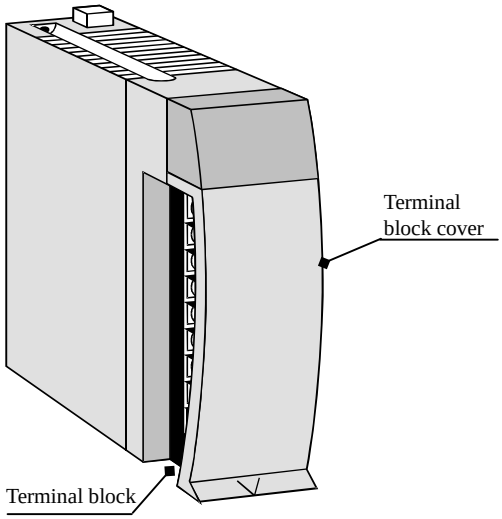
For external wiring cable, the space needs more than 70 mm (2.76 in.) in front of the module.
In the case of the replacement, the depth is similar as the right figure.



Chapter 7 Analog I/O Module

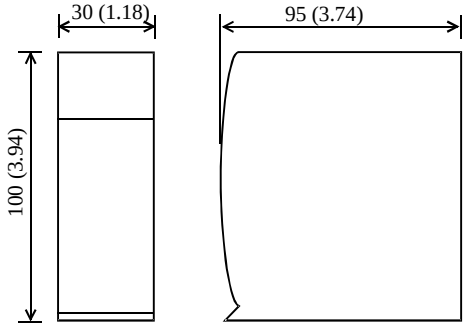
7.1 12-bit Analog I/O Module

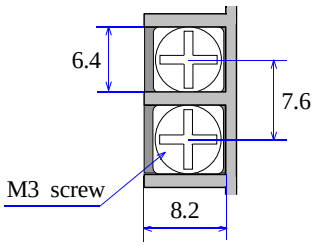
Name and function of each part



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

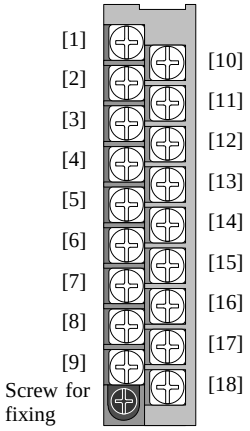
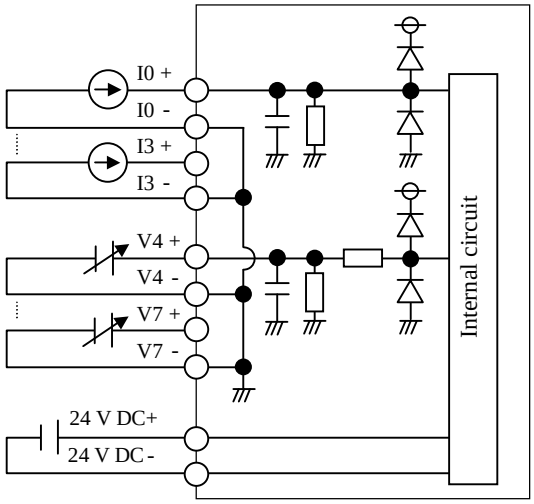
Dimensions (mm (in.))



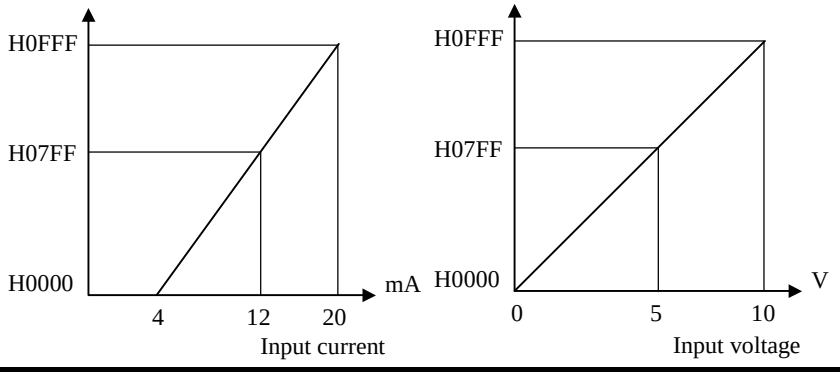
Item	Description
Terminal block	This is a terminal block for connecting the I/O signals. The terminal block is removable. Screws for the terminal block are M3 screw. Use a crimp terminal fitting to the screw diameter. The maximum thickness of the cable should be 0.75 mm^2. (Use a 0.5 mm^2 cable when attaching two crimp terminals to the same terminal.) Recommended crimp terminal is shown below.  6 (0.24) (Recommended)  6 (0.24) Take great care on handling the terminal because it may fall off if the screw is loose. Unit: mm (in.) 
Terminal block cover	This is a covert for installing on the terminal block.

(1) EH-AX44

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

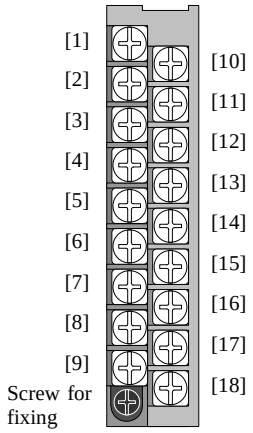
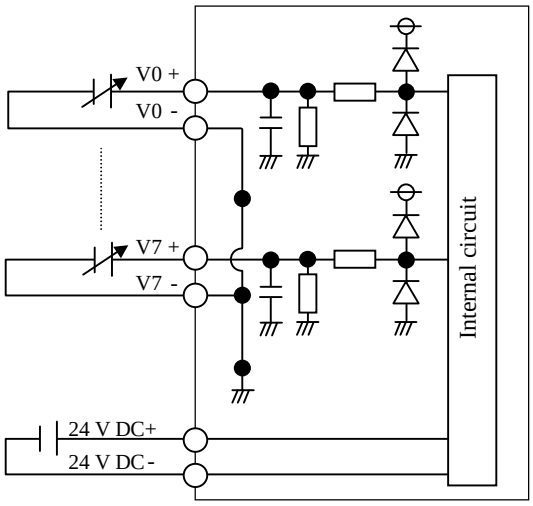
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	I0 +	
	[2]	I1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	V4 +	
	[6]	V5 +	
	[7]	V6 +	
	[8]	V7 +	
	[9]	24 V DC +	
	[10]	I0 -	
	[11]	I1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	V4 -	
	[15]	V5 -	
	[16]	V6 -	
	[17]	V7 -	
	[18]	24 V DC -	

Support to analog data and digital data

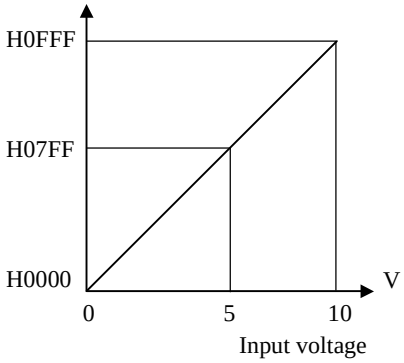


(2) EH-AX8V

Specification		EH-AX8V
Current range		-
Voltage range		0 to 10 V DC
Number of channels	Current	-
	Voltage	8 (0 to 7 channels)
Resolution		12 bits
Conversion time		5 ms or less
Overall accuracy		±1 % or less (of full-scale value)
Input impedance	Current	-
	Voltage	Approx. 100 kΩ
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24 V DC (+20 %, -15 %) Approx. 150 mA (Approx. 400 mA at power ON)
External wiring		2-core shield cable (20 m or less)
Internal current consumption		Approx. 100 mA

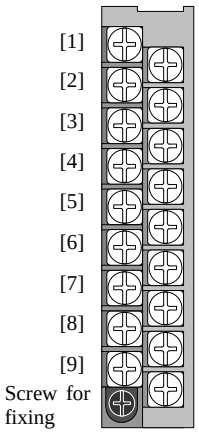
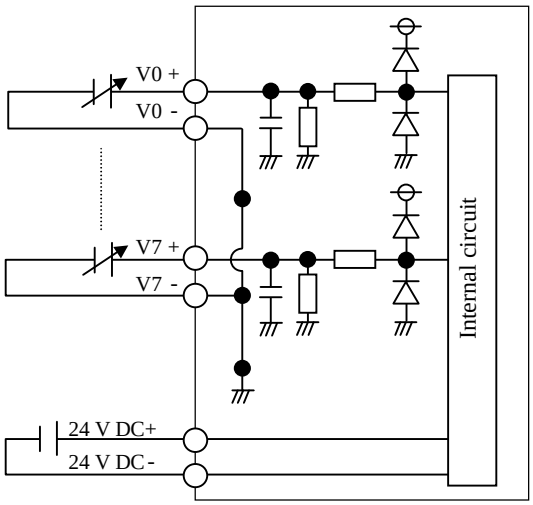
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	V2 +	
	[4]	V3 +	
	[5]	V4 +	
	[6]	V5 +	
	[7]	V6 +	
	[8]	V7 +	
	[9]	24 V DC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	V2 -	
	[13]	V3 -	
	[14]	V4 -	
	[15]	V5 -	
	[16]	V6 -	
	[17]	V7 -	
	[18]	24 V DC -	

Support to analog data and digital data

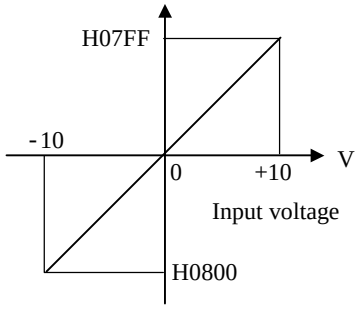


(3) EH-AX8H

Specification		EH-AX8H
Current range		-
Voltage range		+/- 10 V DC
Number of channels	Current	-
	Voltage	8 (0 to 7 channels)
Resolution		12 bits
Conversion time		5 ms or less
Overall accuracy		±1 % or less (of full-scale value)
Input impedance	Current	-
	Voltage	Approx. 100 kΩ
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24 V DC (+20 %, -15 %) Approx. 150 mA (Approx. 400 mA at power ON)
External wiring		2-core shield cable (20 m or less)
Internal current consumption		Approx. 100 mA

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 V DC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	V2 -	
	[13]	V3 -	
	[14]	V4 -	
	[15]	V5 -	
	[16]	V6 -	
	[17]	V7 -	
	[18]	24 V DC -	

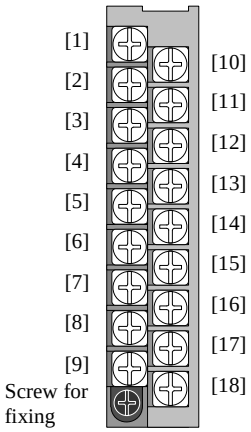
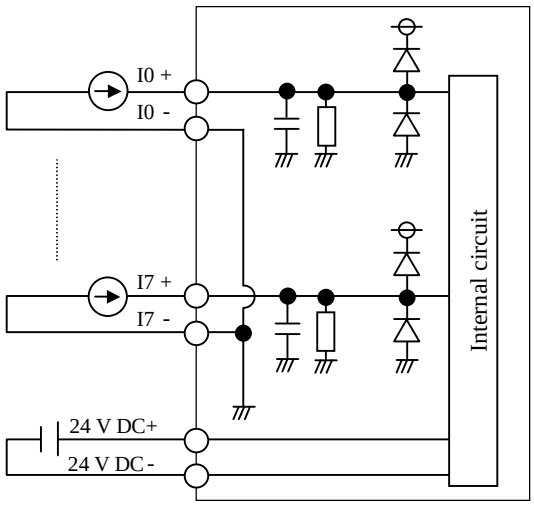
Support to analog data and digital data



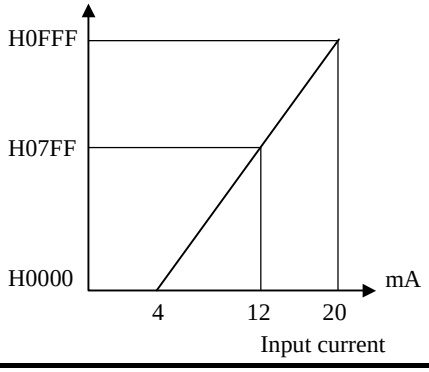
(A complement of 2)

(4) EH-AX8I

Specification		EH-AX8I
Current range		4 to 20 mA
Voltage range		-
Number of channels	Current	8 (0 to 7 channels)
	Voltage	-
Resolution		12 bits
Conversion time		5 ms or less
Overall accuracy		±1 % or less (of full-scale value)
Input impedance	Current	Approx. 100 Ω
	Voltage	-
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24 V DC (+20 %, -15 %) Approx. 150 mA (Approx. 400 mA at power ON)
External wiring		2-core shield cable (20 m or less)
Internal current consumption		Approx. 100 mA

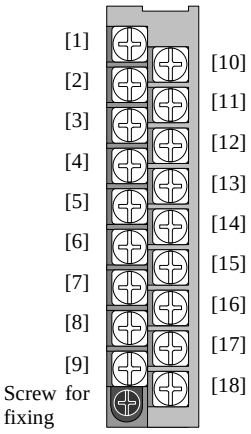
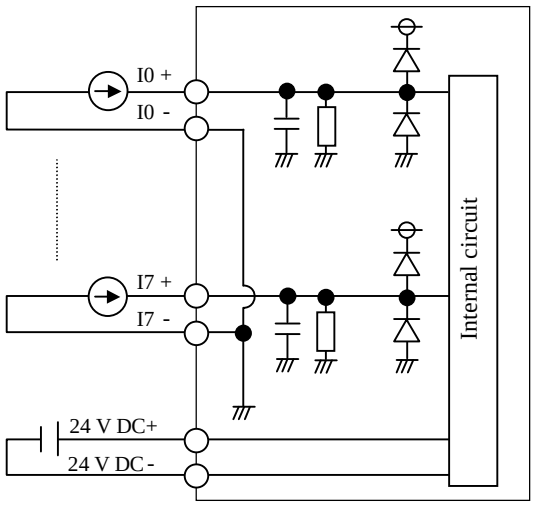
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	I0 +	
	[2]	I1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	I4 +	
	[6]	I5 +	
	[7]	I6 +	
	[8]	I7 +	
	[9]	24 V DC +	
	[10]	I0 -	
	[11]	I1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	I4 -	
	[15]	I5 -	
	[16]	I6 -	
	[17]	I7 -	
	[18]	24 V DC -	

Support to analog data and digital data

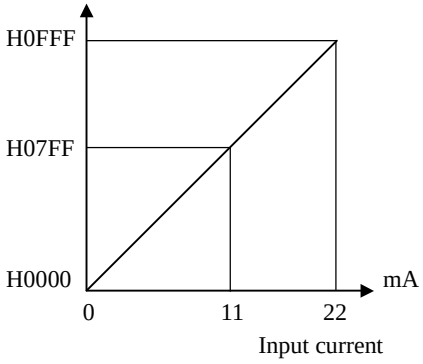


(5) EH-AX8IO

Specification		EH-AX8IO
Current range		0 to 22 mA
Voltage range		-
Number of channels	Current	8 (0 to 7 channels)
	Voltage	-
Resolution		12 bits
Conversion time		5 ms or less
Overall accuracy		±1% or less (of full-scale value)
Input impedance	Current	Approx. 100 Ω
	Voltage	-
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24 V DC (+20 %, -15 %) Approx. 150 mA (Approx. 400 mA at power ON)
External wiring		2-core shield cable (20 m or less)
Internal current consumption		Approx. 100 mA

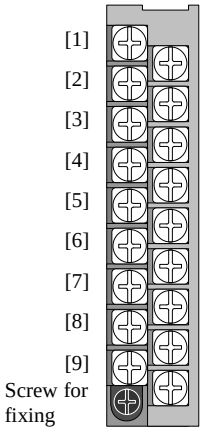
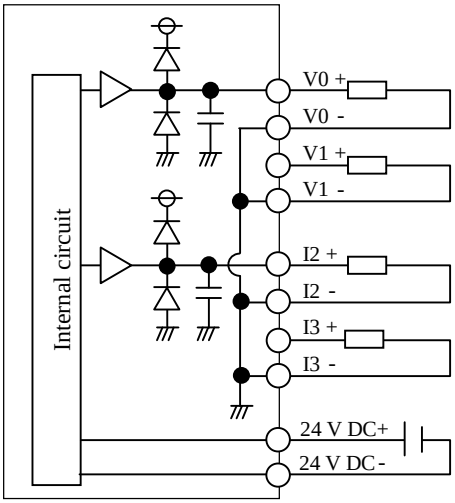
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	I0 +	
	[2]	I1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	I4 +	
	[6]	I5 +	
	[7]	I6 +	
	[8]	I7 +	
	[9]	24 V DC +	
	[10]	I0 -	
	[11]	I1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	I4 -	
	[15]	I5 -	
	[16]	I6 -	
	[17]	I7 -	
	[18]	24 V DC -	

Support to analog data and digital data

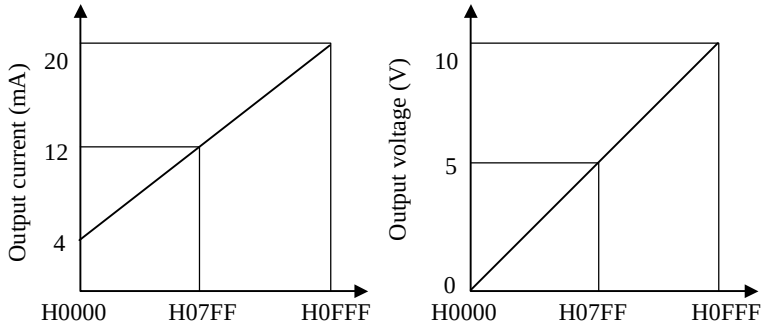


(6) EH-AY22

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

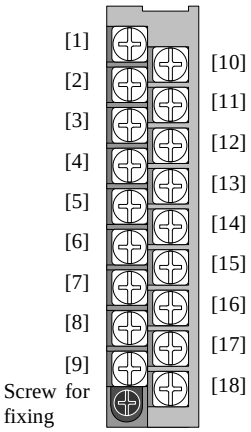
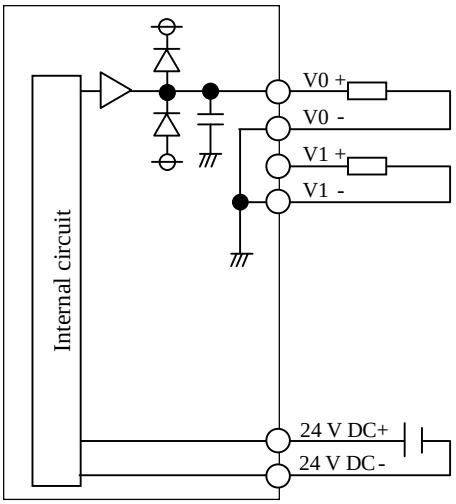
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 V DC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 V DC -	

Support to analog data and digital data

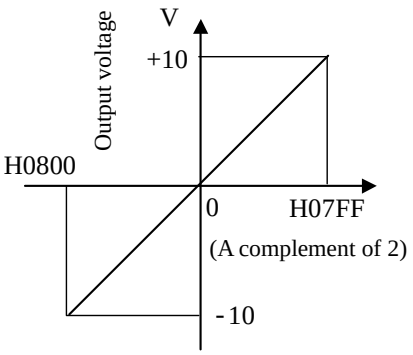


(7) EH-AY2H

Specification		EH-AY2H
Current range		–
Voltage range		+/- 10 V DC
Number of channels	Current	-
	Voltage	2 (0 to 1 channels)
Resolution		12 bits
Conversion time		5 ms or less
Overall accuracy		±1 % or less (of full-scale value)
External load resistance	Current	–
	Voltage	10 kΩ or more
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24 V DC (+20 %, -15 %) Approx. 150 mA (Approx. 500 mA at power ON)
External wiring		2-core shield cable (20 m or less)
Internal current consumption		Approx. 100 mA

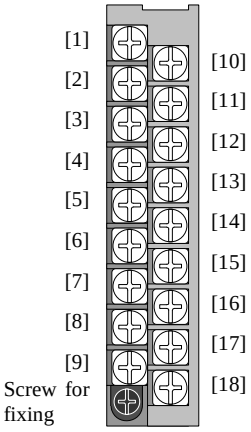
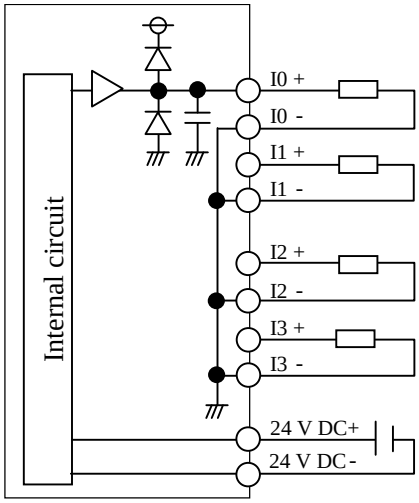
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	N.C.	
	[4]	N.C.	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 V DC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	N.C.	
	[13]	N.C.	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 V DC -	

Support to analog data and digital data

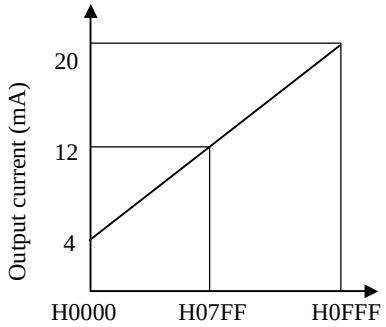


(8) EH-AY4I

Specification		EH-AY4I
Current range		4 to 20 mA
Voltage range		-
Number of channels	Current	4 (0 to 3 channels)
	Voltage	–
Resolution		12 bits
Conversion time		5 ms or less
Overall accuracy		±1 % or less (of full-scale value)
External load resistance	Current	0 to 350 Ω
	Voltage	-
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24 V DC (+20 %, -15 %) Approx. 150 mA (Approx. 500 mA at power ON)
External wiring		2-core shield cable (20 m or less)
Internal current consumption		Approx. 130 mA

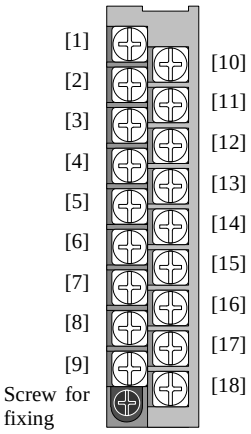
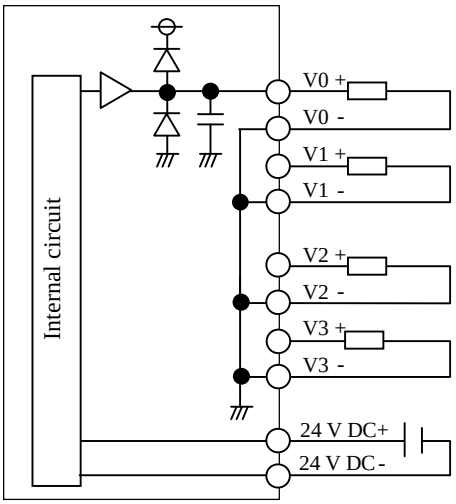
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	I0 +	
	[2]	I1 +	
	[3]	I2 +	
	[4]	I3 +	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 V DC +	
	[10]	I0 -	
	[11]	I1 -	
	[12]	I2 -	
	[13]	I3 -	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 V DC -	

Support to analog data and digital data

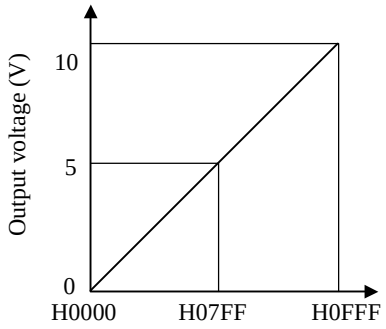


(9) EH-AY4V

Specification		EH-AY4V
Current range		–
Voltage range		0 to 10 V DC
Number of channels	Current	–
	Voltage	4 (0 to 3 channels)
Resolution		12 bits
Conversion time		5 ms or less
Overall accuracy		±1 % or less (of full-scale value)
External load resistance	Current	–
	Voltage	10 kΩ or more
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24 V DC (+20 %, -15 %) Approx. 150 mA (Approx. 500 A at power ON)
External wiring		2-core shield cable (20 m or less)
Internal current consumption		Approx. 100 mA

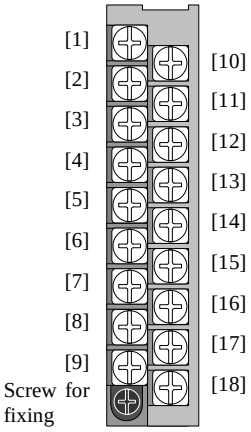
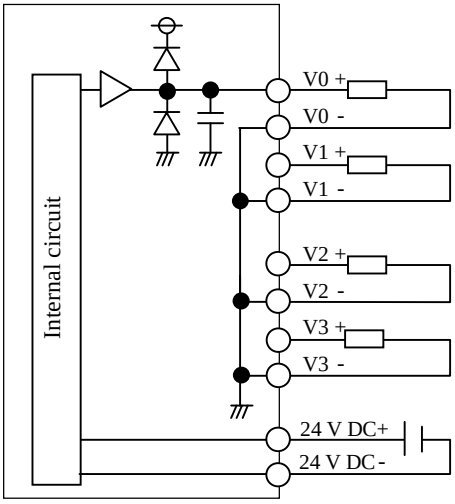
Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	V0 +	
	[2]	V1 +	
	[3]	V2 +	
	[4]	V3 +	
	[5]	N.C.	
	[6]	N.C.	
	[7]	N.C.	
	[8]	N.C.	
	[9]	24 V DC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	V2 -	
	[13]	V3 -	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 V DC -	

Support to analog data and digital data

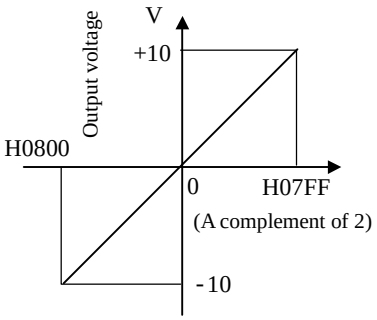


(10) EH-AY4H

Specification		EH-AY4H
Current range		–
Voltage range		+/– 10 V DC
Number of channels	Current	–
	Voltage	4 (0 to 3 channels)
Resolution		12 bits
Conversion time		5 ms or less
Overall accuracy		±1 % or less (of full-scale value)
External load resistance	Current	–
	Voltage	10 kΩ or more
Insulation system	Channel and Internal circuit	Photo-coupler insulation
	Between channels	No insulation
External connection		Removable type screw terminal block (M3)
External power supply		24 V DC (+20 %, -15 %) Approx. 150 mA (Approx. 500 mA at power ON)
External wiring		2-core shield cable (20 m or less)
Internal current consumption		Approx. 100 mA

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 V DC +	
	[10]	V0 -	
	[11]	V1 -	
	[12]	V2 -	
	[13]	V3 -	
	[14]	N.C.	
	[15]	N.C.	
	[16]	N.C.	
	[17]	N.C.	
	[18]	24 V DC -	

Support for analog data and digital data



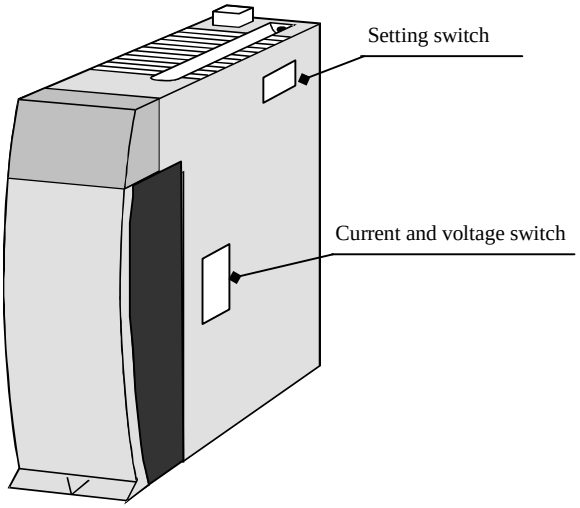
7.2 14-bit Analog I/O Module

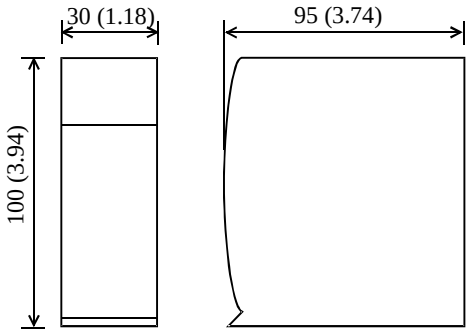
Name and function of each part

Type (Weight)	EH-AXH8M (Approx. 0.15 kg (0.34 lb.))
	EH-AYH8M (Approx. 0.18 kg (0.41 lb.))

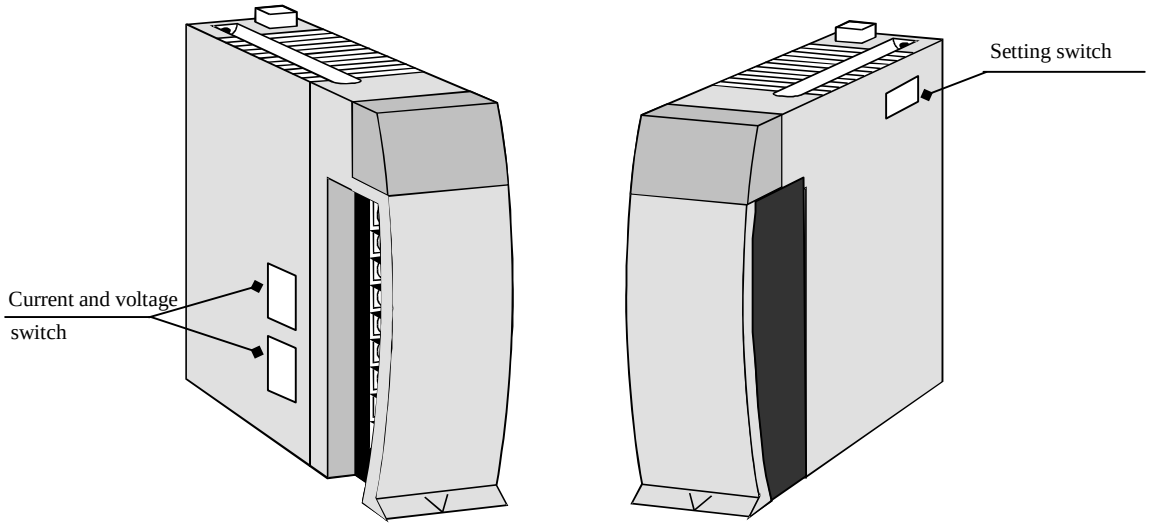
Dimensions (mm (in.))

EH-AXH8M





EH-AYH8M

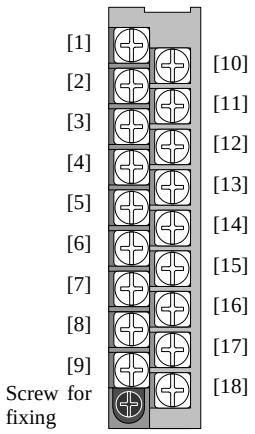
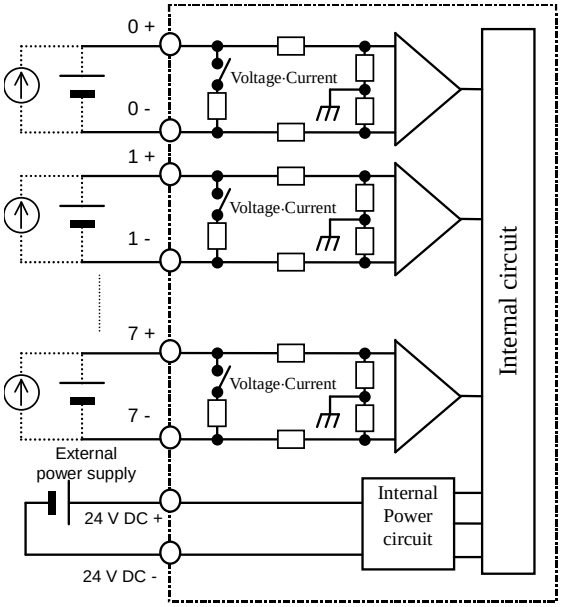


Name	Description
Setting switch	Sets the switching of the I/O range, valid/invalid of the input filter, and resolution.
Current and voltage switch	Switches current and voltage depending on the range of a setting switch.

Front view of LED	Indicating contents
	OK: Light is on when the module is normal. 0 to 7: Light is off when normal. [EH-AXH8M] LED corresponding to the channel flashes if the input becomes 2mA or less when the range is 4 to 22 mA. (when selecting 0.002 mA resolution.) [EH-AYH8M] LED corresponding to the channel flashes if the data outside the output range is set.

(1) EH-AXH8M

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

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]	24 V DC+	
	[10]	0 -	
	[11]	1 -	
	[12]	2 -	
	[13]	3 -	
	[14]	4 -	
	[15]	5 -	
	[16]	6 -	
	[17]	7 -	
	[18]	24 V DC-	

Reference

[Under flow flag]

If the input becomes 2 mA or less when the range is 4 to 22 mA, an applicable bit to the following internal output turns on.

WEXus00: Bit0 to 7 corresponds to Channel 0 to 7.
It turns off when he input value has become normal.

WEX is an internal output added newly in EHV-CPU module. Refer to Appendix 1 for the rule of address.

Setting switch

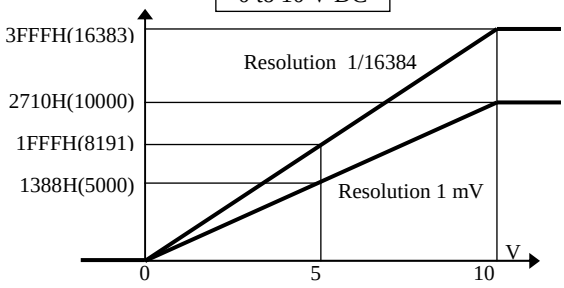
Switch No.	Setup		Function
1, 2	1	2	0 to 3 channel input range switching
	OFF	OFF	0 to 10 V DC
	ON	OFF	-10 to 10 V DC
	OFF	ON	0 to 22 mA
	ON	ON	4 to 22 mA
3, 4	3	4	4 to 7 channel input range switching
	OFF	OFF	0 to 10 V DC
	ON	OFF	-10 to 10 V DC
	OFF	ON	0 to 22 mA
	ON	ON	4 to 22 mA
5	5		Input filter
	OFF		Valid
	ON		Invalid
6	6		Resolution switching
	OFF		1/16384 (14 bits)
	ON		1 mV to 0.002 mA
7	7		(System mode)
	OFF		Always OFF (Do not turn ON)
8	8		(System mode)
	OFF		Always OFF (Do not turn ON)

Current and Voltage switch

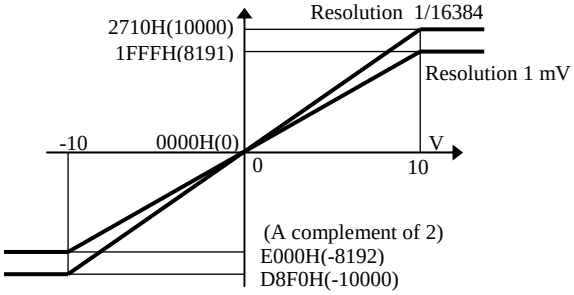
Switch No.	Setup		Function
1 to 8	1 to 4	5 to 8	Switching of current and voltage
	OFF	OFF	0 to 7 channel voltage input
	ON	OFF	0 to 3 channel current input 4 to 7 channel voltage input
	OFF	ON	0 to 3 channel voltage input 4 to 7 channel current input
	ON	ON	0 to 7 channel current input

Support to analog data and digital data

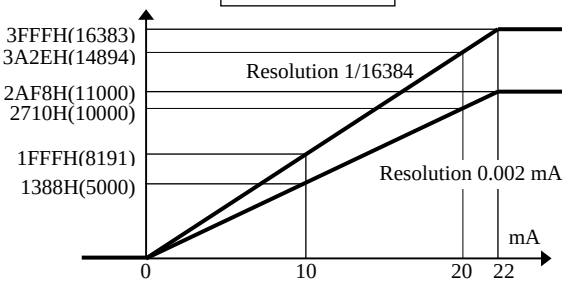
0 to 10 V DC



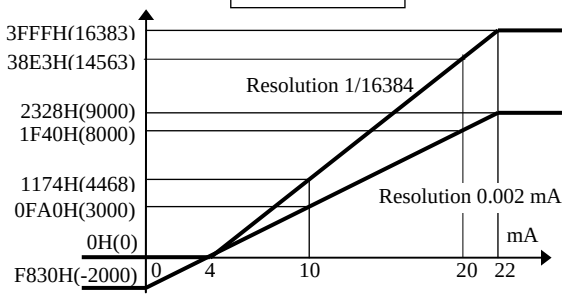
-10 to 10 V DC



0 to 22 mA



4 ～ 22 mA

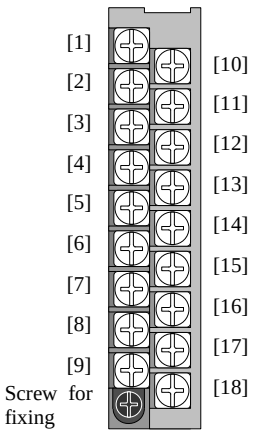
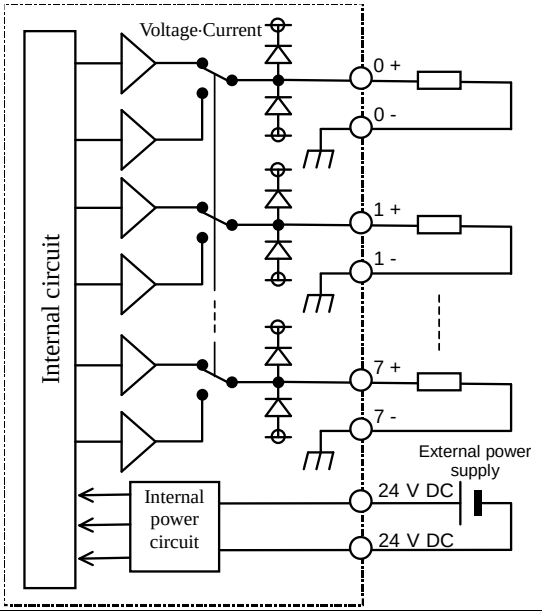


[The white font on a black background is a setup at the shipment.]

* In this module, be sure to perform the above setup before use. Further, be sure to turn off the power in setting up. Otherwise, the setups are invalid. And when the input range is switched with the function selectable switch, be sure to set the current/voltage switch to the corresponding range accordingly.

(2) EH-AYH8M

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

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]	24 V DC+	
	[10]	0 -	
	[11]	1 -	
	[12]	2 -	
	[13]	3 -	
	[14]	4 -	
	[15]	5 -	
	[16]	6 -	
	[17]	7 -	
	[18]	24 V DC-	

Reference

[Over / Under flow flag]

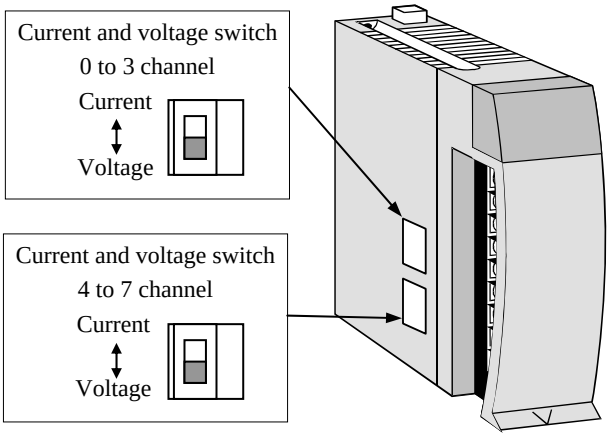
An applicable bit turns on when data outside the output range is set.
WEXus00: Bit 0 to 7 corresponds to Channel 0 to 7.
It turns off when the input value has become normal.

WEX is an internal output added newly in EHV-CPU module. Refer to Appendix 1 to the rule of address.

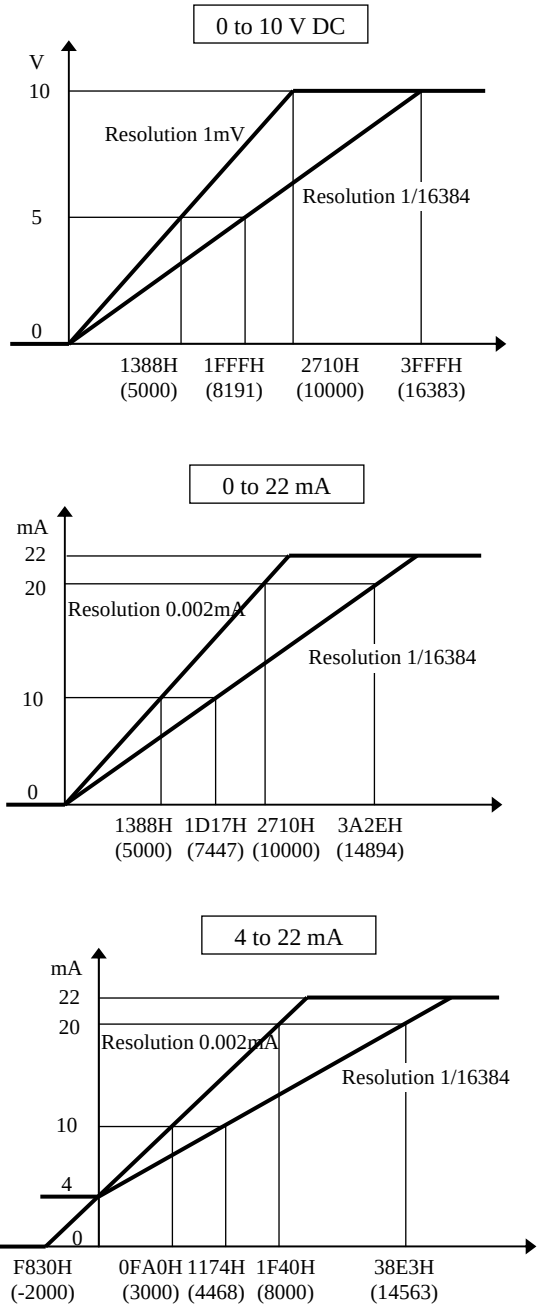
Setting switch

No.	Setup		Function
1, 2	1	2	0 to 3 channel output range switching
	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	4 to 7 channel output range switching
	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		Invalid
	ON		Valid
6	6		Resolution switching
	OFF		1/16384 (14 bits)
	ON		1 mV or 0.002 mA
7	7		(System mode)
	OFF		Always OFF (Do not turn ON)
8	8		(System mode)
	OFF		Always OFF (Do not turn ON)

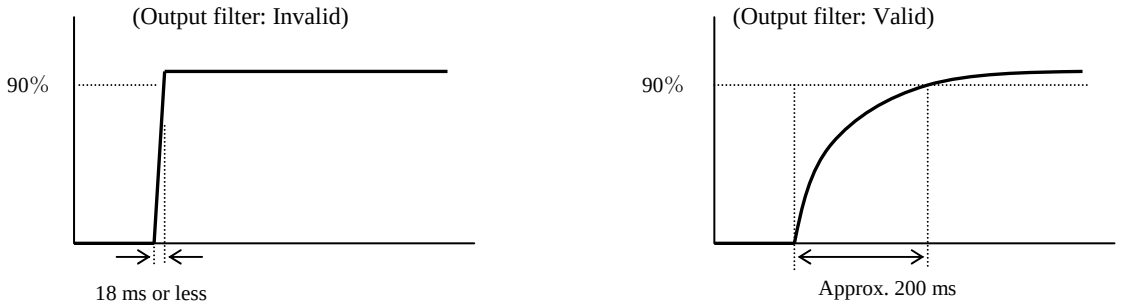
Current and voltage switch



Support to analog data and digital data



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

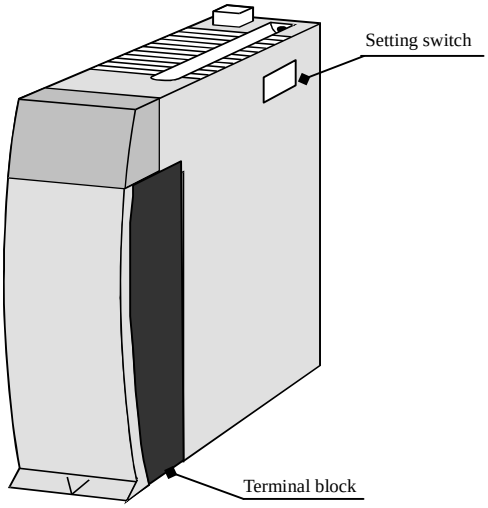


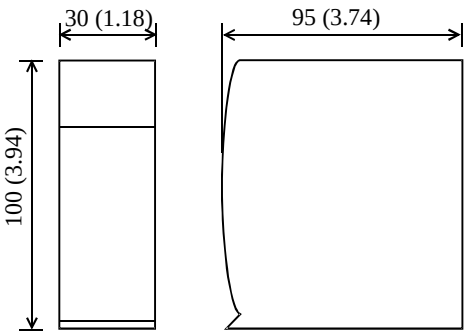
[The white font on a black background is setups a the shipment.]

* In this module, be sure to perform the above setups before use. Further, be sure to turn of f the power in setting up. Otherwise, the setups are invalid. And when the input range is switched with the function selectable switch, be sure to set the current/voltage switch to the corresponding range accordingly.

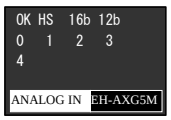
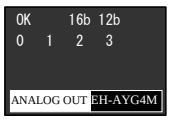
7.3 Isolated Analog I/O Module

Name and function of each part	Type (Weight)	EH-AXG5M (Approx. 0.15 kg (0.34 lb.))
		EH-AXG5M (Approx. 0.15 kg (0.34 lb.))
	Dimensions (mm (in.))	





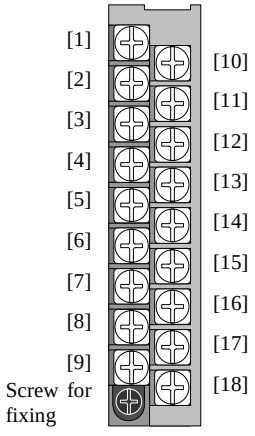
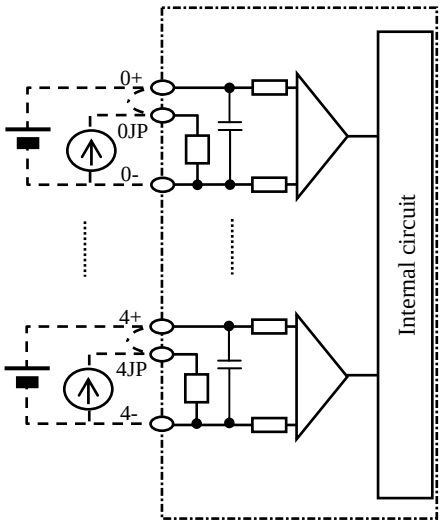
Name	Description
Terminal block	This is a terminal block for connecting the I/O signals. The terminal block is removable. Screws for the terminal block are M3 screws. Use a crimp terminal fitting to the screw diameter. The maximum thickness of cable is 0.75 mm^2. (Use a 0.5 mm^2 cable when attaching two crimp terminals to the same terminal.) The recommended crimp terminal is shown below.  (Recommended)  Take great care on handling the terminal because it may fall off if the screw is loose. Unit: mm (in.)
Setting switch	Sets the switching of the I/O range, valid/invalid of the input filter, and resolution.

Front view of LED	Indicating contents
EH-AXG5M 	OK: Light is on when the module is normal. HS : Light up when this module is high speed conversion mode. Light is turned off when this module is high accuracy mode 16b : Light up when this module is high resolution mode. 12b : Light up when this module is 12 bit resolution mode. 0 to 7: Light is off when normal. LED corresponding to the channel flashes if the input becomes 2 mA or less when the range is 4 to 22 mA.(when selecting high resolution mode.)
EH-AYG4M 	OK: Light is on when the module is normal. 16b : Light up when this module is high resolution mode. 12b : Light up when this module is 12 bit resolution mode. 0 to 3 : In case of current range, LED of each channel is blinking when wire breaking (when current mode) or out of data range was detected.

(1) EH-AXG5M

Specification		EH-AXG5M
Current range		0 to 22 mA / 4 to 22 mA
Voltage range		0 to 10 V DC / -10 to 10 V DC
Number of channels	Current	5 channels (can switch current/voltage)
	Voltage	
Resolution	Current	0 to 64000,-7111 to 32000 or 0 to 4095 (20 mA)
	Voltage	0 to 64000 or 0 to 4095
Conversion time		8 ms or 0.25 ms / 5 channels
Overall accuracy*1,*2	At 25 °C	-0.05 to +0.05 % or less (of full-scale value)
	Temperature coefficient	-80 to +80 ppm / °C or less (of full-scale value)
Absolute maximum ratings		Voltage: -15 to 15 V Current :30 mA*3
Input filter		1 kHz
Input impedance	Current	249 Ω
	Voltage	Differential 200 kΩ
Insulation system	Channel and Internal circuit	Transformer (1,000 V AC, 1 minutes)
	Between channels	Transformer (1,000 V DC, 1 minutes)
External connection		Removable type screw terminal block (M3)
External power supply		None
External wiring		2-core shield cable (20 m or less)
Internal current consumption（5 V DC）		Approx. 70 mA
I/O allocation		X8W (WXrus0 to 4 corresponds to Channel 0 to 4)

*1 Example) Accuracy at 40 °C is calculated as follows,
0.05 % (accuracy at 25 °C) + 0.008 %/ °C (Temperature coefficient) * 15 °C (difference form 25 °C) = 0.17 %
*2 The accuracy indicates the value after 15 minutes from the power-up. The value may become a lightly higher immediately after the power-up.
*3 It is the momentary current value that does not destroy the resistance in the module.

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

Reference

[Under flow flag]

If the input becomes 2 mA or less when the range is 4 to 22 mA.(when selecting high resolution mode.), an applicable bit to the following internal output turns on.

WEXus00: Bit0 to 4 corresponds to Channel 0 to 4. It turns off when he input value has become normal.

WEX is an internal output added newly in EHV-CPU module. Refer to Appendix 1 for the rule of address.

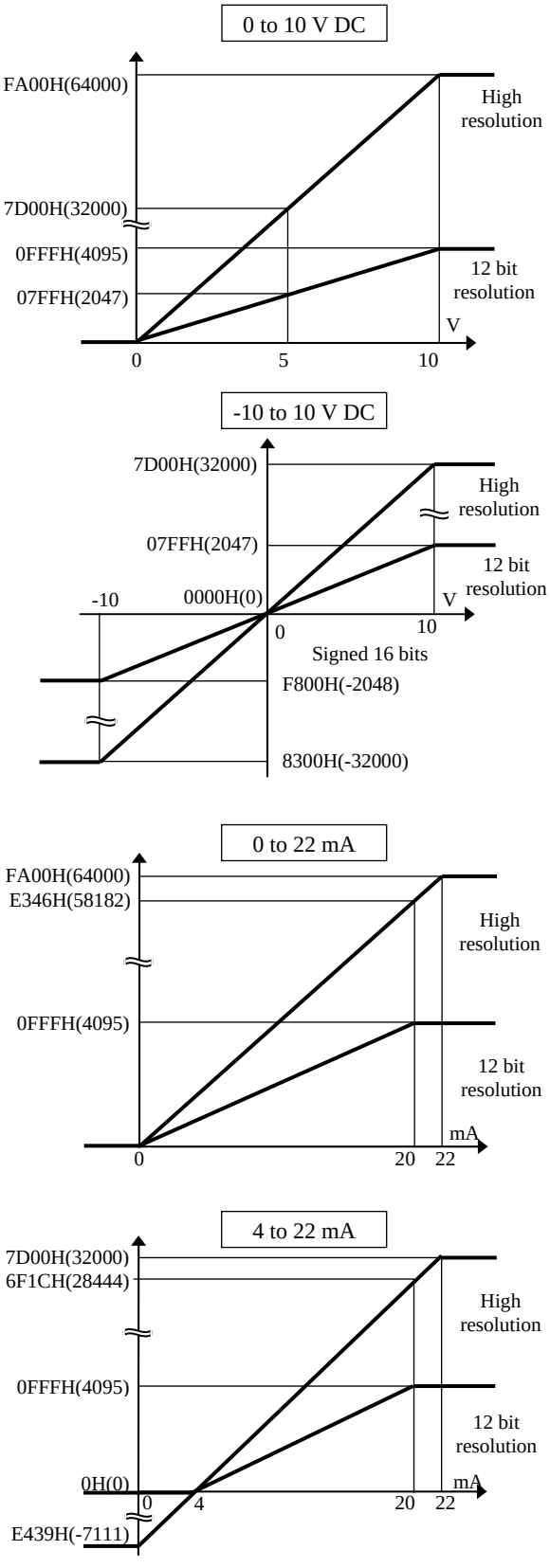
Setting switch

Switch No.	Setup		Function
1, 2	1	2	Input range switching
	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	Moving Average data number
	OFF	OFF	Not use moving Average
	ON	OFF	4
	OFF	ON	16
	ON	ON	64
5	5		Resolution
	OFF		High resolution mode (equally 16 bit)
	ON		12 bit mode
6	6		Conversion time
	OFF		High accuracy, 8 ms (whole channel)
	ON		High speed,0.25 ms (whole channel)
7	7		For system
	OFF		Always OFF (should not turn ON)
8	8		For system
	OFF		Always OFF (should not turn ON)

[The white font on a black background is a setup at the shipment.]

* In this module, be sure to perform the above setup before use. Further, be sure to turn off the power in setting up. Otherwise, the setups are invalid.

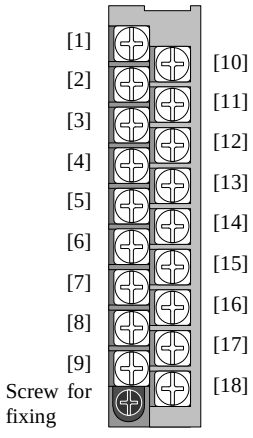
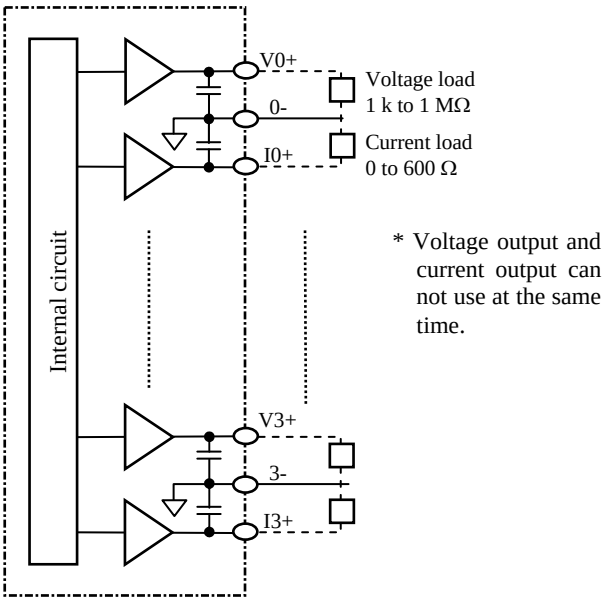
Support to analog data and digital data



(2) EH-AYG4M

Specification		EH-AYG4M
Current range		0 to 22 mA / 4 to 22 mA
Voltage range		0 to 10 V DC / -10 to 10 V DC
Number of channels	Current	4 channels (can switch current/voltage)
	Voltage	
Resolution	Current	0 to 64000,-7111 to 32000 or 0 to 4095 (20 mA)
	Voltage	0 to 64000 or 0 to 4095
Conversion time		0.25 ms / 4 channels
Overall accuracy*1,*2	At 25 °C	-0.1 to +0.1 % or less (of full-scale value)
	Temperature coefficient	-80 to +80 ppm / °C or less (of full-scale value)
Absolute maximum ratings		Voltage: -15 to 15 V Current :24 mA
Output impedance	Current	More than 1 k Ω
	Voltage	Less than 600 Ω
Insulation system	Channel and Internal circuit	Transformer (1,000 V AC, 1 minutes)
	Between channels	Transformer (1,000 V DC, 1 minutes)
External connection		Removable type screw terminal block (M3)
External power supply		None
External wiring		2-core shield cable (20 m or less)
Internal current consumption（5 V DC）*3		Max. 730 mA
I/O allocation		Y8W (WYrus0 to 3 corresponds to Channel 0 to 3)

*1 Example) Accuracy at 40 °C is calculated as follows,
0.1 % (accuracy at 25 °C) + 0.008 %/ °C (Temperature coefficient) * 15 °C (difference form 25 °C) = 0.22 %
*2 The accuracy indicates the value after 15 minutes from the power-up. The value may become a lightly higher immediately after the power-up.
*3 480 mA (All channel output 10 V voltage output with 10 kΩ impedance)
600 mA (All channel output 10 V voltage output with 1 kΩ impedance) or (All channel output 11 mA current output)
730 mA (All channel output 22 mA current output)

Terminal configuration	No.	Signal name	Diagram of Internal circuit
	[1]	(NC)	
	[2]	(NC)	
	[3]	0 -	
	[4]	(NC)	
	[5]	1 -	
	[6]	(NC)	
	[7]	2 -	
	[8]	(NC)	
	[9]	3 -	
	[10]	(NC)	
	[11]	V0 +	
	[12]	I0 +	
	[13]	V1 +	
	[14]	I1 +	
	[15]	V2 +	
	[16]	I2 +	
	[17]	V3 +	
	[18]	I3 +	

Reference

[Wire breaking and Out of data range flag]
If wire breaking (when current mode) or out of data range, an applicable bit to the following internal output turns on.
WEXus00: Bit0 to 3 corresponds to Channel 0 to 3. It turns on when data outside the output range is set.
Bit8 to 11 corresponds to Channel 0 to 3. It turns on when when wire breaking.
WEX is an internal output added newly in EHV-CPU module. Refer to Appendix 1 for the rule of address.

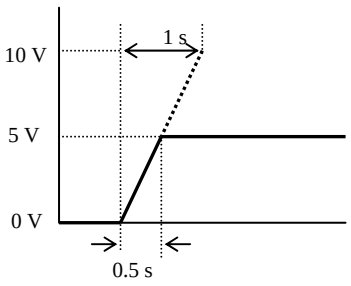
Setting switch

Switch No.	Setup		Function
1, 2	1	2	Output range switching
	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	Slew Rate
	OFF	OFF	OFF
	ON	OFF	0.1 s
	OFF	ON	1 s
	ON	ON	10 s
5	5		Resolution
	OFF		High resolution mode (equally 16 bit)
	ON		12 bit mode
6	OFF		For system
	ON		Always OFF (should not turn ON)
7	7		For system
	OFF		Always OFF (should not turn ON)
8	8		For system
	OFF		Always OFF (should not turn ON)

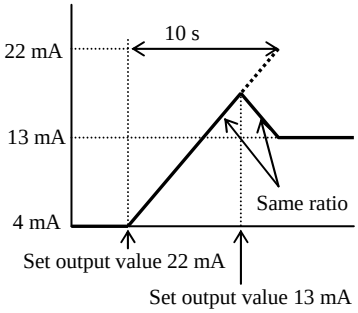
Slew Rate function

Slew Rate is a function to change the time of signal change ratio. It defines the time for the full scale value. The image is as follows.

Example1)
In the case that the signal setting changes 0 to 5V
[Mode setting]
Output range:0 to 10 V DC
Slew Rate :1 s

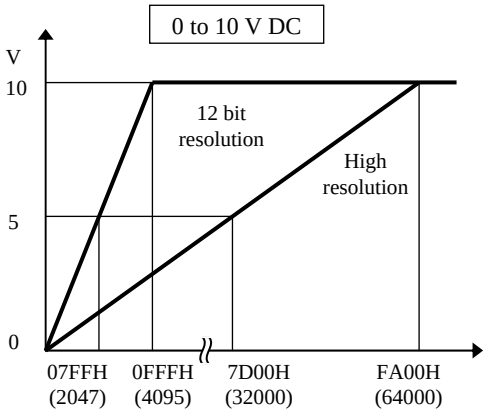


Example2)
In the case that the signal setting changes 4 to 22 mA, it is changed to 13 mA before completion of the setting.
[Mode setting]
Output range : 4 to 22 mA
Slew Rate : 10 s

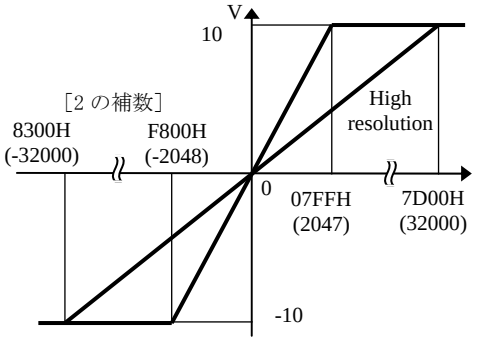


Support to analog data and digital data

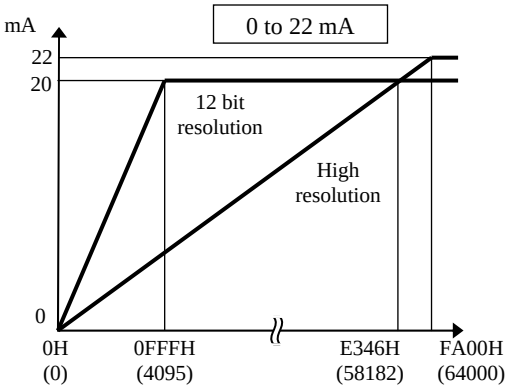
0 to 10 V DC



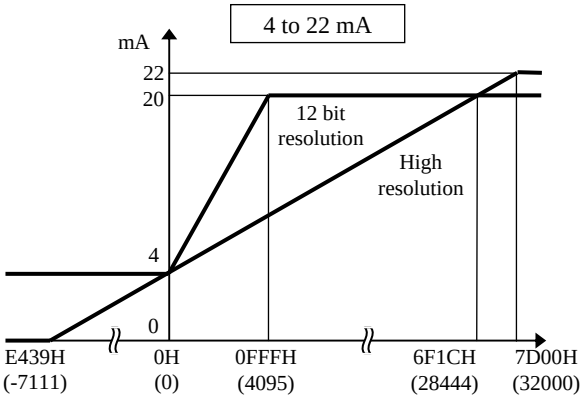
-10 to 10 V DC



0 to 22 mA



4 to 22 mA

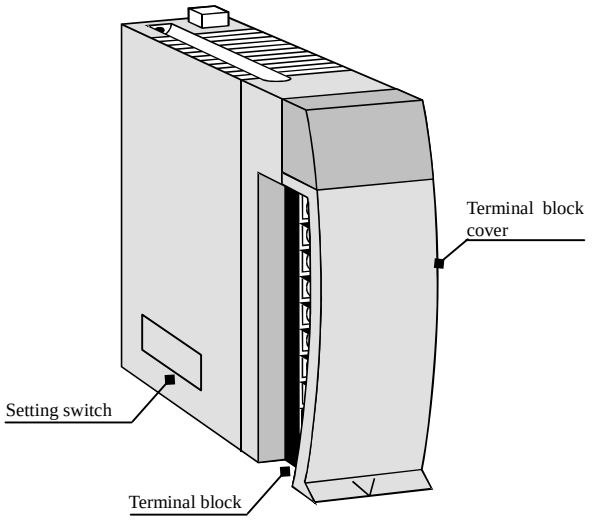


[The white font on a black background is a setup at the shipment.]

* In this module, be sure to perform the above setup before use. Further, be sure to turn off the power in setting up. Otherwise, the setups are invalid.

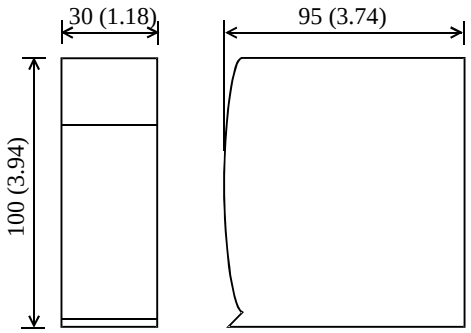
7.4 Resistance Temperature Detective Input Module

Name and function of each part



Type (Weight): EH-PT4 (Approx. 0.18 kg (0.41 lb.))

Dimensions (mm (in.))



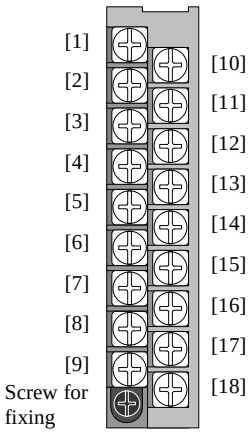
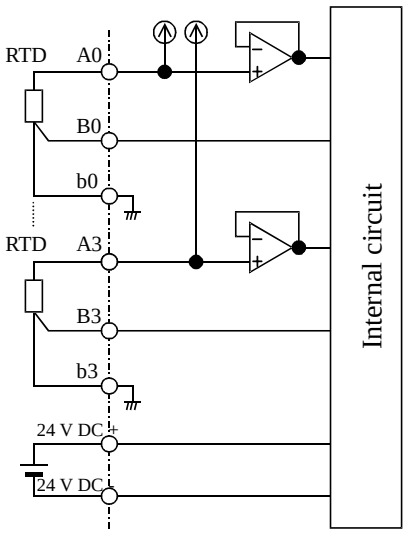
Name	Description
Terminal block	This is a terminal block for connecting the I/O signals. The terminal block is removable. Screws for the terminal block are M3 screws. Use a crimp terminal fitting to the screw diameter. The maximum thickness of cable is 0.75 mm^2. (Use a 0.5 mm^2 cable when attaching two crimp terminals to the same terminal.) The recommended crimp terminal is shown below.  (Recommended)  Take great care on handling the terminal because it may fall off if the screw is loose. Unit: mm (in.)
Terminal block cover	This is a cover for attaching to the terminal block.
Select switch	Selects a resistance temperature detector to be used and a measuring temperature range.

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

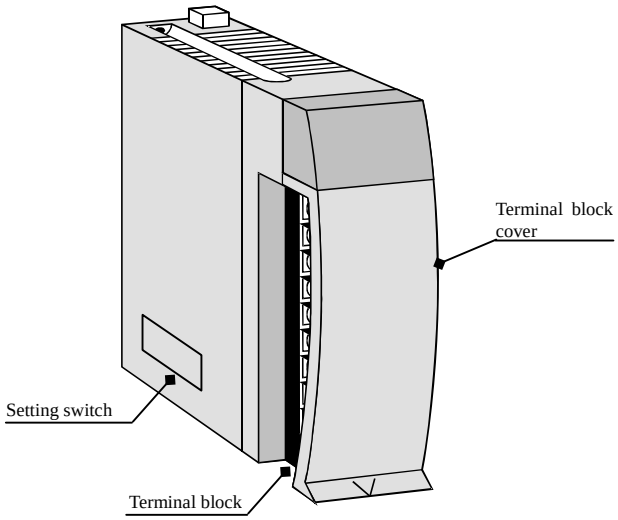
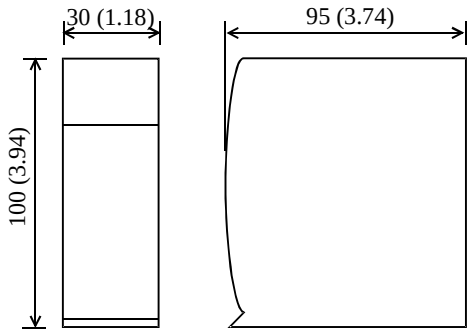
Note that the temperature data are indefinite in the setup except the above.

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 (2 mA constant current system)
Input channel		4 channels
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		24 V DC
External wiring		Shield cable
Unused terminal processing		Temperature conversion data is H7FFF
External wiring resistance		Total resistance of 4 channels 400 Ω at the maximum
Additional function		Linearization
Error detection*2		Temperature conversion data is H7FFF at –51 °C or less, or 410 °C or more
Wire breakage processing*2		Temperature conversion data is H7FFF
Internal current consumption		Approx. 160 mA

*1 The accuracy indicates the value after 10 minutes from the power-up. The value may become a lightly higher immediately after the power-up. Also, check the resistance thermometer in advance because there is error in the resistance thermometer.
*2 Indicates the current terminal wiring in open state. When an open error occurs in the voltage terminal wiring, the data is indefinite.

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]	24 V DC+	
	[10]	A0	
	[11]	N.C.	
	[12]	A1	
	[13]	N.C.	
	[14]	A2	
	[15]	N.C.	
	[16]	A3	
	[17]	N.C.	
	[18]	24 V DC-	

7.5 Thermocouple Input Module

Name and function of each part	Type (Weight)	EH-TC8 (Approx. 0.16 kg (0.35 lb.))
	Dimensions (mm (in.))	

Name	Description
Terminal block	This is a terminal block for connecting the I/O signals. The terminal block is removable. Screws for the terminal block are M3 screws. Use a crimp terminal fitting to the screw diameter. The maximum thickness of cable is 0.75 mm^2. (Use 0.5 mm^2 cable when attaching two crimp terminals to the same terminal.) The recommended crimp terminal is shown below.  (Recommended)  Take great care on handling the terminal because it may fall off if the screw is loose. Unit: mm (in.)
Terminal block cover	This is a cover for attaching to the terminal block.
Select switch	Sets the switching of the temperature range, Celsius/Fahrenheit, etc.

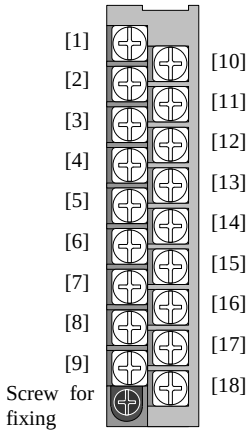
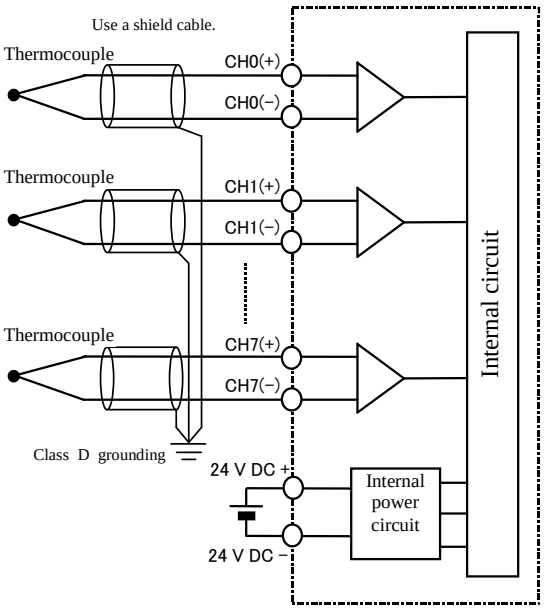
Front view of LED	Indicating contents
	OK: Light is on when the module is normal. 0 to 7: Light is off when normal LED corresponding to the channel which detected the error flashes.

Specification		EH-TC8	
Applicable thermocouple (switchable by a switch)		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 or less (Ambient temperature 15 to 35 °C) ±3 °C or less (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)	
Input channel		8 channels	
Conversion time		108/860 ms	
Insulation system	Channel and Internal circuit	Photo-coupler insulation	
	Between channels	No insulation	
External connection		Removable type screw terminal block (M3)	
External power supply		24 V DC ±10% 100 mA at the maximum	
External wiring*3		Shield cable	
Internal current consumption		Approx. 70 mA	
Error detection	Input upper limit value over / Breaking wiring detection	Input data: H7FFF (LED corresponding to a channel which detected error flashes.) Error of the applicable channel can be detected in the following WEX.	
	Input lower limit value over	Input data: H8000	

*1 The sum of accuracy of each sensor and the cold junction temperature error is the overall accuracy. Also, there is error in the thermocouple.

*2 Error is the value after 10 minutes from the power-up. Error may increase slightly because of a quick change in using ambient temperature.

*3 The external wiring length is possible to 100 m (328ft.) at the maximum. However, understand in advance that it may change according to the environment used.

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]	24 V DC+	
	[10]	CH0(-)	
	[11]	CH1(-)	
	[12]	CH2(-)	
	[13]	CH3(-)	
	[14]	CH4(-)	
	[15]	CH5(-)	
	[16]	CH6(-)	
	[17]	CH7(-)	
	[18]	24 V DC-	

Item	Switch setup			Setting contents
Thermocouple sensor switching (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 interval switching	5			
	OFF			860ms
	ON			108ms
Internal cold junction compensation switching	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.)

[The white font on a black background is the setup at the shipment.]

* In this module, be sure to perform the above setups. And, be sure to turn off the power in setting up. Otherwise, the setups are invalid.

Reference

If the internal cold junction compensation is invalidated and a highly accurate ice-bus is installed outside, the temperature can be measured accurately on higher level.

Reference

[Overflow flag]

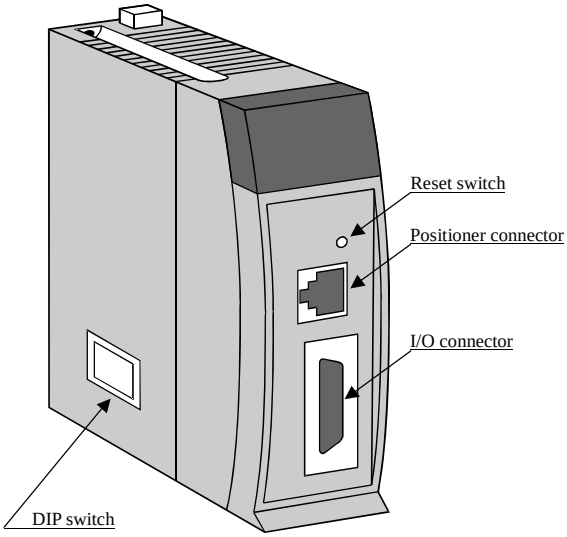
If the input upper limit over / breaking cable is detected, an applicable bit in the following internal output turns on.
WEXus00: Bit 0 to 7 corresponds to Channel 0 to 7.
It turns off when the input value has become normal.

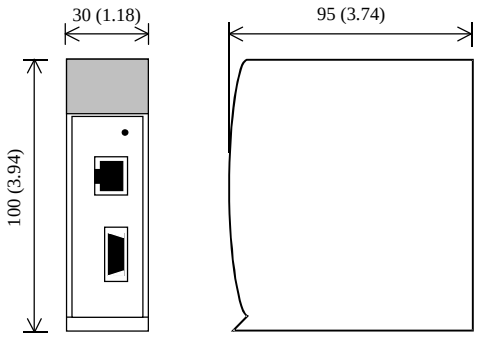
WEX is an internal output added newly in EHV-CPU module. Refer to Appendix 1 to the rule of address.

Chapter 8 Positioning and Counter Module

8.1 Single-axis Positioning Module

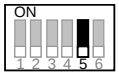
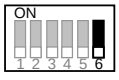
Name and function of each part	Type (Weight)	EH-POS (Approx. 0.17 kg (0.37 lb.))
	Dimensions (mm (in.))	





Name	Description
Reset switch	The module is reset if this switch is pressed.
Positioner connector	This is used for connecting the 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.
Mounting position		Basic base and Expansion base
Number of units to be mounted simultaneously		Unlimited within power supply capacity of the power module
I/O allocation		Word 4W/4W

(continued on the following page)

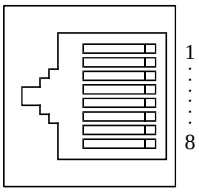
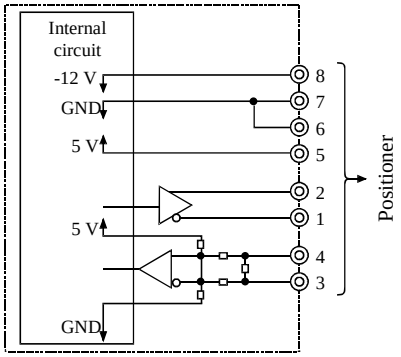
*1 When the CPU is stopped during operation, the motor decelerates and stops.

*2 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.

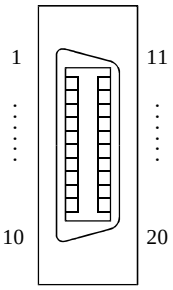
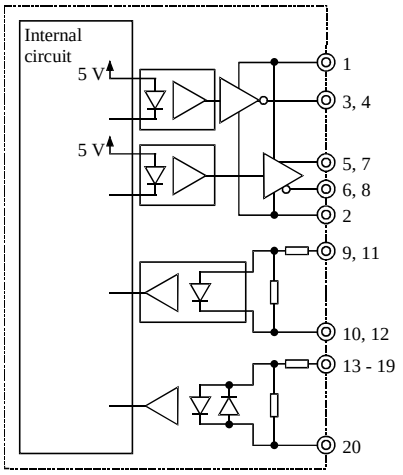
Specifications (continued from the preceding page)

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 μ A or less
	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 K Ω
	Input current		Approx. 10 mA (24 V DC)
	Operating voltage	Minimum ON voltage	9 V
		Maximum OFF voltage	3.6 V
	Input lag	ON → OFF	1 ms or less
		OFF → ON	1 ms or less
	Polarity		Only encoder signal input uses the plus common inside the unit, and other inputs do not specify polarity.
	Insulation system		Photo-coupler

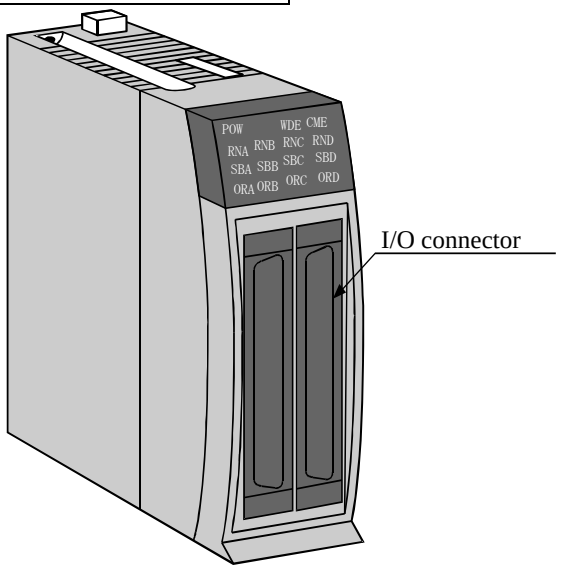
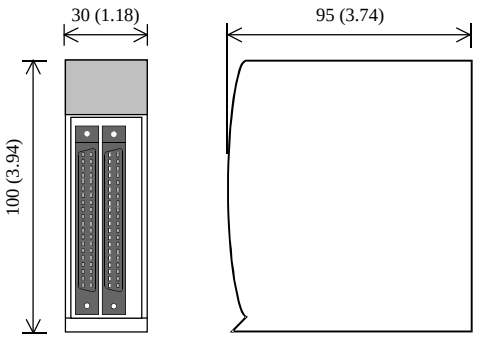
A) Specifications of Positioner connector (CN1): conforms to RS-422

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	

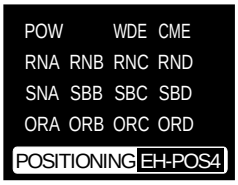
8.2 4-axes Positioning Module

Name and function of each part	Type (Weight)	EH-POS4 (Approx. 0.13 kg (0.29 lb.))
	Dimensions (mm (in.))	

Item	Description
Reset switch	The module is reset if this switch is pressed.
Positioner connector	This is used for connecting a positioner.
I/O connector	This is a connector (40 pins × 2) for pulse output and external control input. A and B axes are connected to CN1 and C and D axes are connected to CN2. Applicable connector

Manufacturer 1:	Fujitsu Takamizawa		
Soldering type:	Socket:	FCN-361J040-AU	
	Cover:	FCN-360C040-E	
Crimp type:	Housing:	FCN-363J040	
	Contact:	FCN-363J-AU	
	Cover:	FCN-360C040-E	
Pressure-displacement type:		FCN-367J040-AU/F	
Manufacturer 2:	TYCO AMP		
Soldering type:		1473381-1	

LED name

External view of LED part	Name	Details	Color
	POW	Lighted when the power is ON and the module operates regularly.	Yellow green
	RN*	Lighted when the applied axis outputs pulse.	Yellow green
	SB*	Lighted when the applied axis is in standby mode.	Yellow green
	OR*	Lighted when overrun error occurs on the applied axis.	Red
	CME	Lighted when command error occurs.	Red
	WDE	Lighted watchdog timer error occurs.	Red

LED name with * indicates A-axis to D-axis.

Each LED lights up for an instant after the power ON. That is no error.

Specifications

Item		Specification
Number of control axes		4-axes
Number of interpolation axes		Linear interpolation 4 axes and Arc interpolation 2 axes
Highest frequency		1 M pulses/s
Positioning data	Positioning points	256 points / axis
	Setup method	1. Ladder program 2. Data setting tool
Positioning	Method	1. Absolute system 2. Absolute system + Increment system 3. Increment system
	Position instruction	1. Pulse specifying 2. μm specifying 3. inch specifying 4. degree specifying
	Speed instruction	Automatic, manual, and homing 1 pulse/s to 1 M pulses/s μm/s, inch/s, degree/s input data settable
	Speed stage	256 stages at the maximum (at continuous operation)
	Acceleration and deceleration method	Trapezoid acceleration and deceleration and S-curve acceleration and deceleration (3 steps acceleration and deceleration)
	Acceleration and deceleration time	1 to 65,535 ms
	Backlash	0 to 65,535 pulses
	High and low limit setting	+2,147,483,647 to -2,147,483,648 pulses +214,748,364.7 to -214,748,364.8 μm +21,474.83647 to -21,474.83648 inch +21,474.83647 to -21,474.83648 degree
	Pulse output method	1. Pulse chain (CW/CCW) 2. Pulse + Direction signal (PLS/SIG) (The common parameter or I/O setting command sets the choice of the pulse output method and the switching of each positive and negative logic.)
	Pulse output procedure	Line driver output
Homing function		1. Free home position 2. Low speed homing 3. High speed homing 1 (OFF edge) 4. High speed homing 2 (Z phase stop) 5. Absolute value encoder homing
Absolute value encoder input		Hitachi AD series Yasukawa Electric Co. Σ II series
Manual (JOG) operation		Pulse output by manual operating command
Teaching		Teaching setting command can set the current position to the target position of specified step.
Operation when CPU has stopped		Operation is possible by Forced set/reset or using data setting tool.
Mounting position		Basic base and Expansion base (cannot mount on Remote base)
Number of units to be mount simultaneously		Unlimited within power supply capacity of the power module.
I/O allocation		Word 4W/4W

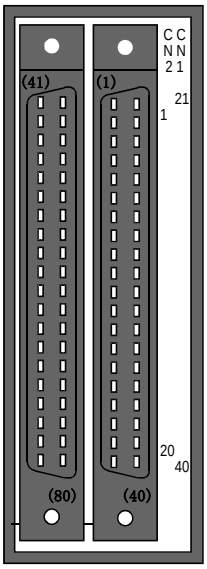
* When the CPU is switched from RUN to STOP or from STOP to RUN during operation, the motor decelerates and stops.

I/O interface

Item			Specification
Pulse output	Pulse chain (CW/CCW) output Pulse + Direction signal (PLS/SIGN)		Line driver output (equivalent to SN75158 by Texas Instruments Inc.)
	High level voltage at ON		2.4 V or more
	Low level voltage at OFF		0.4 V or less
Z phase input	Z phase (absolute value encoder serial data) input		Line driver (Input series impedance 220Ω)
Control input	Input voltage		20.4 to 28.8 V DC
	Input impedance		Approx. 5.6 kΩ
	Input current		Approx. 4.3 mA (24 V DC)
	Operating voltage	Minimum ON voltage	15 V
		Maximum OFF voltage	5 V
	Input lag	ON→OFF	1 ms or less
		OFF→ON	1 ms or less
	Polarity		No polarity
	Insulation system		Photo-coupler

Specification of I/O connector (CN1, CN2)

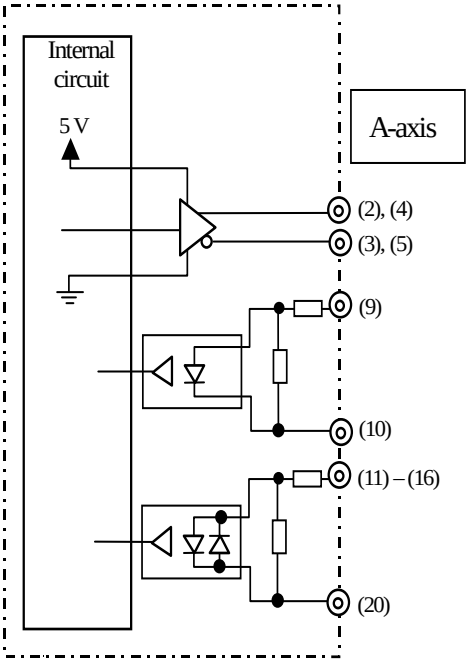
Terminal configuration



Pin No. and signal name of external wiring connector

Left side (CN2)		Right side (CN1)		Signal name (Common to each axis)
C-axis	D-axis	A-axis	B-axis	
No.	No.	No.	No.	
(41)	(61)	(1)	(21)	—
(42)	(62)	(2)	(22)	CW+(PLSP)
(43)	(63)	(3)	(23)	CW-(PLSN)
(44)	(64)	(4)	(24)	CCW+(SIGP)
(45)	(65)	(5)	(25)	CCW-(SIGN)
(46)	(66)	(6)	(26)	—
(47)	(67)	(7)	(27)	—
(48)	(68)	(8)	(28)	—
(49)	(69)	(9)	(29)	OZN(PS-)
(50)	(70)	(10)	(30)	OZP(PS+)
(51)	(71)	(11)	(31)	SRDY
(52)	(72)	(12)	(32)	COIN
(53)	(73)	(13)	(33)	PORG
(54)	(74)	(14)	(34)	+ORUN
(55)	(75)	(15)	(35)	-ORUN
(56)	(76)	(16)	(36)	MODSEL
(57)	(77)	(17)	(37)	—
(58)	(78)	(18)	(38)	—
(59)	(79)	(19)	(39)	—
(60)	(80)	(20)	(40)	COM(+24V)

Diagram of Internal circuit



Same circuit about B-axis, C-axis, D-axis

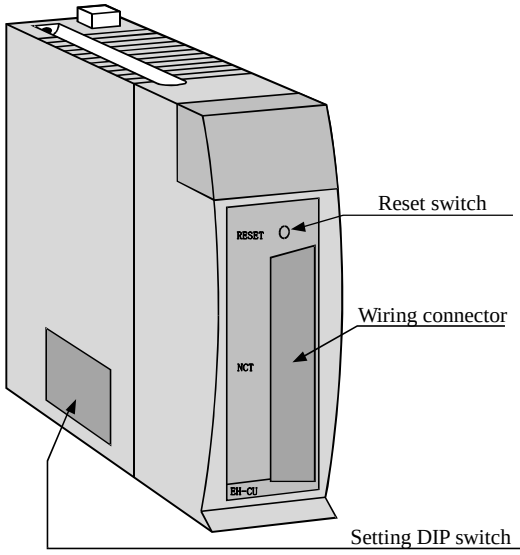
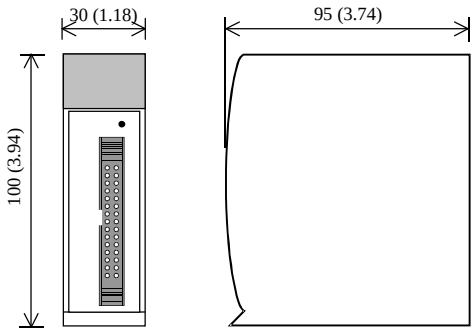
Reference

Operation status of EH-POS4 is always displayed on the following area.

Display address	Displayed details
WEXus00	A and B axis I/O setup
WEXus01	C and D axis I/O setup
WEXus02	A-axis error code
WEXus03	B-axis error code
WEXus04	C-axis error code
WEXus05	D-axis error code
WEXus06	A-axis current position data (lower word)
WEXus07	A-axis current position data (upper word)
WEXus08	B-axis current position data (lower word)
WEXus09	B-axis current position data (upper word)
WEXus0A	C-axis current position data (lower word)
WEXus0B	C-axis current position data (upper word)
WEXus0C	D-axis current position data (lower word)
WEXus0D	D-axis current position data (upper word)

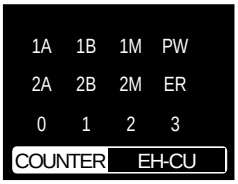
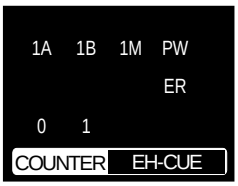
WEX is an internal output added newly in EHV-CPU. Refer to Appendix 1 for the rule of address.

8.3 High speed Counter Module

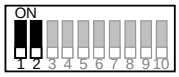
Name and function of each part	Type (Weight)	EH-CU (0.16 kg (0.35 lb.))
EH-CU: 2-ch High counter, EH-CUE: 1-ch High speed counter		EH-CUE (0.16 kg (0.35 lb.))
	Dimensions (mm (in.))	

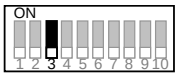
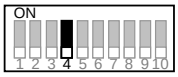
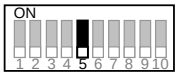
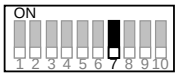
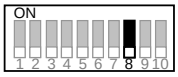
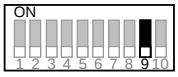
Name	Description
Reset switch	The module is reset if this switch is pressed.
Wiring connector	This is a connector with 30 pins (15×2 lines) for connecting the external wiring. Note) In EH-CU, common to 2 channels Applicable connector on the module side Manufacturer: Hirose Electric Co. Type: HIF3BA-30PA-2.54DS (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	Performs each initial setting of EH-CU and EH-CUE. Turn off the power and remove the module from the base to change the setting.

LED name

External view of LED part	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
 EH-CUE (1-ch type)	1	Lighted depending on ON/OFF of Y1 output terminal.	Green
	2	Lighted depending on ON/OFF of Y2 output terminal.	Green
	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)

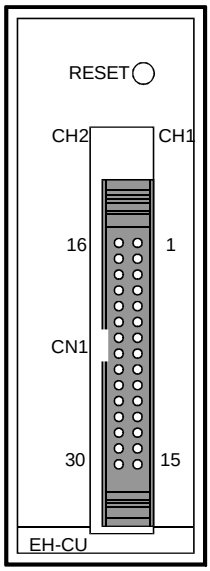
Purpose	Applied switch		Explanation
Select the marker polarity	Bit 3 	OFF	Channel 1 Detects the marker at the input OFF edge.
		ON	Channel 1 Detects the marker at the input ON edge.
	Bit 4 	OFF	Channel 2 Detects the marker at the input OFF edge.
		ON	Channel 2 Detects the marker at the ON edge.
Select 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.

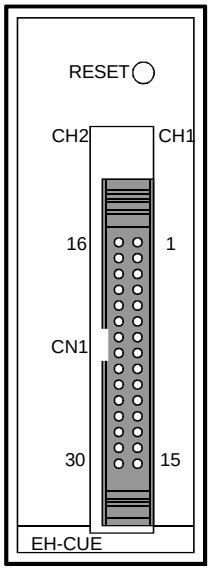
Specifications

Item		Specification	
Type		EH-CU	EH-CUE
Number of channels		2 channels	1 channel
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 or more	
Differential input voltage		12 to 24 V DC	
	Minimum ON voltage	10 V DC	
	Minimum OFF voltage	4 V 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 or more, OFF: 4 μs or more	
Minimum marker pulse width		10 μs or more (detected at ON edge)	
External wiring method		30-pin batch connector for both channels	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 or less	
	OFF → ON	1 ms or less	
Voltage down at ON		1.5 V at the maximum	
Number of external output points		4 points / module External terminal of output destination can be specified for each channel	2 points / module
	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	
Mounting position		Basic base, Expansion base (cannot mount on the remote base)	
Number of units to be mounted simultaneously		Unlimited within power supply capacity of the power module.	
I/O allocation		FUN 0	

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 12-24 V 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 to a 12-24 V 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 to a 12-24 V 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.
		25－27 N.C.		10－12 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.

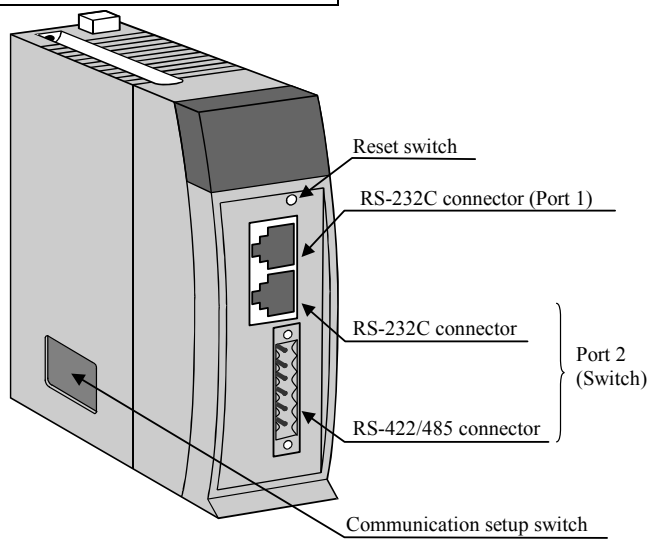
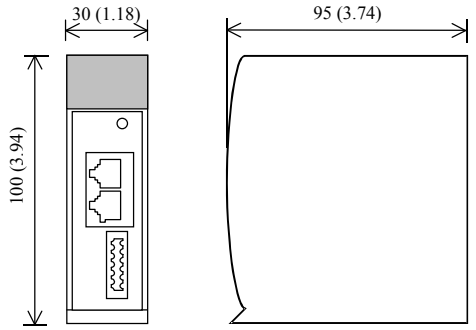
* Pin No. defined in EH-CU does not accord with pin No. defined by connector maker.

EH-CUE	Terminal configuration	No.	CH2	No.	CH1	Meaning of signal	
		16	N.C.	1	Vin A	Phase A	Connects to a 12-24 V 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 12-24 V 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 12-24 V 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.
		25－27 N.C.		10－12 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

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

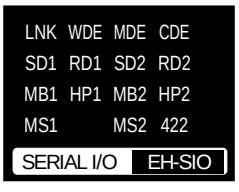
Chapter9 Communication and Network Module

9.1 Serial Interface Module

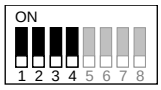
Name and function of each part	Type (Weight)	EH-SIO (Approx. 0.13 kg (0.29 lb.))
	Dimensions (mm (in.))	

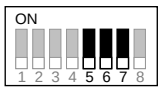
Name		Description
Reset switch		The module is reset if this switch is pressed.
Port 1	RS-232C port	Connects a transmission channel of RS-232C.
Port 2	RS-232C port	Connects a transmission channel of RS-232C.
	RS-422 / 485 port	Connects a transmission channel of RS-422 / 485.
Communication setup switch		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.

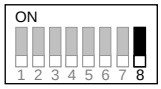
LED display

Front view of LED part	Name	Details	Color
	LNK	Lights up in the simple data link mode.	Yellow 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.	Yellow green
	RD1	Flashes while port 1 receives data.	Yellow green
	MB1	Lights up when port 1 is set to communication on Modbus protocol.	Yellow green
	HP1	Lights up when port 1 is set to communication on H series dedicated protocol.	Yellow green
	MS1	Lights up when port 1 is set to Modbus master station.	Yellow green
	SD2	Flashes while data is transmitted from port 2	Yellow green
	RD2	Flashes while port 2 receives data.	Yellow green
	MB2	Lights up when port 2 is set to communication on Modbus protocol.	Yellow green
	HP2	Lights up when port 2 is set to communication on H series dedicated protocol.	Yellow green
	MS2	Lights up when port 2 is set to Modbus master station.	Yellow green
	422	Lights up when port 2 is selected to RS-422/485.	Yellow green

Communication setup switch

<table>
<tr><th>Setting</th><th>Details</th></tr>
<tr><td>Communication speed setup
- DIP switch1 is for port 1 setup
- DIP switch2 is for port 2 setup</td><td>Bit 1, 2, 3, and 4 are used for the communication speed setting.
 

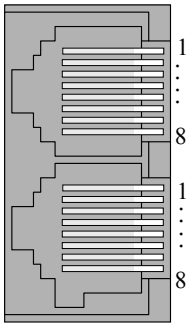
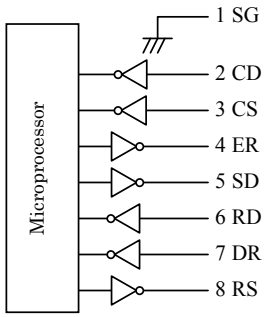
<table>
<tr><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Communication speed</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>Outside setting range</td></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>300 bps</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>600 bps</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>1,200 bps</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>2,400 bps</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>4,800 bps</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>9,600 bps</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>19,200 bps</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>38,400 bps</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>57,600 bps</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>Outside setting range</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>ON</td><td></td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td></td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>ON</td><td></td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td></td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td></td></tr>
</table></td></tr>
<tr><td>Transmission letter configuration setup
- DIP switch1 is for port 1 setup.
- DIP switch2 is for port 2 setup.</td><td>Bit 5, 6, and 7 are used for the transmission letter configuration setup.
 

<table>
<tr><th rowspan="2">Bit5</th><th rowspan="2">Bit6</th><th rowspan="2">Bit7</th><th colspan="3">Communication format setup</th></tr>
<tr><th>Data length</th><th>Stop bit</th><th>Type of parity</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>7</td><td>2</td><td>Even number</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>7</td><td>2</td><td>Odd number</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>7</td><td>1</td><td>Even number</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>7</td><td>1</td><td>Odd number</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>8</td><td>2</td><td>None</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>8</td><td>1</td><td>None</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>8</td><td>1</td><td>Even number</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>8</td><td>1</td><td>Odd number</td></tr>
</table></td></tr>
<tr><td>Select of I/F of port 2 communication (Only DIP switch2)</td><td>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.)
 

<table>
<tr><th>Bit8</th><th>Select I/F of Port 2 communication</th></tr>
<tr><td>OFF</td><td>RS-232C port</td></tr>
<tr><td>ON</td><td>RS-422 / RS-485 port</td></tr>
</table></td></tr>
</table>

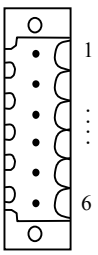
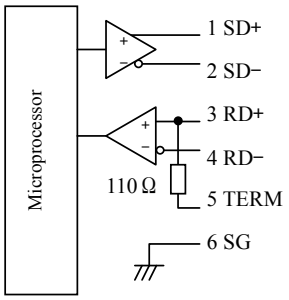
* The system uses DIP switch1(Bit8). Do not turn on it.

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	

* Un-used in Modbus mode.

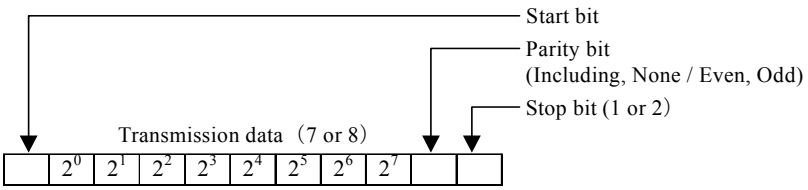
RS-422 / 485 connector

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

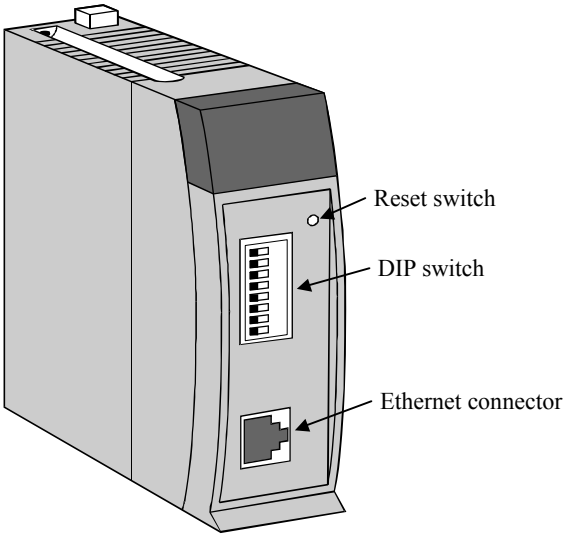
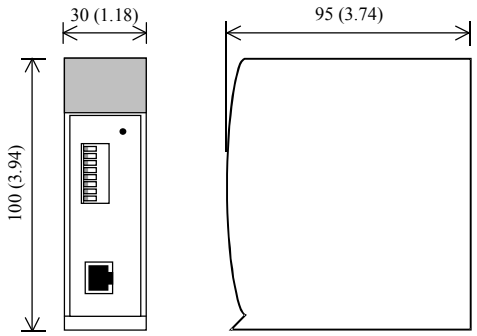
Item	Specification
Mounting position	Basic base and Expansion base (cannot mount on Remote base)
Number of units to be mounted at once	Unlimited within the range of power supply capacity of the power module. (The operation in the Modbus slave mode is 8 units at the maximum.)
Number of occupied I/O points	128 points
I/O assignment	Word 4W/4W
Supporting communication mode	No protocol, Modbus mater (RTU), Modbus slave (RTU)

Communication specifications

Item		Specification	
Interface		Port 1	RS-232C
		Port 2	Selectable from RS-232C, RS-422, and RS-485
Transmission speed		Selectable from 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400, and 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 (49.37 ft.) (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	Packaged connector (BL3.5/6F by Weidmuller)	

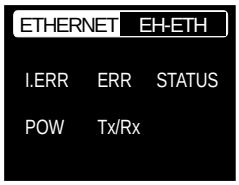
9.2 Ethernet Module

1st generation type

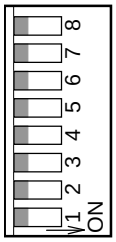
Name and function of each part	Type (Weight)	EH-ETH (Approx. 0.13 kg (0.29 lb.))
	Dimensions (mm (in.))	

Item	Description
Reset switch	The module is reset if this switch is pressed.
DIP switch	This is a switch to change the operating mode.
Ethernet connector	This is a RJ45 type connector.

LED name

Front view of LED part	LED	Details	Color
	POW	Lights up when the link is established.	Yellow green
	Tx/Rx	Flashes when transmitting and receiving the packet.	Yellow green
	I.ERR	Lights up when error is in Ethernet information which is set up.	Red
	ERR	Lights up when error related to the transmitting and receiving processing occurs.	Red
	STATUS	Indicates the status of the module by combination of illumination color and flashing count.	Yellow green / Red

Setup of the operating mode

External view	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Explanation
	ON	ON	LSB of IP address b'000001 to b'111111(1 to 63)						Sets up the Ethernet information via the user program.
		OFF							Sets up the Ethernet information using the general-purpose Web browser.
	OFF	*	*	*	*	*	ON	ON	Transmitting and receiving test mode
								OFF	External loop back check
							OFF	ON	Internal loop back check
								OFF	Normal operation

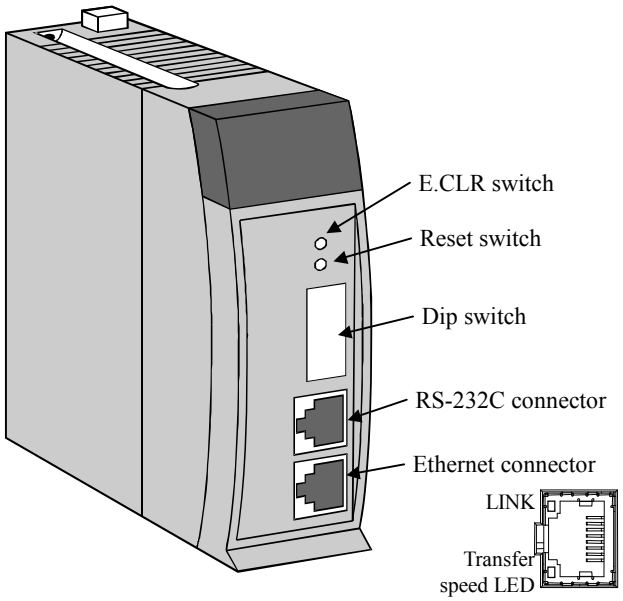
1 It means that the indication of "" does not depend on ON/OFF of the bit.

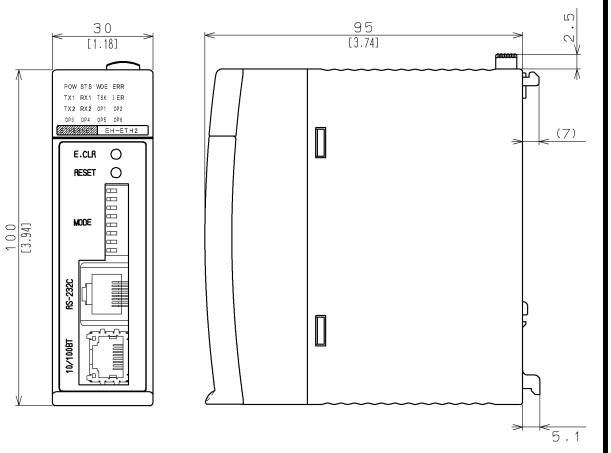
*2 When setting up LSB of IP address, OFF of switch means 0 and ON means 1.

*3 Do not set all MSB of IP address to OFF.

2nd generation type

Name and function of each part	Type (Weight)	EH-ETH2 (Approx. 0.12 kg (0.29 lb.))
	Dimensions (mm (in.))	





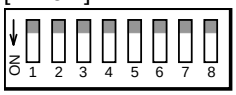
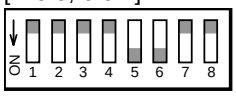
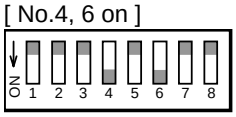
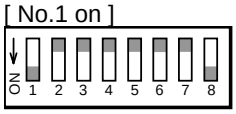
Item	Description
E.CLR switch	Clear the error status.
Reset switch	Module is reset by pushing this button.
Dip switch	Setting of operating status, IP address etc.
RS-232C connector	No use.
Ethernet connector	RJ45 type connector LINK LED turns on when connecting cables. Transfer speed LED is lit in orange by 10 Mbps and in green by 100 Mbps.

LED name

Front view of LED part	LED	Details	
		Turn on	Turn off
POW STS WDE ERR TX1 RX1 TSK IER TX2 RX2 OP1 OP2 OP3 OP4 OP5 OP6 ETHERNET EH-ETH2	POW	Normal operation mode [Blinking] Utility mode	Power off
	STS	Normal operation [Slow Blinking] An error has been detected.*1 [Fast Blinking] During reset process*2	Power off
	WDE	Watchdog timer error	Software program is running
	ERR	Communication error	Normal operation
	TX1	Data being transmitted over the Ethernet	No data being transmitted over the Ethernet
	RX1	Data being received over the Ethernet	No data being received over the Ethernet
	TSK	Task cord communication is running. (TCP/IP)	Task cord communication is not in use.
	IER	Configuration error	Normal operation
	TX2	Always off	
	RX2	Always off	
	OP1 to 6	ASR port No.1 to 6 is opened.	ASR port No.1 to 6 is closed.

*1 STS LED blinks with turning on ERR LED or IER LED, when EH-ETH2 has been detected an error.

*2 Even I/O assignment is not correct, accessing to Web server is possible and also it is possible to change Ethernet and ASR connecting parameters. But to set Ethernet parameters by Ladder program is not possible.

Dip switch	Operation mode	Explanation
[All off] 	Normal operation mode	Operate normal mode
[No.5, 6 on] 	Utility mode	Test Transmitting / receiving
[No.4, 6 on] 		Configure Ethernet Information by user program.
[No.1 on] 	Communication parameter setting mode	Configure Communication parameter (Ethernet Information and ASR Information) by EH-ETH2 Configurator. At this time, Dip switches No.4 to 8 are the last 5 bits of temporally IP address for Communication parameter setting mode[*1].

* In case of setting IP address, OFF position of the switch means “0” and ON position means “1”.

*1 Temporally IP address for Communication parameter

Via the Ethernet, make Communication parameters setting by EH-ETH2 Configurator. So, require setting temporally IP address to connect to EH-ETH2 Configurator. 3-top octet of temporally IP address is fixed value “192.168.0”. By dip switches No.4 to 8, set lowest octet of temporally IP address. “192.168.0.0”(No.4 to 8 are all off) is invalid. Therefore, the range of assignable temporally IP address is “192.168.0.1” to “192.168.0.31”.

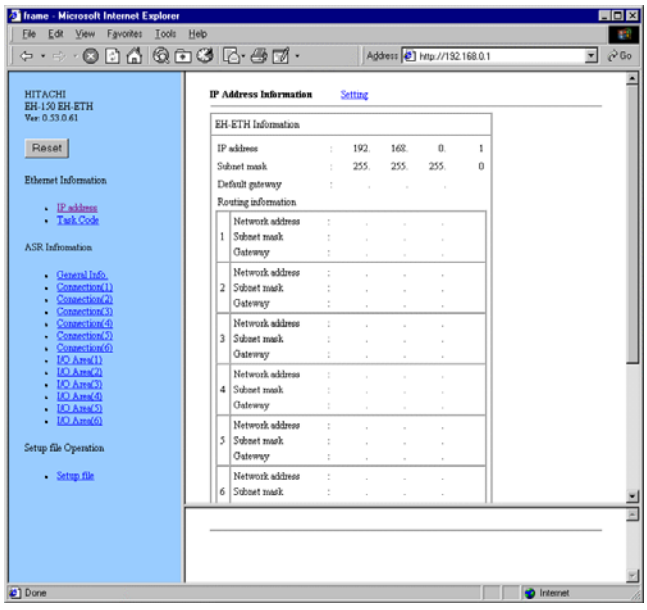
ON-OFF of Dip switches					bin.	hex.	dec.	Temporally IP address
4	5	6	7	8				
OFF	OFF	OFF	OFF	ON	b'00001	H'01	1	192.168.0.1
ON	OFF	ON	ON	OFF	b'10110	H'16	22	192.168.0.22
ON	ON	ON	ON	ON	b'11111	H'1F	31	192.168.0.31

Specifications

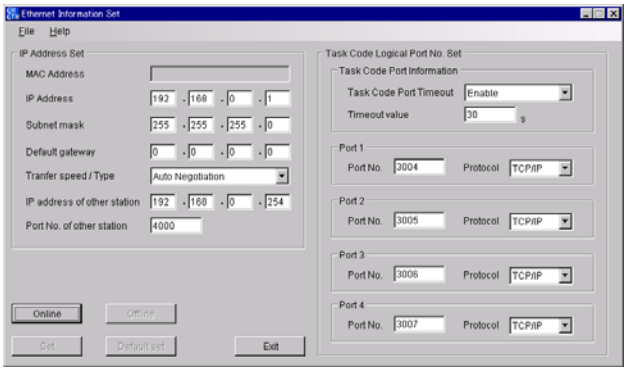
Item		Specification
Transmission specification	Ethernet standard	IEEE802.3 standard
	Transmission modulation method	Base band
	Medium access method	CSMA/CD
	Transmission speed (Theoretical value)	10 Mbps (EH-ETH) 10/100 Mbps Auto-negotiation (EH-ETH2)
	Connection cable	UTP or STP category 5
	Maximum segment length	100 m (329.17 ft.)
ASR connection		Maximum connection is 6 at once. Transmitting data is 1,454 byte per once at the maximum
Task code communication		Maximum connection is 4 at once.
Mounting position		The slot 0 to 7 on the basic base.
Number of units to be mouthed at once		8 units or less
I/O assignment		COMM
Setup function		- Selects the setup mode using a DIP switch, and performs initial settings such as IP address, transmission operation specifying, and transmitting and receiving area specifying using the general-purpose Web browser. (EH-ETH) - Selects the setup mode using a DIP switch, and performs initial settings such as IP address, transmission operation specifying, and transmitting and receiving area specifying using the EH-ETH2 Configurator. (EH-ETH2) - The IP address can also be set up by programming with a ladder program.
Auto transmitting/receiving communication, and Event transmitting communication		- Data can be transmitted and received periodically by specifying an internal output signal in a table forma. - Data can be transmitted and received by signal variation (event) in a ladder program.
Task code communication		- Either TCP/IP or DP/IP can be specified. - H series task code communication can be performed.
Test function		- Internal loop and external loop check functions are supported. - One to one transmitting/receiving test function is supported.

Example of setup function

In the case of EH-ETH, the general-purpose Web browser is used to create Ethernet information and an auto communication table. The setup tool screen is shown below.

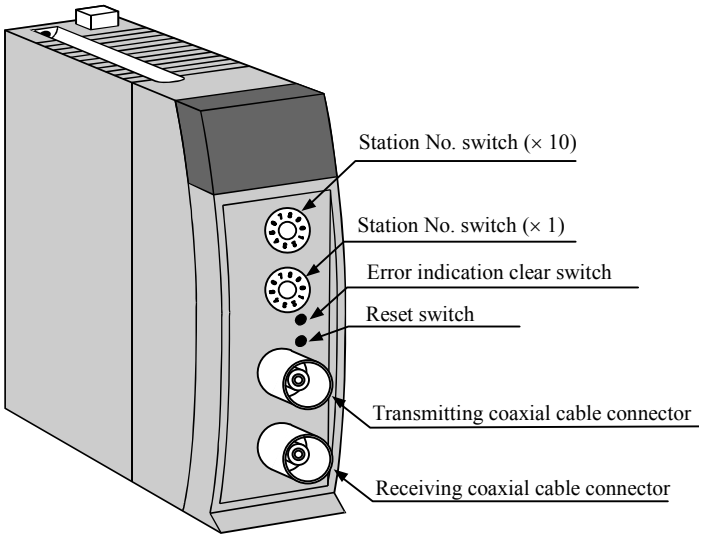
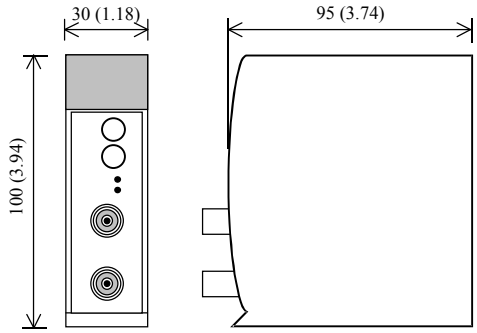


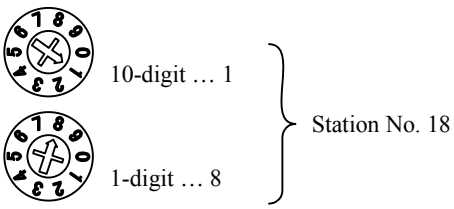
In the case of EH-ETH2, the EH-ETH2 Configurator is used to create Ethernet information and an auto communication table. The setup tool screen is shown below.



9.3 CPU Link Module

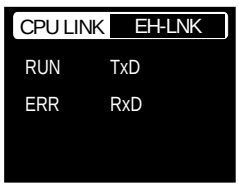
Coaxial cable type

Name and function of each part	Type (Weight)	EH-LNK (Approx. 0.15 kg (0.33 lb))
	Dimension (mm (in.))	

Name	Description
Station No. switch (× 10)	This switch determines the link station No. The setting of this switch is validated when the power is turned on or the reset switch is pressed. The setting range is between 00 and 63. Example) Sets the station No. to 18.  - Setting of 64 or higher triggers an out-of-range error for the station No. - Duplication of station No. triggers a duplication error for the station No. - If there is no station No.00 (master station) in the link system, it cannot work normally.
Station No. switch (× 1)	
Error indication clear switch	Clears the indication displayed on ERR LED. (ERR LED will light up again if the error factor is not resolved.)
Reset switch*	The module is reset if this switch is pressed.
Transmitting coaxial cable connector (TXD)	Transmits data from the own station. Connect to RXD on the next station using a coaxial cable.
Receiving coaxial cable connector (RXD)	Receives data from other station. Connect to TXD on the next station using a coaxial cable.

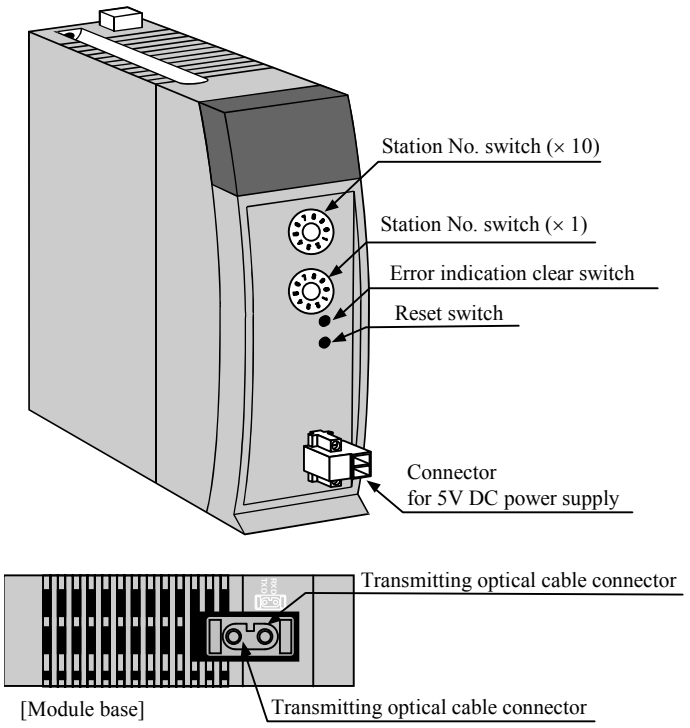
* The CPU module will detect a "Link Module Error (error code: 59H)" if the reset switch is pressed. Please resolve the error of the CPU module after making sure that the link module is operating normally.

LED name

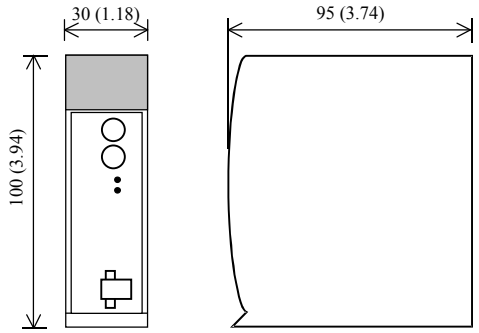
Front view of LED part	LED	Details	Color
	TxD	Flashes when data is received.	Yellow green
	RxD	Flashes when data is transmitted.	Yellow green
	RUN	Lights up when the link module is operating properly.	Yellow green
	ERR	Normal state : OFF Error (data link is possible) : Flashing (in 1s interval) Error (data link is impossible) : Flashing (in 0.5 s interval), turn on	Red

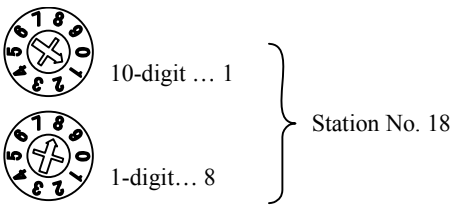
Optical cable type

Name and function of each part



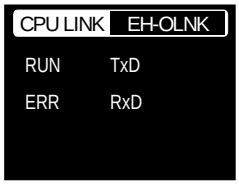
Type (Weight)	EH-OLNK (Approx. 0.15 kg (0.33 lb.))
	EH-OLNKG (Approx.0.15 kg (0.33 lb.))
	EH-OLNKE (Approx. 0.15 kg (0.33 lb,))
Dimensions (mm (in.))	



Name	Description
Station No. switch (× 10)	This switch determines the link station No. The setting of this switch is validated when the power is turned on or the reset switch is pressed. The setting range is between 00 and 63. Example) Sets the station No. to 18.  - Setting of 64 or higher triggers an out-of-range error for the station No. - Duplication of the station No. trigger a duplication error for the station No. - If there is no station No.00 (master station) in the link system, it cannot operate normally.
Station No. switch (× 1)	
Error indication clear switch	Clears the indication displayed on ERR LED. (ERR LED will light up again if the error factor is not resolved.)
Reset switch*	The module is reset if this switch is pressed.
Connector for 5V DC power supply	Supply 5 V DC from another power source if the link system needs to work while this module is not powered.
Receiving optical cable connector (RXD)	Receives data from other station. Connect to the TXD on the next station by an optical cable.
Transmitting optical cable connector (TXD)	Transmits data from other station. Connect to RXD on the next station by an optical cable.

* If the reset switch is pressed, the CPU module will detect a “Link Module Error (error code: 59H)”. Please resolve the error of the CPU module after making sure that the link module is operating normally.

LED name

Front view of LED part	LED	Details	Color
	TxD	Flashes when data is received.	Yellow green
	RxD	Flashes when data is transmitted.	Yellow green
	RUN	Lights up when the link module is operating properly.	Yellow green
	ERR	Normal state : OFF Error (data link is possible) : Flashing (in 1s interval) Error (data link is impossible) : Flashing (in 0.5 s interval), turn on	Red

Specifications (CPU link module (coaxial, optical))

Item			Specification
Functional Specification	Number of connected link modules		64 units at the maximum per link system
	Number of link points		1,024 words per loop (2,048 words per 2 loops)*1
	Data delivery system		Common data area system
	Transmit/Receive distinction on data area allocation		Parameter setup from peripheral devices
	Station No. specifying		Specifies 0 to 63 by a rotary switch.
	Transmission speed		1.0 Mbps
	Transmission method		Half-duplex serial transmission, frame synchronization
	Communication method		Token passing
	Modulation method		Base band
	Refresh time		At 64 stations connection and 1024 words transfer; Approx. 390 ms*2
	Error check		CRC, overrun check, timeout, open circuit parameter error (Dual specifying of station No., overlap of link area, etc.)
	Self-diagnosis		System ROM/RAM check, watchdog timer check, transmission loop back check
Transmission channel Specification	Transmission channel form		Loop type
	Cable length	Between stations	Maximum 500 m (EH-LNK), Maximum 1,000 m (EH-OLNK), Maximum 2,000 m (EH-OLNKG,E)
		Total extension	Maximum 1,000 m (EH-LNK), Maximum 15,000 m (EH-OLNK,-OLNKG,E)
	Error station processing		Bypass system (coaxial), Bypass system (optical; only when supplying 5 V DC from another power source)
	Recommended cable (EH-LNK)		Coaxial cable with shield (equivalent to the 5D-2V with shield)
	Recommended connector (EH-LNK)		Link module side: equivalent to 413631-1 (by AMP)
	Recommended cable and connector (Refer to the instruction of each module for more details.)	EH-OLNK	CA7103－ 1 M－ 2 L 3 1 Hitachi Hybrid Network Co., Ltd. 1 : cable length, 2 : cable type, 3 : core number
		EH-OLNKG, EH-OLNKE	CA9103S－ 1 M－AL11 Hitachi Hybrid Network Co., Ltd. CA9003S－ 1 M－AL12 CA9103S－ 1 M－ 2 B 1 : cable length, 2 : core number For the recommended cable of EH-OLNKE, add “-625” at the end of above types.
Mounting position			Slot 0 to 7 on the basic base
I/O assignment			CPU link

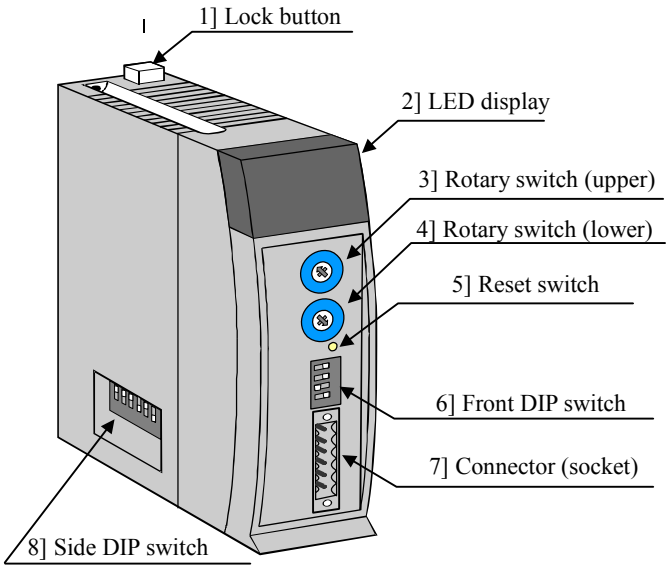
*1 Power failure memory protection is not possible.

*2 This could be more in case peripheral devices access to a remote CPU via link network.

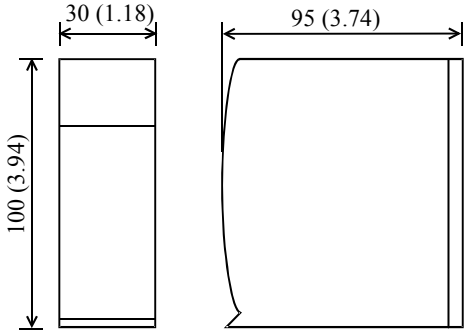
9.4 Compact Remote Module

(1) Master module

Name and function of each part

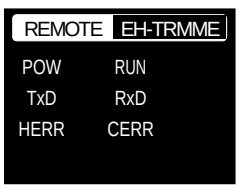
Name and function of each part	
	

Model name	EH-TRMME
Weight	Approx. 0.12 kg
Consumption current (5 V DC)	Approx. 150 mA
Dimensions (mm (in.))	

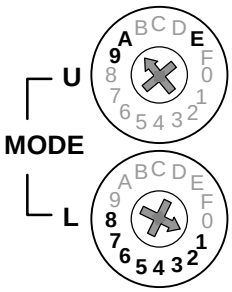


No.	Name	Function	Remarks
1	Lock button	This is used when removing the module from base unit. After it is installed to the base unit, the fixation can be reinforced using screws. In this case, use M4 × 10 mm (0.39 in.) screw.	
2	LED display	The status of module is displayed on this LED.	See a table shown below.
3	Rotary switch (upper)	This is a switch to set I/O assignment for master module.	See next page.
4	Rotary switch (lower)	This s a switch to set the number of connected slave modules.	See next page.
5	Reset switch	The module can be reset by pressing this switch when error such as the module abnormal occurred.	
6	Front DIP switch	This is a switch to set an operation mode (HS refresh mode, etc.).	See next page.
7	Connector	This is a connector to connect a twist-pair cable for connecting slave modules.	See next page or later.
8	Side DIP switch	This is a switch to set an operation mode (the last channel number of master, etc.).	See next page or later.

Description of LED display

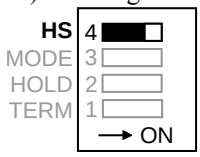
LED	LED name	Indication	Details
	POW	Power supply	Light up when 5 V DC power is supplied to the module.
	RUN	Normal communication	Light up in proper communication. (Light is turned off due to time out error when the communication with slave station is discontinued for 500ms or more.)
	TxD	Transmission data	Light up according to transmission data from master station.
	RxD	Received data	Light up according to received data from slave station.
	HERR	Hardware error	Light up when hardware failure in master module is detected.
	CERR	Communication error	Light up during communication error. (Light is turned off automatically when communication is recovered.)

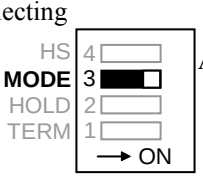
Description of Rotary switch

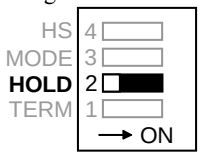
<table>
<tr><th>Rotary switch</th><th>Symbol</th><th>Meaning</th><th>Details of setting</th></tr>
<tr><td rowspan="2"> 

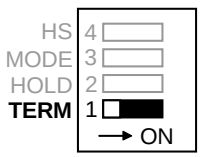
[Default setting: U=A, L=0]</td><td>U
(upper)</td><td>I/O assignment
(9, A, E)</td><td>I/O assignment of master module is set. Always set 9 or A or E.
<table>
<tr><th>Set</th><th>I/O assignment of master</th><th>Remarks</th></tr>
<tr><td>0 to 8</td><td>Undefined</td><td>-</td></tr>
<tr><td>9</td><td>4W/4W</td><td>Maximum I/O points 128 points / master
Also available to EH-CPU104A/208A/316A</td></tr>
<tr><td>A</td><td>Remote 2</td><td>Maximum I/O points 256 points/master
Available to EH-CPU516/548 and EHV-CPU16/32/64/128</td></tr>
<tr><td>B to C</td><td>Undefined</td><td>-</td></tr>
<tr><td>E</td><td>Remote 2</td><td>In the case of mix with EM/EM-II station</td></tr>
<tr><td>F</td><td>Undefined</td><td>-</td></tr>
</table></td></tr>
<tr><td>L
(lower)</td><td>Number of slave stations
(1 to 8 units)</td><td>Set the number of connected slave stations. Up to 8 units can be connected. 1 to 8 is available to the number of units.</td></tr>
</table>

Description of Front DIP switch

<table>
<tr><th>Symbol</th><th>Setting description</th><th>Details</th></tr>
<tr><td>HS</td><td>HS (high-speed refresh mode) selecting
 

[Default setting: ON]</td><td>Refresh operation mode on remote communication is set (High-speed or Low-speed).
In the case of all local stations are EH-TRMLE, the high-speed refresh mode can be selectable. Remote refresh time is shown below.
HS = ON: Refresh time = 0.156 ms × Number of master occupancy channels
HS = OFF: Refresh time = 0.338 ms × Number of master occupancy channels
The channel is unit of transmitted and received data between master and slave stations. Refer to the application manual of compact remote module for detail.
<table>
<tr><th>HS</th><th>Position</th><th>Remote refresh mode selection</th></tr>
<tr><td>OFF</td><td>  </td><td>Low-speed refresh mode (for low-speed remote slave module)</td></tr>
<tr><td>ON</td><td>  </td><td>High-speed refresh mode (for high-speed EH-TRMLE)</td></tr>
</table></td></tr>
<tr><td>MODE</td><td>MODE (compatible mode) selecting
 

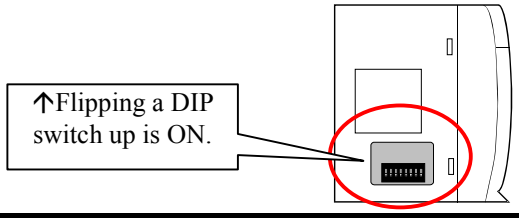
Always ON
[Default setting: ON]</td><td>Operation mode on remote communication for remote master module is set. Compatible mode allows slave module(EH-TRMLE) to connect with master/slave stations for series other than EH-150.
Always make sure that this switch is turned on, that is the compatible mode.
<table>
<tr><th>MODE</th><th>Position</th><th>Compatible mode selection</th></tr>
<tr><td>OFF</td><td>  </td><td>Undefined</td></tr>
<tr><td>ON</td><td>  </td><td>Compatible mode</td></tr>
</table></td></tr>
<tr><td>HOLD</td><td>HOLD (input hold function) selecting
 

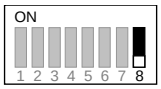
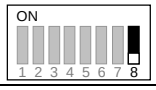
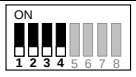
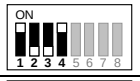
[Default setting: OFF]</td><td>When the communication timeout error occurred, it is selected whether the input data from the slave is held or not. (Hold means the last data received properly is fixed.)
<table>
<tr><th>HOLD</th><th>Position</th><th>Input hold function selection</th></tr>
<tr><td>OFF</td><td>  </td><td>Disable the input hold function (Turn off all input data from slave at the communication error.)</td></tr>
<tr><td>ON</td><td></td><td>Enable the input hold function (At the communication error, input data from the slave is held with last data received properly.)</td></tr>
</table></td></tr>
<tr><td>TERM</td><td>TERM (built-in terminator insertion / non-insertion) selecting
 

[Default setting: OFF]</td><td>It is selected whether the terminator build in the master module is inserted between A and B terminals of the communication connector. The terminator has to be inserted in both ends of master or slave module connected through a twist-pair cable.2 types of terminator, 100 Ω and 150 Ω, are build in the master module. It is possible to select which to insert by the side DIP switch.
<table>
<tr><th>TERM</th><th>Position</th><th>Selection of insertion / non-insertion of terminator</th></tr>
<tr><td>OFF</td><td>  </td><td>Not insert a built-in terminator. (in unnecessary case because it is not both ends of a twist-pair cable)</td></tr>
<tr><td>ON</td><td>  </td><td>Insert a built-in terminator. (when it is both ends of a twist-pair cable)</td></tr>
</table></td></tr>
</table>

Description of Side DIP switch

When flipping a DIP switch up, it means ON as the figure shown in the right side.

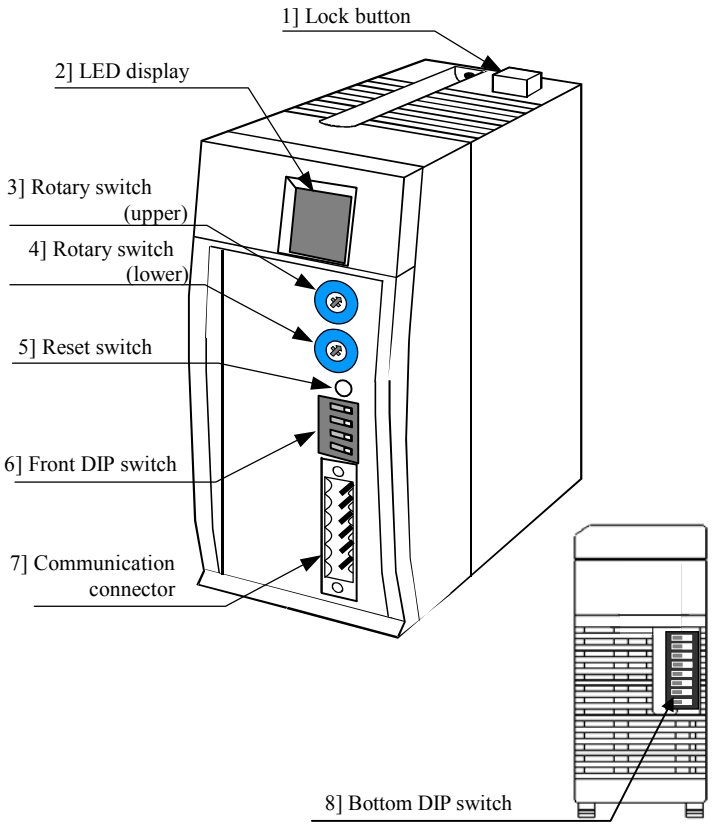


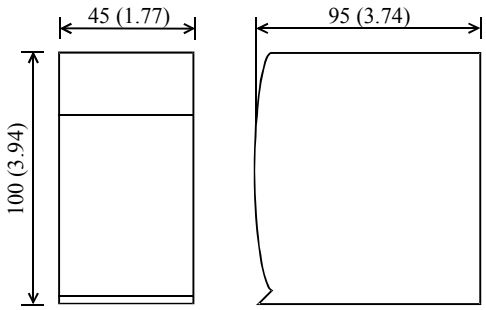
No.	Setting description	Details
1	Select the built-in terminator value  [Default setting: OFF]	100 Ω or 150 Ω terminator build in a master module, it is chosen which terminator is inserted between A and B terminals of communication connector. **Bit8** / Position / Selection of built-in terminator OFF —  — 100 Ω (for recommended 0.3 mm² twist-pair cable) ON —  — 150 Ω (for recommended 0.75 mm² twist-pair cable)
2	Compression mode selecting  [Default setting: OFF]	Enable/disable of the compression mode is chosen according to I/O assignment of master and slave module. Refer to the application manual of the compact remote module for the compression mode. **Bit7** / Position / Selection of compression mode / Master I/O assignment / Local I/O assignment OFF —  — Disable of compression mode — 4W/4W — Unnecessary Remote2 — X16, Y16, Empty16 ON —  — Enable of compression mode — Remote2 — B1/1 in all slots
3	Setting the last channel number of master  [Default setting: all OFF]	The last channel number of the master station is set. Don't set 0 to this switch. When the last channel number of the master station is 0, set 1 to this switch.. Refer to the application manual of the compact remote module for the compression mode. **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / Last channel No. / **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / Last channel No. OFF OFF OFF OFF —  — 0 — OFF OFF OFF ON —  — 8 ON OFF OFF OFF —  — 1 — ON OFF OFF ON —  — 9 OFF ON OFF OFF —  — 2 — OFF ON OFF ON —  — A ON ON OFF OFF —  — 3 — ON ON OFF ON —  — B OFF OFF ON OFF —  — 4 — OFF OFF ON ON —  — C ON OFF ON OFF —  — 5 — ON OFF ON ON —  — D OFF ON ON OFF —  — 6 — OFF ON ON ON —  — E ON ON ON OFF —  — 7 — ON ON ON ON —  — F
4	Undefined  [Default setting: all OFF]	Bit 5 to 6 are undefined. Always turn off Bit 5 and 6. **Bit5** / **Bit6** / Position / Description OFF OFF —  — Undefined (Always turn Bit5 and 6 off.)

(2) Slave module

Name and function of each part

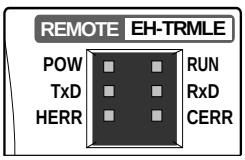
Name and function of each part	Model name	EH-TRMLE
	Weight	Approx. 0.14 kg
	Consumption current (5 V DC)	Approx. 150 mA
	Dimensions (mm (in.))	



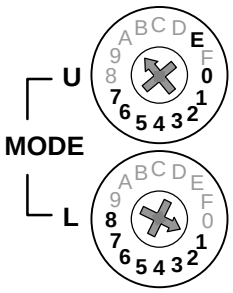


No.	Name	Function	Remarks
1	Lock button	This is used when removing the module from base unit. After it is installed to the base unit, the fixation can be reinforced using screws. In this case, use M4 × 10 mm (0.39 in.) screw.	
2	LED display	The status of module is displayed on this LED.	See a table shown below
3	Rotary switch (upper)	This is a switch to set the station No.	See next page
4	Rotary switch (lower)	This is a switch to set the number of occupancy slots.	See next page
5	Reset switch	The module can be reset by pressing this switch when error such as the module abnormal occurred.	
6	Front DIP switch	This is a switch to set an operation mode (HS refresh mode, etc.).	See next page
7	Communication connector	This is a connector to connect a twist-pair cable for communication.	See next page or later.
8	Bottom DIP switch	This is a switch to set an operation mode (the first slave number of slave, etc.).	See next page or later.

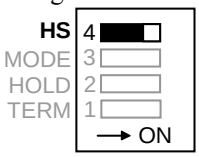
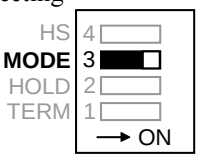
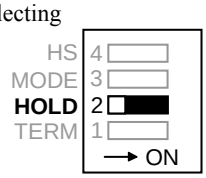
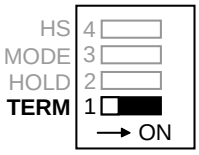
Description of LED display

LED	LED name	Indication	Details
	POW	Power supply	Light up when 5 V DC power is supplied to the module.
	RUN	Normal communication	Light up in proper communication. (Light is turned off due to timeout error when the communication with slave station is discontinued for 500 ms or more.)
	TxD	Transmission data	Light up according to transmission data from slave station.
	RxD	Received data	Light up according to received data from master station.
	HERR	Hardware error	Light up when hardware failure in master module is detected.
	CERR	Communication error	Light up during communication error. (Light is turned off automatically when communication is recovered.)

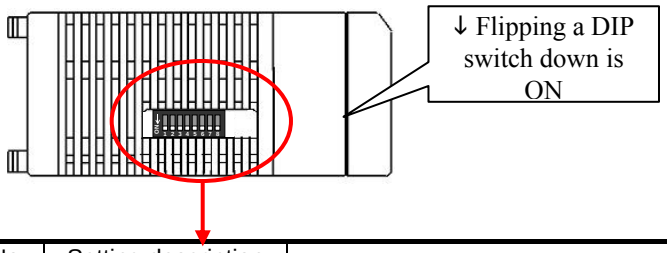
Description of Rotary switch

Rotary switch	Symbol	Meaning	Details of setting
 [Default setting: U=0, L=0]	U (upper)	Station No. (0 to 7) Mix with EM mode (E)	The station No. of the slave modules is set from 0 to 7. In the case of mix with EM/EM-II station, set E in spite of station No..
	L (lower)	Number of occupancy slots (1 to 8 units)	The number of occupancy slots used in the slave station is set from 1 to 8.

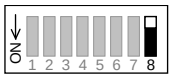
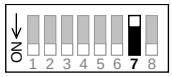
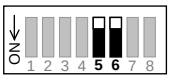
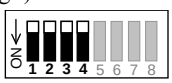
Description of Front DIP switch

Symbol	Setting description	Details
HS	HS (high-speed refresh mode) selecting  [Default setting: ON]	Refresh operation mode on remote communication is set (High-speed or Low-speed). In the case of all stations consist from EH-TRMME and EH-TRMLE, the high-speed refresh mode can be selectable. Remote refresh time is shown below. HS = ON: Refresh time = 0.156 ms × Number of master occupancy channels HS = OFF: Refresh time = 0.338 ms × Number of master occupancy channels The channel is unit of transmitted and received data between master and slave stations. Refer to the application manual of compact remote module for detail. **HS** / Position / Remote refresh mode selection OFF: Low-speed refresh mode (for low-speed remote modules) ON: High-speed refresh mode (for high-speed remote modules EH-TRMME, EH-TRMLE)
MODE	MODE (compatible mode) selecting  Always ON [Default setting: ON]	Operation mode on remote communication for remote slave module is set. Compatible mode allows slave module (EH-TRMLE) to connect with master/slave stations for series other than EH-150. Always make sure that this switch is turned on, that is the compatible mode. **MODE** / Position / Compatible mode selection OFF: Undefined ON: Compatible mode
HOLD	HOLD (output hold function) selecting  [Default setting: OFF]	When the communication timeout error occurred, it is selected whether the output data from the master is held or not. (Hold means the last data received properly is fixed.) **HOLD** / Position / Output hold function selection OFF: Disable the output hold function (Turn off all output data from the master at the communication error.) ON: Enable the output hold function (At the communication error, output data from the master is held with last data received properly.)
TERM	TERM (built-in terminator insertion / non-insertion) selecting  [Default setting: OFF]	It is selected whether the terminator build in the slave module is inserted between A and B terminals of the communication connector. The terminator has to be inserted in both ends of master or slave module connected through a twist-pair cable.2 types of terminator, 100 Ω and 150 Ω, are build in the slave module. It is possible to select which to insert by the bottom DIP switch. The built-in terminator is disconnected when power supply is turned off. So, please set TERM off and connect external terminator to communication connector when you use fallback operation. **TERM** / Position / Selection of insertion / non-insertion of terminator OFF: Not insert a built-in terminator. (in unnecessary case because it is not both ends of a twist-pair cable) ON: Insert a built-in terminator. (when it is both ends of a twist-pair cable)

Description of Bottom DIP switch



When flipping a DIP switch down, it means ON as the figure shown in the left side.

No.	Setting description	Details
1	Built-in terminator value selecting  [Default setting: OFF]	100 Ω or 150 Ω terminator built in a slave module, it is chosen which terminator is inserted between A and B terminals of a connection connector. **Bit8** / Position / Selection of built-in terminator OFF — 100 Ω (for 0.3 mm² recommended twist-pair cable) ON — 150 Ω (for 0.75 mm² recommended twist-pair cable)
2	Compression mode selecting  [Default setting: OFF]	Enable/disable of the compression mode is chosen according to I/O assignment of master module. Refer to the application manual of the compact remote module for the compression mode. **Bit7** / Position / Selection of compression mode OFF — Disable of compression mode (In this case, we can use the number of I/O modules equal to the number of occupancy slots of slave module setting with rotary switch) ON — Enable of compression mode (In this case, we can use the number of I/O modules equal to the double number of occupancy slots of slave module setting with rotary switch.)
3	Slave first channel No. setting (Upper digit)  [Default setting: all OFF]	Upper digit of the first channel No. for slave station is set. Set 0 to upper digit except using with Remote I/O MINI master module of mode 0. **Bit5** / **Bit6** / Position / Upper digit of 1st channel No. (×2) OFF / OFF — 0 ON / OFF — 1 OFF / ON — 2 ON / ON — 3
4	Slave first channel No. setting (Lower digit)  [Default setting: all OFF]	Lower digit of the first channel No. for slave station is set. **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / Lower digit of 1st channel No. (×2) OFF / OFF / OFF / OFF — 0 ON / OFF / OFF / OFF — 1 OFF / ON / OFF / OFF — 2 ON / ON / OFF / OFF — 3 OFF / OFF / ON / OFF — 4 ON / OFF / ON / OFF — 5 OFF / ON / ON / OFF — 6 ON / ON / ON / OFF — 7 OFF / OFF / OFF / ON — 8 ON / OFF / OFF / ON — 9 OFF / ON / OFF / ON — A ON / ON / OFF / ON — B OFF / OFF / ON / ON — C ON / OFF / ON / ON — D OFF / ON / ON / ON — E ON / ON / ON / ON — F

(3) Specifications

Functional specifications

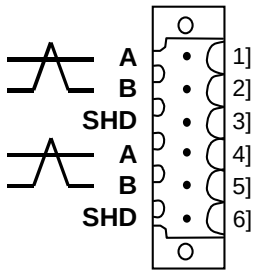
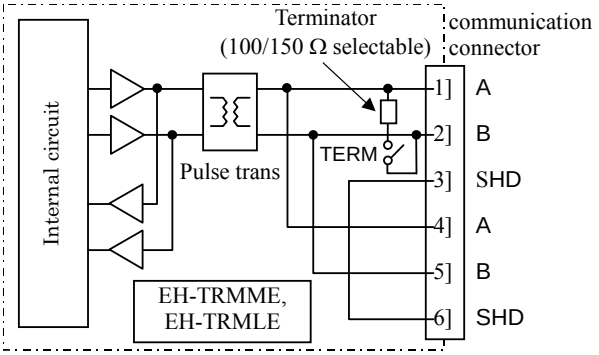
Item			Specifications
Functional specifications	Usable CPU		EH-CPU104A/208A/316A/516/548, EHV-CPU16/32/64/128
	Connection modules		Remote master module: Maximum 4 units / CPU (I/O assignment: “Remote 2”)
			Remote slave module: Maximum 8 units / Master (Master: EH-TRMME, RIOH-TM, RIOM-TM) Maximum 12 units / Master (Master: REM-MMH)
	Number of I/O points		1,536 points/master (Master: REM-MMH with mode 0) 256 points/master (Master: EH-TRMME, I/O assignment: “Remote 2”) 128 points/master (Master: EH-TRMME, I/O assignment: “4W/4W”) 256 points/master (Master: RIOH-TM, RIOM-TM, HL-40DR, HL-64DR)
	Refresh time		2.5 ms/256 points (HS: ON), 5.4 ms/256 points (HS: OFF)
	Self-diagnosis		SRAM check, WDT check, Loop back check
	Fallback operation		Available (Even if a slave module is failed or powered off, it is possible to continue communication between a master module and other slave modules)*3
	I/O assignment*1		Master: “Remote 2” or “Word 4W/4W”, Slave: No assignment
	Mountable module on slave base*2		8-point, 16-point I/O module (I/O assignment is “X16” or “Y16”) Dummy module (I/O assignment is “Empty 16”) 〔32-point/64-point module, analog I/O module, and high-performance module, communication modules, etc. cannot be mounted on the slave base.〕
	Consumption current		EH-TRMME: Approximately 150 mA, EH-TRMLE: Approximately 150 mA
Transmission specifications	Transmission speed		768 kbps
	Transmission mode		Half-duplex serial transfer, frame synchronization
	Insulation, modulation method		Trans insulation, bipolar pulse modulation
	Transmission error check		Reverse double-transmission, time out
	Error display		LED, special internal output
Transmission line	Connection mode		Multi-drop system
	Cable length		Between stations: 150 m (0.3 mm^2) / 300 m (0.75 mm^2)
			Total length: 150 m (0.3 mm^2) / 300 m (0.75 mm^2)
	Error station processing		Slave station: Bypass system
	Cable		Shielded twist-pair cable
	Recommended cable (made by Hitachi cable)	Existing	CO-SPEV-SB(A)-1P-0.3SQ (Terminator 100 Ω) CO-EX-SX-1P-0.75SQ (Terminator 150 Ω)
		New	CO-SPEV-SB(A)-1P-0.3SQ LF (Terminator 100 Ω) CO-EX-SX 2×0.75SQ LF (Terminator 150 Ω)
	Applicable connector		BL3.5/6F attached (made by Weidmuller)

*1 “Remote 2” is unavailable to EH-CPU104A/208A/316A. Always use “Word 4W/4W” for these. There is no function for the read I/O assignment and copy. Set I/O assignment for remote slave by a programming software.

*2 Please refer to compact remote module manual for detail.

*3 Please connect external terminator to communication connectors of end slave modules connected through a twisted-pair cable when you use fallback operation. Refer to Compact remote module Application manual for details.

Description of Communication connector

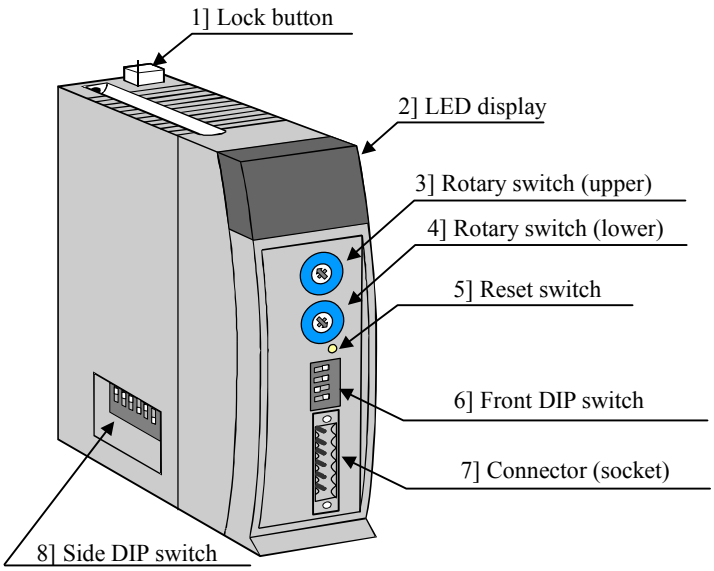
Terminal configuration	No.	Signal	Signal name	Internal circuit
	1]	A *	Transmitted and received data A	
	2]	B *	Transmitted and received data B	
	3]	SHD *	Grounding for cable	
	4]	A *	Transmitted and received data A	
	5]	B *	Transmitted and received data B	
	6]	SHD *	Grounding for cable	

* Two pairs of A, B, and SHD terminals are internally-connected. Therefore, even if a slave module is powered off, it is possible to continue communication between the master module and other slave modules while operating.
However, cables connected to the connector are disconnected (a disconnected state) because of connection inside module if the connector is unplugged. If the slave module is replaced while operating when the slave module breaks down, connect 2 cables to same terminals beforehand, following the connection method 2 shown in next page.
The built-in terminator is disconnected when power supply is turned off. So, please set TERM off and connect external terminator to communication connector of end slaves instead of a built-in terminator when you use fallback operation.
Refer to Compact remote module Application manual for details.

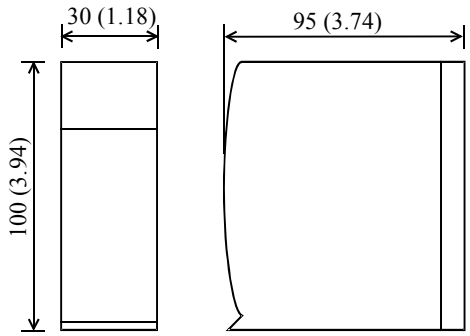
9.5 Compact LINK Module

(1) Compact LINK module (EH-TLNKE)

Name and function of each part

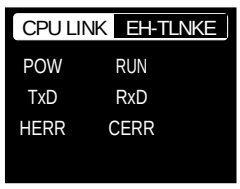


Model name	EH-TLNKE
Weight	Approx. 0.12 kg (0.26 lb.)
Consumption current (5 V DC)	Approx. 270 mA
Dimensions (mm (in.))	

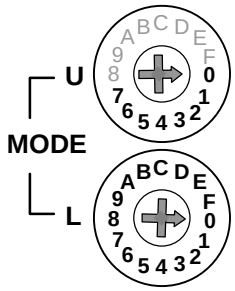


No.	Name	Function	Remarks
1	Lock button	This is used when removing the module from base unit. After it is installed to the base unit, the fixation can be reinforced using screws. In this case, use M4 × 10 mm (0.39 in.) screw.	
2	LED display	The status of module is displayed on this LED.	See a table shown below.
3	Rotary switch (upper)	This is a switch to set station number or station count for link module. There are different from setting contents by operation mode (normal mode or compatible mode).	See next page.
4	Rotary switch (lower)		
5	Reset switch	Pressing this switch when abnormal error occurred can reset the module.	
6	Front DIP switch	This is a switch to set an operation mode (HS refresh mode, etc.).	See next page.
7	Connector	This is a connector to connect a twist-pair cable for connecting other stations.	See next page or later.
8	Side DIP switch	This is a switch to set number of stations or an operation mode of the module. The contents change by the mode setting.	See next page or later.

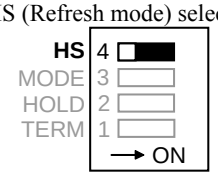
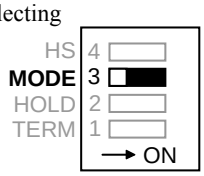
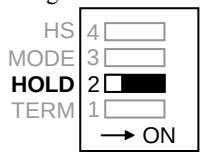
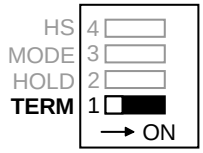
Description of LED display

LED	LED name	Indication	Details
	POW	Power supply	Light up when 5 V DC power is supplied to the module.
	RUN	Normal communication	Light up in proper communication. (Light is turned off due to time out error when the communication is discontinued for 500ms or more.)
	TxD	Transmission data	Light up according to transmission data on the module.
	RxD	Received data	Light up according to received data from other stations.
	HERR	Hardware error	Light up when hardware failure in link module is detected.
	CERR	Communication error	Light up during communication error. (Light is turned off automatically when communication is recovered.)

Description of Rotary switch

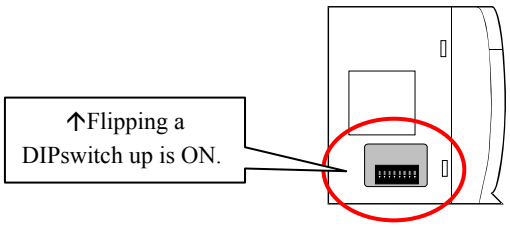
Rotary switch	Communication mode	Symbol	Meaning	Details of setting
 [Default setting: U=0, L=0]	Normal mode	U (Upper)	Station number	Set the station number of the module. Set it in 00h to 1Fh (Hex two digits) ranges.
		L (Lower)		
	Compatible mode	U (Upper)	Station number	Set the station number of the module. Set it in 0 to 7 ranges.
		L (Lower)	Number of stations	Set the number of connected modules. Set it in 2 to 8 ranges.
	Set the station number with the continued number. If setting number was beyond a range, EH-TLNKE becomes the hardware error.			

Description of Front DIP switch

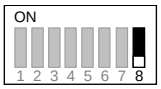
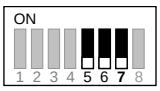
Symbol	Setting description	Details
HS	HS (Refresh mode) selecting  MODE / HS / Transmission interval Normal mode / OFF / Approx. 100μs Normal mode / ON / Approx. 6μs Compatible mode / OFF / Approx. 700μs Compatible mode / ON / Approx. 6μs [Default setting: OFF]	Refresh operation mode on link communication is set (High-speed or Low-speed). In the case of all station is EH-TLNKE the high-speed refresh mode can be selectable. HS / Position / Remote refresh mode selection OFF /  / Low-speed refresh mode ON /  / High-speed refresh mode (for high-speed EH-TLNKE)
MODE	MODE (Communication mode) selecting  [Default setting: OFF]	Operation mode on link communication for the module is set. Compatible mode (HS:OFF) allows link module (EH-TLNKE) to connect with link modules for series other than EH-150. MODE / Position / Communication mode selection OFF /  / Normal mode ON / / Compatible mode
HOLD	HOLD (Input hold function) selecting  [Default setting: OFF]	When the communication timeout error occurred, it is selected whether the input data from other stations is held or not. (Hold means the last data received properly is fixed.) HOLD / Position / Input hold function selection OFF /  / Disable the input hold function (Turn off all received data from other stations at the communication error.) ON /  / Enable the input hold function (At the communication error, received data from other stations is held with last data received properly.)
TERM	TREM (Terminator insertion / Non-insertion) selecting  [Default setting: OFF]	It is selected whether the terminator build in the link module is inserted between A and B terminals of the communication connector. The terminator has to be inserted in both ends of link modules connected through a twisted pair cable. 2 types of terminators (100 Ω and 150 Ω) are built in link module. It is possible to select which to insert by the side Dipswitch. The built-in terminator is disconnected when power supply is turned off. So, please set TERM off and connect external terminator to communication connector when you use fallback operation. TERM / Position / Selection of insertion / non-insertion of terminator OFF /  / Not insert a built-in terminator. (An unnecessary, if it is not both ends of a twisted pair cable.) ON /  / Insert a built-in terminator. (When it is both ends of a twisted pair cable)

Description of Side DIP switch

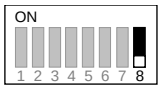
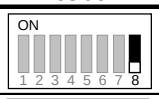
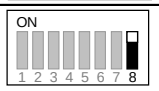
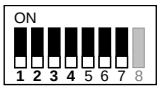
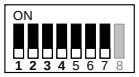
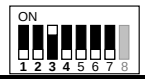
When flipping a Dipswitch up, it means ON as the figure shown in the right side.



See the list below about setting the DIPswitch in the normal mode.

No.	Setting description	Details
1	Select the built-in terminator value  [Default setting: OFF]	100 Ω or 150 Ω terminators build in a link module, it chooses which terminator is inserted between A and B terminals of communication connector. **Bit8** / Position / Selection of built-in terminator OFF — 100 Ω (For recommended 0.3 mm² and 0.5 mm² twisted pair cable) ON — 150 Ω (For recommended 0.75 mm² twisted pair cable)
2	Setting the number of connected modules (Upper)  [Default setting: All OFF]	Set the value of Hex two digits for the number of connected modules on the same link system. Set it in 02h to 20h ranges. Bit 7 is undefined. Always turn off Bit 7. **Bit7** / Position / Description OFF — Undefined (Always turn Bit7 off.) Set an upper digit of the number of connected modules by Bit5 and Bit6 of DIP switch. **Bit5** / **Bit6** / Position / Set value / **Bit5** / **Bit6** / Position / Set value OFF OFF — 0 — OFF ON — 2 ON OFF — 1 — ON ON — Undefined
3	Setting the number of connected modules (Lower)  [Default setting: All OFF]	Set a lower digit of the number of connected modules from Bit1 to Bit4 in DIPswitch. **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / Set value / **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / Set value OFF OFF OFF OFF — 0 — OFF OFF OFF ON — 8 ON OFF OFF OFF — 1 — ON OFF OFF ON — 9 OFF ON OFF OFF — 2 — OFF ON OFF ON — A ON ON OFF OFF — 3 — ON ON OFF ON — B OFF OFF ON OFF — 4 — OFF OFF ON ON — C ON OFF ON OFF — 5 — ON OFF ON ON — D OFF ON ON OFF — 6 — OFF ON ON ON — E ON ON ON OFF — 7 — ON ON ON ON — F

See the list below about setting the DIPswitch in the compatible mode.

<table>
<tr><th>No.</th><th>Setting description</th><th>Details</th></tr>
<tr><td>1</td><td>Select the built-in terminator value
 
[Default setting: OFF]</td><td>100 Ω or 150 Ω terminators build in a link module, it chooses which terminator is inserted between A and B terminals of communication connector.
<table>
<tr><th>Bit8</th><th>Position</th><th>Selection of built-in terminator</th></tr>
<tr><td>OFF</td><td>  </td><td>100 Ω (for recommended 0.3 mm^2 and 0.5 mm^2 twisted pair cable)</td></tr>
<tr><td>ON</td><td>  </td><td>150 Ω (for recommended 0.75 mm^2 twisted pair cable)</td></tr>
</table></td></tr>
<tr><td>2</td><td>Select the I/O assignment*1
 
[Default setting: All OFF]</td><td>Set the I/O assignment of the module.*1
<table>
<tr><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Bit5</th><th>Bit6</th><th>Bit7</th><th>Position</th><th>I/O assignment</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>  </td><td>LINK</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>  </td><td>X4Y4W</td></tr>
</table></td></tr>
</table>

*1 See the list below about the CPU modules and I/O assignments.

I/O assignment	EH-CPU104A EH-CPU208A	EH-CPU316A EH-CPU516 EH-CPU548	EHV-CPU16 EHV-CPU32 EHV-CPU64 EHV-CPU128	Link points*1
LINK	Not available	Available	Available	16,384 points / loop (Normal mode) 128 points / loop (Compatible mode)
X4Y4W	Available	Available	Available	64 points / loop

*1 By I/O assignment except "LINK", the external outputs are send data area. In addition, external inputs are received data area.
Therefore, received link data from other stations are stored away in the external inputs area.

If do not set a switch definitely, be careful as EH-TLNKE does not operate normally.

Item			Specifications
Functional specifications	Usable CPU		EH-CPU104A/208A/316A/516/548, EHV-CPU16/32/64/128
	No. of mounted units	EHV-CPU***	MAX 8 units per CPU (8 loops per CPU) (I/O assignment: “LINK”)
		EH-CPU***	MAX 2 units per CPU (2 loops per CPU) (I/O assignment: “LINK”)*1
	No. of connected link modules	Normal mode	MAX 32 units per system
		Compatible mode	MAX 8 units per system (Connectable mode to IOLH-T and IOLM-T)
	Number of link points	Normal mode	1024 words per system (I/O assignment: “LINK”)
		Compatible mode	8 words per system (I/O assignment: “LINK”) 4 words per system (I/O assignment: “X4Y4W”)
	Refresh time*2		Approx. 100 msec/1024 words (HS: ON), Approx. 55 msec/8 words (HS: OFF)
	Self-diagnosis		SRAM check, WDT check, Loop back check
	Fallback operation		Available (Even if some slave stations are failed or powered off, it is possible to continue communication between other stations.)*4
	I/O assignment		“LINK” or “X4Y4W”
	Consumption current		Approx. 270 mA
Transmission specifications	Transmission speed		768 kbps
	Transmission mode		Half-duplex serial transfer, frame synchronization
	Insulation, modulation method		Trans insulation, bipolar pulse modulation
	Transmission error check		Reverse double-transmission, time-out
	Error display		LED, special internal output
Transmission line	Connection mode		Multi-drop system
	Cable length (Compatible mode)*3		Between stations: 150 m (0.3 mm^2) / 300 m (0.5 mm^2, 0.75 mm^2)
			Total length: 150 m (0.3 mm^2) / 300 m (0.5 mm^2, 0.75 mm^2)
	Error station processing		Slave station: Bypass system
	Cable		Shielded twisted pair cable
	Recommended cable (Made by Hitachi cable)	Existing	0.3 mm^2 cable: CO-SPEV-SB(A)-1P-0.3SQ (Terminator 100 Ω) 0.75 mm^2 cable: CO-EV-SX-1P-0.75SQ (Terminator 150 Ω)
		New	0.3 mm^2 cable: CO-SPEV-SB(A)-1P-0.3SQ LF (Terminator 100 Ω) 0.5 mm^2 cable: CO-SPEV-SB(A)-1P-0.5SQ LF (Terminator 100 Ω)
	Applicable connector		BL3.5/6F attached (made by Weidmuller)

*1 “LINK” is unavailable to EH-CPU104A/208A. Always use “X4Y4W” for these.

*2 Refresh time is transmission refresh time between the link module.

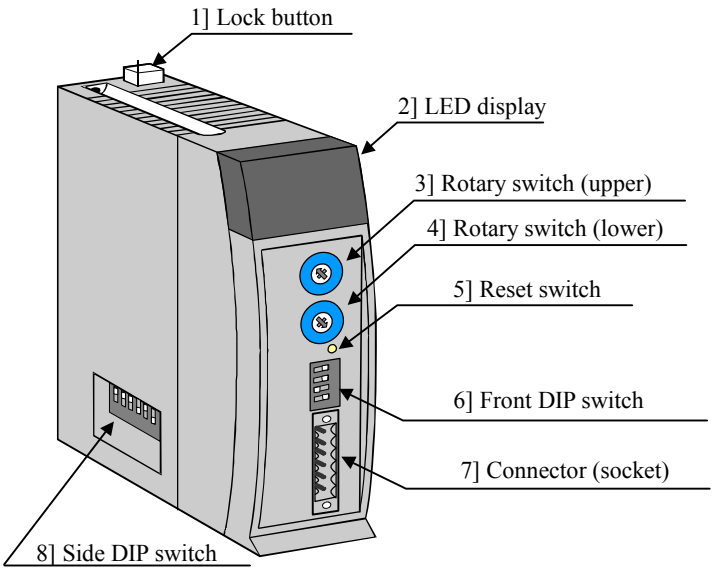
*3 Maximum-length of cable seems below by number that connected stations in the case of normal mode setting.

No. of connected stations	0.3 mm^2 cable	0.5 mm^2, 0.75 mm^2 cable
2 to 8 stations	150 m	300 m
9 to 16 stations	130 m	260 m
17 to 32 stations	100 m	200 m

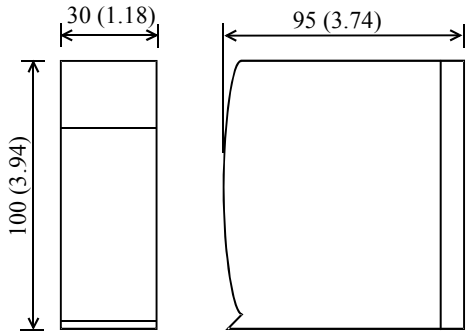
*4 Please connect external terminator to communication connectors of end link modules connected through a twisted-pair cable when you use fallback operation.

(2) Compact I/O LINK module (EH-TRLLE)

Name and function of each part

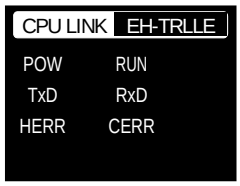


Model name	EH-TRLLE
Weight	Approx. 0.12 kg (0.26 lb.)
Consumption current (5VDC)	Approx. 270 mA
Dimensions (mm (in.))	



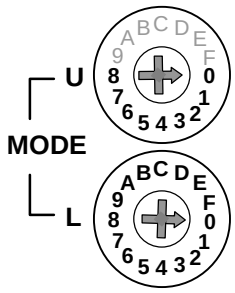
No.	Name	Function	Remarks
1	Lock button	When dismounting the module from a base unit, press this button and lift up the module. The module can be fixed firmly by a screw (M4, 10mm (0.39 in.))	
2	LED display	The status of module is displayed on this LED.	See a table shown below.
3	Rotary switch (upper)	This is a switch to set head channel number for link module. The module that is set to 80h by rotary switches is a link master station.	See next page.
4	Rotary switch (lower)		
5	Reset switch	Pressing this switch when abnormal error occurred can reset the module.	
6	Front DIP switch	This is a switch to set an operation mode (HS refresh mode, etc.).	See next page.
7	Connector	This is a connector to connect a twist-pair cable for connecting other stations.	See next page or later.
8	Side DIP switch	This is a switch to set an I/O assignment or set a value of terminators that built in link module.	See next page or later.

Description of LED display

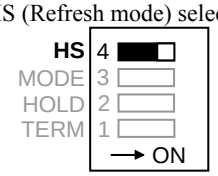
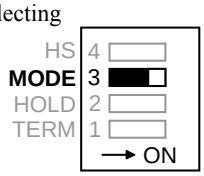
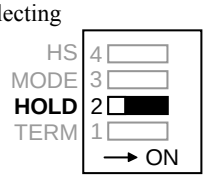
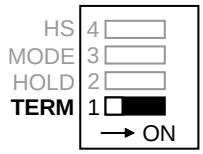


LED name	Indication	Details
POW	Power supply	Light up when 5 V DC power is supplied to the module.
RUN	Normal communication	Light up in proper communication. (Light is turned off due to time out error when the communication is discontinued for 500 ms or more.)
TxD	Transmission data	Light up according to transmission data on the module.
RxD	Received data	Light up according to received data from other stations.
HERR	Hardware error	Light up when hardware failure in link module is detected.
CERR	Communication error	Light up during communication error. (Light is turned off automatically when communication is recovered.)

Description of Rotary switch

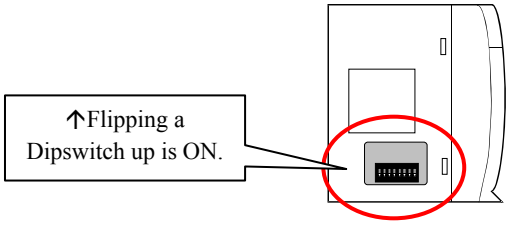
Rotary switch	Symbol	Meaning	Details of setting
 [Default setting: U=0, L=0]	U (Upper)	Head channel number/ master station setting	Set the head channel number of the link area that occupied in module. Set it in 00h to 3Fh (Hex two digits) ranges. The station that was set to 80h by rotary switches becomes the link master.
	L (Lower)		
	If setting number was beyond a range, EH-TRLLE becomes the hardware error.		

Description of Front DIP switch

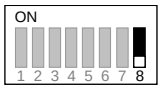
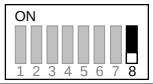
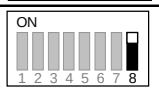
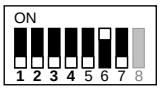
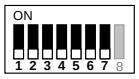
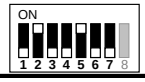
Symbol	Setting description	Details
HS	HS (Refresh mode) selecting  HS: Transmission interval OFF: Approx. 600μs ON: Approx. 6μs [Default setting: ON]	Refresh operation mode on link communication is set (High-speed or Low-speed). In the case of all station is EH-TRLLE and EH-TRMME/TRMLE the high-speed refresh mode can be selectable. When the conventional products are included in I/O link system, turn it off. The transmission interval of data changes by the setting of the refresh operation mode. Refer to section 4.6 about the calculation method of link refresh time. **HS** / Position / Link refresh mode selection OFF: Low-speed refresh mode ON: High-speed refresh mode
MODE	MODE (Communication mode) selecting  [Default setting: ON]	Always turn on this switch. **MODE** / Position / Communication mode selection OFF: Invalid ON: Compatible mode
HOLD	HOLD (Input hold function) selecting  [Default setting: OFF]	When the communication timeout error occurred, it is selected whether the input data from other stations is held or not. (Hold means the last data received properly is fixed.) **HOLD** / Position / Input hold function selection OFF: Disable the input hold function (Turn off all input area data at the communication error.) ON: Enable the input hold function (At the communication error, all input area data is held with last data received properly.)
TERM	TREM (Terminator insertion / Non-insertion) selecting  [Default setting: OFF]	It is selected whether the terminator build in the link module is inserted between A and B terminals of the communication connector. The terminator has to be inserted in both ends of link modules connected through a twisted pair cable. 2 types of terminators (100 Ω and 150 Ω) are built in link module. It is possible to select which to insert by the side Dipswitch. The built-in terminator is disconnected when power supply is turned off. So, please set TERM off and connect external terminator to communication connector when you use fallback operation. **TERM** / Position / Selection of insertion / non-insertion of terminator OFF: Not insert a built-in terminator. (An unnecessary, if it is not both ends of a twisted pair cable.) ON: Insert a built-in terminator. (When it is both ends of a twisted pair cable)

Description of Side DIP switch

When flipping a Dipswitch up, it means ON as the figure shown in the right side.



See the list below about setting the Dipswitch.

<table>
<tr><th>No.</th><th>Setting description</th><th>Details</th></tr>
<tr><td>1</td><td>Select the built-in terminator value
 
[Default setting: OFF]</td><td>100 Ω or 150 Ω terminators build in a link module, it chooses which terminator is inserted between A and B terminals of communication connector.
<table>
<tr><th>Bit8</th><th>Position</th><th>Selection of built-in terminator</th></tr>
<tr><td>OFF</td><td>  </td><td>100 Ω (for recommended 0.3 mm^2 and 0.5 mm^2 twisted pair cable)</td></tr>
<tr><td>ON</td><td>  </td><td>150 Ω (for recommended 0.75 mm^2 twisted pair cable)</td></tr>
</table></td></tr>
<tr><td>2</td><td>Select the I/O assignment*1
 
[Default setting: No.6 ON]</td><td>Set the I/O assignment of the module.*1
<table>
<tr><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Bit5</th><th>Bit6</th><th>Bit7</th><th>Position</th><th>IO assignment</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>  </td><td>LINK (1)</td></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>  </td><td>LINK (2)</td></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>  </td><td>LINK (3)</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>  </td><td>Y8W</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>  </td><td>X4Y4W</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>  </td><td>X8W</td></tr>
</table></td></tr>
</table>

*1 See the list below about the CPU modules and I/O assignments.

I/O assignment	Operation mode	EH-CPU104A EH-CPU208A	EH-CPU316A EH-CPU516 EH-CPU548	EHV-CPU16 EHV-CPU32 EHV-CPU64 EHV-CPU128	I/O link points
LINK (1)	Mode0	Not available	Available	Available	Input: 1,024 points/ Output: 1,024 points
LINK (2)	Mode2c	Not available	Available	Available	Input: 64 points / Output: 64 points
LINK (3)	Mode0c	Not available	Available	Available	Input: 128 points / Output: 128 points
Y8W	Mode1	Available	Available	Available	Output: 128 points
X4Y4W	Mode2	Available	Available	Available	Input: 64 points / Output: 64 points
X8W	Mode3	Available	Available	Available	Input: 128 points

Mode0, Mode1, Mode2, Mode3: Compatible mode of REM-MMH/LMH
Mode0c, Mode2c: Compatible mode of REM-LH2

By I/O assignment except "LINK", the external outputs are send data area. In addition, external inputs are received data area. Therefore, received link data from the master station are stored away in the external inputs area.

* If do not set a switch definitely, be careful as EH-TRLLE does not operate normally.

Item			Specifications
Functional specifications	Usable CPU		EH-CPU104A/208A/316A/516/548, EHV-CPU16/32/64/128
	No. of mounted units	EHV-CPU***	MAX 8 units per CPU (8 loops per CPU) (I/O assignment: “LINK”)
		EH-CPU***	MAX 2 units per CPU (2 loops per CPU) (I/O assignment: “LINK”)*1
	No. of connected slave modules		MAX 12 units per system (Connectable mode to REM-MMH/LMH/LH2)
	Number of link points*2		64 channels (2,048 points) per system (I/O assignment: “LINK”)
	Refresh time*3		Approx. 10 msec/ 64 channels (12 slaves, HS: ON) Approx. 22 msec/ 64 channels (12 slaves, HS: OFF)
	Self-diagnosis		SRAM check, WDT check, Loop back check
	Fallback operation		Available (Even if some slave stations are failed or powered off, it is possible to continue communication between other stations.)*4
	I/O assignment		“LINK” or “Y8W” or “X4Y4W” or “X8W”
	Consumption current		Approx. 270 mA
Transmission specifications	Transmission speed		768 kbps
	Transmission mode		Half-duplex serial transfer, frame synchronization
	Insulation, modulation method		Trans insulation, bipolar pulse modulation
	Transmission error check		Reverse double-transmission, time-out
	Error display		LED, special internal output
Transmission line	Connection mode		Multi-drop system
	Cable length		Between stations: 150 m (0.3 mm^2) / 300 m (0.5 mm^2, 0.75 mm^2)
			Total length: 150 m (0.3 mm^2) / 300 m (0.5 mm^2, 0.75 mm^2)
	Error station processing		Slave station: Bypass system
	Cable		Shielded twisted pair cable
	Recommended cable (Made by Hitachi cable)	Existing	0.3 mm^2 cable: CO-SPEV-SB(A)-1P-0.3SQ (Terminator 100 Ω) 0.75 mm^2 cable: CO-EV-SX-1P-0.75SQ (Terminator 150 Ω)
		New	0.3 mm^2 cable: CO-SPEV-SB(A)-1P-0.3SQ LF (Terminator 100 Ω) 0.5 mm^2 cable: CO-SPEV-SB(A)-1P-0.5SQ LF (Terminator 100 Ω)
	Applicable connector		BL3.5/6F attached (made by Weidmuller)

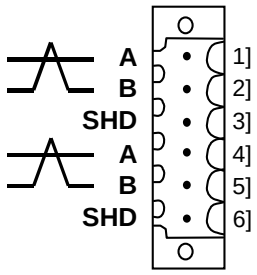
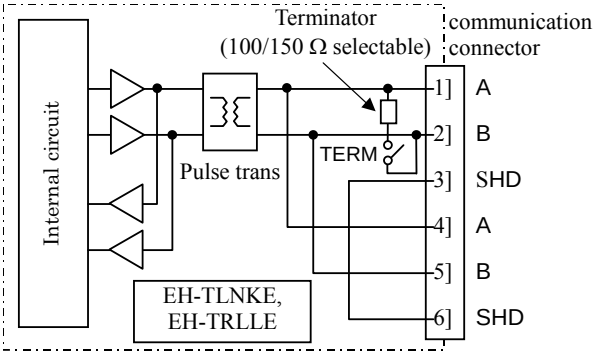
*1 “LINK” is unavailable to EH-CPU104A/208A. Always use “Y8W” or “X4Y4W” or “X8W” for these.

*2 The number of data transferred between master and slave stations is called the "channel". A channel means that the pair of an input word (data sent to the master station by the slave station) and an output word (data sent to the slave station by the master station) is allocated to one address. Therefore, one channel is 32 points (2 words).

*3 Refresh time is transmission refresh time between the link module.

*4 Please connect external terminator to communication connectors of end link modules connected through a twisted-pair cable when you use fallback operation.

Description of Communication connector

Terminal configuration	No.	Signal	Signal name	Internal circuit
	1]	A *	Transmitted and received data A	
	2]	B *	Transmitted and received data B	
	3]	SHD *	Grounding for cable	
	4]	A *	Transmitted and received data A	
	5]	B *	Transmitted and received data B	
	6]	SHD *	Grounding for cable	

* Two pairs of A, B, and SHD terminals are internally-connected. Therefore, even if a link module is powered off, it is possible to continue connection between the link master and other stations while operating. However, cables connected to the connector are disconnected (a disconnected state) because of connection inside module if the connector is unplugged. If the module is replaced while operating when the module breaks down, connect 2 cables to same terminals beforehand.

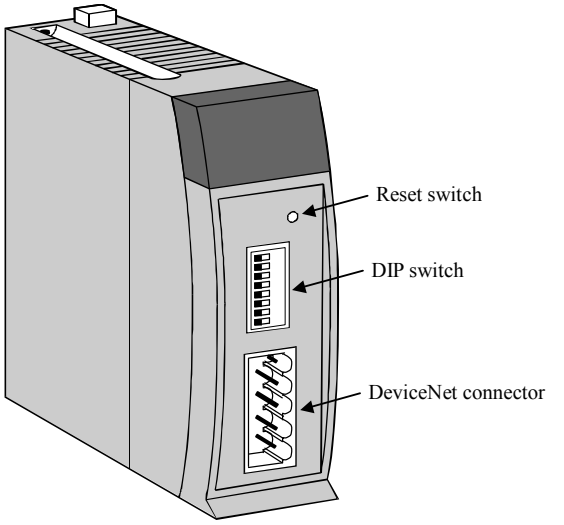
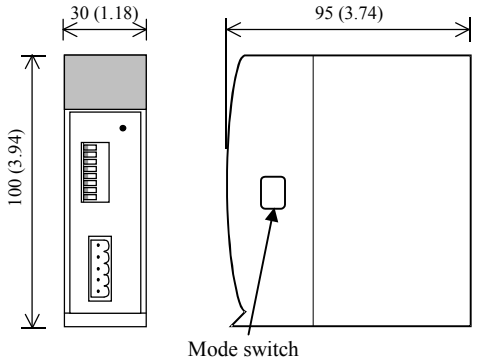
When you connect twisted pair cables to the communication connector, do not intersect between the parts of peeled cables. If the cables intersected, link module may become the communication error.

The built-in terminator is disconnected when power supply is turned off. So, please set TERM off and connect external terminator to communication connector of end slaves instead of a built-in terminator when you use fallback operation.

Refer to Compact link module (EH-TLNKE, EH-TRLLE) Application manual for details.

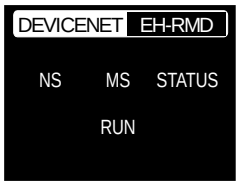
9.6 DeviceNet Module

DeviceNet master module

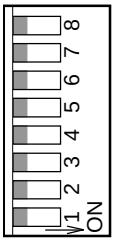
Name and function of each part	Type (Weight)	EH-RMD (Approx. 0.13 kg (0.29 lb.))
	Dimensions (mm (in.))	

Name	Description
Reset switch	The module is reset if this switch is pressed.
DIP switch	Sets up the node address and the communication speed.
DeviceNet connector	This is a connector for connecting to the network. Use an attached connector.
Mode switch	EH-RMD (“SOFTWARE VER.02” or later version) has a link mode and a remote mode as an operating mode. This switch can change the operating mode. Link mode:  All is OFF Remote mode:  Only Bit 4 is ON Stick an attached protect sheet on after selecting the operating mode.
	EH-RMD (before “SOFTWARE VER.02”) operates in the link mode only. Therefore, the client does not need to operate this switch. This module is shipped covering the mode switch with the protect sheet.

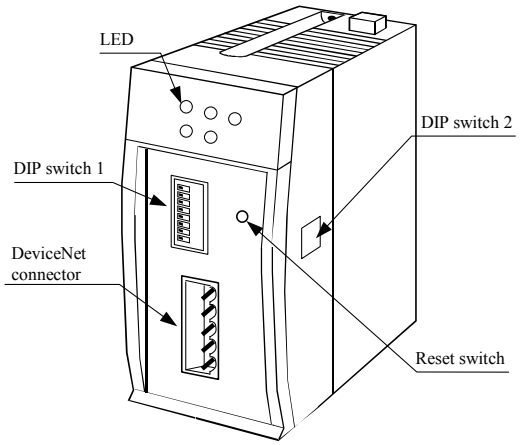
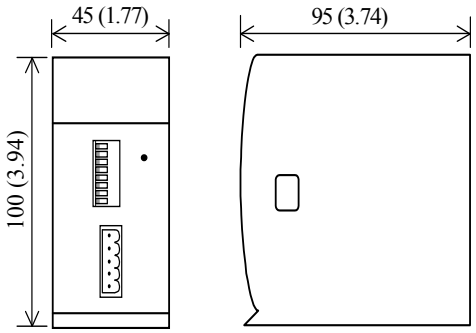
LED name

Front view of LED part	LED	Details	Color
	NS	Indicates the status of the network by combination of illumination color and flashing count	Yellow green / Red
	MS	Indicates the status of the communication interface board by combination of the illumination color and flashing count.	Yellow green / Red
	RUN	Indicates the status of the module and the CPU module by the flashing pattern.	Yellow green / Red
	STATUS	Indicates the status of the PLC interface board by combination of illumination color and flashing count.	Yellow green / Red

Setup node address and communication speed

External view	Node address	NA1	NA2	NA4	NA8	NA16	NA32	Communication speed	DR0	DR1
	0	OFF	OFF	OFF	OFF	OFF	OFF	125	OFF	OFF
	1	ON	OFF	OFF	OFF	OFF	OFF	250	ON	OFF
	2	OFF	ON	OFF	OFF	OFF	OFF	500	OFF	ON
	:	:	:	:	:	:	:		ON	ON
	:	:	:	:	:	:	:			
	62	OFF	ON	ON	ON	ON	ON			
	63	ON	ON	ON	ON	ON	ON			

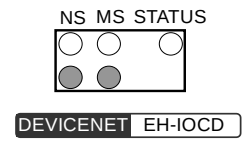
DeviceNet slave module

Name and function of each part	Type (Weight)	EH-IOCD (Approx. 0.17 kg (0.37 lb.))
	Dimensions (mm (in.))	

Name	Description
LED	This is a LED for indicating the network status and error information.
DIP switch 1	Sets up the node address and the communication speed.
DeviceNet connector	This is a connector for connecting to the network. Use an attached connector.
Reset switch	The module is reset if this switch is pressed.
DIP switch 2	This is a switch for specifying that the status of the output module on EH-IOCD is 'OFF' or 'HOLD' at the communication error or at the stop of the CPU module.

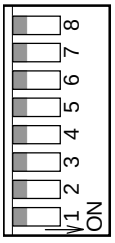
Output OFF	Output HOLD
 All is OFF	 Only Bit 4 is ON

LED name

Front view of LED part	LED	Details	Color
	NS	Indicates the network status by combination of illumination color and flashing count.	Yellow green / Red
	MS	Indicates the status of the communication interface board by combination color and flashing count.	Yellow green / Red
*	STATUS	Indicates the status of PLC interface board by combination of illumination color and flashing count.	Yellow green / Red

* ◯ LED does not light up because it has not been used.

Setup node address and communication speed

External view	Node address	NA1	NA2	NA4	NA8	NA16	NA32	Communication speed	DR0	DR1
	0	OFF	OFF	OFF	OFF	OFF	OFF	125	OFF	OFF
	1	ON	OFF	OFF	OFF	OFF	OFF	250	ON	OFF
	2	OFF	ON	OFF	OFF	OFF	OFF	500	OFF	ON
	:	:	:	:	:	:	:		ON	ON
	:	:	:	:	:	:	:			
	62	OFF	ON	ON	ON	ON	ON			
	63	ON	ON	ON	ON	ON	ON			

DeviceNet master / slave module
Common Specifications

Item	Specification
Communication protocol	DeviceNet 2.0 standard
Supported connections	1. Poll I/O connection 2. Bit Strobe I/O connection 3. Cyclic I/O connection 4. Change of State(COS) I/O connection 5. Explicit Message connection
Connection mode	1. Multi-drop connection 2. Multi-drop connecting using T-branch
Communication speed	500k / 250k / 125 kbps (switched by DIP switch)
Cable	Dedicated DeviceNet cable*
Communication distance	The network length becomes the maximum when a thick trunk cable is used.

Communication speed	Maximum network length	Each sub-line length	Total sub-line length
500 k bits/s	100 m or less	6 m or less	39 m or less
250 k bits/s	250 m or less	6 m or less	78 m or less
125 k bits/s	500 m or less	6 m or less	156 m or less

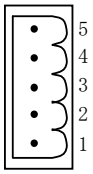
* We recommend the followings as communication cables and crimp type terminals for cables.

Made by Showa Densen	TDN18-**G	Trunk cable (thick cable)
	TDN24-**G	Drop cable (thin cable)

(** indicates the number of 'm's. Available lengths are 10 / 30 / 50 / 100 / 300 / 500 m.)

Made by Nichifu	TME TC-2-11	Crimp type terminal for trunk cable (power supply line)
	TME TC-1.25-11	Crimp type terminal for trunk cable (communication line)
	TME TC-0.5	Crimp type terminal for drop cable (common to power supply line / communication line)
	NH-32	Crimp tool

DeviceNet connector

External view of connector	No.	Signal	Wiring color
	5	V+	Red
	4	CAN_H	White
	3	Drain	No colored
	2	CAN_L	Blue
	1	V-	Black

DeviceNet master module
Specifications

Item	Specification	
	Link mode*	Remote mode*
Mounting position	Slot 0 to 7 on the basic base	Slot 0 to 7 on the basic base
Number of units to be mounted at once	2 units or less	4 units or less
IO assignment	CPU link	Remote 2
Output data	4,096 points / 256 words (from WL0)	Total 1024 points / 64 words (from WX/WY1000)
Input data	4,096 points / 256 words (from WL200)	
Number of slave connecting units	63 units	

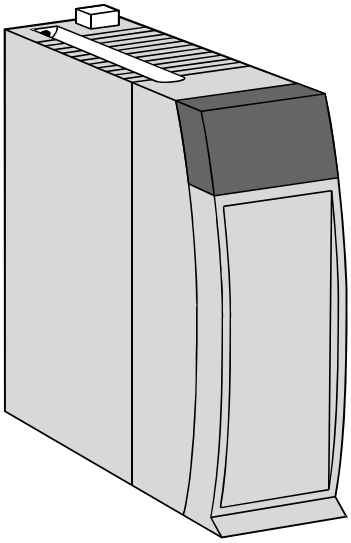
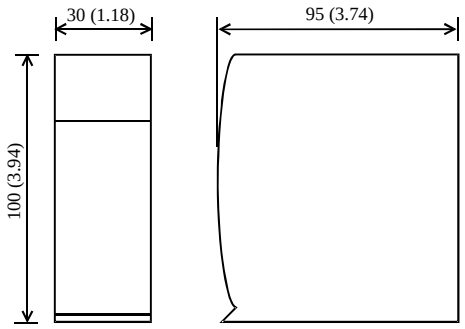
* “SOFTWARE VER.02” or later version can switch a link mode and a remote mode.
Version before “SOFTWARE VER.02” is only link mode.

DeviceNet slave module
Specifications

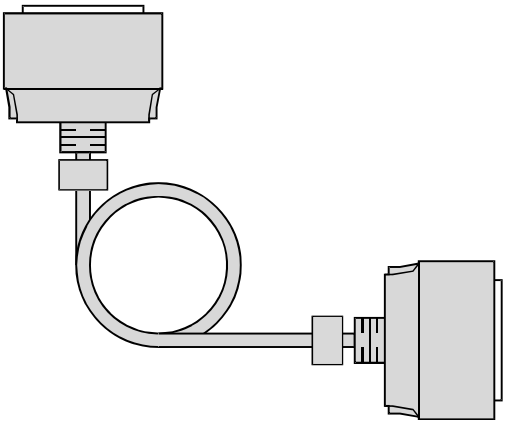
Item	Specification
Mounted I/O module	16 units / EH-IOCD (uses EH-IOC/H in case of 9 units or more.)
I/O data	256 words input/ 256 words output

Chapter 10 Accessory

10.1 Dummy Module

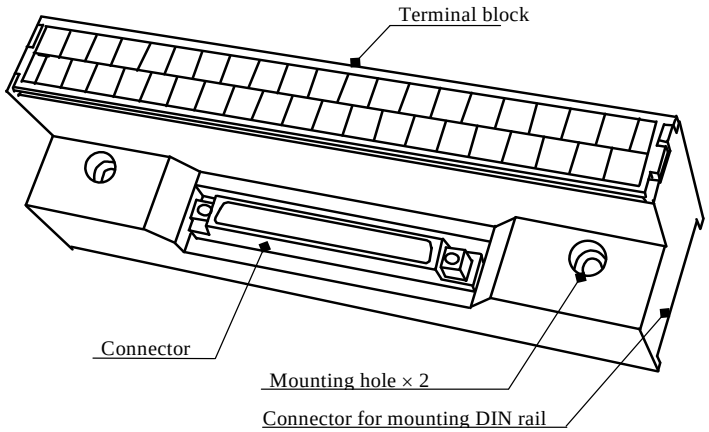
Name and function of each part		Type (Weight)	EH-DUM (Approx. 0.06 kg (0.132 lb.))
		Dimensions (mm (in.))	
Function	This module is used for protecting the un-mounted slot.		

10.2 Expansion Cable

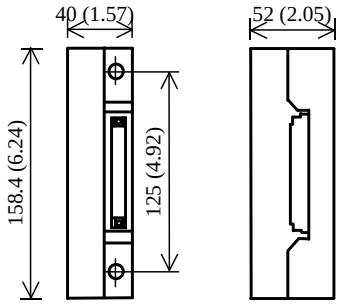
Name and function of each part		Type	EH-CB5A / 10A / 20A
		Weight	Approx. 0.21 (0.46) / 0.24 (0.53)/ 0.30 kg (0.66 lb.)
		Length	0.5 (1.64)/ 1.0 (3.28)/ 2.0 m (6.56 ft.)
Function	Connects to the expansion cable connector of the base unit and to the connector of the I/O controller. There is no directivity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

10.3 Relay Terminal Block for 32 / 64-point Module

Name and function of each part

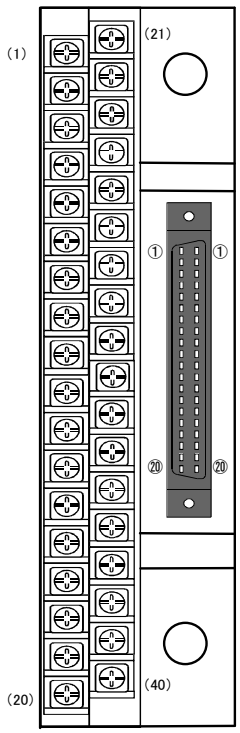


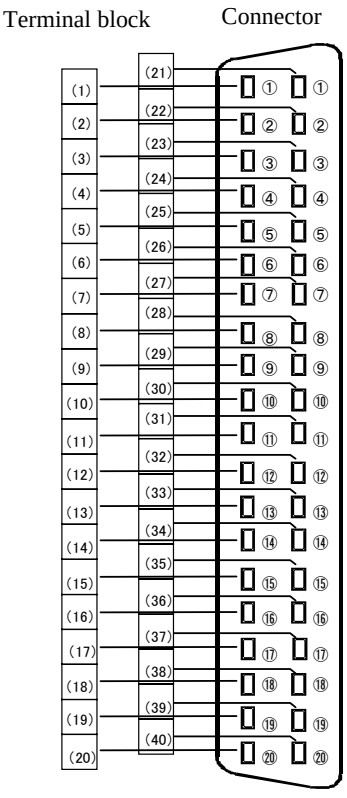
Type (Weight)	HPX7DS-40V6 (Approx. 0.22 kg (0.049 lb.))
Dimensions (mm (in.))	



Item	Description
Terminal block	This is a terminal block for connecting the external wiring.
Connector	This is a connector with 40 pins = 20 × 2 lines for connecting each module.
Mounting hole	These holes are used when attaching the terminal unit to a panel. Use M4×25 mm screws.
Connector for mounting DIN rail	This is used when mounting attaching the terminal unit to the DIN rail.

Terminal configuration





I/O and Terminal block

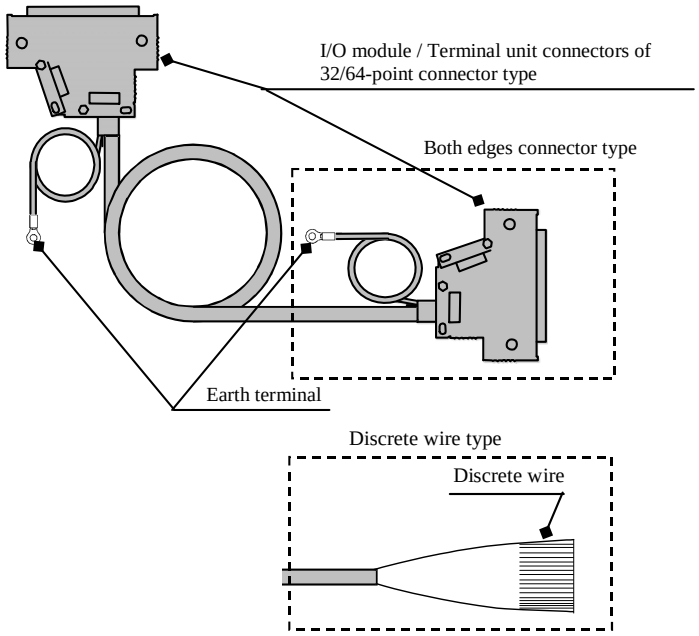
EH-XD32				EH-YT32/YTP32			
I/O No. (Signal)	Terminal block No.	I/O No. (Signal)	Terminal block No.	I/O No. (Signal)	Terminal block No.	I/O No. (Signal)	Terminal block No.
X_ _ _00	1	X_ _ _16	21	Y_ _ _00	1	Y_ _ _08	21
X_ _ _01	2	X_ _ _17	22	Y_ _ _01	2	Y_ _ _09	22
X_ _ _02	3	X_ _ _18	23	Y_ _ _02	3	Y_ _ _10	23
X_ _ _03	4	X_ _ _19	24	Y_ _ _03	4	Y_ _ _11	24
X_ _ _04	5	X_ _ _20	25	Y_ _ _04	5	Y_ _ _12	25
X_ _ _05	6	X_ _ _21	26	Y_ _ _05	6	Y_ _ _13	26
X_ _ _06	7	X_ _ _22	27	Y_ _ _06	7	Y_ _ _14	27
X_ _ _07	8	X_ _ _23	28	Y_ _ _07	8	Y_ _ _15	28
C	9	C	29	C	9	C	29
X_ _ _08	10	X_ _ _24	30	S	10	S	30
X_ _ _09	11	X_ _ _25	31	Y_ _ _08	11	Y_ _ _24	31
X_ _ _10	12	X_ _ _26	32	Y_ _ _09	12	Y_ _ _25	32
X_ _ _11	13	X_ _ _27	33	Y_ _ _10	13	Y_ _ _26	33
X_ _ _12	14	X_ _ _28	34	Y_ _ _11	14	Y_ _ _27	34
X_ _ _13	15	X_ _ _29	35	Y_ _ _12	15	Y_ _ _28	35
X_ _ _14	16	X_ _ _30	36	Y_ _ _13	16	Y_ _ _29	36
X_ _ _15	17	X_ _ _31	37	Y_ _ _14	17	Y_ _ _30	37
C	18	C	38	Y_ _ _15	18	Y_ _ _31	38
N.C.	19	N.C.	39	C	19	C	39
N.C.	20	N.C.	40	S	20	S	40

*** In case the 64-point module,** the signal No.00 to 31 depends on the table mentioned above. For signal No.32 to 63 (including COM), **read signal No.00 to 31 as signal No.32 to 63** in above table.

When using the 64-point module, 2 sets of the terminal block (HPX7DS-40V6) and the connection cable (EH-CBM**W) per a module are needed.

10.4 Cable for 32 / 64-point Module

Name and function of each part



Type (Length) (Both edges connector type)	EH-CBM01W (1 m (3.28 ft.))
	EH-CBM03W (3 m (9.84 ft.))
	EH-CBM05W (5 m (16.4 ft.))
	EH-CBM10W (10 m (32.8 ft.))
Type (Length) (One edge connector type)	EH-CBM01 (1 m (3.28 ft.))
	EH-CBM03 (3 m (9.84 ft.))
	EH-CBM05 (5 m (16.4 ft.))
	EH-CBM10 (10 m (32.8 ft.))
Diameter	AWG# 28

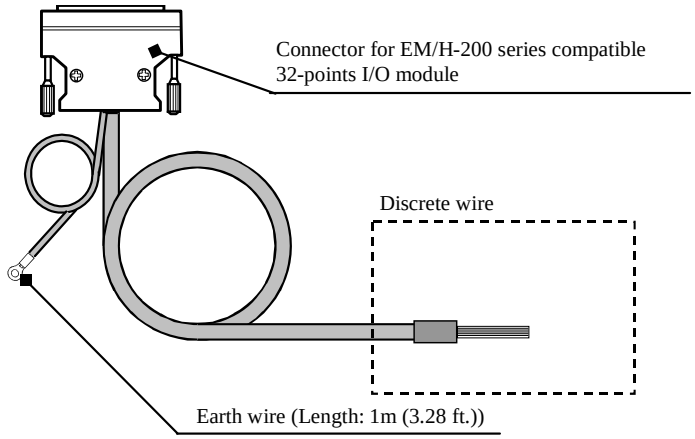
Item	Description
Connector	This is a connector for connecting to the 32/64-point I/O module and the relay terminal block.
Discrete wire	This is a discrete wire for wiring from the 32/64-point I/O module or the terminal unit.
Earth terminal	Uses this terminal for class D grounding

Cable code for wiring

Connector Pin No.	Color	Dot (Color)	Connector Pin No.	Color	Dot (Color)
1	Orange	■(Black)	21	Orange	■■■(Black)
2	Orange	□(Red)	22	Orange	□□□(Red)
3	Gray	■(Black)	23	Gray	■■■(Black)
4	Gray	□(Red)	24	Gray	□□□(Red)
5	White	■(Black)	25	White	■■■(Black)
6	White	□(Red)	26	White	□□□(Red)
7	Yellow	■(Black)	27	Yellow	■■■(Black)
8	Yellow	□(Red)	28	Yellow	□□□(Red)
9	Pink	■(Black)	29	Pink	■■■(Black)
10	Pink	□(Red)	30	Pink	□□□(Red)
11	Orange	■■(Black)	31	Orange	■■■■(Black)
12	Orange	□□(Red)	32	Orange	□□□□(Red)
13	Gray	■■(Black)	33	Gray	■■■■(Black)
14	Gray	□□(Red)	34	Gray	□□□□(Red)
15	White	■■(Black)	35	White	■■■■(Black)
16	White	□□(Red)	36	White	□□□□(Red)
17	Yellow	■■(Black)	37	Yellow	■■■■(Black)
18	Yellow	□□(Red)	38	Yellow	□□□□(Red)
19	Pink	■■(Black)	39	Pink	■■■■(Black)
20	Pink	□□(Red)	40	Pink	□□□□(Red)

10.5 Cable for EM/H-200 series Compatible 32-point Module

Name and function of each part



Type (Length) (One edge connector type)	CBM-02 (2 m (6.56 ft.))
	CBM-05 (5 m (16.4 ft.))
	CBM-10 (10 m (32.8 ft.))
Diameter	AWG# 28

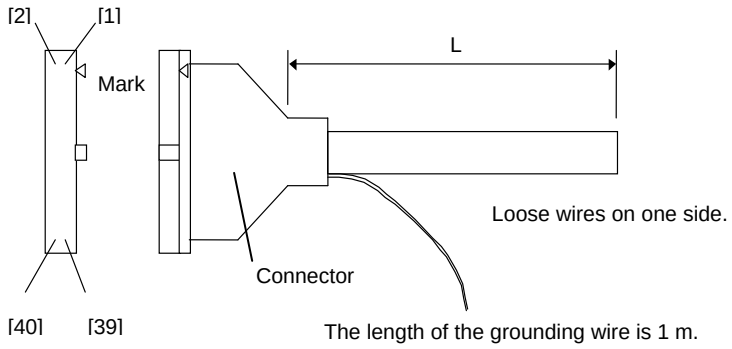
Item	Description
Connector	This is a connector for connecting to the EM/H-200 series compatible 32-point I/O module.
Discrete wire	This is a discrete wire for wiring from the EM/H-200 series compatible 32-point I/O module.
Earth wire	Uses this wire for class D grounding

Cable code for wiring

Terminal No.	Color of insulator	Dot mark	Color of Dot	Terminal No.	Color of insulator	Dot mark	Color of Dot
1	White	■■■	Black	26	Pink	■■cont.■■	Red
2	Gray	■■■	Red	27	Pink	■■cont.■■	Black
3	Gray	■■■	Black	28	Yellow	■■cont.■■	Red
4	Orange	■■■	Red	29	Yellow	■■cont.■■	Black
5	Orange	■■■	Black	30	White	■■cont.■■	Red
6	Pink	■■	Red	31	White	■■cont.■■	Black
7	Pink	■■	Black	32	Gray	■■cont.■■	Red
8	Yellow	■■	Red	33	Gray	■■cont.■■	Black
9	Yellow	■■	Black	34	Orange	■■cont.■■	Red
10	White	■■	Red	35	Orange	■■cont.■■	Black
11	White	■■	Black	36	Pink	■■■■	Red
12	Gray	■■	Red	37	Pink	■■■■	Black
13	Gray	■■	Black	38	Yellow	■■■■	Red
14	Orange	■■	Red	39	Yellow	■■■■	Black
15	Orange	■■	Black	40	White	■■■■	Red
16	Pink	■	Red	41	White	■■■■	Black
17	Pink	■	Black	42	Gray	■■■■	Red
18	Yellow	■	Red	43	Gray	■■■■	Black
19	Yellow	■	Black	44	Orange	■■■■	Red
20	White	■	Red	45	Orange	■■■■	Black
21	White	■	Black	46	Pink	■■■	Red
22	Gray	■	Red	47	Pink	■■■	Black
23	Gray	■	Black	48	Yellow	■■■	Red
24	Orange	■	Red	49	Yellow	■■■	Black
25	Orange	■	Black	50	White	■■■	Red

10.6 Cable for TTL I/O Module

Name and function of each part



Type (Length) (One edge connector type)	CBEM-01 (1 m (3.28 ft.))
	CBEM-03 (3 m (9.84 ft.))
	CBEM-05 (5 m (16.4 ft.))
	CBEM-10 (10 m (32.8 ft.))
	CBEM-15 (15 m (49.2 ft.))
Diameter	AWG# 24

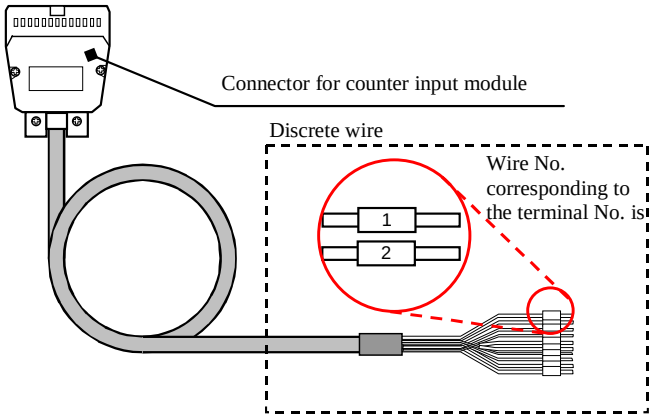
Item	Description
Connector	This is a connector for connecting to the EM/H-200 series compatible TTL I/O module.
Discrete wire	This is a discrete wire for wiring from the TTL I/O module.
Earth wire	Uses this wire for class D grounding

Cable code for wiring

Terminal No.	Color of insulator	Dot mark	Color of Dot	Terminal No.	Color of insulator	Dot mark	Color of Dot
[1]	Orange	O	Black	[21]	Orange	OOO	Red
[2]	Orange	O	Red	[22]	Orange	OOO	Black
[3]	Yellow	O	Black	[23]	Yellow	OOO	Red
[4]	Yellow	O	Red	[24]	Yellow	OOO	Black
[5]	Bright green	O	Black	[25]	Bright green	OOO	Red
[6]	Bright green	O	Red	[26]	Bright green	OOO	Black
[7]	Gray	O	Black	[27]	Gray	OOO	Red
[8]	Gray	O	Red	[28]	Gray	OOO	Black
[9]	White	O	Black	[29]	White	OOO	Red
[10]	White	O	Red	[30]	White	OOO	Black
[11]	Orange	OO	Black	[31]	Orange	OOOO	Red
[12]	Orange	OO	Red	[32]	Orange	OOOO	Black
[13]	Yellow	OO	Black	[33]	Yellow	OOOO	Red
[14]	Yellow	OO	Red	[34]	Yellow	OOOO	Black
[15]	Bright green	OO	Black	[35]	Bright green	OOOO	Red
[16]	Bright green	OO	Red	[36]	Bright green	OOOO	Black
[17]	Gray	OO	Black	[37]	Gray	OOOO	Red
[18]	Gray	OO	Red	[38]	Gray	OOOO	Black
[19]	White	OO	Black	[39]	White	OOOO	Red
[20]	White	OO	Red	[40]	White	OOOO	Black

10.7 Cable for Counter Input Module

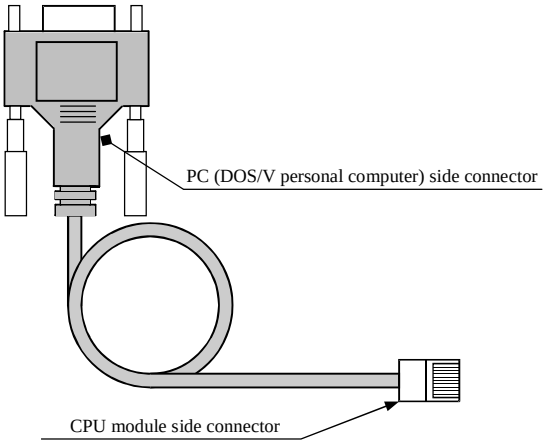
Name and function of each part



Type (Length) (One edge connector type)	EH-CUC01 (1 m (3.28 ft.))
	EH-CUC02 (2 m (6.56 ft.))
	EH-CUC03 (3 m (9.84 ft.))
	EH-CUC04 (4 m (13.1 ft.)))
	EH-CUC05 (5 m (16.4 ft.))
Diameter	AWG# 24

Item	Description
Connector	This is a connector for connecting to the counter input module.
Discrete wire	This is a discrete wire for wiring from the counter input module.

10.8 Cable for connecting between CPU and PC (DOS/V Personal Computer)

Name and function of each part		Type (Weight)	EH-VCB02 (Approx.0.13 kg (0.29 lb.))
		Length	2.0 m (6.56 ft.)
			
Function	Connects a serial port of EHV-CPU with a personal computer suing this cable.		

10.9 Others

Product	Model name	Specification
I/O connector cable for 1-axis positioning module (EH-POS)	EH-POC10	I/O connector cable for EH-POS 1 m (3.28 ft.)
	EH-POC20	I/O connector cable for EH-POS 2 m (6.56 ft.)
	EH-POC50	I/O connector cable for EH-POS 5 m (16.4 ft.)
Cable for connecting peripheral devices*1	EH-RS05	Length 0.5 m (1.64 ft.) (between RJ45 and D-sub15-pin female)
	WVCB02H	Length 2 m (6.56 ft.) (between D-sub15-pin male and D-sub9-pin female)
Lithium battery	LIBAT-H	The battery is used for data memory backup.
L-type connector	EH-LCN	L-type connector for the turn of coaxial connector (2 connectors per 1 set) (for coaxial type CPU link module)

*1 EHV-CPU and PC (DOS/V) are connected using EH-RS05 and WVCB02H.

Chapter 11 PLC installation, Loading, Wiring

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 5 % or more than 95 %
- 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

11.1 Installation

(1) Installing location and environment

(a) Use the module in the “3.1 General specification” environment when installing the EH-150.

(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 20 mm (0.79 in.)or longer) or DIN rail when installing it.

2] To keep using the unit within the ambient temperature range.

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

b) Avoid installing the unit directly above equipment that generates a lot of heat (heater, transformer, large-capacity resistance, etc.).

c) Install a fan or a cooler to lower the ambient temperature to below 55 °C when the temperature reaches more than 55 °C.

3] Avoid mounting inside a panel where high-voltage equipment is installed.

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

5] Avoid mounting the unit upside down, in vertical, or in horizontal.

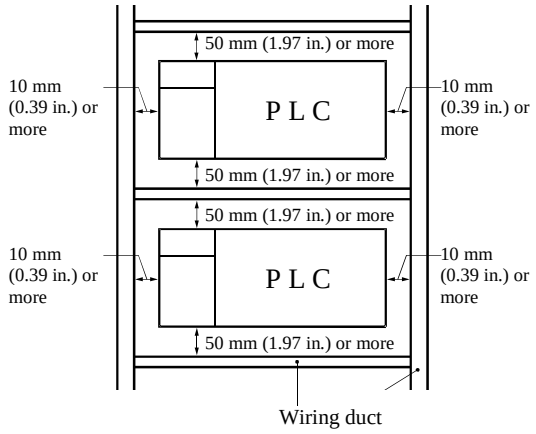


Figure 11.1 Amount of installation

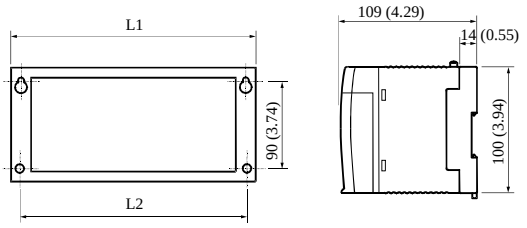


Figure 11.2 External dimensions

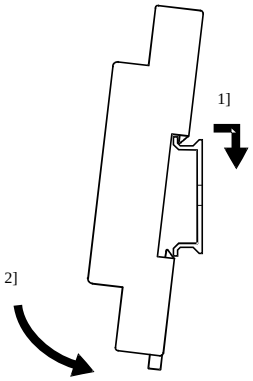
Dimensional table

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(12.31)	297(11.70)
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

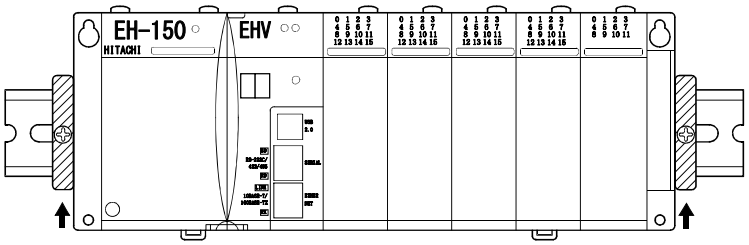
Attaching to a DIN rail



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.

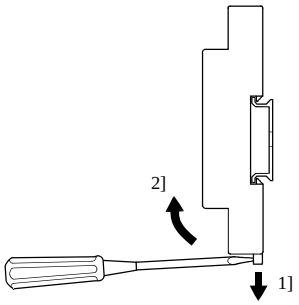
* Make sure the base unit is securely fixed after installation.

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.)

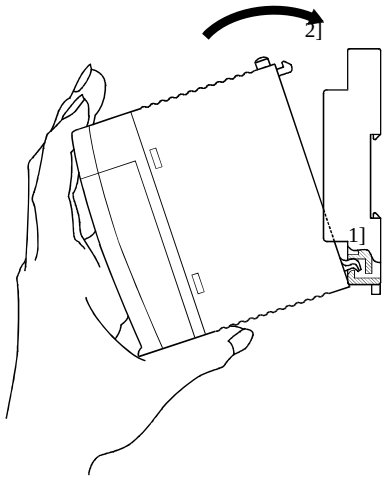
Removing the unit from the DIN rail



1] While lowering the DIN rail fixing mounting lever toward the bottom, raise the base upward to remove.

11.2 Loading Module

(1) Installing

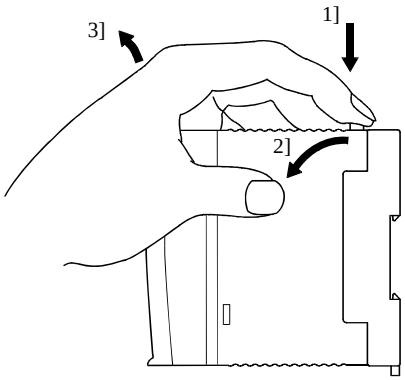


1] Hook the claw at the lower section of the module to the hole in the base.
2] Press in the upper side of the module until it clicks.

*1 Make sure the module does not come out after loading the module.
*2 Load the power module at the far left side of base unit.
*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 M4×10 mm 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.

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

11.3 Wiring

(1) Separation of the power system

There is power for the EH-150 PLC unit / power for I/O signal / power for general equipment as the power supply. These power supplies should be sired from separate systems as much as possible.

When these power supplied are supplied from one main power source, separate the wiring with a transformer or similar devices, so that each power supply is a separate system.

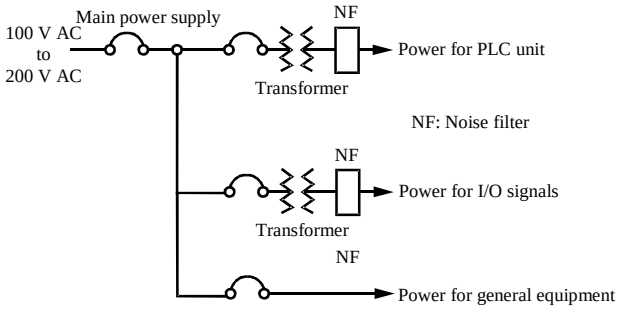


Figure 11.3 Example of power system diagram

(2) Regarding 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 condenser 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 ladder 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 ladder.

The EH-150 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 100 ms. 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

(3) Wiring to the power module

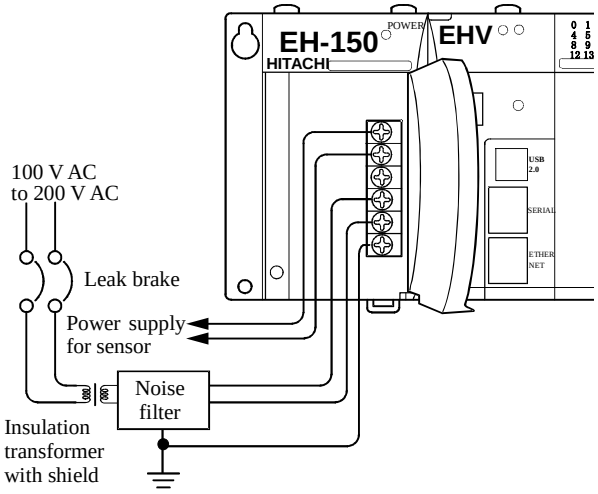


Figure 11.4 Wiring power diagram

(a) For power supply wiring, use a cable of 2 mm^2 (0.0031 in^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 (0.0031 in^2) or more and Class D grounding (100 Ω or less). The appropriate distance for ground cable is within 20 m (65.62 ft.).

1] Shared with instrumentation panel, relay panel grounding.

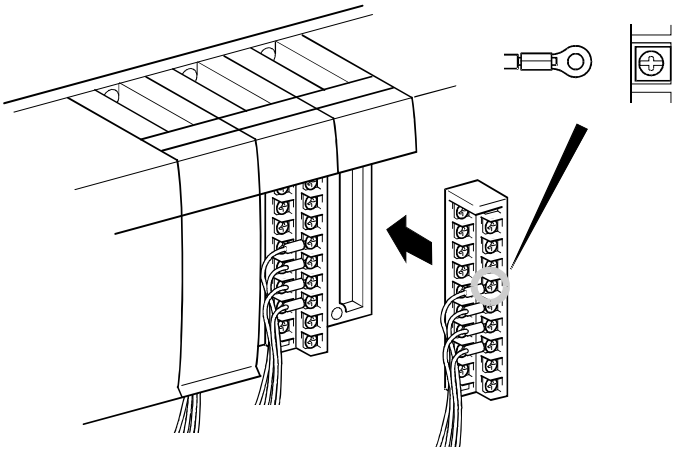
2] Avoid joint grounding with equipment that can generate noise such as high-frequency heating furnace, large power panel (several kW or more), thyristor exchanger, electric welders, etc.

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.

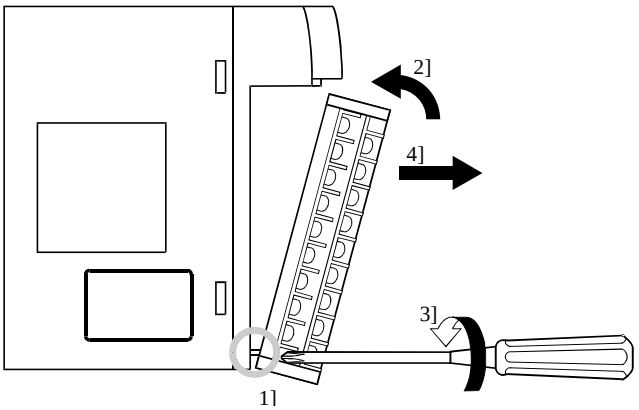
(4) Wiring cable for I/O signals



A screw for al 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 6 mm (0.24 in.) 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 0.75 mm^2 (0.0011 in^2.) at the maximum. (Use a 0.5 mm^2 (0.00075 in^2.) cable when adding 2 crimp terminals in the same terminal.)

* 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 cure that it is locked and cannot come out.

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

(5) Input wiring for the input module

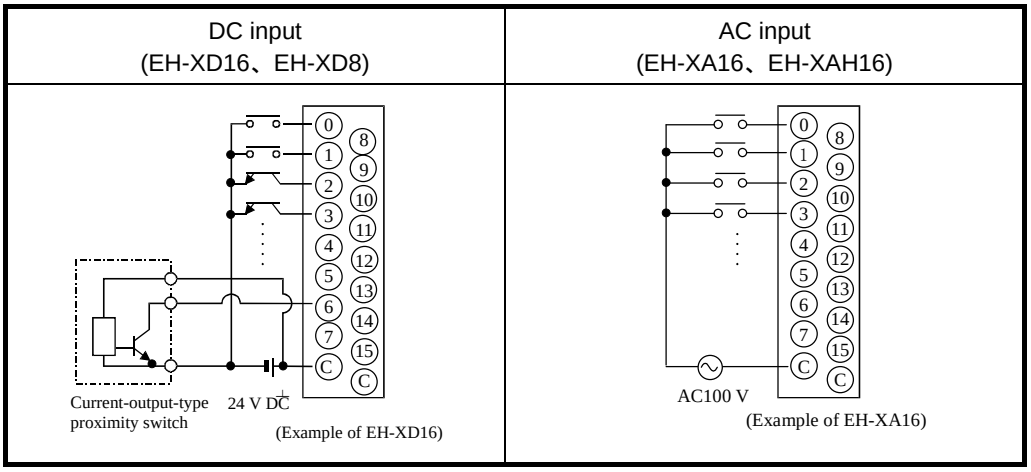


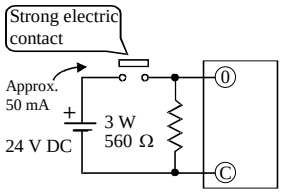
Figure 11.5 Input wiring

(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.

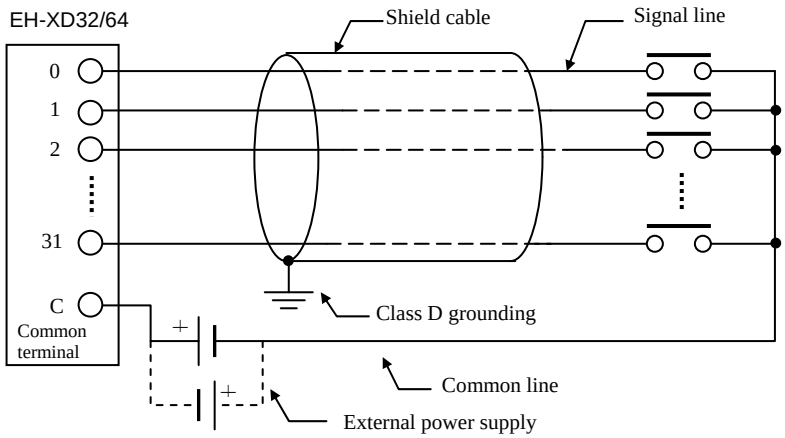
3] Measures to prevent faulty contact in a strong electric contact



The current that flows to a contact when external contacts are closed is approximately 6.9mA for the EH-XD8, and approximately 6.9 mA 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 (98.43 ft.).

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



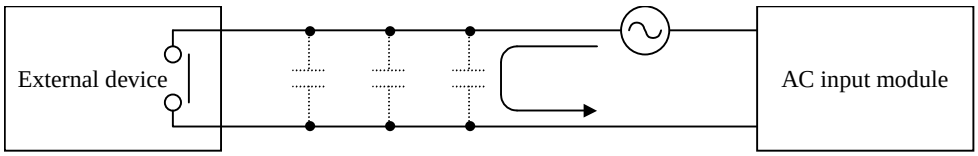
*1 Wire only the signal line through the shield cable, and provide class D grounding on the shield cable side.

*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

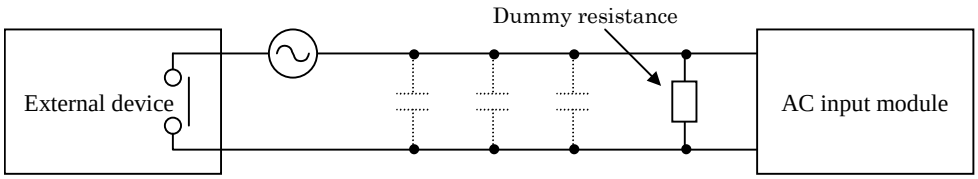
When using the AC input module, if the wiring route gets longer, a phenomenon that voltage is generated on the input terminal though there is no signal actually because the leak current flows by the stray capacity between wirings may occur.



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

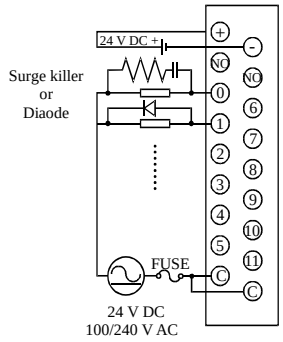
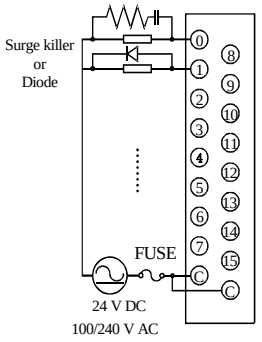
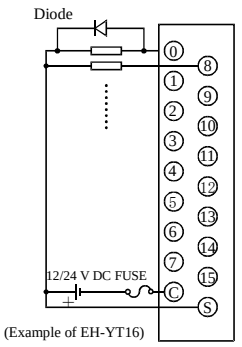
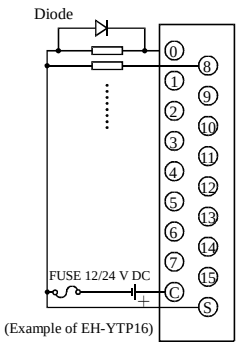
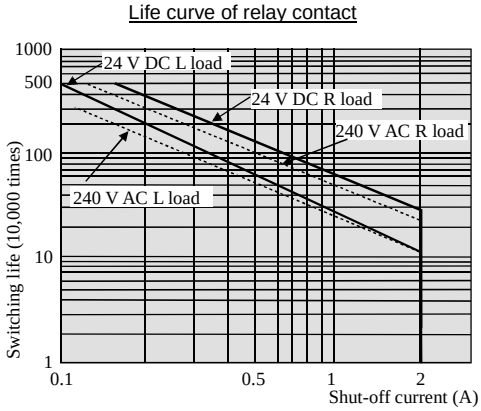
Item	Relay output (EH-YR12)	Relay output (EH-YR16)	Transistor output (sink type) (EH-YT16、EH-YT8)	Transistor output (source type) (EH-YTP16、EH-YTP16S、EH-YTP8)
External wiring				

Figure 11.6 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 condenser 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 (condenser 0.1 μF, + 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

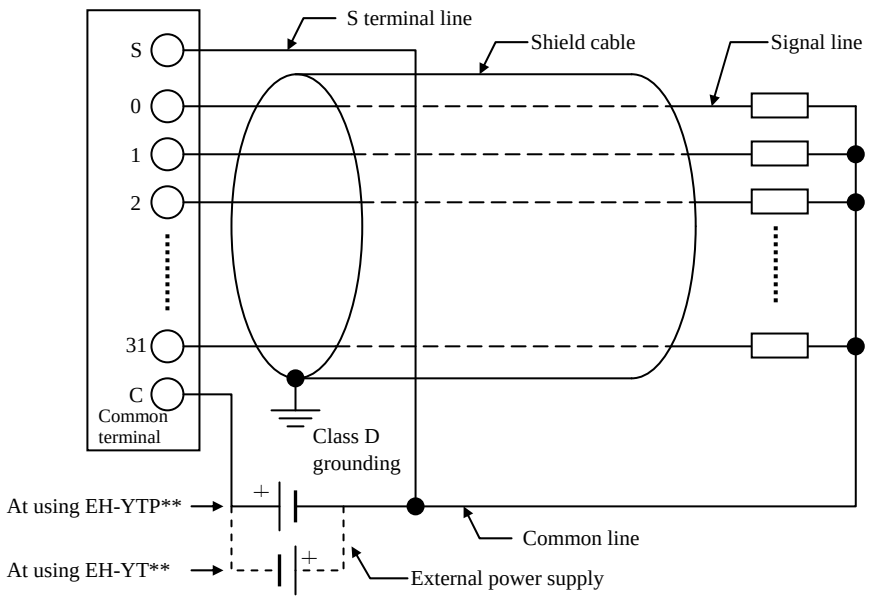
A fuse is inserted in the common to prevent the external wiring from burning out, but this does not protect transistor elements. Therefore, note that these elements are destroyed when the external load is short-circuited. Please contact us for repair if the external load short-circuits.

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.)

* 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



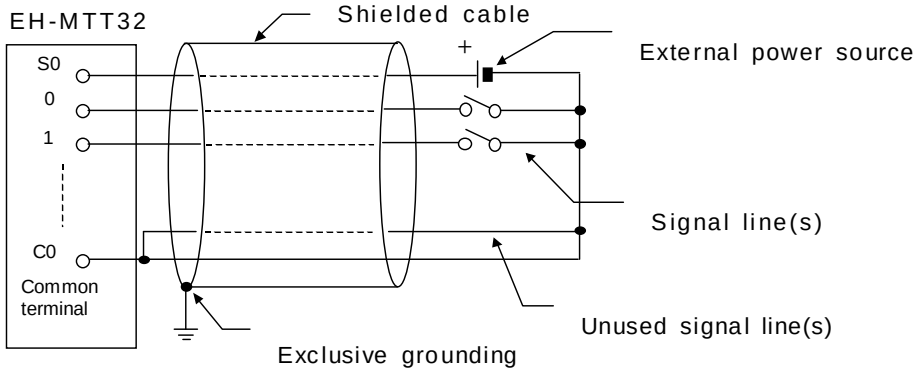
*1 Wire only the signal line through the shield cable and provide class D grounding on the shield cable side.

*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) Wiring for the TTL I/O module (EH-MTT32) (Based on CE marking)

- Unused electrical cable through the shield should be connected to common wiring. Otherwise, this module might be occurred malfunction by inductive noise from I/O wiring.



(8) 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.

(9) Wiring to the module terminal

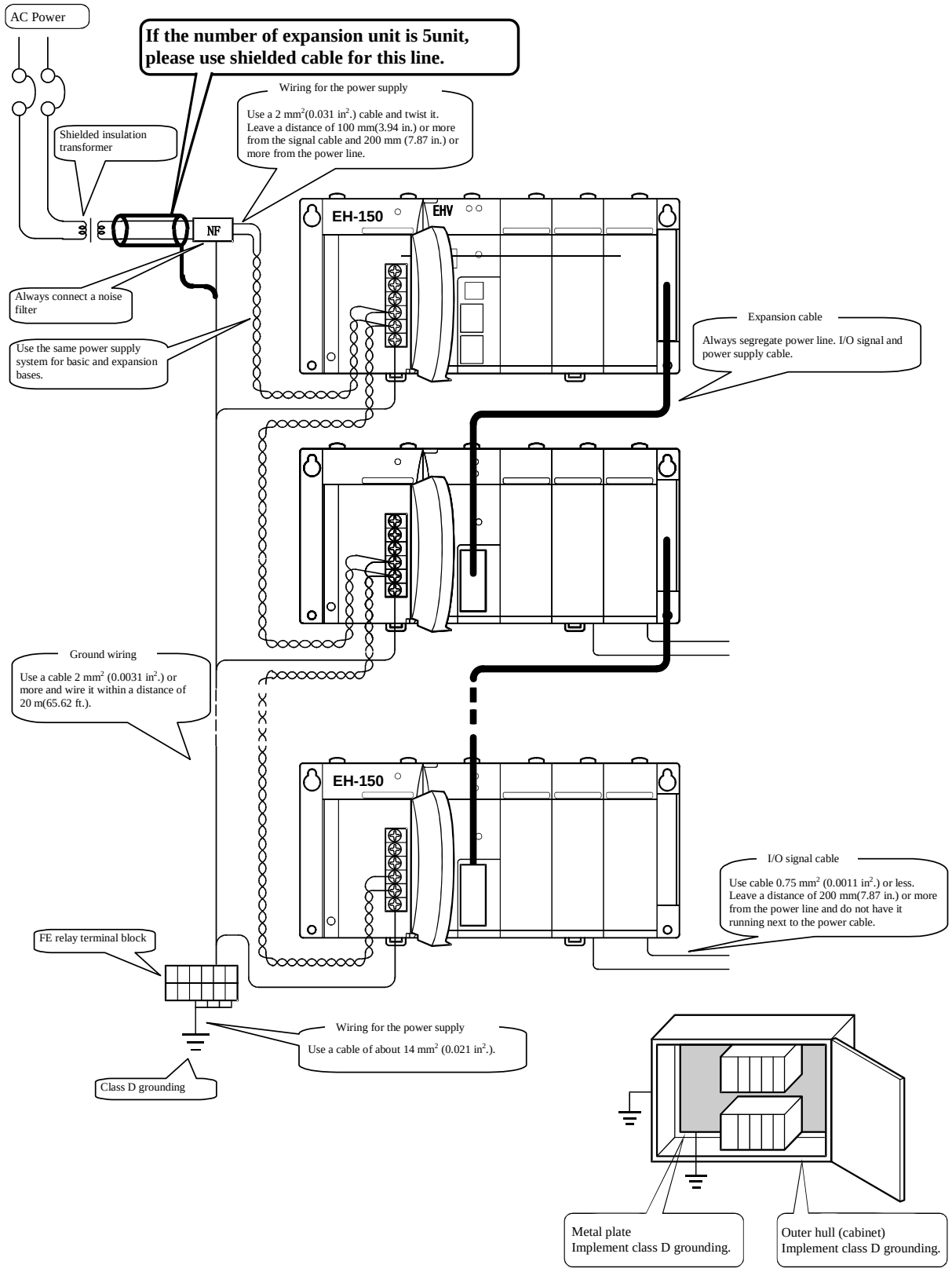


Figure 11.7 Example of wiring

MEMO

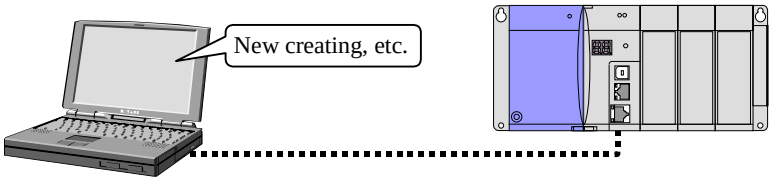
Chapter 12 Boot

12.1 User Program Up/Downloading

A programming tool downloads and uploads a user program. The programming tool has three connection modes.

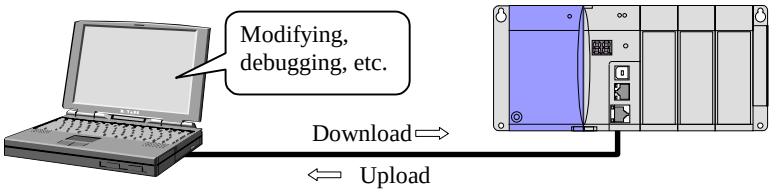
■ Offline mode

This is a mode which is not connected with EHV-CPU. In this mode, programs cannot be downloaded to the EHV-CPU and uploaded from the EHV-CPU either. This mode is used when creating a new program and modifying the program without connecting the EHV-CPU.



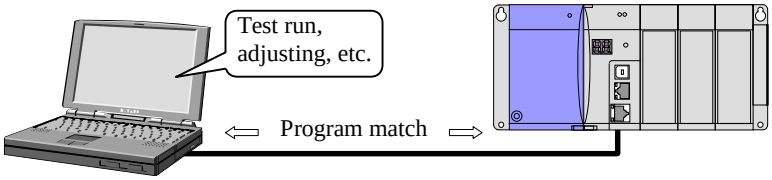
■ Online mode

This is a mode which is connected with the EHV-CPU. In this mode, programs are transmitted and received by operations of “PLC download” and “PLC upload”. This mode is used mainly at debugging and a test run, connecting an actual unit.



■ On-direct mode

This is a mode which is connected with the EHV-CPU. Programs in the programming tool are reflected to the EHV-CPU by the “Build” operation. Online change in RUN is possible in this mode. This mode is used mainly at a test run and a program modification during system operation.



(1) Download of the user program (PLC download)

This section describes a procedure to download the user program created with the programming tool into the CPU module.

But, procedures to turn on the PLC power supply and to connect a CPU module to a programming tool using a communication tool are not described here.

i) Selects “Online” mode in the programming tool.

Clicks an icon of the Online on the upper part of the editor, or selects “Online” of “Mode” of “Online” in the menu.

ii) Selects the PLC download.

Clicks an icon of the Download to PLC on the upper part of the editor, or selects “Download (PC to PLC)” of “PLC Transfer” of “Online” in the menu.

(2) Upload of the user program (PLC upload)

This section describes a procedure to upload programs stored in the CPU module to the programming tool

i) Selects the “Online” mode in the programming tool.

ii) Selects the PLC upload.

Clicks an icon of the Upload from PLC on the upper part of the editor, or selects “Upload (PLC to PC)” of “PLC Transfer” of “Online” in the menu.

Note

Note that a former project file than the upload operation is performed is eliminated if the upload operation is performed.

(3) Verifying of the user program (PLC verify)

This section describes a procedure to verify the user program opened by the programming tool with the user program stored in the CPU module.

i) Selects the “Online” mode in the programming tool.

ii) Selects the PLC verify.

Clicks an icon of the PLC Verify on the upper part of the editor, or selects “Verify With PLC” of “PLC Transfer” of “Online” in the menu.

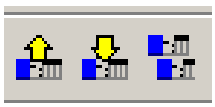
Reference

Icons to perform above operations by the Control Editor are shown below.

Icons for switching the connection mode

From left to right, ”Offline”, “Online”, “On-Direct”

Icons for PLC transfer



From left to right, “Upload from PLC”, “Download to PLC”, “PLC Verify”

12.2 Online Change in RUN

It is called “Online change in RUN” to modify a user program while the program is executed.

By the online change in RUN, output and data memory can be kept and the user program can be modified without influencing the network.

Usually, the online change in RUN modifies the program at the next scan END after preparation for the online change in RUN. However, the program can be modified also by an instruction from the programming tool after preparation for the online change in RUN by changing the mode of online change in RUN of the programming tool. If the online change in RUN is performed by the instruction from the programming tool, the program can be modified while avoiding the time when the system must not stop even for a moment.

(1) Procedure of the online change in RUN

To execute the online change in RUN, the user program of the programming tool and the user program stored in the CPU module must be matched. If not matched, upload the program from the CPU module by the programming tool, or open the same program (the project file) as the user program stored in the CPU module.

A flow chart for the online change in RUN is shown below.

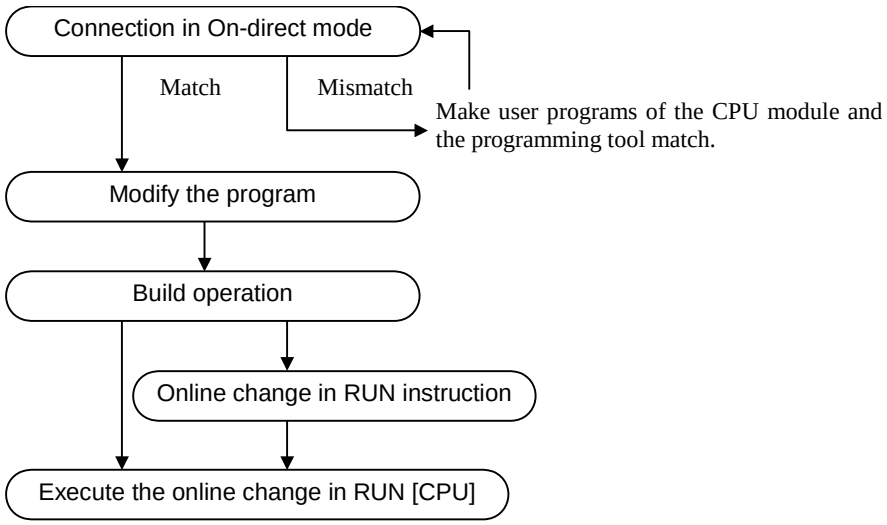


Figure 12.1 Flow chart of the online change in RUN

Even if the CPU module has stopped during the On-direct connection, the circuit after the Build is reflected to the user program of the CPU module by the Build operation.

(2) Comment transfer in RUN

A function of “Comment transfer in RUN” is supported from EHV-CPU software Ver.*114 (for “*” attached to the software Ver., “0” represents EHV-CPU128, “1” represents EHV-CPU64, “2” represents EHV-CPU32, and “3” represents EHV-CPU16) and Control Editor Ver.2.11. This function is to transfer all comment data to the CPU after modifying the program.

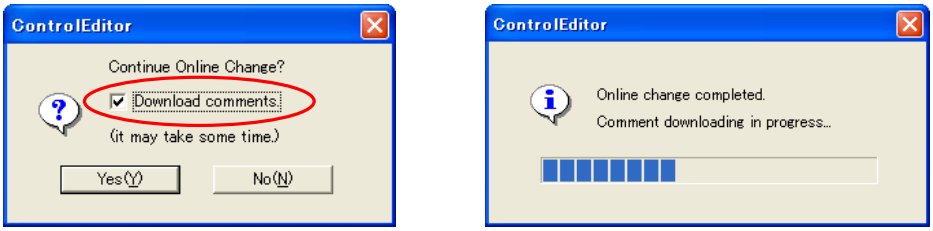


Figure 12.2 Messages for Online change in RUN, and of Comment transfer

If you wish to transfer the comment data together after modifying the program, you must check the checkbox on the left message in the above figure 12.2. The right message in the above figure 12.2 is displayed in comment transfer. Since the comment data begins to be transferred after the program change has completed, the CPU continues to operate.

I/O comment, box comment, and circuit comment are transferred all together. It does not matter to transfer the comment data only at the last program change without transferring the comment data at each program change. But there is no function to transfer only the comment data. If necessary, in order to change the program into edit state, you can double-click one symbol in the program and click the OK button without adding any change. After that, you can execute the change program.

Note

Control Editor checks the program when changing to the On-direct mode and to the monitor mode. If programs in the CPU and in the Control Editor are matched, each mode change is done. However, it is not verified whether the comment is matched or not at this time. So, since the change to the On-direct mode is enabled even if the comment data is not matched, you need a lot of attention when uploading both program and comment data from the CPU simultaneously after the online change in RUN. The function of “PLC Verify” verifies also the comments. If you cannot decide whether the comments in the CPU are the latest, you should upload only the program at the PLC Upload.

(3) Comment capacity at the online change in RUN

When the comment data exceeds the maximum capacity in the On-direct mode during the online change in RUN, the operations between when the checkbox is checked and when it is not are different.

■ When the checkbox is not checked. (When the comments are not transferred.)

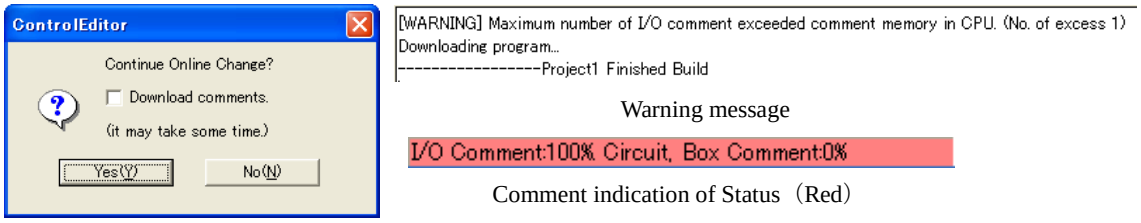


Figure 12.3 Online change in RUN at comment excess (1)

Since the comments are not transferred to the CPU even if the comment capacity exceeds, the online change in RUN is enabled though the warning such as the above figure is displayed.

■ When the checkbox is checked. (When the comments are transferred.)

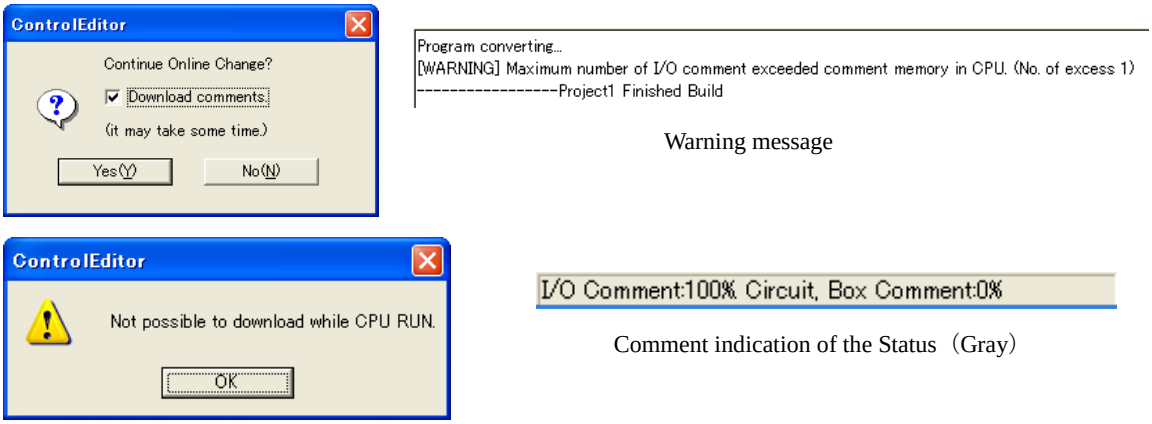


Figure 12.4 Online change in RUN at comment excess (2)

Since the comments cannot be transferred because the capacity excess, the program also is not transferred. Therefore, the left lower message in the above figure is displayed and the processing of the online change in RUN stops. In this case, you should execute the online change in RUN with great care because the indication of the comment in the bottom of the screen is gray.

(4) Conditions where online change in RUN cannot be executed.

Online change in RUN cannot be executed in the following situations. Perform this operation after completing the conditions.

Table 12.1 Conditions where online change in RUN cannot be done

No	Conditions	Concrete situation	How to satisfy conditions
1	READ occupation is performed.	Other programming tool, etc. is connected.	Change other programming tool to offline.
2		Monitor is performed connecting PC, touch panel, etc.	Change PC or touch panel to offline.*
3	END command is not executed.	Program of limitless loop is running.	Correct the program not so as to be limitless loop.
4	Password has been set.	Program with password is running.	Operates after releasing the password by system administrator.
5	Logging in with ID without authority to modify the program.	Program change is forbidden by the protection function.	Log in again with ID authorized to modify the program.

* Hi-Protocol which is a communication protocol of EHV-CPU has a command which needs occupation and a command which does not need occupation even if those are same requests. When executing Monitor and Set/Reset by the command which does not need occupation, you do not need to set to the Offline mode.

(5) HALT time

If the online change in RUN is performed, a scan stops for only a few time in changing the program. This scan stop time is called the HALT time.

HALT time is 100 μs or less except online change in RUN including the following conditions.

■ Addition / Deletion of the edge command

The number of edge commands, which is included in the target circuit of online change in RUN, × 1μs is added.

Edge command: DIF, DFN, Edge coil, Edge processing box

(6) Online change in RUN for the control command

EHV-CPU can perform “Online change in RUN” operation for control command. But the program that the grammar error occurs cannot perform “Online change in RUN” operation in the programming tool.

Table 12.2 Grammar error factor of control commands

Command	Grammar error factor
END	There are 2 END commands. The startup conditions are including in the END command.
CEND (s)	CEND (s) is behind the END command.
JMP n / CJMP n	There is no corresponding LBL n. Trying to jump to other program area.
LBL	LBL is duplex defined.
FOR n (s) / NEXT	FOR is duplex defined. NEXT is not defined. Nesting-over between FOR and NEXT. FOR and NEXT are not in the same area.
CAL / SB n / RTS	SB is not defined. Nesting-over. SB is duplex defined. RTS is not defined. SB and RTS are not in the same area. The startup condition is including in the RTS.
INT (s) / RTI	INT is not defined. The same cycle is defined twice. RTI is not defined. INT and RTI are not in the same area. The startup condition is including in the RTI.

(7) Online change in RUN including the cyclic scan

When performing the online change in RUN including the cyclic scan, the cyclic scan is skipped once when the online change in RUN and the cyclic scan are started at the same time. (This is only when they are started at the same time and it does not mean that the cyclic scan is skipped once whenever performing the online change in RUN.)

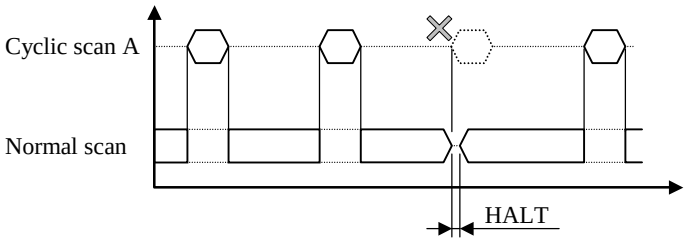


Figure 12.5 Online change in RUN of the program including the cyclic scan

Reference

EHV-CPU can change the cycle time of the cyclic scan and add / delete the cyclic scan in the online change in RUN. The cycle change and the cyclic scan added start counting the cycle after completion of the online change in RUN.

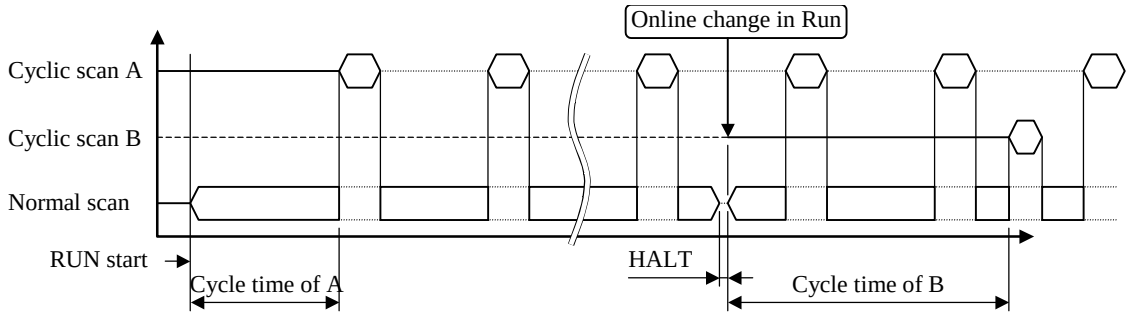


Figure 12.6 Online change in RUN for added cyclic scan (1)

When adding the cyclic scan in the online change in RUN, motion may be changed, compared with a case programmed first.

For example, the cyclic scan B (cycle time: 10 ms, processing time: 2 ms) is added to the program which has the cyclic scan A (cycle time: 5 ms, processing time: 1 ms) in the online change in RUN. If the cyclic scan B is added 9 ms later after starting the cyclic scan A in the online change in RUN, the cyclic scan A will start while the cyclic scan B is running. So the cyclic scan B always becomes a cycle such as start, suspension and restart (start ➔ suspension ➔ restart).

And when the cyclic scans A and B are input in the program first, A and B try to start at the same time. However, since the cyclic scan A has priority over the cyclic scan B, the scan A will start before B.

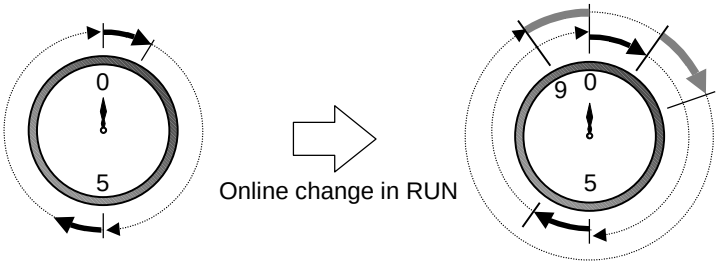


Figure 12.7 Online change in RUN for added cyclic scan (2)

12.3 Forced Output

Forced output is a function to output only the specified output. Since the outputs other than specifying are turned off by the forced output even if the several outputs are ON, it is useful for checking the wiring of the output module.

Reference

There are the I/O set and reset functions as similar functions. Though the wiring can check using the set/reset functions, it needs to turn off the output which completed the check when each 1-point output is checked. The forced output is useful in order to turn off the outputs other than specifying automatically.

12.4 Monitor

The programming tool can monitor the I/O and the running status of the program.

■ I/O monitor

The specified I/O and the value can be monitored on the I/O monitor window.

The bit I/O can confirm ON(1) / OFF(2). Word data and double word data can be monitored in the type written into the program because the data type can be specified to individual I/O.

(Even if the same I/O is monitored, another value is displayed if the indication type is changed.)

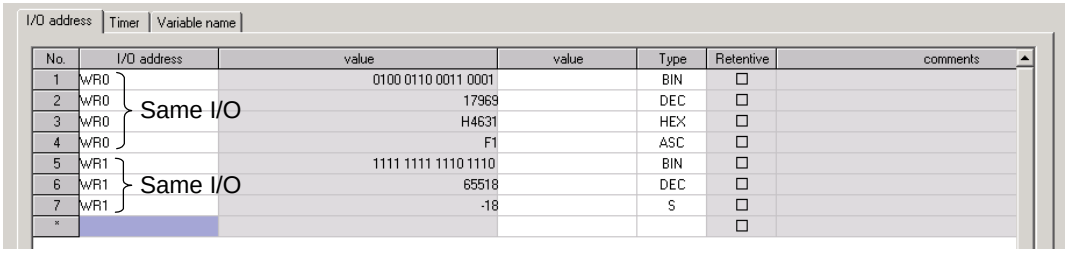


Figure 12.8 Difference of the monitor value by the data type

■ Ladder monitor

The status of the user program can be monitored.

The color of the center of the contact point changes if the contact point is ON, and it remains white if it is OFF. The coil is colored if the coil is ON, and it remains white if it is OFF. The I/O inside the processing box displays the value by moving the mouse cursor onto the processing box.

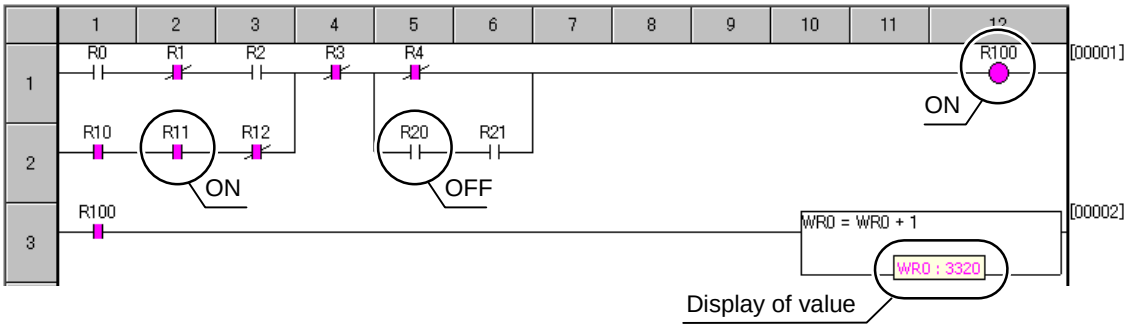


Figure 12.9 Ladder monitor

12.5 Real Time Clock Setting

EHV-CPU includes a function that manages the time and data of PLC data. The clock function can be operated with either special internal output or task code. Clock data is retained by battery power. Note that the battery is not connected when the module is shipped. When using the clock function, connect the battery and set the clock data.

12.5.1 Operation by Special Internal Output

(1) Reading clock data

By turning the read request (R7F8) on, the clock data at the time of the request is stored in the read value area (WRF01B to WRF01F).

(2) Clock data setting

The clock data stetting is done by first set the data to store in the set value area (WRF01B to WRF01F), and then turning on the setting request (R7F9). At this time, if there is an error in the set value, the setting data error (R7F8) turns on. When the setting request (R7F9) turns off and the setting data error (R7FB) is off, setting is complete.

Note

When NTP function is active, the clock data setting cannot be done. If the setting request (R7F9) is turned on, the setting data error (R7F8) turns on.

(3) Clock data ±30 seconds adjustment

By turning on the ±30 seconds adjustment request (R7FA), the seconds value will be set as follows depending on the value at this time.

When the digit for seconds is 00 to 29, the digit becomes 00.

When the digit for seconds is 30 to 59, the time becomes +1 minute and the digit becomes 00.

(4) Definition of the special internal output

Operation bit

Item	I/O No.	Name	Function
1	R7F8	Calendar, clock read request	Reads the current value.
2	R7F9	Calendar, clock set request	Sets the contents set in the setting area, in RTC.
3	R7FA	Clock ±30 seconds adjustment request	Changes the digit for seconds in RTC to 0.
4	R7FB	Calendar, clock set data error	This turns on when the set data has an error.

Current value display area: Current time of the clock is always displayed (all in BCD data)

Item	I/O no.	Name	Content
1	WRF00B	Year	Displays 4-digit year.
2	WRF00C	Month / day	Displays month and day data.
3	WRF00D	Day of the week	Displays day of the week data.
4	WRF00E	Hour	Displays hour (24-hour format) data.
5	WRF00F	Seconds	Displays second data.

Read value / set value area: Value read from the clock is displayed or set value is stored (all in BCD data)

Item	I/O No.	Name	Content
1	WRF01B	Year	Displays or stores 4-digit year.
2	WRF01C	Month / day	Displays or stores month and day data.
3	WRF01D	Day of the week	Displays or stores day of the week data.
4	WRF01E	Hour	Displays or stores hour (24-hour format) data.
5	WRF01F	Seconds	Displays or stores second data.

*1 Day of the week data is as follows. (Upper 3 digits area always 000.)
0-Sunday, 1-Monday, 2-Tuseday, 3-Wednesday, 4-Thursday, 5-Friday, 6-Saturday
*2 Upper 2 digits of second data is always 00.

12.5.2 Operation by Control Editor

The Control Editor can operate the clock setting and reading.

Opens the clock setting window, selecting [CPU calendar clock setting] of [CPU setting] of [Tool] in the pull-down menu.

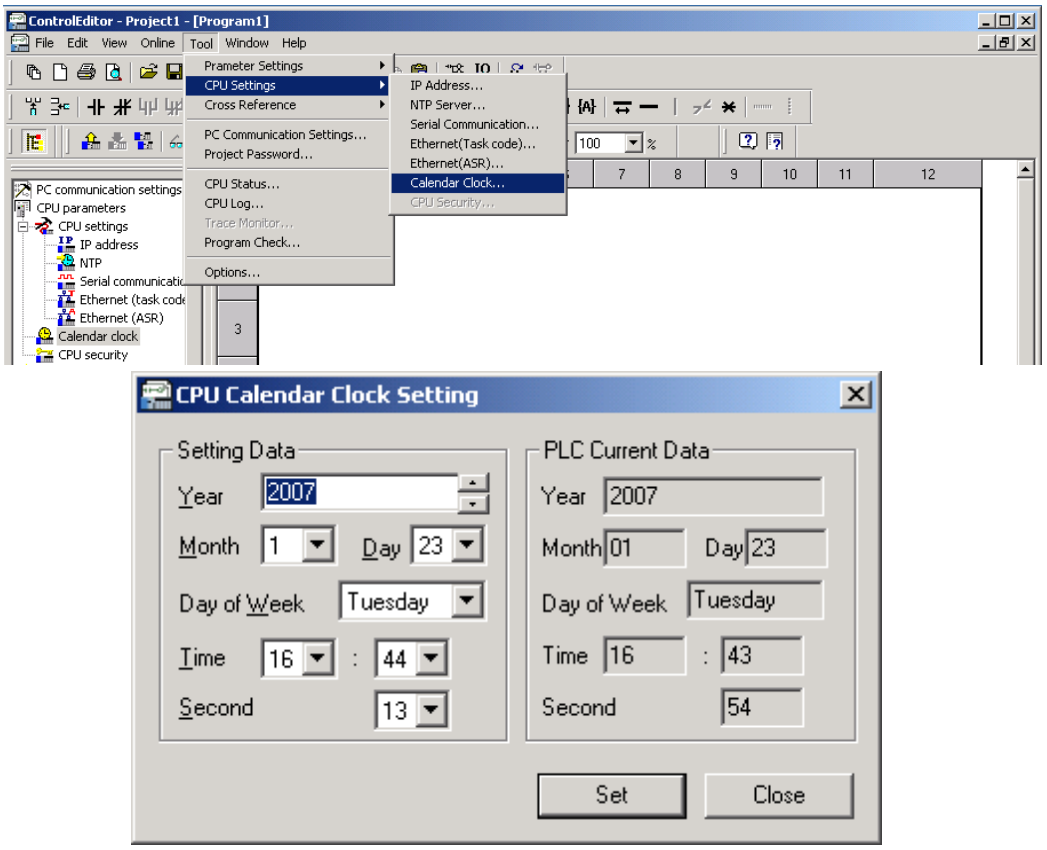


Fig. 12.10 Calendar clock setting

The clock data of the personal computer is displayed on the screen as the clock data current value and set value of CPU module. If the [set] button is clicked after changing the set value into the value you want to set, the clock data is written into the CPU module

12.5.3 Retrieving Real Time from NTP Server

The calendar clock can be updated by using the NTP function which retrieves the real time from the clock server on the network.

Refer to the application manual (for Network) for details.

Chapter13 Maintenance and Inspection

In order to use the EH-150 functions in the most desirable condition and maintain the system to operate normally, it is necessary to conduct daily and periodic inspections.

13.1 Daily and Periodic Inspection

(1) Daily inspection

Verify the following items while the system is running.

Table 13.1 Items for daily inspection

Item	LED display	Inspection method	Normal status	Main cause of error
Power module display	POW	Visual check	Lit	Power supply error, etc.
CPU module display	RUN	Visual check	Lit (running)	When unlit: When CPU stop error such as microcomputer malfunction, memory error, etc., occurs.
	ERR	Visual check	Unlit	When lit: When CPU stop error such as microcomputer malfunction, memory error, etc., occurs. When flashing: When errors 71*, 76, 77 occur.
	7-segment	Visual check	00	Self-diagnosis error code is displayed. (except while user data is being displayed)

*1 If the power supply for the basic unit is left turned off without replacing the battery over a week after the ERR lamp has flashed, the memory contents may be destroyed. Please pay attention that the memory contents may have been already destroyed because this error cannot be detected if the system power is turned off for a long time. Note that the memory contents may have been already destroyed because this error cannot be detected if the system power is turned off for a long period.

(2) Periodic inspection

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

Table 13.2 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 normally.	
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 11).
	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.

13.2 Life of Product

The electrolytic condenser is used in the power module of PLC as parts which have a lifetime. Also, there is a module provided the electrolytic condenser for improving the noise resistance. Since original product performance cannot be satisfied if the parts which have a lifetime are exhausted, please conduct installation, inspection, and maintenance, taking the following items into consideration.

(1) Power module

Numbers of electrolytic condensers are used in the power module. The electrolytic condenser has a lifetime and it is believed that the life is reduced by half when the ambient temperature rise 10 °C.

If the electrolytic condenser reaches its life, the product operation becomes unstable, that is for the power module not to boot up normally since the power supply output supplying to all module becomes unstable, and that is for the power voltage to drop, owing to the increase in the electric consumption because the number of the output ON points gets more.

When stocking spare parts, the standard for consideration is that the power module has a life of approcimately5years when used at the rated ambient temperature (30 °C). Also, to lengthen the life of the module, consider the air circulation around the module and ambient temperature when installing it

(2) CPU module

The CPU module has the electrolytic condenser. If the electrolytic condenser reaches its life, since the occurrence of error is caused by a lowering of noise resistance, overhaul the CPU module periodically.

Also, the CPU module has the clock data and the battery in order to retain power failure for the internal output. Note the following items about the battery life.

- The length of the battery life is expressed as the total time during which the power supply for the basic unit is OFF.
- Determine the battery life by checking for the flashing of the ERR lamp.
  Note that the battery error is not displayed if the check box of [LED indication at the 7 error] is not marked in the error indication control setting of the operating parameter.
- The battery life is also displayed in the bit special internal output “R7D9”.
  A ladder example using “R7D9” is shown below.

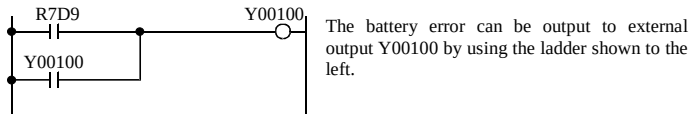


Figure 13.1 Battery error detection ladder

- The self-diagnosis error code “71” is indicated that the battery is not loaded or that it has reached its life.

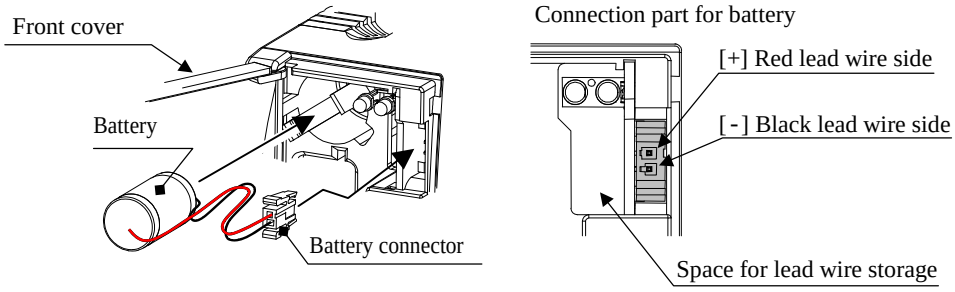
Use the reference table shown below to determine the remaining life of battery.

As a guideline, replace the 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)[Hr]	
Guaranteed value (MIN) @ 55 °C	Actual value (MAX) @25 °C
2,000	17,700

* Even when a error occurs in writing to the backup memory, R7D9 turns on. You cannot write the user program to the backup memory when R7D9 turns on even if the battery is replaced. In this case, be careful because your program cannot be backed up.

How to replace the battery



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

Figure 13.2 How to replace the battery

1] Prepare a new battery (LIBAT-H).

2] Confirm that the latest program is saved on the personal computer. Always save a backup of the program on the personal computer for the safety purpose if it is not saved.

3] Replace the battery while the power supply for the basic base is turned on.

4] Remove the consumed lithium battery from the battery case, and remove the connector on the battery side.

5] Insert the connector on the battery side to the CPU module connector.
Insert the red lead wire to ⊕ and the black lead wire to ⊖.

6] Fold the excess lead wire and store it in the space for lead wire storage.
(Otherwise, the wire may be severed by the front cover.)

* When replacing the battery while the power supply for the basic base unit is turned off, finish the step 4], 5],and 6] within a minute.

⚠ DANGER

Precaution when handling the battery.

Use LIBAT-H for the new batteries. 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

Batteries that have been replaced should be individually place in a suitable plastic bag (to prevent shorting) and a disposal company should be requested to dispose of them.

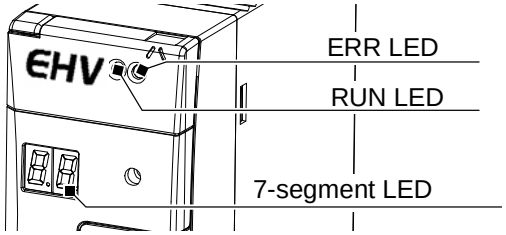
MEMO

Chapter 14 Troubleshooting

14.1 Error Code and Countermeasure Procedures

(1) Error indication

EHV-CPU module can display an error code by the 7-segment LED in addition to the error indication by the ERR/RUN lamp in EH-150 CPU module.



And an error code is set in the special internal output (such as WRF000).
The smaller the error code number, the more serious the error is.
When two or more errors occur, the smaller number is set. For example, if “71” (battery error) and “31” (user memory error) occur simultaneously, “31” is set. If the levels are same, the cause code which occurs later than others will be displayed.
The clearing of the error special internal output is performed by setting the special internal output R7EC to 1. R7EC can be set to 1 either by connecting the programming device or by incorporating a subprogram to set R7EC using external input. (Turn R7EC on always after checking the error factor when turning it on by the program. However, if R7EC is turned on by the program in which a watchdog error occurs, the system may clear the error factor and run again after the system detects the watchdog error.)

* Error codes are set in a hexadecimal number. Verify the error code by setting the monitor to hexadecimal display.

A list of self-diagnosis error codes is shown below.

Table 14.1 List of error codes

Error code	Error name [Detecting timing]	Classification	Details of error	ERR LED	Operation	Related special internal output	
						Bit	Word
–	Power off, Power error [Always check]	Serious failure	No power supply from the power module.	●	Stop	–	–
– (88)	Microcomputer overload error [Always check]	Serious failure	The watchdog timer detected a microcomputer overload error because the microcomputer did not operate according to the system program.	○	Stop	–	–
11	System ROM error [At power ON]	Serious failure	FLASH which is a copy source of the system has a sum error or cannot be read.	○	Stop	R7C8 R7DB	–
12	System RAM error [At power ON]	Serious failure	RAM used in the system program cannot be read and written properly.	○	Stop	R7C8 R7DB	–
13	Microcomputer error [Always check]	Serious failure	Address error interrupt and undefined command interrupt occurred in the microcomputer.	○	Stop	R7C8 R7DB	–
16	System program abnormal [Always check]	Serious failure	RAM after expanding the system program has a sun error.	○	Stop	R7C8 R7DB	–
17	System program abnormal [Always check]	Serious failure	RAM after expanding the system program has a sun error.	○	Stop	R7C8 R7DB	–
18	ID error peculiar to Ethernet	Serious failure	MAC address has a sum error.	○	Stop	R7C8 R7DB	–
1F	System program abnormal [Always check]	Serious failure	The system on the FLASH has a sun error.	○	Stop	R7C8 R7DB	–

Table 14.1 List of error codes (continued from the preceding page)

Error code	Error name [Detecting timing]	Classification	Details of error	ERR LED	Operation	Related special internal output	
						Bit	Word
22	Sequence processor error [At power On]	Medium failure	The microcomputer detected that the processor for user program was not operating.	○	Stop	R7DB	—
23	Undefined code [Checking during operation]	Medium failure	The microcomputer code which cannot be decoded was performed and as a result, error was detected.	○	Stop	R7C9 R7DB	—
27	Data memory error [At power On, at initializing]	Medium failure	Data memory cannot be read and written properly.	○	Stop	R7DB	—
28	Data memory error [At power On, at initializing]	Medium failure	Data memory cannot be read and written properly.	○	Stop	R7DB	—
2C	Sequence processor error [Checking during operation]	Medium failure	The processor for performing the user program does not operate according to the program.	○	Stop	R7DB	—
31	User memory error [At power On, at a start of RUN, during RUN, at changing parameter, at initializing]	Medium failure	A sun error is detected in the user memory or the RUNNING memory.	○	Stop	R7CA R7DB	—
32	User memory error [at a start of RUN, at initializing]	Medium failure	A sun error is detected in the user memory or the RUNNING memory.	○	Stop	R7CA R7DB	—
3F	Programming software un-support [at transferring program]	Medium failure	The program was transferred from the programming software not supporting the CPU type.	○	Stop	R7DB	—
41	I/O information verify error [Always check, at a start of RUN]	Minor failure	I/O assignment information and actual mounting of module do not match.	○	Stop *	R7CD R7DB	WRF002
43	Remote err [Always check]	Minor failure	- I/O assignment verify mismatch occurred in the remote slave station module. - Communication error occurred between the remote master station module and CPU. - Transmission to the space station has stopped because of error in the remote master station module.	○	Stop *	R7D0 R7DB	WRF006 WRF080 to WRF0DF
44	Overload error (Normal scan) [During operation]	Minor failure	Performance time for the normal scan exceeded the overload check time set by the parameter.	○	Stop *	R7D1 R7DB	—
45	Overload error (Cyclic scan) [Cyclic processing]	Minor failure	Performance time for the cyclic scan exceeded the performance cycle.	○	Stop *	R7D2 R7DB	—
47	I/O assignment points over [At power ON, at a start of RUN, during RUN, at changing parameter]	Minor failure	The number of assignment slots of CPU exceeded the prescribed slots.	○	Stop *	R7D6 R7DB	—
4F	Overlord error (Cyclic scan) [Cyclic processing]	Minor failure	The different scan, of which priority is lower, from the executing scan is started during execution of the cyclic scan.	○	Stop *	R7D2 R7DB	—
51	I/O module abnormal [Always check]	Warning	A hardware error in the high function module was detected.	●	Run	—	WRF005 WRF080 to WRF0DF
54	Communication module abnormal [Always check]	Warning	A hardware error in the communication module was detected.	●	Run	R7D7	WRF004
55	Communication module transmission error [In connecting peripheral device to the communication module]	Warning	Error occurred during transmission to communication module	●	Run	R7D7	WRF004
57	Communication module I/O assignment over [Always check]	Warning	The number of assignments of communication module exceeds the maximum..	●	Run	R7DD	—
58	Communication module I/O verify error [Always check]	Warning	Assignment information of communication module and mounting of module do not match. Communication module hardware error	●	Run	R7CE	WRF003

○ : ON ● : OFF

* Depending on the run parameter setting, operation can continue even when error occurs.

Table 14.1 List of error codes (continued from the preceding page)

Error code	Error name [Detecting timing]	Classification	Details of error	ERR LED	Operation	Related special internal output	
						Bit	Word
59	Link module abnormal [Always check]	Warning	Hardware error or link parameter error in link module was detected.	●	Run	R7DE	WRF007 WRF0E0 to WRF19F
61	Serial communication port transmission error (parity / framing / overrun) [At transmission]	Warning	Parity error, framing error, or overrun error was detected during transmission.	●	Run	—	—
63	Serial communication port transmission error (timeout) [At transmission]	Warning	Timeout error was detected during transmission.	●	Run	—	—
64	Serial communication port transmission error (protocol error) [At transmission]	Warning	Protocol (transmission procedure) error was detected during transmission.	●	Run	—	—
65	Serial communication port transmission error (BCC error) [At transmission]	Warning	Sum error was detected during transmission.	●	Run	—	—
6C	Ethernet communication port (Con 1) Timeout error [At transmission]	Warning	Timeout error of Ethernet communication port (Connection 1) was detected during transmission.	●	Run	—	—
6D	Ethernet communication port (Con 2) Timeout error [At transmission]	Warning	Timeout error of Ethernet communication port (Connection 2) was detected during transmission.	●	Run	—	—
6E	Ethernet communication port (Con 3) Timeout error [At transmission]	Warning	Timeout error of Ethernet communication port (Connection 3) was detected during transmission.	●	Run	—	—
6F	Ethernet communication port (Con 4) Timeout error [At transmission]	Warning	Timeout error of Ethernet communication port (Connection 4) was detected during transmission.	●	Run	—	—
71	Battery error [Always check]	Warning	Battery voltage dropped below prescribed value. Battery is not installed.	☼	Run	R7D9	—
76	Power failure storage area undefined [At power ON]	Warning	Area specified to power failure storage is undefined because the battery is dead.	☼	Run	R7CA	—
77	Backup memory error (FLASH) [in writing into FLASH memory]	Warning	Data cannot be written into the backup memory.	☼	Run	R7D9	—
78	Each setting parameter un-defined	Warning	Serial communication stored in CPU, Ethernet communication, and parameter set by security function have sum error.	●	Run	R800 ～ R807	—
79	Comment memory error [At power ON, at program transfer *]	Warning	Part of comment data or all of comment data are undefined because battery is dead.	●	Run	—	—
7A	Real-Time Clock error [Always checking]	Warning	The update of the clock data stopped.	●	Run	R7D8	—
8C	Modbus-TCP communication port (CON1) Timeout error [At transmission]	Warning	Timeout error of Modbus-TCP communication port (CON1) was detected during transmission.	●	Run	—	—
8D	Modbus-TCP communication port (CON2) Timeout error [At transmission]	Warning	Timeout error of Modbus-TCP communication port (CON2) was detected during transmission.	●	Run	—	—
8E	Modbus-TCP communication port (CON3) Timeout error [At transmission]	Warning	Timeout error of Modbus-TCP communication port (CON3) was detected during transmission.	●	Run	—	—
8F	Modbus-TCP communication port (CON4) Timeout error [At transmission]	Warning	Timeout error of Modbus-TCP communication port (CON4) was detected during transmission.	●	Run	—	—

● : OFF ☼ :1s OFF / 1s ON

* If only program is transferred by the Control Editor ver.1.20 or later to the CPU of which the program was transferred by the Control Editor ver.1.04 or before, the 79 error will occur.

Table 14.1 List of error codes (continued from the preceding page)

Error code	Error name [Detecting timing]	Classification	Details of error	ERR LED	Operation	Related special internal output	
						Bit	Word
91	Serial communication port No model response [In connection modem]	Warning	There is no response from the modem connected to port.	●	Run	—	—
92	Serial communication port Model connection timeout [In connecting modem]	Warning	There is no response for connection completion within the set time from the port connected to port.	●	Run	—	—
93	Serial communication port Timeout during modem connection [In connecting modem]	Warning	There is no response within the set time from the modem connected to port.	●	Run	—	—

● : OFF ☼ :1s OFF / 1s ON

The range of the special internal output that is cleared when R7EC is set to 1 is shown below.

No.	Bit special internal output
R7C8	Serious failure flag
9	Operation microcomputer abnormal
A	User memory error
B	(Undefined)
C	(Undefined)
D	I/O verify mismatch
E	Communication module assignment verify mismatch
R7CF	(Undefined)
R7D0	Remote error
1	Overload error (Normal scan)
2	Overload error (Cyclic scan)
3	(Undefined)
4	(Undefined)
5	(Undefined)
6	I/O assignment points over
7	Communication module abnormal
8	Clock error
9	Battery error
A	(Undefined)
B	Self-diagnosis error
C	(Undefined)
D	Communication module assignment over
R7DE	Link module abnormal

No.	Word special internal output
WRF000	Self-diagnosis error code
1	(Undefined)
2	I/O verify mismatch details
3	Communication module/I/O verify mismatch details
4	Communication module abnormal slot No.
5	I/O module abnormal slot No.
6	Remote I/O master station module Abnormal slot No.
7	Link module abnormal slot No.
8	(Undefined)
9	(Undefined)
WRF00A	(Undefined)
WRF080 to WRF0DF	Remote master error flag
WRF0E0	Link 1 Own station error information
WRF140	Link 2 Own station error information
WRF1A0	Link 3 Own station error information
WRF200	Link 4 Own station error information
WRF260	Link 5 Own station error information
WRF2C0	Link 6 Own station error information
WRF320	Link 7 Own station error information
WRF380	Link 8 Own station error information

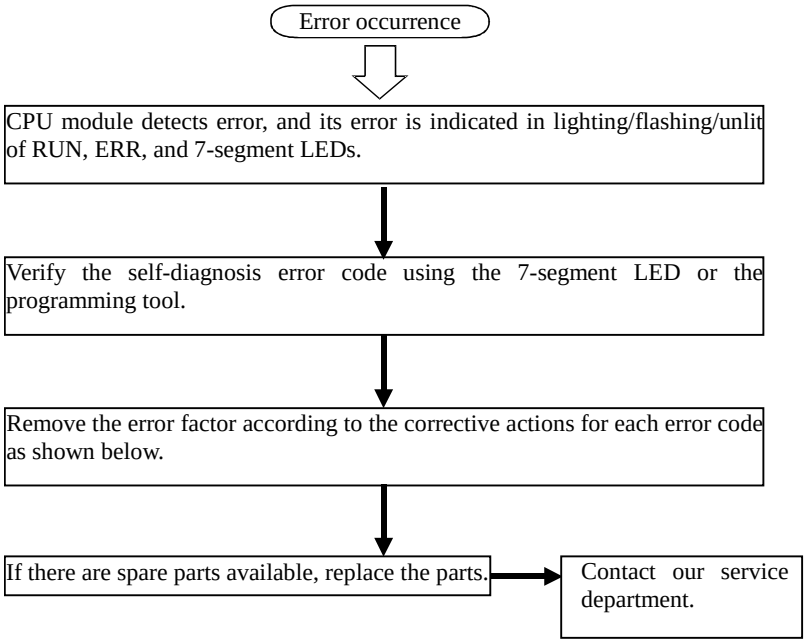
When all of the special internal output data cannot be cleared even if the program is performed, refer to the list of self-diagnosis error codes, and clear only the corresponding error flag by using the forced set of peripheral device.

Note

If the internal output R7DB (WRF000) of a self-diagnosis error is used as a system error for the stop condition of CPU RUN, CPU may be stopped because R7DB turns on even if occurring error (battery error, etc.) is the warning level. Therefore, do not use the internal output of a self-diagnosis error for the stop condition of CPU RUN.

(2) Corrective actions when error occurs

The process flow when error occurs is shown below.



Error code	Error name	Corrective action
88	Microcomputer overload error	Recheck the fixation of the CPU module to the basic base unit, and restart the power supply.
11	System ROM error	If the same error occurs, it is a hardware error in the CPU module. Replace the CPU module with a spare.
12	System RAM error	Make sure that there are no machines which generates excessive noise, etc. near EH-150 system.
13	Microcomputer error	
16	System program error	
17	System program error	
18	ID error peculiar to Ethernet	
1F	System program error	
22	Sequence processor error	
23	Undefined command	
27	Data memory error	
28	Data memory error	
2C	Sequence processor error	
—	Power off, Power error	Check the basic and expansion power supply voltage.
31	User memory error	The contents of the user program are destroyed. Transfer the program again after initialization. This is displayed if the battery is left removed or the battery is left dead for a long period.
32	User memory error	Transfer the program again after initialization.
3F	Programming software unsupport	Use the Control Editor Ver. 1.20 or later.
41	I/O information verify error	Check the I/O assignment once more. Recheck the fixation of each I/O module and I/O controller, and the connection of the expansion cable.
43	Remote error	Perform the module setting, reset, etc. according to the error code of the malfunctioning remote module.
44	Overload error (Normal scan)	Change the program so that the scan time of the user program is shorter, or change the watchdog check time.
45	Overload error (Cyclic scan)	Change the program so that the performance time of the cyclic interrupt program is shorter.
47	I/O assignment points over	Perform the I/O assignment not so as to exceed the maximum I/O points of CPU module.
4F	Overload error (Cyclic scan)	Set a cycle of all cyclic scan to a multiple of integer.

Error code	Error name	Corrective action
51	I/O module abnormal	Check for error in I/O modules and replace the malfunctioning module.
54	Communication module abnormal	Perform error recovery procedure according to the error code of the malfunctioning communication module.
55	Communication module transmission error	
57	Communication module I/O assignment over	Perform assignment so that the number of assignments of communication module does not exceed the maximum.
58	Communication module I/O information verify error	Change the parameter setting or install the communication function module properly.
59	Link module abnormal	Perform error recovery procedure according to the error code of the malfunctioning link module.
61	Serial communication port transmission error (parity / framing / overrun)	Check the connection of the communication cable. Check the settings such as the transmission velocity. Check there are no sources of noise near the communication cable.
63	Serial communication port transmission error (timeout)	Check the connection of the communication cable. Check there are no sources of noise near the communication cable.
64	Serial communication port transmission error (protocol error)	Verify the protocol specification, examine the host computer processing, and correct any error.
65	Serial communication port transmission error (BCC error)	
6C	Ethernet communication port (Con1) timeout error	Check the connection of the communication cable. Verify if the other device is operating normally. Check there are no sources of noise near the communication cable.
6D	Ethernet communication port (Con2) timeout error	
6E	Ethernet communication port (Con3) timeout error	
6F	Ethernet communication port (Con4) timeout error	
71	Battery error	Replace the battery with a new one. Check the connection of the battery connector.
76	Power failure storage area undefined	Clear the power failure storage area.
77	Backup memory error	Read the programming tool from the user program and back up it. Though the CPU module can operate unless the program is changed, replace with a spare part because of a hardware error of the CPU module.
78	Each setting parameter undefined	Set using the programming tool again.
79	Comment memory error	Transfer the comment again. Replace the battery with a new one. Check the connection of the battery connector.
7A	Real-Time Clock error	Restart the power supply.
8C	Modbus-TCP communication port (CON1) Timeout error	Check the connection of the communication cable. Verify if the other device is operating normally. Verify the protocol specification, examine the host computer processing, and correct any error.
8D	Modbus-TCP communication port (CON2) Timeout error	
8E	Modbus-TCP communication port (CON3) Timeout error	
8F	Modbus-TCP communication port (CON4) Timeout error	
91	Serial communication port Modem no response	Check the connection of the communication cable. Verify if the modem is operating normally. Check there are no sources of noise near the communication cable.
92	Serial communication port Modem connection timeout	
93	Serial communication port Timeout during modem connection	

↓

Perform the following procedure to erase the error display.

(a) When CPU is stopped.

Turn the CPU RUN switch to “STOP”, then to “RUN” again.

The ERR lamp turns off if the error has been corrected. However, the error information remains in the error special internal output, which stored the CPU error types and details. (It is possible to analyze error after recovery.)

To reset the error information, perform the procedures shown in (b).

(b) When the CPU is still running.

1] Clear the ERR lamp display only.

Set the special internal output R7EB to 1.

② Clear the ERR lamp display and the error special internal output.

Set the special internal output R7EB to 1.

14.2 Operation error and Countermeasure Procedures

When an error occurs in an execution of a control command, "1" will set to the internal special output (R7E3) for the operation error (ERR), and an error code that indicates the error description will be set to WRF015.

Please perform "R7F3 = 0" by the forced sets from a program or a peripheral device to clear the operation error. Please perform "WRF015 = 0" by the forced sets from a program or a peripheral device to clear the error code.

Table 14.2 Operation error code

Error code	Name of the error	Description	The command that an error occurs
H0041	CAL nesting overflow	Number of nesting layers exceeds six in a subroutine.	CAL
H0046	FOR - NEXT nesting overflow	Number of nesting layers exceeds six in a "FOR - NEXT".	FOR NEXT

14.3 Checklist when Error Occur

Check the following items if an error is generated in the EH-150 system. Please contact our service department if there are no problems in the following items

(1) Power supply related items

- Is the power voltage correct? (85 to 264 V AC)
- Are there any warps in the power supply waveform?
- Are there any excessive noises in the power supply?
- Is power supplied for all basic and expansion modules?
- Is the capacity of the power supply module greater than the total of module current consumption?

(2) CPU related items

- Are the initial settings (CPU initialization, I/O assignment, parameter settings, etc.) proper?
- Is the error code displayed on the 7-segment?
- Is the RUN switch in the proper location?
- Is the battery mounted? Is the battery life sill remaining?
- Are the CPU connectors properly connected to the base connectors?

(3) Input module related items

- Is the input voltage within the specification for the module?
- Are there any chattering, noise, and etc. in the input?
- Do the I/O assignment No. in the program match?
- Is the wiring done properly?

(4) Output module related items

- Do the module and the load power supply type (DC/AC) match?
- Do the load voltage and current match the module specification?
- Are there any chattering, noise, and etc. in the output waveform?
- Is the wiring done properly?
- DO the I/O assignment No. in the program match?
- Are there any unintentional overlaps in the output No.?

(5) Wiring related items

- Is the FE terminal of the power supply module grounded using class D dedicated grounding?
- Is the wiring between expansions mixed up with other wires?
- Are the power supply wiring and I/O cables separated?
- Are there any foreign substances in the connector of each module?

Note

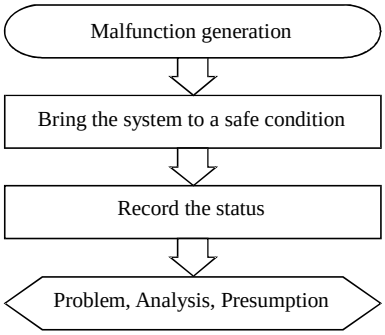
(1) Be sure to replace the modules with the power supply turned off.

(2) Please notify us of the malfunctioning effect in as much detail as possible when returning the module for repair. (including error codes, malfunctioning I/O bit No., will not turn on or off, etc.)

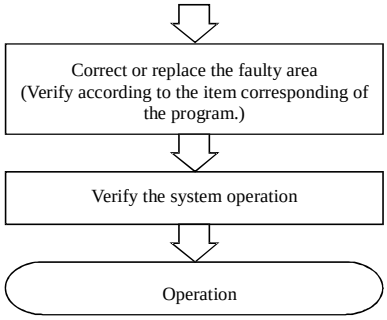
(3) The tools and devices necessary for troubleshooting are roughly as follows:
Phillips/flathead drivers, digital MultiMate, tester, oscilloscope (necessary depending on the case), etc.

14.4 Procedure to Solve Error

The processing flow when a malfunction has occurred is shown below.

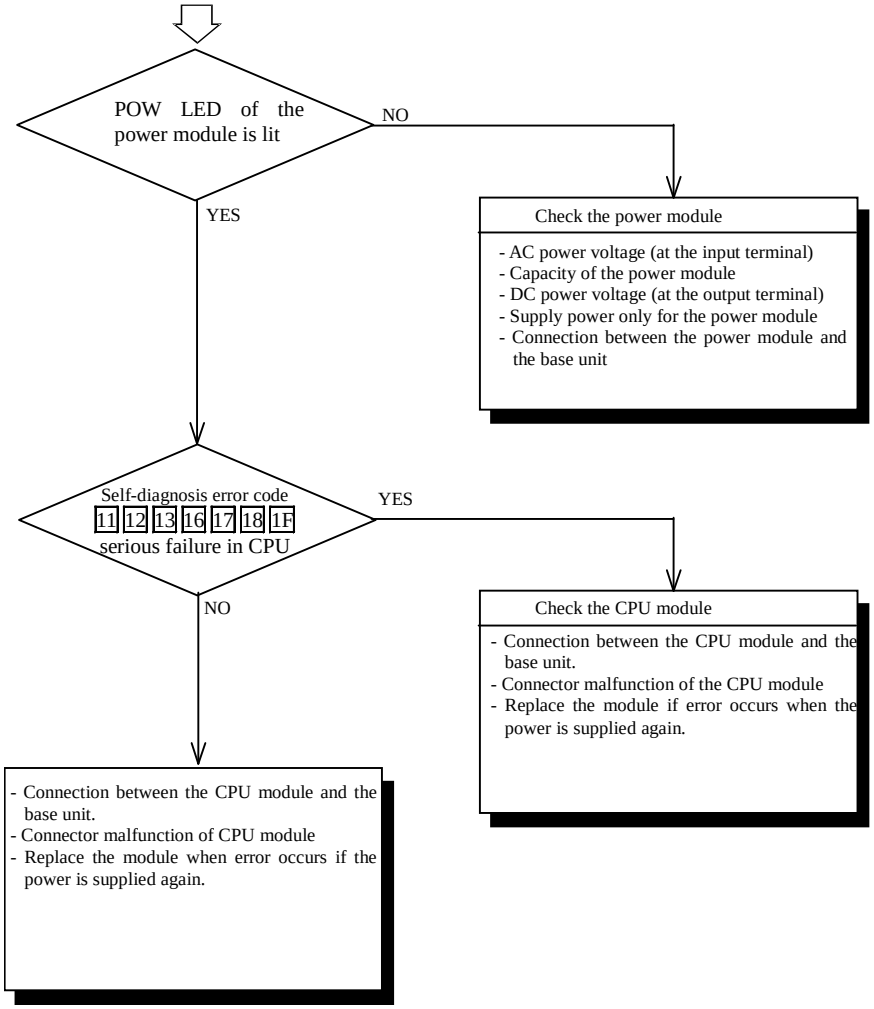


Major problem	Check point	Typical causes of the problem	Reference item
PLC will not start.	Power supply LED CPU error code	Power supply abnormal, power off, power supply capacity shortage, module connector error, serious PCU failure	(a)
Will not operate (will not RUN)	CPU error code, CPU LED, Internal output of error	I/O assignment error, incorrect parameter setting, incorrect user program, Syntax error, drive conditions not met, write-occupied status	(b)
Operation stopped (RUN stopped)	Power LED, CPU LED, CPU error code	Power supply abnormal, expansion power supply abnormal/off, CPU abnormal, memory error, communication module error, base error	(c)
Wrong input of input module, or input modules will not input. (abnormal operation)	CPU LED, I/O LED, Monitoring by peripheral devices	User program timing, input power supply, bad connection, input module abnormal, I/O inductive noise	(d)
Wring output of output module, or output module will not output (abnormal operation)	CPU LED, I/O LED, Monitoring by peripheral devices Forced set	User programming, bad connection, output module abnormal, I/O inductive noise	(e)
Peripheral devices abnormal	CPU error code, CPU, peripheral devices	Serious CPU failure, peripheral devices abnormal, peripheral devices setting error, cable abnormal	(f)



(a) PLC will not start.

The CPU ERR LED does not light off even when the power is started, nor peripheral devices cannot be connected on-line.

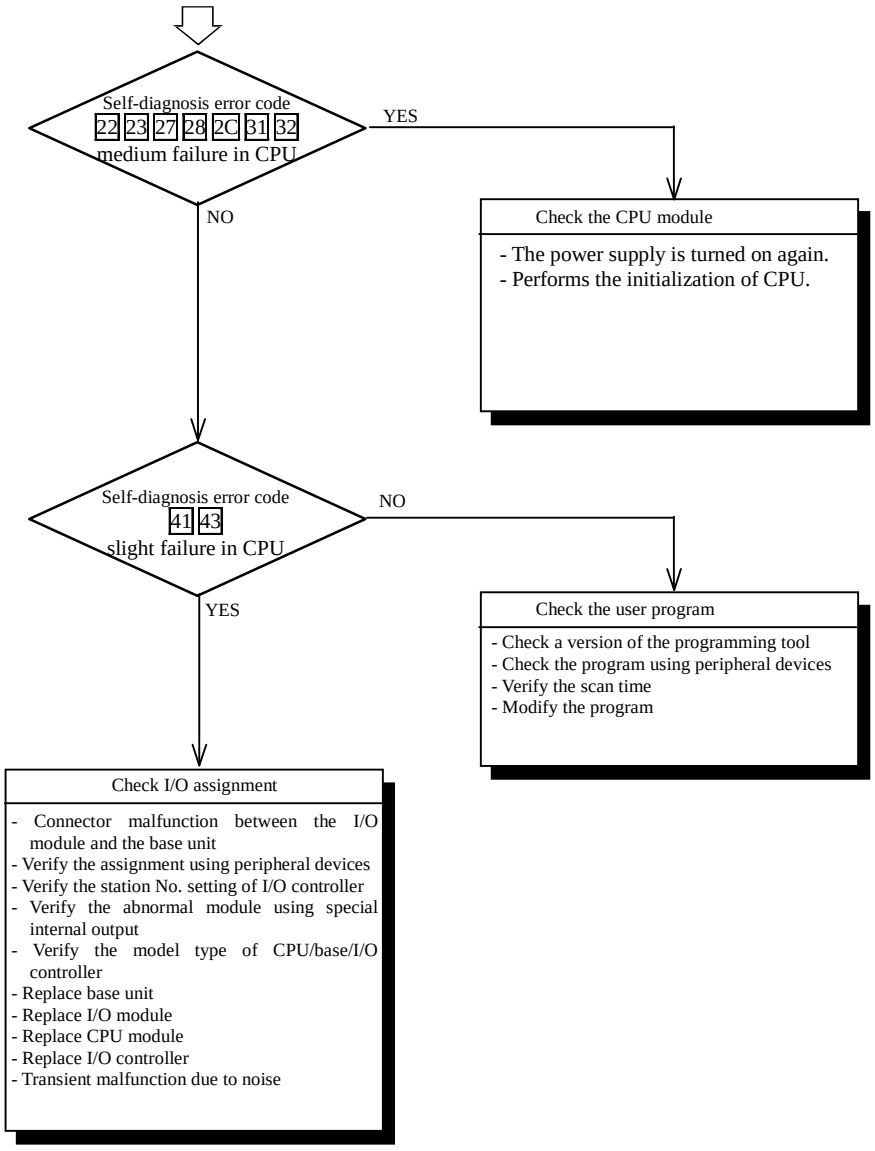


(b) Will not operate. (will not RUN.)

Even if the operation conditions of PLC are met, CPU does not operate (RUN LED does not light up) and remains stopped. However, peripheral devices go on-line.

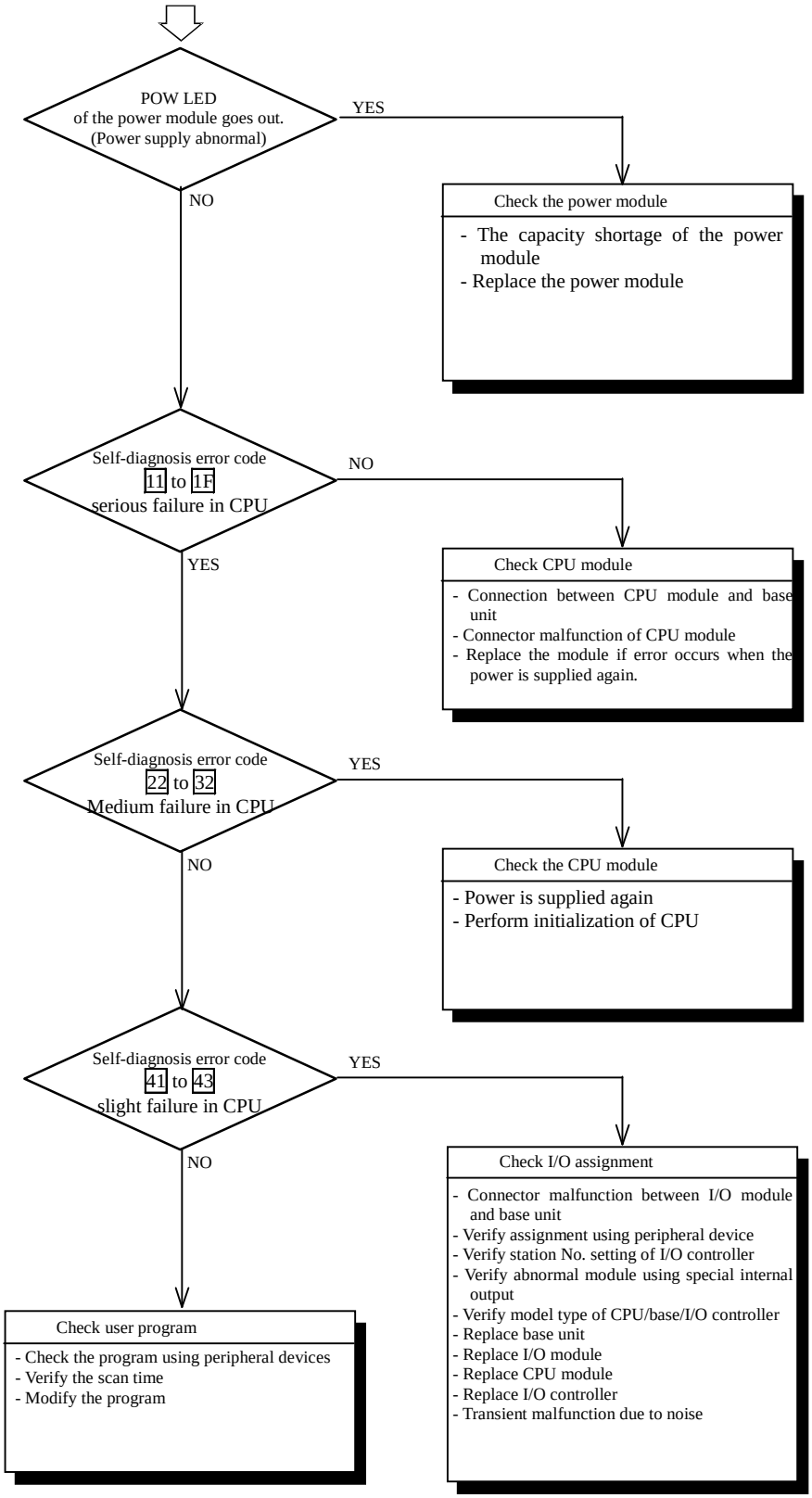
Note

If CPU is WRITE-occupied, CPU will not run even if the RUN switch is switched from “STOP” to “RUN”. Connect peripheral devices, and perform the operation for canceling the occupation.



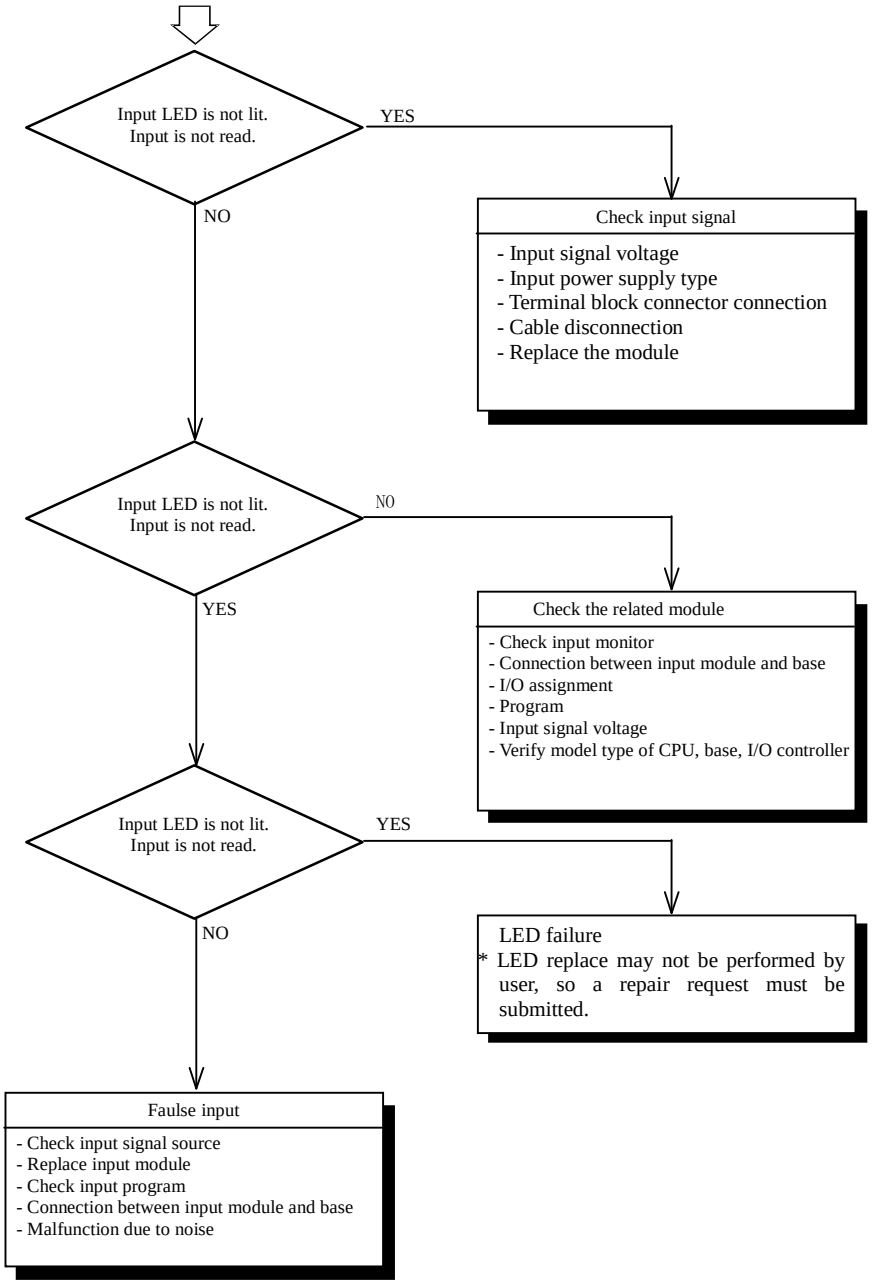
(c) Operation stopped (RUN stopped)

[CPU stops suddenly (the RUN LED goes out) during normal operation.]

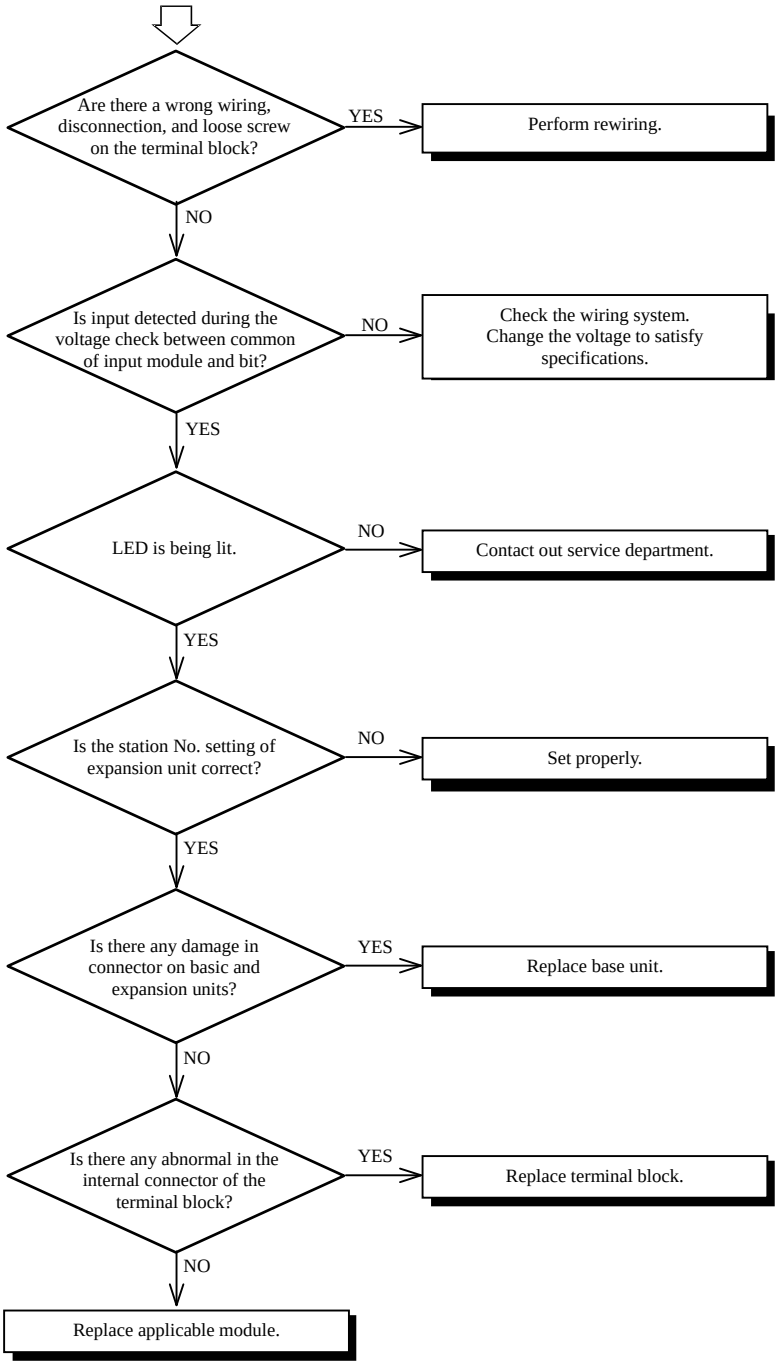


(d) Wrong input of input module, or input module does not input. (operation error)

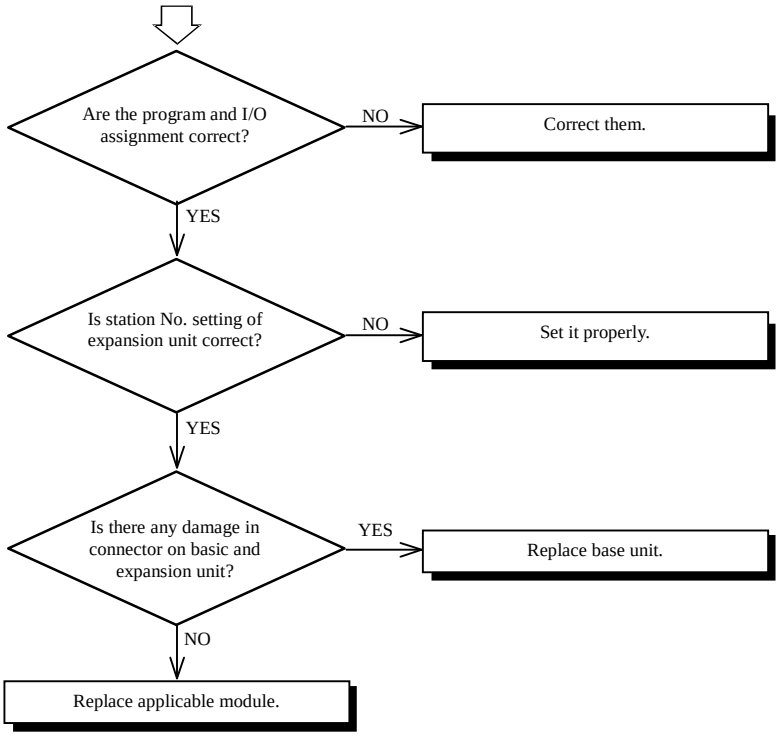
[CPU runs, but the input data is not correct.]



Data cannot be input.

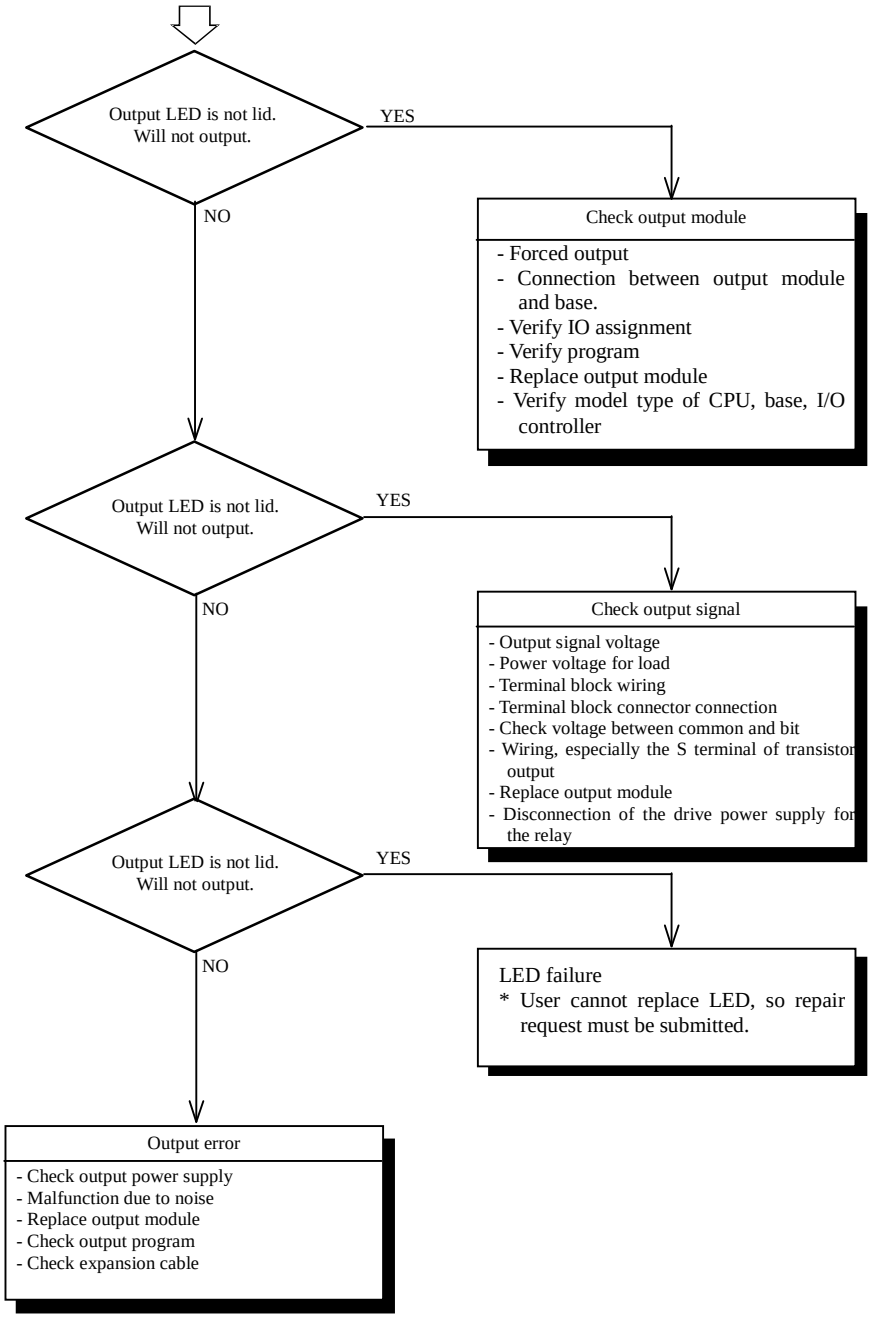


[I/O assignment error occurs, but data is read.]

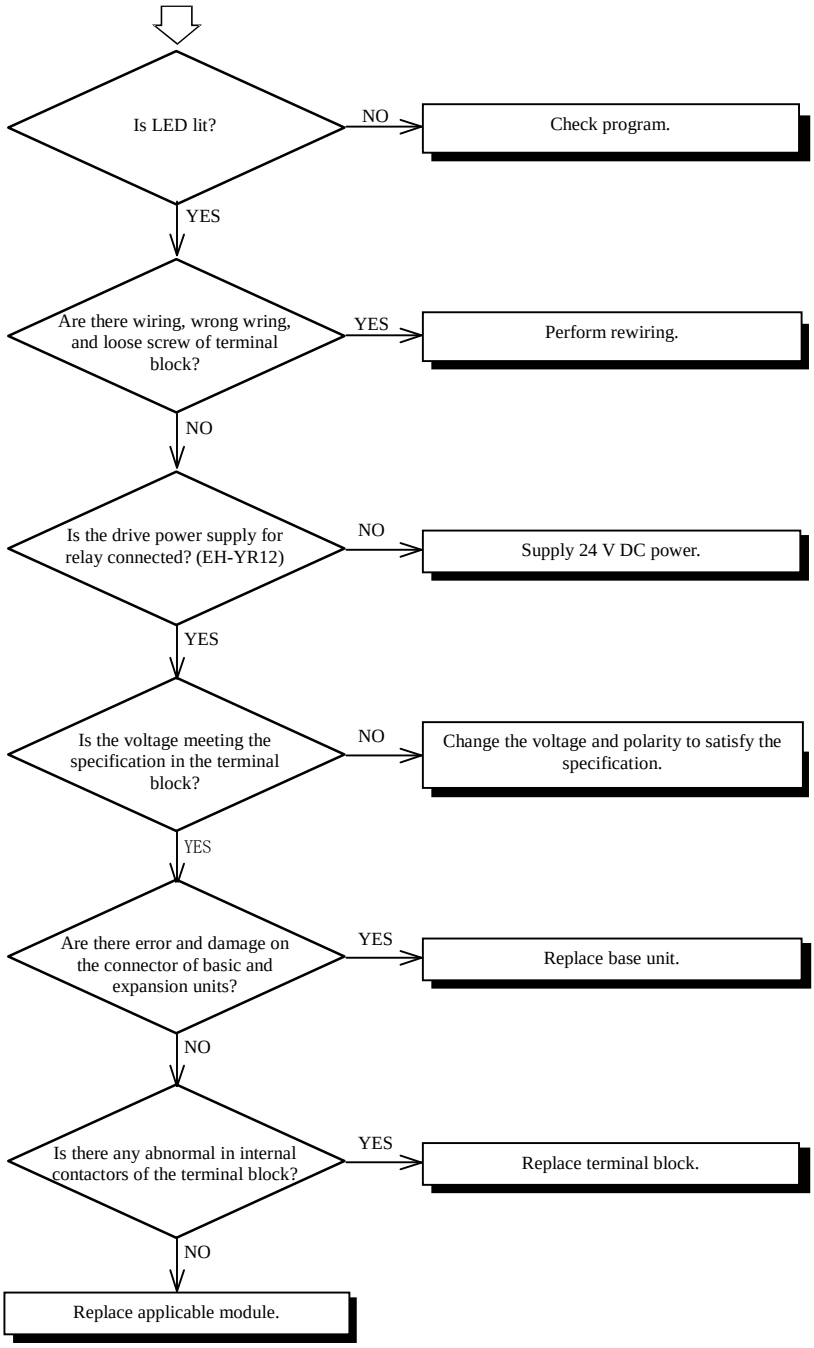


(e) Wrong output of output module, or output module will not output. (abnormal operation)

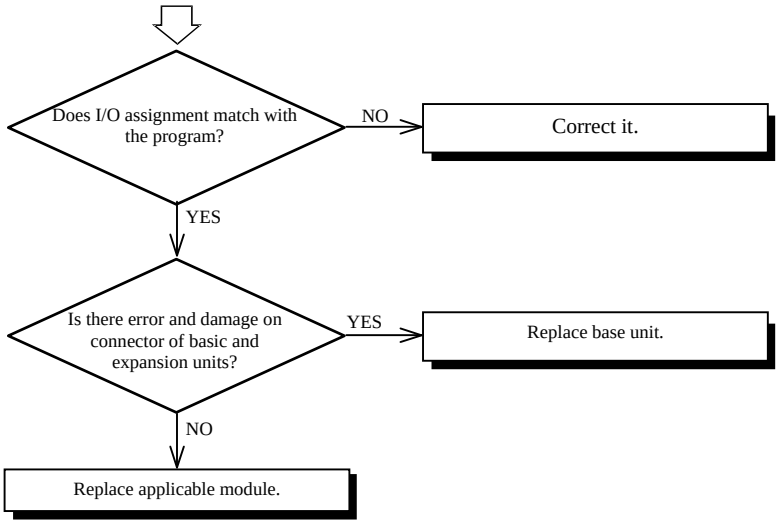
[CPU runs, but output signals are not correct.]



CPU runs, but output signal are not detected.

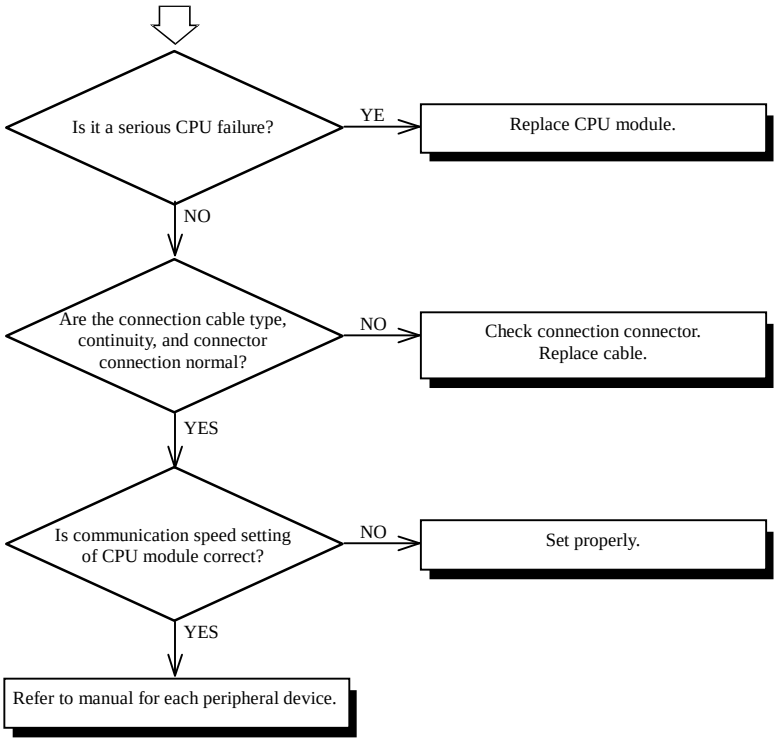


[I/O assignment error occurs, but output is normal.]

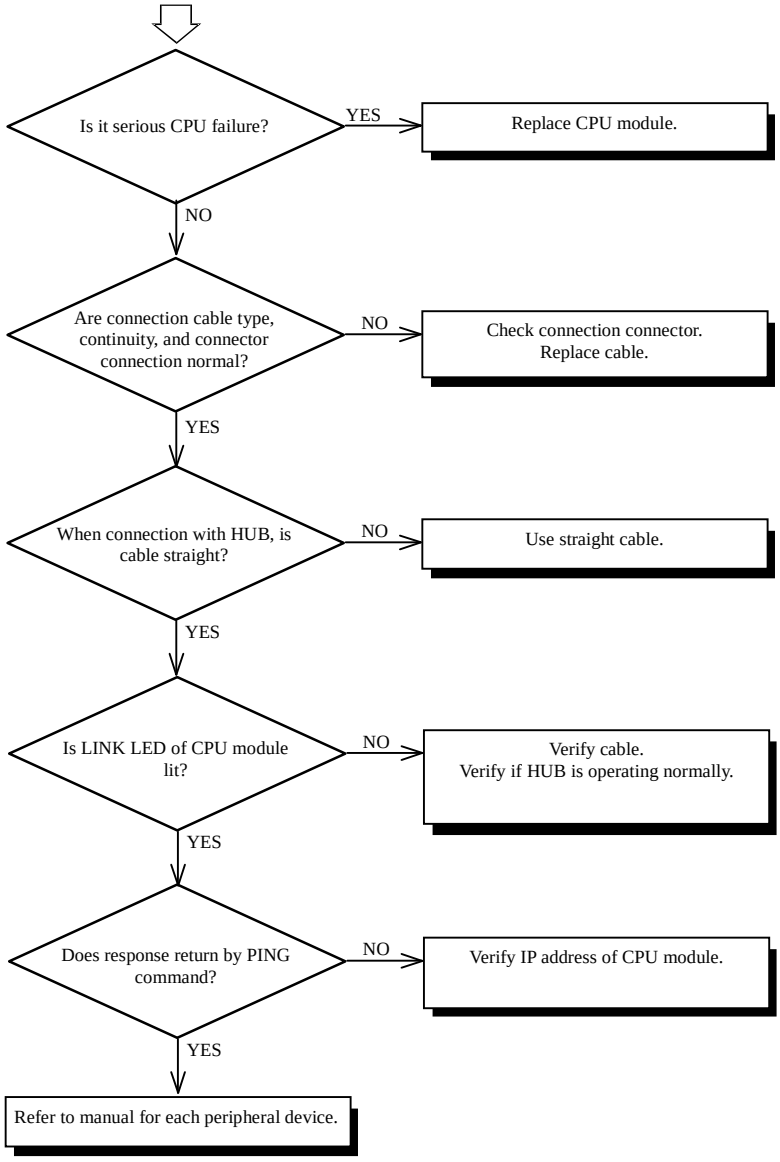


(f) Peripheral devices abnormal

[Peripheral devices cannot be connected with serial communication port.]



Peripheral devices cannot be connected with Ethernet communication port.



Appendix 1 Rule of I/O Address

Appendix 1.1 External I/O

The external input is represented by X and the external output is represented by Y.

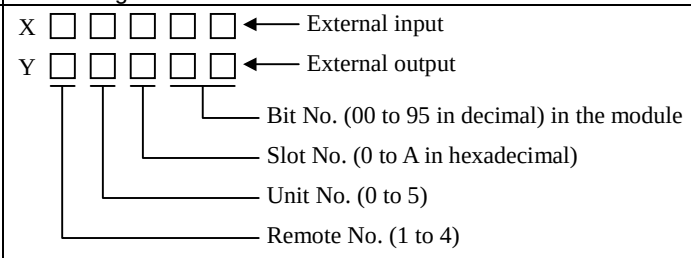
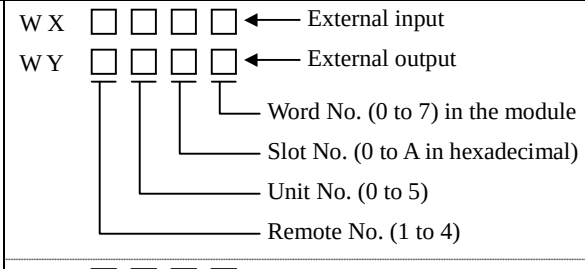
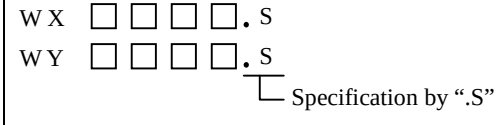
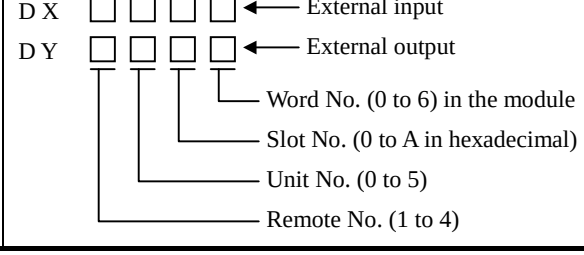
The only peculiar No. of both a bit I/O and a word I/O is determined according to the loading location of the module, respectively.

Table A.1 List of external I/O classification and data type

Classification	I/O classification	Data type	Remarks
X	External input	Bit type	Corresponds to the signal of each terminal block. * Decimal number (X0,1,2,..,9,10,..,15,16,17,..,95)
WX		Word type (16-point)	Data in 0 to 15 are batch-processed. 16-point synchronicity is guaranteed.
DX		Double word type (32-point)	2 word data are batch-expressed. 32-point synchronicity is not guaranteed.
Y	External output	Bit type	Corresponds to the signal of each terminal block. * Decimal number (Y0,1,2,..,9,10,..,15,16,17,..,95)
WY		Word type (16-point)	Data in 0 to 15 are batch-processed. 16-point synchronicity is guaranteed.
DY		Double word type (32-point)	Two word data are batch-expressed. 32-point synchronicity is not guaranteed.

The external I/O No. is expressed with the following rules.

Table A.2 List of I/O No. rule of external I/O

Data type	Numbering rule
Bit type (Basic/Expansion)	
Word type	 
Double word type	

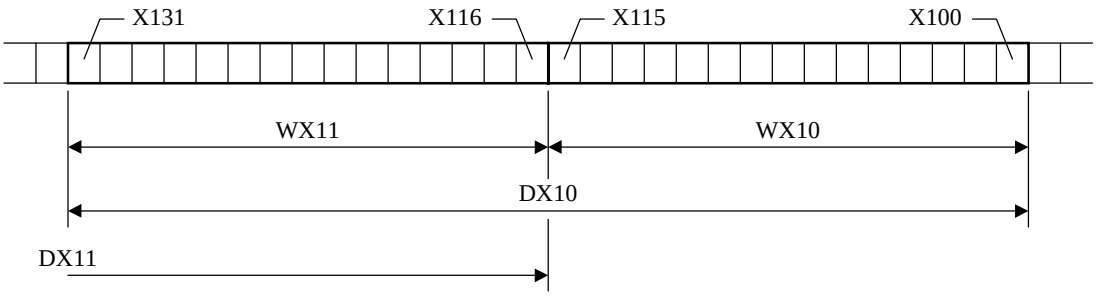
* EHV-CPU can be constructed with a basic unit and five expansion units at the maximum. The input (X) range is from 0 to 5A95 and the output (Y) range is from 0 to 5A95 because the maximum number of slots of the base unit is 11.

Reference

The remote No. is represented with a symbol r, the unit No. is with u, and the slot No. is with s in this manual.

The external I/O word type is a collection data of 16 points, and double word type is a collection data of 32 points of the applicable bit type.

Example) Relationship between DX10, WX10, and X100 to X115,



Appendix 1.2 Extension External I/O (Extension XY)

In EHV-CPU, each slot has a 256-word dedicated internal output.

This internal output is represented with a symbol EX and EY. Since X and Y exist in symbols, these are called the extension external output. Though these can be handled as same as the internal output, according to the I/O assignment, these are used for storing information of the external I/O as same as the normal X and Y, and used as the dedicated area of the module.

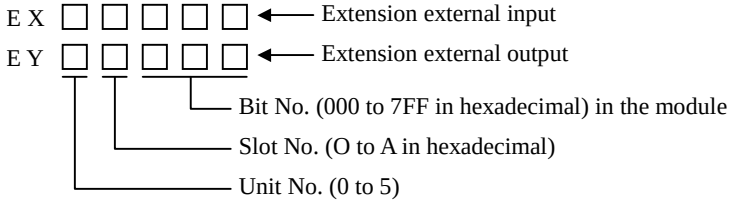
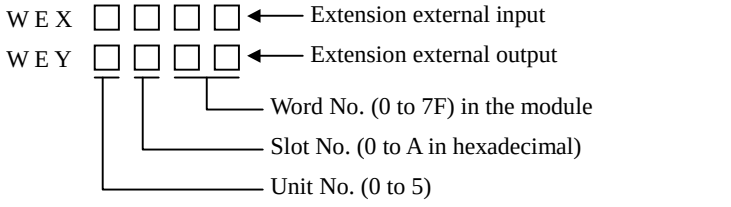
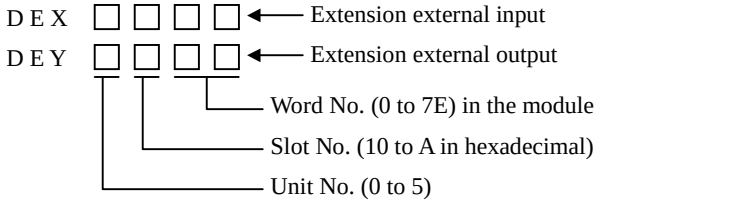
The area for the extension external output is divided into a 128-word extension input area and a 128-word extension output area. And the I/O No. is determined depending on the slot position. However, note that the I/O No. of the extension XY is assigned in a hexadecimal system, differing the normal XY which is assigned in a decimal system.

Table A.3 List of extension external I/O classification and data type

Classification	I/O classification	Data type	Remarks
EX	External input	Bit type	Corresponds to the signal of each terminal block. * Hexadecimal number (EX0,1,2,..,9,A,..,F,10,11,..,7FF)
WEX		Word type (16-point)	Data in 0 to 15 are batch-processed. 16-point synchronicity is guaranteed.
DEX		Double word type (32-point)	Two word data are batch-expressed. 32-point synchronicity is not guaranteed.
EY	External output	Bit type	Corresponds to the signal of each terminal block. * Hexadecimal number (EY0,1,2,..,9,A,..,F,10,11,..,7FF)
WEY		Word type (16-point)	Data in 0 to 15 are batch-processed. 16-point synchronicity is guaranteed.
DEY		Double word type (32-point)	Two word data is batch-expressed. 32-point synchronicity is not guaranteed.

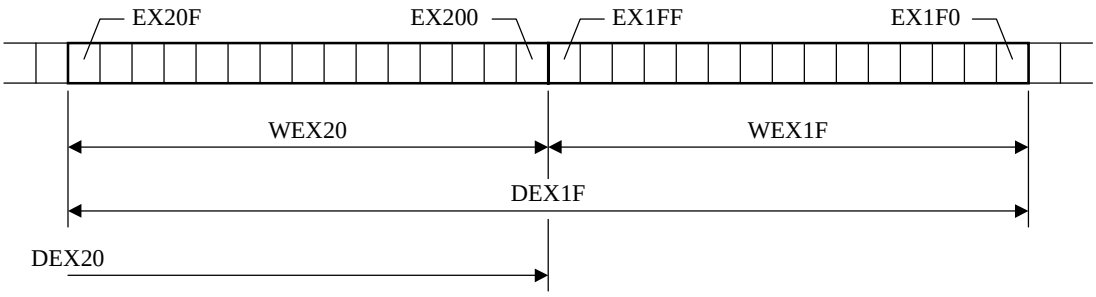
The extension external I/O No. is expressed as the following rules.

Table A.4 List of I/O number rule for extension external I/O

Data type	Numbering rule
Bit type (Basic / Expansion)	
Word type	 
Double word type	

The extension external I/O word type is a collection data of 16 points, and double word type is a collection data of 32points of the applicable bit type.

Example) Relation between DEX1F, WEX1F, and EX1F0 to EX1FF,



■ Module which uses for the extension external I/O only

The module which uses the extension external I/O as a dedicated area of the module and its uses are shown below.

Table A.5 Usable module of extension external I/O and its uses

No.	Module type	Specification	Uses		
1	EH-ETH	Ethernet communication module	EX, WEX	[command] [command]	Status area Module setting parameter display
			EY, WEY	[command] [command]	Control area Module setting parameter display
2	EH-POS4	4-axes positioning module	EX, WEX	[CPU] [command]	Status area (14 word) Read data at command execution
			EY, WEY	[command]	Write data at command execution
3	EH-AXH8M, EH-AXG5M, EH-TC8	Analog input module, Thermocouple input module	EX, WEX	[CPU] [command]	Analog input status flag Module setting parameter display
			EY, WEY	[command]	Module setting parameter module
4	EH-AYH8M, EH-AYG4M	Analog output module	EX, WEX	[CPU] [command]	Analog output status flag Module setting information display
			EY, WEY	[command]	Module setting parameter

[command] : This is refreshed at the command execution. [CPU] : CPU module refreshes this automatically.

Note

EHV-CPU performs the same processing (refreshes some areas of extension XY automatically by the system program.) to the module with the same I/O assignment as the above module. Though the extension XY area can be handled as the internal output, be careful because it is overwritten at the refresh processing if the are to be refreshed by the system program is used.

Example) when using EH-AX8V

WEXus00, as same as EH-AXH8M, is refreshed automatically at every scan END. A calculation result is stored in WEXus00. Since the undefined value is overwritten at the scan END if the program to be referred at other processing is created, the operation may be different from the expectation.

Appendix 1.3 Internal Output

The internal output is a register that the user program can use.

There are three areas; a bit dedicated area (R), a word dedicated area (WR and WN), and a bit/word common area (M/WM), in the internal output. And there is an area (L/WL) for exchanging data with other CPU using link module.

Furthermore, there are two areas in the internal output, one is the area where user can access freely and the other is used for the special purpose, and the latter is called a special internal output. The special internal output is used for setting the system and indicating the status.

Refer to “Appendix 2 List of Special Internal Output” for the details.

Table A.6 List of Internal output

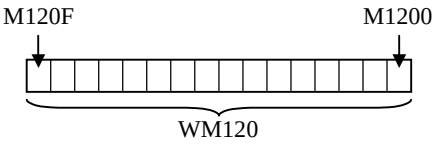
I/O type		Number of points			
		EHV-CPU128	EHV-CPU64	EHV-CPU32	EHV-CPU16
Bit		1,984 points (R0 to R7BF)			
Word (WR)		61,440 words (WR0 to WREFFF)			
Word (WN)		131,072 words (WN0 to WN1FFFF)	32,768 words (WN0 to WN7FFF)		
Bit / Word common (WM)		524,288 points 32,768 words (M0 to M7FFFF, WM0 to WM7FFF)			
Special internal output	Bit	2,112 points (R7C0 to RFFF)			
	Word	4,096 words (WRF000 to WRFFFF)			
CPU link		16,384 points 1,024 words × 8 loops Link system 1: L0 to L3FFF / WL0 to WL3FF Link system 2: L10000 to L13FFF / WL1000 to WL13FF Link system 3: L20000 to L23FFF / WL2000 to WL23FF Link system 4: L30000 to L33FFF / WL3000 to WL33FF Link system 5: L40000 to L43FFF / WL4000 to WL43FF Link system 6: L50000 to L53FFF / WL5000 to WL53FF Link system 7: L60000 to L63FFF / WL6000 to WL63FF Link system 8: L70000 to L73FFF / WL7000 to WL73FF			

The internal output I/O No. is expressed with the following rules.

Table A.7 List of I/O No. rule for internal output (1/2)

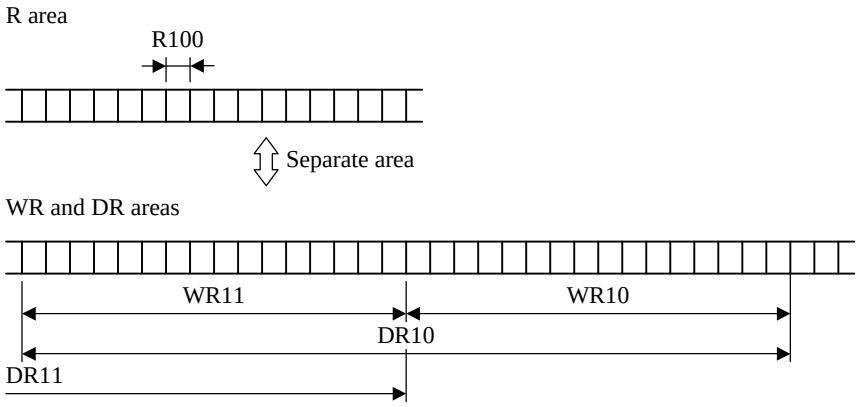
Data type	Numbering rule	
Bit dedicated type		R □□□ Normal area H000 to H7BF Special area H7C0 to H7FF Both are expressed in hexadecimal.
Word dedicated type	<Word>	W R □□□□ Normal area from H0000 Special area from HF000 Both are expressed in hexadecimal. W N □□□□□ Normal area from H00000 Expresses in hexadecimal.
	[Bit specifying]	W R □□□□.□ W N □□□□□.□ Specifying by ".n" (n: bit No. , 0 to F)
	[Signed integer]	W R □□□□.S W N □□□□□.S Specifying by ".S"
	[Character train specifying]	W R □□□□.ASC.n W N □□□□□.ASC.n Specifying by ".n" (n: number of bytes 1 to 32 [decimal]) Specifying by ".ASC"
	<Double word>	D R □□□□ Normal area from H0000 Special area from HF000 Expressed WR for 2 words in continuation. Both are expressed in hexadecimal. D N □□□□□ Normal area from H0000 Expresses in hexadecimal.
	[Signed integer]	D R □□□□.S D N □□□□□.S Specifying by ".S"
	[Real number (floating point)]	D R □□□□.FL D N □□□□□.FL Specifying by ". FL"

Table A.8 List of I/O No. rule for internal output (2/2)

Data type	Numbering rule
Bit/Word common type	<Bit> M □□□□□ L □□□□□ From H00000 / from H0000 Expresses in hexadecimal.
	<Word> W M □□□□ W L □□□□ H0000～ Represented in hexadecimal.  * There is no bit specifying in bit/word common type.
	[Signed integer] W M □□□□.S W L □□□□.S Specifying by ".S".
	[Character train specifying] W M □□□□.ASC.n W L □□□□.ASC.n Specifying by ".n" (n: number of bytes 1 to 32 [decimal]) Specifying by ".ASC"
	<Double word> D M □□□□ D L □□□□ From H0000 Both are expressed in hexadecimal, Expresses WR for 2 words in continuation
	[Signed integer] D M □□□□.S D L □□□□.S Specifying by ".S"
	[Real number (floating point)] D M □□□□.FL D L □□□□.FL Specifying by ". FL"

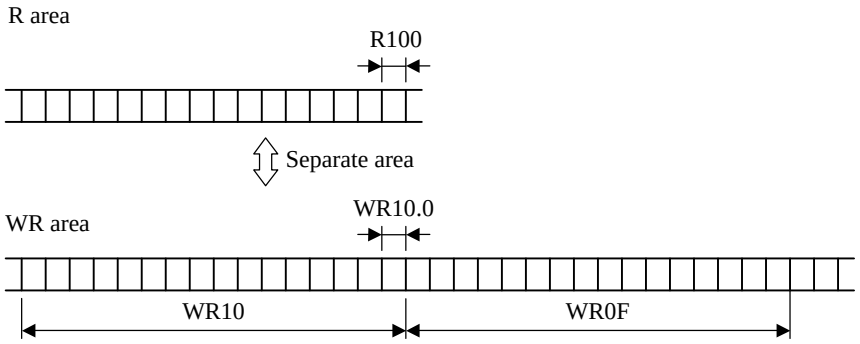
The internal output R, WR, and DR are separate area.

Example) Relation between R100, WR10, and DR10



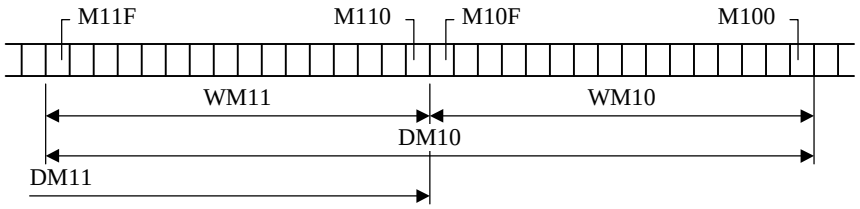
Note

EHV-CPU can access by selecting any one bit from word data.



The internal output M, WM, and DM use the same area. (The bit unit operation is possible by the word I/O.)

Example) Relation between M100, WM10, and DM10



Appendix 2 List of Special Internal Output

The special internal output is an internal output of bit or word that special functions are assigned.

The functions of the special internal output are a status display of CPU module, a operation control of CPU module, a parameter setting, a use for user program, and etc.

Since the special internal output area is a power failure storage area, the value is retained even if the power supply is OFF if the battery is installed. Also, the special internal output used for the parameter setting and etc. is stored in the backup memory.

Appendix 2.1 Bit Special Internal Output

The bit special internal output area is from R7C0 to RFFF. The functions of each bit are shown in the following table.

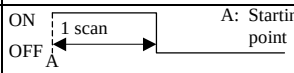
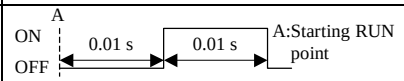
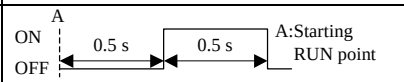
No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R7C0 to R7C7	Undefined	—	—	—	—
R7C8	Serious failure flag [ERR]	0: No serious failure 1: Serious failure	Indicates whether there is an abnormal in the system.	S	U, RCL
R7C9	Microcomputer abnormal [ERR]	0: Normal 1: Abnormal	Indicates whether there is abnormal in the microcomputer.	S	U, RCL
R7CA	User memory abnormal [ERR]	0: Normal 1: Abnormal	Indicates whether there is abnormal in the user memory.	S	U, RCL
R7CB	Undefined	—	—	—	—
R7CC	Undefined	—	—	—	—
R7CD	I/O verify mismatch [ERR]	0: Normal 1: Unmatched	Indicates whether I/O assignment and loading are matched. (Mismatch information output to WRF002)	S	U, RCL
R7CE	Communication module assignment verify mismatch [ERR]	0: Normal 1: Unmatched	Indicates whether I/O assignment and loading are matched. (Mismatch information output to WRF003.)	S	U, RCL
R7CF	Undefined	—	—	—	—
R7D0	Remote abnormal [ERR]	0: Normal 1: Abnormal	Indicates whether the remote module is normal. (Abnormal slot No. display to WRF006, detailed information output to WRF080 to WRF0DF.)	S	U, RCL
R7D1	Overload error (Normal scan) [ERR]	0: Normal 1: Scan time over	Indicates whether the normal scan execution time has exceeded the specified time.	S	U, RCL
R7D2	Overload error (Cyclic scan) [ERR]	0: Normal 1: Scan time over	Indicates whether the cyclic scan was completed within the cycle time.	S	U, RCL
R7D3	Undefined	—	—	—	—
R7D4	Undefined	—	—	—	—
R7D5	Undefined	—	—	—	—
R7D6	I/O assignment points over [ERR]	0: Normal 1: Assignment points over	Indicates whether the number of I/O assigned points has exceeded the maximum points.	S	U, RCL
R7D7	Communication module abnormal [ERR]	0: Normal 1: Abnormal	Indicates whether there is abnormal in the communication module. (Abnormal slot No. output to WRF004)	S	U
R7D8	Clock error [ERR]	0: Normal 1: Abnormal	When clock IC is in error, this bit is activated.	S	U

Main use:

[ERR]…Error display, [DISP]…Status display, [CONT]…CPU control, [PROG]…Program uses, [PRM] …Parameter

Setting / Resetting conditions:

S…ON / OFF by system, U…ON / OFF by user, RCL…OFF by power failure storage area clear, X…Always display

No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R7D9	Battery error [ERR]	0: Normal 1: Abnormal	Indicates the battery voltage drop or the backup memory abnormal.	S	U, RCL *1
R7DA	Undefined	—	—	—	—
R7DB	Self-diagnosis error [ERR]	0: Normal 1: Error	Indicates whether there is a self-diagnosis error. (Detailed information output to WRF000)	S *2	U, RCL
R7DC	Undefined	—	—	—	—
R7DD	Communication module assignment over [ERR]	0: Normal 1: Error	Indicates whether the communication module assignment has exceeded the maximum.	S	U, RCL
R7DE	Link module abnormal [ERR]	0: Normal 1: Abnormal	Indicates whether there is abnormal in the link module. (Abnormal slot No. display to WRF007, detailed information output to WRF0E0 to WRF19F)	S	U, RCL
R7DF	Undefined	—	—	—	—
R7E0	Operation switch position (STOP) [DISP]	0: RUN switch position is RUN. 1: RUN switch position is STOP	R7E0 or R7E2 is ON.	S	S
R7E1	Undefined	—	—	—	—
R7E2	Operation switch position (RUN) [DISP]	0: RUN switch position is STOP 1: RUN switch position is RUN	R7E0 or R7E2 is ON.	S	S
R7E3	1 scan ON after RUN [PROG]	0: From the 2nd scan after RUN 1: The 1st scan after RUN		S	S
R7E4	Always ON [PROG]	0: Non-status of 0 1: Always	Always outputs 1 regardless of CPU status.	S	OFF not possible
R7E5	0.02 seconds clock [PROG]	0: 0.01 seconds 1: 0.01 seconds		S	S
R7E6	0.1 seconds clock [PROG]	0: 0.05 seconds 1: 0.05 seconds		S	S
R7E7	1.0 second clock [PROG]	0: 0.5 seconds 1: 0.5 seconds		S	S
R7E8	Occupied flag [DISP]	0: Unoccupied 1: Occupied	Indicates occupancy status from the peripheral device.	S	S
R7E9	RUN stop [DISP]	0: Operation allowed 1: Operation prohibited	Indicates whether it is operation prohibited status.	S	S
R7EA	Executing the inline change in RUN [DISP]	0: Not being executed 1: Being executed	Indicates whether operation is temporarily stopped (output hold) due to online change in RUN.	S	S
R7EB	Clear error [CONT]	Clear with 1.	Clears the status such as ERR LED, 70segment LED, CPU status * Not clear the special internal output.	U	S *3
R7EC	Clear error special internal output [CONT]	Clear with 1	Clear error special internal output (WRF000 to F00A, 080 to 0DF, 0E0, 140, 1A0, 200, 260, 2C0, 320, 380, R7C8 to 7DE), ERR LED, 7-segment LED, CPU status.	U	S *3
R7ED	Undefined	—	—	—	—
R7EE	Undefined	—	—	—	—
R7EF	Backup memory writing execution flag [DISP]	0: Write complete 1: Write in progress	Indicates whether data is being writing to the backup memory.	S	S
R7F0	Carry flag (C) [PROG]	0: No carry 1: Carry	Indicates whether there is carryover from the operation result.	S	S

Main use:

[ERR]…Error display, [DISP]…Status display, [CONT]…CPU control, [PROG]… Use in program, [PRM] …Parameter

Setting / Resetting conditions:

S…ON / OFF by system, U…ON / OFF by user, RCL…OFF by power failure storage area clear, X…Always display

*1 Battery error (R7D9) will turn off when the error factor is gone by exchanging the batteries, etc.

*2 Self-diagnosis error (R7DB) will turn on only on failure. Differently to EH-CPU, error with warning level does not turn on.

*3 This flag is reset at about 40 ms after detecting "1".

No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R7F1	Overflow flag(V) [PROG]	0: No overflow 1: Overflow	Indicates whether there is overflow in the operation result.	S	S
R7F2	Shift data (SD) [PROG]	0: Sift data "0" 1: Sift data "1"	Specifies the shift data used in shift commands, etc.	U	U
R7F3	Operation error (ERR) [PROG]	0: Normal 1: Error	Indicates whether there is an operation error when executing operation.	S	S
R7F4	Data error (DER) [PROG]	0: Normal 1: Error	Indicates whether there is data error when executing operation.	S	S
R7F5 to R7F7	Undefined	—	—	—	—
R7F8	Calendar, Clock read request [CONT]	1: Read	Reads current value of calendar and clock, and sets in WRF01B to WRF01F.	U	S *3
R7F9	Calendar, Clock setting request [CONT]	1: Set	Sets data set in WRF01B to WRF01F into calendar and clock.	U	S *4
R7FA	Clock ± 30 seconds adjustment request [CONT]	1: Adjustment request	It becomes0 second when second data (WRF00F) is 0 to 29, and +1 minute is added and second data becomes 0 when it is 30 to 59.	U	S *4
R7FB	Calendar, Clock setting data error [ERR]	0: Normal 1: Error	Indicates whether there is an error in calendar and clock set data.	S	S
R7FC	Undefined	—	—	—	—
R7FD	Undefined	—	—	—	—
R7FE	Undefined	—	—	—	—
R7FF	Undefined	—	—	—	—
R800 *1	No fixed IP address [ERR]	0: Normal 1: Error	IP address of Ethernet port is unfixed.	S	U, RCL
R801 *1	No fixed serial communication setup [ERR]	0: Normal 1: Error	Setup about serial communication port is unfixed.	S	U, RCL
R802 *1	No fixed Ethernet task code function setup [ERR]	0: Normal 1: Error	Parameter about task code function of Ethernet port is not fixed.	S	U, RCL
R803 *1	No fixed ASR function setup [ERR]	0: Normal 1: Error	Parameter about ASR function of Ethernet port is not fixed.	S	U, RCL
R804 *1	No fixed NTP function setup [ERR]	0: Normal 1: Error	Parameter about NTP function of Ethernet port is not fixed.	S	U, RCL
R805 *1	No fixed security function parameter [ERR]	0: Normal 1: Error	Parameter about security function is unfixed.	S	U, RCL
R806 *1 *2	No fixed ASR mode setup [ERR]	0: Normal 1: Error	Parameter about ASR mode of Ethernet port is not fixed.	S	U, R.CL
R807	No fixed Modbus-TCP parameter [ERR]	0: Normal 1: Error	The parameter about a Modbus-TCP server function is undefined.	S	S
R808 to R8FF	Undefined	—	—	—	—
R900	NTP time retrieval user program control valid/invalid [CONT]	0: Program setting cycle 1: Control by R901 ➔Refer to the application manual for network for details.	Specifies whether to perform the time data retrieval from NTP server with the cycle set in programmer, or to control it by R901.	U	U

Main use:

[ERR]…Error display, [DISP]…Status display, [CONT]…CPU control, [PROG]…Use in program, [PRM] …Parameter

Setting / Resetting conditions.

S…ON / OFF by system, U…ON / OF by user, RCL…OFF by power failure storage area clear, X…Always display

*1 Even if there were multiple error factors, only one bit is turned on.

*2 This is supported by software Ver.*112 or newer. (For * of software Ver., 0 indicates EHV-CPU128, 1 indicates EHV-CPU64, 2 indicates EHV-CPU32, and 3 indicates EHV-CPU16.)

*3 This flag is reset at about 40 ms after detecting "1".

*4 This flag is reset at about 100 ms after detecting "1".

No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R901	NTP time retrieval request [CONT, PROG]	1: Retrieval start ➔Refer to the application manual for network for details.	Retrieves the time data from NTP server.	U	S *1
R902	NTP time retrieval result [ERR]	0: Retrieval success 1: Retrieval failure ➔Refer to the application manual for network for details.	Indicates failure of the time data retrieval from NTP server.	S	U
R903 to R90F	Undefined	—	—	—	—
R910	Ethernet port Task code port 1 [CONT]	1: Re-construction request	Returns the task code port 1 processing to the initial status.	U	S *2
R911	Ethernet port Task code port 2 [CONT]	1: Re-construction request	Returns the task code port 2 processing to the initial status.	U	S *2
R912	Ethernet port Task code port 3 [CONT]	1: Re-construction request	Returns the task code port 3 processing to the initial status.	U	S *2
R913	Ethernet port Task code port 4 [CONT]	1: Re-construction request	Returns the task code port 4 processing to the initial status.	U	S *2
R914	Ethernet port ASR port 1 [CONT]	1: Re-construction request	Returns the ASR port 1 processing to the initial status.	U	S *2
R915	Ethernet port ASR port 2 [CONT]	1: Re-construction request	Returns ASR port 2 processing to the initial status.	U	S *2
R916	Ethernet port ASR port 3 [CONT]	1: Re-construction request	Returns ASR port 3 processing to the initial status.	U	S *2
R917	Ethernet port ASR port 4 [CONT]	1: Re-construction request	Returns ASR port 4 processing to the initial status.	U	S *2
R918	Ethernet port ASR port 5 [CONT]	1: Re-construction request	Returns ASR port 5 processing to the initial status.	U	S *2
R919	Ethernet port ASR port 6 [CONT]	1: Re-construction request	Returns ASR port 6 processing to the initial status.	U	S *2
R91A	Modbus-TCP port reset [CONT]	1: Port reset	The port of Modbus-TCP is reset.	U	S *2
R91B to RFFF	Undefined	—	—	—	—

Main use:
[ERR]…Error display, [DISP]…Status display, [CONT]…CPU control, [PROG]…Use in program, [PRM] …Parameter
Setting / Resetting conditions:
S…ON / OFF by system, U…ON / OFF by user, RCL…OFF by power failure storage area clear, X…Always display

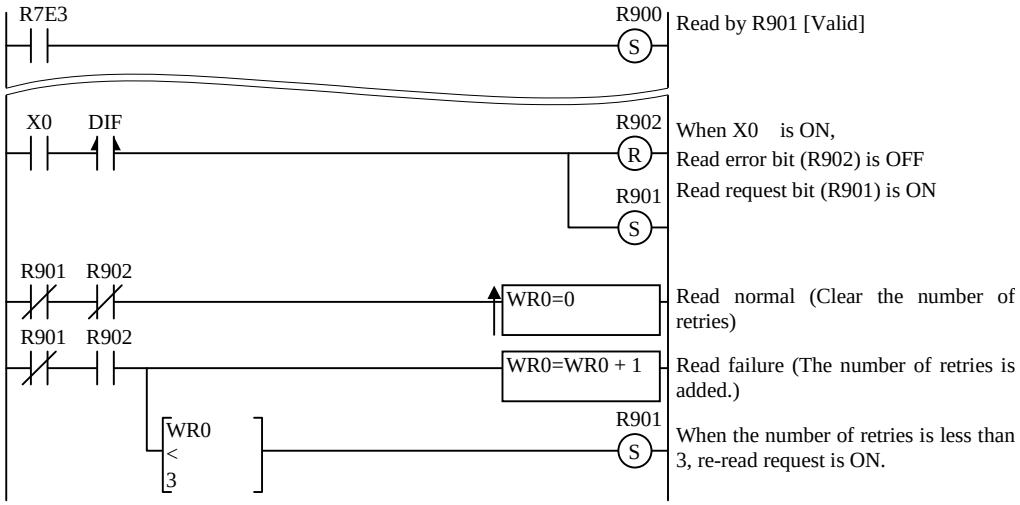
*1 This flag is reset at the time of having retrieved data from NTP server.
*2 This flag is reset between 80 ms and 120 ms after having detected a rising edge from "0" to "1".

(1) Special internal output for NTP client function

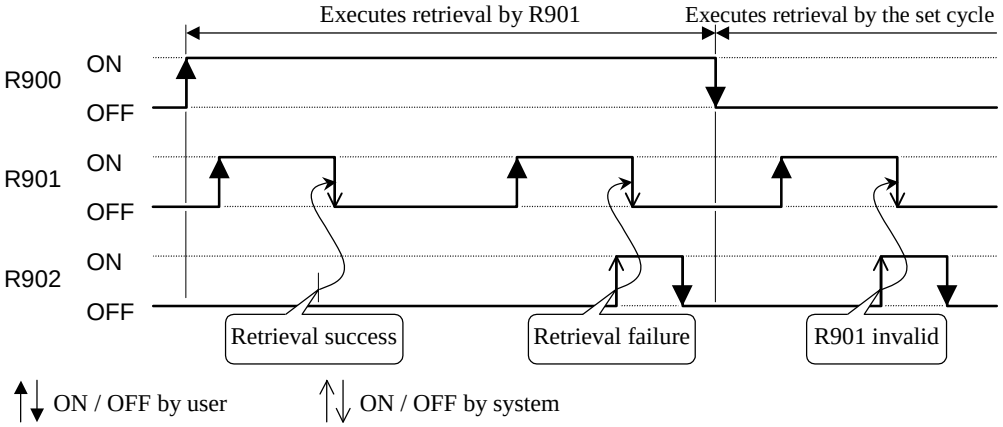
The clock data can be retrieved from NTP server automatically by setting NTP client function using the programming tool.

There are two methods to retrieve the clock data, one is a method by a constant cycle and the other is a method by the user program. In the case of the former, the cycle is specified using the programming tool. In the case of the latter, the bit special internal output is used. (In both cases, it needs to validate the NTP client function beforehand using the programming tool.)

■ Clock data read using NTP client function Sample program



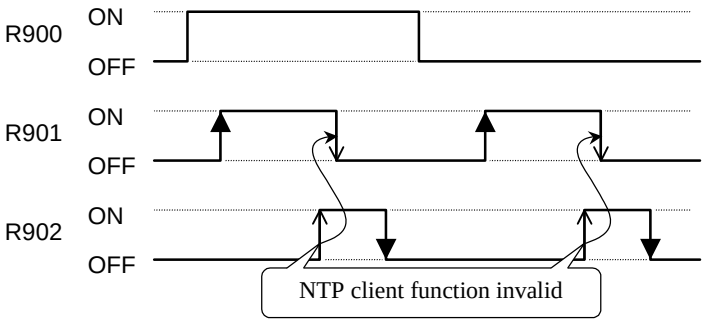
■ Control of special internal output



Note

In order to validate NTP client function, the power supply needs to be turned on again after setting the parameter using the programming tool.

When NTP client function is invalid, the clock data cannot be read from NTP server using the special internal output.



Appendix 2.2 Word Special Internal Output

The word special internal output area is from WRF000 to WRFFFF. Each word function is shown in the following table.

No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condision
WRF000	Self-diagnosis error code [ERR]	Error code (2 digit hexadecimal, upper 2 digits are 00)	Stores the error No. in CPU as a binary code.	S	U
WRF001	Undefined	—	—	—	—
WRF002 (R7CD)	I/O verify mismatch details [ERR]	Mismatched slot No.*1	15 12 11 8 7 4 3 0 0 | a | b | 0 a: Unit No. (0 to 5) b: Slot No. (0 to A)	S	U
WRF003 (R7CE)	Communication module I/O verify mismatch details [ERR]	Mismatched module slot No. *1	Stores the mismatched slot No. (Lower 4 bits: 0 to 7, upper bit: 0)	S	U
WRF004 (R7D7)	Communication module abnormal slot No. [ERR]	Slot No. of communication module with abnormal*1	Stores abnormal slot No. (Lower 4 bits: 0 to 7, upper: 0)	S	U
WRF005 (R7D5)	I/O module abnormal slot No. [ERR]	Slot No. of I/O module with abnormal*1	15 12 11 8 7 4 3 0 0 | a | b | 0 a: Unit No. (0 to 5) b: Slot No. (0 to A)	S	U
WRF006 (R7D0)	Remote I/O master station abnormal slot No. [ERR]	Slot No. of module with abnormal*1		S	U
WRF007 (R7DE)	Link module abnormal slot No. [ERR]	Slot No. of module with abnormal*1		S	U
WRF008 to WRF00A	Undefined	—	—	—	—
WRF00B	Calendar and clock Current value (4-digit BCD) [DISP]	Year	Always displays the 4-digit year.	S	X
WRF00C		Month / day	Always displays month/day.	S	X
WRF00D		Day of the week	Always displays day of the week. (Sun: 0000 to Sat.: 0006)	S	X
WRF00E		Hour/minute	Always displays hour/minute. (24-hour notation)	S	X
WRF00F		Second	Always displays second data. (Lower 2 digits and upper 2 digits are 00)	S	X
WRF010	Scan time (Maximum) [DISP]	Maximum execution time for a normal scan	Stores the maximum execution time for a normal scan in 1 ms unit.	S	S
WRF011	Scan time (Current) [DISP]	Current execution time for a normal scan	Stores the current execution time for a normal scan in 1 ms unit.	S	S
WRF012	Scan time (Minimum) [DISP]	Minimum execution time for a normal scan	Stores the minimum execution time for a normal scan in 1 ms unit. (The 1st scan is HFFFF after RUN.)	S	S
WRF013	CPU status [DISP]	15 12 11 8 7 6 5 4 3 2 1 0 Unused | a | b | c | d | e | f | g | h | i a: CPU type (1000)、 b: Battery error (1-error, 0-no error)、 c: Unused, d: Unused, e: Unused, f: Error (1-error, 0-no error), g: Unused, h: Halt (1-executing, 0-no executing), i: CPU operation (1-RUN, 0-STOP)	S	S

Main use:
[ERR]…Error display, [DISP]…Status display, [CONT]…CPU control, [PROG]…Use in program, [PRM] …Parameter
Setting / Resetting conditions:
S…ON / OFF by system, U…ON / OFF by user, RCL…OFF by power failure storage area clear, X…Always display

*1 When checking to see which slot is currently in error, it needs to turn off the respective bit special internal output (the number within ( ) of the No. column) once, to turn on R7EC once.

No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF014	Word internal output capacity [DISP]	Number of words for word internal output (WR)	EHV-CPU: HF000	S	X
WRF015	Operation error code	Operation error code	Operation error code is stored. (4 digit hexadecimal)	S	U
WRF016	Division remainder register (lower) [PROG]	Remainder data when executing division command	Double word operation: WRF017 (upper), WRF016 (lower)	S	S
WRF017	Division remainder register (upper) [PROG]		Word operation: only WRF016	S	S
WRF018	Communication module startup flag [DISP]	15 8 7 6 5 4 3 2 1 0 Unused | h | g | f | e | d | c | b | a a: Slot 0, b: Slot 1, …, h: Slot 7 1-startup complete 0-startup incomplete		S	S
WRF019	Undefined	—	—	—	—
WRF01A	Undefined	—	—	—	—
WRF01B	Read value for calendar and clock Set value (4-difit BCD) [DISP, PRM]	Year	Stores the 4-digit year read or sets the set value.	S, U	U
WRF01C		Month/Day	Stores month/day data read or sets the set value.	S, U	U
WRF01D		Day data of the week (Sun.: 0000 to Sat.: 0006)	Stores day data of the week read or sets the set value.	S, U	U
WRF01E		Hour/minute (24-hour system)	Stores hour/minute data read or sets the set value.	S, U	U
WRF01F		Second	Stores second data read or sets the set value.	S, U	U
WRF020 to WRF02F	Communication module status [DISP]	Status data	Represents the communication module status in 2 words. WRF020 to WRF021 Slot 0 WRF022 to WRF023 Slot 1 WRF024 to WRF025 Slot 2 WRF026 to WRF027 Slot 3 WRF028 to WRF029 Slot 4 WRF02A to WRF02B Slot 5 WRF02C to WRF02D Slot 6 WRF02E to WRF02F Slot 7 15 8 7 0 Status 1 | Status 2 Status 3 | Status 4 * Refer to the application manual of each communication module for details.	S	S
WRF030 to WRF03F	Undefined	—	—	—	—
WRF040 WRF042	Occupied member registration area 1 [DISP]	Occupied port No. 15 8 7 0 a | Fixed to 0 b | c d | e a: 0-Not occupied, 1-Read-occupied, 2-Write-occupied b: Loop No. c: Unit No. d: Module No. e: Port No. (Serial H01, Ethernet H03 to H06, USB H07)		S	S
WRF043 WRF045	Occupied member registration area 2 [DISP]			S	S
WRF046 WRF048	Occupied member registration area 3 [DISP]			S	S
WRF049 WRF04B	Occupied member registration area 4 [DISP]			S	S
WRF04C to WRF04F	Undefined	—	—	—	—

Main use:

[ERR]…Error display, [DISP]…Status display, [CONT]…CPU control, [PROG]…Use in program, [PRM] …Parameter

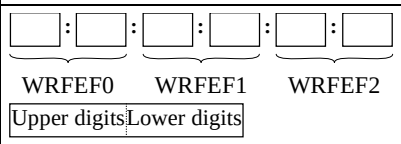
Setting / Resetting conditions:

S…ON / OFF by system, U…ON / OFF by user, RCL…OFF by power failure area clear, X…Always display

No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF050	System software version [DISP]	System software version	Stores the system software version. Ver.0100: H0100	X	X
WRF051 to WRF054	System use area	—	(Area which is used by system.)	X	X
WRF055 to WRF07F	Undefined	—	—	—	—
WRF080 to WRF0DF	Remote master error flag [DISP]	Remote error information ➔ Refer to another table for details	WRF080 to WRF097 Remote master 1 WRF098 to WRF0AF Remote master 2 WRF0B0 to WRF0C7 Remote master 3 WRF0C8 to WRF0DF Remote master 4	S	S
WRF0E0 to WRF3DF	Link error flag [DISP]	Link information ➔ Refer to another table for details	WRF0E0 to WRF13F Link 1 WRF140 to WRF19F Link 2 WRF1A0 to WRF1FF Link 3 WRF200 to WRF25F Link 4 WRF260 to WRF2BF Link 5 WRF2C0 to WRF31F Link 6 WRF320 to WRF37F Link 7 WRF380 to WRF3DF Link 8	S	S
WRF3E0 to WRF409	Undefined	—	—	—	—
WRF40A	NTP client time zone [PRM, DISP]	Time zone setting	Specifies the time zone of NTP client function. ➔ Refer to another table for the set value. * Sets current time zone set value in system only when the power is ON.	S, U	X
WRF40B	read value from NTP server for calendar and clock (4-digit BCD) [DISP]	Year	Sets the 4-digit year read from NTP server .	S	U
WRF40C		Month/day	Sets month/day data read from NTP server.	S	U
WRF40D		Day data of the week (Sun.: 0000 to Sat.: 0006)	Sets day data of the week read from NTP server.	S	U
WRF40E		Hour/minute (24-hour system)	Sets hour/minute data read from NTP server.	S	U
WRF40F		Second	Sets second data read from NTP server.	S	U
WRF410 to WRF5FF	Undefined	—	—	—	—
WRF600 to WRF617	Ethernet port ASR communication control [PROG]	Control of ASR communication, status display ➔ Refer to another table for details	WRF600 to WRF603 ASR port 1 WRF604 to WRF607 ASR port 2 WRF608 to WRF60B ASR port 3 WRF60C to WRF60F ASR port 4 WRF610 to WRF613 ASR port 5 WRF614 to WRF617 ASR port 6	Refer to another table	Refer to another table
WRF618 to WRF62F	Undefined	—	—	—	—
WRF630 to WRF68F *1	Ethernet port ASR communication control [PROG, DISP]	Setup of ASR mode and sending size, the display of receiving size. ➔ See the attached table for details.	WRF630 - WRF63F ASR port 1 WRF640 - WRF64F ASR port 2 WRF650 - WRF65F ASR port 3 WRF660 - WRF66F ASR port 4 WRF670 - WRF67F ASR port 5 WRF680 - WRF68F ASR port 6	See the attached table.	See the attached table.
WRF690 to WRFE9E	Undefined	—	—	—	—

Main use:
[ERR]…Error display, [DISP]…Status display, [CONT]…CPU control, [PROG]…Use in program, [PRM] …Parameter
Setting / Resetting conditions:
S…ON / OFF by system, U…ON / OFF by user, RCL…OFF by power failure storage area clear, X…Always display

*1 This is supported by software Ver.*112 or newer. (For * of software Ver., 0 indicates EHV-CPU128, 1 indicates EHV-CPU64, 2 indicates EHV-CPU32, and 3 indicates EHV-CPU16.)

No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRFE9F *1	Ethernet port communication speed [DISP]	Displays communication speed of Ethernet port which is set to EHV-CPU	0: Auto-negotiation 1: 100 Mbps / Full duplex 2: 100 Mbps / Half duplex 3: 10 Mbps / Full duplex 4: 10 Mbps / Half duplex	S	X
WRFEA0 to WRFEEF	Undefined	–	–	–	–
WRFEF0 to WRFEF2	MAC address [DISP]	Displays Ethernet peculiar address of EHV-CPU (MAC address)	 Example) Case of 00:00:E1:73:34:FD WRFEF0 … H0000 WRFEF1 … HE173 WRFEF2 … H34FD	S	X
WRFEF3 to WRFEFC	Undefined	—	—	—	—
WRFEFD	Hours of system operation [DISP]	Second lower		S	X
WRFEFE	Hours of system operation [DISP]	Second upper		S	X
WRFEFF	History memory number of times [DISP]	Displays the memory number of times for operation/error history	Displays the number of times stored as history.	S	X
WRFF00 to WRFFFF	Operation / error history [DISP]	Operation and error history memory of CPU ➔ Refer to another table for details	One data consists of 8 words, and memorizes operation information and error information	S	X

Main use:
[ERR]…Error display, [DISP]…Status display, [CONT]…CPU control, [PROG]…Use in program, [PRM] …Parameter
Setting / Resetting conditions:
S…ON / OFF by system, U…ON / OFF by user, RCL…OFF by power failure storage area clear, X…Always display

*1 This is supported by software Ver.*107 or newer. (For '*'of software Ver., 0 indicates EHV-CPU128, 1 indicates EHV-CPU64, 2 indicates EHV-CPU 32, and 3 indicates EHV-CPU16.

(1) Remote Error Flag Area

The details of remote error flag area for coaxial and optical remote module area are shown below.

For compact remote module (EH-TRMME/TRMLE), refer to the dedicated manual.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Slave station participation flag	a																+00
Slave station error flag	b																+01
Master station error detail information	c	d	e	f	g	h	i	j	Number of times transmission error *								+02
Slave station No.0 detail information	c	d	-	f	g	h	i	-	Number of times transmission error *								+03
Slave station No.1 detail information	c	d	-	f	g	h	i	-	Number of times transmission error *								+04
Slave station No.2 detail information	c	d	-	f	g	h	i	-	Number of times transmission error *								+05
Slave station No.3 detail information	c	d	-	f	g	h	i	-	Number of times transmission error *								+06
Slave station No.4 detail information	c	d	-	f	g	h	i	-	Number of times transmission error *								+07
Slave station No.5 detail information	c	d	-	f	g	h	i	-	Number of times transmission error *								+08
Slave station No.6 detail information	c	d	-	f	g	h	i	-	Number of times transmission error *								+09
Slave station No.7 detail information	c	d	-	f	g	h	i	-	Number of times transmission error *								+0A
Slave station No.8 detail information	Undefined																+0B
Slave station No.9 detail information	Undefined																+0C
Slave station No.10 detail information	Undefined																+0D
Slave station No.11 detail information	Undefined																+0E
Slave station No.12 detail information	Undefined																+0F
Slave station No.13 detail information	Undefined																+10
Slave station No.14 detail information	Undefined																+11
Slave station No.15 detail information	Undefined																+12
I/O verify mismatch slot No.	0									Slave station No.				Slot No.			+13
I/O error slot No.	0									Slave station No.				Slot No.			+14
Refresh time (Maximum)	(unit: ms)																+15
Refresh time (Minimum)	(unit: ms)																+16
Refresh time (Current)	(unit: ms)																+17

* [Number of times transmission error] a cumulative total of the number of c or d error occurrences.

a: Bit No. corresponds to the slave station No. (1: participating 0: non-participating)

b: Bit No. corresponds to the slave station No. (1: error 0: no error)

c: Time out error (1: error 0: no error)

d: Frame error (1: error 0: no error)

e: System bus error (1: error 0: no error)

f: Slave station I/O error (1: error 0: no error)

g: Duplicate station No. (1: error 0: no error)

h: Slave station connection mismatch (1: error 0: no error)

i: I/O information mismatch (1: error 0: no error)

j: Remote points error (1: error 0: no error)

-: Undefined

(2) Link error flag area

The details of link error flag area for coaxial and optical remote module area are shown below.

For compact link module (EH-TRLLE/TLNKE), refer to the dedicated manual.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Local station error information	Undefined		a	b	c	d	e	f	Undefined		Disconnected station No.						+00
Link participation flag (g)	15	～														0	+01
	31	～														16	+02
	47	～														32	+03
	63	～														48	+04
Link operation status flag (h)	15	～														0	+05
	31	～														16	+06
	47	～														32	+07
	63	～														48	+08
CPU status flag (i)	3			2				1			0						+09
	⋮			⋮				⋮			⋮						⋮
	63			62				61			60						+18
Error status flag (j)*1	15	～														0	+19
	31	～														16	+1A
	47	～														32	+1B
	63	～														48	+1C
Station 0 to63 Error detail information	k	l	m	Undefined					Number of times transmission error*2								+1D
	⋮			⋮					⋮								⋮
	k	l	m	Undefined					Number of times transmission error*2								+5C
Refresh time (Maximum)	(unit: ms)																+5D
Refresh time (Minimum)	(unit: ms)																+5E
Refresh time (Current)	(unit: ms)																+5F

*1 [Error status flag] is set to 1 when one error of k, l, and m of [Error detail information] occurs.
k, l, and m are set to 1 when error occurs in peripheral device in connecting with the CPU of other station.
*2 [Number of times transmission error] is a cumulative total of the number of k or l error occurrences.

a: System bus error (1-error, 0-no error)

b: Undefined

c: Area error (1-error, 0-no error)

d: Duplicate area error (1-error, 0-no error)

e: Station No. error (1-error, 0-no error)

f: Transmission path disconnected (1-error, 0-no error)

g: Number indicates the station No. (1-participation, 0-non-participation)

h: Number indicates the station No. (1-operating, 0-stopped)

i: Number indicates the station No.

[1]	[2]	[3]	[4]

(of 4 bits, [1]1-CPU error, 0-normal [2]Undefined [3]1-HALT status, 0-other than HALT status [4]1-running, 0-stopped)

j: Number indicates the station No. (1-error, 0-no error)

k: Time out error (1-error, 0-no error)

l: Frame error (1-error, 0-no error)

m: Abnormal between CPU and link (1-abnormal, 0-normal)

(3) NTP client functional time zone

The relation between the value set to WRF40A and the time zone is shown below.

Set value	Time zone
H0000	GMT – 12:00
H0001	GMT – 11:00
H0002	GMT – 10:00
H0003	GMT – 9:00
H0004	GMT – 8:00
H0005	GMT – 7:00
H0006	GMT – 6:00
H0007	GMT – 5:00
H0008	GMT – 4:00
H0009	GMT – 3:30
H000A	GMT – 3:00
H000B	GMT – 2:00
H000C	GMT – 1:00

Set value	Time zone
H000D	GMT
H000E	GMT + 1:00
H000F	GMT + 2:00
H0010	GMT + 3:00
H0011	GMT + 3:30
H0012	GMT + 4:00
H0013	GMT + 4:30
H0014	GMT + 5:00
H0015	GMT + 5:30
H0016	GMT + 5:45
H0017	GMT + 6:00
H0018	GMT + 6:30
H0019	GMT + 7:00

Set value	Time zone
H001A	GMT + 8:00
H001B	GMT + 9:00
H001C	GMT + 9:30
H001D	GMT + 10:00
H001E	GMT + 11:00
H001F	GMT + 12:00
H0020	GMT + 13:00
Outside of range	GMT

Note

When the parameter is set to WRF40A, the value of the time zone is validated at that time. However, if the change is performed while reading from NTP server, the time zone is the value before changing.

(4) Ethernet communication port ASR function

■ Status register and Control register

The status register for ASR and the control register are from WRF600 to WRF617 of the special internal output. In order to user the message communication (ASR function), the control register has to be operated with reference the status register for ASR. The status register and the control register are shown below.

Refer to the application manual for network for a concrete program.

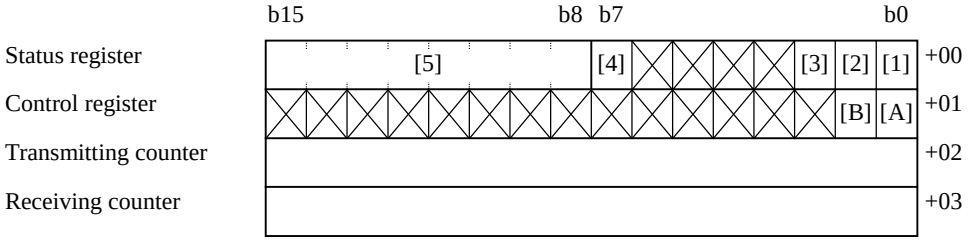


Fig. 7.8 Status register and Control register

[Status register]

[1] Port status flag 1: be opening

[2] Event transmitting complete flag 1: Transmitting completion

[3] Receiving complete flag 1: Receiving completion

[4] Error flag 1: Error occurrence

[5] Error code 0x01: Though the port does not open, the even transmitting request flag is turned on.

0x02: The event transmitting request flag is turned on again as transmitting is not completed.

[Control register]

[A] Port open request flag 1: Opened request, 0: Closed request

[B] Event transmitting request flag 1: Transmitting start

■ Mode, Sending data size and Receiving data size

The new function of ASR communication was added from the software Ver.x112 or newer.

- The sending data size is dynamically changed of bytes in the ladder program.
- The receiving data size is referred to in the ladder program.

Special internal outputs about this function are assigned after WRF630.

Please refer to network of the application manual for the details of this function.

Special internal outputs	Meanings
WRF630 - WRF63F	Mode, Sending data size and Receiving data size about ASR port 1.
WRF640 - WRF64F	Mode, Sending data size and Receiving data size about ASR port 2
WRF650 - WRF65F	Mode, Sending data size and Receiving data size about ASR port 3.
WRF660 - WRF66F	Mode, Sending data size and Receiving data size about ASR port 4.
WRF670 - WRF67F	Mode, Sending data size and Receiving data size about ASR port 5.
WRF680 - WRF68F	Mode, Sending data size and Receiving data size about ASR port 6.

No	Name	Set condition	Reset condition
WRF6x0	Setup of mode	ON by system and user	OFF by user
WRF6x1	Setup of sending data size for send area 1	ON by user	OFF by user
WRF6x2	Setup of sending data size for send area 2	ON by user	OFF by user
WRF6x3	Setup of sending data size for send area 3	ON by user	OFF by user
WRF6x4	Setup of sending data size for send area 4	ON by user	OFF by user
WRF6x5	Setup of sending data size for send area 5	ON by user	OFF by user
WRF6x6	Setup of sending data size for send area 6	ON by user	OFF by user
WRF6x7	Setup of sending data size for send area 7	ON by user	OFF by user
WRF6x8	Setup of sending data size for send area 8	ON by user	OFF by user
WRF6x9	Setup of sending data size for send area 9	ON by user	OFF by user
WRF6xA	Setup of sending data size for send area 10	ON by user	OFF by user
WRF6xB	Display of receiving data size	ON by system	OFF by user
WRF6xC ～ WRF6xF	Reserve	—	—

* "x" of No means 3-8.

(5) History of operation / error

This is a area to store histories of which user performs operations to the CPU module and histories of error occurring in the CPU module. The maximum of 32 histories can be stored. Since the history storage area is a link buffer, histories over 32 overwrite the oldest histories. The number of times of history storage (WREFFF) is added even if the history stored in the history storage area exceeds 32, and it returns to 0 if it exceeds 65,535.

Further, though user cannot clear the history area, if the battery is dead, the history is deleted and is re-stored from the first.

The details of the history area of operation / error is shown below.

	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
No.	History storage No.	+00
Storage 4-digit year	Calendar and clock data (4-digit year) of CPU module	+01
Storage month/day	Calendar and clock data (month/day) of CPU module	+02
Storage hour/minute	Calendar and clock data (hour/minute) of CPU module	+03
Storage second	Calendar and clock data (second) of CPU module	+04
Error code / operation code	Refer to the followings.	+05
(Spare)	-	+06
(Spare)	-	+07

■ Operation to store

Operations and codes to store are shown below.

No.	Operation	Memory code	Remarks
1	CPU initializing	H8001	
2	Program transfer (ALL)	H8002	
3	Online change in RUN	H8005	
4	Power failure storage area clear	H8006	
5	Error clear	H8007	
6	7-seg clear	H8008	
7	Battery error restoration	H8009	
8	Power supply ON	H8010	
9	RUN start	H8011	
10	STOP	H8012	
11	Clock data change	H8020	
12	Each setting change (Change from C/E)	H8021	
13	Automatic restoration of user program	H8030	

■ Error to store

If the CPU module detects error, the error code (the same as the value set to WRF000) of the detected error is stored. Further, though the programming tool can detect the error detection level, all errors which occur are stored in the history area regardless level.

Reference

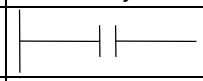
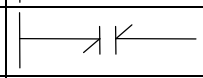
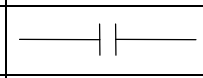
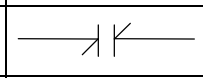
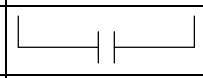
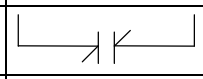
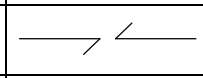
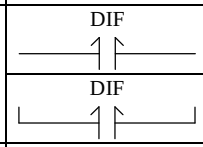
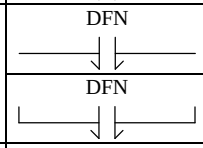
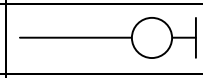
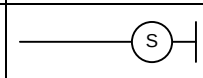
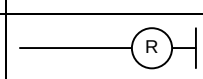
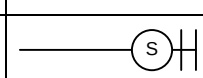
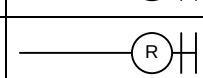
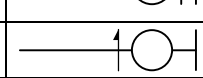
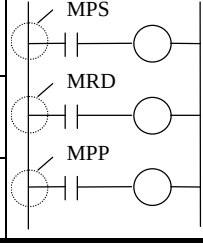
Since the operation and error factors are displayed legibly if the CPU history indication function of the programming tool is used, the construction of the history area and codes need not be checked

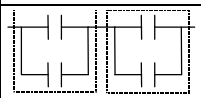
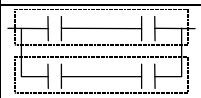
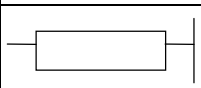
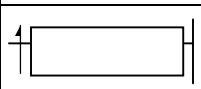
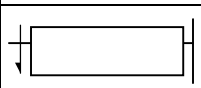
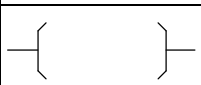
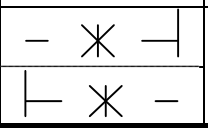
Appendix 3 List of Commands

The list of commands which are usable in EHV-CPU is shown in the following table.

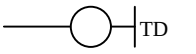
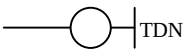
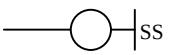
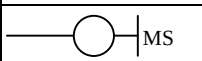
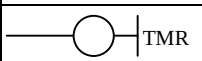
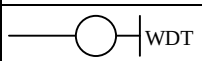
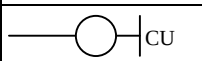
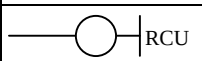
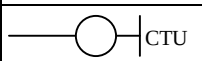
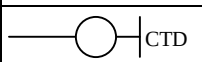
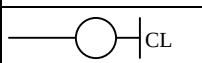
Refer to the programming manual for details.

(1) Basic commands (sequence commands)

No.	Ladder symbol	Command name	Process description
1		Logical operation start	Indicates the commencement of a-contact operation.
2		Logical negation operation start	Indicates the commencement of b-contact operation.
3		Logical AND	Indicates a-contact series connection.
4		Logical NAND	Indicates b-contact series connection.
5		Logical OR	Indicates a-contact parallel connection.
6		Logical NOR	Indicates b-contact parallel connection.
7		Logical NOT	Reverses all operation results up to then.
8		Rising edge detection	Indicates detection of the input rise.
9		Falling edge detection	Indicates detection of the input fall.
10		Coil output	Indicates an output coil.
11		Set coil output	Indicates a set output.
12		Reset coil output	Indicates a reset output.
13		Set master control	Indicates a master control set operation.
14		Reset master control	Indicates a master control reset operation.
15		Coil with edge (rise)	Detects a condition rise, and an output is turned on only for one scan.
16		Coil with edge (fall)	Detects a condition fall, and an output is turned on only for one scan.
17		Operation result push	Saves the operation result immediately prior.
18		Operation result read	Reads the saved operation result and continues operation.
19		Operation result pull	Reads the saved operation result, continues operation, and clears the saved result.

No.	Ladder symbol	Command name	Process description
20		Logical block series connection	Indicates series connection between two logical blocks.
21		Logical block parallel connection	Indicates parallel connection between two logical blocks.
22		Processing box start and end	Indicates start and end of a processing box.
23		Processing box with edge start and end (rise)	Indicates start and end of a processing box. (A scan only of which the condition in front of the processing box is turned on is executed.)
24		Processing box with edge start and end (fall)	Indicates start and end of a processing box. (A scan only of which the condition in front of the processing box is turned off is executed.)
25		Relational box start and end	Indicates start and end of a comparison box.
26		Turning symbol	This is used for dividing a line when connecting one or more contact point.

(2) Basic commands (timer, counter)

No.	Ladder symbol	Command name	Process description
1		On delay timer	Indicates an on delay timer operation.
2		Off delay timer	Indicates an off delay timer operation.
3		Single shot	Indicates a single shot operation.
4		Mono stable timer	Indicates a mono stable timer operation.
5		Integral timer	Indicates an integral timer operation.
6		Watchdog timer	Indicates a watchdog timer operation.
7		Counter	Indicates a counter operation.
8		Ring counter	Indicates a ring counter operation.
9		UP of up/down counter	Indicates an up operation of up/down counter.
10		Down of up/down counter	Indicates a down operation of up/down counter.
11		Counter clear	Indicates a clear operation for CU, RCU, CTU, CTD, and WDT.

Reference

(1) Timer

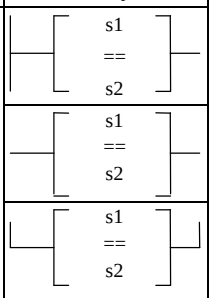
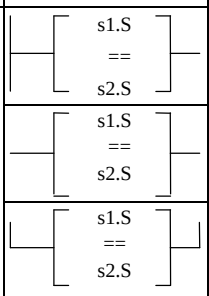
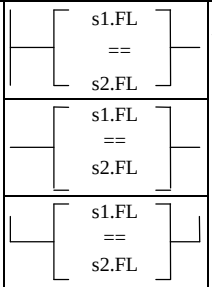
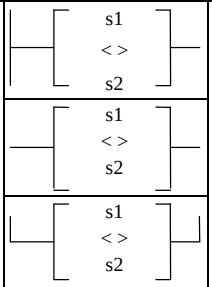
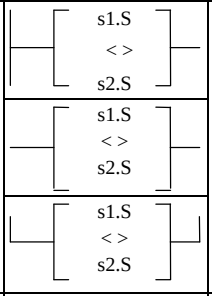
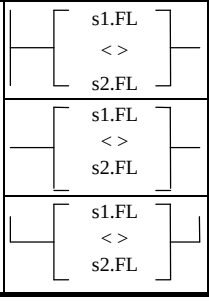
A total point of the timer is 2560 points. A time base can be selected from 1 s, 100 ms, 10 ms, and 1 ms.

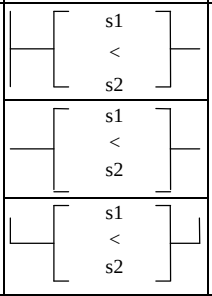
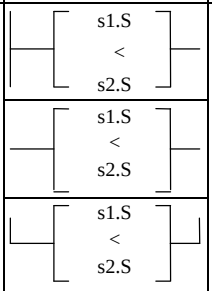
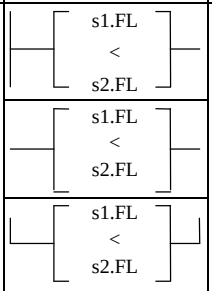
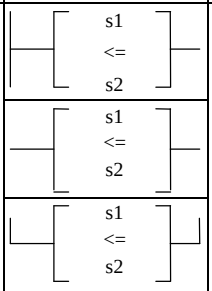
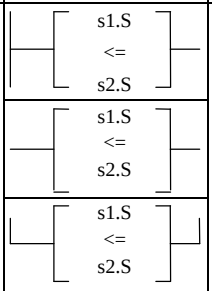
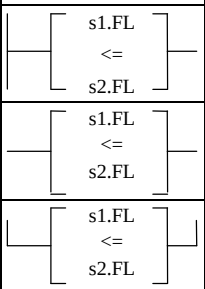
(A point limit of the time base currently in use is abolished.)

(2) Counter

A total point of the counter is 512 points. The timer and the counter cannot use the same No.

(3) Basic commands (relational box)

No.	Ladder symbol	Command name	Process description
1		= Relational box	When s1 = s2: Continuity When s1≠s2: Non-continuity
2		Signed = Relational box	When s1 = s2: Continuity When s1 ≠ s2: Non-continuity s1 and s2 are compared as signed 32-bit binary or signed 16-bit binary.
3		Floating point = Relational box	When s1 = s2: Continuity When s1 ≠ s2: Non-continuity s1 and s2 are compared as floating point.
4		< > Relational box	When s1 = s2: Non-continuity When s1 ≠ s2: Continuity
5		Signed < > Relational box	When s1 = s2: Non-continuity When s1 ≠ s2: Continuity s1 and s2 are compared as signed 32-bit binary or signed 16-bit binary.
6		Floating point < > Relational box	When s1 = s2: Non-continuity When s1 ≠ s2: Continuity s1 and s2 are compared as floating point.

No.	Ladder symbol	Command name	Process description
7		< Relational box	When s1 < s2: Continuity When s1 ≥ s2: Non-continuity
8		Signed < Relational box	When s1 < s2: Continuity When s1 ≥ s2: Non-continuity s1 and s2 are compared as signed 32-bit binary or signed 16-bit binary.
9		Floating point < Relational box	When s1 < s2: Continuity When s1 ≥ s2: Non-continuity s1 and s2 are compared as floating point.
10		<= Relational box	When s1 ≤ s2: Continuity When s1 > s2: Non-continuity
11		Signed <= Relational box	When s1 ≤ s2: Continuity When s1 > s2: Non-continuity s1 and s2 are compared as signed 32-bit binary or signed 16-bit binary.
12		Floating point <= Relational box	When s1 ≤ s2: Continuity When s1 > s2 Non-continuity s1 and s2 are compared as floating point.

No.	Ladder symbol	Command name	Process description
13	s1 > s2	> Relational box	When s1 > s2: Continuity When s1 ≤ s2: Non-continuity
	s1 > s2		
	s1 > s2		
14	s1.S > s2.S	Signed > Relational box	When s1 > s2: Continuity When s1 ≤ s2: Non-continuity s1 and s2 are compared signed 32-bit binary or signed 16-bit binary
	s1.S > s2.S		
	s1.S > s2.S		
15	s1.FL > s2.FL	Floating point > Relational box	When s1 > s2: Continuity When s1 ≤ s2: Non-continuity s1 and s2 are compared as floating point.
	s1.FL > s2.FL		
	s1.FL > s2.FL		
16	s1 >= s2	>= Relational box	When s1 ≥ s2: Continuity When s1 < s2: Non-continuity
	s1 >= s2		
	s1 >= s2		
17	s1.S >= s2.S	Signed >= Relational box	When s1 ≥ s2: Continuity When s1 < s2: Non-continuity s1 and s2 are compared as signed 32-bit binary or signed 16-bit binary.
	s1.S >= s2.S		
	s1.S >= s2.S		
18	s1.FL >= s2.FL	Floating point >= Relational box	When s1 ≥ s2: Continuity When s1 < s2: Non-continuity s1 and s2 are compared as floating point.
	s1.FL >= s2.FL		
	s1.FL >= s2.FL		

(4) Arithmetic command

No.	Ladder symbol	Command name	Process description
1	d = s	Substitution statement	d ← s
	d = s.m2	Substitution statement (Bit←Bit cut)	d ← s (the m2th bit) d is bit I/O
	d.m1 = s	Substitution statement (Bit cut ←Bit)	d (the m1st bit) ← s s is bit I/O.
	d.m1 = s.m2	Substitution statement (Bit cut ← Bit cut)	d (the m1st bit) ← s (the m2nd bit)
2	d.S = s.S (d =s.S, and d.S = s are possible)	Substitution statement (Signed integer)	d.S ← s.S
3	d.FL = s.FL	Substitution statement (Floating point)	d.FL ← s.FL d.FL and s.FL are double word.
4	d = s1 + s2	Binary addition	d ← s1＋s2
5	d.S = s1.S + s2.S	Binary addition (Signed)	d.S ← s1.S + s2.S
6	d = s1 B + s2	BCD addition	d ← s1 + s2
7	d.FL = s1.FL + s2.FL	Binary addition (Floating point)	d.FL ← s1.FL＋s2.FL [FUN 105(s)]
8	d = s1 - s2	Binary subtraction	d ← s1 - s2
9	d.S = s1.S - s2.S	Binary subtraction (Signed)	d.S ← s1.S – s2.S
10	d = s1 B - s2	BCD subtraction	d ← s1 - s2
11	d.FL = s1.FL - s2.FL	Binary subtraction (Floating point)	d.FL ← s1.FL - s2.FL [FUN 106(s)]
12	d＝s1 × s2	Binary multiplication	d ← s1 × s2
13	d.S = s1.S × s2.S	Signed binary multiplication	d.S ← s1.S × s2.S
14	d＝s1 B × s2	BCD multiplication	d ← s1 × s2
15	d.FL = s1.FL × s2.FL	Binary multiplication (Floating point)	d.FL ← s1.FL × s2.FL [FUN 107(s)]
16	d = s1 / s2	Binary division	[Word] d ← s1 / s2 WRF016 ← s1 mod s2 [Double word] d ← s1 / s2 DRF016 ← s1 mod s2 * Floating point has no remainder. [Floating point is FUN 107(s)]
17	d.S = s1.S / s2.S	Signed binary division	
18	d = s1 B/ s2	BCD division	
19	d.FL = s1.FL / s2.FL	Binary division (Floating point)	

[ ] : Ladder symbol in EH/H series

No.	Ladder symbol	Command name	Process description
20	d = s1 OR s2	Logical OR	d ← s1 + s2
	d = s1.m1 OR s2	Logical OR (Bit cut)	d ← s1 (the m1 bit) + s2
	d = s1 OR s2.m2	Logical OR (Bit cut)	d ← s1 + s2 (the m2 bit)
	d = s1.m1 OR s2.m2	Logical OR (Bit cut)	d ← s1 (the m1 bit) + s2 (the m2 bit)
	d.m0 = s1 OR s2	Logical OR (Bit cut)	d (the m0 bit) ← s1 + s2
	d.m0 = s1.m1 OR s2	Logical OR (Bit cut)	d (the m0 bit) ← s1 (the m1 bit) + s2
	d.m0 = s1 OR s2.m2	Logical OR (Bit cut)	d (the m0 bit) ← s1 + s2 (the m2 bit)
	d.m0 = s1.m1 OR s2.m2	Logical OR (Bit cut)	d (the m0 bit) ← s1 (the m1 bit) + s2 (the m2 bit)
21	d = s1 AND s2	Logical AND	d ← s1 · s2
	d = s1.m1 AND s2	Logical AND (Bit cut)	d ← s1 (the m1 bit) · s2
	d = s1 AND s2.m2	Logical AND (Bit cut)	d ← s1 · s2 (the m bit)
	d = s1.m1 AND s2.m2	Logical AND (Bit cut)	d ← s1 (the m1 bit) · s2 (the m bit)
	d.m0 = s1 AND s2	Logical AND (Bit cut)	d (the m0 bit) ← s1 · s2
	d.m0 = s1.m1 AND s2	Logical AND (Bit cut)	d (the m0 bit) ← s1 (the m1 bit) · s2
	d.m0 = s1 AND s2.m2	Logical AND (Bit cut)	d (the m0 bit) ← s1·s2 (the m bit)
	d.m0 = s1.m1 AND s2.m2	Logical AND (Bit cut)	d (the m0 bit) ← s1 (the m1 bit) · s2 (the m bit)
22	d = s1 XOR s2	Exclusive OR	d ← s1 ⊕ s2
	d = s1.m1 XOR s2	Exclusive OR (Bit cut)	d ← s1 (the m1 bit) ⊕ s2
	d = s1 XOR s2.m2	Exclusive OR (bit cut)	d ← s1 ⊕ s2 (the m bit)
	d = s1.m1 XOR s2.m2	Exclusive OR (Bit cut)	d ← s1 (the m1 bit) ⊕ s2 (the m bit)
	d.m0 = s1 XOR s2	Exclusive OR (Bit cut)	d (the m0 bit) ← s1 ⊕ s2
	d.m0 = s1.m1 XOR s2	Exclusive OR (Bit cut)	d (the m0 bit) ← s1 (the m1 bit) ⊕ s2
	d.m0 = s1 XOR s2.m2	Exclusive OR (Bit cut)	d (the m0 bit) ← s1 ⊕ s2 (the m bit)
	d.m0 = s1.m1 XOR s2.m2	Exclusive OR (Bit cut)	d (the m0 bit) ← s1 (the m1 bit) ⊕ s2 (the m bit)

No.	Ladder symbol	Command name	Process description
23	d = s1 == s2	= Relational expression	When s1 = s2, d ← 1 When s1 ≠ s2, d ← 0
	d.m = s1 == s2	= Relation expression	When s1 = s2, d.m ← 1 When s1 ≠ s2, d.m ← 0
24	d = s1.S == s2.S	Signed = Relational expression	When s1.S = s.S2, d ← 1 When s1.S ≠ s2.S, d ← 0 s1 and s2 are compared as signed 16-bit binary or signed 32-bit binary.
	d.m = s1.S == s2.S	Signed = Relational expression	When s1.S = s2.S, d.m ← 1 When s1.S ≠ s2.S, d.m ← 0 s1 and s2 are compared as signed 16-bit binary or signed 32-bit binary.
25	d = s1.FL == s2.FL	Floating point = Relational expression	When s1.FL = s2.FL, d ← 1 When s1.FL ≠ s2.FL, d ← 0 s1 and s2 are compared as floating point (32-bit).
	d.m = s1.FL == s2.FL	Floating point = Relational expression	When s1.FL = s2.FL, d.m ←1 When s1.FL ≠ s2.FL, d.m ← 0 s1 and s2 are compared as floating point (32-bit).
26	d = s1 <> s2	<> Relational expression	When s1 = s2, d ← 0 When s1 ≠ s2, d ← 1
	d.m = s1 <> s2	<> Relational expression	When s1 = s2, d.m ← 0 When s1 ≠ s2, d.m ← 1
27	d = s1.S <> s2.S	Signed <> Relational expression	When s1.S = s2.S, d. ← 0 When s1.S ≠ s2.S, d ← 1 s1 and s2 are compared as signed 16-bit binary or signed 32-bit binary.
	d.m = s1.S <> s2.S	Signed <> Relational expression	When s1.S = s2.S, d.m ← 0 When s1.S ≠ s2.S, d.m ← 1 s1 and s2 are compared as signed 16-bit binary or signed 32-bit binary.
28	d = s1.FL <> s2.FL	Floating point <> Relational expression	When s1.FL = s2.FL, d ← 0 When s1.FL ≠s2.FL, d ← 1 s1 and s2 are compared as floating point (32-bit).
	d.m = s1.FL <> s2.FL	Floating point <> Relational expression	When s1.FL = s2.FL, d.m ← 0 When s1.FL ≠s2.FL, d.m ← 1 s1 and s2 are compared as floating point (32-bit).
29	d = s1 < s2	< Relational expression	When s1 < s2, d ← 1 When s1 ≥ s2, d ← 0
	d.m = s1 < s2	< Relational expression	When s1 < s2, d.m ← 1 When s1 ≥ s2, d.m ← 0
30	d = s1.S < s2.S	Signed < Relational expression	When s1.S < s2.S, d ← 1 When s1.S ≥ s2.S, d ← 0 s1 and s2 are compared as signed 16-bit binary or 32-bit binary.
	d.m = s1.S < s2.S	Singed < Relational expression	When s1.S < s2.S, d.m ← 1 When s1.S ≥ s2.S, d.m ← 0 s1 and s2 are compared as signed 16-bit binary or signed 32-bit binary.
31	d = s1.FL < s2.FL	Floating point < Relational expression	When s1.FL < s2.FL, d ← 1 When s1.FL ≥ s2.FL, d ← 0 s1 and s2 are compared as floating point (32-bit).
	d.m = s1.FL < s2.FL	Floating point < Relational expression	When s1.FL < s2.FL, d.m ← 1 When s1.FL ≥ s2.FL, d.m ← 0 s1 and s2 are compared as floating point (32-bit).

No.	Ladder symbol	Command name	Process description
32	d = s1 <= s2	<= Relational expression	When s1 ≤ s2, d ← 1 When s1 > s2, d ← 0
	d.m = s1 <= s2	<= Relational expression	When s1 ≤ s2, d.m ← 1 When s1 > s2, d.m ← 0
33	d = s1.S <= s2.S	Signed <= Relational expression	When s1.S ≤ s2.S, d ← 1 When s1.S > s2.S, d ← 0 s1 and s2 are compared as signed 16-bit binary or 32-bit binary.
	d.m = s1.S <= s2.S	Signed <= Relational expression	When s1.S ≤ s2.S, d.m ← 1 When s1.S > s2.S, d.m ← 0 s1 and s2 are compared as signed 16-bit binary or 32-bit binary.
34	d = s1.FL <= s2.FL	Floating point <= Relational expression	When s1.FL ≤ s2.FL, d ← 1 When s1.FL > s2.FL, d ← 0 s1 and s2 are compared as floating point (32-bit).
	d.m = s1.FL <= s2.FL	Floating point <= Relational expression	When s1.FL ≤ s2.FL, d.m ← 1 When s1.FL > s2.FL, d.m ← 0 s1 and s2 are compared as floating point (32-bit).
35	d = s1 > s2	> Relational expression	When s1 > s2, d ← 1 When s1 ≤ s2, d ← 0
	d.m = s1 > s2	> Relational expression	When s1 > s2, d.m ← 1 When s1 ≤ s2, d.m ← 0
36	d = s1.S > s2.S	Signed > Relational expression	When s1.S > s2.S, d ← 1 When s1.S ≤ s2.S, d ← 0 s1 and s2 are compared as signed 16-bit binary or signed 32-bit binary.
	d.m = s1.S > s2.S	Signed > Relational expression	When s1.S > s2.S, d.m ← 1 When s1.S ≤ s2.S, d.m ← 0 s1 and s2 are compared as signed 16-bit binary or singed 32-bit binary.
37	d = s1.FL > s2.FL	Floating point > Relational expression	When s1.FL > s2.FL, d ← 1 When s1.FL ≤ s2.FL, d ← 0 s1 and s2 are compared as floating point (32-bit).
	d.m = s1.FL > s2.FL	Floating point > Relational expression	When s1.FL > s2.FL, d.m ← 1 When s1.FL ≤ s2.FL, d.m ← 0 s1 and s2 are compared as floating point (32-bit).
38	d = s1 >= s2	>= Relational expression	When s1 ≥ s2, d ← 1 When s1 < s2, d ← 0
	d.m = s1 >= s2	>= Relational expression	When s1 ≥ s2, d.m ← 1 When s1 < s2, d.m ← 0
39	d = s1.S >= s2.S	Signed >= Relational expression	When s1.S ≥ s2.S, d ← 1 When s1.S < s2.S, d ← 0 s1 and s2 are compared as signed 16-bit binary or singed 32-bit binary.
	d.m = s1.S >= s2.S	Signed >= Relational expression	When s1.S ≥ s2.S, d.m ← 1 When s1.S < s2.S, d.m ← 0 s1 and s2 are compared as signed 16-bit binary or singed 32-bit binary.
40	d = s1.FL >= s2.FL	Floating point >= Relational expression	When s1.FL ≥ s2.FL, d ← 1 When s1.FL < s2.FL, d ← 0 s1 and s2 are compared as floating point (32-bit).
	d.m = s1.FL >= s2.FL	Floating point >= Relational expression	When s1.FL ≥ s2.FL, d.m ← 1 When s1.FL < s2.FL, d.m ← 0 s1 and s2 are compared as floating point (32-bit).

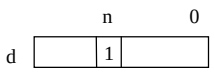
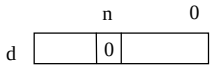
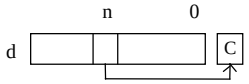
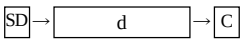
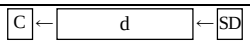
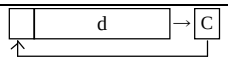
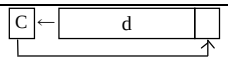
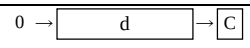
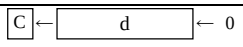
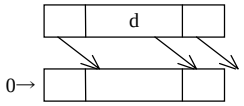
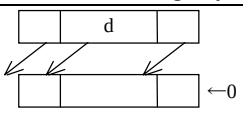
No.	Ladder symbol	Command name	Process description
41	d.S = INTG (s.FL)	Floating point operation (Real number to Integer)	Converts a real number to an integer. [FUN 100(s) / FUN 101(s)]
42	d.FL = FLOAT (s.S)	Floating point operation (Integer to Real number)	Converts an integer to a real number. [FUN 102(s) / FUN 103(s)]
43	d.FL = RAD (s.FL)	Radian conversion (Floating point operation)	Converts a degree to a radian. [FUN 108(s)]
44	d.FL = DEG (s.FL)	Degree conversion (Floating point operation)	Converts a radian to a degree. [FUN 109(s)]
45	d = ABS (s.S)	Absolute value	Stores an absolute value of s in d, and a sign value of s in carry (R7F0). (0:Positive, 1:Negative) [ABS (d, s)]
46	d.S = SGET (s)	Sign addition	If a value of carry (R7F0) is 0, a value of s is stored without change, and if it is 1, two's compliment of s is stored. [SGET (d, s)]
47	d.S = EXT (s.S, n)	Sign expansion	Copies a sign bit value of s to all bits from the n bit to the MSB of d, and stores the value of s in the lower word of d. [EXT(d, s)]
48	d= NEG (s)	Two's complement	Stores two's complement of a value stored in I/O No. s in d. [NEG(d)]
49	d = SQR (s) d.FL = SQR (s.FL)	Binary square root	Calculates the square root of a 32-bit binary value. [FUN 60 (s) / FUN 116(s)]
50	d = BSQR (s)	BCD square root	Finds the square root of a value (8-digiti BCD) of s, and stores it in d (4-digit BCD). [SQR (d, s)]
51	d = POW (s, n) d.FL = POW (s.FL, n.FL)	Power	Calculates the power.
52	d = SIN (s)	Sine function (unit: Degree)	Calculates the sine of the value indicated by s, and stores the result in s+1 and s+2. [FUN 10 (s)]
53	d.FL = SINR (s.FL)	Sine function (unit: Radian)	Calculates the sine of the radian unit system by floating point. [FUN 110(s)]
54	d = COS (s)	Cosine function (unit: Degree)	Calculates the cosine of the value indicated by s, and stores the result in s+1 and s+2. [FUN 11 (s)]
55	d.FL = COSR (s.FL)	Cosine function (unit: Radian)	Calculates the cosine of the radian unit system by floating point. [FUN 111(s)]
56	d = TAN (s)	Tangent function (unit: Degree)	Calculates the tangent of the value indicated by s, and stores the result in s+1 and s+2. [FUN 12 (s)]
57	d.FL = TANR (s.FL)	Tangent function (unit: Radian)	Calculates the tangent of the radian unit system by floating point. [FUN 112(s)]
58	d = ASIN (s)	Arc sine function (unit : Degree)	Calculates the arc sine of the value indicated by s(fractional portion) and s+1 (integer portion), and stores the result in s+2. [FUN 13 (s)]
59	d.FL = ASINR (s.FL)	Arc sine function (unit: Radian)	Calculates the arc sine of the radian unit system by floating point. [FUN 113(s)]

[ ]: Ladder symbol in EH/H series

No.	Ladder symbol	Command name	Process description
60	d = ACOS (s)	Arc cosine function (unit: Degree)	Calculates the arc cosine of the value indicated by s (fractional portion) and s+1 (integer portion), and stores the results in s+2. [FUN 14 (s)]
61	d.FL = ACOSR (s.FL)	Arc cosine function (unit: Radian)	Calculates the arc cosine of the radian unit system by floating point. [FUN 114(s)]
62	d = ATAN (s)	Arc tangent function (unit: Degree)	Calculates the arc tangent of the value indicated by s (fractional portion) and s+1 (integer portion), and stores the result in s+2. [FUN 15 (s)]
63	d.FL = ATANR (s.FL)	Arc tangent function (unit: Radian)	Calculates the arc tangent of the radian unit system by floating point. [FUN 115(s)]
64	d.FL = EXP (s.FL)	Exponent (Floating decimal operation)	Calculate the exponent. [FUN 117(s)]
65	d.FL = LOG (s.FL)	Natural logarithm (Floating decimal operation)	Calculates the logarithm of which the base is the natural logarithm. [FUN 118(s)]
66	d.FL = LOG10 (s.FL)	Common logarithm (Floating decimal operation)	Calculates the logarithm of which the base is the common logarithm.

[ ]: Ladder symbol in EH/H series

(5) Application command

No.	Ladder symbol	Command name	Process description
1	d = ADR (s)	I/O address conversion	Stores a real address of I/O specified by s in d. [ADRIO (d, s)] * d needs two words in EHV.
2	BSET (d, n)	Bit set	 Sets 1 to bit n.
3	BRES (d, n)	Bit reset	 Sets 0 to bit n.
4	BTS (d, n)	Bit test	 Takes the value of bit n in C(R7F0).
5	BCU (d, s)	Bit count	Stores the number of bits that 1 is stored in s (word and double word) in the I/O No. d.
6	SHR (d, n)	Shift right	 Shifts the right by n bits.
7	SHL (d, n)	Shift left	 Shifts the left by n bits.
8	ROR (d, n)	Rotate right	 Rotates the right by n bits.
9	ROL (d, n)	Rotate left	 Rotates the left by n bits.
10	LSR (d, n)	Logical shift right	 Shifts the rights by n bits.
11	LSL (d, n)	Logical shift left	 Shifts the left by n bits.
12	BSR (d, n)	BCD shift right	 Shifts BCD to the right by n digits.
13	BSL(d, n)	BCD shift left	 Shifts BCD to the left by n digits.
14	WSHR (d, n)	Batch shift right	Shifts n bits (or words) starting with the I/O No.d to the right by 1 bits (or 1 word).
15	WSHL (d, n)	Batch shift left	Shift n bits (or words) starting with the I/O No.d to the left by 1 bit (or 1 word).
16	WBSR (d, n)	Batch BCD shift right	Shift n-digit BCD starting with the I/O No.d to the right by 1 digit.
17	WBSL (d, n)	Batch BCD shift left	Shift n-digit BCD starting with the I/O No.d to the left by 1 digit.
18	BSHR (d, n)	Right-shift byte unit	Shifts the specified data train to the right by the specified number of bytes (8 bits *n). [FUN 48 (s)]
19	BSHL (d, n)	Left-shift byte unit	Shifts the specified data train to the left by the specified number of bytes (8 bits *n). [FUN 49 (s)]

[ ]: Ladder symbol in EH/H series

No.	Ladder symbol	Command name	Process description
20	BCD (d, s)	Binary →BCD conversion	Converts the value of s into BCD, and stores it in the I/O No.d. If the value of s is abnormal, DER(R7F4)=1 is set.
21	BIN (d, s)	BCD → Binary conversion	Converts the value of s into binary, and stores it in the I/O No.d. If the value of s is abnormal, DER(R7F4)=1 is set.
22	GRY (d, s) *	Binary → Grey code conversion	Converts the value (binary) of s into Grey code, and stores it in the I/O No.d.
23	GBIN (d, s) *	Grey code → Binary conversion	Converts the value (grey code) of s into binary and stores it in the I/O No.d.
24	BINDA (d, s)	BIN (16bit) → ASCII conversion	Converts 16-bit unsigned BIN data into decimal ASCII code, and stores it. [FUN 30 (s)]
25	SBINDA (d, s.S)	BIN (signed 32bit) → ASCII conversion	Converts 32-bit signed BIN data into the decimal ASCII code, and stores it. [FUN 31 (s)]
26	BINHA (d, s)	BIN → ASCII conversion (16bit / 32bit)	Converts 16-bit unsigned BIN data into ASCII code, and stores it. [FUN 32 (s) / FUN 33 (s)]
27	BCDDA (d, s)	BIN → ASCII conversion (16bit / 32bit)	Converts 16 / 32-bit BCD data (BCD 4 / 8-digit) into ASCII code, and stores it. [FUN 34(s) / FUN 35(s)]
28	DABIN (d, s)	ASCII → BIN conversion (16bit)	Converts unsigned BCD 5-digit data into ASCII code, and stores it. [FUN 36 (s)]
29	SDABIN (d.S, s)	ASCII → BIN conversion (signed 32bit)	Converts signed BCD 10-digit data into ASCII code, and stores it. [FUN 37 (s)]
30	HABIN (d, s)	ASCII → BIN conversion (16bit / 32bit)	Converts 4 / 8-digit hexadecimal ASCII code into 16 / 32-bit BIN data, and stores it. [FUN 38 (s) / FUN 39 (s)]
31	DABCD (d, s)	ASCII → BIN conversion (16bit / 32bit)	Converts 4 / 8-digit ASCII code into 4 / 8-digit BCD data, and stores it. [FUN 40 (s) / FUN 41(s)]
32	ASC (d, s, n)	BIN → ASCII conversion (Specifying)	Converts BIN data into ASCII code of the specified number of characters, and stores it. [FUN 42 (s)]
33	HEX (d, s, n)	ASCII → BIN conversion (Specifying)	Converts ASCII code of the specified number of characters into BIN data, and stores it. [FUN 43 (s)]
34	WTOB (d, s, n)	Word → Byte conversion	Divides 16-bit word data, and converts it into 8-bit byte data and stores it. [FUN 46 (s)]
35	BTOW (d, s, n)	Byte → Word conversion	Divides 8-bit word data, and combines into 16-bit byte data and stores it. [FUN 47 (s)]
36	NOT (d, s)	Reverse	Reverses the bit for the value of the I/O No. s, and stored it in d.
37	UNIT (d, s, n)	Unit	Stores the value of lower 4-bit of n words starting with s into the lower 4-bit each of d (word).
38	DIST (d, s, n)	Distribute	Extracts the value of s (word) in 4-bit each starting with LSB, and sets them in lower 4-bit of every word starting with the I/O No. d (word). Upper bits are set to 0.
39	SADD (d, s1, s2)	Character row combination	Units the specified character row (to NULL), and stores the result considering d the head address. [FUN 44 (s)]
40	SCMP (d, s1, s2)	Character row relation	Compares the specifies character rows (to NULL), and stores it in d. [FUN 45 (s)]

[ ]: Ladder symbol in EH/H series

* CPU: Supported by Ver.x103 or newer, C/E: Supported by Ver.1.04 or newer

No.	Ladder symbol	Command name	Process description
41	BITTOW (d, s, n)	Expansion bit data to word data	Sets the number of bits from the specified I/O No. to the specified the word I/O No. [FUN 127(s)]
42	WTOBIT (d, s, n)	Expansion word data to bit data	Sets the number of bits from the specified I/O No. to the specified the bit I/O No. [FUN 128(s)]
43	INTPL (s)	Linear interpolation	Calculates the linear expression out of two data in the table, and calculates data of the area between two points found by its expression and stores it.
44	INC (s)	Increment	Adds 1 to the number specified with word I/O or double word I/O. [FUN 123(s) / FUN 124(s)]
45	DEC (s)	Decrement	Subtracts 1 from the number specified with the word I/O or double word I/O. [FUN 125(s) / FUN 126(s)]
46	DSRCH (d, s1, s2, n)	Data search	Searches the specified data from the data row, and sets the data position and the number of data. [FUN 20 (s)]
47	TSRCH (d, s, n1, n2)	Data table search	Extracts the specified No. data table from the data row and stores it in the specified position. [FUN 21 (s)]
48	VSRCH (d, s1, s2, n)	Average, minimum, and maximum values search	Calculates average, minimum, and maximum values for the specified data table. [FUN 63 (s)]
49	SWAP (d, s)	Swap	Swaps the upper 8 bits and the lower 8 bits of the value (word) of for I/O No. s, and stored it in d.
50	XCG (d1, d2, n)	Block exchange	Exchanges the n bits (or words) range starting with the I/O No. d2 for the n bits (or words) range starting with the I/O No. d1.
51	MOV (d, s, n)	Block transfer	Transfers (copies) n bits (or words) data starting with the I/O No. s to the n bits (or words) range starting with the I/O No. s.
52	BMOV (d, s, n1, n2)	Bit block transfer	Considering the lower n1 bits one block in the I/O No. s, and transfers n2 blocks starting with the I/O No. d.
53	COPY (d, s, n)	Copy	Copies the bit data (or word data) of the I/O No. s to the n bits (or words) range starting with the I/O No. d.
54	BCOPY (d, s, n1, n2)	Bit block copy	Considering the lower n1 bits one block of the I/O No. s, and copies n2 blocks of the same block starting with the I/O No. d.
55	DECO (d, s, n)	Decode	Decodes the value indicated by the least significant n bits of s, and sets the bit corresponding to the decoding result of the bit row starting with the I/O No. d to 1.
56	ENCO (d, s, n)	Encode	Encodes the bit location in which 1 is set within the bit row, which starts with the I/O No. s and lasts for the amount of the n-th power of 2, and stores it in the I/O No. d. If multiple bits that contain 1 exist, the one with the upper bit locations will be encoded.
57	SEG (d, s)	7 segment decode	Converts the value of s as 1-digit 4-bit to the 4-digit 7-segment display code, and stores it in d.

[ ]: Ladder symbol in EH/H series

No.	Ladder symbol	Command name	Process description
58	RECSET (s, n)	Data storage (initial setting)	Performs the initial setting for RECEXE command (data storage).
59	RECEXE (s, n)	Data storage (execution)	Stores the specified data and the time data that the command is executed on the internal output table specified by RECSET command.
60	SEGCTL (s)	7 segment control	Displays the value from H00 to HFF on the 7-segment.
61	ALREF	I/O refresh (all points)	Refreshes all external I/O ranges. [FUN 80 (s)]
62	IOREF (s)	I/O refresh (Input/output/link specifying)	Refreshes only input range, only output range, and only link range. [FUN 81 (s)]
63	SLREF (s)	I/O refresh (any slot)	Refreshes the I/O at the specified slot. [FUN 82 (s)]
64	PIDIT (s)	PID operation initialization	Initialized the area for PID operation. [FUN 0(s)]
65	PIDOP (s)	PID operation execution control	Performs control for executing PID operation. [FUN 1(s)]
66	PIDCL (s)	PID operation calculation	Performs PID operation. [FUN 2(s)]
67	FIFIT (p, n)	FIFO initialization	Stores the value of n in the size range (p) of FIFO, and stores 0 in the FIFO used number range (p+1)
68	FIFWR (p, s)	FIFO write	Stores the value of the I/O No. s in the write position of FIFO, and adds 1 to the value of the FIFO used number range (p+1).
69	FIFRD (p, d)	FIFO read	Reads data from the read position of FIFO and stores it in d. Then shifts one data in FIFO and subtracts 1 from the value of the FIFO used number range (p+1).
70	CCCL (s)	Check code calculation	Creates check codes to add the data frame in general-purpose communication. [FUN22 (s)]
71	CCCMP (s)	Check code collation	Collates check codes of the receiving frame in general-purpose communication. [FUN23 (s)]
72	IFR (s)	Process stepping	Performs the process stepping processing. [FUN 4 (s)]
73	PGEN (s)	Dynamic scan pulse	Repeats ON/OFF motion several times, which is the specified number of scans. [FUN 61 (s)]
74	TMRNGE (d, s1, s2) *	Time range judgment	If the clock data (data for hour and minute) of PLC is s1 or more and less than s2, I/O specified by d turns on.

[ ]: Ladder symbol in EH/H series.

* CPU: Supported by Ver.x105 or newer, C/E: Supported by Ver.1.20 or newer

(6) Control command

No.	Ladder symbol	Command name	Process description
1	END	Normal scan end	Indicates the normal scan end, and re-executes the normal can from the head of the normal scan.
2	CEND (s)	Scan conditional end	Re-executes the normal scan from the head of the normal scan when s=1, while the next command is executed when s=0.
3	JMP n	Unconditional jump	Jumps to LBL n of the same No.n.
4	CJMP n (s)	Conditional jump	Jumps to LBL n of the same No. n when s=1, while the next command is executed when s=0.
5	LBL n	Label	Indicates the jump destination of JMP and CJMP of the same No.n.
6	FOR n (s)	FOR	Jumps to next position after NEXT n of the same No.n when s=0, while the next command is executed when s ≠0.
7	NEXT n	NEXT	Subtracts 1 from the value of s of the FOR n of the same No.n, and jumps to FOR n.
8	CAL n	Call subroutine	Executes SB n subroutine of the same No.n.
9	SB n	Start subroutine	Indicates the start of No.n subroutine.
10	RTS	RETURN subroutine	Returns from subroutine.
11	INT (s)	Start constant cycle scan	Indicates the start of interrupt scan/constant cycle scan of the cycle [ms]. [NT 0, INT 1, INT 2, INT 3]
12	RTI	RETURN constant cycle scan	Returns from interrupt scan/constant cycle scan.

[ ]: Ladder symbol in EH/H series.

(7) Command for CPU serial port

No.	Ladder symbol	Command name	Process description
1	TRNS 0 (s, t)	General-purpose port transmission command	Transmits data from the CPU general-purpose port. [TRNS 0 (d, s, t)]
2	RECV 0 (s, t)	General-purpose port receiving command	Receives data from the CPU general-purpose port. [RECV 0 (d, s, t)]
3	MBMST (s, t) *1	Modbus protocol query transmitting command	Performs serial communication with Modbus protocol by CPU general-purpose port.
4	MBTCL (s, t) *2	Modbus TCP client command	Performs ethernet communication with Modbus protocol by CPU ethernet port.

[ ]: Ladder symbol in EH/H series.

*1 CPU: Supported by Ver.x107 or newer, C/E: Supported by Ver.2.00 or newer

*2 CPU: Supported by Ver.x121 or newer, C/E: Supported by Ver.2.00 or newer

(8) Transfer command for high-function module

No.	Ladder symbol	Command name	Process description
1	TRNS 9 (d, s, t)	EH-SIO transmission and receiving command	Transmits and receives data to and from EH-SIO with the CPU ladder program.
2	EXMEIT (s)	Explicit message sending and receiving initial setting	Performs the initial setting for executing EXMEEX. [FUN 163 (s)]
3	EXMEEX	Explicit message sending and receiving execution	Issues Explicit message to other node on DeviceNet through EH-RMD. [FUN 162 (s)]
4	QP4INIT (s)	EH-POS4 initializing (Command completion type)	Sets the initial command to EH-POS4.
5	QP4CTRL (s)	EH-POS4 control (Command completion type)	Sets the command to EH-POS4, and stands by until EH-POS4 recognizes the commands.
6	P4INIT (s)	EH-POS4 initializing (Division type)	Sets the initial command to EH-POS4.
7	P4CTRL (s)	EH-POS4 control (Division type)	Sets the command to EH-POS4, and monitors that EH-POS4 recognizes the command.
8	XYRW (d, t)	Extension XY area read and write command	Read and write command which is using XY area. [FUN 200 (s)]
9	SCRW (d, t)	Status control area read and write command	Command which reads and writes data in status control area. [FUN 201 (s)]

[ ]: Ladder symbol in EH/H series.

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